



INSTALLATION INSTRUCTIONS

MSD PWM Water Control Switch, PN KT4259

IMPORTANT: Read these instructions completely before attempting this installation!

WARNING: During installation, disconnect the battery cables. When disconnecting the battery, always remove the Negative cable first and install it last.

Parts Included

- 1 - PWM Water Control Switch, PN 4259
- 1 - Mounting Bracket, Stainless
- 2 - Mounting Screws
- 3 - Perma Seal Connectors,
- 1 - Solenoid, PN 4340
- 1 - Spray Nozzle

Note: Before installing the MSD PWM System the craft's exhaust and water system must be functioning properly. The additional water supplied to the exhaust system by the PWM System is not intended to replace the original water system but to enhance it.

OPERATION

Currently, exhaust systems used on personal watercraft are carefully "tuned" or shaped to a certain length to produce maximum power within a specific rpm range. The basic function of this tuning is to cause exhaust pulse waves to reflect inside the exhaust chamber creating local pressure variations. These pressure variations can either help scavenge the remaining exhaust gases or plug the exhaust port to prevent the intake charge from exiting into the exhaust.

The more precisely the pipe is tuned for a specific rpm, the more performance throughout the rest of the rpm range will suffer. The speed of the exhaust pulse waves change according to many variables with the exhaust chamber length being the most critical. Since high speed performance is generally what the pipe is tuned for, the exhaust chamber is kept relatively short. Unfortunately, this design is a compromise which adversely affects performance at lower rpm where the exhaust pulse wave reaches the exhaust port too early to effectively seal the exhaust port during the compression stroke. This early arrival of the pulse wave is especially detrimental to performance of highly modified engines with large or raised exhaust ports.

The MSD PWM Water Control System resolves this design compromise by effectively "lengthening" the exhaust chamber during low rpm operation, while allowing the chamber to retain its short length tuning for optimum high rpm operation. The PWM System operates by taking the engine's rpm signal from the stock or MSD Ignition and processing it through a "Pulse Width Modulated" switch. This PWM switch in turn activates a solenoid which injects water from the main water flow to the engine into the exhaust chamber itself. This injection of the water into the exhaust chamber has the effect of cooling the exhaust gases, thereby increasing the density of the exhaust charge in the chamber and slowing the exhaust pulse wave. This has the same effect as mechanically lengthening the chamber to increase torque and horsepower at low and mid engine rpm. The dyno chart in Figure 1 illustrates the difference the PWM Water Switch can make when properly tuned.

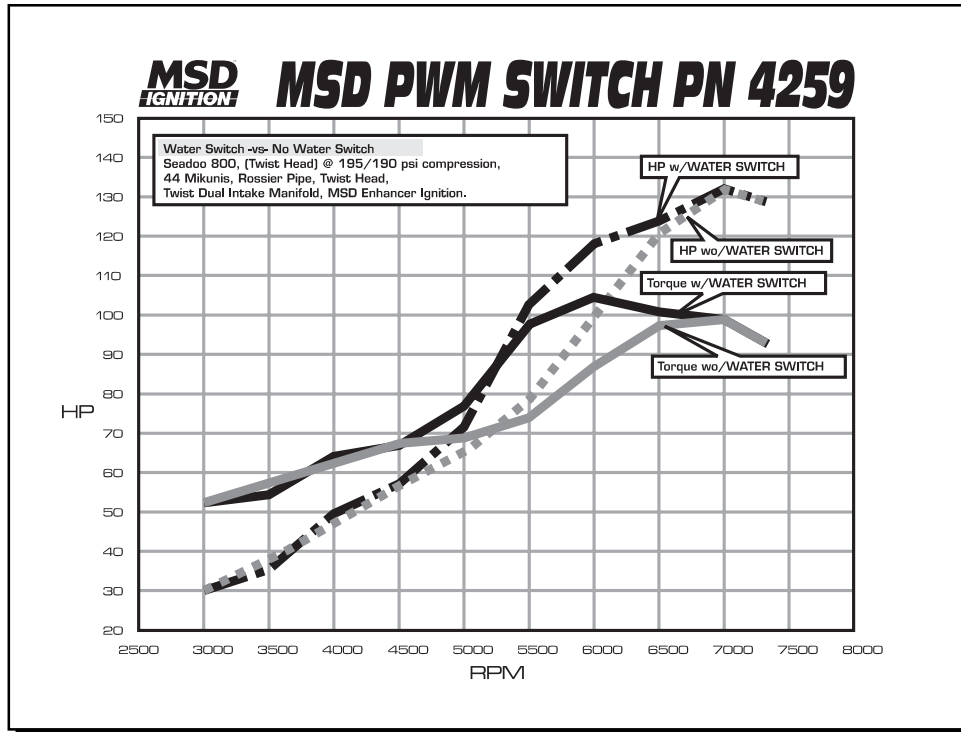


Figure 1 Example Dyno Chart.

