



INSTALLATION INSTRUCTIONS

Programmable Midget Racing Ignition Control PN 6214

1 - Midget Ignition	1 - Wire Harness	2 - ASY19796 - Pickup
1 - Magnet .250" x .200"	2 - Ring Terminal (#6 Red)	2 - 9-Pin Harness (6', 10')
1 - Aluminum Magnet Rivet	2 - Ring Terminal (#1/4 Yellow)	4 - Vibration Mounts
1 - Pro-Data+ Disk	1 - ON/OFF Toggle Switch	

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

Note: Solid Core spark plug wires cannot be used with the Midget Ignition.

The MSD Programmable Midget Ignition is a distributorless ignition system (DIS). It provides powerful capacitive discharge sparks for complete combustion while providing a variety of rpm and timing tuning programs. It consists of an Ignition Control, 2-Channel Coil Pack, and incorporates a waste spark firing design. This means that two cylinders are fired at the same time, one on the compression stroke and the other on the exhaust stroke. Two magnetic pickups are used for trigger inputs and two outputs go to the supplied coil pack. The components offer a direct plug-in wiring harness with sealed, locking Deutsch Connectors. A 12 volt battery is required.

The MSD Programmable Midget Ignition Control requires a crank trigger system. MSD supplies two Non-Magnetic Pickups, but due to the variety of engines and applications, a crank trigger wheel is not offered. Information is supplied on fabricating a crank trigger wheel.

Note: The Midget Ignition must be used on engines equipped with a battery.

GENERAL INFORMATION

DIGITAL OPERATION

The Programmable Midget Ignition uses a high speed RISC microcontroller to control the ignition's output while constantly analyzing the various inputs such as supply voltage, trigger signals and rpm. The high speed controller can make extremely quick compensations to the timing and rpm limits while maintaining accurate timing signals to within +/- 0.1° and +/- 10 rpm. The circuits and controller of the Ignition have been thoroughly debounced and suppressed to create protection against Electro Magnetic Interference (EMI).

Note: This Ignition can be removed from power and still retain its programmed settings.

CAPACITIVE DISCHARGE

The Midget Ignition features a capacitive discharge ignition design. The majority of stock and aftermarket ignition systems are inductive ignitions. In an inductive ignition, the coil must store energy and step up the supplied voltage to maximum strength between each firing. At higher rpm, since there is less time to charge the coil to full capacity, the secondary voltage falls short of reaching its maximum energy level which results in a loss of power or a top end miss.

The Midget Ignition features a capacitor which is quickly charged to 490 - 505 volts and stores this energy until the ignition is triggered. With the CD design, the voltage sent to the coil is always at maximum power even at high rpm.

MULTIPLE SPARKS

The Midget Ignition produces full power multiple sparks for each firing of a plug. The number of multiple sparks that occur decreases as rpm increases, however the spark series always lasts for 20° of crankshaft rotation. Above 1,200 rpm there is only one full power spark, for limiting power drain on the battery. Multiple sparks will not activate unless rpm drops below 500 rpm.

BATTERY

The Midget Ignition Control will operate on any negative ground, 12 volt electrical system. The Ignition can be used with 16 volt batteries and can withstand a momentary 24 volts in case of jump starts. The Ignition will deliver full voltage with a supply of 11- 18 volts and will operate momentarily with a supply voltage as low as 9 Volts.

If your application does not use an alternator, allow at least 17 amp/hour for every half hour of operation. The Ignition uses about .8 Amps for every 1,000 rpm. If the engine is cranked with the same battery or other accessories such as an electric fuel or water pump are used, the amp/hour rating should be higher. **Note:** The negative battery terminal must be grounded to the engine case.

COIL PACK

The MSD Programmable Midget Ignition should be used with the PN 8240 matched connector coil pack. For more information on recommended coils, contact our Customer Support Department at (915) 855-7123.

TACHOMETERS

The Midget Ignition features a Tach Output Wire (Gray) and Black Ground wire. This wire provides a trigger signal and ground for tachometers. The Tach Output Terminal produces a 12 volt square wave signal with a 30° duty cycle.

