MSD POWERSPORTS

Tech Tips • Diagrams • Troubleshooting

ATV
Go-Ped
Go-Kart
Motorcycle
Snowmobile
Watercraft

MSD®
POWERSPORTS

Wiring Diagrams and Tech Notes

MSD Tech line: (888) 258-3835
WWW.MSDPOWERSPORTS.COM

CONTENTS

Service

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

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 (915) 855-7123 or fax a request to (915) 857-3344. Send the unit prepaid with proof of purchase to the attention of: **MSD Powersports, Customer Service - RMA #, 12120 Esther Lama, Dock 5, El Paso, Texas 79936.**

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 after receipt, COD/Cashiers Check for any charges. For more information, call the MSD Powersports Customer Service Line **(915) 858-3365**. MSD Powersports technicians are available from 8:00 a.m. to 5:00 p.m. Monday - Friday (Mountain Time).

Limited Warranty

MSD Powersports warrants this product to be free from defects in material and workmanship under its intended normal use* and if properly installed, for a period of one year from the date of original purchase. If found to be defective as mentioned above, it will be repaired or replaced at the option of MSD Powersports. Any item that is covered under this warranty will be returned free of charge through standard shipping methods. If faster service is required the customer has the option of paying for this service.

This shall constitute the sole remedy of the purchaser and the sole liability of MSD Powersports. To the extent permitted by law, the foregoing is exclusive and in lieu of all other warranties or representations whether expressed or implied, including any implied warranty of merchantability or fitness. In no event shall MSD Powersports 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 Powersports. Any modifications to this item or if it is used on an application other than what MSD Powersports 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 Powersports will accept no liability for custom applications.

WIRING DIAGRAMS AND TECH NOTES

MSD believes that customer service does not end at just producing the best ignition components available, but helping the customer is also a number one priority. That is why we have assembled this MSD Ignition Wiring Diagrams and Tech Notes Book. This book is a collection of component installation procedures, applications and technical information. Wiring descriptions and troubleshooting procedures for most MSD products can be found within these pages.

Once you buy an MSD Ignition, you will never be alone. We stand behind our products with a highly trained customer service staff that is more than willing to answer your questions and give you component recommendations. Our Customer Support Technicians are available by phone, fax and email. If you cannot find a wiring diagram for your specific application or simply need more information, contact our Customer Support Technicians at (888) 258-3835 or (915) 858-3365. Our trained technicians are available from 8 - 5 (MST) to answer your questions or comments. You can also email the techs at msdtech@msdignition.com and will generally receive a reply within 48-72 hours.

Good luck in your performance and racing endeavors and remember, technical assistance is only a few pages, key strokes or a phone call away.

REPAIR AND SERVICE

If you would like to have your MSD components tested during the off season or need something repaired, you can send your MSD parts to our Customer Support Department and have them inspected by specialized technicians for a minor cost.

When an Ignition Control comes in to be checked, all of the circuits are closely inspected and any updates that we may have made since your component was built will be installed (except on potted units). Prices are capped at a very reasonable rate but it varies between products. Check with our Customer Support Techs for an estimate on your components.

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 (915) 855-7123 or fax a request to (915) 857-3344. Send the unit prepaid with proof of purchase to the attention of: **MSD Powersports, Customer Service - RMA #, 12120 Esther Lama, Dock 5, El Paso, Texas 79936.**

When sending a component in, leave all of the wires at the length in which they are installed. Also include a detailed description of any problems and what components and accessories are being used. Repair usually takes 10 - 18 working days. The repaired unit will be delivered by ground shipping, COD for any charges. Send the components to:

MSD Ignition, Customer Service Department, 12120 Esther Lama, Dock 5, El Paso, TX 79936.

GENERAL INSTALLATION TIPS

Mounting

MSD Ignition Controls are designed to withstand high temperatures and can be mounted in any location except next to heat sources. Mounting the unit in an enclosed area is not recommended. When running, the housing of the MSD will be hot to the touch.

When a suitable location is found, make sure the wires and harness will reach the coil and battery. Use the ignition as a template and mark the mounting hole locations. Remove the ignition and drill the mounting hole locations. If extremely high vibrations and shocks are expected, use a set of MSD Vibration Mounts to help protect the ignition. The mounts come in sets of four; PN 8823.

Sealing MSD Units

While applying some type of sealant between the MSD case and base plate would seem to be smart, it is not recommended. All MSD Ignitions have a special water resistant treatment to prevent water damage. By sealing the base plate to the case the condensation and water that seeps past the cables is trapped in the unit which may result in corrosion. Always allow the unit to drain by not sealing the base plate.

Wiring Tips

When making permanent electrical connections it is imperative that proper terminals, connectors and soldering be used. Using connectors such as MSD's Weathertight or Deutsch connectors provide positive locking, sealed connections. Never simply "twist and tape" wires together. Faulty wiring will result in ignition and electrical problems.

MSD Power Cables

The Power Cables of the MSD Ignitions are the heavy (12 gauge) Red and Black wires. The Black wire connects to battery negative (-) or ground and the Red goes to battery positive (+). No switch or fuse should be used.

The Red wire must be connected directly to the battery positive terminal or to the constant positive side of the starter solenoid.

Grounds

A poor ground connection can cause many frustrating problems. When a wire is specified to go to ground it should be connected to the battery negative terminal, engine block or a common solid ground on the chassis. Always connect the ground to a clean, paint free metal surface and always have a ground strap between the engine and the chassis. **Do not rely on solid engine mounts as a ground between the chassis and engine.**

Wire Lengths

The power leads and the wires of the MSD can be shortened, however the correct connectors should be properly installed and soldered in place. If the wires of your MSD Ignition are not long enough for your application, they can be lengthened if properly done. If lengthening the heavy Power Cables, the next size larger (10 gauge) must be used. For the 14 gauge wiring, use the same size or 12 gauge. Always take the time to solder and insulate these connections. Doing it right the first time will save you frustration later!

Battery

The battery is one of the most important parts of the electrical system. A MINIMUM battery rating, when used with an alternator, should be no less than 25 amp/hours. If no alternator is used, allow at least 15 amp/hour for every 1/2 hour of MSD operation. If the engine is cranked using the same battery or other accessories such as fuel pumps and electric fans are used, the rating should be more.

In all cases, to ensure adequate running time, the battery should be fully charged at the start of operation. A fully charged 12 volt battery will read around 12.6 volts on a voltmeter and should not drop below 8 volts when cranking. Each cell of a fully charged battery will read 1.260 on a hydrometer.

An MSD Ignition Control will operate at full strength with 11-18 volts.

Here are a few battery tips on charging and jump starts:

- When charging the battery, DO NOT run the engine. Some chargers may produce potentially damaging high voltage spikes that could damage the ignition control.
- It is not necessary to disconnect the MSD when charging the battery, as long as the charger is making good contact with the battery.
- Receiving a jump from another battery or vehicle will not damage the MSD Ignition.

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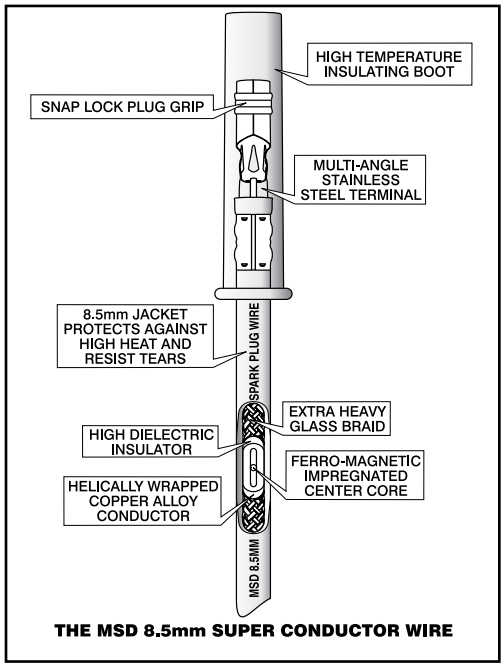
SPARK PLUG WIRES AND SPARK PLUGS

Spark Plug Wires

Spark plug wires have two main objectives; transfer the spark energy to the plugs and suppress the Electro Magnetic Interference (EMI) that the spark voltage projects. Too high of resistance decreases the spark energy, yet too low of resistance may generate too much EMI noise which will interfere with the operation of other electronics on the vehicle. A good quality wire, proper routing and routine inspection are all important in getting the most performance out of your ignition system.



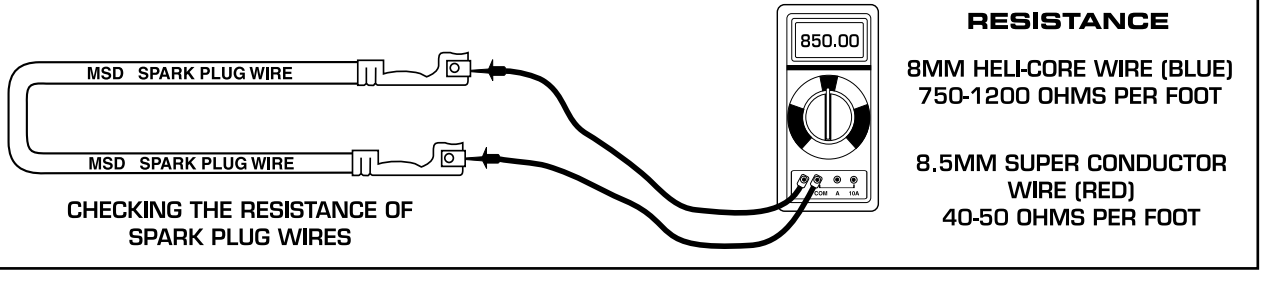
THE MSD 8.5mm SUPER CONDUCTOR WIRE

MSD offers two great spark plug wires; Heli-Core Wire and the 8.5mm Super Conductor Wire. The Heli-Core Wires are a premium performance wire upgrade for any car or truck. For serious performance, the 8.5mm Super Conductor Wire is the wire of choice. Both sets of wires feature a conductor that is helically wound around a special center core that is designed to suppress, or choke, EMI. Helically wound, sometimes called spiral core, must be used with an MSD Ignition Control. Solid core wires do not suppress EMI so there could be interference with the ignition or other electronics on the vehicle.

The Super Conductor Wire has less than 50 ohms per foot, the lowest available in a helically wound wire. A special copper-alloy conductor is wrapped very tightly around a ferro-magnetic impregnated center core which gives the wire extremely high EMI suppression. This design ensures that optimum spark energy will reach the spark plugs while EMI noise is held at a minimum.

Note: Solid Core spark plug wires cannot be used with any MSD Ignition controls or Pro Mags.

Just like tires, oil or spark plugs, the spark plug wires are a maintenance item. Service of the wires hinges on your application and ignition control. If you have a 6AL Ignition and use the car as a daily driver, the wires will last for thousands of miles. Conversely, if you are racing a high compression engine with nitrous and an MSD 10, the wires should be inspected and even replaced during the race season. When checking wires, closely inspect for signs of burning or arc-through. Look at the boots for signs of cracking or burning and using an ohm meter to check resistance of each wire is a good idea. Also, keep in mind that the coil wire is delivering eight times the spark so it should be checked closely. When checking resistance of the wires note that the longer wires will have more total resistance, but their values should average out. If one wire stands out among the others, it should be replaced.



CHECKING THE RESISTANCE OF SPARK PLUG WIRES

RESISTANCE

8MM HELI-CORE WIRE (BLUE)
750-1200 OHMS PER FOOT

8.5MM SUPER CONDUCTOR WIRE (RED)
40-50 OHMS PER FOOT

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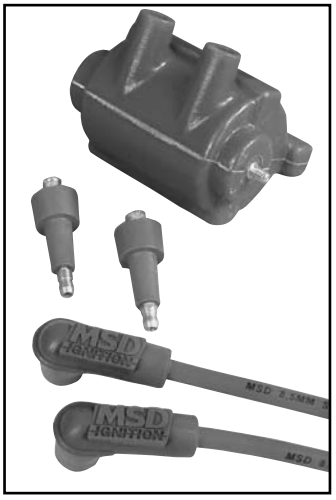
SPARK PLUG WIRES AND SPARK PLUGS

Plug Wire Tip

To keep your engine's spark plug wires in tip-top condition there are a few simple steps you can take. For starters, apply a small amount of MSD Spark Guard, PN 8804, a dielectric grease, to each wire terminal. This keeps any moisture out of the boot while lubricating and insulating the terminal-to-plug connection. It also aids in pulling the plug socket off without tearing the boot or wire.



Extra protection from heat is always a good idea. MSD wires have a very durable sleeve but in applications with tight engine compartments and close exhaust systems, additional protection is a benefit. MSD offers Pro-Heat Sleeve, PN 3411, a silicone coated woven glass sleeve that slides over your wires for added protection. If you're looking for protection around the boot MSD's Pro-Boot Guard, PN 3412, is the answer. This is an extra thick sleeve of woven glass with a silicone coating and will protect the boot from excessive heat.

Another important point to consider is the way the plug wires are routed. Using good wire separators is a key in preventing inductive crossfire which occurs when two wires that are consecutive in the firing order are run next to each other. MSD offers a variety of Separators that will help position the wires away from exhaust manifolds and sharp edges while keeping the engine compartment looking good.

Spark Plug

Choosing the correct spark plug design and heat range is important when trying to get all the performance possible. Since there are so many engine combinations and manufacturers, MSD cannot recommend which plug or what size gap is exactly right for your application. It is recommended to follow the engine builder's or manufacturer's recommendations for plug heat range and gap.

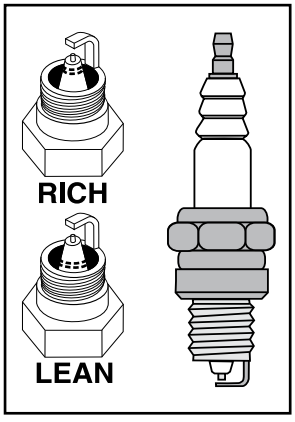
Once a proper plug is selected, you can experiment with the gap to get the best performance. By using these recommendations as a starting point, you can experiment by opening the gap in 0.005" increments then test. When the performance falls off, the gap is too large. Carbureted or fuel injection engines can use larger gaps, but turbo or supercharged engines should stick with the smaller gap. If no significant gains are achieved, go with the smaller gap. Remember, the larger gap taxes the plug, wires, cap and rotor.

Rule of Thumb Plug Gap

COMPRESSION	GAP
UP TO 10.5:1	.040 - .045
10.5:1 - 13:1	.032 - .040
OVER 13:1	.025 - .032

Note: These are recommended for normally aspirated engines only. Reduce the gap for blower, turbo or nitrous applications.

After changing the gap, reading the spark plugs is a helpful tool in getting the right tune up. The air/fuel ratio and how it's burning can be read on the ceramic portion of the spark plug. A ring can be seen where the effective heat transfer takes place. The closer this ring is to the tip, the richer the mixture. Closer to the base of the plug means the engine is running more lean.



NITRO PROGRAMMABLE IGNITION
PN 4215

WIRING FUNCTIONS

		Power Leads	These are the two heavy 12 gauge wires and are responsible for getting direct battery voltage to the ignition. The Ignition is load protected from reverse battery connections and will automatically shut down if there is over 27 volts input. Do not connect to batteries over 16 volts!
CDI Unit / HEI Unit		**Heavy Red**	This wire connects directly to the battery positive (+) terminal or a positive battery junction such as the starter solenoid. Minimun 10V to Maximum 16V. Note: Do not connect to the alternator.
CDI Unit / HEI Unit		**Heavy Black**	This wire connects to a good ground, either at the battery negative (-) terminal or to the engine. Note: Engine must be grounded to battery negative.
		Ignition Switch	
		Red	This wire is responsible for turning the Nitro-Harley Ignition On and Off as well as supplying power to the triggers. Connect to a switched 12 volt source such as the ignition key or switch. Also recommended for lanyards.
CDI		**Coils**	
CDI	Two Pin Connector Coil A	**Brown/Orange**	This wire connects to the coil A positive (+) terminal.
CDI	Two Pin Connector Coil A	**Brown/White**	This wire connects to the coil A negative (-) terminal.
CDI	Two Pin Connector Coil B	**Brown/Orange**	This wire connects to the coil B positive (+) terminal.
CDI	Two Pin Connector Coil B	**Brown/Green**	This wire connects to the coil B negative (-) terminal.
Inductive		**Coils**	
Inductive	Two Pin Connector Coil A	**Red**	This wire connects to the Inductive coil A positive (+) terminal.
Inductive	Two Pin Connector Coil A	**Black**	This wire connects to the Inductive coil A negative (-) terminal.
Inductive	Two Pin Connector Coil B	**Red**	This wire connects to the Inductive coil B positive (+) terminal.
Inductive	Two Pin Connector Coil B	**Black**	This wire connects to the Inductive coil B negative (-) terminal.
		Trigger Pickups	
4 - Pin Connector		**White/Blue**	+12V to Trigger Pickups
4 - Pin Connector		**Black**	Ground to Trigger Pickups
4 - Pin Connector		**White (Coil A)**	This wire connects to the trigger pickups (***3-Magnet Rotor Only PN 4216***).
4 - Pin Connector		**Green (Coil B)**	This wire connects to the trigger pickups (***3-Magnet Rotor Only PN 4216***).
		6 Pin Connector	Provides power and triggers from CDI to HEI unit.

Accessories

Launch Control	
Dark Blue	When 12 volts are applied, this wire activates several features including; Launch Retard value, Launch Timing Curve and will reset the Shift Light sequence to 1st gear & Step 3 slope.
Tach Output	
Gray	Used to provide a tach signal to rpm sensing devices. 12 volt square wave with 30° duty cycle.

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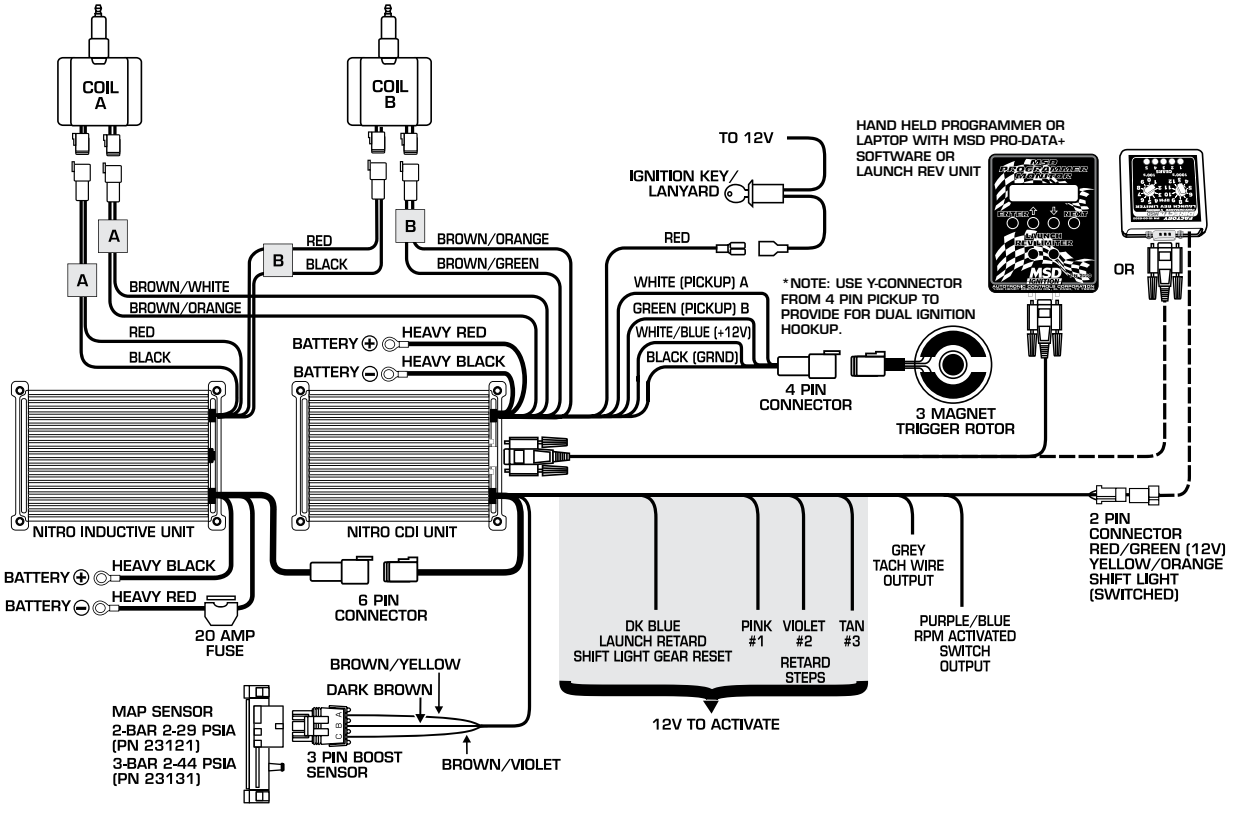
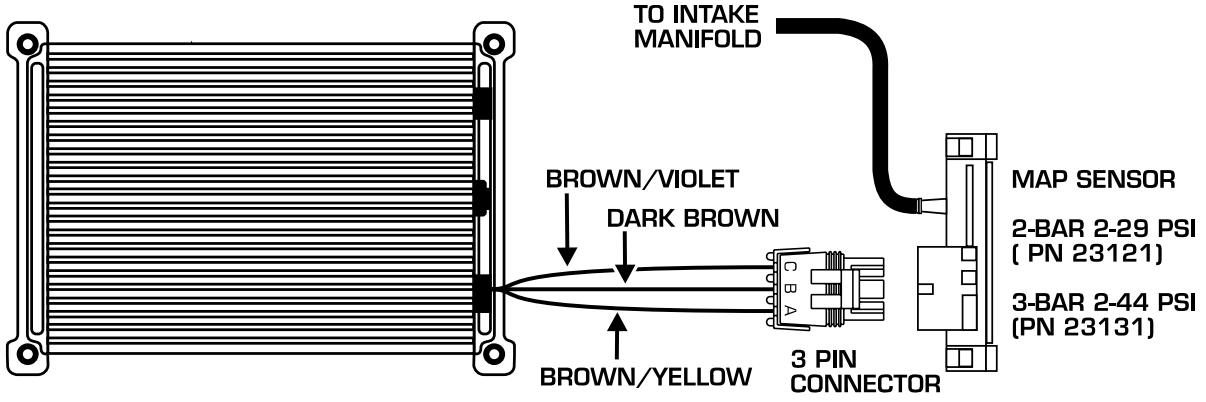
WIRING FUNCTIONS CONTINUED

3-Step Retard	
Pink	This wire activates the first retard stage when it is applied to 12 volts. When 12 volts are removed the retard is deactivated.
Violet	This wire activates the second retard stage when it is applied to 12 volts. When 12 volts are removed the retard is deactivated.
Tan	This wire activates the third retard stage when it is applied to 12 volts. When 12 volts are removed the retard is deactivated if ramp value = 0. Step 3 retard ramp can be activated by this wire providing a progressive retard ramp that is programmable from .1 to 9.9 seconds.
Shift Light/Shifter 2 Pin Connector	
Red/Green Yellow/Orange	Shift Light activation wire. Connects to the Shift Light PN 7552 or PN 4360 to any air shifter with a 3 amp or less current draw. A 3 amp fuse is in line on the Red/Green wire.
RPM/Time Switch	
Purple/Blue	RPM/Time Activation Switch. This wire will supply a ground to complete a circuit at a desired rpm. It will handle up to 3 amps continuous.
Map Sensor 3 Pin Connector	
Brown/Violet Brown/Yellow Dark Brown	Three Pin Connector - Used for an optional external pressure sensor for turbo applications. (2 - Bar/2-29 psia - PN 23121) (3 - Bar/2-44 psia - PN 23131).

2-CYLINDER SINGLE PLUG (CAMSHAFT TRIGGERED)

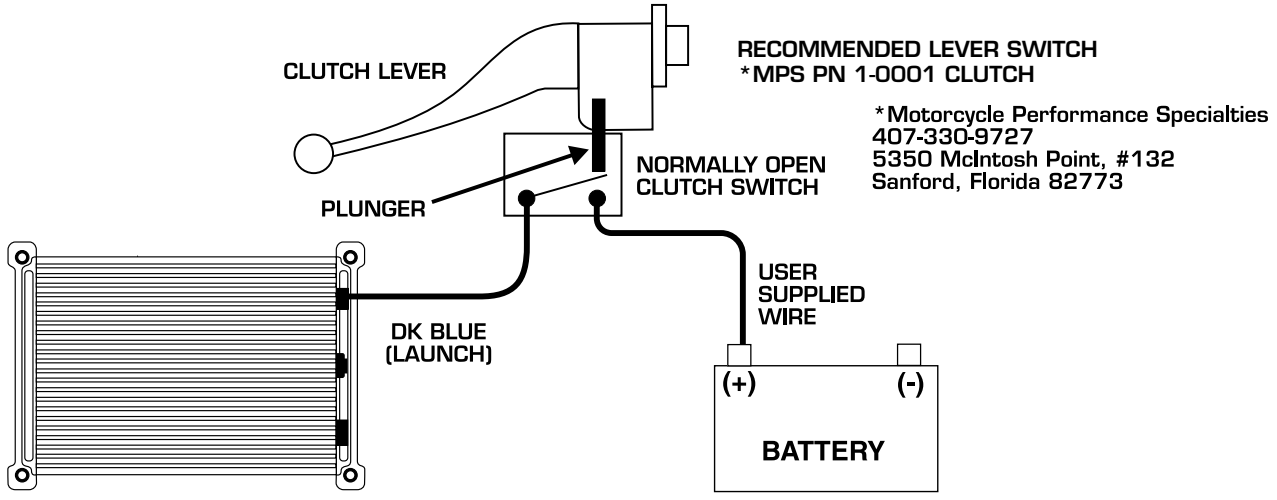


USING A MAP SENSOR.



NITRO PROGRAMMABLE CD CONTROL
PN 4215

WIRING DIAGRAM FOR THE LUANCH CONTROL.



DEFAULT SETTINGS AND ADJUSTMENTS

The following list shows all of the default values and adjustable increment of the Nitro Programmable Ignition.

Display	Default	Data Low-High (step by)
AlertsPer #	0	0-1 (1)
BoostSensor #Bar	3	2-3 (1)
BoostCurve Psia##.##	2.0	2.0-45.0 (.25)
BoostCurve RetDeg##.#	0	0.0-25.0 (.1)
Drop Rpm##00	600	200-1,500 (100)
LastGear#	2	2-3 (1)
LaunRet Deg##.#	0	0-30.0 (.5)
LaunRet Ramp #.##	.50	0-2.50 (.01)
RevMax ###00 Rpm	5,500	2,000-8,000 (100)
RpmTimeSw Sel$$$$	_RPM	_RPM-TIME
RpmSw RpmOn###00	2000	2000-8,000 (100)
RpmSw RpmOff###00	5000	2000-8,000 (100)
RunCurve Rpm###00	800	800-8,000 (100)
RunCurve RetDeg##.#	0	0.0-25.0 (.1)
ShiftLight#	1	1-2 (1)
ShiftLt1 Rpm###00	5,000	2,000-8,000 (100)
ShiftLt2 Rpm###00	5,500	2,000-8,000 (100)
SparkSEQ#	1	1-2 (1)
Spark1 Deg##.#	0	0-10.0 (.1)
Spark2 Deg##.#	0	0-10.0 (.1)
StartRetard Deg##	10	00-30
Step1 Deg##.#	2.0	0-25.0 (.1)
Step2 Deg##.#	3.0	0-25.0 (.1)
Step3 Deg##.#	5.0	0-25.0 (.1)
Step1 Rpm###00	800	800-8,000 (100)
Step2 Rpm###00	800	800-8,000 (100)
Step3 Rpm###00	800	800-8,000 (100)
Step1 Sec#.##	0	0-2.50 (.01)
Step2 Sec#.##	0	0-2.50 (.01)
Step3 Ramp#.#	0	0-9.9 (.1)
StepOffDelay#.##Sec	.50	0-2.50 (.01)
LaunchCurve Rpm###00	800	800-8,000 (100)
Launch CurveRetDeg##.#	0	0.0-25.0 (.1)
TimeCurve Sec##.##	0	0.0-12.50 (.05)
TimeCurve RetDeg##.#	0	0.0-25.0 (.1)
TimeSw OnDelay##.#	1.0	0.0-25.0 (.1)
TimeSw OnTime##.#	2.0	0.0-25.0 (.1)
ScanTime #Sec	1	1-9
ShiftLt $$$		OFF/ON
Rpm#####		monitor
RetSum##.#		monitor
Gear #		1-3
RpmTimeSw $$$		OFF/ON
Pressure ##.#		monitor
BoostRet##.##		monitor
Step1In $$$		OFF/ON
Step2In $$$		OFF/ON
Step3In $$$		OFF/ON
LaunchSec##.##		monitor
TimeRet##.#		monitor

TROUBLESHOOTING

Every MSD Ignition undergoes numerous quality control checks including a four hour burn-in test. If you experience a problem with your Nitro Programmable Ignition, our research has shown that the majority of problems are due to improper installation or poor connections. The Troubleshooting section has several checks and tests you can perform to ensure proper installation and operation of the Ignition. If you have any questions concerning your Ignition, call our Customer Support Department at (915) 858-3365, 8 - 5 Mountain Time, or e-mail at: tech@msdpowersports.com.

LED

The LED on the side of the Ignition monitors several operating conditions of the Ignition. If the LED indicates that there is a problem with the ignition system, follow the steps through the Troubleshooting section. The LED will appear to be on steady at above idle speeds when everything is functioning properly.

- A Code 2 (flash flash)will flash if the supply voltage drops below 10 volts, when operating below 3300 rpm.
- The LED will flash for every trigger signal from the crank trigger. You can take advantage of this when statically setting the timing of the engine.
- A Code 3 will flash if the input trigger signal in not correct.

TACH/FUEL ADAPTERS

If your tachometer does not operate correctly you probably need a Tach Adapter. The chart below lists common tachometers and if an Adapter is necessary.

