

## Multi-Channel Ignition Control Module PN 00-00-2530

**IMPORTANT:** Read these Instructions before attempting the 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 - Multi-Channel Ignition Module, PN 00-00-2530
- 1 - Wire Terminal Kit

### **Tools Required**

- 1 - Metric Wrench Set
- 1 - Wire Terminal Crimper
- 1 - Heat Gun
- 1 - Metric Allen Wrench Set

## **MOUNTING THE IGNITION**

The Multi-Channel Ignition module may be mounted in any location except on the engine or near the exhaust manifold. Excessive heat at these locations may cause damage to the ignition. When selecting a mounting location, make sure the cable assembly will reach the battery, coil and trigger assembly. A stainless steel or aluminum mounting plate with room for complimentary components is recommended.

**IMPORTANT:** Do not mount the coil within 6" of the ignition control unit.

## **WIRING**

All wires must be routed away from direct heat sources and not allowed to rub on any surface when cutting to desired length. Strip the wire ends to expose the internal strands and use the supplied solderless/heat shrink connectors (Figure 1).

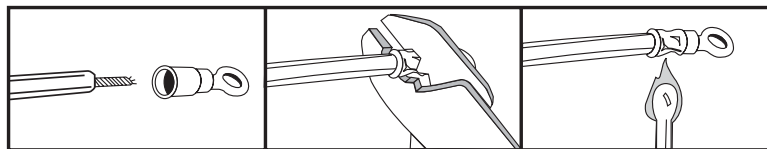


Figure 1

## **WIRING THE IGNITION**

**Note:** Any unused wires should be capped off to prevent shorting out or from picking up EMI.

**Note:** When used on 1 or 2-cylinder engines, some channel inputs and outputs are not connected, cap these off.

1. Figures 2 and 3 shows the complete wiring diagram for the Multi-Channel Ignition unit for universal applications. Connect the VIOLET wire to one wire of an On/Off switch (not supplied). Then connect the other wire of the switch to the positive (+) terminal of the battery or starter solenoid.
2. Connect the PINK wire to one wire of a normally closed lanyard type kill switch. If not used seal the end of the wire.

3. Connect the remaining wire of the kill switch to negative (-) terminal of the battery or to an engine ground.
4. To utilize the Holeshot feature, the LIGHT BLUE wire must be connected to one wire of a normally open momentary switch (PN 00-00-0520) then connect the remaining wire of the switch to the negative (-) battery terminal or to an engine ground.