SPARK PLUGS AND WIRES

Spark plug wires are very important to the operation of your ignition system. A good quality, helically wound wire and proper routing are required to get the best performance from your ignition, such as the MSD 8.5mm Super Conductor Wire. Helically wound wires provide a good path for the spark to follow while keeping Electro Magnetic Interference (EMI) to a minimum. Excessive EMI, such as the amount that solid core wires produce, may interfere with the operation of the MSD. **Solid Core spark plug wires cannot be used.**

PROTECTION

The Programmable Midget Ignition has a built in reverse polarity protection circuit. This will protect the ignition in the event of wrong connections. It will also shut off for protection from a surge in power. The ignition will still operate once the surge or polarity is corrected.

LED INDICATOR

There is an LED that monitors the status of the Ignition. The LED will verify trigger inputs and will flash trouble codes such as a Code 2 for Low Battery supply voltage.

PROGRAMMING OPTIONS

The Programmable Midget Ignition has many features that give you more control over your timing and rev limits. For more information on programming these features, consult the supplied Programming Instruction booklet, or see the Help menu in the Pro-Data+ Software.

HAND HELD PROGRAMMER, PN 7550

The Hand Held Programmer (Fig. 1) allows you to select and program the different features of the Programmable Midget Ignition. The Ignition 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 Ignition Control. The Programmer only needs to be connected when you want to check or change programs or to monitor different operating parameters.



Figure 1

PRO-DATA+ (INCLUDED)

MSD has a software package for your PC that allows you to create timing and rpm programs for this ignition. All of the adjustable parameters can be reviewed and set, then uploaded to the ignition. This software program is included to allow the upload and download of programs for the Ignition Control as well as monitoring and editing of all the ignition's parameters. It will work with any PC running Windows 95, 98, NT, ME, 2000 or XP. More information is available in the Programming instructions. Visit our website to download the current version at www.msdition.com.

CYLINDER SELECTION

The Ignition default is for 4-cylinder operation only, using two mag pickups and two Ignition Coils for waste spark operation.

PROGRAMMING FEATURES

The most current release of the **MSD Pro-Data+** software is available which allows transferring all of the menu items and user data to the PC or from the PC to the timing controller as well as viewing the Alternate and Run Timing curves and the monitored items. Also this program allows editing the Alternate and Run timing curves on the PC. This software allows all the data to be printed out, timing plots and the other data items, from the Graph-View program.

RUN TIMING RETARD CURVE

This is the default timing curve and is active at all times unless the Alternate Timing Curve is activated. This Curve is adjustable from 800 – 15,000 rpm and is programmable in 0.1° increments every 100 rpm. The maximum amount of retard is 25°.

ALTERNATE TIMING RETARD CURVE

This feature provides the opportunity to switch to a second timing curve. This Curve will override the Run Timing curve when the Dark Blue wire is supplied with 12 volts. It will remain active until the 12 volts are removed (where the Run Curve becomes active again). This Curve is adjustable from 800 – 15,000 rpm and is programmable in 0.1° increments every 100 rpm. The maximum amount of retard is 25°.

Note: Both the Run Timing Curve and the Alternate Timing Curve defaults are zero degrees of retard over the full RPM range.

START RETARD

This program will retard the timing when cranking to ease the load on the starter and flywheel. The retard will activate during cranking and will automatically turn off at 800 rpm. If the engine drops below 500 rpm, the Start Retard rate will reactivate. The Start Retard has a default setting of 15°.

REV LIMITER

An overrev rpm limit can be programmed in 100 rpm increments from 2,000 to 15,000 rpm. The limiter has a default setting of 9,500 rpm.

IGNITION COMPENSATION

This compensation circuit is designed for MSD's Crank Trigger Pickups and is automatic. The circuit compensates for the inherent retard of magnetic pickups creating stable ignition timing from idle to the maximum engine rpm. This function is automatic and does not require any adjustments with the MSD pickups. **Note:** There is an offset of 4° from the input signals to output signals to produce accurate timing. This must be taken into consideration when statically setting the timing.

BATTERY MONITOR

This Ignition has a program that monitors the supply voltage of the battery in real time. There are three different battery types that can be selected to automatically set a low voltage threshold by entering the number of cells that the battery has from six to 12. The battery choices are Lead Acid, NIMH and NICAD. The default battery specification is a Lead Acid, 12 volt, six cell battery which has a low voltage threshold of 10.8 volts.

An example of some battery specs are:

12 volt Lead-Acid, 6 cell——10.8 volts	
16 volt Lead-Acid, 8 cell——14.4 volts	13.2 volt NICAD,NIMH, 11 cell- 12.8 volts
12 volt NICAD,NIMH, 10 cell— 11.64 volts	14.4 volt NICAD,NIMH, 12 cell- 13.97 volts

The battery supply voltage is shown as **BatVolts** on the monitor.

