PVL IGNITION INSTALLATION & OPERATING INSTRUCTIONS

COMPONENTS INCLUDED IN THIS KIT:
Rotor
Stator (Windings/Legs attached to Stator Plate)
Adapter Mounting Plate (If required for your particular engine)
CDI Module & Upper Coil (Two separate pieces or as one combined piece)
Puller (for removing the PVL Rotor from the engine crank)
Spark Plug Cap (Non-resistor Cap/Caps for analog systems, Resistor for digital systems)
Mounting Hardware

Warning!! Please read this complete manual and follow the applicable guidelines. Failure to read and follow the information contained in these instructions could result in damage to your new ignition and engine components! IGNITION COMPONENTS THAT ARE MARRED, DAMAGED DURING INSTALLATION, OR IMPROPER CARE WILL NOT BE ACCEPTED FOR RETURN, EXCHANGE OR WARRANTY REPLACEMENT CONSIDERATION. PVL ignition systems distributed by Penton Racing Products, Inc. are sold as bolt on applications with no engine modifications required, or "forcing" of parts to the engine. However, your engine is an assembly of many machined parts and each part has tolerances that are allowed during production. Due to these tolerances, it may be necessary to adjust the fit of the magneto to your specific engine.. It is advisable to have a shop tech install the ignition.

Section 1: GROUNDING INFORMATION: Many operational problems occur due to improper grounding. **If the grounding is not done properly, starting the motor will cause permanent damage to the stator**. This damage will not be obvious immediately, but will get gradually worse over time. When installing any type of ignition system, it is very important that the grounding connections are secure and that the surfaces to which they are fastened are sanded clean of any paint, rust and corrosion. All mounts must be bare metal to bare metal! The ground connection between the frame and engine is important because of the circuit between the spark plug, coil and the CDI unit. If the ground connection between any of these parts is not sufficient, the system will not work properly and can cause damage to the components. If the engine uses rubber mounts between the engine cases and the frame, it is recommended that a ground wire be run from the frame to the engine cases. This ground wire needs to be at least a 12 gauge wire and the ends and mounting points must be free of paint, rust and corrosion. Care must also be taken when mounting the coil and CDI unit to the frame. Do not use star washers between the mounting brackets and vehicle frame. Over a period of time surfaces can accumulate rust and corrosion, and it may be necessary to re-establish these grounds. Sometimes, just loosening the stator and coil fasteners and retightening will correct a grounding problem. Otherwise, completely remove the pieces and sand the mounting surfaces. Checking the ground connection with an Ohm meter will not give you an exact value of the connection because normally an Ohm meter uses a voltage of only three volts to check the continuity. During the operation of the engine, the ignition system's grounding path carries 270 volts, so you have no real idea if the connection will carry voltage and current of the ignition system during operation.

Section 2: STATOR/ADAPTER PLATE MOUNTING INSTRUCTIONS: Remove all existing ignition components from the engine and chassis, including the woodruff key, as it will not be used in the installation or timing of this ignition. If an adapter mounting plate is included in the kit, mount it to the engine case, using Blue Loctite on all adapter plate and stator plate mounting screws Be sure that the stator mounting screws do not bottom out on any part of the engine cases. Cut or grind off the ends of any screws that are too long to prevent damage to the adapter mounting plate. Adjust the route of the wire coming out of the stator to make sure that it will not be pinched between the flat surface of the stator or adapter mounting plate and the engine case, as damaged wires are often the cause of ignition problems. After completing the timing process, apply a sufficient amount of silicone seal around the wires to seal the outer hole where the wires exit the case.
Installation of the Maico #70069 ignition kit requires another hole to be drilled to route the stator wires. Using the existing outer hole as a guide, drill a 7/16" hole through the second wall of the case and remove the burrs from around the hole. Feed the stator wires through both holes in the case and then mount the stator to the engine case with the three 6mm cross recess pan head screws supplied in this hardware kit.

Engines over a 250cc displacement require the use of a 5000 wind version. 5000 wind stators can also be used on the lower displacement engines. Mount the PVL stator to the engine case or to the installed adapter mounting plate provided in your ignition kit. With the stator in the middle of its available adjustment, slightly tighten the stator screws enough that the stator will not move. They will be firmly tightened after the installation of the rotor is complete.

Section 3: ROTOR MOUNTING INSTRUCTIONS: The rotor is wrapped with spacer tape. Leave this in place, as it helps determine the required minimum of .010" clearance needed between the rotor and stator legs. If the tape has been removed, common one inch width masking tape can be used, wrapping it around the circumference of the rotor two times. Do not overlap the ends of the masking tape.