**Note:** It is very important that the BLK Ring Lug wire from the coil be attached directly to the engine.

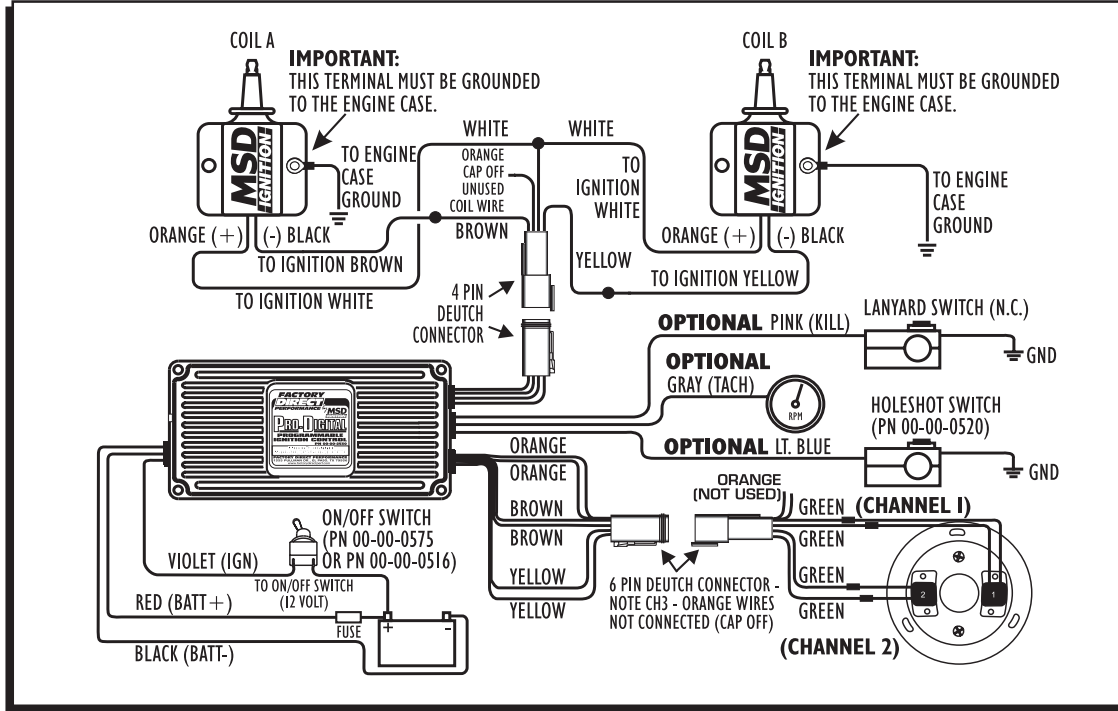


Figure 2 Universal Two Cylinder wiring application.

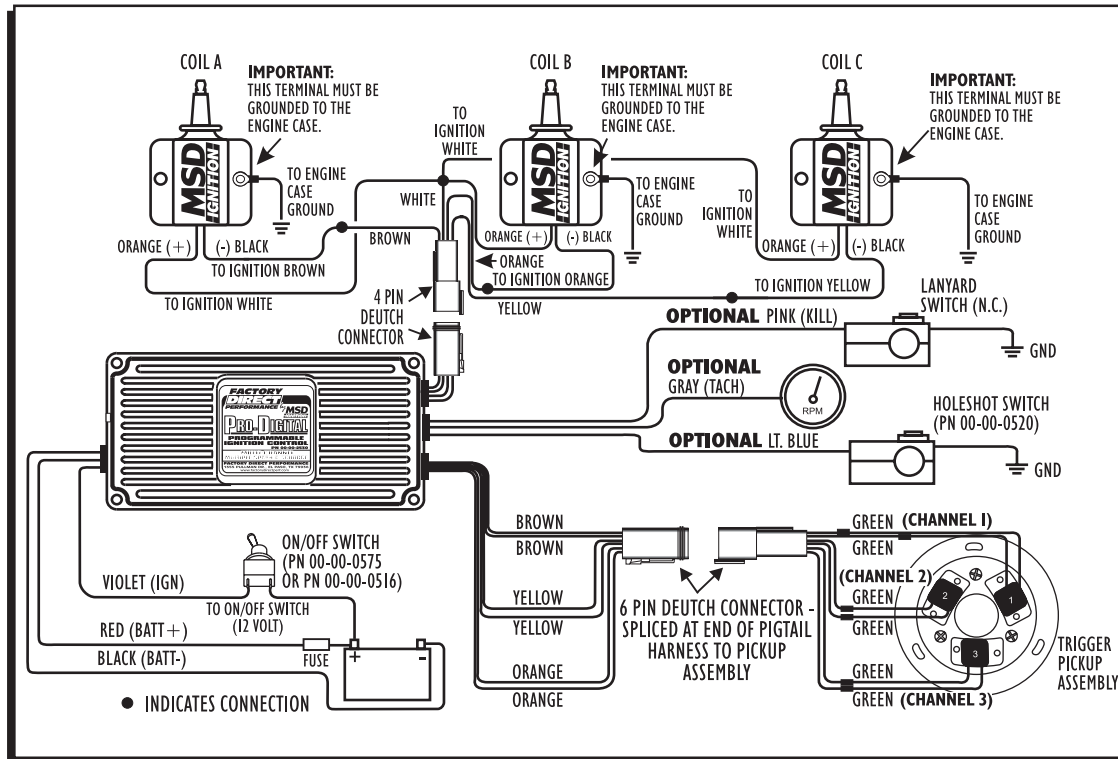


Figure 3 Universal Three Cylinder Wiring Application.