Battery type is listed as **BattType** and **BattCells** displays the number of cells for selecting the low threshold.

BATTERY LOW PERCENTAGE MONITOR

This program is useful to see how the battery is holding up throughout a race. If the supply voltage from the battery drops below the low voltage threshold, this monitor will display the percentage of time that the voltage is below the recommended spec. This percentage is taken from the entire time frame that the engine is run until it is shut off. This value will be stored in the Ignition until the engine is started again. It is shown as **%LOW** on the monitor.

For example, if a race lasts 20 minutes (from the time the engine is started) and the voltage dips below the threshold for 2 of those minutes, the %LOW value would be 10%. Note: If the engine is started again, the program over writes the previous setting.

ALERTS

Alerts are messages that can be allowed to momentarily interrupt the current display screen on the PN 7550 Monitor. The **Alerts** menu allows the user to select alert messages to be displayed, even to interrupt other screens, be scrolled through or skipped altogether. The default of the **Alerts/Scan** program is set at 0 and will not show any alerts unless configured to show any alerts. Until the user desires to change this feature to allow the alert mode of operation. The alert messages at this time are: **Low Spark and DisLost**. More alert codes can be implemented as this component matures and as warranted by racer feedback.

OUTPUTS

An LED indicator is mounted on the 6214 end panel and can be used to verify trigger input from mag-pickups. This LED also displays alert codes such as **Low Spark** code 2 by blinking when this condition occurs. This alert code will be indicated both on the LED and the 7550 Monitor/Programmer/PC. An error condition of a lost pickup signal will indicate DisLost and blink a code 3.

TRIGGER WHEEL FABRICATION

Due to the variety of engines and applications, a crank trigger wheel is not offered and must be fabricated. The brackets for the two pickups must also be made.

The trigger wheel must be 3/8" thick for the MSD magnet to properly fit. The wheel can be any type of non-magnetic material (aluminum, non-magnetic stainless, etc...) and can be any diameter over 4". MSD offers several trigger wheels for V8 applications that may be modified for certain applications.

A magnet is supplied that must be installed in the trigger wheel. This magnet must be oriented in one position to produce the correct trigger signal for the non magnetic pickups. This is detailed in Figure 2.

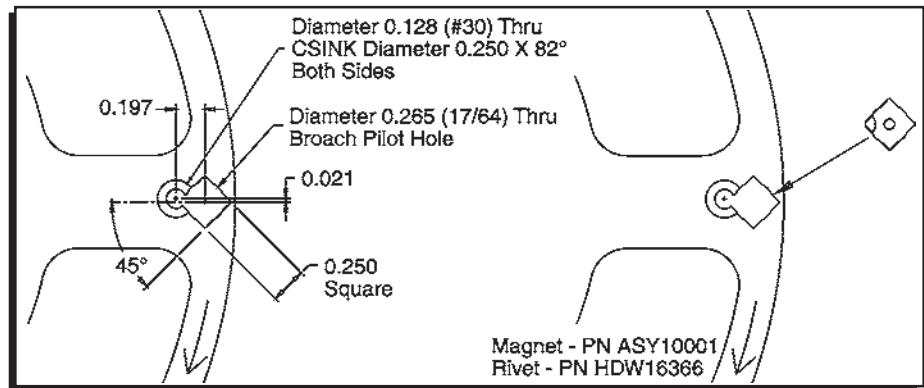


Figure 2 Mounting the Magnet in the Trigger Wheel.

1. Place the magnet in the wheel with the hole in the plastic overmolding facing the front of the motor. The chamfer in the magnet must be positioned next to the hole for the aluminum rivet.
2. Insert the aluminum rivet. The rivet must be set using a press or a vice with a set of smooth, parallel jaws (such as the vice on a milling machine).

MOUNTING THE TRIGGER PICKUPS

Since the MSD Programmable Midget Ignition is a two channel, waste spark ignition system there must be two trigger pickups. Brackets must be fabricated so the pickups are positioned 180° apart. Figure 3 shows two different mounting brackets.

Individual Brackets: Each pickup can be mounted on it's own individual bracket 180° from each other. In this configuration both pickups will need to be moved to make timing adjustments. Care will have to be taken to ensure that the pickups remain 180 degrees apart.

