



INSTALLATION INSTRUCTIONS

MSD Programmable PWM Water Control Switch, PN 42592

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 - Programmable PWM Water Control Switch, PN 42592 | 1 - 6-Pin/9-Pin PC Harness, PRD 26399 |
| 1 - Mounting Bracket, Stainless | 1 - Pro-Data+ CD ROM Software |
| 2 - Mounting Screws | |
| 3 - Perma Seal Connectors, | |

Optional Components

- 1 - PN 7550 Programmer/Monitor

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 programmable "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.

PROGRAMMABLE FEATURES

- Tach:** Input period selectable for 90°, 120°, 180°, 360°
- WaterSw:** WaterPT1-10 - selectable points from 1 to 10 for the PWM vs. RPM curve
 WaterRPM - Selectable from 0 to 12,500 rpm in 100 rpm steps
 WaterPWM - Selectable from 0 to 100% duty cycle in 1% steps
- Monitor Values:** RPM - real time engine speed 0 to 15,000 RPM
 PWM - real time water switch duty cycle 0 to 100%

OPTIONAL HAND HELD PROGRAMMER

The Hand Held Programmer (Figure 9) allows you to select and program the different features of the Programmable PWM Water Control Switch Ignition. The PWM Water Control Switch does not need to be connected to the programmer in order to operate because the program values are stored in an erasable memory circuit in the Water Control. The Programmer only needs to be connected when you want to check or change programs or to monitor different operating parameters. It connects to the Water Control harness with a molded 9-pin connector to 6-pin connector.

Note: This is a special cable supplied only by MSD.

PRO-DATA+ (INCLUDED)

MSD has a software package for your PC that allows you to create a program for this Water Control. All of the adjustable parameters can be reviewed and set, then uploaded to the Water Control. This software program is included to allow the upload and download of programs for the Water Controller as well as monitoring and editing of all the Control's parameters. It will work with any PC running Windows '95, '98 or NT. More information is available in the Programming instructions. Visit our website to download the current version at www.msdpowersports.com.

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.

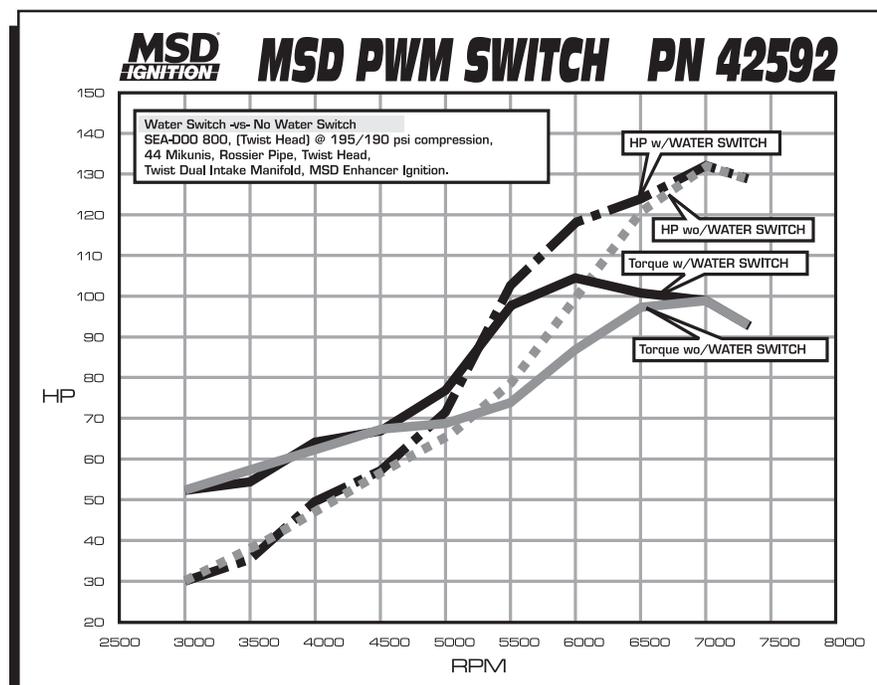


Figure 1 Example Dyno Chart.