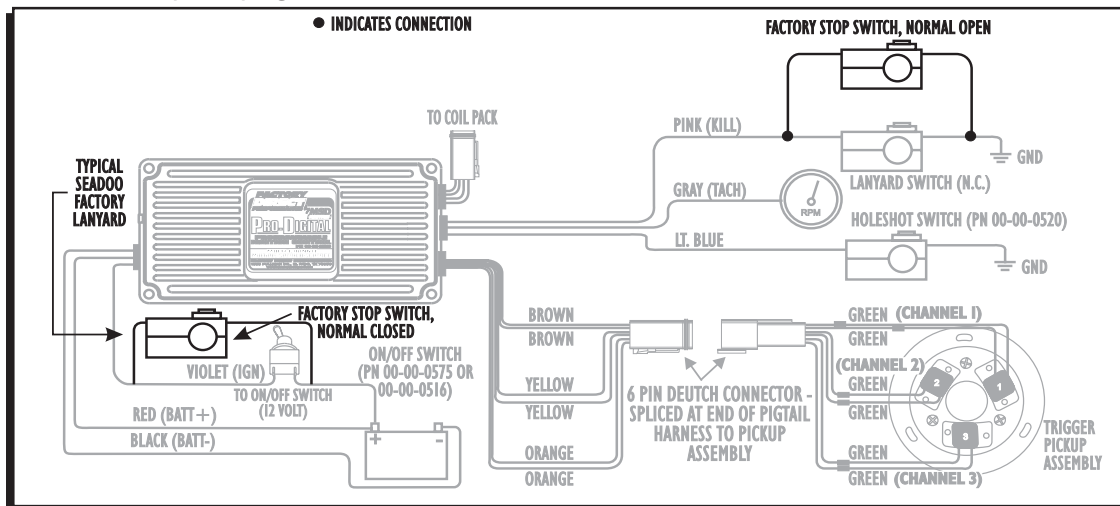
5. Connect the following wires from the Multi-Channel Ignition to the three trigger pickups.

Ignition Channel	Ignition Wire	Pickup Number	Coil Wire
<b>Channel 1</b>	Brown Brown	Green 1 Green 1	Brown
<b>Channel 2</b>	Yellow Yellow	Green 2 Green 2	Yellow
<b>Channel 3</b>	Orange Orange	Green 3 Green 3	Orange

**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 (Figure 4).

**Note:** SEA-DOO® uses the factory lanyard switch to kill the engine. See Lanyard Switch hookup on page 4.



**Figure 4 Connecting the Factory Stop Switch.**

**CONNECTING THE IGNITION KILL LANYARD FEATURE**

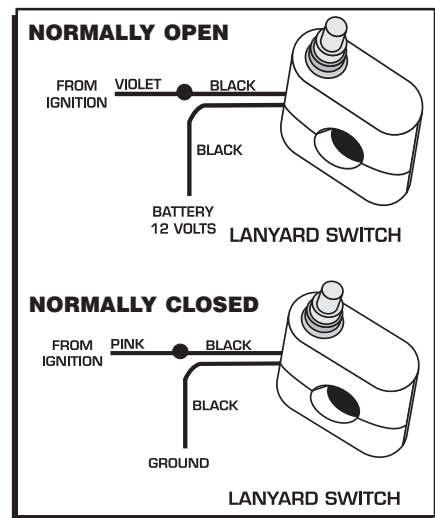
Lanyard Switches are listed as Normally Open or Closed when the switch is not connected to anything and the Lanyard is removed from the switch.

**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) (Figure 5).

**Normally Closed Lanyard Switch**

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



**Figure 5 Lanyard Switch.**

**CONNECTING THE HOLE SHOT 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 (Figure 6).

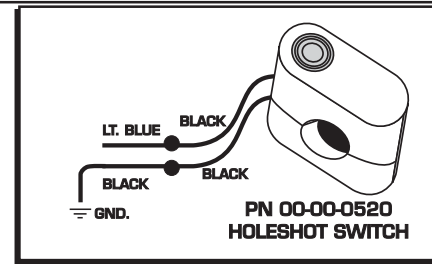


Figure 6 Holeshoot Switch.