One Bracket: By using one bracket to position both pickups, timing adjustments will be easier to set. The bracket will have to be slotted to make timing adjustments and one pickup will be fixed and the other one will require adjustment slots to index it 180° from the other. Once the two pickups are indexed correctly the entire bracket will be able to be rotated to make timing changes. This configuration may be harder to produce but has the advantage of easier timing adjustments once the pickups are indexed.

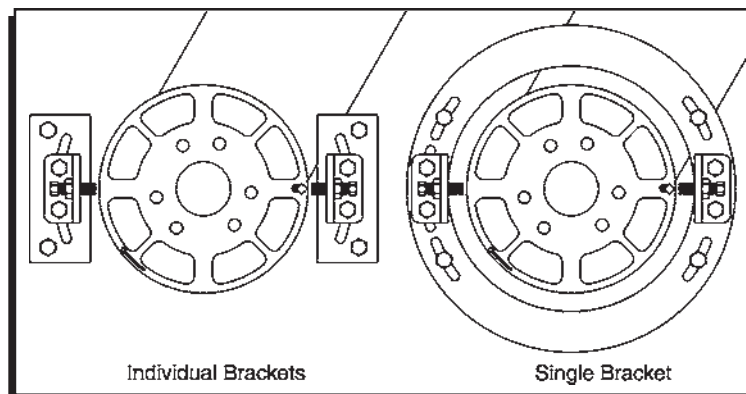


Figure 3 Trigger Pickup Mounting Examples.

WIRING AND INSTALLATION

MOUNTING

The Ignition Control can be mounted in any position but should be kept away from direct engine heat sources. It is fully potted with a polyurethane compound and sealed. Make sure all of the wiring reaches their connecting components. Four rubber mounts and sleeves are supplied for installation and should be installed to the Control as shown in Figure 4.

With everything mounted, connect all of the wiring harnesses and secure them away from engine heat sources. The magnetic pickup harnesses each have a ground wire which should be connected to engine ground.

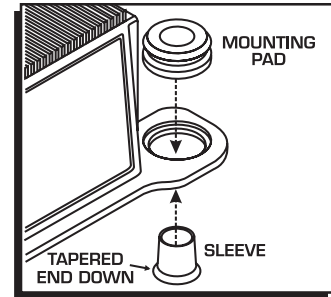


Figure 4 Installing the Vibration Mounts.

WIRE FUNCTIONS

All of the wires, except the Power Leads, are supplied with Deutsch connectors already terminated for a direct plug-in installation. It is not recommended to modify or lengthen any wiring. Always route the wires away from direct heat sources and sharp edges. It is best to route the trigger wires along a ground plane and away from the other wires.

Large 2-Pin Connector: Power Leads

Large Red	To the battery positive (+) terminal.
Large Black	To battery negative (-) terminal or a common engine ground

Small 2-Pin Connector:

Red/Green wire	Connect to one side of the On/Off switch(+v source, internal fuse link)
Red wire	Connect to other side of the On/Off Switch

8-Pin Connector:

Violet/Green	Magnetic Pickup, channel 1 (Violet is +, Green is -)
LT Blue/LTGreen	Magnetic Pickup, channel 2 (LT Blue is +, LT Green is -)
Dark Blue	This wire activates the Alternate Timing curve. When 12 volts are applied, the Alternate Timing Curve is activated. When this wire is removed from 12 volts the Alternate Curve is deactivated and timing returns to the Run setting.
Gray	Tach output, 12 volt, 20°- 30°duration. Note: Not compatible with Magneto style Tachometers
Black	Tachometer ground wire

Coil Connector, 4-Pin:

Brown/White	Connects to the negative terminal of Coil 1
Brown/Green	Connects to the negative terminal of Coil 2
Brown/Orange	Connects to the positive terminal of Coil 1
Brown/Orange	Connects to the positive terminal of Coil 2

9-Pin connector	Interface connector (RS232) to a PC or PN 7550 Programmer
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value (as used for the first cylinder). Line up the second pickup (Light Blue and Light Green wires) with the magnet.

Note: When setting the static timing the timing must be set 4° advanced from maximum run timing, this allows the **IgnComp** to automatically function to remove all timing retard caused by pickups, ignition delays and coil rise-time delays.

Setting running ignition timing: Attach the inductive lead from the timing light to the number one ignition wire. Set the desired timing by moving the primary pickup on it's slotted bracket. Now attach the inductive lead to the second cylinder (in the firing order) ignition wire and position the secondary pickup to your desired timing. Both pickups are now phased 180° apart.