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.

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.

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

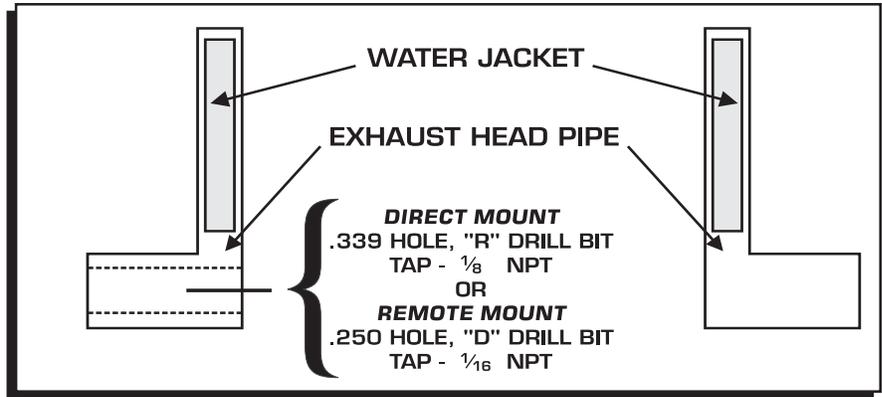


Figure 2 Recommended Mounting Location.

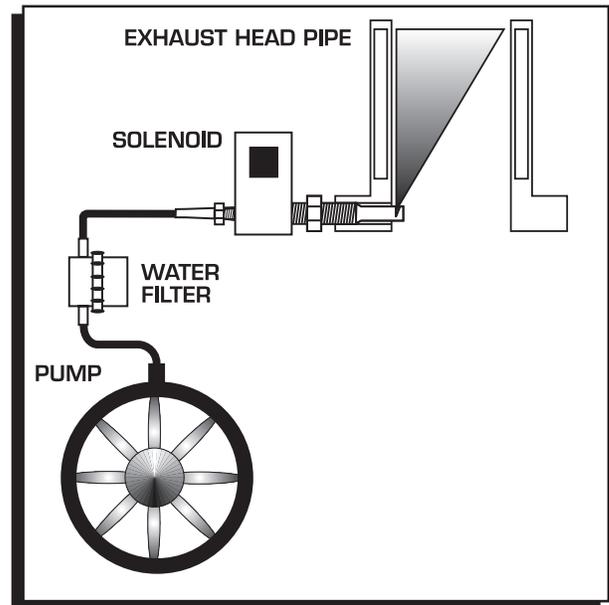


Figure 3 Direct Mount.

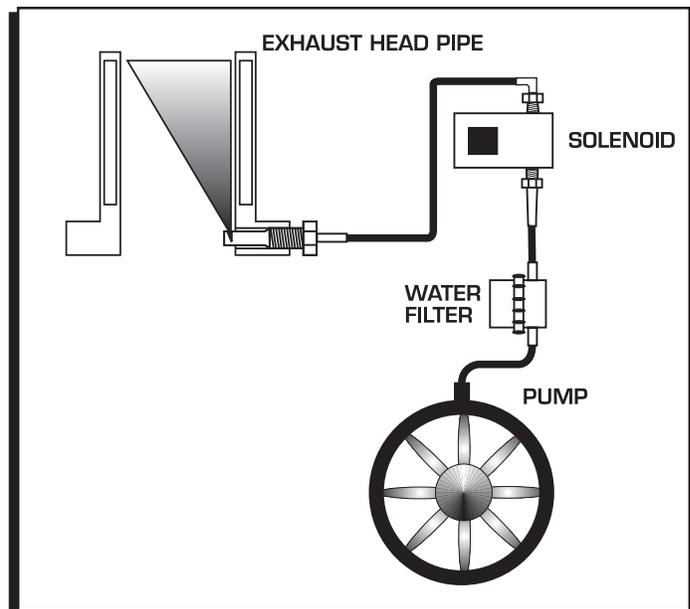


Figure 4 Remote Mount.