INSTALLING THE MSD PWM WATER SOLENOID

The PWM Water Control Switch is a universal design that is intended to fit most O.E.M. and aftermarket exhaust systems such as Twist, Rossier, Factory Pipe, Riva, APE, Pro Tec, West Coast, DG, Coffman, R&D, PSI, TNT etc. Installation of the water solenoid on some models may require modification of existing exhaust system. Two installation setups are available for mounting the PWM Solenoid assembly:

Direct Mount - Solenoid is mounted directly to exhaust head pipe.

Remote Mount - Solenoid is mounted remotely.

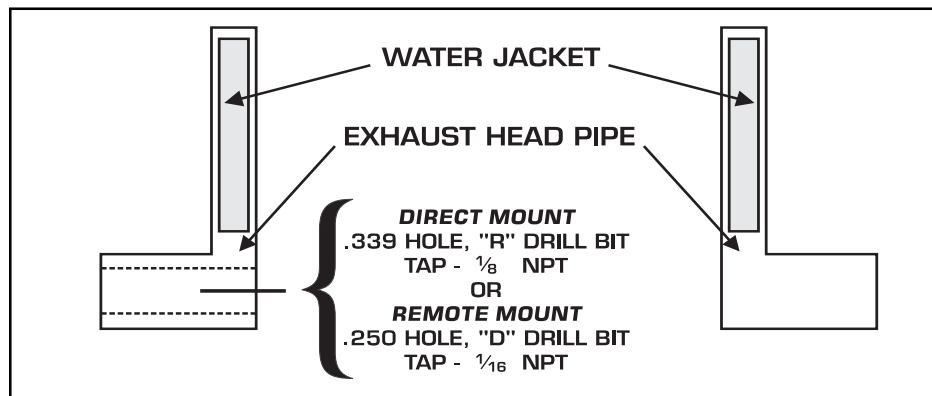


Figure 2 Recommended Mounting Location.

Direct Mount

1. Locate a position on the exhaust's head pipe where a hole can be drilled and tapped without entering the water jacket (Figure 2). Normally, the best location to drill the hole is at the base of the head pipe where it attaches to the exhaust manifold. **Note:** Make sure the solenoid assembly can mount without interfering with other components.
2. Use a .339" ("R") drill bit and drill the hole using extreme caution not to enter the water jacket.
3. Thread the hole using an 1/8" NPT pipe tap. Install the solenoid and spray nozzle so the water will spray in the direction of the exhaust gasses (Figure 3).
4. Attach a hose between the water solenoid and the main water feed line to the engine. When plumbing the system, it is recommended that a water filter be installed on the water feed line to prevent clogging of the spray nozzle when riding the watercraft in water with high silt content.

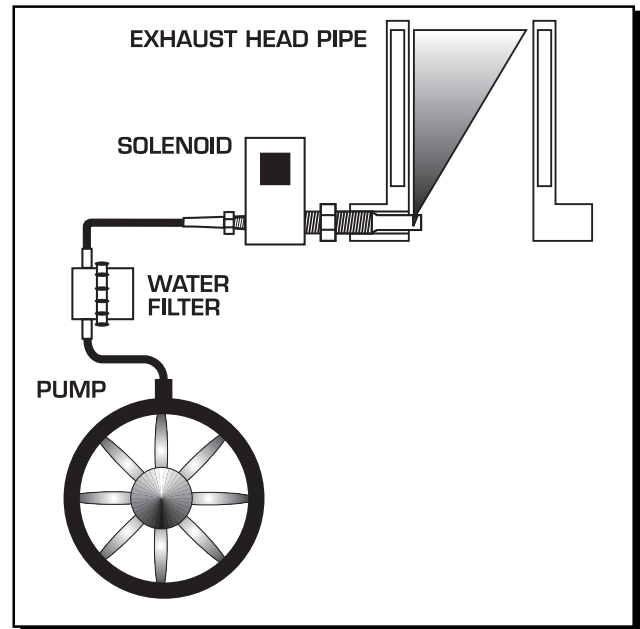


Figure 3 Direct Mount.