Pro-Data+ Programming Instructions

These instructions will walk you through the different programming features of the Midget Ignition using the Pro-Data+ Software. If you need help with the installation of the Midget please refer to the Installation Instruction that came with your unit or you can download a new set from our web site at www.msdisignition.com

INSTALLATION

1. Insert the installation disk into your disk drive.
2. In Windows click "Start" then Select "Run".
3. In the box type "A:\Setup" Press Enter
4. Follow the on screen instructions.
5. At this point you should have two new icons on your desk top.
6. Select the one that says "MSD Graph View"
7. At this point you should see several timing graphs.
8. In the upper left corner of your screen select "File"
9. Scroll down and select "Open"
10. Select the folder that says "6214"
11. Highlight the file that says "6214vxx.IGN" (xx = The latest version #; Example "01")
12. Click Open

At this point you are in the default setting for the Programmable Midget Ignition. When you make a change to this file always select the "Save As" option and rename the new file.

SAVES AND TRANSFERS

Whenever a change is made to a program, it either must be saved to your PC as part of the file you are programming or it must be saved/transferred to the MSD. The software gives you the choice of automatically transferring the change to the MSD or the PC.

Save to MSD: By saving the change right to the MSD, the new change is automatically put into the Controller.

Save to PC: This saves the changes on your PC screen only. The information still must be transferred to the MSD before it becomes active or saved to a file.

You can create numerous files with different options on our PC and download them at the track for testing.

MONITOR

The rpm meter is a graphical interface that allows you to monitor the rpm and retard functions of the Midget Ignition while the engine is running. The dial on the left side will indicate the rpm in real time. The dial on the right side will show the total degrees retard.

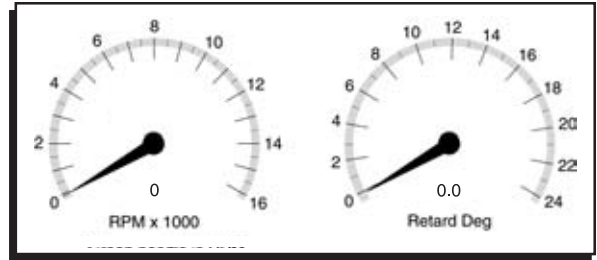


Figure 6 RPM and Retard Monitor.

DEFAULT SETTINGS

The default settings are for a four cylinder engine with a Waste Spark (two spark plugs fire at the same time). This ignition should only be used on 4-cylinder engine with two mag pickup inputs, with two coils.

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

Display	Default	Data Low-High (step by)
RevMax ###00 Rpm	9,500	2,000-15,000 (100)
StartRetard ## Deg	15	0-25 (1)
BattType \$\$\$\$	Lead	Lead, NiCad, NiMH
BattCells ##	6	6-12 (1)
RunMap Rpm ###00	800	800-15,000 (100)
RunMap Deg ##.#	0	0-25.0 (0.1)
AltMap RPM ###00	800	800-15,000 (100)
AltMap Deg ##.#	0	0-25.0 (0.1)
AlertsPerScan #	0	0-1 (1)

REV LIMITER OPTIONS

RevMax – (Default 9,500)

This is the Max Rev Limiter. The options are from 2,000 rpm to 15,000 rpm in 100 rpm increments.

```

RevLim
RevMax
*Rpm          9500
    
```

START RETARD OPTION

Start retard is used to ease the load on the starter and to prevent backfires. This option is in effect from 0 to 800 rpm on start up. If the engine drops below 500 rpm, it will activate again. It is adjustable in 1° increments from 0° - 25°. The default is 15°.