If there is any interference between the rotor and the legs of the stator, use a #27 Torx bit or driver to loosen the screws that hold the stator coil pack to the stator mounting plate. The rotor should now slip onto the crank with no resistance or interference. There must be a minimum of .010" clearance between the rotor and the stator legs. Using your fingers, (not Channel Lock pliers) press the legs of the stator against the tape in place on the rotor and tighten the Torx screws. Again check to see that there is not a clearance problem. Using the supplied puller, pull the rotor from the crank and remove the tape, as it will no longer be needed.

PULLER WARNING! Use only the puller supplied with the ignition kit! Failure to do so may result in damage or destroy the rotor! There are four drilled holes in the rotor. The two holes closest to the center of the rotor are used for attachment of the puller tool. Using the incorrect holes or jaw type puller will break the rotor. Loosen the crankshaft nut until its surface is flush with the end of the crankshaft. Screw the puller into the appropriate holes in the rotor using the supplied 6X50mm screws. Ideally, the screw threads should be completely into the rotor. Using a crescent or jaw type wrench to hold the puller "bar", tighten the puller bolt (which should now rest against both the end of the crankshaft and the loosened crankshaft nut) with a 19mm (3/4) wrench to approximately 20-25 pounds. If rotor does not budge at this point, sharply strike the top of the puller bolt to unseat the rotor from the crank. The other two holes closest to the outside diameter of the rotor are for mounting optional rotor weights, used mainly for open class high displacement engines.

TIMING PROCEDURE: Timing the PVL ignition to your engine requires the use of a dial indicator type timing gauge to measure the position of the piston. By aligning the marks on both the rotor and the stator, and measuring the position of the piston before top dead center (BTDC), you will be able to set the timing to the needs of your engine.

The timed interval between ignition and when the piston reaches TDC in a cylinder is expressed in degrees of flywheel (crankshaft) rotation. Because the spark is always fired before the piston reaches TDC, the timing is considered "advanced". The greater the number of degrees before TDC the spark is fired, the more advanced the ignition timing is for that cylinder. When the number of degrees at which the spark is fired is reduced, the timing has been "retarded". It should be noted that even though the timing in a cylinder may have been retarded, the spark is still being fired before TDC and is still considered advanced, just not as much. The first step is to remove the stock woodruff key from the crank. The woodruff key is used by mass producing suppliers for timing purposes, but the PVL system does not require its use. Then clean the bore of the rotor and the stub of the crankshaft with contact cleaner, acetone, or other suitable product to be sure that it is free from grease, oil, or other residue.

Single cylinder Engine Timing Marks: *PVL stators have a 3/16th straight line timing mark stamped onto each leg of the stator frame. Use the timing mark that is on the same leg as the arrow on the stator indicating the direction of rotation of the engine. With a dial indicator in the spark plug hole, rotate the crankshaft in the direction of the engine's rotation until the piston reaches Top Dead Center. Turn the crankshaft backwards until the piston reaches the desired timing position. Install the rotor to the crankshaft so that the timing mark on the rotor are face up and line up with the appropriate timing mark on the stator. The timing mark is a 3/16th inch stamped-in straight line on the legs of the stator. The timing mark to be used for the Honda XL 250/350's is highlighted with yellow on the backside of the stator.*

Twin Cylinder Engine Timing Marks: *The timing mark on one of the two stator frames attached to a single plate should be used to set the timing of the ignition to the left cylinder of the engine. Done properly, the right cylinder should automatically be in time.*

Once the rotor is in place, use a hammer handle or a plastic faced hammer to lightly tap on the face of the rotor to seat the taper. Place the two supplied washers on the crank and install the rotor nut, tightening to 30ft.lb. or the manufacturer's torque specification, whichever is less. A couple short burst of a 3/8" air impact gun will usually achieve this torque. Reset the piston to the chosen timing figure and check to see that the timing marks are still lined up. If not, simply loosen the stator mount screws and move the stator so that the marks are aligned. If the marks cannot be lined up with the piston at the chosen timing figure, the rotor will have to be removed and the procedure repeated. Use only the puller supplied with this ignition kit to pull the rotor from the crankshaft, as using any other type puller could damage the rotor to the point of breaking it.