MOUNTING THE MSD PWM WATER CONTROL SWITCH

The PWM Water Control Switch is supplied with a Rynite 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 Water Control 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.

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. -).

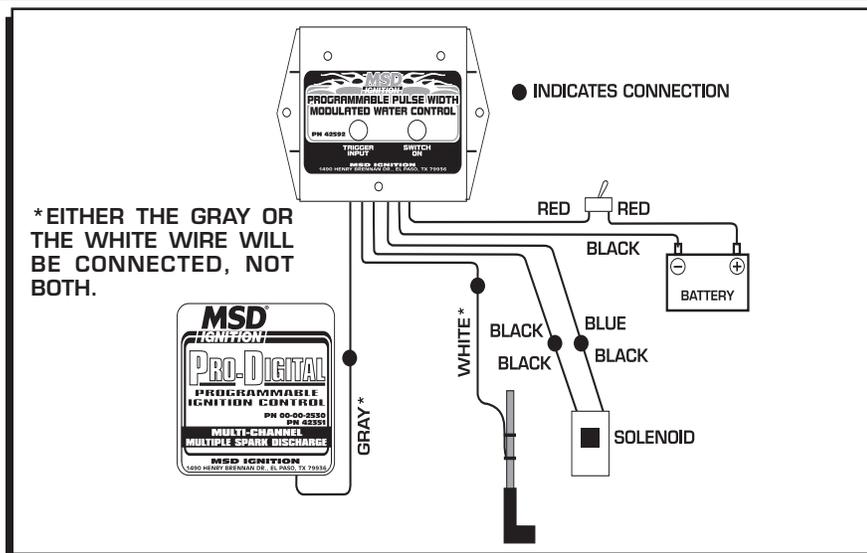


Figure 5 Wiring the PWM.

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.

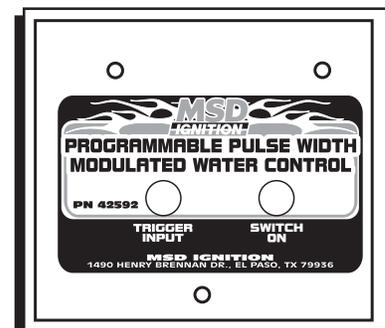


Figure 6 The PWM LED's.

PRO-DATA+

INSTALLATION OF THE PRO-DATA+ SOFTWARE

1. Insert the installation disk into your PC.
2. In Windows, click on Start then select Run.
3. In the box type, "D:Setup" and press Enter.
4. The screen will walk you through several steps.
5. Once loaded, your monitor will have an MSD Graph View logo. Click on it to open the software.
6. A program will open. Go to the upper left corner of the screen and click on File, then Open.
7. This will open a menu of part numbers. Select "42592".
8. This will open another menu of versions. Highlight and open the "42592vxx.IGN" (xx determines the versions, such as 02). This will open the Pro-Data+ software for the Programmable PWM Water Control.

SAVES AND TRANSFERS

Whenever a change is made to a program, it either must be saved to a file in your PC or it needs to be transferred to the Water Control. You will notice that whenever you make a change to a program, the bullet next to the modified value will turn red. It will remain red until you save it to a file or to the MSD. There are two ways to save your files.

Save to MSD: This step will save any changes directly into the ignition. If you are only making one or just a couple modifications this works well.

Save to PC: This will save your changes to only show on the PC screen (indicated by a red bullet point next to any altered values). These modifications will not be active or saved until you save the file or transfer the information to the MSD.

You can create numerous files on your PC and download them for testing purposes or by saving programs you used at different races or events.