Tachometer Compatibility List

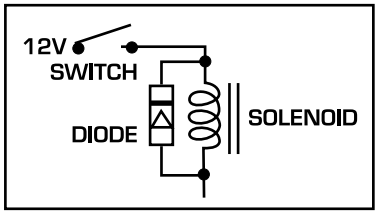
AFTERMARKET TACHOMETER	WHITE WIRE TRIGGER
AUTOGAGE	REQUIRED
AUTOMETER	NO TACH ADAPT REQUIRED
MALLORY	NO TACH ADAPT REQUIRED
MOROSO	NO TACH ADAPT REQUIRED
STEWART	REQUIRED
S.W. & BI TORX	REQUIRED
SUN	REQUIRED
VDO	REQUIRED

MISSES AND INTERMITTENT PROBLEMS

Experience at the races has shown that if your engine is experiencing a miss or hesitation at higher rpm, it is usually not directly ignition. Most probable causes include faulty wiring, a coil or plug wire failure, arcing from the boot plug to ground. Several items to inspect are:

WARNING: Do not touch the coil terminals during cranking or while the engine is running.

- Always inspect the plug wires at the plug for a tight connection and visually inspect for cuts, abrasions or burns. Dielectric grease such as Spark Guard, PN 8804, is also recommended.
- Inspect the Primary Coil Wire connections. **Caution:** There may be high voltage at the Coil Positive (+) terminal even with the key turned On. During cranking or while the engine is running, very high voltage will be present and no test equipment should be connected.
- Make sure that the battery is fully charged and the connections are clean and tight. If you are not running an alternator this is an imperative check. If the battery voltage falls below 11 volts during a race, the Ignition current draw will increase.
- Is the engine running lean? Inspect the spark plugs and complete fuel system.
- Inspect all wiring connections for corrosion or damage. Remember to always use proper connections followed by soldering and seal the connections completely.
- If you are using any inductive load on an ignition control wire, you may be getting a noise kick back which could cause stumbling of the ignition. Attach the supplied Diode to the solenoid.



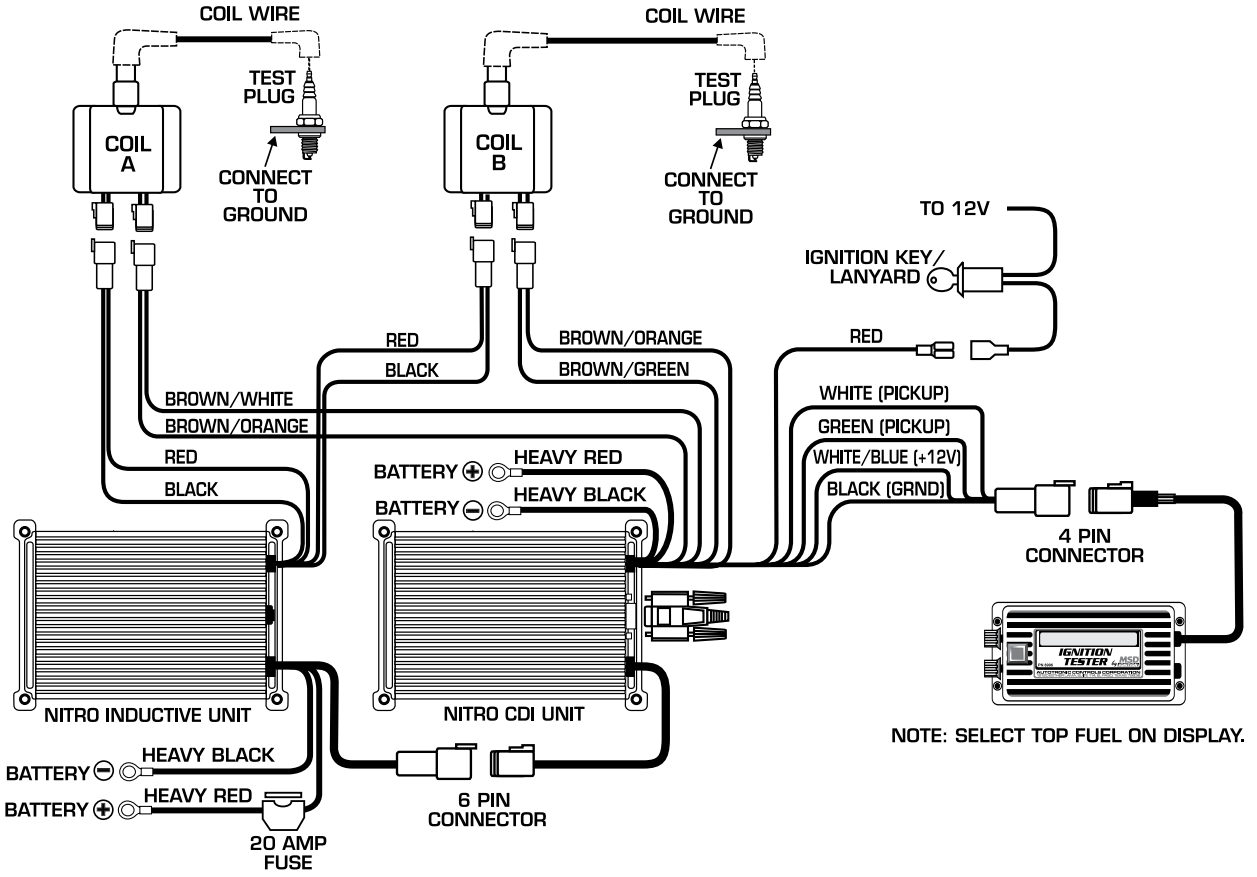
If everything checks positive, use the following procedure to test the ignition for spark.

MSD Powersports also offers a Nitro Ignition Tester, PN 43751. This tool allows you to check your complete ignition system while it is on the bike as well as the operation of rpm limits, activated switches and shift lights and the Cam Sync Signal.

CHECKING FOR SPARK

1. Make sure the ignition switch is in the “Off” position.
2. Remove the coil wires from the spark plugs and install test plugs to ground.
3. Disconnect the Nitro Ignition harness from the trigger pickups and connect to the tester.
4. Turn the ignition power On. Do not crank the engine. Select Top Fuel on display by pushing the red button.
5. Set the Tester to 1000-2000.
   A. If there is spark, verify the HEI coil is functioning by unplugging the red/black wire to the HEI coil. The spark intensity should decrease. If there is no change, the HEI coil may be defective, or the fuse may be blown on the Inductive Ignition unit.
   B. If spark intensity did not change, substitute another coil and repeat the test. If there is now a change in intensity, the coil is at fault.
6. If there is no spark:
   A. Inspect all of the wiring.
   B. Substitute another coil and repeat the test. If there is now spark, the coil is at fault.
   C. If there is still no spark, check to make sure there are 12 volts on the small Red wire from the Ignition when the key is in the On position. If 12 volts are not present, find another switched 12 volt source and repeat the test.
   D. If, after following the test procedures and inspecting all of the wiring, there is still no spark, the Harley-Nitro Ignition is in need of repair. See the Warranty and Service section for information.

WIRING THE TESTER.



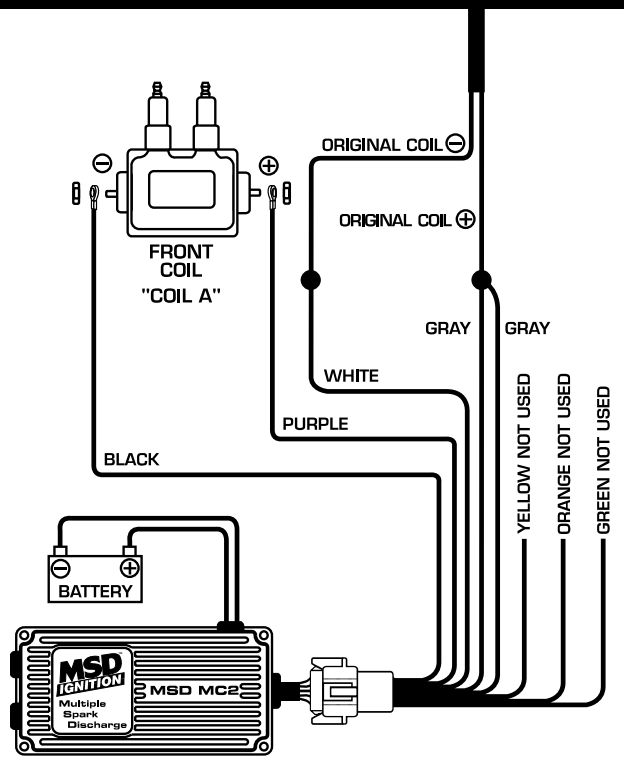
MSD MC-2 MOTORCYCLE IGNITION
PN 4220

WIRING FUNCTIONS	
RED	Connects directly to the battery positive (+) terminal or starter solenoid 12 volt terminal.
BLACK	Connects to the battery negative (-) terminal or the engine ground.
GRAY	Connects to switched 12 volt side of ignition switch. It switches the input voltage from the RED wire on and off.
WHITE	Connects to the "COIL A" trigger wire from the points or electronic amplifier (triggers the PURPLE and BLACK wire coil).
GREEN	Connects to the "B COIL" trigger wire from the points or electronic amplifier (triggers the ORANGE and YELLOW wired coil).
BROWN	Shift Interrupt wire interrupts the ignition output when applied to ground.
LIGHT BLUE	Activates the low rpm module when connected to ground.
SHORT BLUE LOOP	Cylinder select wire loop.

The following groups of two wires connect to the same components in different applications.

PURPLE/BLACK	Connects to the front coil, "COIL A" terminals. One to coil negative, the other to positive. It does not matter which wire.
ORANGE/YELLOW	Connects to the back coil, "COIL B" terminals. One to coil negative, the other to positive. It does not matter which wire.

WIRING TO A STOCK SINGLE COIL SYSTEM.



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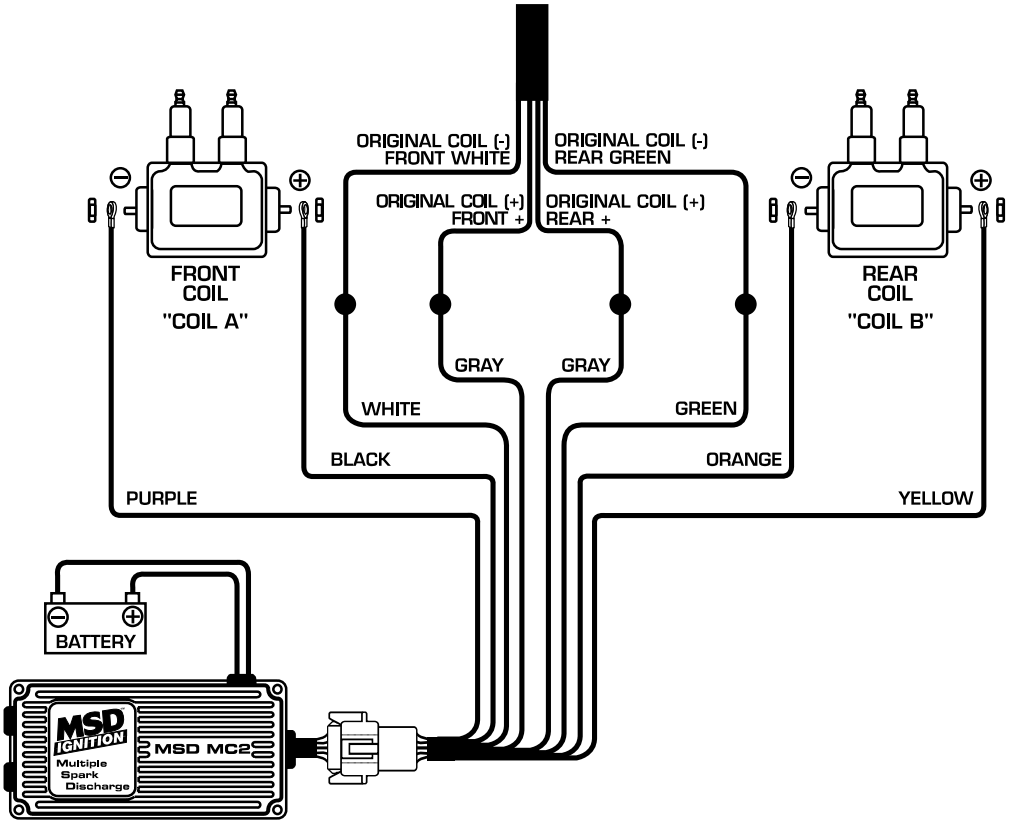
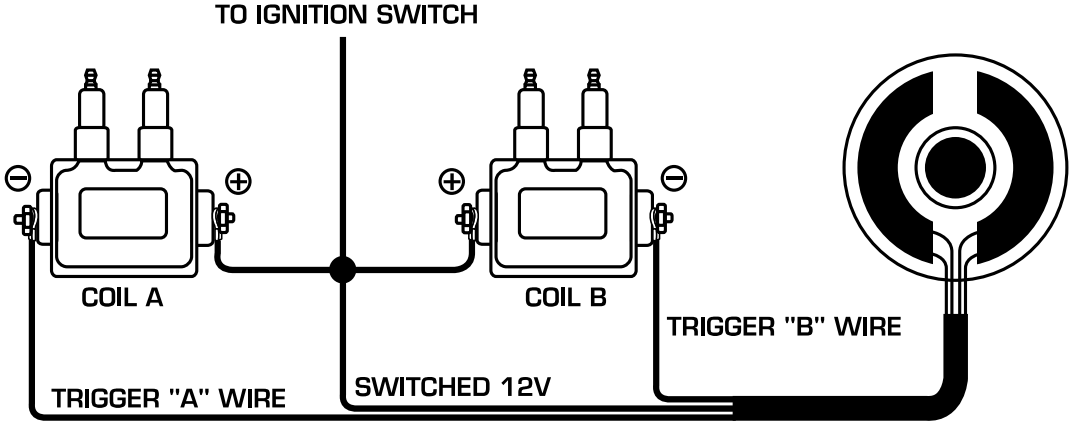
WIRING TO A STOCK DUAL COIL IGNITION SYSTEM.



AFTERMARKET AMPLIFIER TRIGGER

By using an aftermarket amplifier trigger system on some bikes, the factory timing curve and rev limit may be bypassed. Use the same wiring procedure as described in the Wiring to a Stock Ignition section.

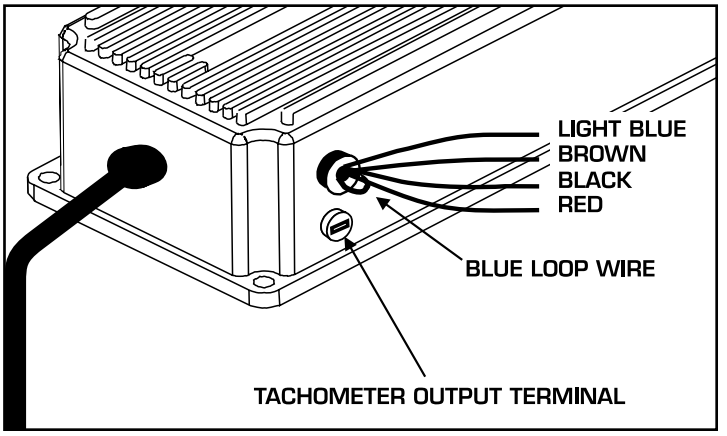
TYPICAL AFTERMARKET AMPLIFIER TRIGGER WITHOUT MC-2.



NOTE: DO NOT USE THE MC-2 WITH AFTERMARKET CDI IGNITIONS.

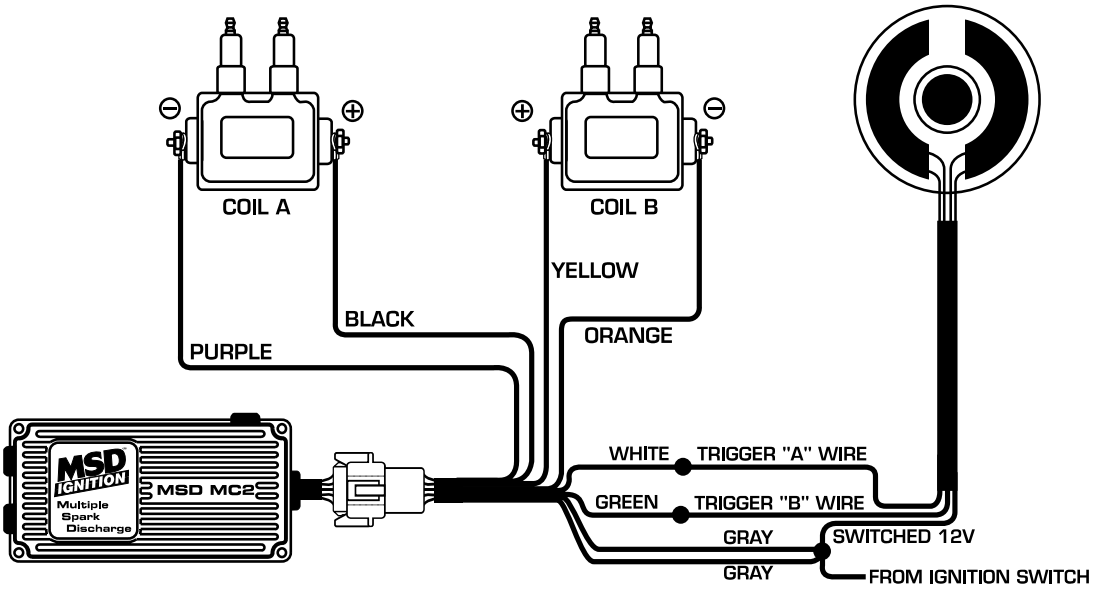
TACHOMETER OUTPUT

The MC-2 Ignition has a built-in tach output terminal. This terminal will directly drive many models of tachs. The output combines both input signals from either the points or electronic ignition amplifier into one signal. Due to this, it is possible for some tachs to read double the engine rpm. If the rpm reading is doubled when using the tach output terminal, splice the tach wire into either the WHITE or the **single** GREEN wire.

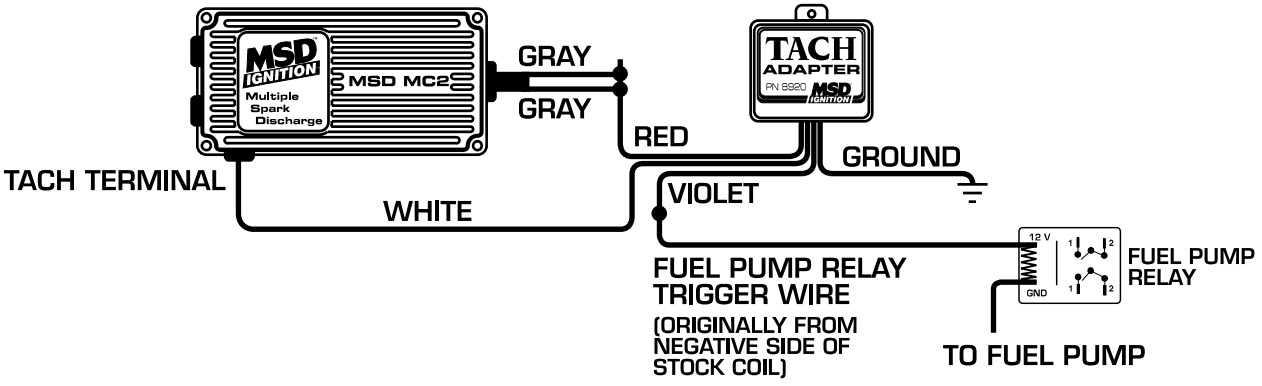


Tachometer Output Terminal.

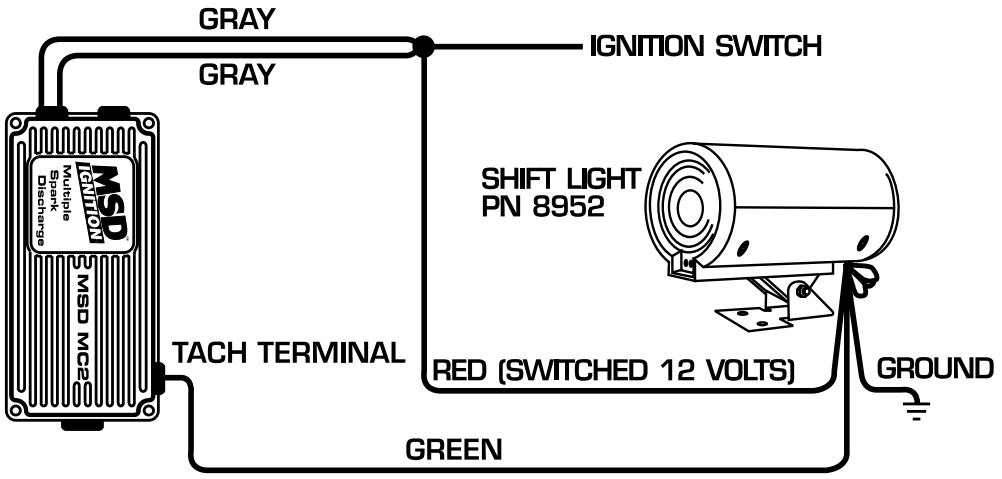
WIRING THE MC-2 TO AN AFTERMARKET AMPLIFIER TRIGGER.



INSTALLING AN MSD TACH ADAPTOR.



WIRING AN MSD SHIFT LIGHT.



TROUBLESHOOTING

WIRING CHECK

WARNING: The MC-2 produces very high voltages. Never short the battery or coil terminals. Use caution when checking connections and while troubleshooting.

- Check all of the wiring connections making sure they are clean and tight. If connectors have been crimped on make sure they are tight and sealed.
- Confirm that the battery is fully charged and properly connected. Also check that the MSD power leads are connected properly and are tight.
- Check that the only wires connected to the coil(s) are from the MSD.

WARNING: Do not connect any test equipment to the coil terminals.

After checking the wiring for loose or faulty connections, follow the next procedure to confirm that the MSD is “sparking” properly.

CHECKING FOR SPARK

The following procedure will determine if the ignition is producing a spark.

1. With the ignition Off, remove one of the plug wires from the spark plug. Use a spark tester tool (such as the ST 125) or position the wire so the terminal is about 1/2" from ground.
2. Disconnect the White wire of the MSD.
3. Turn the ignition On. **DO NOT CRANK THE ENGINE.**
4. Tap the White wire to ground several times. A spark should jump to ground when the wire is removed from ground. If it sparks, the ignition is operating properly. Repeat the procedure with the Green wire if your engine has two coils.
5. **No Spark:** Substitute another coil and test again. If there is still no spark and all of the wiring and connections have been inspected and confirmed, contact the MSD Customer Service Line to send the unit in for repair.

CHECKING THE COIL

Using an Ohm meter, you can check the resistance of the coil(s). The following specifications are for MSD's PN 8204 Motorcycle Coil. Check your Service Manual for stock coil specifications.

Primary Resistance: Check the resistance between the positive and the negative terminals. It should be 1.2 - 1.4 ohms.

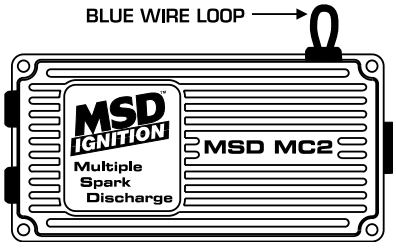
Secondary Resistance: Check the resistance between the spark plug terminals. It should be 11,000 - 11,500 ohms (11K - 11.5K).

If either measurement is out of specification the coil must be replaced.

CYLINDER SELECT

The MC-2 is programmed at the factory for 4-cylinder, four stroke or 2-cylinder, two stroke engines. To program the unit for different applications, see the chart below.

PROGRAMMING



CYLINDER	FOUR STROKE	TWO STROKE
1	CUT LOOP	CUT LOOP
2	CUT LOOP	NO MODIFICATIONS
4	NO MODIFICATIONS	- - - - -

MSD MC-3 MOTORCYCLE IGNITION
PN 4223

The MC-3 Motorcycle Ignition is a universal ignition that fits most applications with 12-volts at the coils. The MC-3 Ignition features a built in Rev-Limiter Two Step and Shift Interrupter.

Note: There are no timing curves in this particular ignition.

OPERATING SPECIFICATIONS

VOLTAGE INPUT:	12 Volts, no less than 10 amps
PLUGS:	32 - 36
HIGH COMPRESSION	17 - 22
MAXIMUM RPM:	15,000 (4 Cylinder)
ENERGY OUTPUT:	110 mJ
CURRENT REQUIREMENTS:	4.3 Amps @ 10,000 RPM
MULTI SPARK DURATION:	35° (4 Cylinder)
WEIGHT & SIZE:	1.25 lbs., 6"L x 3.5"W x 1.75"H
PRIMARY VOLTAGE:	450 Volts
SECONDARY VOLTAGE:	45,000 with MSD Coil

WIRING FUNCTIONS

The following chart describes what each wire of the MC-3 is used for.

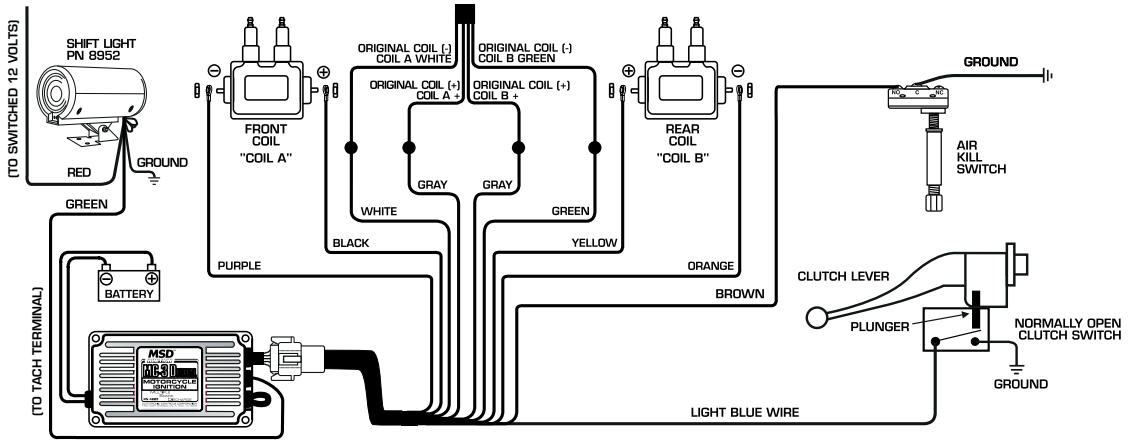
RED	Connects directly to the battery positive (+) terminal or starter solenoid 12 volt terminal.
BLACK	Connects to the battery negative (-) terminal or the engine ground.
GRAY	Connects to switched 12 volt side of ignition switch. It switches the input voltage from the RED wire on and off.
WHITE	Connects to the "COIL A" trigger wire from the points or electronic amplifier (triggers the PURPLE and BLACK wire coil).
GREEN	Connects to the "B COIL" trigger wire from the points or electronic amplifier (triggers the ORANGE and YELLOW wired coil).
BROWN	Shift Interrupt wire interrupts the ignition output when applied to ground.
LIGHT BLUE	Activates the low rpm module when connected to ground.
SHORT BLUE LOOP	Cylinder select wire loop.

The following groups of two wires connect to the same components in different applications.

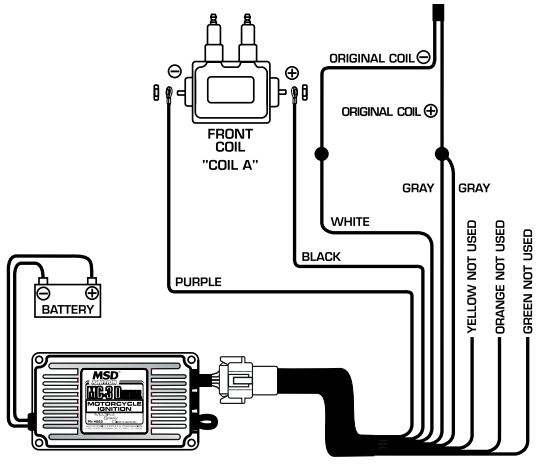
PURPLE BLACK	Connects to the front coil, "COIL A" terminals. One to coil negative, the other to positive. It does not matter which wire.
ORANGE YELLOW	Connects to the back coil, "COIL B" terminals. One to coil negative, the other to positive. It does not matter which wire.

MSD MC-3 MOTORCYCLE IGNITION, PN 4223

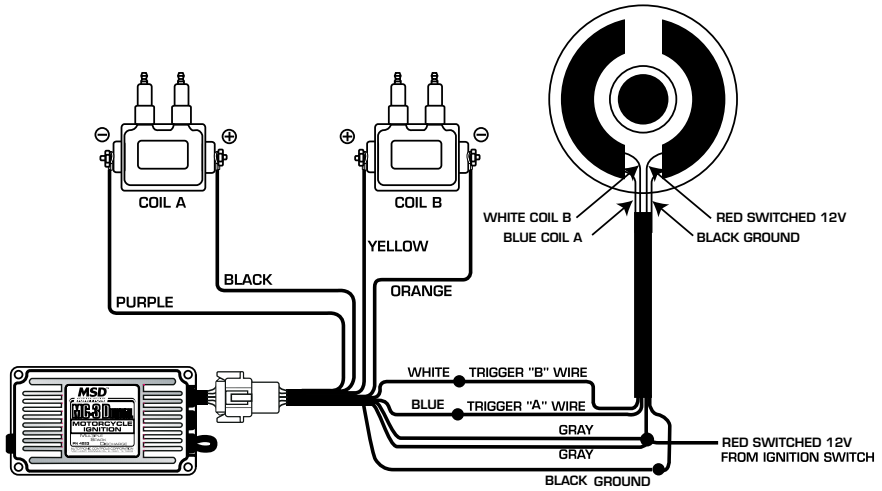
WIRING TO A STOCK DUAL COIL IGNITION SYSTEM.



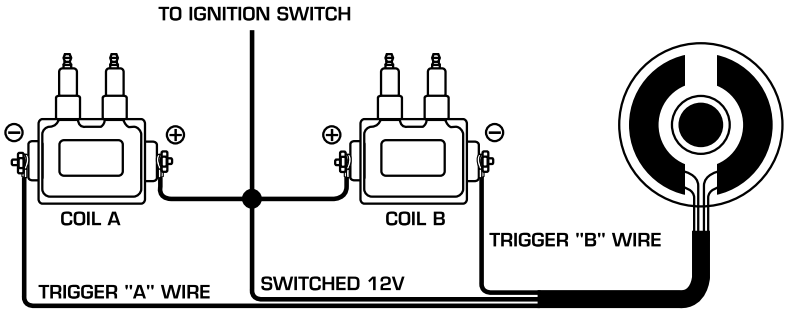
WIRING TO A STOCK SINGLE COIL IGNITION SYSTEM.