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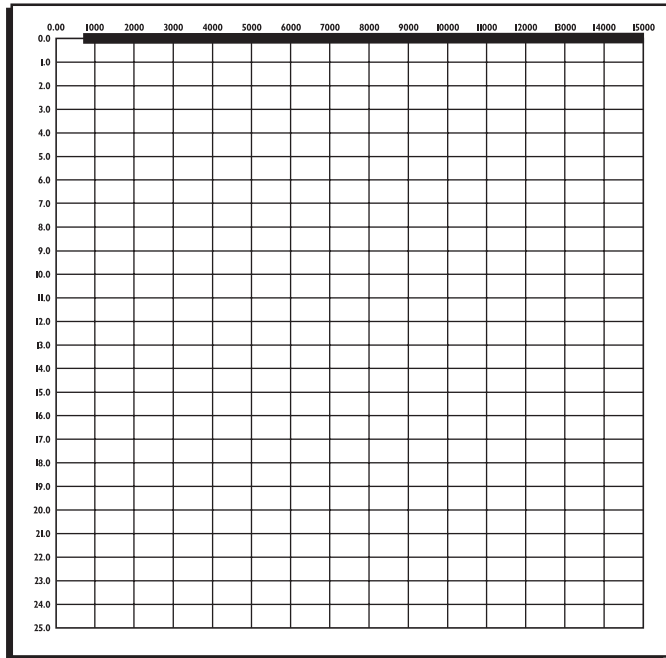
Retards
Starts
StartRetard
*Deg          10
    