**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 as shown in Figures 2 and 3.

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			
 MULTICHANNEL PN 00-00-2530				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				
ON  OFF RBS=5000 LED= ON MSRL=7750				ON  OFF HRL=3000 MSR= 6°				ON  OFF MMRL OFF HSR OFF ES ON SR ON RBR OFF MT-6																
Switch 3								Switch 2								Switch 1								

Figure 7 Switch Program Labels

**TIMING THE IGNITION**

At this point in the installation, the ignition, coil and starter relay should be mounted in the craft and the flywheel and trigger pickup assembly should be installed. If you have completed the installation of these components, you are now ready to time the engine. Refer to your craft's owners manual on how to find TDC and mark the engine case or flywheel cover to indicate where TDC is located at.

**FIRING ORDER**

This procedure ensures the correct firing order. The engine's order is 1-2-3, with the cylinder closest to the flywheel being #1.

**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.**

1. To inspect spark, insure that S4 of switch 3 is in the Off position (Ignition Operate) and S3 of switch 1 is in the Off position (Elect Start On) and S4 of switch 1 is in the Off Position (Start Retard).

**WARNING:** High voltage will discharge at spark plugs to engine ground. DO NOT TOUCH spark plugs with ignition On.

2. Make sure that the RED wire from the Multi-Channel Ignition is connected to the positive side of the battery.
3. Remove the spark plugs from the engine, plug them into the spark plug wires and lay the plugs on the cylinder head.
4. Using a Dial Indicator, find Top Dead Center of the #1 cylinder (the front cylinder).
5. Rotate the flywheel counterclockwise about 1/4 of a turn.
6. Turn the ignition On/Off Switch to the On position and slowly rotate the flywheel clockwise until the front plug sparks. (Ignore LED at this time and look for spark from the spark plug). Mark the spark plug that fires #1.
6. Continue rotating the crankshaft until the next spark plug fires. Verify cylinder 2 is near TDC, then mark this spark plug wire #2 and mark the last spark plug wire as #3.
7. If the plugs do not fire in the 1-2-3 order, the wires or the pickups are not installed correctly. Check the wiring to the pickups and make sure the coil #1 terminal is connected to the #1 spark plug.

## SETTING THE TIMING

**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.

The Multi-Channel Ignition's innovative design allows you to static time the engine before the engine is started.

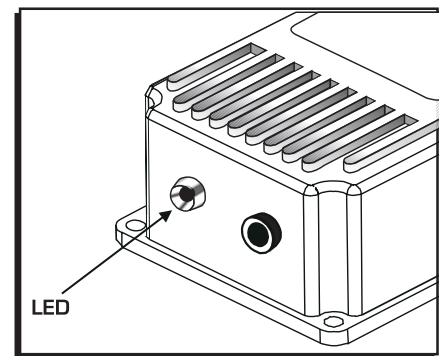
1. Remove the spark plugs from the engine, plug them into the spark plug wires and lay the plugs on the cylinder head. Insure that S4 of switch 3 is in the On position (LED Operate), then turn the ignition On/Off Switch to the On position.
2. Slowly rotate the crankshaft clockwise until the LED Indicator Light first turns on (Figure 9). When the LED is on, this indicates that the magnet on the flywheel is entering over a trigger pickup and that the ignition will fire at this point (at maximum advance timing). Follow the timing mark down to the flywheel and determine where the timing is set at by reading the timing mark on the flywheel. Write this number down.
3. Next continue rotating the flywheel until the LED light turns on for the second pickup. Follow the timing mark down to the flywheel and determine where the second pickup's timing is set. Write this number down.
4. Continue rotating the flywheel until the LED indicator light turns on. Follow the timing mark down the flywheel and determine where the timing is set at for the third pickup. Write this number down.

## Timing Individual Cylinders

On some engines with untuned exhaust and intake manifolds or an out of phase crankshaft, it may be advantageous to set each trigger pickup independently.