WIRING THE MC-3 TO AN AFTERMARKET AMPLIFIER TRIGGER.



TYPICAL AFTERMARKET AMPLIFIER TRIGGER WITHOUT MC-3



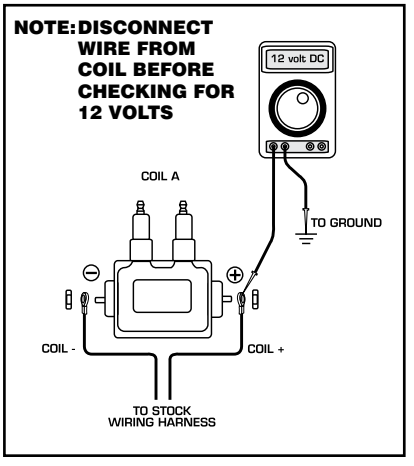
NOTE: DO NOT USE THE MC-3 WITH AFTERMARKET CDI IGNITIONS.

CHECKING FOR COIL WIRE POLARITY

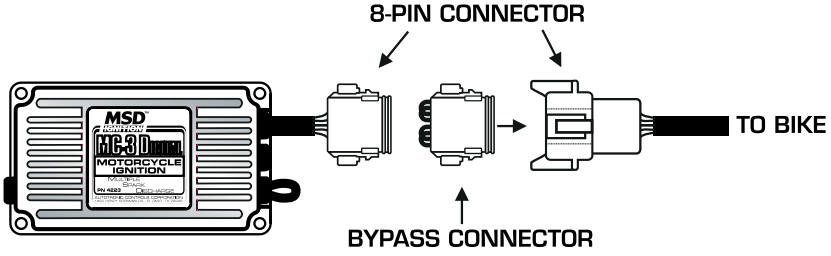
Note: The MC-3 will not work with Capacitive Discharge Ignitions or 4-cylinder engines with an individual coil per cylinder. The Yamaha V-Max is one bike that cannot accept an MC-3.

Note: The factory rev limiter and timing curve will still function with the MSD installed. To disable the factory rev limiter and timing curve an aftermarket stand alone trigger amplifier is required.

1. Locate the ignition coils and identify which side of the coil(s) has 12 volts going to it. If the polarity of the coil is not identified, follow this procedure:
   A. Disconnect the coil wires and remove them from the terminals.
   B. Using a voltmeter connected to one wire and to ground, turn the ignition to the On position and check for 12 volts. **Note:** Make sure the wires do not make contact with any engine components.
   C. The wire that shows 12 volts is the positive side. Turn the ignition Off and mark that coil wire as positive and the other as negative. If necessary, mark which wires go to Coil A and Coil B.



BYPASSING THE MC-3



Caution: If using MSD pick-up triggers, **DO NOT USE** the bypass connector. The pickups will be damaged.

TROUBLESHOOTING

WIRING CHECK

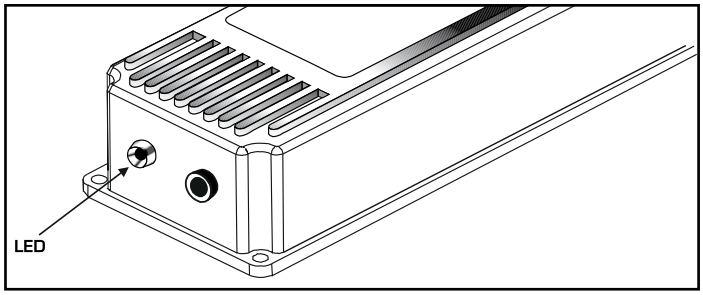
WARNING: The MC-3 produces very high voltages. Never short the battery or coil terminals. Use caution when checking connections and while troubleshooting.

- Check all of the wiring connections making sure they are clean and tight. If connectors have been crimped on make sure they are tight and sealed.
- Confirm that the battery is fully charged and properly connected. Also check that the MSD power leads are connected properly and are tight.
- Check that the only wires connected to the coil(s) are from the MSD.
- After checking the wiring for loose or faulty connections, follow the next procedure to confirm that the MSD is “sparking” properly.

WARNING: Do not connect any test equipment to the coil terminals.

LED MONITOR

The MC-3 is equipped with an LED monitor. The LED will light every time there is a spark. At above idle engine speeds, it may appear to be on continuously. Also, the static timing can be checked and adjusted by watching for the LED to light.



If the LED begins flashing erratically, it is indicating a problem. The battery may be getting too low for full power operation, or a coil positive wire may be grounded.

WIRING TO A STOCK SINGLE COIL IGNITION SYSTEM.

CHECKING FOR SPARK

The following procedure will determine if the ignition is producing a spark.

1. With the ignition Off, remove one of the plug wires from the spark plug. Use a spark tester tool (such as the ST 125) or position the wire so the terminal is about 1/2" from ground.
2. Disconnect the White wire of the MSD.
3. Turn the ignition On. **DO NOT CRANK THE ENGINE.**
4. Tap the White wire to ground several times. A spark should jump to ground when the wire is removed from ground. If it sparks, the ignition is operating properly. Repeat the procedure with the Green wire if your engine has two coils.
5. **No Spark:** Substitute another coil and test again. If there is still no spark and all of the wiring and connections have been inspected and confirmed, contact the MSD Customer Service Line to send the unit in for repair.

CHECKING THE COIL

Using an Ohm meter, you can check the resistance of the coil(s). The following specifications are for MSD’s PN 8204 Motorcycle Coil. Check your Service Manual for stock coil specifications. If either measurement is out of specification the coil must be replaced.

Primary Resistance: Check the resistance between the positive and the negative terminals. It should be 1.2 - 1.4 ohms.

Secondary Resistance: Check the resistance between the spark plug terminals. It should be 11,000-11,500 ohms (11K - 11.5K).

MSD MC-4 Motorcycle Ignition
PN 4224

The MC-4 Ignition is a race and street ignition and is applicable for 1, 2 & 4 cylinder engines. This ignition is lap top programmable and can only operate with points or after market trigger pickups. Note: it cannot be used on fuel injected or coil on plug engines.

OPERATING SPECIFICATIONS

VOLTAGE INPUT:	11-18 Volts DC, Neg. Ground
MAXIMUM RPM:	15,000 (4 Cylinder)
ENERGY OUTPUT:	190 mJ
CURRENT REQUIREMENTS:	4.3 Amps @ 10,000 RPM
MULTI SPARK DURATION:	35° (4 Cylinder)
WEIGHT & SIZE:	1.25 lbs., 6"L x 3.5"W x 1.75"H
PRIMARY VOLTAGE:	450-505 Volts
SECONDARY VOLTAGE:	48,000 with MSD Coil

WIRE FUNCTIONS

	Power Leads	These are the two heavy 12 gauge wires and are responsible for getting direct battery voltage to the ignition. The Ignition is load protected from reverse battery connections and will automatically shut down if there is over 27 volts input.
	Heavy Red	This wire connects directly to the battery positive (+) terminal or a positive battery junction such as the starter solenoid. Note: Do not connect to the alternator.
	Heavy Black	This wire connects to a good ground, either at the battery negative (-) terminal or to the engine. Note: Engine must be grounded to battery negative.
	Ignition Switch	
	Red	This wire is responsible for turning the MC-4 On and Off as well as supplying power to the triggers. Connect to a switched 12 volt source such as the ignition key or switch. Also recommended for lanyards
	Coils	
Coil 1	**Brown/Orange**	This wire connects to the coil 1 positive (+) terminal. This is the ONLY wire that makes electrical contact with the positive coil terminal.
Coil 1	**Brown/White**	This wire connects to the coil 1 negative (-) terminal. This is the ONLY wire that makes electrical contact with the negative coil terminal.
Coil 2	**Brown/Orange**	This wire connects to the coil 2 positive (+) terminal. This is the ONLY wire that makes electrical contact with the positive coil terminal.
Coil 2	**Brown/Green**	This wire connects to the coil 2 negative (-) terminal. This is the ONLY wire that makes electrical contact with the negative coil terminal.
	Trigger Pickups	
4 - Pin Connector	**White/Blue**	+12V to Trigger Pickups
4 - Pin Connector	**Black**	Ground to Trigger Pickups
4 - Pin Connector	**White (Coil 1)**	This wire is used to connect to breaker points or trigger pickups (Dyna* or MSD), electronic ignition amplifier output or to the trigger output of the ECU for coil 1. (*Single Magnet Rotor Only.)
4 - Pin Connector	**Green (Coil 2)**	This wire is used to connect to breaker points or trigger pickups (Dyna* or MSD), electronic ignition amplifier output or to the trigger output of the ECU for coil 2. (*Single Magnet Rotor Only.)

3-Step Retard	
Pink	This wire activates the first retard stage when it is applied to 12 volts. When 12 volts are removed the retard is deactivated.
Violet	This wire activates the second retard stage when it is applied to 12 volts. When 12 volts are removed the retard is deactivated.
Tan	This wire activates the third retard stage when it is applied to 12 volts. When 12 volts are removed the retard is deactivated if ramp value = 0. Step 3 retard ramp can be activated by this wire providing a progressive retard ramp that is programmable from .1 to 9.9 seconds.
Shift Light/Shifter 2 Pin Connector	
Red/Green Yellow/Orange	Shift Light activation wire. Connects to the Shift Light PN 8952 or to any air shifter with a 3 amp or less current draw. A 3 amp fuse is in line on the Red/Green wire.
RPM Switch	
Purple/Blue	RPM Activation Switch. This wire will supply a ground to complete a circuit at a desired rpm. It will handle up to 3 amps continuous.
Map Sensor 3 Pin Connector	
Brown/Violet Brown/Yellow Dark Brown	Three Pin Connector - Used for an optional external pressure sensor for turbo applications. (2 - Bar/2-29 psi - PN 23121) (3 - Bar/2-44 psi - PN 23131).
Shift Kill	
Yellow	Used to activate the Shift Kill feature. Note: Do Not use for kill lanyard.
2 - Pin Connector Cam Sync	
Light Blue Light Green	This 2-pin connector plugs into a Cam Sync Sensor to indicate when the number one cylinder is triggered.
Accessories	
3-Step Rev	
Light Blue	This wire activates the Burnout rev limit when 12 volts are applied.
Dark Blue	When 12 volts are applied, this wire activates several features including; Launch rev limit, Launch Retard value, Launch Timing Curve and will reset the Shift Light sequence to 1st gear & Step 3 slope.
Tach Output	
Gray	Used to provide a tach signal to rpm sensing devices. 12 volt square wave with 30° duty cycle.

GENERAL WIRING INFORMATION

Wire Length: All of the wires of the MC-4 Ignition may be shortened as long as quality connectors are used or soldered in place. To lengthen the wires, use one size bigger gauge wire (10 gauge for the power leads and 16 gauge for the other wires) with the proper connections. All connections must be sealed.

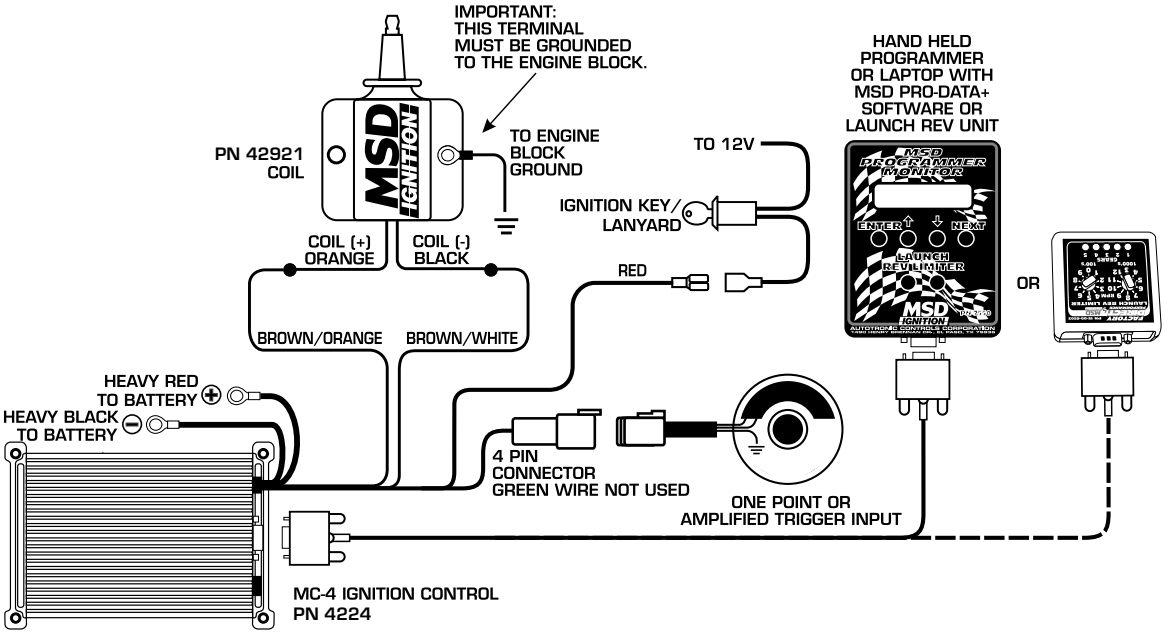
Grounds: A poor ground connection can cause many frustrating problems. When a wire is specified to go to ground, it should be connected to the battery negative terminal, engine block or chassis. There should always be a ground strap between the engine and the chassis. Always securely connect the ground wire to a clean, paint free metal surface.

Routing Wires: The MC-4 wires should be routed away from direct heat sources such as exhaust manifolds and headers and any sharp edges. The trigger wires should be routed separate from the other wires and spark plug wires. It is best if they are routed along a ground plane such as the block or frame.

MC-4 MOTORCYCLE IGNITION, PN 4224

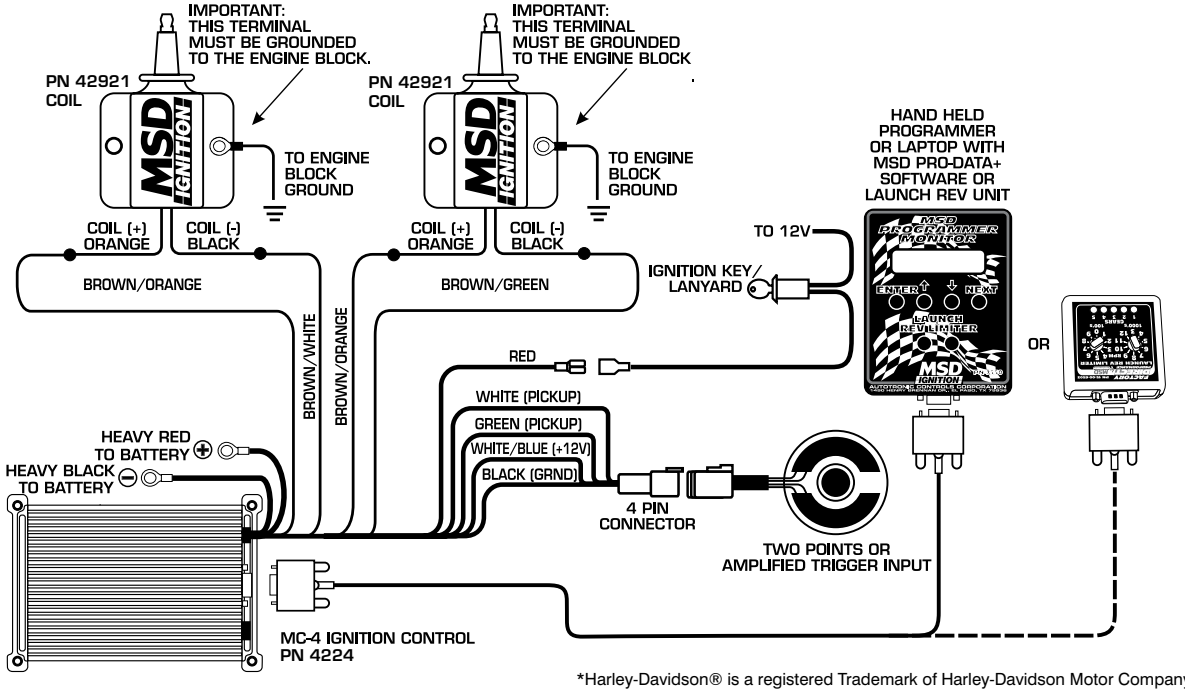
SINGLE CYLINDER WIRING.

MENU - CYLCNT=1
DIS=WSON - (Crankshaft Triggered)
DIS=WSOFF - (Camshaft Triggered)



2-CYLINDER, SINGLE FIRE, WSOF (NO WASTE SPARK - HARLEY-DAVIDSON®).

MENU - CYLCNT=2
DIS=WSOFF - (Camshaft Triggered)



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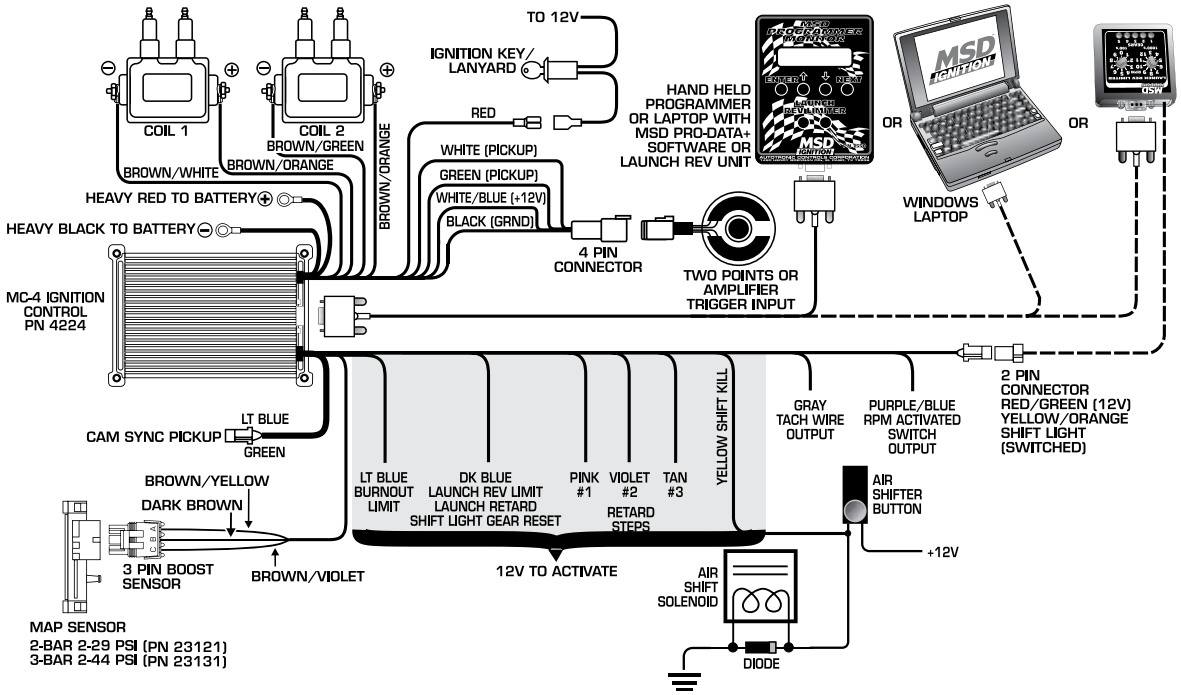
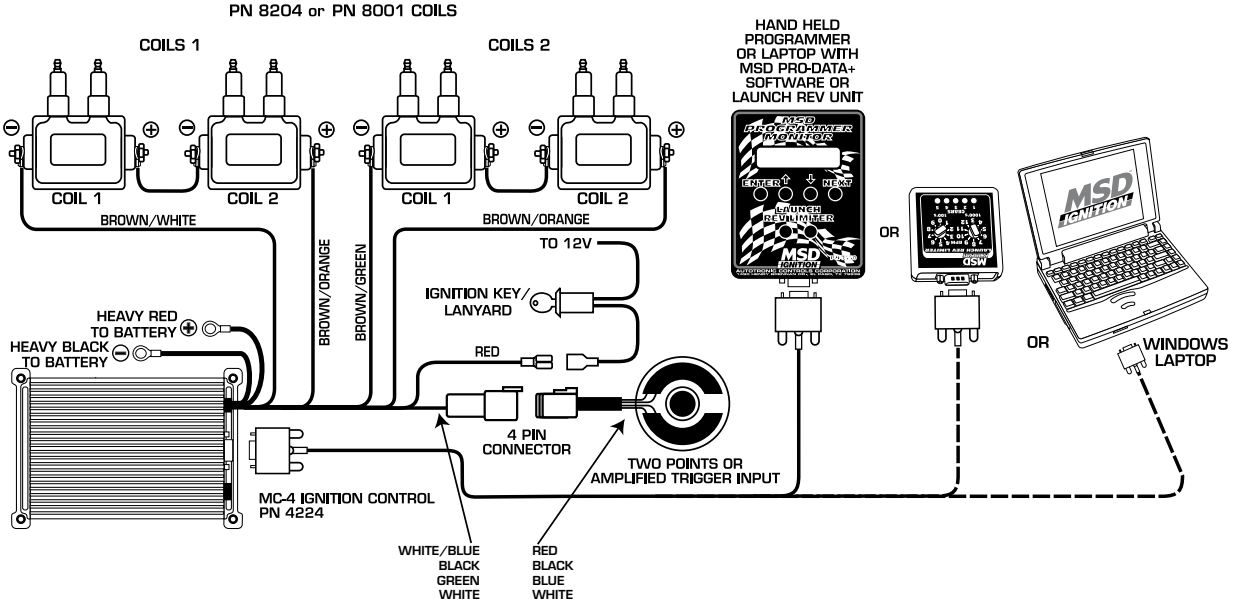
MC-4 MOTORCYCLE IGNITION, PN 4224

4-CYLINDER SINGLE PLUG WSON (WASTE SPARK ON - CRANKSHAFT TRIGGERED) 2-CYLINDER DUAL PLUG WSOFF (WASTE SPARK OFF - CAMSHAFT TRIGGERED)

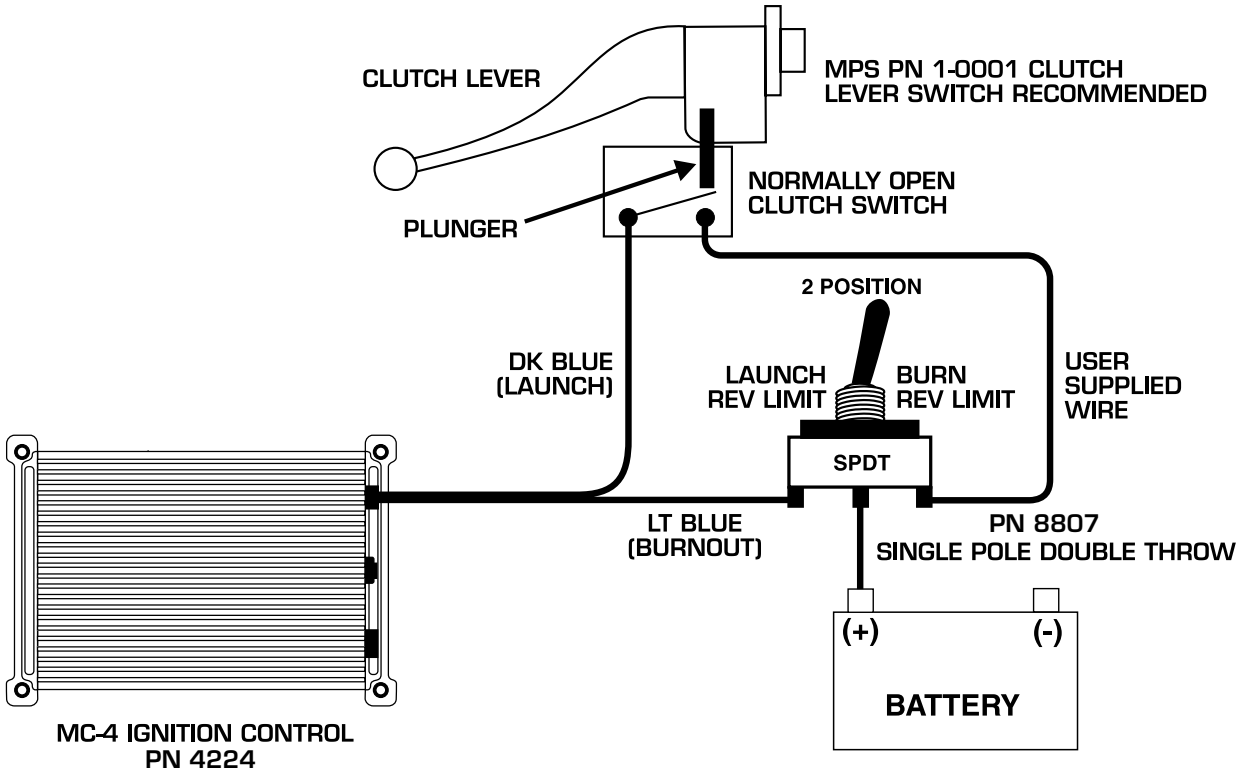


4-CYLINDER DUAL SPARK PLUG SYSTEM WIRING WSON (WASTE SPARK ON).

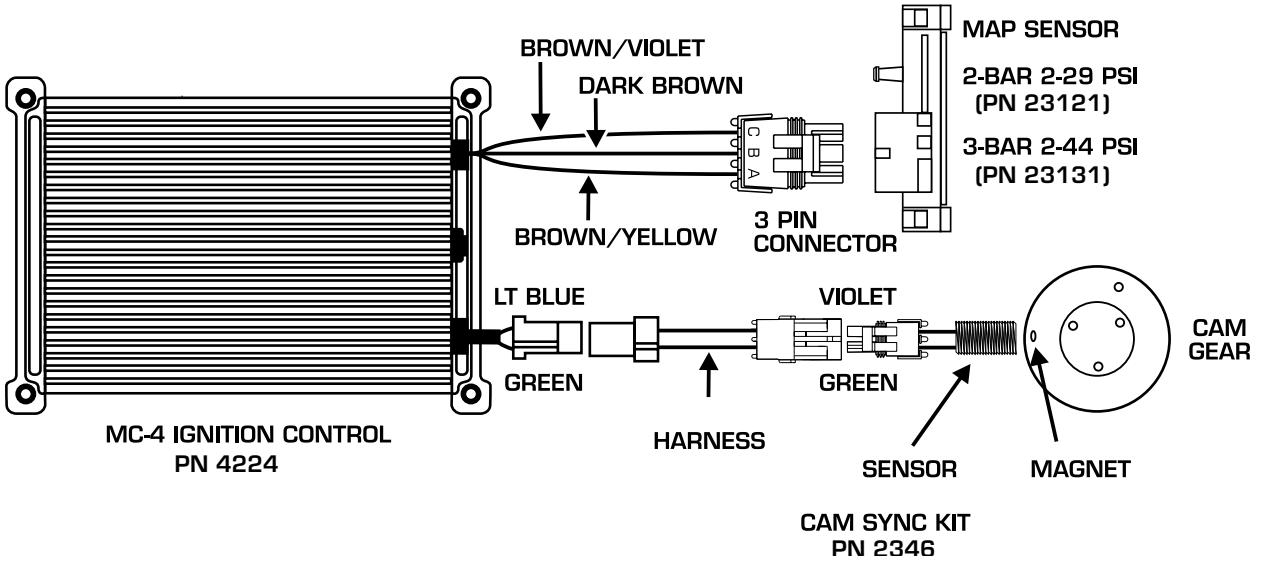
MENU - CYLCNT=4
DIS=WSON - (CRANKSHAFT TRIGGERED)



WIRING DIAGRAM FOR BURNOUT/LAUNCH REV LIMITS.



USING A SYNC SIGNAL OR MAP SENSOR.



TROUBLESHOOTING

Every MSD Ignition undergoes numerous quality control checks including a four hour burn-in test. If you experience a problem with your MC-4, our research has shown that the majority of problems are due to improper installation or poor connections. The Troubleshooting section has several checks and tests you can perform to ensure proper installation and operation of the MC-4.

LED

The LED on the side of the MC-4 monitors several operating conditions of the MC-4. If the LED indicates that there is a problem with the ignition system, follow the steps through the Troubleshooting section. The LED will appear to be on steady at above idle speeds when everything is functioning properly.

- A Code 2 (flash flash) will flash if there is a problem with the Cam Sync Signal.
- A Code 3 (flash flash flash) will flash if the supply voltage drops below 12 volts, when operating below 3300 rpm.
- The LED will flash for every trigger signal from the crank trigger. You can take advantage of this when statically setting the timing of the engine.

TACH/FUEL ADAPTERS

If your tachometer does not operate correctly you probably need a Tach Adapter. The chart below lists common tachometers and if an Adapter is necessary.

Tachometer Compatibility List

AFTERMARKET TACHOMETER	WHITE WIRE TRIGGER
AUTOGAGE	REQUIRED
AUTOMETER	NO TACH ADAPT REQUIRED
MALLORY	NO TACH ADAPT REQUIRED
MOROSO	NO TACH ADAPT REQUIRED
STEWART	REQUIRED
S.W. & BI TORX	REQUIRED
SUN	REQUIRED
VDO	REQUIRED

Common Tachometers and Adapters.

MISSES AND INTERMITTENT PROBLEMS

Experience at the races has shown that if your engine is experiencing a miss or hesitation at higher rpm, it is usually not directly the ignition. Most probable causes include faulty wiring, a coil or plug wire failure, arcing from the boot plug to ground. Several items to inspect are:

WARNING: Do not touch the coil terminals during cranking or while the engine is running.