PROGRAMMING

MSD Pro-Data+ software is compatible with Windows 95, 98, NT, Me, XP, or 2000. From the desktop screen, click on the MSD Graphview icon to open the program. The Programmable 42592 is programmed through a serial communications port located under the mounting bracket. Remove the three screws holding the 42592 unit to the bracket to access the 6-pin connector on top of the water switch. Connect the special 6-pin to 9-pin cable provided between the PWM to either an MSD 7550 hand held programmer, or a laptop/PC.

Turn the power On to the Controller and the Graphview program should open and look similar to Figure 7.

Verify the Product Connected displays the following: 42592 V01 M01.

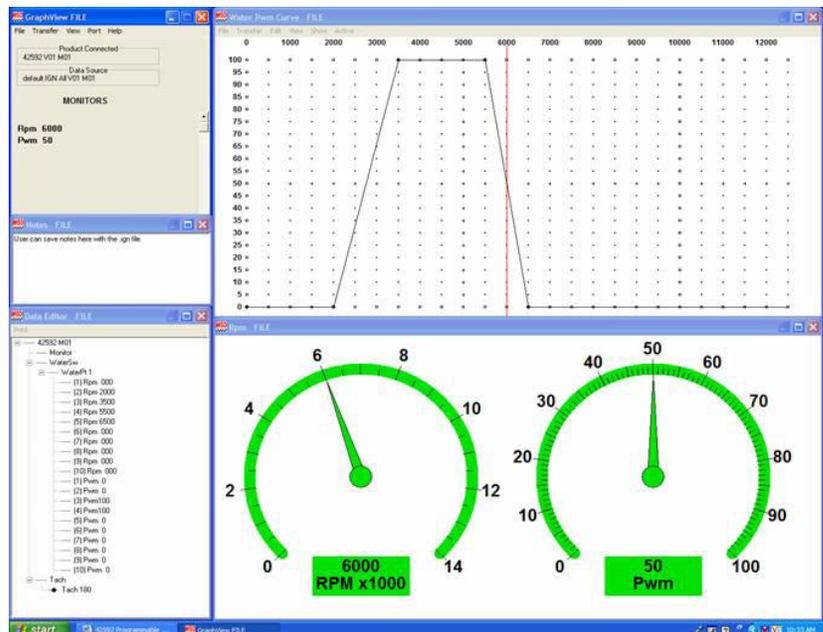


Figure 7 MSD GraphView Screen for the PWM Control.

PROGRAMMING THE TACH

To program the 42592 Tach for the correct number of engine cylinders, select from the following:

- 180 for a two stroke 2-cylinders
- 120 for a two stroke 3-cylinders
- 180 for a 4 stroke, 4-cylinders with waste spark
- 360 for a Coil-per-Cylinder engine

Note: The default cylinder setting is 180°, two stroke, 2-cylinders.

PROGRAMMING THE RPM WATER SWITCH POINTS

1. Place the cursor in the Water PWM Curve window.
2. Right click to add a point/dot.
3. Once the dot has been added, click on it to select it. This will turn the dot red and show the points where the dot is located. (Up to 10 points can be added.)
4. With the cursor over the red dot, click and drag the selected red dot to the desired rpm and PWM value positions. Continue to add dots and position them to the desired values for the PWM and rpm values.

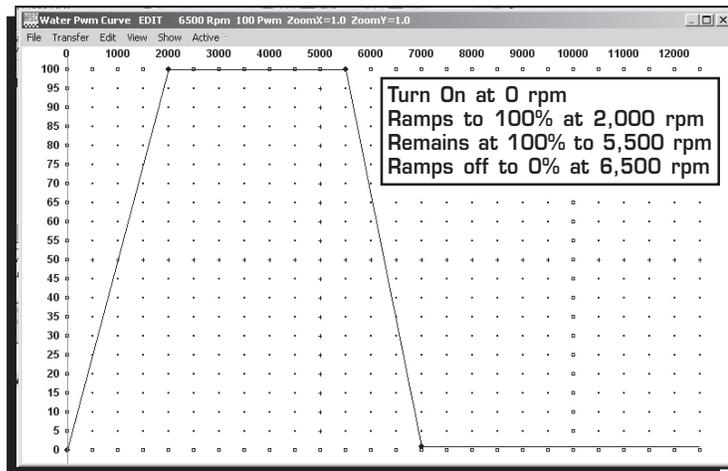


Figure 8 Example of the Water PWM Curve.