Section 4: TIMING SPECIFICATIONS:

Engine timing is directly related to the compression of the engine. The higher the compression, the less advance (as in advance of the piston's arrival at top dead center or highest position) can be used for the timing position. To get more bottom end, advance the timing from the recommended range. Since the exhaust pipe, carburetor, cylinder porting, and cylinder head design are all tied to the amount of heat that an engine makes, they must be taken into consideration when setting the engine's timing. It's all about heat that is generated in the engine's combustion chamber. An engine burning a specific fuel can only tolerate a certain amount of heat, and all of the above mentioned factors are related to this heat. Since the ignition timing and its effect on that heat are directly related to the engine's longevity, it is critical that you get it right. Too much and you toast the engine, too little and you are giving up horsepower. Gasoline and alcohol (methanol) have different figures due to their burn characteristics. Generally, alcohol burns slower than gasoline and needs more heat. This can be accomplished in one of two ways - advance the timing or up the compression. You still can only have so much heat for the engine to operate. The following timing specifications are offered **only as a starting point guideline**! To determine whether your system is Analog or Digital, compare your part numbers to those listed in the PVL Components Testing Chart on page 4 of these instructions.

Engine Displacement in Standard Form*	**Analog System(BTDC)** Millimeters / Thousandths* *Millimeters x .039 = Thousandths*		**Digital System (BTDC)** Millimeters / Thousandths* *Millimeters x .039 = Thousandths*	
50cc	1.0 to 1.9mm		0.8 mm	
60/65/80cc w/4642000029 CDI Module	1.4 to 1.6mm	54 - 62th	0.8 - 0 mm	31th
60/65/80cc w/537202 CDI Module			0.5mm	19th
KTM 65 #82145 Kit w/#537200 CDI Module			.3 to 0 mm	11 – 0th
KX 65 #82105 Kit w/#537200 CDI Module			.3 to 0 mm	11 – 0th
Mini Quads 50/70/90cc (200 Compression to 150)	1.8 to 2.8mm			
90cc	1.8mm			
125cc	1.2 to 1.4mm	46 – 54th	1.0 to 1.2	39 – 46th
175cc	2.2 to 2.4mm	85 – 93th		
250cc	1.8 to 2.2mm	70 – 85th	0.8 to 1.0mm	31 – 39th
Open Class Engines	2.2 to 2.4 mm	85 – 93th		
Twin Cylinder Engines **	2.0 mm			

Modified engines (higher compression) will need to use timing that is retarded from the above figures.

**Engine, carburetor or pipe modifications necessitate experimenting with the timing.

Section 5: MOUNTING THE COIL AND CDI MODULE: Your coil and CDI module may be either one combined piece or two individual pieces. Refer to the chart on Page 4 of these instructions to identify your PVL components. Remove the upper coil and/or CDI module prior to doing any welding on the vehicle!

If the coil and CDI module are two individual pieces, check to see if the coil will bolt directly to the chassis. It may be necessary to make a small tab that will extend the OEM mount for the PVL coil to bolt to, making sure the ground terminal at the end of the coil is placed under the screw holding that end of the coil. The CDI module itself can be mounted any place where a 6mm hole can be found that allows the wire from the module to be connected to the coil. The black wire from the CDI module must be grounded to a surface that has been sanded clean of any corrosion, rust and paint.

If the coil and CDI module are combined in one piece, its mounting may require modification. Modification can be as simple as drilling new holes or possibly having to cut off the original mount and welding on new mount. Whenever mounting the coil to a solid mount, it is absolutely essential that the coil mount bracket be mounted in a vertical plane (straight up and down). If the bracket is mounted horizontally, the coil body could break apart from the bracket, especially in applications where vibration levels are particularly high. It is recommended that the coil be rubber mounted or surrounded by foam and wrapped with duct tape in order to minimize these vibrations. If a solid mount is not possible, you can mount the coil using any method that will securely hold the coil to the frame, such as tie wraps or duct tape in a foam cradle. The black wire with the ring terminal must be grounded to the frame of the machine or the engine. Make sure to sand the grounding surface to remove any corrosion, rust and paint.

If a coil/CDI module piece and a slave coil are included in your kit, the wire exiting the red coil plugs into the wire end of the black coil wire. The stator wires slide onto the spades of the black coil.

Section 6: WIRE CONNECTIONS: It is important that all wire connections fit tightly. Make sure the stator wire ends are fitting very tightly onto the spades, as over time these connections can become loose, and the power generated by the magneto assembly will not properly transfer to the CDI and coil. Also be sure that no wires will come in contact with the exhaust of your machine, as the insulation on the wires can melt, resulting in a short and possibly damaging the ignition system.
The stator wires connect to the coil or CDI in one of two methods, depending on the type of system and parts provided. Analog systems use a spade terminal type attachment. The bayonet clip of the blue wire exiting the stator slides onto the large spade of the coil/CDI piece, or to that of the CDI module if it is a separate piece, and the black stator wire to the small spade. If the CDI module is separate from the coil, the blue wire exiting it plugs into the blue wire of the coil. The black wires are for grounding, and the red wire exiting the CDI is for a kill button connection. (Refer to section 10 for information about kill switches.) In the case of a dual lead coil, the blue stator wire clip slides onto the coil spade marked positive, and the black wire to the spade marked negative. Digital stators have a double terminal plastic connector that connects to the CDI module. The CDI blue wire connects to the blue wire of the coil and red to a kill switch.