- Always inspect the plug wires at the plug for a tight connection and visually inspect for cuts, abrasions or burns. Dielectric grease such as Spark Guard, PN 8804, is also recommended.
- Inspect the Primary Coil Wire connections. **Caution:** There may be high voltage at the Coil Positive (+) terminal even with the key turned On. During cranking or while the engine is running, very high voltage will be present and no test equipment should be connected.
- Make sure that the battery is fully charged and the connections are clean and tight. If you are not running an alternator this is an imperative check. If the battery voltage falls below 11 volts during a race, the MC-4 current draw will increase.
- Is the engine running lean? Inspect the spark plugs and complete fuel system.
- Inspect all wiring connections for corrosion or damage. Remember to always use proper connections followed by soldering and seal the connections completely.
- If you are using the Yellow Shift Kill Wire with a Shift Solenoid, you may be getting a double kill when shifting. Attach the supplied Diode to the solenoid.

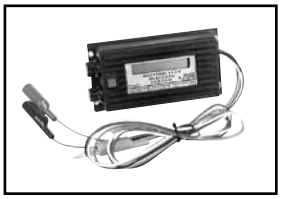
If everything checks positive, use the following procedure to test the ignition for spark.

TROUBLESHOOTING

PRESTART CHECK LIST

- The only wires connected to the coil terminals are the MC-4 wires to coil positive and coil negative.
- The small Red wire of the MC-4 is connected to a switched 12 volt source and, if used, the lanyard is installed.
- Confirm the cylinder select is in the proper position for your application.
- The power leads are connected directly to the battery positive and negative terminals.
- The battery is fully charged.
- The engine is equipped with at least one ground strap to the chassis.

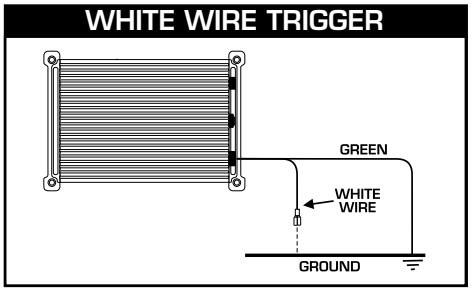
MSD also offers an Ignition Tester, PN 43751. This tool allows you to check your complete ignition system while it is on the bike as well as the operation of rpm limits, activated switches and shift lights and the Cam Sync Signal.



Ignition Tester

CHECKING FOR SPARK

1. Make sure the ignition switch is in the “Off” position.
2. Remove the coil wires from the spark plug and set them approximately 1/2" from ground.
3. Disconnect the MC-4 wire from the points or trigger.
4. Connect the Green wire to ground.
5. Turn the ignition to the On position. Do not crank the engine.
6. Tap the white wire to ground quickly several times (see figure to right). Each time you pull the wires from ground, a spark should jump from the coil wires to ground. If spark is present, the ignition is working properly. Do the same test using the Green Trigger wire. If there is no spark skip to step 7 below:
7. If there is no spark:
   A. Inspect all of the wiring.
   B. Substitute another coil and repeat the test. If there is now spark, the coil is at fault.
   C. If there is still no spark, check to make sure there are 12 volts on the small Red wire from the MC-4 when the key is in the On position. If 12 volts are not present, find another switched 12 volt source and repeat the test.
   D. If, after following the test procedures and inspecting all of the wiring, there is still no spark, the MC-4 Ignition is in need of repair. See the Warranty and Service section for information.



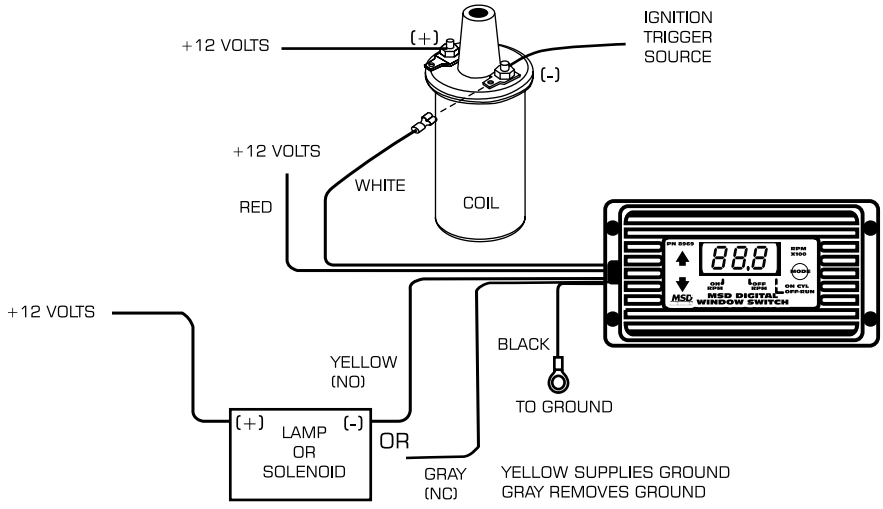
Checking for Spark with the White Wire.

Digital RPM Activated Window Switch
PN 8969

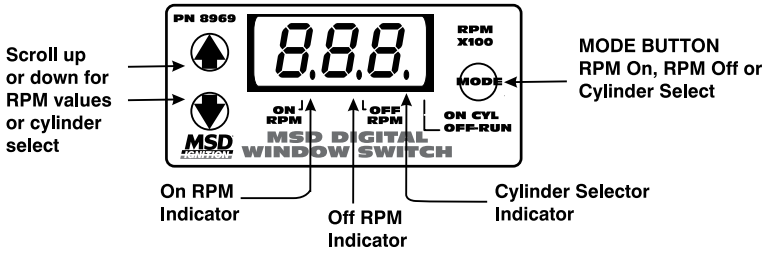
The MSD Digital RPM Activated Window Switch accepts a variety of input signals from sources such as a coil negative terminal (factory inductive ignitions), a CD ignition tach-output such as an MC-1, MC-2 and MC-3 Ignitions, an output from an ECU, or a 5-400 volt signal from an MSD Tach Adapter.

WIRING	
RED	This is the On/Off wire. Connects to switched 12 volts.
BLACK	Connects to a good ground source.
WHITE	Signal Input. Provides the trigger signal from a tach input, +5-12 volt signal from an ignition tach output terminal, ECU output or coil negative terminal.
OUTPUT WIRES	
GRAY	Normally Closed. This wire will remove the ground source at your desired On rpm, and complete the ground circuit at the set Off rpm.
YELLOW	Normally Open. This wire will provide a ground source at your desired On rpm, and remove the ground at the set Off rpm.
Note: The output wires are capable of a switch load of 2.5 amps, continuous. The operating input voltage of the Switch is 9-18 volts.	

WIRED TO A STOCK INDUCTIVE STYLE IGNITION AT THE COIL NEGATIVE TERMINAL.



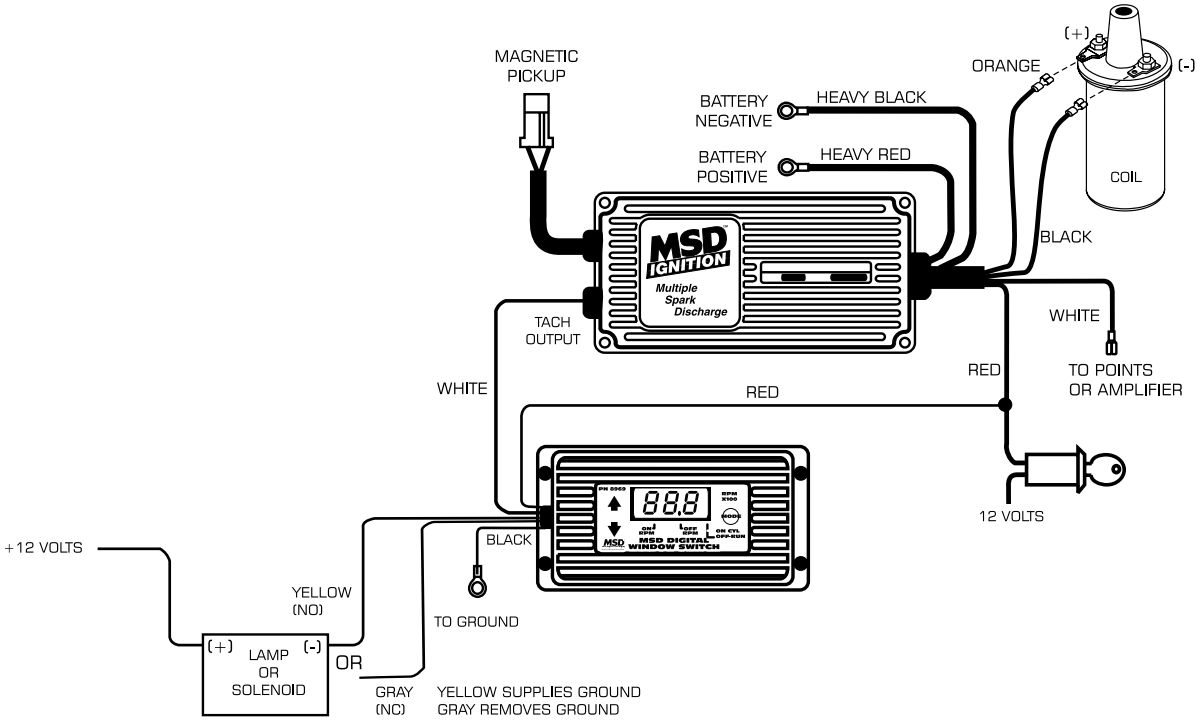
PROGRAMMING THE DIGITAL SWITCH.



NOTE: If the RPM point is not changed with 2 seconds, the screen returns to current RPM (zero if the engine is not running).

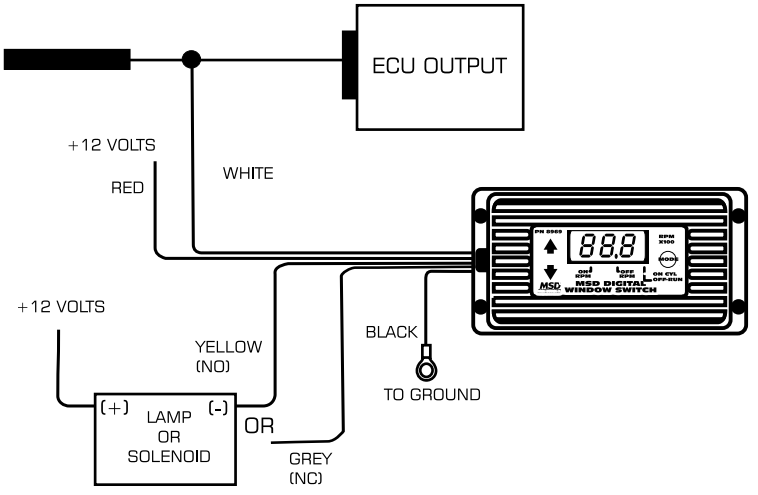
DIGITAL RPM ACTIVATED WINDOW SWITCH, PN 8969

WIRED TO AN MSD MC-3, 6, 7, 8 OR 10 SERIES IGNITION CONTROL.



WIRED TO AN ECU OUTPUT.

NOTE: It is recommended to have your vehicle's service manual to determine the trigger output wire.



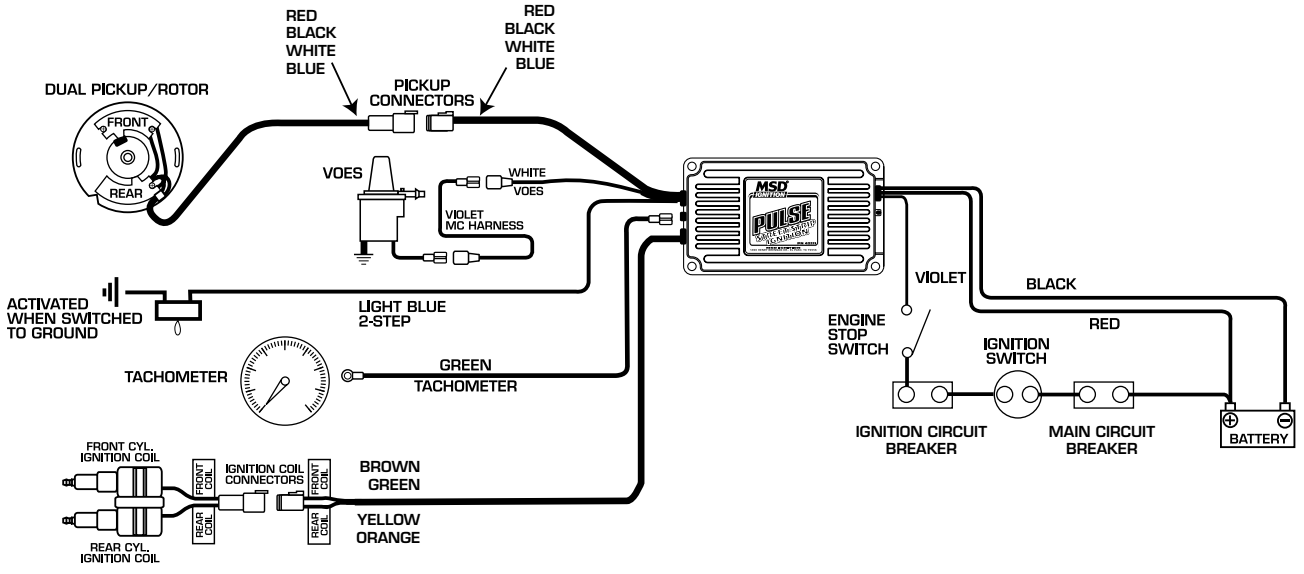
MSD Pulse Ignition for Harley-Davidson®
PN 42211

The Pulse Ignition is a complete bolt on replacement ignition manufactured specifically for Harley-Davidson® Evolution, Shovel Head and Knucklehead engines. Note: for '69 and older engines you must use the MSD Pro Billet Distributor PN 4231.

WIRING

RED	Connects to the battery positive terminal.
BLACK	Connects to the battery negative terminal.
VIOLET	On/Off wire. Connect to the ignition switch.
LIGHT BLUE	Two step rev limiter. When connected to ground, the two step rpm limit will be active.
TACH TERMINAL	This terminal provides a standard tach signal.
COIL HARNESS	This is the longer 4-wire harness with two wires tagged Front Cyl. (for the front cylinder) and the other two marked Rear Cyl.
PICKUP HARNESS	This is the short 4-wire harness that connects to the MSD pickup assembly.

WIRING THE MSD PULSE IGNITION.

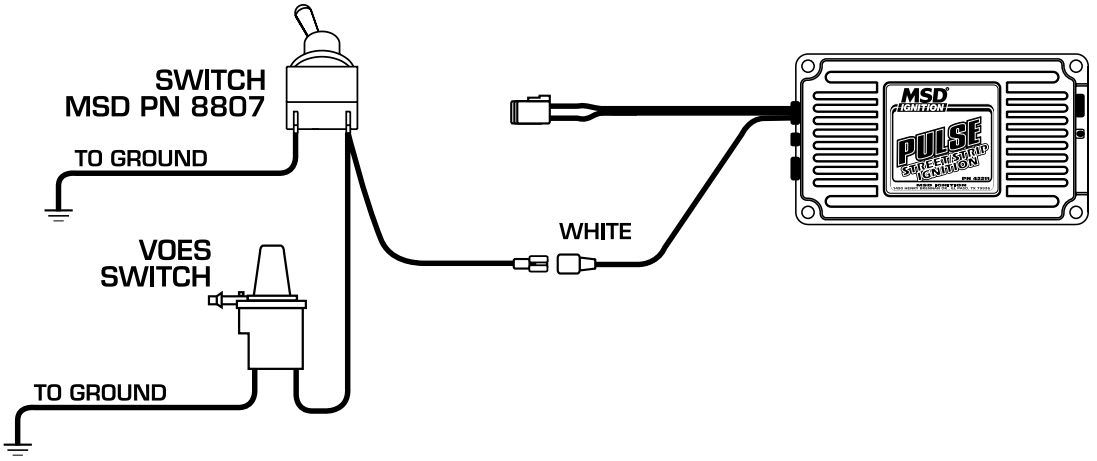


*Harley-Davidson® is a registered Trademark of Harley-Davidson Motor Company.

WIRING THE VOES CONTROL SWITCH.

An auxiliary SPDT Switch (not included in the MSD Pulse kit) may be used to easily turn the VOES Curve on or off. Connect the White wire of the MSD and a wire of the VOES Switch to one terminal of the Switch. The other terminal of the switch goes to ground.

- When the switch is OPEN, the VOES curve is enabled via the VOES Switch. This is suited for less aggressive operation and highway cruising.
- When the switch is closed (connected to ground), the VOES curve is disabled. This configuration reverts to the basic advance program, providing full advance at all engine speeds in excess of the programmed max timing rpm value 1,750 to 3,500 rpm.



TROUBLE SHOOTING

INOPERATIVE TACHOMETER

The MSD Pulse Ignition delivers a conventional 12-13 volt square wave signal that is compatible with most factory tachometers. Some aftermarket tachometers require a high voltage spike. If the tachometer does not operate properly, an MSD PN 8920 Tach Adaptor should be used to provide a suitable signal.

CHECK WIRING

- Check wiring routing and connections.
- Make sure all of the terminals and pins are crimped tightly and are fully seated in the connectors.
- Confirm all of the connections with the wiring diagram in the installation instructions.
- If any wires or connections have been modified or shortened, use an ohm meter to confirm continuity through the connectors.

CHECK THE BATTERY

- Verify the Red wire of the MSD is firmly connected to the positive (+) battery terminal.
- Verify the Black wire is firmly connected to the negative (-) battery terminal.

Battery Condition: Connect a volt-ohm meter across the battery to check battery voltage. If the meter indicates less than 10 volts static (non-cranking, ignition switch On) or less than 7 volts while cranking the engine with the starter, the MSD Pulse will not operate properly.

Ignition Supply: Check for a 12-volt input to the MSD Module. With the ignition switch On, use a volt-ohm meter to verify that at least 10 volts is supplied to the MSD Violet wire. If less than 10 volts is supplied, the MSD Pulse will not operate properly.

TROUBLESHOOTING

SYSTEM FUNCTION CHECKS

If the system meets all the above criteria but will not start, the difficulty may be in one of the three areas: the pickup assembly, the coils or the ignition module. The following procedures may be used to identify a possible difficulty:

Pickup Test

Turn ignition switch On and crank the engine. The LED should blink which means that it is receiving a trigger signal and that the problem is in the amplifier or coil section.

- Inspect the pickup harness for proper connections.
- Inspect the rotor installation.
- Check the operation of the Ignition using the following test.

CHECKING FOR SPARK

Note: MSD PN 43751 MC Ignition Tester is available for complete ignition testing.

This test false triggers each channel of the ignition so the operation of the Ignition or pickup(s) can be determined. Set the selector S1 of Switch 1 to On, for the kick start position.

1. With the ignition Off remove both spark plugs. Re-attach the plug wires and position the threaded section of each spark plug to the engine case (ground).
2. Disconnect the trigger harness of the MSD amplifier from the pickup plate harness.
3. Using a jumper wire (a straightened paper clip works well), link the terminal of the black wire in the MSD connector to the terminal of the White wire in the pickup connector.
4. Attach a similar jumper wire to the terminal of the Blue wire in the pickup connector and join it to the first paper clip.
5. Turn the ignition switch On and separate the jumpers. A spark should jump from one of the spark plugs.
6. Turn the ignition switch Off and reverse the connection. Link the terminal of the Black wire in MSD connector to the terminal of the Blue wire in the pickup connector. Attach the second jumper to the terminal of the White wire in the pickup connector.
7. Turn the ignition switch On and separate the jumpers. A spark should jump from the other spark plug.
   - If both the plugs fired, the MSD and the Coils are working properly and the corresponding pickup(s) is probably at fault.
   - If one or both plugs did not fire, check the operation of the Coils.

MSD Digital Shift Light
PN 89631

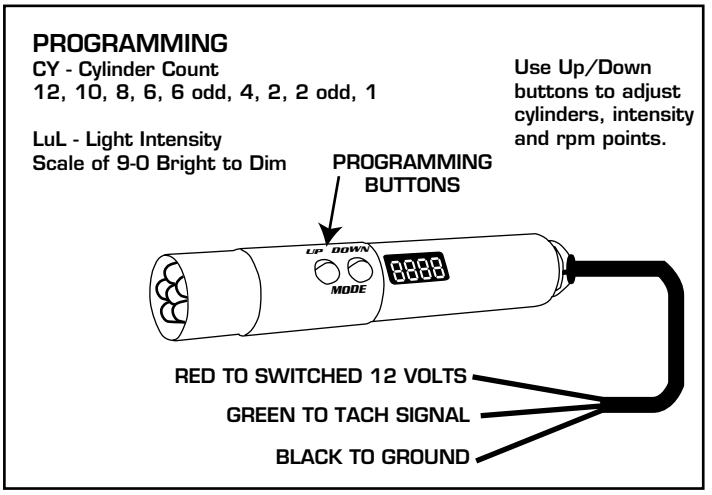
WARNING: When installing the Shift Light disconnect the battery cables. When disconnecting, always remove the negative cable first and install it last.

IMPORTANT: **Do NOT connect to the coil (-) terminal.** The supplied GMR pickup must be used when installing the Digital Shift Light unless the rpm signal is coming from the tach output of an MSD Ignition or aftermarket ECU. Damage to the DSL will occur if connected to a high voltage trigger source.

PROGRAMMING

By pressing the two buttons simultaneously, you get the Shift Light into the different programming modes.

RPM: To adjust the rpm, press the two buttons until the rpm shows. Notice that all of the numbers flash. Adjust the rpm then push the two buttons again to move to the next mode. The rpm can be set up to 16,000 rpm. Once you go over 9,900 rpm, the display will show 1,000 indicating 10,000 rpm and higher.



Digital Shift Light Wiring and Programming.

Cylinder Count: The display will read CY and allow you to select between one to 12-cylinder engines using the Up/Down buttons. On single cylinder two stroke or four stroke applications that fire every revolution (waste spark systems) the shift light should be programmed for two cylinder operation for correct operation. Please call our Powersports Tech line, at (888) 258-3835, if you need help with calibration.

Intensity: Control the intensity of the LED and read out. Hold the buttons until LuL displays. Use the buttons to select from 9 (brightest) to 0 to turn off the shift light.

Self: Self mode will walk through all of the settings programmed into the light. It will first show the rpm shift value for the shift light, the cylinder count and light intensity. Start the test mode by pushing either button once Self is displayed. To reset the Self mode, push either button when SELF is displayed, or turn the power Off.

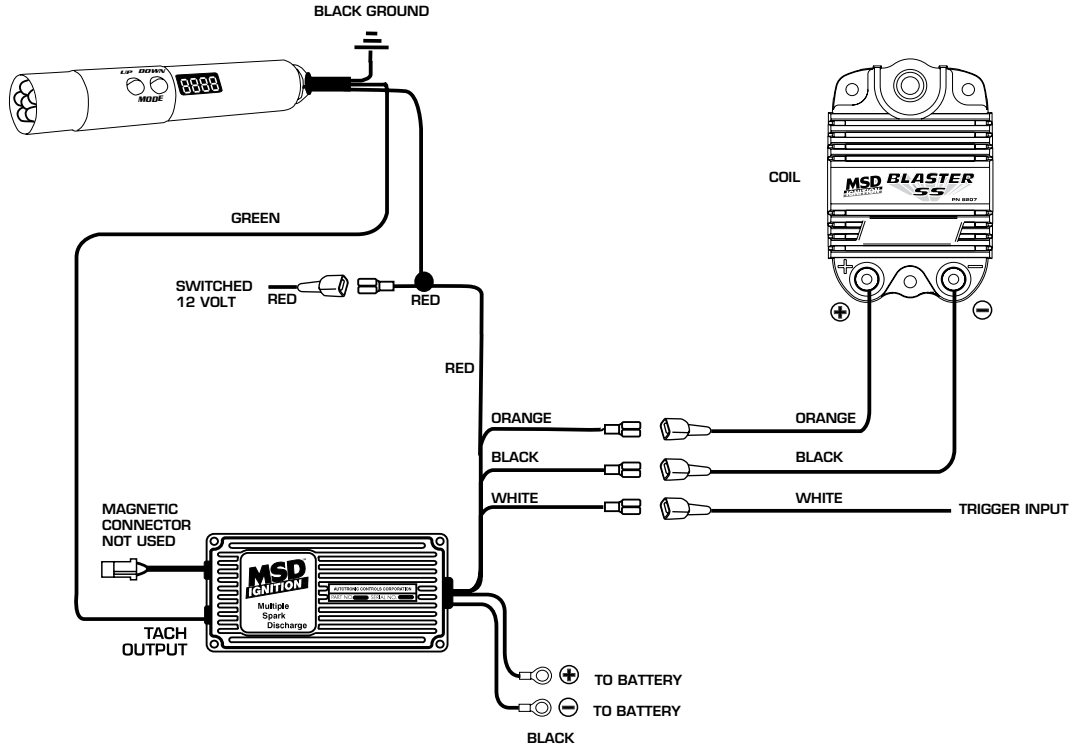
Each time the DSL is powered on, the LED will display the program values that are set.

INSTALLATION

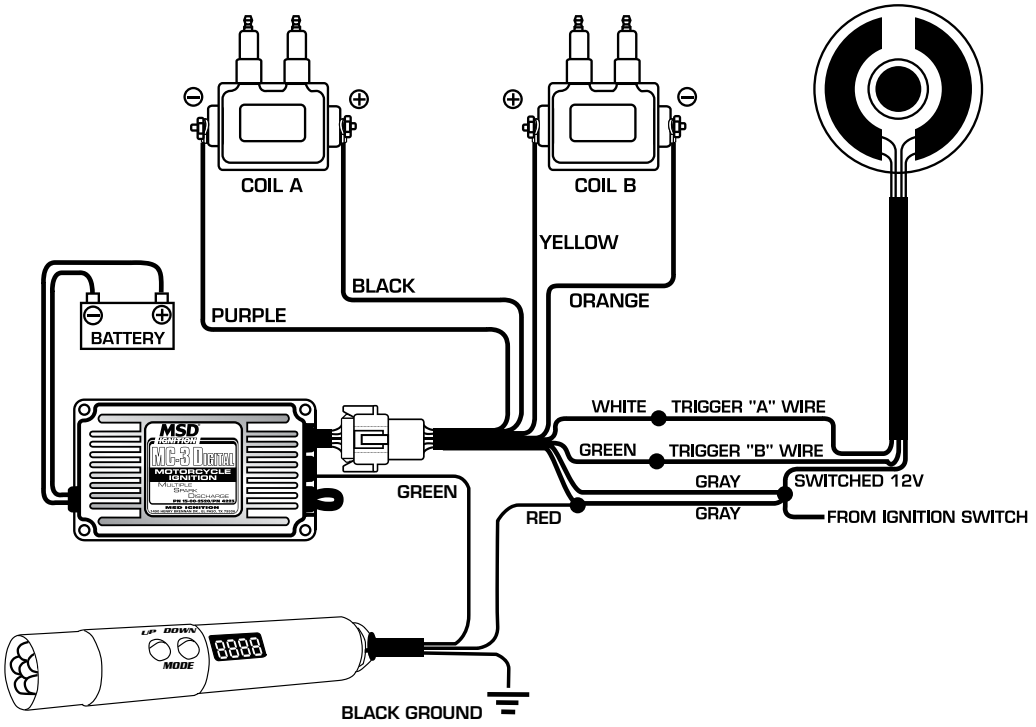
The Shift Light installs easily with the GMR Pickup or through the tach output terminal of an MSD Ignition Control or aftermarket ECU. It will accept a trigger signal rated from 0-24 volt amplitude. **Never connect the Green Wire directly to the coil negative terminal.**
If an ignition control or aftermarket ECU are not being used, the GMR pickup must be connected.

MSD DIGITAL SHIFT LIGHT, PN 89631

INSTALLING WITH AN MSD IGNITION.

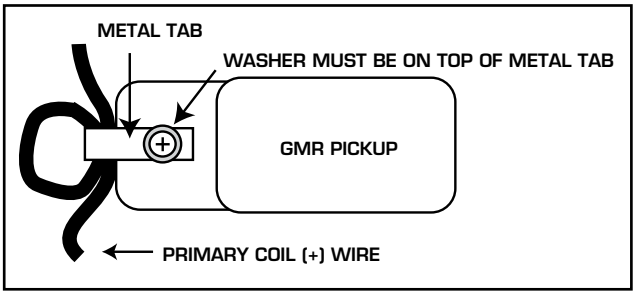


INSTALLING WITH AN MSD MOTORCYCLE IGNITION.



GMR PICKUP INSTALLATION

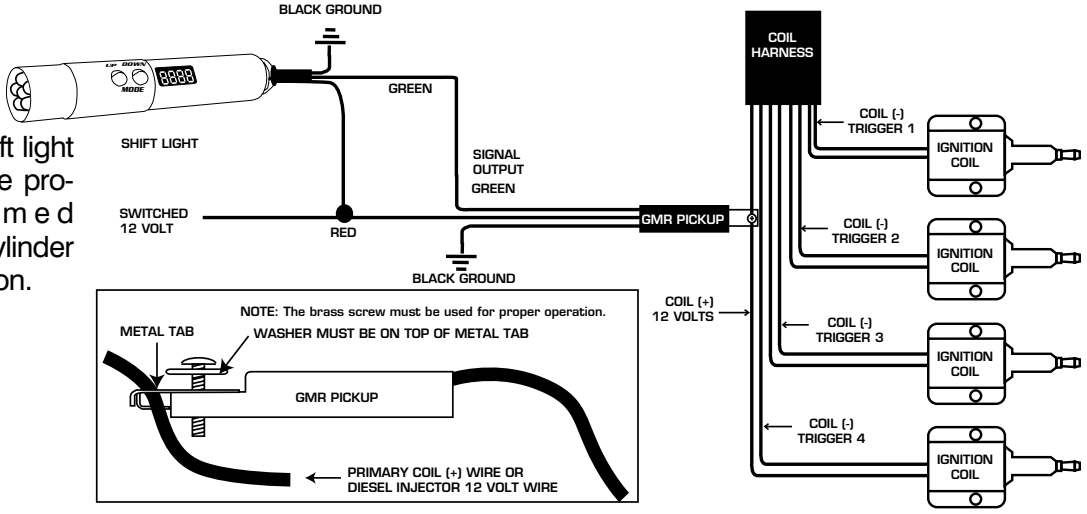
The MSD GMR pickup can be used with inductive or capacitive ignition types to provide an rpm signal of 30% duration when the ignition coil fires. Two washers are provided with the pickup and must be installed in one of two positions depending on the type of ignition driving the coil. For late model applications, it is recommended to have a wiring schematic of the vehicle's ignition system. **On some motorcycle and ATV applications, the stock coils do not produce a long enough pulse. In these cases, loop the coil wire through the GMR pickup twice.**



Looping Coil Wire.