TRANSFERRING THE DESIRED CURVE TO THE 42592

At the top of the Water PWM curve window, click “Transfer.”

Next, select “Plot to MSD” to begin the file transfer from the laptop to the 42592 water switch.

Note: Editing changes that have not been transferred will request transfer confirmation.

When the product is powered on, and the Graphview program is opened afterward, the file in the 42592 will be automatically opened on the laptop screen.

If any edits are underway on the laptop when the 42592 is powered on after the Graphview program is open, the user will be asked to save the file before the product file is loaded on the screen. To verify the program is loaded in the 42592, click on the “Transfer” menu item at the top left of the window. Next, click on “MSD to PC” to initiate a file load from the 42592 to the laptop screen.

SAVING A FILE TO PC/LAPTOP

Once the file has been transferred to the 42592, save a copy of the file on the laptop drive for editing, or restoring at later date.

1. Click on “File.”
2. Click on “Save As”
3. The default file name “User01” will be displayed. You can name the file yourself.
4. Click on “Save” in the “Save As” window to complete the file save, or type a preferred file name before the file is saved in the laptop.

PROGRAMMING THE 42592 WITH THE MSD 7550 PROGRAMMER

HAND HELD PROGRAMMER/MONITOR, PN 7550

This section illustrates the operation of the optional hand-held Programmer/Monitor and how to navigate its program menus. Reading the instructions as you operate the Programmer to become familiar with the screens and menus will assist in your programming.

Remove the three screws from the mounting bracket to access the 6-pin connector of the Water Control.

The PN 7550 Programmer connects to the MSD Programmable PWM Water Control with the supplied 9-pin wiring harness. It should be disconnected when making passes. If you choose to remove it after making changes in the program, you must go to the Save menu to store the new programs in the Ignition before disconnecting the harness.

There are six buttons on the PN 7550 (Figure 9). The top four are used for programming all of the features of the Water Controller. The two Launch Control buttons will not be used.



Figure 9 The Optional Hand-Held Programmer.

ENTER – This is used to open the selected field for further programming or to load a new program.

NEXT – Pressing this button moves the cursor to the next field. After making an adjustment to a program, pressing NEXT will take you to the Save menu.

Up (↑) and Down (↓) Arrows – These buttons are used to change the settings of programs such as rpm or timing. Pressing the up button increases the rate while the down arrow lowers it.

Connect the cable between the Controller and the PN 7550 Hand Held Programmer.
Turn power on.

VIEWING THE SCREENS

The 7550 screen will display the following:

- Programmer part number
- Version number
- Product description
- Product part number
- Product version number
- Menu number

(The next screen is the MSD phone number.)

The first menu screen will display the following:

Monitor
WaterSw Tach

Press the “Next” button until the **T** in **Tach** is blinking.
 Push the “Enter” button to go to the **Tach** screen.
 The Tach menu screen will display:

^ **Tach__180**

Note: The default setting is 180 degrees for 2 cylinder engines.

To change the Tach value for a different cylinder count, press the **UP** or **Down** arrows to select a different cylinder count to match your watercraft engine.

Return to the main menu by pressing the “**Next**” button until the carrot symbol begins blinking, then press the “**Enter**” button. The menu should now display:

Monitor
 WaterSw Tach

Press the “**Next**” button until the “**W**” in “**WaterSw**” is blinking, then press the Enter button. The screen will display:

^ **WaterPt 1**
 RPM 000 PWM 0

The **WaterPT#** indicates the point at which the **RPM** and **PWM** values are programmed.