Remote Mount

1. Locate a position on the exhaust's head pipe where a hole can be drilled and tapped without entering the water jacket (Figure 2). Normally, the best location to drill the hole is at the base of the head pipe where it attaches to the exhaust manifold.
2. Use a .250" ("D") drill bit and drill the hole using extreme caution not to enter the water jacket.
3. Thread the hole using a 1/16" NPT pipe tap. Install the spray nozzle so that the water will spray in the direction of the exhaust gasses (Figure 4).
4. Mount the solenoid on the hull in a position away from direct engine heat sources. Connect a hose from the spray fitting to the solenoid and then from the solenoid to the main water feed line to the engine. When plumbing the system, it is recommended that a water filter be installed on the water feed line to prevent clogging of the spray nozzle.

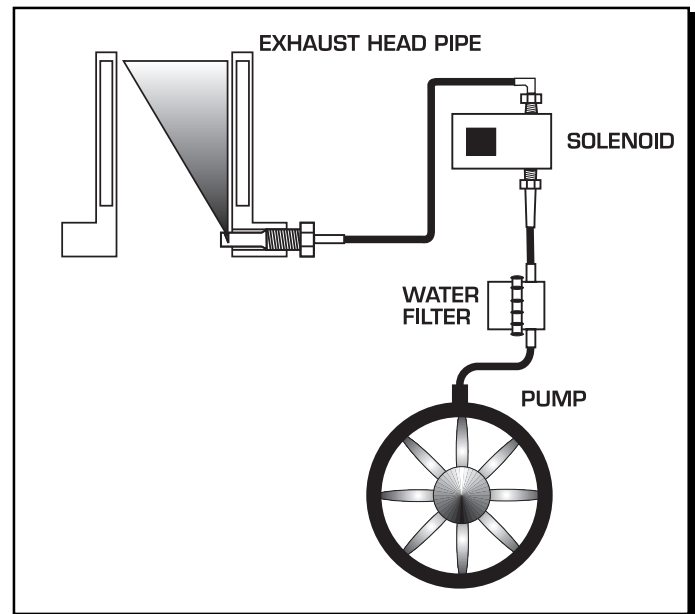


Figure 4 Remote Mount.

Note: It is recommended that the spray nozzle be periodically checked to ensure that the spray orifice is not obstructed or clogged.

MOUNTING THE MSD PWM WATER CONTROL SWITCH

The PWM Switch is supplied with a stainless steel mounting plate. Find a location where the switch can be easily accessed, and away from direct engine heat. Make sure that the wires from the PWM Switch will reach the Water Solenoid. Secure the PWM Switch and Bracket using the supplied screws.

WIRING

The MSD PWM Water Control Switch is supplied with MSD Perma-Seal connectors for quick, easy connections. Figure 5 shows the diagram for proper installation to most watercraft models.

- 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. -).

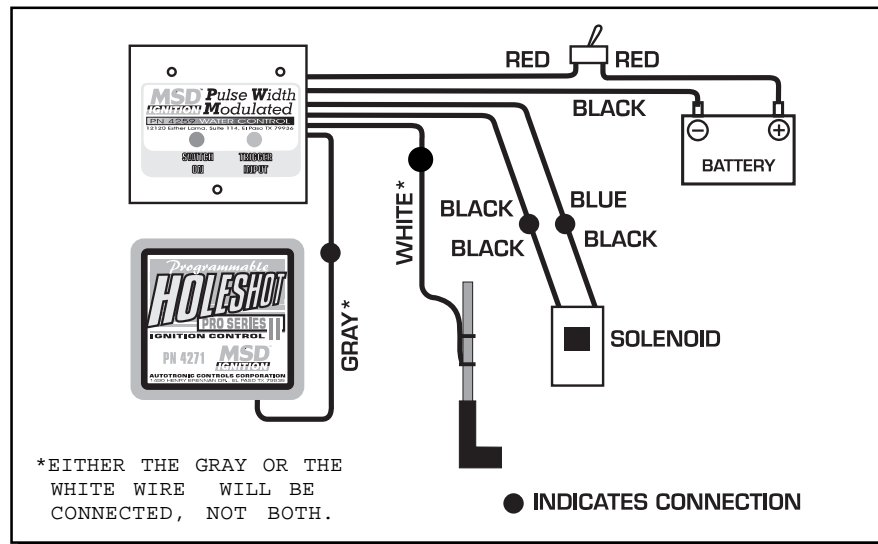


Figure 5 Wiring the Water Control Switch.