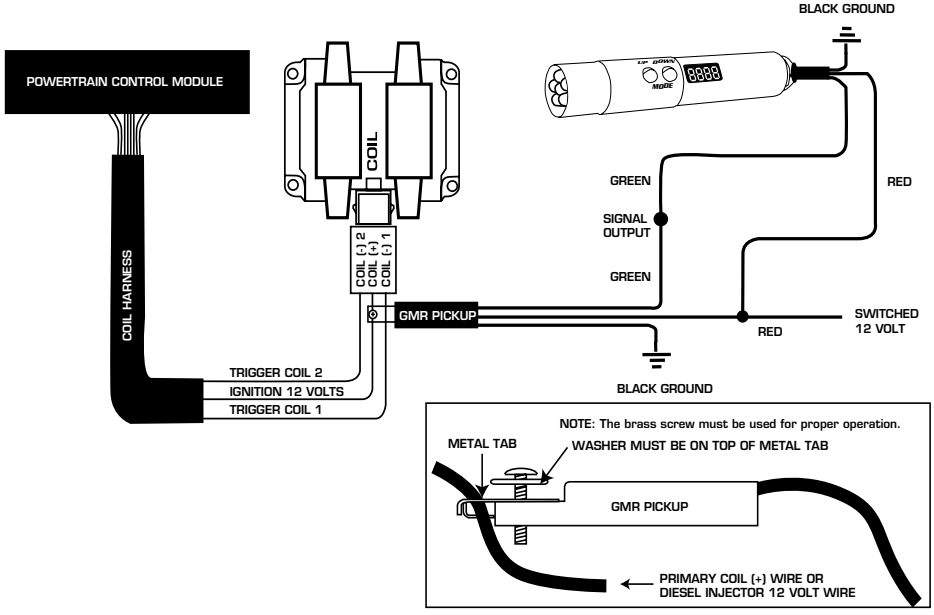
INSTALLING ON AN INDUCTIVE COIL-PER-CYLINDER IGNITION SYSTEM.

Note: The shift light must be programmed for 1-cylinder operation.



INSTALLING TO AN INDUCTIVE COIL PACK.

Note: The shift light must be programmed for two (2) cylinder operation.



MSD Honda TRX400EX Ignition System
PN 42130

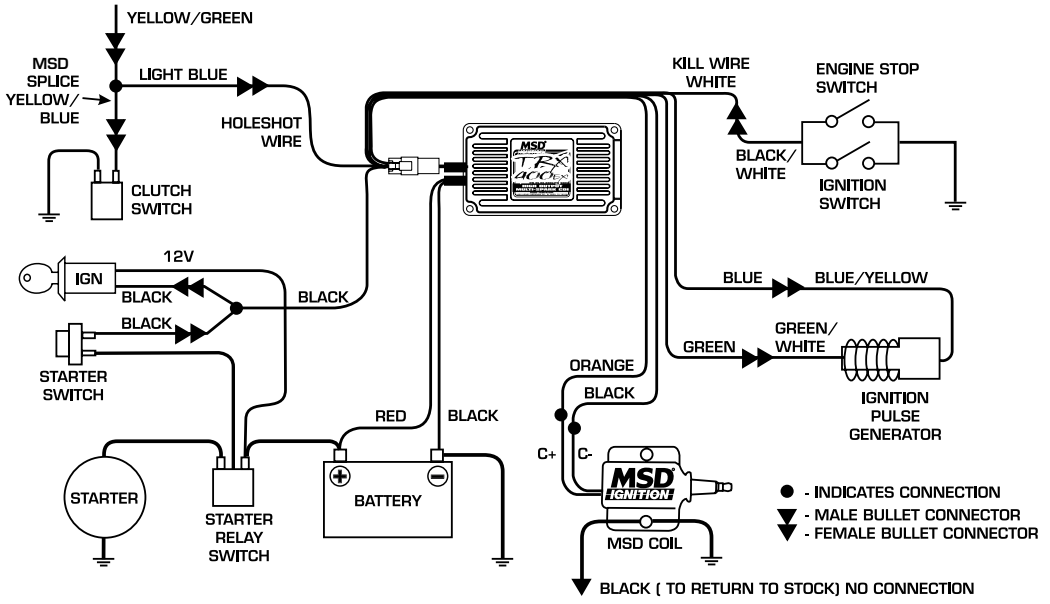
The MSD Enhancer Ignition system for the Honda 400EX is designed as a complete system, no parts may be substituted with the stock Ignition system.

WIRING FUNCTIONS

	Power Leads
RED	Direct to battery positive
BLACK	Direct to battery negative
	Coil Lead
BLACK	Direct to one side of the coil
	Optional Holeshot
LIGHT BLUE	Wire into a momentary switch
	Factory Run Switch
WHITE	Wire to the Factory Run Switch
	Pulse Generator Leads
BLUE	Wire to the blue/yellow wire of the pulse generator
GREEN	Wire to the green/white wire of the pulse generator
	Stock CDI Leads
ORANGE	Plug direct into stock CDI six pin connector
VIOLET	Plug direct into stock CDI six pin connector

Spark Plug Gap - .032 to .036
Coil - .02 Primary
2K Secondary

WIRING DIAGRAM



Note: It is recommended that you have the factory service manual while performing this installation.

TECHNICAL INFORMATION

Spark Output: The Enhancer Ignition System for the Honda 400EX produces a high output spark that is approximately double the stock spark output. This increased spark energy allows the use of richer fuel mixtures or even exotic fuel such as alcohol. The MSD Ignition will put out approximately 30,000 volts to the spark plug.

Spark Plugs: With the MSD Enhancer, it is recommended to use as cold a spark plug as possible while still being able to start the engine easily. The spark plug gap will largely depend on the compression of the engine. The higher the compression the smaller the plug gap you must run. A good rule of thumb for the spark plug gap is between .032" and .036". Taking the time to test with different gaps will give you the best gap for your application.

MSD Coil and Spark Plug Wires: The MSD Coil features low resistance (0.2 Ohms Primary, 2K Ohms Secondary) with a turns ratio of 70:1 for maximum spark voltage and energy. The 8.5mm Super Conductor Spark Plug Wires are very low resistance (less than 50 Ohms per foot) for maximum voltage carrying capabilites. Even with this low resistance, the wire still suppresses EMI (Electro Magnetic Interference) from disrupting the electronics of the ignition. This is the only wire recommended to be used with the MSD Enhancer Ignition System.

Adjustable Ignition Timing Curve: The MSD Enhancer Ignition system allows you to program an ignition timing curve. Changes in altitude, compression, fuel octane or a number of other variables requires that the ignition timing be compensated. The Enhancer allows you to advance or retard the initial timing as well as designate a different timing curve to increase overall power and performance.

Holeshot Feature: The MSD Enhancer Ignition has a special built-in circuit that sets a low rpm limit. This rpm limit produces consistent and quick starts. This allows you to concentrate on the start of the race instead of throttle position.

Rev Limiter: The MSD Enhancer Ignition max speed rev limiter is adjustable from 8,750 to 12,500 rpm.

PROGRAMMING

One of the many advanced features of the Enhancer Ignition System is the ability to program different timing options into the ignition system. This is especially important when making any engine modifications or running special fuels.

Default Positions:
Switch Bank 1
Max Timing +5° BTDC
S1=ON, S2=OFF, S3=ON

HS Retard S4=OFF

Max Speed Rev Limit 11,000 rpm
S5=ON, S6=OFF, S7=OFF, S8=ON

Switch Bank 2
Hole Shot Rev Limit 6,000 rpm
S1=OFF, S2=OFF, S3=ON, S4=ON

Full Timing RPM 2,000 rpm
S5=OFF, S6=OFF, S7=OFF, S8=OFF

This setup will give stock max timing of 27° BTDC at a lower speed of 2,000 rpm. The timing can be increased to a maximum of 29° BTDC for a higher elevation or high octane fuel. The timing advance is set to reach full maximum advance timing at 2,000 rpm vs. 4,200 rpm stock curve for better low speed response. The MAX speed rev limiter is set for 11,000 rpm which is 1,975 rpm greater than the stock rev limiter. The Holeshot is set up for 6,000 rpm and can be adjusted from 3,000 to 6,750 rpm.

MAXIMUM TIMING			
DEG	S1	S2	S3
YMT	OFF	OFF	OFF
+1	ON	OFF	OFF
+2	OFF	ON	OFF
+3	ON	ON	OFF
+4	OFF	OFF	ON
+5	ON	OFF	ON
+6	OFF	ON	ON
+7	ON	ON	ON

High Speed Retard	S4
2 Deg Retard	ON
No Retard	OFF

PN 4203

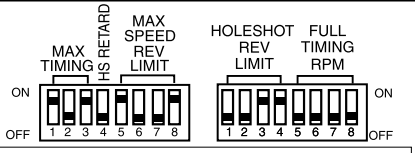
MAX SPEED REV LIMIT				
RPM	S5	S6	S7	S8
8750	OFF	OFF	OFF	OFF
9000	ON	OFF	OFF	OFF
9250	OFF	ON	OFF	OFF
9500	ON	ON	OFF	OFF
9750	OFF	OFF	ON	OFF
10000	ON	OFF	ON	OFF
10250	OFF	ON	ON	OFF
10500	ON	ON	ON	OFF
10750	OFF	OFF	OFF	ON
11000	ON	OFF	OFF	ON
11250	OFF	ON	OFF	ON
11500	ON	ON	OFF	ON
11750	OFF	OFF	ON	ON
12000	ON	OFF	ON	ON
12250	OFF	ON	ON	ON
12500	ON	ON	ON	ON

CHECK TIMING WITH SWITCHES
S1,S2,S3=OFF

THIS IS YOUR MINIMUM TIMING (above Full Timing RPM)

Any switch can be changed while engine is running.

DEFAULT SETTINGS



CUT THIS AREA OUT

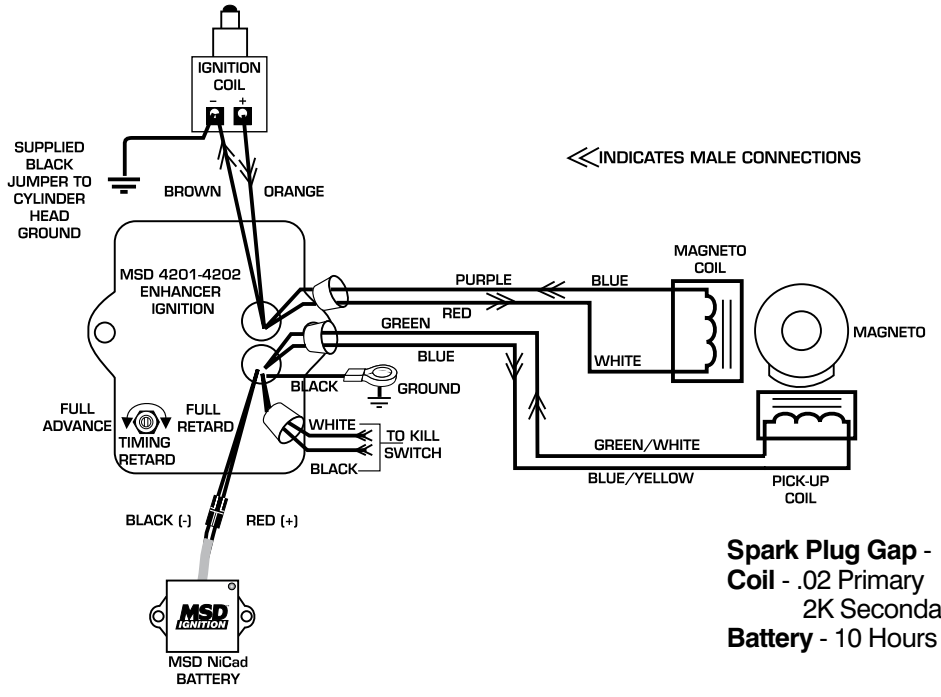
HOLESHOT REV LIMIT					FULL TIMING RPM				
RPM	S1	S2	S3	S4	RPM	S5	S6	S7	S8
3000	OFF	OFF	OFF	OFF	2000	OFF	OFF	OFF	OFF
3250	ON	OFF	OFF	OFF	2250	ON	OFF	OFF	OFF
3500	OFF	ON	OFF	OFF	2500	OFF	ON	OFF	OFF
3750	ON	ON	OFF	OFF	2750	ON	ON	OFF	OFF
4000	OFF	OFF	ON	OFF	3000	OFF	OFF	ON	OFF
4250	ON	OFF	ON	OFF	3250	ON	OFF	ON	OFF
4500	OFF	ON	ON	OFF	3500	OFF	ON	ON	OFF
4750	ON	ON	ON	OFF	3750	ON	ON	ON	OFF
5000	OFF	OFF	OFF	ON	4000	OFF	OFF	OFF	ON
5250	ON	OFF	OFF	ON	4250	ON	OFF	OFF	ON
5500	OFF	ON	OFF	ON	4500	OFF	ON	OFF	ON
5750	ON	ON	OFF	ON	4750	ON	ON	OFF	ON
6000	OFF	OFF	ON	ON	5000	OFF	OFF	ON	ON
6250	ON	OFF	ON	ON	5250	ON	OFF	ON	ON
6500	OFF	ON	ON	ON	5500	OFF	ON	ON	ON
6750	ON	ON	ON	ON	5750	ON	ON	ON	ON

Honda CR 125/250R
PN 42010

The MSD Honda CR 125 or 250R Motorcycle Ignition is designed as a complete system. No parts may be substituted with the stock Ignition system.

WIRING FUNCTIONS	
WIRING	
BROWN	Connects to coil Negative (-) wire.
ORANGE	Connects to coil Positive (+) wire.
PURPLE	Connects to factory Blue wire from the magneto.
RED	Connects to factory White wire from the magneto.
GREEN	Connects to factory Green/White wire from the pickup coil.
BLUE	Connects to factory Blue/Yellow wire from the pickup coil.
BLACK WITH RING LUG	Connects to Ground on the frame.
WHITE	Connects to Handle Bar Kill Switch.
BLACK	Connects to other side of Handle Bar Kill Switch.
BLACK & RED CONNECTOR	Connects to an MSD PN 4381 Nicad Battery Pack.
	On some older models these wires may be a different color or have different color wires coming from the magneto. In this case, the MSD wires connect the following way:
PURPLE	Connects to factory Red coming from the magneto.
RED	Connects to factory White wire coming from the magneto.
BLUE	Connects to the Blue wire from the pickup coil (run with Green/White wire).

WIRING DIAGRAM



Spark Plug Gap - .032 to .036
Coil - .02 Primary
2K Secondary
Battery - 10 Hours of run time

Honda TRX 250R
PN 42020

The MSD Enhancer Ignition system for the Honda TRX 250R ATV is designed as a complete system. No part may be substituted nor should any part be used with the stock ignition components.

WIRING FUNCTIONS

MSD Wires	HONDA STATOR WIRES
Red	Black/Red
Violet	Violet
Green (male connector)	Green/White
Blue	Blue/Yellow
Black	To frame ground
None	White (lights)

Spark Plug Gap - .082 - .036
Battery - 10-12 Hours run time

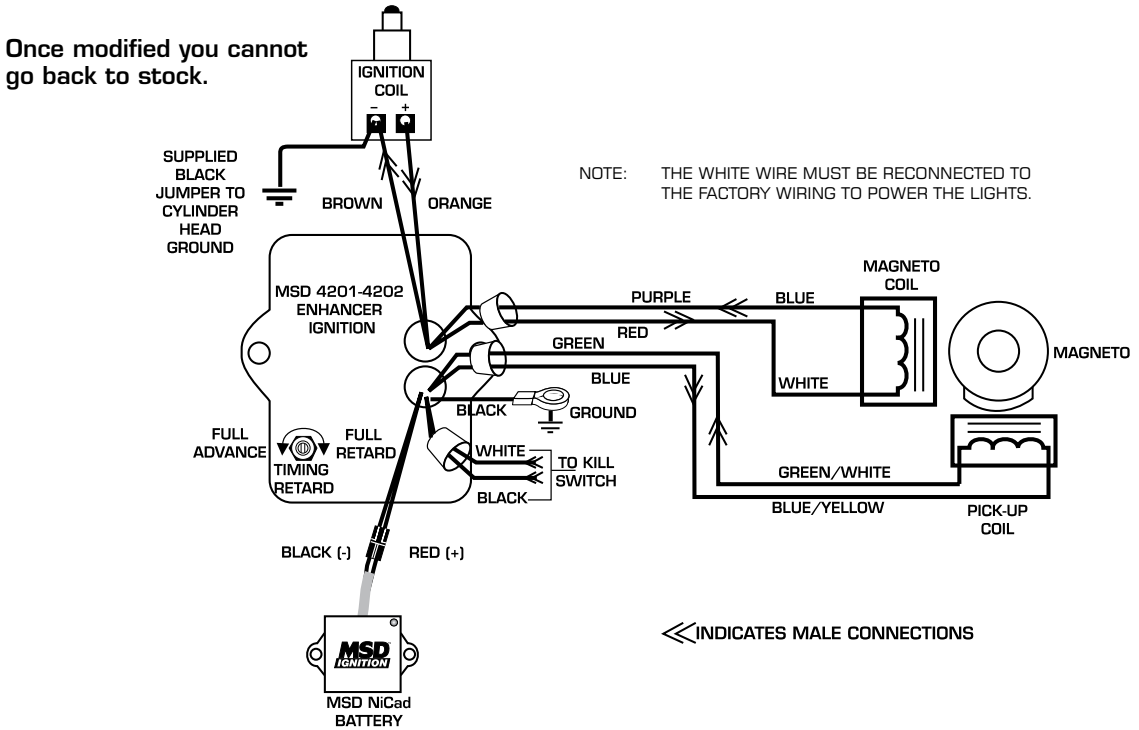
Note: The BLACK wire of the MSD should go to bare metal on the frame for best ground.

1. Install the supplied bullet connectors. Crimp and solder the connectors to achieve the best connections. Be sure to use the matching connector.

Note: The factory WHITE wire does not connect to the MSD. This wire remains connected for powering the lights.

2. Connect the MSD wires to the Honda stator wires.
3. The BROWN wire of the MSD connects to the coil negative (-).
4. The ORANGE wire of the MSD connects to the coil positive (+).
5. Connect the supplied BLACK jumper to the coil negative to ground on the engine head.

WIRING DIAGRAM



MSD Yamaha Banshee Ignition System
PN 42040

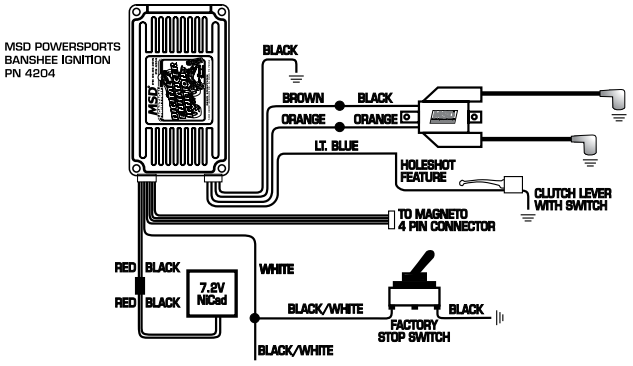
The Yamaha Banshee Ignition System fits all Banshees from '87 to '05. On '95 and '96 models it is a direct plug-in, all other models must be hard wired.

WIRING FUNCTIONS

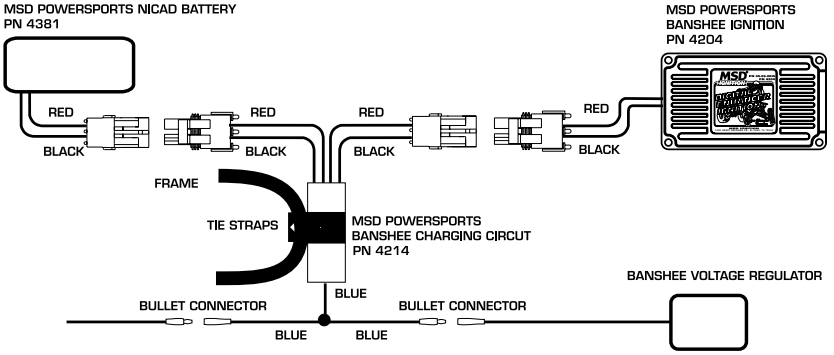
	Power Leads
RED	Direct to 7.2 Nicad Battery red wire
BLACK	Direct to 7.2 Nicad Battery black wire
	Coil Leads
BROWN	Direct to MSD black coil wire
ORANGE	Direct to orange coil wire
	Magneto Leads
YELLOW	Direct to Banshee Magneto White/Red wire
GREEN	Direct to Banshee Magneto White/Green wire
RED	Direct to Banshee Magneto Red wire
PURPLE	Direct to Banshee Magneto Green wire
	On/Off Switch
WHITE	Direct to Factory Stop Switch Black/White wire
	Holeshot
LIGHT BLUE	Direct to Clutch Lever (Optional Feature)
	Ground Lead
BLACK	Direct to Engine Ground

Spark Plug Gap - .032 to .036
Coil - .02 Primary
2K Secondary
Battery - 2 Hours of run time

WIRING DIAGRAM



WIRING THE CHARGING UNIT

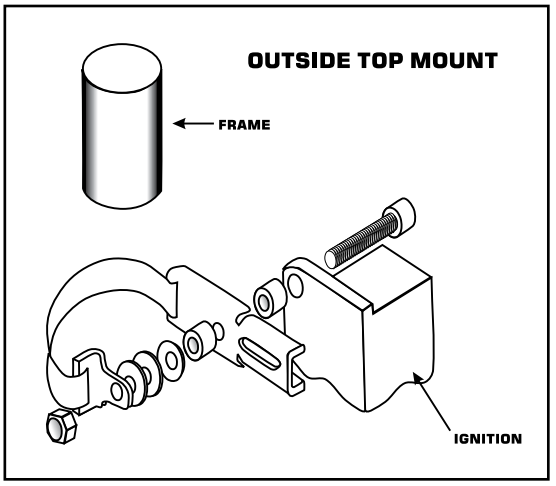


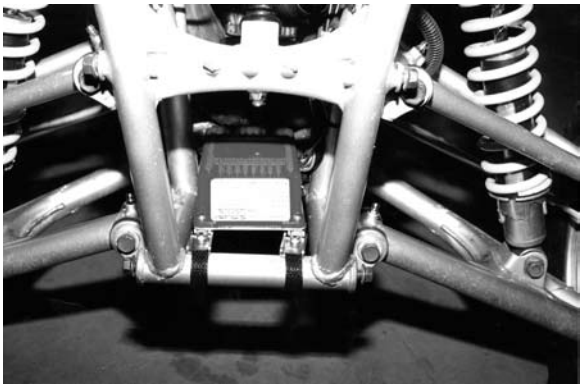
The wiring on certain Banshees is different. Here is the correct wiring for 1987 through 1994 and 1997 through 2002 Banshees. This diagram does not apply for the 1995 through 1996 Banshees.

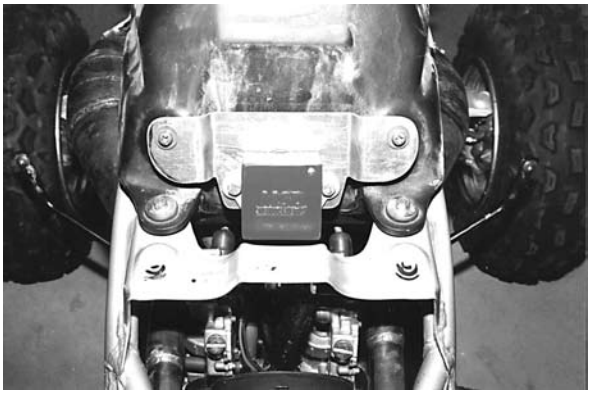
MSD	Stock Banshee
Yellow	White/Red
Green	White/Green
Red	Red
Purple	Green

MSD YAMAHA BANSHEE IGNITION SYSTEM, PN 42040

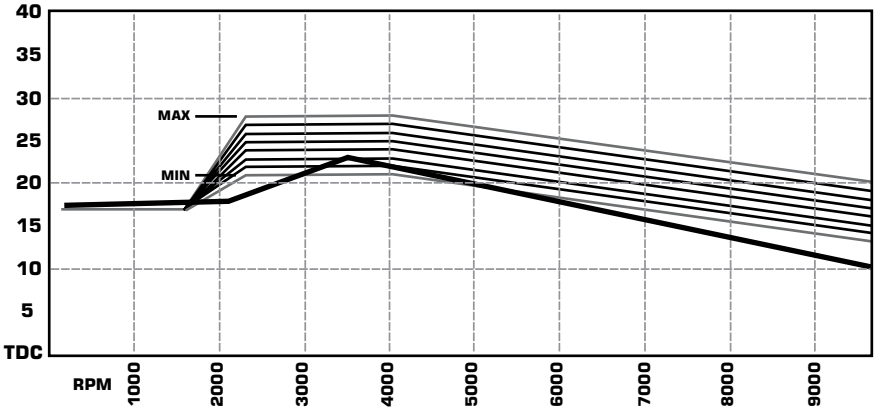
MOUNTING THE IGNITION AND NICAD BATTERY





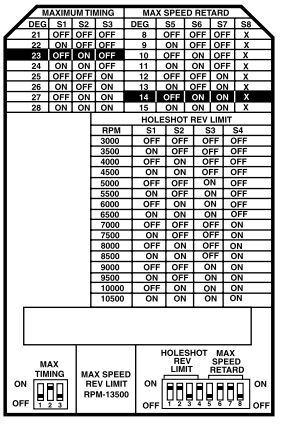


MAX TIMING ADJUSTMENTS



MAXIMUM TIMING				MAX SPEED RETARD				
DEG	S1	S2	S3	DEG	S5	S6	S7	S8
21	OFF	OFF	OFF	8	OFF	OFF	OFF	X
22	ON	OFF	OFF	9	ON	OFF	OFF	X
23	OFF	ON	OFF	10	OFF	ON	OFF	X
24	ON	ON	OFF	11	ON	ON	OFF	X
25	OFF	OFF	ON	12	OFF	OFF	ON	X
26	ON	OFF	ON	13	ON	OFF	ON	X
27	OFF	ON	ON	14	OFF	ON	ON	X
28	ON	ON	ON	15	ON	ON	ON	X

HOLESHOT REV LIMIT				
RPM	S1	S2	S3	S4
3000	OFF	OFF	OFF	OFF
3500	ON	OFF	OFF	OFF
4000	OFF	ON	OFF	OFF
4500	ON	ON	OFF	OFF
5000	OFF	OFF	ON	OFF
5500	ON	OFF	ON	OFF
6000	OFF	ON	ON	OFF
6500	ON	ON	ON	OFF
7000	OFF	OFF	OFF	ON
7500	ON	OFF	OFF	ON
8000	OFF	ON	OFF	ON
8500	ON	ON	OFF	ON
9000	OFF	OFF	ON	ON
9500	ON	OFF	ON	ON
10000	OFF	ON	ON	ON
10500	ON	ON	ON	ON



YAMAHA BANSHEE TIPS

P**lug Gap:** .032 to .036
Battery: 7.2V Nicad Battery. Aproximately two hours of run time
Recommended Timing: 23 Degrees BTDC

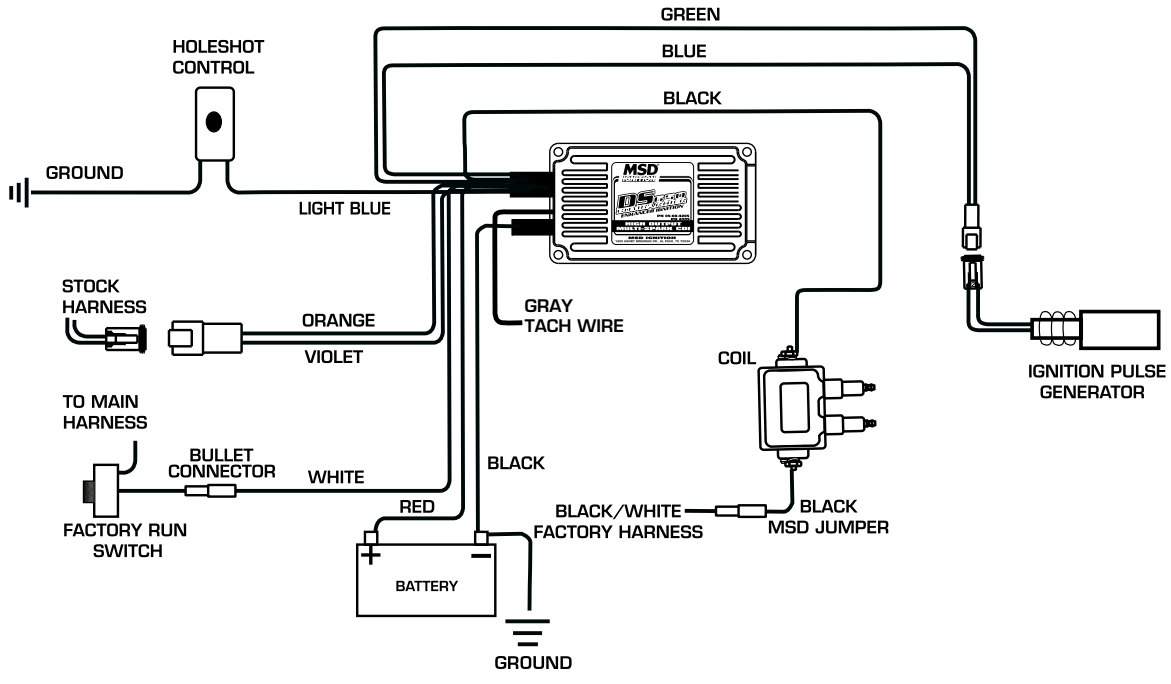
MSD DS 650 Bombardier® Ignition System
PN 42052

The MSD Enhancer system for the DS 650 Bombardier is designed as a complete system, no parts may be substituted with the stock ignition system.