To view the values of each point, press the **Next** button until the “**W**” in “**WaterPt**” is blinking, then press the “**Up**” arrow to see the next point in the programmed curve.

Continue to press the “**UP**” arrow to see each point until the last point is displayed.

PROGRAMMING RPM

Note: The maximum points are 10, but all of these do not have to be programmed. The last point with a valid RPM value is the last point of the curve.

The default curve has 5 points:

Pt1 RPM=0,000 PWM=0
 Pt2 RPM=2,000 PWM=0
 Pt3 RPM=3,500 PWM=100
 Pt4 RPM=5,500 PWM=100
 Pt5 RPM=6,500 PWM=0

Use the **UP** or **Down** arrows to view these points.

To edit the **RPM** value for each point, first select the desired point, then press “**Next**” until the “**R**” in “**RPM**” is blinking. Next press the **UP** or **Down** arrows to change the **RPM** value.

Note: Point 1 RPM cannot be edited and will remain at **RPM 000**, all other points can be programmed from 000 to 12,500 rpm by increments of 100.

PROGRAMMING PWM

After each Point **RPM** value is programmed the **PWM** value can be edited for each point, by pressing the **Next** button until the **P** in **PWM** is blinking, then pressing the **UP** or **Down** arrows to change the **PWM** value from zero up to 100 in 1% increments.

Note: The points should be entered in order from the lowest RPM at point 1 to the highest RPM at the last point, because the points will be resorted. Editing RPM values out of this sequence will be resorted after they are entered and may appear confusing to which points are actually being edited.

TESTING

After all edits are made return to the monitor screen to watch the **RPM** and **PWM** values in real time while the engine is running.

Press **Next** until the carrot is blinking, then press **Enter**, press **Next** until **M** in **Monitor** is blinking then press **Enter**, then screen will display:

```

^s Rpm      0
s Pwm      0
    
```

Note: The laptop or MSD 7550 can be left connected when starting the engine to verify the water switch and Tach-input operation. The LEDs on the 42592 will indicate the Tach-input and the operation of the PWM switch output. The 42592 should be reinstalled in the mounting bracket before the watercraft is ridden to keep the 6-pin connector sealed.

Start the engine - Rev up the engine, and observe the **RPM** and **PWM** values.

TUNING TIPS

Adjusting the Low RPM Turn ON

Note: Set the lowest RPM to begin ramping the water turn on for a smooth transition over the desired RPM range as the engine speed increases.

First, test the watercraft with the default factory settings.

Turn On at 2,000 rpm
Ramps to Full On at 3,500 rpm

Try programming changes for the begin RPM and the Full ON RPM for the best acceleration in this low end speed range.

Adjusting the High RPM Turn Off

Note: The high RPM side of the PWM switch needs to be set so that the engine 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 being currently used.

First, test the watercraft with the default factory settings.

Turn Off at 5,500 rpm and full Off at 6,500 rpm.

Note: You will notice as the RPM is raised, the engine power will smooth out slightly and will be more controllable.

Try increasing and lowering the RPM value until the smoothest high speed setting is achieved.

Select a desired “Water full Off” RPM value.

Adjust the “Water Begin Turn OFF” RPM value.