Section 9: Kill Switches: When using a tether switch on an ATV, you must use a separate tether for each high tension coil. A twin cylinder actually has two ignitions, so it is necessary to use either two separate shut off devices or a device that is capable of handling two separate circuits independent of one another. If you are using a toggle switch, you must use a double pole/single throw switch to keep the circuits separate during operation. The red wire exiting the coil or CDI module is to be used for the kill button wire. Connect the red wire to the “hot” side of the switch/tether and the opposite side of the switch/tether to ground. When the two sides of the device are connected, the charge from the stator is then taken to ground, stopping the engine.

Section 7: SPARK PLUGS: In order to get spark from the PVL ignition, the engine needs to be turned over at the speed attained when kick starting. This required speed usually cannot be met when turning by hand.
Because of the low voltage output of the PVL system at starting speed, the spark plug selection is important. The least amount of electrical resistance in the system will result in a better spark at start up or low RPM.

We recommend using non-resistor spark plugs and caps. They use less of the ignitions’ energy to and thus have a more powerful spark. If you are not able to find a non-resistor spark plug, as they are becoming hard to find, then you will have to use a resistor type plug. It is important to select plugs with fine wire or precious metal center electrode such as gold, platinum, or iridium. The smaller or finer the center electrode of the spark plug is, the less energy it takes to create spark to start your engine. Large center electrode plugs require more of the ignitions current to make spark and will cause starting difficulties, especially open class engines. Always use the engine manufacturer’s exact specified heat range (usually 6, 7, 8, 9, or 10) thread size, length & gap.

SECTION 8: SPARK PLUG CAPS & INSTALLATION:

For Analog PVL ignitions, It is important to use a non-resistor spark plug cap. The cap that we provide with the PVL analog ignition is the most basic form of spark plug cap, consisting of a metal connector and rubber boot.
Before installing the spark plug cap on the spark plug wire, make sure that the wire is at a length that it reaches the spark plug loosely so that the spark plug cap will remain fastened securely to the spark plug. When mounting the cap provided in the analog version kits, it is imperative that the bare end of the coil’s spark plug wire has solid contact with the terminal spring and that the spring fits snugly onto the spark plug. To attach the terminal spring, strip 1¼ “of the spark plug wire insulation off of the end of the wire. Bend the exposed wire over at 90 degrees back to the insulated portion of the wire. Press the pointed tang of the terminal spring through the insulation at a point about ¼” back from the end of the insulated portion of the wire, making sure that it makes contact with the wire core. Use a pair of pliers to press the tang down tight. Once the terminal is in place with the spring loop at the end of the wire, wrap the bare wire end around the end of the spring loop. Spray a little contact cleaner on the insulation boot and slide it over the spring loop and wire.

For Digital PVL ignitions, you must have a resistor in the spark path. We recommend that you use a resistor type cap such as the 5K Ohm spark plug cap supplied with your PVL ignition, rather than using a resistor type spark plug. To install the cap provided in our digital version kits, spray a small amount of contact cleaner into the cap, and twist it onto the end of the spark plug wire. We recommended that you use a plug gap of 0.020" – 0.022” for engines that are very high compression. In cases of engines with extreme high compression and running on alcohol or fuel, it may be necessary to bring the gap down as low as 0.018”.

Troubleshooting: We receive many systems in for testing that are not working correctly due to improper installation. We recommend reviewing the complete mounting instructions to ensure proper installation and set up.
While nearly all electronic ignitions are resistant to moisture during operation, they will suffer damage if moisture is left on the stator portion of the ignition. Pay special attention after washing the machine with high powered spray equipment, as the moisture will soak into the field plates and coil. When the engine again gets hot, the heat from the engine can turn the moisture to steam which will harm the stator. We recommend that after use, the magneto cover be removed to allow any accumulated moisture to evaporate. An added benefit of doing this is that you will be able to spot any other problems that may have caused by a failed seal or bearing which will nearly always result in a destroyed ignition.