```

ALTERNATE TIMING CURVE

AltCurve – (Default - See Graph)

The Midget Ignition allows you to program a timing curve that is only active when the Alt Wire is switched to +12V. When this curve is active the word active appears on the bottom of this graph. This curve is programmable by the graphical map. The easiest way to achieve this is to maximize the box that contains the Alt Curve. In order to move the curve you will need to place your mouse over the portion of the graph that you would like to move. Right click your mouse and select “Add Dot”. This will give you a red dot that you will be able to position anywhere along the curve. Continue to do this until your curve is completely mapped out. After this curve has been edited, save it in the Midget Ignition with a transfer - Plot to MSD or File-Save As to save it in a file on the PC.

^Rpm 800 Alt
Copy RetDeg 0.0

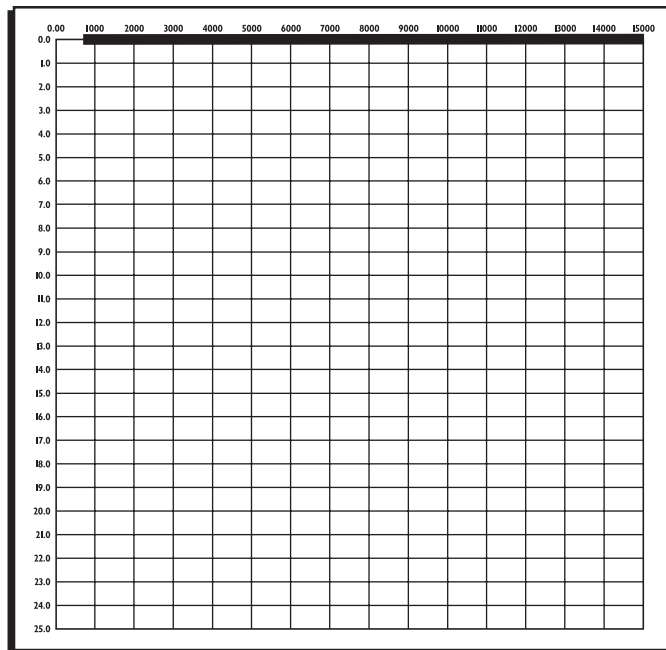


RUN TIMING CURVE

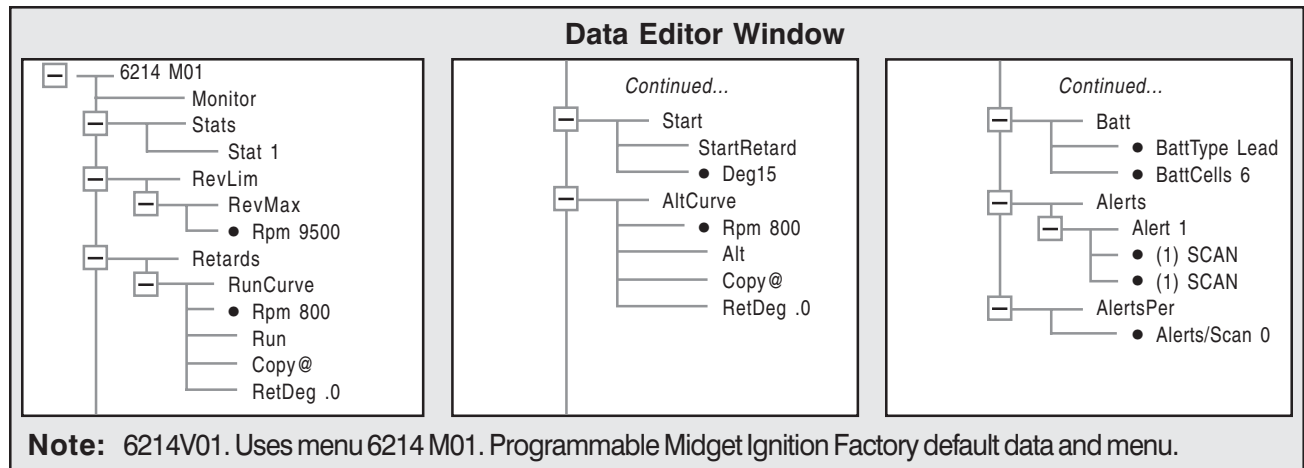
RunCurve – (Default - See Graph)

The Run Curve is active when the Alt Wire is not switched to +12V. The Midget Ignition gives you the ability to map out a complete timing curve from 800 rpm all the way to 15,000 rpm. This timing curve can increase or decrease at any point along the graph. The easiest way to achieve this is to maximize the box that contains the Run Timing Curve. In order to move the curve you will need to place your mouse over the portion of the graph that you would like to move. Right click your mouse and select “Add Dot”. This will give you a red dot that you will be able to position anywhere along the curve. Continue to do this until your curve is completely mapped out. After this curve has been edited, save it in the Midget Ignition with a transfer - Plot to MSD or File-Save As to save it in a file on the PC.

^Rpm 800 Run
Copy RetDeg 0.0



Note: Any graph can be printed by selecting Transfer-Print. Also all other parameters can be printed from the Data Editor-Select-Print.



ALERTS

Alerts – (Default - (1) Scan -

The Alerts will provide a flash code to the LED on the outside of the Ignition.

This indicates a Low Battery situation. This will blink the LED two times.

Alert (1) SCAN
LowSPARK

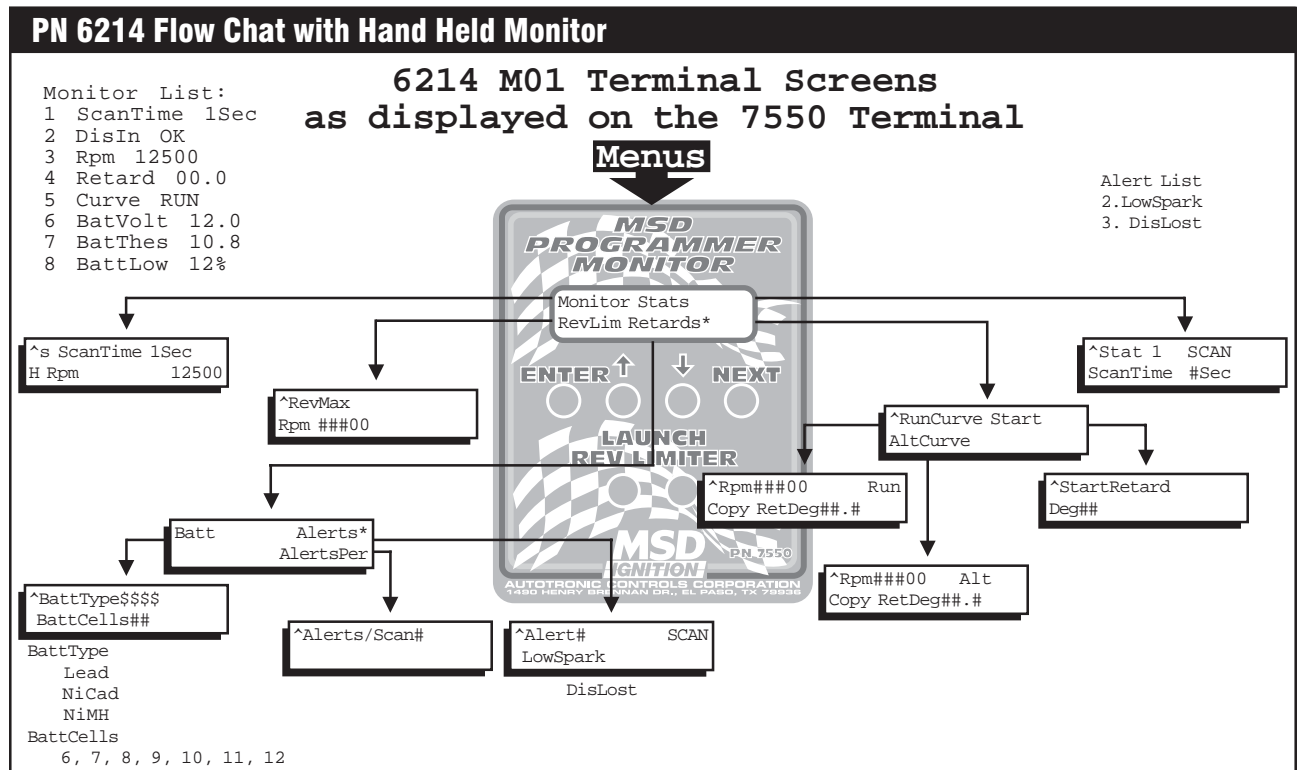
The Options are: **Scan** (to enable)
Skip (to disable)

This indicates that the Ignition is not receiving a trigger signal from one of the pickups. This will blink the LED three times.

Alert (2) SCAN
DisLost

MENU TREE

The following menu tree shows the different screens and programs of the PN 6214 and Monitor.



TROUBLESHOOTING