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 6).

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 received from the ignition/spark plug wire.

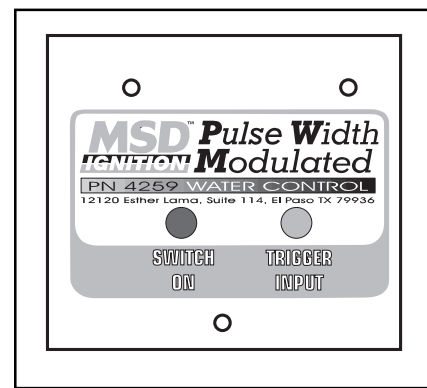


Figure 6 The PWM LED's.

PROGRAMMING

The activation point where the water turns on and where it turns off is easily adjusted with the built-in selector switch. The PWM Switch is set at the factory with a basic curve (Figure 7). This is the recommended starting point for most 2-cylinder watercraft engines.

LOW SIDE WATER

Begin-On Point

The point where the water begins to turn on at is preset at 3000 rpm and is not adjustable.

Full-On Point

The point where the solenoid has completed pulsing and the water is fully on can be set at 3500 or 4000 rpm. To program the point where the water solenoid is fully on, position switch S1 to match the desired rpm point.

HIGH SIDE WATER

Begin-Off Point

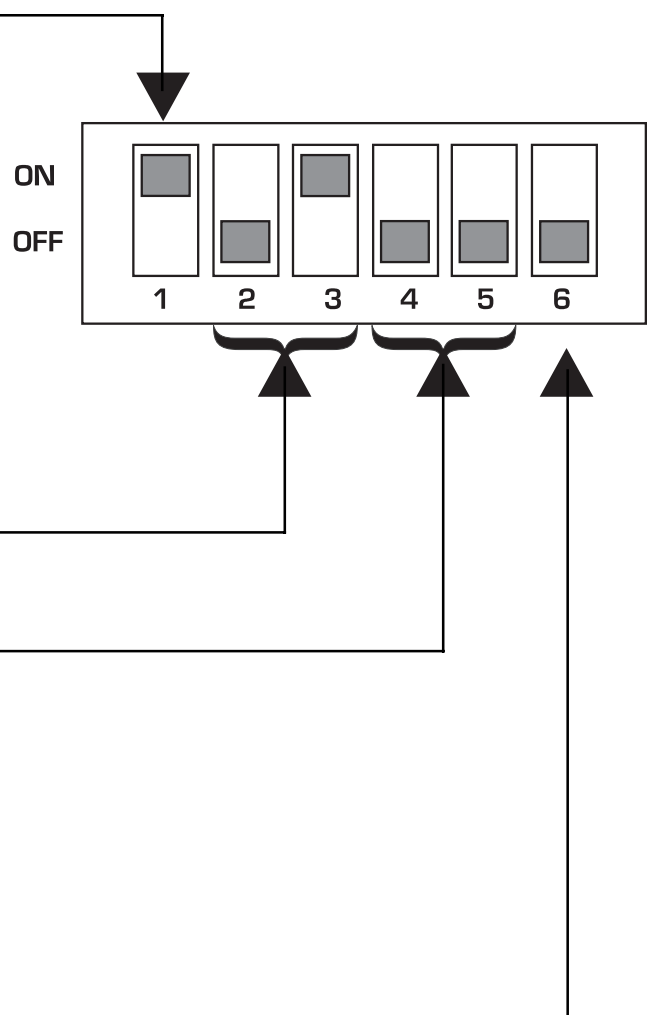
The point where the solenoid begins pulsing again and the water **begins to turn off** can be set at 4500, 5000, 5500 and 6000 rpm. To program this point, position switch S2 and S3 as required in Figure 7 to match the desired rpm point.

Full-Off Point

The point where the solenoid has completed pulsing and the water is **fully off** can be set at +750, +1000, +1250, +1500 rpm above where the High Side Water Begin-Off Point is set. To program this point, position switch S4 and S5 as required in Figure 7 to match the desired rpm point.

CYLINDER SELECT

The PWM Water Control Switch is programmable for 2 or 3-cylinder engines. Position switch S6 for the number of cylinders that the engine has.