## PROGRAMMING

The function of the timing curve is to match the ignition to the burning rate of the fuel and the speed (RPM) of the engine. By adjusting the timing of the Ignition, maximum combustion pressure can be achieved at the same time the piston is beginning the power stroke.



**Figure 9 LED Indicator**

Any factor that changes the burning rate of the fuel or the engine speed (RPM) can cause a need for an ignition timing change. Figure 11 shows some of the factors that will effect ignition timing.

As you can see from the chart, most factors will change throughout the range of engine operation. Timing adjustments must be made to compensate for these changes. Obviously, a full technical explanation of the correct ignition timing would be very complicated. The best way to arrive at a suitable timing curve for your engine is to use the above chart as a guide to compare your engine combination with.

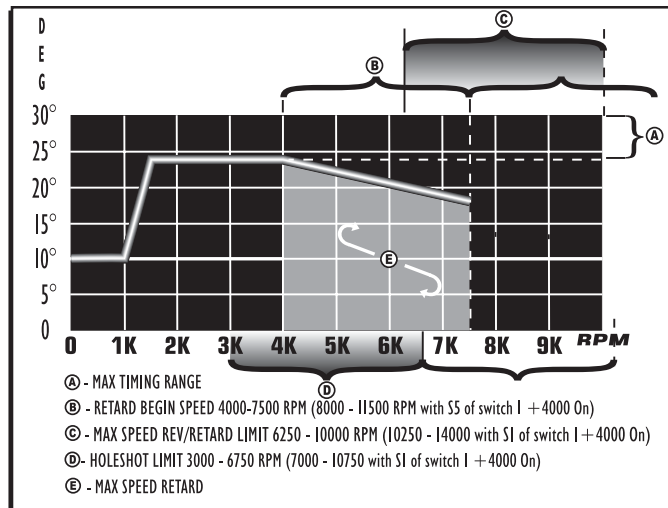


Figure 10 Programming Points

### 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.

FACTOR	ADVANCE FOR	RETARD FOR
Cylinder Pressure	Low	High
RPM Engine	Low	High
Energy of Ignition	Low	High
Fuel Octane	High	Low
Mixture (Fuel/Air)	Rich	Lean
Temperature	Cool	Hot
Combustion Turbulence	Low	High
Load	Light	Heavy

Figure 11 Timing Recommendation Chart

**Note:** With the Start Retard Switch On (S4 of switch 1), the start timing is the trailing edge of the magnet approximately 20°. This is recommended for minimum starter loading.

2. Set the timing retard start point as early as possible without sacrificing low RPM performance.
3. Use the highest retard possible without hurting top end performance.

### PROGRAMMING THE IGNITION

The 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.