Every MSD Ignition undergoes numerous quality control checks including a four hour burn-in test. If you experience a problem with your Midget 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 Midget Ignition. If you have any questions concerning your Midget Ignition, call our Customer Support Department at (915) 855-7123, 8 - 5 Mountain Time, or e-mail at: msdtech@msdignition.com.

LED

The LED on the side of the Midget Ignition monitors several operating conditions of the Midget 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 occur if the supply voltage drops below 12 volts, when operating below 1200 rpm.
- A Code 3 (flash-flash-flash) will occur if a trigger signal is lost.
- The LED will flash for every trigger signal from the crank trigger. You can take advantage of this when checking for input trigger signals.

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:

- Ensure that there is a good ground path from the engine and chassis to the negative terminal of the battery.
- 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 Midget 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.

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

If everything checks positive, use the procedure on page 13 to test the ignition for spark.

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 magnetic pickup connectors from the ignition.
4. Turn the ignition to the On position. Do not crank the engine.
5. With a small jumper wire, short the Violet wire to the Green wire (Pickup Channel 1), then pull them apart (Figure 7). This will cause a spark to jump from the plug wires to ground. If spark is present, the ignition is working properly. Do the same test using the Light Blue and Light Green trigger wires (Channel 2). If there is no spark proceed to step 6:
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 Midget Ignition when the ignition switch 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 Midget Ignition is in need of repair. See the Warranty and Service section for information.

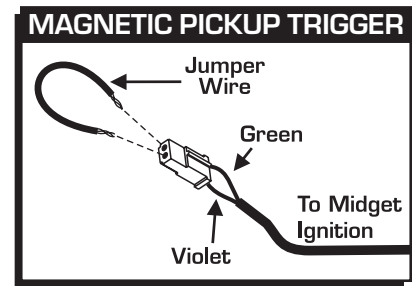


Figure 7 False Triggering Channel 1.

MIDGET IGNITION TESTER, PN 8994

MSD also offers a Multi-Channel Ignition Tester (Fig. 8). This tool allows you to check your complete ignition system while it is on the vehicle as well as the operation of rpm limits.

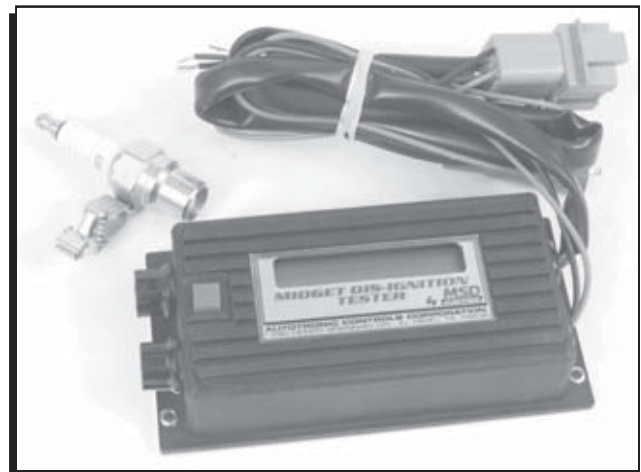


Figure 8 MSD Programmable Midget Ignition Tester.

If you experience difficulties when installing your MSD, contact our Customer Support Department at: (915) 855-7123 (8 - 5 Mountain time) or e-mail us at: msdtech@msdignition.com