WIRING FUNCTIONS

	Power Leads
RED	Direct to battery positive
BLACK	Direct to battery negative
	Coil Lead
BLACK	Direct to one side of the coil
	Optional Holeshot
LIGHT BLUE	Wire into a momentary switch
	Factory Run Switch
WHITE	Wire to the Factory Run Switch
	Pulse Generator Leads
BLUE	Wire to the blue/yellow wire of the pulse generator
GREEN	Wire to the green/white wire of the pulse generator
	Stock CDI Leads
ORANGE	Plug direct into stock CDI six pin connector
VIOLET	Plug direct into stock CDI six pin connector

WIRING DIAGRAM



DEFAULT SETTINGS

PROGRAMMING

The DS650 stock engine has a preset timing curve that is not adjustable. The timing starts at 11° until 2,500 rpm where it starts to slope up to 25° (full advance) at 5,500 rpm. It remains at 25° for remainder of the rpm range.

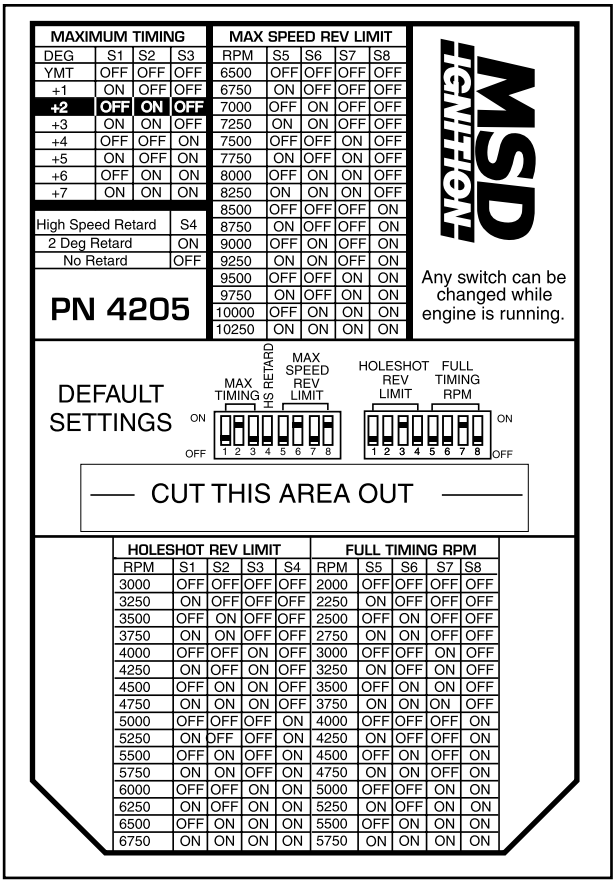
The MSD Ignition provides an adjustment for a timing advance of up to 7° over the factory setting. The slope, or rate of advance, is also adjustable from 2,000 - 5,570 rpm. The MSD Ignition also has a 2° high speed retard. When set, this will retard the timing 2° total from 7,000 rpm through the rev limit setting.

These adjustments are made with the dip switches on the ignition.

Note: Switch settings can be changed while the engine is running.

MAXIMUM TIMING

This feature allows you to advance the timing up to 7°. The advance is added in 1° increments. The system is set at the factory for 2° of advance.



MAXIMUM TIMING			
DEG	S1	S2	S3
YMT	OFF	OFF	OFF
+1	ON	OFF	OFF
+2	**OFF**	**ON**	**OFF**
+3	ON	ON	OFF
+4	OFF	OFF	ON
+5	ON	OFF	ON
+6	OFF	ON	ON
+7	ON	ON	ON

High Speed Retard	S4
2 Deg Retard	ON
No Retard	OFF

PN 4205

MAX SPEED REV LIMIT				
RPM	S5	S6	S7	S8
6500	OFF	OFF	OFF	OFF
6750	ON	OFF	OFF	OFF
7000	OFF	ON	OFF	OFF
7250	ON	ON	OFF	OFF
7500	OFF	OFF	ON	OFF
7750	ON	OFF	ON	OFF
8000	OFF	ON	ON	OFF
8250	ON	ON	ON	OFF
8500	OFF	OFF	OFF	ON
8750	ON	OFF	OFF	ON
9000	OFF	ON	OFF	ON
9250	ON	ON	OFF	ON
9500	OFF	OFF	ON	ON
9750	ON	OFF	ON	ON
10000	OFF	ON	ON	ON
10250	ON	ON	ON	ON

MSD IGNITION

Any switch can be changed while engine is running.

DEFAULT SETTINGS

CUT THIS AREA OUT

HOLESHOT REV LIMIT					FULL TIMING RPM				
RPM	S1	S2	S3	S4	RPM	S5	S6	S7	S8
3000	OFF	OFF	OFF	OFF	2000	OFF	OFF	OFF	OFF
3250	ON	OFF	OFF	OFF	2250	ON	OFF	OFF	OFF
3500	OFF	ON	OFF	OFF	2500	OFF	ON	OFF	OFF
3750	ON	ON	OFF	OFF	2750	ON	ON	OFF	OFF
4000	OFF	OFF	ON	OFF	3000	OFF	OFF	ON	OFF
4250	ON	OFF	ON	OFF	3250	ON	OFF	ON	OFF
4500	OFF	ON	ON	OFF	3500	OFF	ON	ON	OFF
4750	ON	ON	ON	OFF	3750	ON	ON	ON	OFF
5000	OFF	OFF	OFF	ON	4000	OFF	OFF	OFF	ON
5250	ON	OFF	OFF	ON	4250	ON	OFF	OFF	ON
5500	OFF	ON	OFF	ON	4500	OFF	ON	OFF	ON
5750	ON	ON	OFF	ON	4750	ON	ON	OFF	ON
6000	OFF	OFF	ON	ON	5000	OFF	OFF	ON	ON
6250	ON	OFF	ON	ON	5250	ON	OFF	ON	ON
6500	OFF	ON	ON	ON	5500	OFF	ON	ON	ON
6750	ON	ON	ON	ON	5750	ON	ON	ON	ON

MSD Kawasaki Jet Ski 720 Enhancer CD Ignition
PN 4251

INSTALLATION OF THE MSD ENHANCER CD IGNITION

1. Mount the MSD Enhancer in the stock unit's location. Add the two flatwashers provided to the existing bolts, between the bolt head and the flange on the MSD unit. The stock 6mm bolts are too long and will bottom out before tightening down completely. (Note: Use Blue Loctite on these bolts.)
2. Connect the Black ground of the MSD Enhancer to the ground terminal. You will have a total of three wires grounded at this point. (Note: Use Blue Loctite on this bolt.)
3. Route the 4-pin connector (Purple, Green and Blue wires).

Installing the Enhancer.

4. Plug the following matched wires into one another:

MSD ENHANCER CD IGNITION		FACTORY WIRING
White Wire	plugs into	White Wire
Black Wire	plugs into	Black Wire
Orange Wire	plugs into	Orange Wire
Brown Wire	plugs into	Black Wire with White dots

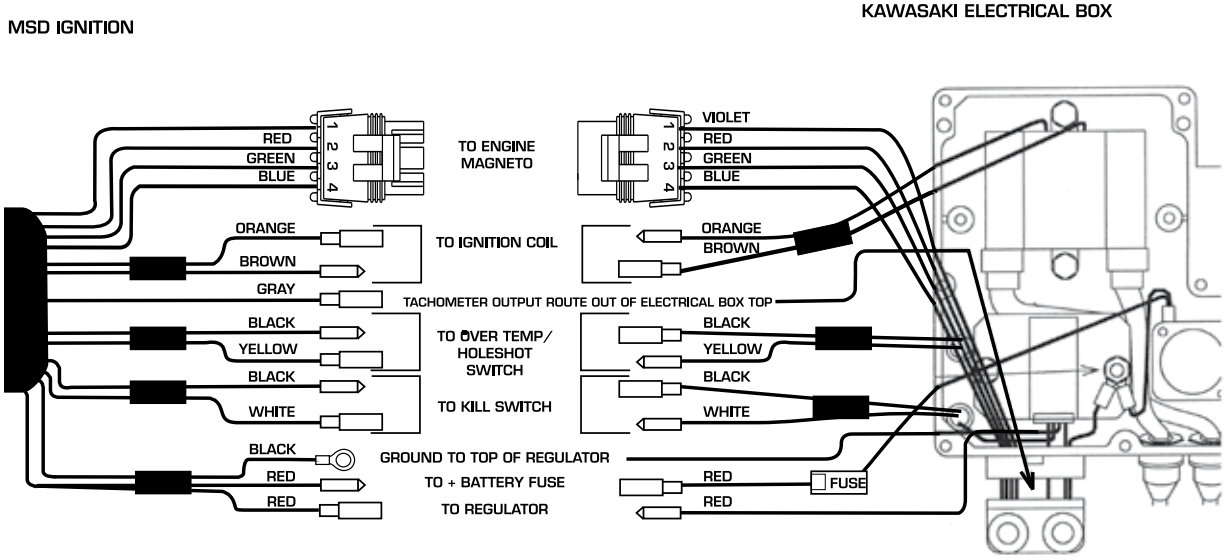
5. Unplug the Red wire coming out of the regulator/rectifier between the fuse holder and the regulator/rectifier itself.
6. Plug the Red wire (male bullet connector) coming off the MSD Enhancer CD Ignition into the Red wire (female connector) with the fuse holder.
7. Plug the Red wire (male bullet connector) coming out of the regulator/rectifier into the Red wire (female connector) coming off the MSD Enhancer CD Ignition.
8. The Yellow and Black wires coming out of the MSD Enhancer CD Ignition are for the Overtemp Limiter. The correct plug in of these wires are as follows:

MSD ENHANCER CD IGNITION		FACTORY WIRING
Yellow Wire	plugs into	Red Wire with Yellow Stripe
Black Wire	plugs into	Black Wire with Yellow Stripe

Note: These wires can be left unplugged if you choose not to use the stock water temperature switch.

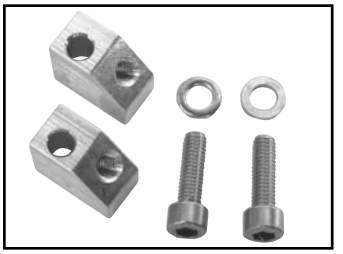
9. The Gray wire is an optional tach output wire. If you run a tach, we recommend that this wire be routed through the same grommet that your temperature switch wires (Red/Yellow and Black/Yellow) run through. If you do not run a tach, roll the Gray wire up, and leave it inside the electrical box.
10. Place the back cover on the electrical box (being sure no wires are getting pinched) and bolt it down (use Blue Loctite on these bolts).
11. Mount the electrical box back on the hull and hook up all hoses and wires that you originally disconnected. Be sure and zip tie the water temperature switch hoses back in place (with the two zip ties included).

WIRING THE ENHANCER IGNITION.



INSTALLATION ON A 750 SS, XI OR XIR

Installing the Enhancer on an SS, XI or XIR Kawasaki will require repositioning the coil. MSD offers a mounting block kit, PN 4296, that allows for easy modification of the coil location (Figure to right).



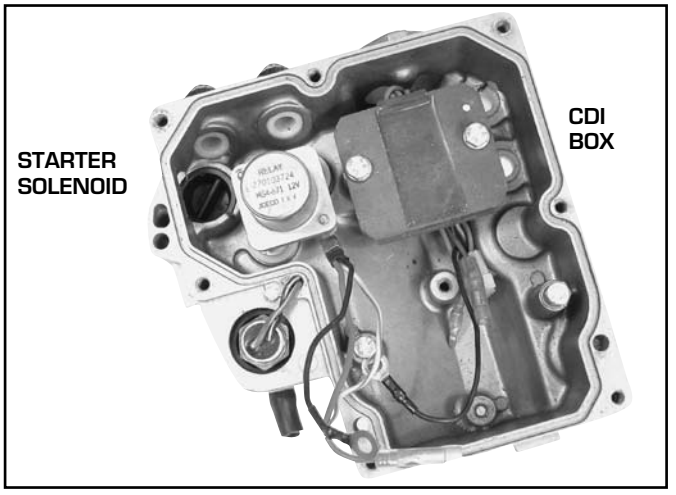
Coil Mounting Block Kit, PN 4296.

INSTALLATION ON THE KAWASAKI 750 ZXi

The Kawasaki ZXi 750 does not have connectors that allow a direct connection to the MSD PN 4251 Ignition. Therefore, the following procedure must be followed for installation on the ZXi 750.

In this procedure, you are going to install a jumper to the starter relay so the Enhancer receives a constant 12 volts.

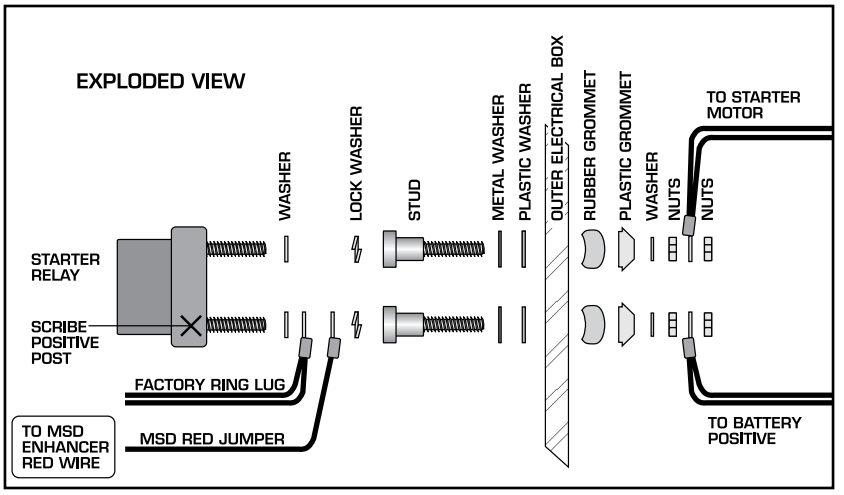
Note: Disconnect the negative battery cable.



The Stock Electrical Box

1. Remove the factory electrical box. Position the box so it can be opened and worked on easily.
2. Open the box then disconnect and remove the CDI box (Figure to right).
3. Locate the starter relay (under the CDI you just removed). Using a marker or scribe, identify which terminal the battery positive (+) cable is connected to.
4. Remove the outer nuts and plastic grommets that hold the starter relay in the electrical box. The relay should be easy to remove from the housing.

5. Remove the bolt and lock washer from the terminal that you marked earlier. There should be one ring lug with two wires attached to this terminal.
6. Install the supplied Red jumper wire with a ring lug on one end and a male and female bullet connector on the other end (Figure to right). Install the ring lug to the terminal, then the lock washer and nut. As it is tightened, make sure the wires do not twist or bind.

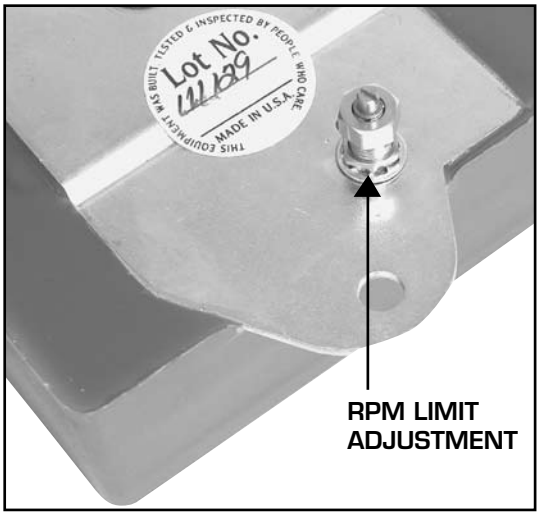


Installing the Jumper on the Starter Relay

7. Install the Starter Relay back into the electrical box. Confirm that the positive post you marked is positioned in the (+) marked hole. Install the plastic flanges and the nuts.
8. Locate the supplied 4-pin extention harness and connect it to the mating connector of the Enhancer.
9. Connect the wires of the MSD Enhancer with the supplied wiring instructions.

SETTING THE MSD ENHANCER CD IGNITION ADJUSTABLE REV LIMITER

The MSD Enhancer CD Ignition has a built-in user adjustable rev limiter which offers an adjustable rpm range from approximately 6,300-8,500 rpm. This rev limiter has a MSD factory pre-set of approximately 8,000 rpm. However, before mounting the ignition into the electrical box, you may adjust the rev limiter to your desired rpm.



Adjusting the RPM Limit.

1. Using an 8mm wrench, back off the lock-down nut on the potentiometer shaft. With a small flat blade screwdriver you will now be able to turn the pot shaft freely.
2. To increase the rpm of the rev limiter, turn the potentiometer shaft clockwise. One full clockwise rotation will give you the maximum rev limit available, approximately 8,500 rpm.
3. To decrease the rpm of the rev limiter turn the pot shaft counter-clockwise. One full rotation will give you the minimum rpm limit of approximately 6,300 rpm.
4. Once you have set the rpm limiter to your desired setting, tighten the lock-down nut on the potentiometer shaft (using the 8mm wrench and the screwdriver to hold the shaft in place). This will prevent the rev limiter from changing rpm.

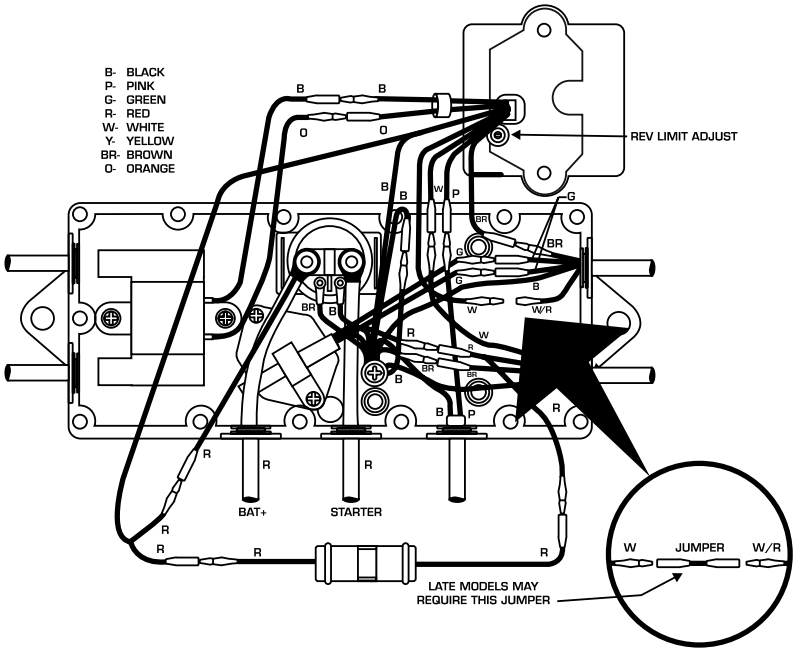
Yamaha 650/701 Enhancer Ignition

PN 4253

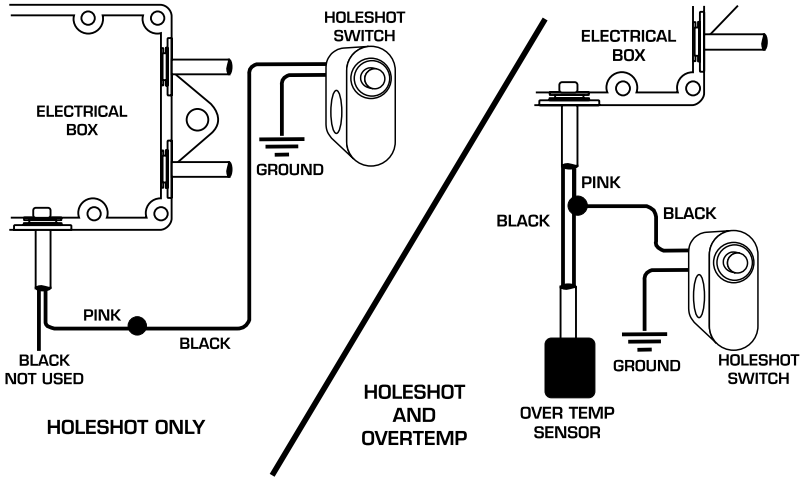
The Enhancer Ignition is a direct replacement for the stock CDI unit. No modifications in mounting or wiring are necessary. The Enhancer increases spark energy and includes an adjustable Rev Control and an engine protecting Hole shot/Engine Overtemp RMP Limiter. The Timing curve is also modified to improve low end mid range while maintaining top end performance.

Note: It is recommended that on the initial start up after installation of the Enhancer, that the ignition timing be left in the factory setting.

WIRING THE YAMAHA ENHANCER.



WIRING THE HOLE-SHOT AND HOLE-SHOT OVERTEMP.



ADJUSTING THE REV LIMIT

The adjustable Rev Limiting function of the Enhancer Ingnition is pre-set at the factory at 8,000 rpm. Its adjustable range is from 5,500 - 9,000 rpm. With this in mind, every 1/3 turn is approximately 1,100 rpm.

Note: While we feel 8,000 RPM is a safe setting, it is the customers responsibility to know the limits of the engine.

MSD SEA-DOO® 800 Enhancer Ignition

PN 4255

Fits SEA-DOO XP, GSX, GTX Watercraft w/Rave Engine

WIRING THE MSD ENHANCER.

The Enhancer uses factory connectors for quick, easy connection. The figure below shows how to wire the ignition.

Gray/Blk/Wht: Disconnect the White 3-pin connector between the MPEM module and Ignition Module. Plug the female 3-pin connector from Enhancer into Male connector on MPEM Module.

Org/Yel/Pur/Blk: Disconnect the White 6-pin connector connected to the Nippondenso Module and discard the ignition module. Plug the female 6-pin connector from Enhancer into Male connector on the open harness.

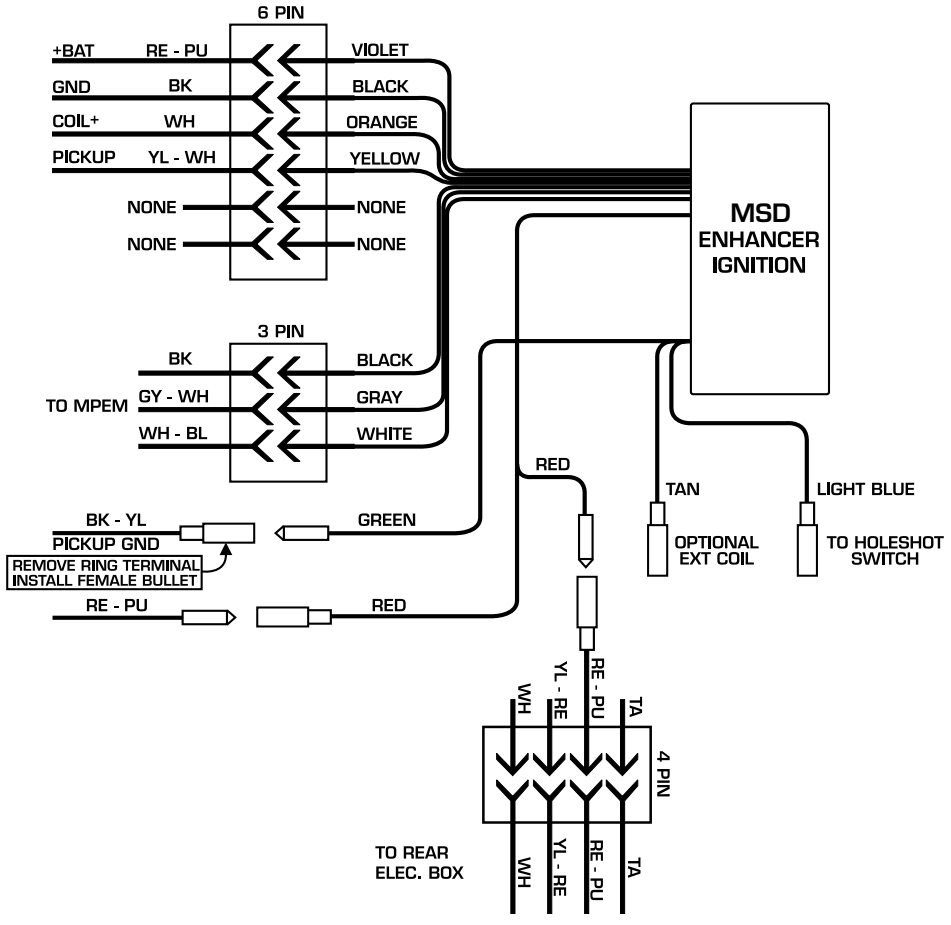
Red Wire: Disconnect Red w/Purple stripe wire from MPEM module and connect the MSD Enhancer's T-Spliced Red wire into matching connectors. Note: there will be several Red w/Purple stripe wires inside the electrical box. Make sure you locate the one wire coming from the MPEM module only.

Green Wire: Remove the ring lug attached to the Black w/Yellow wire in the electrical box and install the supplied female bullet connector to the wire. Connect the Green wire from the Enhancer into the Black w/Yellow stripe wire.

Tan Wire: This is an optional wire. Connect the Tan wire to the negative (-) side of the coil when using an aftermarket coil **only**.

Light Blue Wire: Holeshot feature activation wire. Connect the Light Blue Wire to one side of a momentary on/off switch such as the MSD Holeshot Switch, PN 4372. Connect the other side of the switch to ground.

WIRING



MSD SEA-DOO® 800 ENHANCER IGNITION, PN 4255

PROGRAMMING

Note: If the selector switch settings are changed during the testing procedures, the ignition switch must be turned Off and back On to activate the new program.

MAXIMUM TIMING			
DEG	S1	S2	S3
YMT	OFF	OFF	OFF
+1	ON	OFF	OFF
+2	OFF	ON	OFF
+3	ON	ON	OFF
+4	OFF	OFF	ON
+5	ON	OFF	ON
+6	OFF	ON	ON
+7	ON	ON	ON

CHECK TIMING WITH SWITCHES S1, S2, S3,= OFF THIS IS YOUR MINIMUM TIMING

RETARD BEGIN SPEED			
RPM	S1	S2	S3
4000	OFF	OFF	OFF
4500	ON	OFF	OFF
5000	OFF	ON	OFF
5500	ON	ON	OFF
6000	OFF	OFF	ON
6500	ON	OFF	ON
7000	OFF	ON	ON
7500	ON	ON	ON

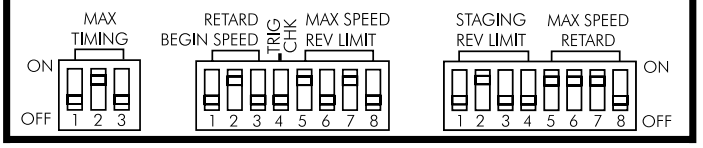
TRIGGER CHECK	S4
LED OPERATE	ON
IGN. OPERATE	OFF

PN 4255

MAX SPEED REV LIMIT				
RPM	S5	S6	S7	S8
6500	OFF	OFF	OFF	OFF
6750	ON	OFF	OFF	OFF
7000	OFF	ON	OFF	OFF
7250	ON	ON	OFF	OFF
7500	OFF	OFF	ON	OFF
7750	ON	OFF	ON	OFF
8000	OFF	ON	ON	OFF
8250	ON	ON	ON	OFF
8500	OFF	OFF	OFF	ON
8750	ON	OFF	OFF	ON
9000	OFF	ON	OFF	ON
9250	ON	ON	OFF	ON
9500	OFF	OFF	ON	ON
9750	ON	OFF	ON	ON
10000	OFF	ON	ON	ON
10250	ON	ON	ON	ON

HOLESHOT REV LIMIT				
RPM	S1	S2	S3	S4
3000	OFF	OFF	OFF	OFF
3250	ON	OFF	OFF	OFF
3500	OFF	ON	OFF	OFF
3750	ON	ON	OFF	OFF
4000	OFF	OFF	ON	OFF
4250	ON	OFF	ON	OFF
4500	OFF	ON	ON	OFF
4750	ON	ON	ON	OFF
5000	OFF	OFF	OFF	ON
5250	ON	OFF	OFF	ON
5500	OFF	ON	OFF	ON
5750	ON	ON	OFF	ON
6000	OFF	OFF	ON	ON
6250	ON	OFF	ON	ON
6500	OFF	ON	ON	ON
6750	ON	ON	ON	ON

MAX SPEED RETARD				
DEG	S5	S6	S7	S8
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON



Note: Staging Rev Limit and Holeshot Rev limit are the same feature.

TROUBLESHOOTING

GENERAL SYSTEM CHECKS:

1. Check the timing setup function. Observe the LED Monitor while attempting to start the engine. If the LED blinks, the timing setup function has not been returned to the ignition operate (off) setting. Change the setting, turn the ignition switch Off and On and start the engine. Note: the MPEM module may require a 30-40 sec. Off period before cranking the engine.
2. Review the wiring diagram and confirm that all of the wires are routed to the correct connections.
3. Check wire connectors by pulling each connector apart; verify all pins are firmly crimped to the wires.
4. Check the battery cables to verify that the positive (+) and negative (-) are firmly connected to the battery terminals.
5. Check the battery condition with a volt-ohm meter. If the meter indicates less than 10 volts static (non-cranking, ignition switch On) or less than 7 volts while cranking the engine with the starter, the Enhancer will not operate properly. Replace or charge the battery.
6. Check all fuses on MPEM module and voltage regulator.
7. Inspect the condition of the lanyard switch, wiring and connections throughout the switch circuit. If necessary, replace.
8. Check the 12-volt input to the MSD by plugging in the lanyard and using a volt-ohm meter to verify that at least 10 volts is supplied to the red wire. Repeat the test on the Violet wire with the start button depressed. If less than 10 volts is supplied to either the Red or Violet wire, the Enhancer will not operate properly. If no voltage is present while cranking, the MPEM may be at fault.

If the system checks out ok, but will not start, the problem may be in one of the four areas: the MPEM, the pickup assembly, the coil or the Enhancer module. The following procedures may be used to identify a possible problem:

MSD SEA-DOO® 800 ENHANCER IGNITION, PN 4255

MPEM/Pickup Operation Test: If the LED Monitor blinks when the timing setup function is active (on) and the engine is cranking, the MPEM is operating properly, the pickup section is operating properly and the malfunction is in the Enhancer/coil section.

If the LED does not blink during this test, four problems may exist: The pickup harness is not properly connected; the MPEM is not fuctioning properly; the pickup is not functioning properly or the Enhancer is malfunctioning.