If the motor starts cutting out as it warms up, suspect a bad ground. (Review Section 1)

If the system is running backwards, or you are getting a kickback or backfiring when kick starting, go through the timing procedure. (Review Section 5)

If you are unable to get the unit to start or not getting a spark, check that the stator wire ends are fitting snugly to the stator wires, and onto the spades of the Upper Coil/CDI (Review Section 7). Use our recommended spark plugs, especially on higher displacement engines. Check the installation of the spark plug cap.(Review Section 8) Make sure there are no cracks in the body/ molding of the coil, as this would allow the spark to escape. Check your grounds. (Review Section 1)

Higher displacement engines can benefit from having additional weight on the crank for easier starting. We offer rotor weights that are machined specifically for the PVL rotors.

If the engine runs good at idle, but starts bogging as if it has a rev limiter, resistance test the stator as instructed below. Check the carburetion, which could be possibly running too lean.

RESISTANCE TESTING: Test components only when they are at ambient temperature. Use a digital Ohm Meter instead of an Analog Meter, as the analog is not specific enough. If you can input range into your meter, set it higher than what the highest recommended reading. Insert either probe of the meter into either stator wire end. For digital stators, using your fingernail, lift the small yellow clip out of the wire end and then insert the probe. Resistance readings lower or well above the recommended ranges indicate that the unit is probably not working correctly. Resistance testing is not a definitive method of testing. If your ohms readings are not falling into the definitely good or bad range, we suggest sending the parts in for dyno testing. Package parts carefully and ship to us, providing a short description of your problems and a daytime phone number that we can contact you with the test results and for payment information. Costs are $27 for each stator and $7 for each combined coil/CDI piece or set of CDI & Coil.

Analog Stator (# stamped into black molding)	**Recommended Resistance Range**	**# of Windings**
1050,1051,1064,1070,1419	47.5 – 52.5	1850
1068,1086	87.0 – 93.45	3000
1058,1061,1063,1066,1088, 1089. 1094,17	162.45 – 179.55	4000
1097, 1067,1426 (Tape Wrapped Windings)	216.6 – 239.4	5000
Analog Stator, Twin Cylinder Engines	**Recommended Resistance Range**	**# of Windings**
1095, 1417 (Earlier Versions have Tape Wrapped Windings)	216.6 – 239.4	5000
Digital Stator	**Recommended Resistance Range**	**# of Windings**
1013, 1032,1002	84.55 – 93.45	3000
Coils, (# printed on piece) Do not test through spark plug cap! Test between blue coil wire and spark plug wires.	**Recommended Resistance Range**	
466 1 0000 00	4.8k - 5.2k Ohms	
466 101	4.8k - 5.2k Ohms	
356102 Dual Lead Coil	8.1k - 9.9k Ohms	
CDI Modules, Analog (# printed on piece)	**Cannot be resistance tested**	
4662000000, 466201, 4642000029, 522200	Send in for diagnostic testing.	
CDI Modules, Digital (# printed on piece)	**Cannot be resistance tested**	
537200, 537202	Send in for diagnostic testing.	
Coil & Analog CDI Module Combination Pieces	**Cannot be resistance tested**	
105458, 105465, 458104, 458115	Send in for diagnostic testing.	
Coil & Digital CDI Module Combination Pieces	**Cannot be resistance tested**	
105 500.52	Send in for diagnostic testing.	

WARRANTY INFORMATION: Penton Racing Products Inc. warrants the PVL ignition systems to be free from manufacturer defects for a period of six months from time of retail purchase. Penton Racing Products Inc. accepts no responsibility for damage or injury due to the installation or use of this ignition system. Our ignition systems are sold as bolt on systems and should never require any "forcing" to install. Components that have been subjected to physical abuse or excessive amounts of dirt and water will not be considered for warranty replacement. This includes parts and systems that have been installed incorrectly or on machines that they were not intended for. No parts will be warranted unless received by Penton Racing Products, Inc. for inspection and testing. Provide a copy of your purchase receipt and a day phone number to call you should you request to be contacted with the testing results. Package your parts carefully for shipment, as Penton Racing Products, Inc. is not responsible for damage to parts incurred in shipping. Upon warranty acceptance by Penton Racing Products, Inc.., replacement parts and the balance of parts sent in for testing will be returned to you, via Ground, UPS at no cost to you. Should you require rush or air shipment return of your parts, you will be responsible for the extra cost of shipping. In the event that you wish to receive new parts prior to our warranty testing and evaluation procedure, said parts and freight must be prepaid prior to shipment. Then, upon warranty acceptance by Penton Racing Products, Inc., a credit or refund check will be issued for the warranted parts. Testing fees and freight will be charged for returning parts that were not replaced under warranty.

***Penton Racing Products Inc.,* 44875 N. Ridge Rd., Amherst, OH 44001 Ph: 440-989-4474**

www.pentonracingproducts.com