ADJUSTING THE PWM SWITCH

Before adjusting the PWM Switch, it is recommended to first test the craft with the PWM in the factory positions. The chart in Figure 8 shows the variety of programs you can set.

Note: After reprogramming, the PWM's power must be turned Off then back On to activate the new program.

TURN ON SLOPE FULL ON SPEED	BEGIN WATER TURN OFF SPEED	WATER FULL OFF OFFSET SPEED	CYLINDER SELECT
100% RPM S1	RPM S2 S3	RPM S4 S5	CYL S6
4000 OFF	4500 OFF OFF	+750 OFF OFF	2 OFF
3500 ON	5000 ON OFF	+1000 ON OFF	3 ON
	5500 OFF ON	+1250 OFF ON	
	6000 ON ON	+1500 ON ON	

Cylinder Select	=	2-Cylinder
Low Side Water Begin On	=	3000 rpm
Low Side Water Full On	=	3500 rpm
High Side Water Begin Off	=	5500 rpm
High Side Water Full Off	=	+750 (6250 rpm)

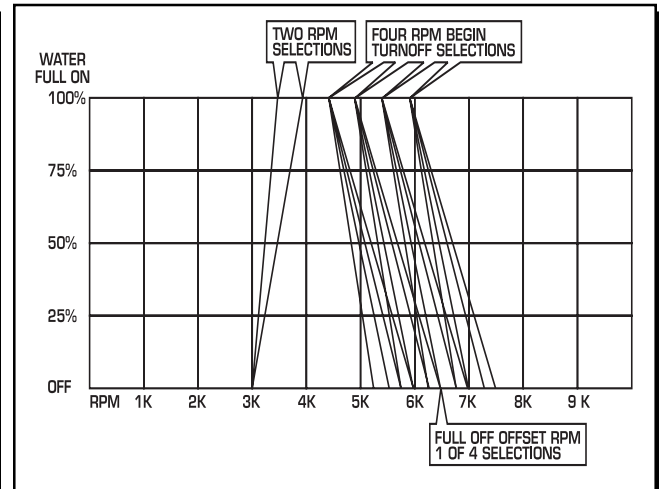


Figure 7 Programming Switches and Factory Settings.

Figure 8 Programming Points.

ADJUSTING LOW SIDE OF PWM SWITCH

Set the Low Side Water Full On setting (switch S1) so a smooth transition occurs from when the Switch begins to pulse to when it is completely on. First test the craft using the factory settings (Water Full On = 3500 rpm). Next, reposition switch S1 to the Off position (Water Full On = 4000 rpm) and retest. Select the setting that provides the smoothest transition.

ADJUSTING HIGH SIDE OF PWM SWITCH

The high side of the PWM Switch needs to be set so the engine's rpm does not fall below its peak power point under heavy loads and during sharp cornering. This setting will vary from engine to engine depending on the type of exhaust pipe currently being used.

First, test the craft with the PWM Switch factory setting (Water Begin Off = 5500 rpm, Water Full Off = +750 - 6250 rpm). Next, begin adjusting the "Water Full Off" setting (switch S4 & S5) so it is fully off at a higher rpm. You will notice that as the rpm is raised, the engine's power will smooth out slightly and will be more controllable. After finding the optimum "Water Full Off" setting, adjust the "Water Begin Off" setting (switch S2 & S3). Raise and lower the rpm setting until the smoothest high side setting is achieved.

Note: After reprogramming, the PWM's power must be turned Off, then back On to activate the new program



INSTALLATION INSTRUCTIONS

Notes

Service

In case of malfunction, this MSD component will be repaired free of charge according to the terms of the warranty. When returning MSD components for 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.

Send the unit prepaid with proof of purchase to the attention of: **Customer Service Department, Autotronic Controls Corporation, 12120 Esther Lama, Suite 114, 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 for any charges. (Ground Shipping is covered by warranty). All units are returned regular UPS unless otherwise noted. For more information, call the MSD Customer Service Line (915) 857-5200. MSD technicians are available from 8:00 a.m. to 5:00 p.m. Monday - Friday (mountain time).

Limited Warranty

Autotronic Controls Corporation warrants MSD Ignition products to be free from defects in material and workmanship under normal use and if properly installed for a period of one year from date of purchase. If found to be defective as mentioned above, it will be replaced or repaired if returned prepaid along with proof of date of purchase. This shall constitute the sole remedy of the purchaser and the sole liability of Autotronic Controls Corporation. 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 Autotronic Controls Corporation be liable for special or consequential damages.