Pickup Test: Refer to the SEA-DOO® Service Manual for proper procedure for checking the factory pickup coil.

Coil Check: If the engine fires intermittently, but will not run consistently and the "Factory Pickup Test" indicates that the pickup is operating properly, the coil may be defective.

Secondary Resistance: Turn the ignition switch off and remove both spark plugs and spark plug caps. Check the secondary resistance value of the coil by inserting the test probes into both spark plug wire ends. The value should be 9K - 15K ohms.

Primary Resistance: Remove both primary wires to the coil terminals. Check the primary resistance of the coil by touching the test probes to both the primary wires on the coil. The primary resistance should be less than one ohm.
If either of the coil's resistance values are out of specifications, replace the coil.

Enhancer: Total Spark Failure: If the general function checks fail to locate the problem and the LED Monitor indicates the pickup is working properly, the Enhancer is probably at fault.

If a solution is not found after completing all of the above tests the best option is to return the Enhancer module to MSD Ignition for evaluation.

Analog Total Loss Ignition System for Watercraft
PN 4270

CONNECTING THE POWER LEADS

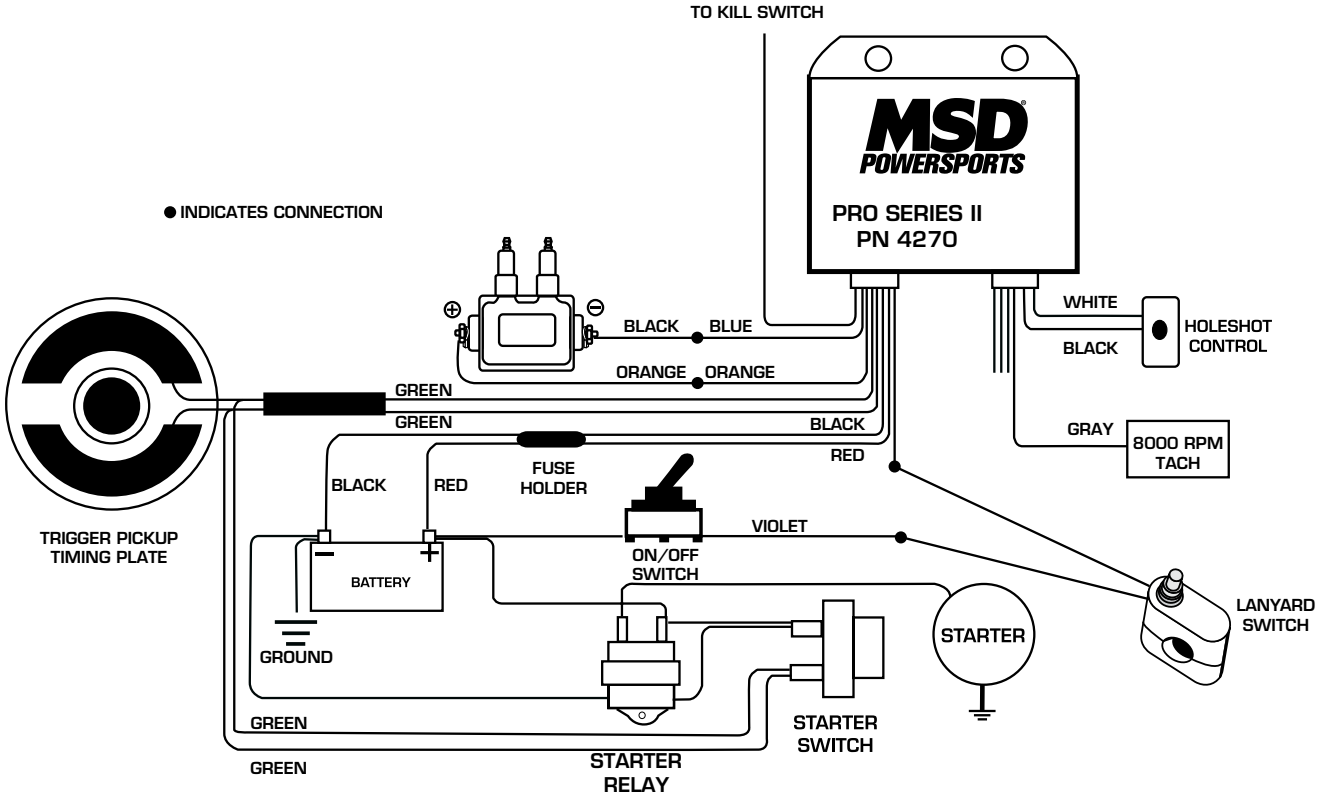
Before connecting the power leads, clean all surfaces of dirt, paint and other foreign substances where the power leads will be connected. If the power leads need to be lengthened, use 14 gauge, wire and solder all splices. Power leads may be shortened if necessary.

1. Install the supplied fuse holder to the Red wire using the supplied butt connectors. Connect the Red wire directly to the battery positive (+) post or to the starter solenoid where the cable from the battery (+) is connected.
2. Connect the Black wire to ground, preferably on the engine where the ground strap from battery (-) is connected to the engine case.

CONNECTING THE IGNITION

1. Connect the ORANGE wire from the ignition to the ORANGE wire from the coil.
2. Connect the BLUE wire from the ignition to the BLACK wire from the coil.
3. Connect the two GREEN wires from the ignition to the two GREEN wires from the trigger pickup.

WIRING THE MSD WATERCRAFT IGNITION SYSTEM



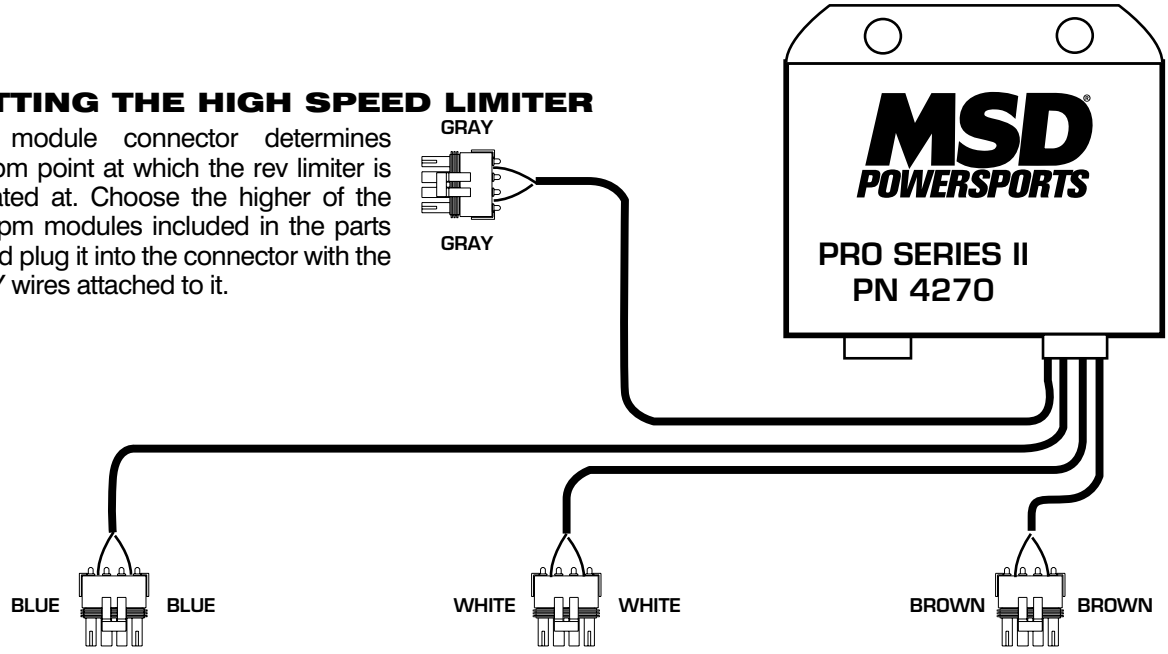
CONNECTING A TACHOMETER TO THE IGNITION

The tach signal from the MSD is a 12 volt square wave signal so many types of tachometers can be used with the ignition. Below is a list of the most common types used on watercraft applications. Connect the tachometer trigger wire to the MSD Ignitions GRAY wire as shown in the diagram above.

PROGRAMMING

SETTING THE HIGH SPEED LIMITER

This module connector determines the rpm point at which the rev limiter is activated at. Choose the higher of the two rpm modules included in the parts kit and plug it into the connector with the GRAY wires attached to it.



SETTING THE RPM POINT WHERE THE RETARD WILL BEGIN

This module connector determines the rpm at which the retard will begin to retard the timing at.

SETTING THE HOLESHOT LIMITER (PN 4271 ONLY)

This module connector determines the rpm point at which the holeshot feature holds the rpm at. Install a low rpm module into the connector with the White wires attached to it.

SETTING THE RATE OF RETARD

This module connector determines the rate per 1000 rpm at which the timing will be retarded at. Choose the module labeled with a degrees/1000 figure and plug it into the connector with the Brown wires attached to it.

SUGGESTED PROGRAMMING POINTS

ENGINE RPM	ENGINE RPM OPERATING RANGE	RETARD START POINT	RETARD RATE	REV LIMITER
440/550 Kaw.	7000-8000	5000-5800 RPM	Deg. 3/1000	8600 RPM
440/550 Kaw.	8000-9000	6000-6800 RPM	Deg. 2/1000	9600 RPM
440/550 Kaw.	8600-10000	7000-7600 RPM	Deg. 2/1000	10600 RPM
650/750 Kaw.	5000-6000	3400-4000 RPM	Deg. 3/1000	7000 RPM
650/750 Kaw.	6000-7000	4600-5000 RPM	Deg. 2/1000	8000 RPM
650/750 Kaw.	6600-7600	5000-5600 RPM	Deg. 2/1000	9000 RPM
650/701 Yam.	5000-6000	3200-4000 RPM	Deg. 3/1000	7000 RPM
650/701 Yam.	6000-7000	4200-5000 RPM	Deg. 2/1000	8000 RPM
650/071 Yam.	6600-7600	4800-5400 RPM	Deg. 2/1000	8600 RPM
Sea Doo 650/720	5000-6000	3200-4000 RPM	Deg. 3/1000	6600 RPM
	6000-7000	4200-5000 RPM	Deg. 2/1000	7600 RPM
	6600-7600	4600-5000 RPM	Deg. 3/1000	8000 RPM

FACTORY AND AFTERMARKET SWITCH INFORMATION APPLICATION.

Note: It does not matter which Green wire on the ignition is hooked to which Green wire on the trigger pickup.

CONNECTING THE FACTORY STOP SWITCH

PN 4260, PN 4262 and PN 4270:
To retain use of the factory stop switch located on the handle bar, attach the two wires coming from the stop switch to the two Green wires from the MSD Ignition.

PN 4271
Connect the Brown wire from the PN 4271 to one side of the ignition kill switch and the other side to ground.

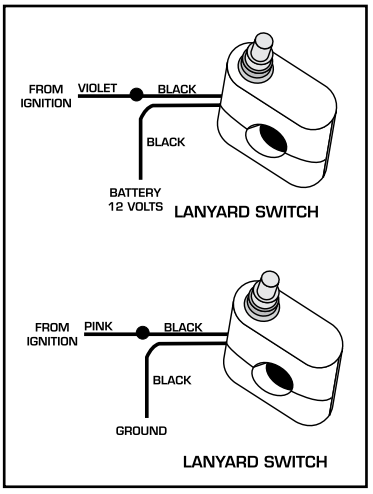
Note: Sea Doo uses factory Lanyard Switch to kill the engine. See Lanyard Switch hookup below.

CONNECTING THE IGNITION KILL LANYARD FEATURE

Lanyard Switches are listed as Normally Open or Closed when the switch is not connected to anything and the Lanyard is removed from the switch.

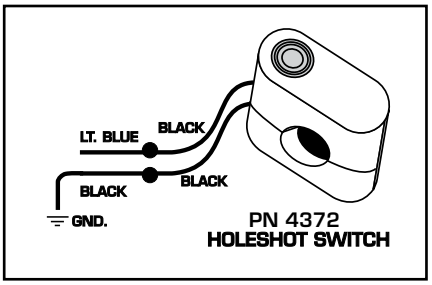
Normally Open Lanyard Switch (Sea Doo and MSD PN 4370)
Connect the Violet wire to the MSD Ignition to one side of the N.O. Lanyard Switch and the other side to positive battery (12 volts).

Normally Closed Lanyard Switch
Connect the Brown wire to one side of the normally closed lanyard switch and the other side of the switch to ground.



CONNECT THE HOLESHOT FEATURE (PN 4271 ONLY)

Connect the White wire to one side of a normally open momentary switch and the other side of the switch to the Black wire.



TROUBLESHOOTING

After installing the MSD Ignition System, if the craft fails to start, check the installation procedure for any missing steps. If everything checks correctly, inspect the following:

1. Check the battery to make sure it is fully charged and properly connected. Also make sure the terminal connections are clean and tight.
2. Check the in-line fuse on the heavy Red wire of the MSD Ignition.
3. Make sure there are no loose wire connections. All connections should be free of rust, paint or other debris.
4. Visually check the connections on the coil. Only two wires should be making contact to the coil wires. Orange should be connected to the Orange wire on the coil and the Blue wire should be connected to the Black wire on the coil. Do Not connect any test equipment, test lights, etc. to the coil wires.
5. Check the Ignition's heavy Red wire for 12 volts. If 12 volts is not there, check the connections or battery condition.
6. Check for 12 volts on the Violet wire of the MSD Ignition when the ignition on/off switch is in the ON position.
7. Check the craft's safety lanyard for proper operation.

If there is still a problem present after checking all of the above steps, continue with the following diagnostic procedures.

TESTING THE IGNITION FOR SPARK.

After checking the wiring through the Troubleshooting Check List and the Wiring of the MSD Watercraft Ignition system, test the MSD Ignition to make sure that it is sparking. If the ignition produces a spark in this test, then it can be assumed that the ignition is functioning properly. To check for spark, follow this procedures:

1. Make sure the ignition switch is in the Off position.
2. Remove the spark plugs, then connect the spark plug wires to the plugs and position them so you can observe the spark jump the plug gap. The plugs must be grounded.
3. Cut the two green trigger wires from the trigger pickup. When finished with this test you must connect the wires together following the wiring tips discussed earlier in this manual.
4. Turn the ignition switch On. Do Not attempt to crank the engine.
5. Take a short length of wire and jump the two Green wires from the ignition together, then release them quickly several times. When you do this, a spark should jump the spark plug gap.
6. If there is no spark, substitute another ignition coil and repeat the test.

TESTING THE TRIGGER PICKUP.

After checking the Ignition Module, you can test the operation of the trigger pickup.

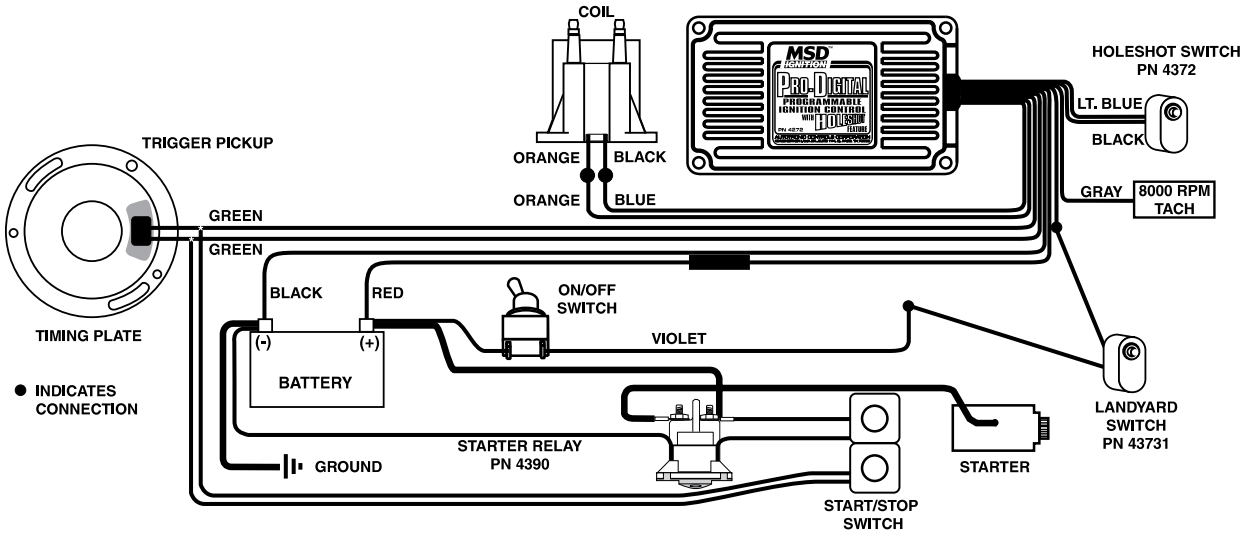
Note: The two Green trigger pickup wires must be connected at this time.

1. Disconnect the MSD Ignition's Red wire from the battery or starter solenoid and turn the ignition switch to the On position.
2. While observing the LED on the side of the ignition, rotate the crankshaft by hand. When the pickup and the magnet on the flywheel line up, the LED should illuminate.
3. If the LED lights, the trigger pickup is operating properly. If the LED does not light, check the air gap between the pickup and the flywheel magnet. It should be .050" - .094". If the air gap is correct, the trigger pickup is at fault.

If you perform all the above suggestions or have any questions concerning the installation or operation of your MSD Watercraft Ignition Kit, call the MSD Powersports Customer service department for more information.

MSD Watercraft Ignition System (Old Style)
PN 4272

WIRING DIAGRAM



SWITCH PANEL DIAGRAM

MAXIMUM TIMING			
DEG	S1	S2	S3
-7	OFF	OFF	OFF
-6	ON	OFF	OFF
-5	OFF	ON	OFF
-4	ON	ON	OFF
-3	OFF	OFF	ON
-2	ON	OFF	ON
-1	OFF	ON	ON
MAX	ON	ON	ON

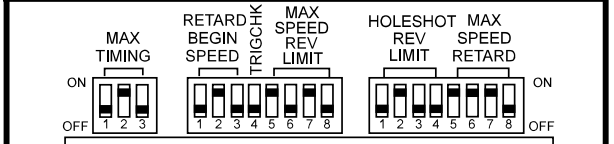
SET MAX TIMING SWITCHES ALL ON AND SET TIMING WITH LED FOR 5 DEG GREATER THAN TIMING DESIRED

RETARD BEGIN SPEED			
RPM	S1	S2	S3
4000	OFF	OFF	OFF
4500	ON	OFF	OFF
5000	OFF	ON	OFF
5500	ON	ON	OFF
6000	OFF	OFF	ON
6500	ON	OFF	ON
7000	OFF	ON	ON
7500	ON	ON	ON

TIMING SETUP	S4
LED OPERATE	ON
IGN. OPERATE	OFF

PN 4272

MAX SPEED REV LIMIT				
RPM	S5	S6	S7	S8
6500	OFF	OFF	OFF	OFF
6750	ON	OFF	OFF	OFF
7000	OFF	ON	OFF	OFF
7250	ON	ON	OFF	OFF
7500	OFF	OFF	ON	OFF
7750	ON	OFF	ON	OFF
8000	OFF	ON	ON	OFF
8250	ON	ON	ON	OFF
8500	OFF	OFF	OFF	ON
8750	ON	OFF	OFF	ON
9000	OFF	ON	OFF	ON
9250	ON	ON	OFF	ON
9500	OFF	OFF	ON	ON
9750	ON	OFF	ON	ON
10000	OFF	ON	ON	ON
10250	ON	ON	ON	ON



SWITCHES ON BACK

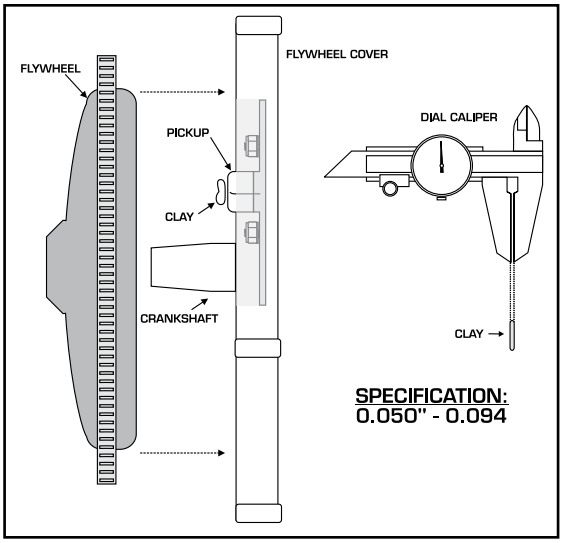
HOLESHOT REV LIMIT				
RPM	S1	S2	S3	S4
3000	OFF	OFF	OFF	OFF
3250	ON	OFF	OFF	OFF
3500	OFF	ON	OFF	OFF
3750	ON	ON	OFF	OFF
4000	OFF	OFF	ON	OFF
4250	ON	OFF	ON	OFF
4500	OFF	ON	ON	OFF
4750	ON	ON	ON	OFF
5000	OFF	OFF	OFF	ON
5250	ON	OFF	OFF	ON
5500	OFF	ON	OFF	ON
5750	ON	ON	OFF	ON
6000	OFF	OFF	ON	ON
6250	ON	OFF	ON	ON
6500	OFF	ON	ON	ON
6750	ON	ON	ON	ON

MAX SPEED RETARD				
DEG	S5	S6	S7	S8
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

CHECKING THE AIR GAP

It is important to have the correct air gap between the pickup and the flywheel. Too much may not trigger the ignition while too little may cause contact to the pickup.

1. Position a small amount of clay on the top of the trigger pickup (Figure to right).
2. Place the flywheel on the crankshaft and lightly tap with a rubber or wooden object to hold it in place.
3. Remove the flywheel and measure the thickness of the clay. Refer to the chart below to right for the number of shims that will need to be placed under the trigger pickup to obtain the correct air gap between the trigger pickup and the magnet in the flywheel. The correct air gap is .050" to .094".
4. Insert the necessary shims under the trigger pickup. Make sure the trigger retaining bolts are the correct length for the number of shims being used and are tightened firmly.



SHIM CHART

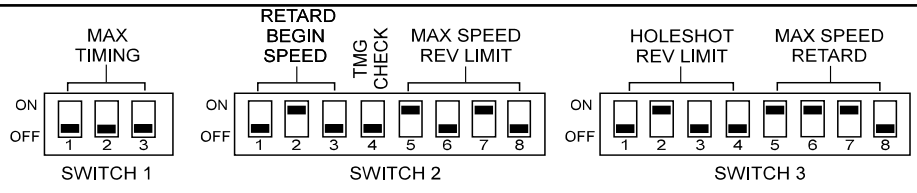
If the thickness of the clay is between:	ADD THESE SHIMS	
	.020"	.060"
.050" - .094"	0	0
.095" - .115"	1	0
.116" - .135"	2	0
.136" - .155"	0	1
.156" - .176"	1	1
.176" - .195"	2	1

TIPS FOR SETTING YOUR IGNITION TIMING

1. Use as much initial advance as possible without encountering excessive starter load or engine kickback on starting. Beware of detonation when setting the initial advance.
2. Set the timing retard start point as early as possible without sacrificing low RPM performance.
3. Use the highest retard as possible without hurting top end performance.

PROGRAMMING THE IGNITION

The MSD Ignition produces a computer-generated timing curve. Several programming options are available to tune the basic timing curve to meet specific engine requirements. The factory program settings are suitable for most watercraft, but changes can be made for special applications. Three switches located under the aluminum plate of the MSD ignition module select the programming options (Figure below). **IMPORTANT NOTE: If the selector switch settings are changed, the ignition switch must be turned "off" and back "on" before the new program functions become active.** Always install aluminum backing plate to seal switches.



The factory settings are:			
Switch 1	Selectors	S1-on, S2-on, S3-on	(Max Timing = 0°)
Switch 2	Selectors	S1-off, S2-on, S3-off	(Begin Retard = 5000 rpm)
		S4-off	(Timing Setup = Ignition Operate)
		S5-on, S6-off, S7-on, S8-off	(Rev Limit = 7750 rpm)
Switch 3	Selectors	S1-off, S2-on, S3-off, S4-off	(Holeshot Rev Limit = 3500 rpm)
		S5-on, S6-on, S7-on, S8-off	(Max Speed Retard = 7°.)

TROUBLESHOOTING

After installing the MSD Ignition System, if the craft fails to start, check the installation procedure for any missed steps. If everything checks correctly, inspect the following:

1. Check the battery to make sure it is fully charged and properly connected. Also make sure the terminal connections are clean and tight.
2. Make sure there are no loose wire connections. All connections should be free of rust, paint or other debris.
3. Visually check the connections on the coil. Only two wires should be making contact to the coil wires. Orange should be connected to the Orange wire on the coil and the blue wire should be connected to the Black wire on the coil. **Do Not** connect any test equipment, test lights, etc. to the coil wires.
4. Check the Ignition's heavy Red wire for 12 volts. If 12 volts is not there, check the connections or battery condition.
5. Check for 12 volts on the Violet wire of the MSD Ignition when the ignition on/off switch is in the ON position.
6. Check the craft's safety lanyard for proper operation.
7. Check the programming switch S4 of switch 2. Timing check - ignition operate position.

If there is still a problem present after checking all of the above steps, continue with the following diagnostic procedures.

TESTING THE IGNITION FOR SPARK

1. Make sure the ignition switch is in the Off position.
2. Remove the spark plugs, then connect the spark plug wires to the plugs and position them so you can observe the spark jump the plug gap. The plugs must be grounded.
3. Cut the two green trigger wires from the trigger pickup. When finished with this test you must connect the wires together following the wiring tips discussed earlier in this manual.
4. Turn the ignition switch On. Do Not attempt to crank the engine.
5. Take a short length of wire and jump the two Green wires from the ignition together, then release them quickly several times. When you do this, a spark should jump the spark plug gap.
6. If there is no spark, substitute another ignition coil and repeat the test.

TESTING THE TRIGGER PICKUP

After checking the Ignition Module, you can test the operation of the trigger pickup.

Note: The two Green trigger pickup wires must be connected at this time.

1. The MSD Ignition's Red wire should be disconnected from the battery or starter solenoid while turning the engine by hand. Turn the ignition switch to the On position. NOTE: This can be left connected if - the timing check switch is moved to the LED operate position. (The switch must be in the LED position to check pickups or timing.)
2. While observing the LED on the side of the ignition, rotate the crankshaft by hand. When the pickup and the magnet on the flywheel line up, the LED should illuminate.
3. If the LED lights, the trigger pickup is operating properly. If the LED does not light when switch 2, S4 is on, check the air gap between the pickup and the flywheel magnet. It should be .050" - .094". If the air gap is correct, the trigger pickup is at fault.

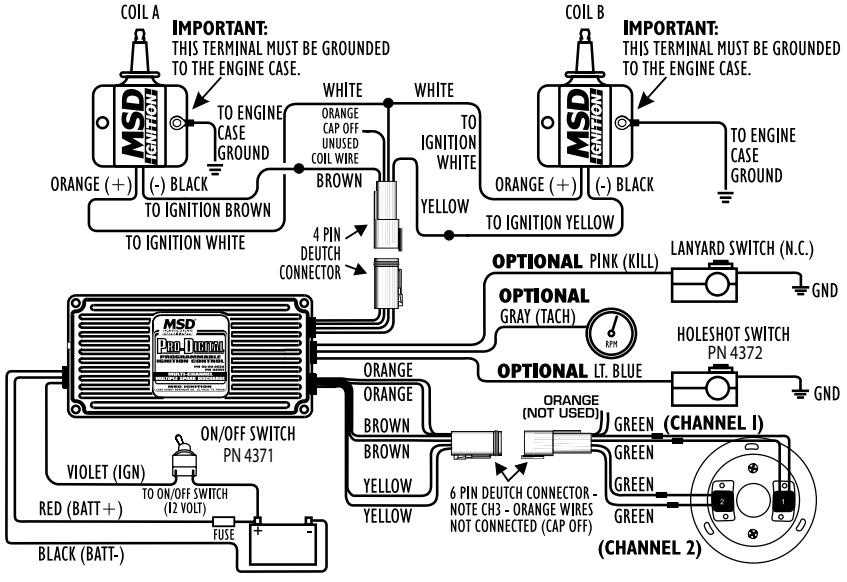
NOTE: Timing setup switch S4 must be in LED operate position.

MSD Multi-Channel Ignition
PN 42351

The multi-Channel Ignition is a race ignition and is applicable for 1, 2 and 3 cylinder engines. This ignition is designed for 2 stoke engines such as Jet Skis and Snowmobiles, but can be used for other applications.