**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 the aluminum backing plate to seal switches.



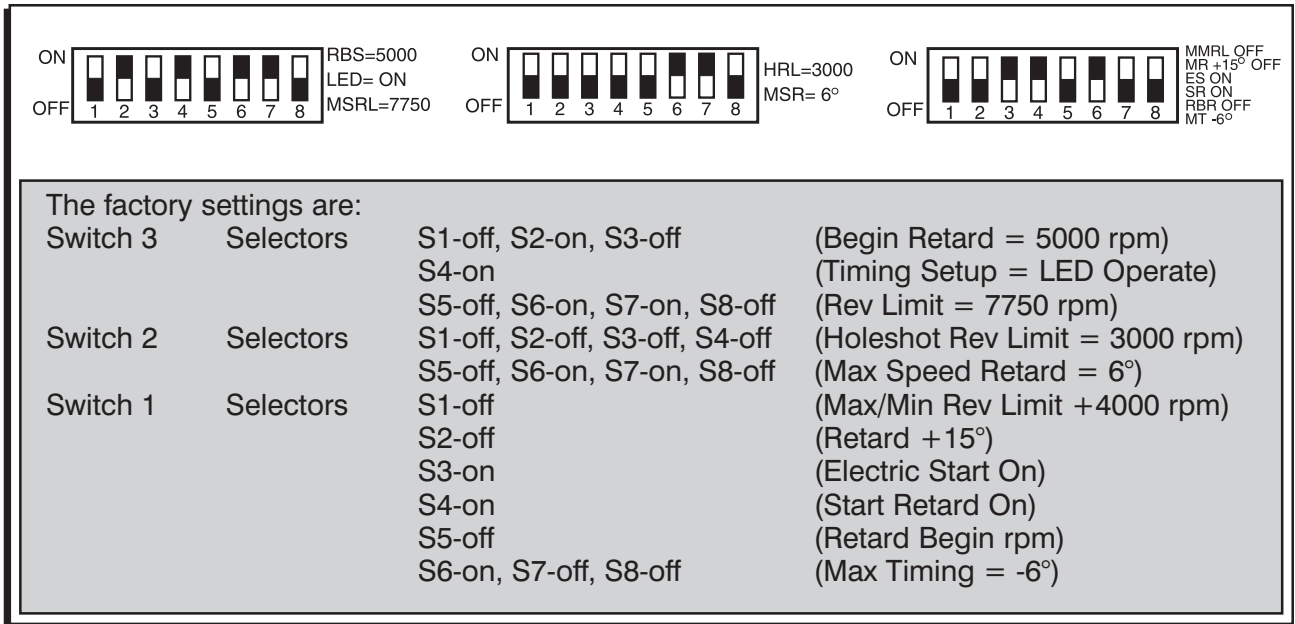


Figure 12 Factory Program

**TIMING RETARD FUNCTION**

The max speed retard function is an rpm-dependent timing retard. It is configured by three separate elements:

1. The "Retard Begin Speed" (B) Figure 13 is the point in the rpm range when the timing retard begins.
2. The "Total Retard" (E) Figure 13 is the total amount of timing retard (in crankshaft degrees) introduced between the retard begin point and the Rev Limit point.
3. The "Rev Limit" (C) Figure 13 is the point in the rpm range where maximum safe engine rpm limit is set and where the timing retard ends at.