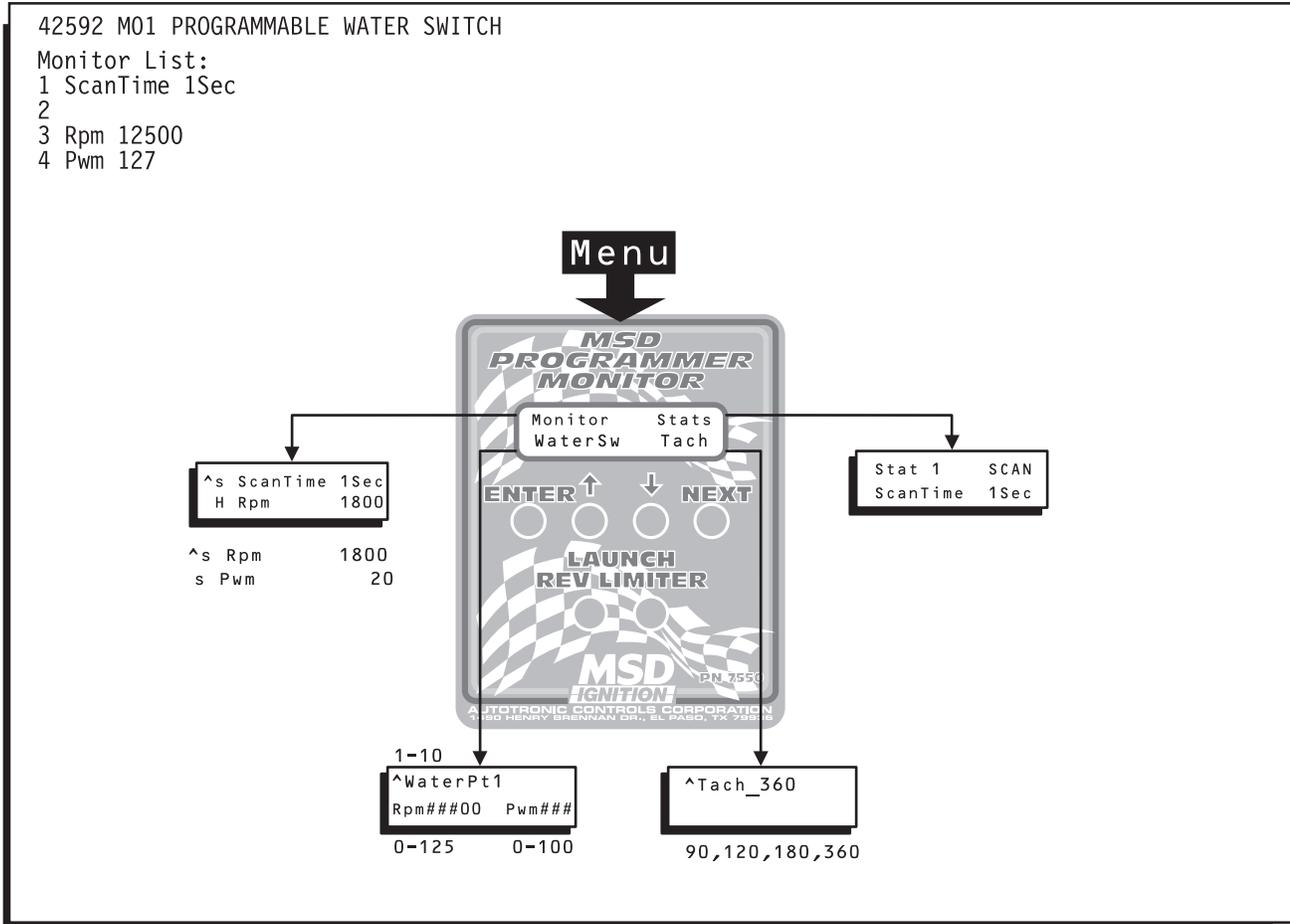


Figure 10 Menu Tree.

DEFAULT MENU

Notes: Factory default data and menu for MSD Programmable Water Switch 42592VO1. Uses menu 42592 MO1.

42592 MO1	
Monitor	
WaterSw	
WaterPt 1	
(1) Rpm 000	(1) Rwm 0
(2) Rpm 2000	(2) Rwm 0
(3) Rpm 3500	(3) Rwm 100
(4) Rpm 5500	(4) Rwm 100
(5) Rpm 6500	(5) Rwm 0
(6) Rpm 000	(6) Rwm 0
(7) Rpm 000	(7) Rwm 0
(8) Rpm 000	(8) Pwm 0
(9) Rpm 000	(9) Pwm 0
(10) Rpm 000	(10) Pwm 0
Tach	
*Tach 180	