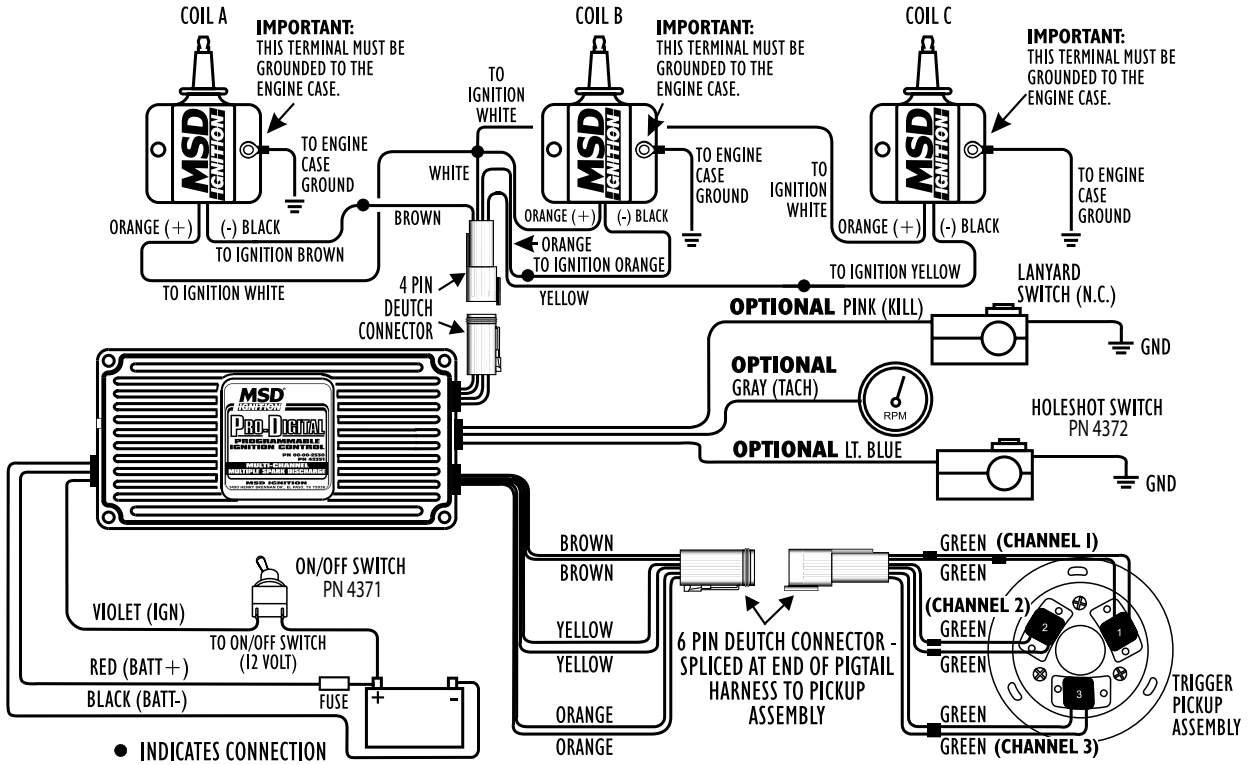
WIRING FUNCTIONS	
	Power Leads
HEAVY RED	Direct to battery positive (+)
HEAVY BLACK	Direct to battery negative (-)
VIOLET	Direct to positive/w in-line on/off switch
	Trigger Pickups
BROWN **BROWN**	These two wires are the trigger pickup leads which wire into the two green trigger pickup wires PN4316 or PN43161. Trigger wires are supplied in kit
YELLOW **YELLOW**	These two wires are the trigger pickup leads which wire into the two green trigger pickup wires PN4316 or PN43161. Trigger wires are supplied in kit
ORANGE **ORANGE**	These two wires are the trigger pickup leads which wire into the two green trigger pickup wires PN4316 or PN43161. Trigger wires are supplied in kit
	Coils
BROWN	Coil wire to be wired to black wire of the single tower coil PN42921
YELLOW	Coil wire to be wired to black wire of the single tower coil PN42921
ORANGE	Coil wire to be wired to black wire of the single tower coil PN42921
WHITE	Coil wire to be wired to all orange wires of the single tower coil PN42921
	Kill Feature
PINK	Optional kill lanyard wire normally closed
	Tach Output
GRAY	Optional tach wire, 12 volt square wave single pulse
	Holeshot Feature
LIGHT BLUE	Optional holeshot wire normally closed

UNIVERSAL TWO CYLINDER APPLICATION



MSD MULTI-CHANNEL IGNITION, PN 42351

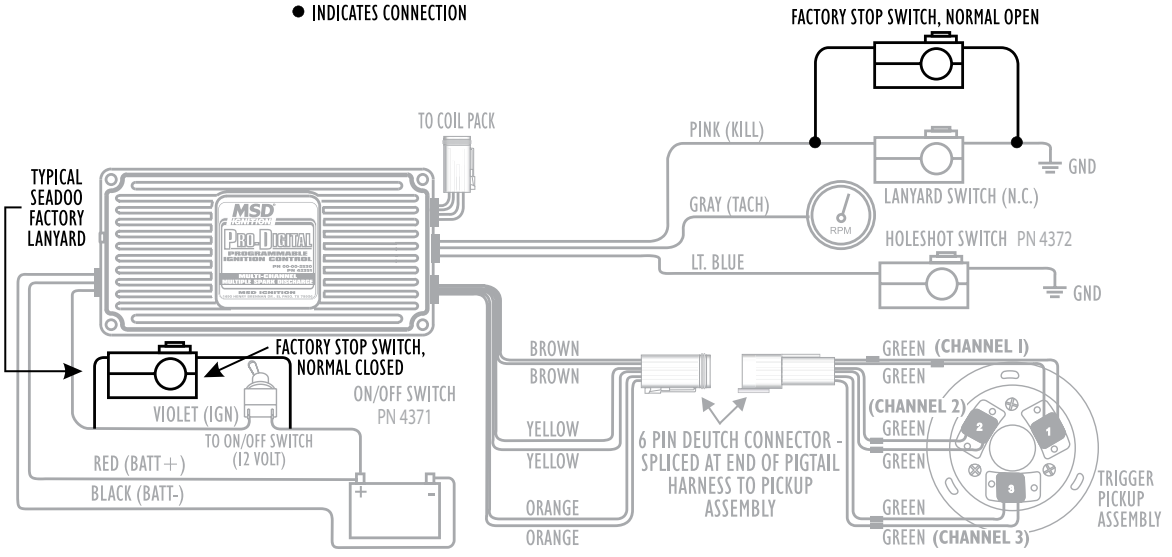
UNIVERSAL THREE CYLINDER APPLICATION



CONNECTING THE FACTORY STOP SWITCH.

To retain use of the factory switch, for a normally open type switch, locate on the handle bar, attach the two wires coming from the stop switch to the PINK wire from the Ignition and the other switch wire to engine ground or the negative terminal of the battery.

Note: SEA-DOO® uses the factory lanyard switch to kill the engine.



IGNITION KILL LANYARD FEATURE.

CONNECTING THE IGNITION KILL LANYARD FEATURE

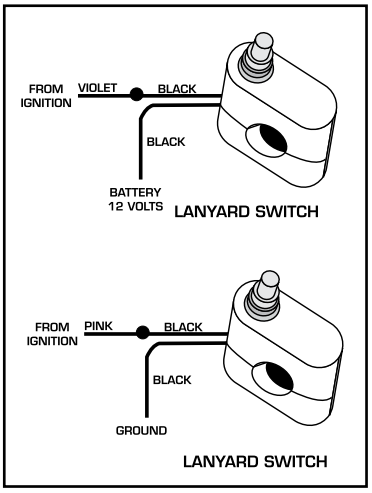
Lanyard Switches are listed as Normally Open or Closed when the switch is not connected to anything and the Lanyard is removed from the switch.

Normally Open Lanyard Switch

Connect the VIOLET wire of the Ignition to one side of the N.O. Lanyard Switch and the other side to the positive battery connect (12 volts).

Normally Closed Lanyard Switch

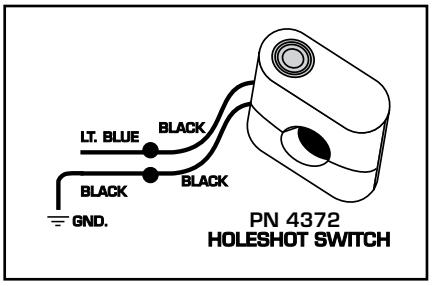
Connect the Pink wire of the Ignition to one side and connect the remaining lanyard wire to ground.



CONNECTING HOLESHOT FEATURE & TACHOMETER.

CONNECTING THE HOLESHOT FEATURE

Connect the LT. BLUE wire to one side of a normally open momentary switch and the other side of the switch to the ground or negative battery terminal.

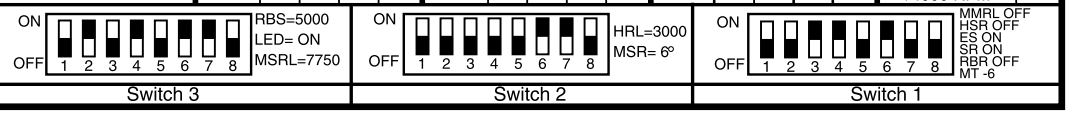


CONNECTING A TACHOMETER

The tach signal from the Ignition is a 12 volt square wave signal so many types of tachometers can be used with the ignition. Some of the more commonly used tachometers are the Jetmeter, Water Strike Marine, Optak, J.R. Electronics, VDO, Faria, and Autometer. Connect the tachometer trigger wire to the Ignition GRAY wire.

SWITCH PROGRAM LABEL

Switch 3									Switch 2									Switch 1			
RETARD BEGIN SPEED				MAX SPEED REV LIMIT					HOLESHOT REV LIMIT					MAX SPEED RETARD					MAX TIMING			
RPM	S1	S2	S3	RPM	S5	S6	S7	S8	RPM	S1	S2	S3	S4	DEG+15	S5	S6	S7	S8	DEG	S6	S7	S8
4000	OFF	OFF	OFF	6250	OFF	OFF	OFF	OFF	3000	OFF	OFF	OFF	OFF	0/15	OFF	OFF	OFF	OFF	−7	OFF	OFF	OFF
4500	ON	OFF	OFF	6500	ON	OFF	OFF	OFF	3250	ON	OFF	OFF	OFF	1/16	ON	OFF	OFF	OFF	−6	ON	OFF	OFF
5000	OFF	ON	OFF	6750	OFF	ON	OFF	OFF	3500	OFF	ON	OFF	OFF	2/17	OFF	ON	OFF	OFF	−5	OFF	ON	OFF
5500	ON	ON	OFF	7000	ON	ON	OFF	OFF	3750	ON	ON	OFF	OFF	3/18	ON	ON	OFF	OFF	−4	ON	ON	OFF
6000	OFF	OFF	ON	7250	OFF	OFF	ON	OFF	4000	OFF	OFF	ON	OFF	4/19	OFF	OFF	ON	OFF	−3	OFF	OFF	ON
6500	ON	OFF	ON	7500	ON	OFF	ON	OFF	4250	ON	OFF	ON	OFF	5/20	ON	OFF	ON	OFF	−2	ON	OFF	ON
7000	OFF	ON	ON	7750	OFF	ON	ON	OFF	4500	OFF	ON	ON	OFF	6/21	OFF	ON	ON	OFF	−1	OFF	ON	ON
7500	ON	ON	ON	8000	ON	ON	ON	OFF	4750	ON	ON	ON	OFF	7/22	ON	ON	ON	OFF	MAX	ON	ON	ON
				8250	OFF	OFF	OFF	ON	5000	OFF	OFF	OFF	ON	8/23	OFF	OFF	OFF	ON	MAX/MIN REVLIM			S1
TIMING SETUP			S4	8500	ON	OFF	OFF	ON	5250	ON	OFF	OFF	ON	9/24	ON	OFF	OFF	ON	+4000 RPM			ON
LED OPERATE			ON	8750	OFF	ON	OFF	ON	5500	OFF	ON	OFF	ON	10/25	OFF	ON	OFF	ON	MAX RETARD			S2
IGN. OPERATE			OFF	9000	ON	ON	OFF	ON	5750	ON	ON	OFF	ON	11/26	ON	ON	OFF	ON	RETARD +15°			ON
MSD IGNITION PN 42315				9250	OFF	OFF	ON	ON	6000	OFF	OFF	ON	ON	12/27	OFF	OFF	ON	ON	ELEC START -ON			S3
				9500	ON	OFF	ON	ON	6250	ON	OFF	ON	ON	13/28	ON	OFF	ON	ON	START RET -ON			S4
				9750	OFF	ON	ON	ON	6500	OFF	ON	ON	ON	14/29	OFF	ON	ON	ON	RET BEGIN RPM			S5
				10000	ON	ON	ON	ON	6750	ON	ON	ON	ON	15/30	ON	ON	ON	ON	+4000 RPM			ON



TROUBLESHOOTING

After installing the Ignition System, if the craft fails to start, check the installation procedure for any missed steps. If everything checks correctly, inspect the following:

1. Check the battery to make sure it is fully charged and properly connected. Also make sure the terminal connections are clean and tight.
2. Make sure there are no loose wire connections. All connections should be free of rust, paint or other debris.
3. Visually check the connections to the coil. The Black Ring Lug Wire must be connected directly to the engine. Do not connect any test equipment, test lights, etc. to the coil wires.
4. Check the Ignition's heavy Red wire for 12 volts. If 12 volts is not there, check the connections or battery condition.
5. Check for 12 volts on the Violet wire of the Ignition when the ignition on/off switch is in the ON position.
6. Check the craft's safety lanyard for proper operation.
7. Check the programming switch S4 of switch 3. Timing check - ignition operate position (*Off*).
8. If the engine is running and the LED is blinking at a rate of once per second, an input channel/ trigger pickup problem exists. If the LED is blinking at a rate of 2 times per second when the engine is below 3000 rpm, there is a low battery, or a bad battery connection to the ignition.

If there is still a problem present after checking all of the above steps, continue with the following diagnostic procedures.

TESTING THE IGNITION FOR SPARK

After checking the wiring thoroughly, test the Ignition to make sure that it is sparking. If the ignition produces a spark in this test, then it can be assumed that the ignition is functioning properly. To check for spark, follow these procedures:

1. Make sure the ignition switch is in the Off position.
2. Remove the spark plug, then connect the spark plug wires to the plugs and position them so you can observe the spark jumping the plug gap. The plugs must be grounded.
3. Unplug the 6-pin connector to the pickup assembly.
4. Turn the ignition switch On. Do Not attempt to crank the engine.

Note: Make sure S3 of switch 1 is Off (Elec Start On) to get an immediate spark.

5. Take a short length of wire and jump the two same color wires from the 6-pin connector together, then release them quickly several times. When you do this, a spark should jump the spark plug gap. Repeat this procedure for the other 2 pairs of pickup wires.
6. If there is no spark on one of the two or one of the three coils, then the coil pack is bad.
7. If there is no spark, substitute another ignition coil and repeat the test.

TROUBLESHOOTING

TESTING THE TRIGGER PICKUP

After checking the Ignition Module, you can test the operation of the trigger pickup.

Note: The trigger pickup 6-pin connector must be connected at this time.

1. The Ignition's Red wire should be disconnected from the battery or starter solenoid while turning the engine by hand. Turn the ignition switch to the On position. NOTE: This can be left connected if - the timing check switch, S3 of switch 1, is moved to the LED operate position. (The switch must be in the LED position to check pickups or timing.)
2. While observing the LED on the side of the ignition, rotate the crankshaft by hand. When the pickup and the magnet on the flywheel line up, the LED should illuminate.
3. If the LED lights, the trigger pickup is operating properly. If the LED does not light when switch 3, S4 is on, check the air gap between the pickup and the flywheel magnet. It should be .050" - .094". If the air gap is correct, the trigger pickup is at fault.

NOTE: Timing setup switch S4 must be in LED operation position.

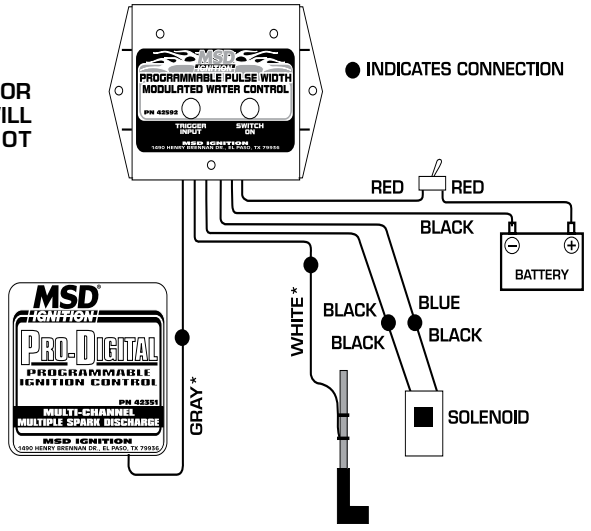
MSD Programmable PWM Water Control Switch
PN 42592

The MSD PWM Water Control Switch is supplied with MSD Perma-Seal connectors for quick, easy connections.

WIRING	
RED	Connect to one side of an On/Off switch. The remaining side of the switch connects to the positive (+) terminal on battery or starter solenoid.
BLACK	Attaches to ground stud or battery negative (-) terminal.
WHITE	Inductive pickup. It connects directly to a spark plug wire with supplied wire ties (qty 2). **Gray wire will not be used when White wire is used.**
GRAY	Connect to the Gray wire (tach output) on any MSD Watercraft Ignition. **White wire will not be used when Gray wire is used.**
BLUE	Connect to one of the Black wires on the water solenoid (Sol. +).
BLACK	Connect to remaining Black wire on the water solenoid (Sol. -).

WIRING THE PWM.

*EITHER THE GRAY OR THE WHITE WIRE WILL BE CONNECTED, NOT BOTH.

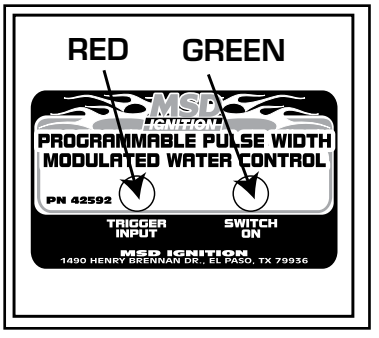


LED Indicators

The MSD PWM Switch is equipped with a Red and Green LED so that the operation of the PWM function can be monitored (Figure at right).

Switch On: This Green LED indicates that the switch is on and the solenoid is pulsing.

Trigger Input: This Red LED indicates that a trigger input signal is being recieved from the ignition/spark plug wire.



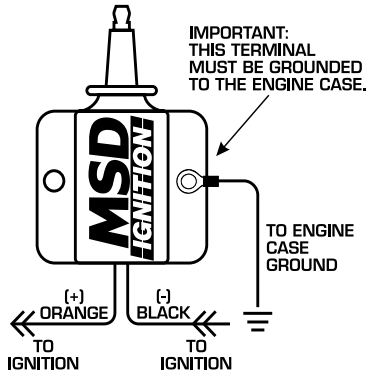
The PWM LEDs.

MSD Single Tower Coil
PN 42921

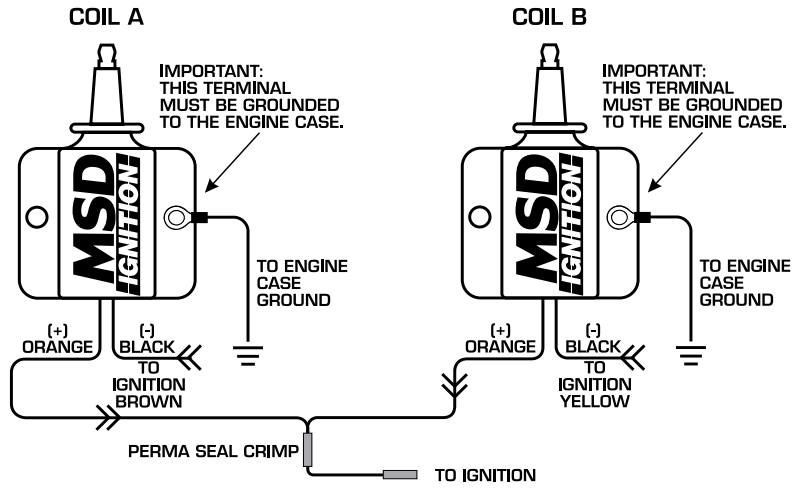
Note: The Single Tower Coil can be used in several applications. No matter what application though, it should always be grounded to the engine case using the right side mounting hole.

The following diagrams show the wiring of the PN 42921 Coil when used in different applications.

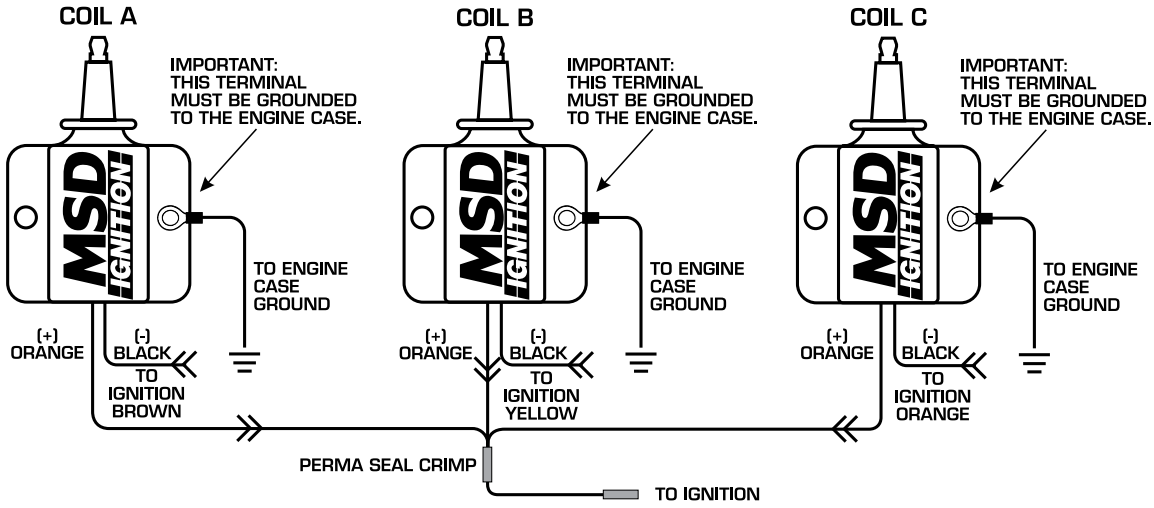
SINGLE COIL SYSTEM.



DUAL COIL SYSTEM.



DUAL COIL SYSTEM.



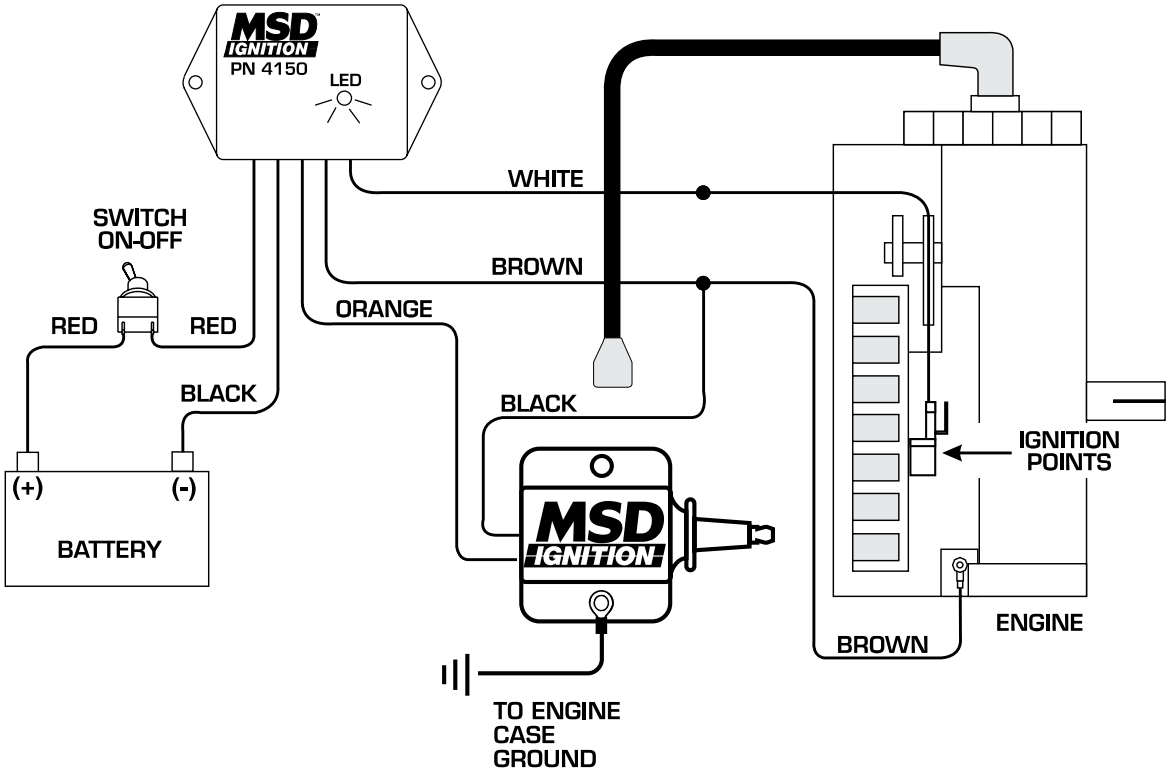
Briggs & Stratton Points System
PN 41500

WIRING FUNCTION

RED	This is the positive power lead. It connects to the battery positive terminal through a kill switch
BLACK	This is the negative (ground) lead. It connects to the battery negative terminal.
ORANGE	Connects to the coil positive (+) terminal.
BROWN	Connects to the coli negative (-) terminal and the engine block.
WHITE	This is the trigger wire. It connects to the points output wire.

Note: To connect the White wire, it may be necessary to remove the flywheel. Refer to the engine's Service Manual for the proper procedure.

WIRING DIAGRAM



RECOMMENDATIONS AND TIPS

Air Gap: 0.030 to 0.095
Plug Gap: 0.040
Recommended Timing: 18 - 20 Degrees BTDC for gas engines and 33 - 34 degrees BTDC for alcohol.
Recommended Battery: Panasonic LCR 12V4BP. Approximate run time of four hours.
Recommended Battery: Two 7.2V Nicad Battery Packs. Approximate run time of two hours.

MSD Briggs & Stratton/Tecumseh Ignition System
PN 41510

The MSD Enhancer system for the Briggs & Stratton/Tecumseh is designed as a complete system, no parts may be substituted with the stock ignition system.

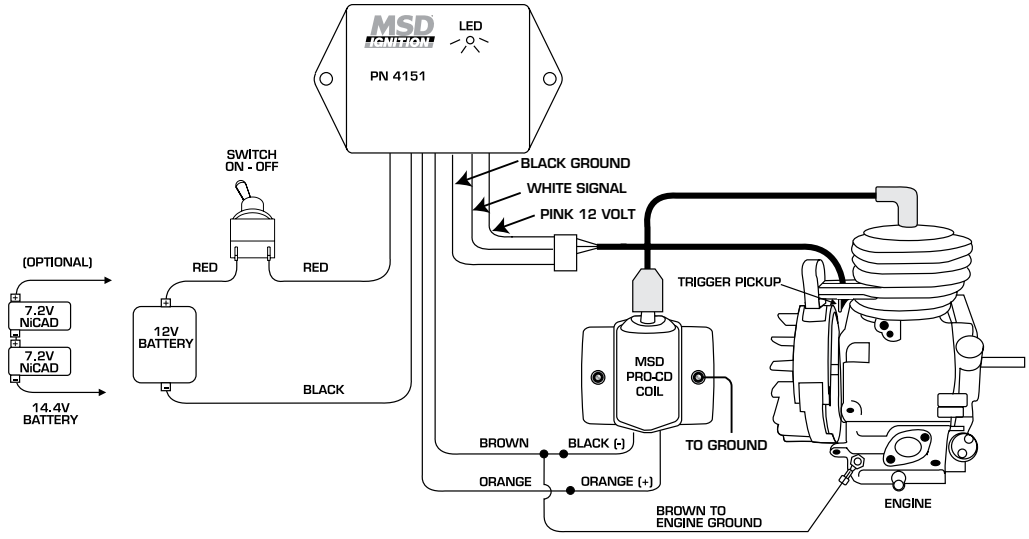
OPERATING SPECIFICATIONS

OPERATING VOLTAGE:	12 Volts DC
RPM RANGE:	14,000 (1 Cylinder)
ENERGY OUTPUT MAX:	100 mJ
MULTIPLE SPARK DURATION:	14° - 18° (1 Cylinder)
CURRENT REQUIREMENTS:	1.5 AMPS @ 10,000 RPM
WEIGHT & SIZE:	0.50 lbs., 3.5"L x 2"W x 1\5"H
VOLTAGE OUTPUT:	Primary 450 Volts
SECONDARY VOLTAGE:	30,000+ VOLTS WITH MSD Coil

WIRING FUNCTION

1.The PINK, BLACK and WHITE wires connect to the weathertight connector coming from the trigger pickup.
2. Connect the BROWN wire to the coil negative (BLACK) wire.
3. Connect the ORANGE wire to the coil positive (ORANGE) wire.
4. Connect the RED wire from the On/Off switch, to the battery positive terminal.
5. Connect the BLACK wire to battery ground.
6. The BROWN jumper should be connected to the coil negative (BROWN) wire and engine ground.

WIRING DIAGRAM



TIPS

Air Gap: 0.030 to 0.095
Plug Gap: 0.040
Recommended Timing: 18 - 20 Degrees BTDC for gas engines and 33 - 34 degrees BTDC for alcohol.
Recommended Battery: Panasonic LCR 12V4BP. Approximate run time of four hours.
Recommended Battery: Two 7.2V Nicad Battery Packs. Approximate run time of two hours.
Current Requirements: 1.5 amp at 10,000

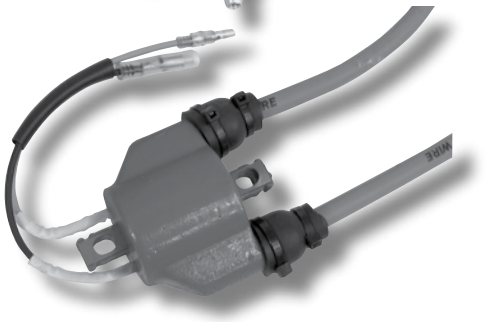
Coil Operation Specifications

PN 8204 Motorcycle Large Coil Twin Tower

SPECIFICATIONS	
OUTPUT VOLTAGE:	40 KV
PRIMARY RESISTANCE:	1.2 Ohms
TURN RATIO:	100:1
SECONDARY RESISTANCE:	11,500 Ohms

PN 4294 Stock Improved Coil

SPECIFICATIONS	
OUTPUT VOLTAGE:	30 KV
PRIMARY RESISTANCE:	0.08 Ohms
TURN RATIO:	70:1
SECONDARY RESISTANCE:	2K Ohms



PN 42921 Single Tower Coil

SPECIFICATIONS	
OUTPUT VOLTAGE:	30 KV
PRIMARY RESISTANCE:	0.2 Ohms
TURN RATIO:	70:1
SECONDARY RESISTANCE:	2K Ohms

PN 4573 Motorcycle Small Twin Tower

SPECIFICATIONS	
OUTPUT VOLTAGE:	45 KV
PRIMARY RESISTANCE:	2.8 Ohms
TURN RATIO:	75:1
SECONDARY RESISTANCE:	11.5K Ohms

PN 8232 Single Tower CPT

SPECIFICATIONS	
OUTPUT VOLTAGE:	43,000 KV
PRIMARY RESISTANCE:	0.09 Ohms
TURN RATIO:	85:1
SECONDARY RESISTANCE:	988 Ohms

Notes

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