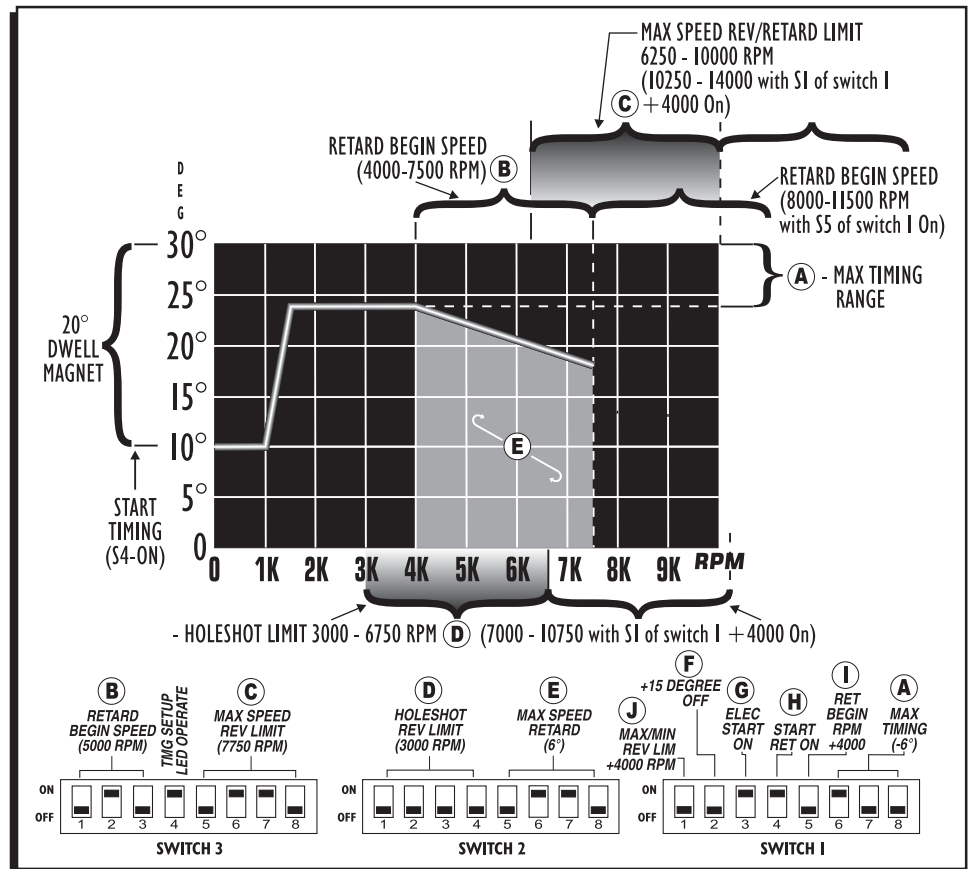


Figure 13 Adjusting the Timing Programs.

**SETTING THE PROGRAM SWITCHES****INITIAL TIMING:**

Refer to Figure 13 for location of each switch. The LED indicated timing is the actual maximum run timing, if S6, S7, and S8 of switch 1 are set to On/On/On.

**A****SETTING MAX TIMING:**

Max timing can be retarded up to  $-7^\circ$  from the max timing setting by Selectors S6-S8 of switch 1. The initial switch positions give  $-6^\circ$  retard below max timing.

**NOTE: In order for this feature to function, the Start Retard Switch (S4 of Switch 1) must be turned on.**

**B****SETTING THE RETARD BEGIN SPEED:**

Selectors S1-S3 of switch 3 determines the rpm point at which the timing will begin to retard at. The rpm point is adjustable in 500 rpm increments between 4000 rpm and 7500 rpm, or 8000 to 11500 rpm if S5 of switch 1 is On. Position selectors S1-S3 of switch 3 to desired retard begin speed for your particular combination.

**C****MAX SPEED REV/RETARD LIMIT:**

The rev/retard limiter function is variable in 250 rpm increments between 6250 rpm and 10000 rpm, and from 10250 to 14000 rpm with S1 of switch 1 on. The system is supplied with the rev/retard limit preset at 7750 rpm. Position selectors S5-S8 of switch 3 to the desired rpm/retard limit point for your particular engine combination.

**D****SETTING THE HOLESHOT LIMIT:**

The Holeshot rev limit function is variable in 250 rpm increments between 3000 rpm and 6750 rpm, and from 7000 to 10750 rpm with S1 of switch 1 on. Position selectors S1-S4 of switch 2 to the desired rpm limit point for your application.

**E****SETTING THE MAX RETARD:**

Selectors S5-S8 of switch 2 determines how much timing retard will occur between the Retard Begin rpm point and the Rev Limit rpm point. The Max Retard is adjustable in 1 degree increments from  $0^\circ$  to  $15^\circ$  ( $15^\circ - 30^\circ$  with  $+15^\circ$  selected, S2 of switch 1). The retard is operational only when the Max Speed Retard function is set to a value other than zero. If the max retard is not desired, the "Max Retard" function should be set to zero (all selectors "off") and S2 of switch 1 off. Position selectors S5-S8 of switch 2 to the desired retard amount for your particular engine combination.

**F****RETARD +15°**

Adds  $15^\circ$  to each of the max retard settings (E). Allows  $15^\circ - 30^\circ$  of timing retard.

**G****ELECTRIC START**

If the 00-00-2530 Ignition is used on a hand or foot crank started engine, then select S3 of switch 1 to Off position for correct start up. If the engine is equipped with an electric starter then this switch should be on.

**Note:** Reposition S4 of switch 3 to Off, Ignition Operate position, before starting the engine.

**H****START RETARD**

This switch produces approximately  $20^\circ$  (with one magnet flywheels) of timing retard for easier starting.

**NOTE: It is recommended to use one magnet ( $20^\circ$ ) for correct maximum/start timing.**

**I**

This will add 4000 rpm to the Retard Begin Speed (B) when in the On position.

**J**

This will add 4000 rpm to the Max Rev Limit (C) speed when in the On position.



**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. See Figure 2 or Figure 3. 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 with the Troubleshooting Check List and schematic on pages 2 & 3 of the instructions, 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 this procedure:

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.

**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.

