INSTALLATION INSTRUCTIONS

GENERATION 3 IGNITION

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TABLE OF CONTENTS:

PARTS LIST

Generation 3 Ignition**,** G3i interface module kit contains the following items to convert and connect both left and right magnetos to G3i module. The left magneto contact set (points) are used as the trigger signal source. MSD components are sold separately.

(1) G3i installation Manual

(1) G3i Module

(2) RG400 coax cables 6ft length, BNC terminated (Coil Leads, Left & Right)

(3) 18-awg shielded P-Leads 6ft length, BNC terminated (P-Lead input/output, Left & Right, Aux.)

(1) Terminal Strip Hardware

(2) Magneto Modification Coil Terminal Stud Hardware kits

(1) Toggle Switch SPST On/Off & LED

(1) Complete packing list of itemized terminal hardware

Additional components and services available

SECTION 1 INTRODUCTION:

This manual covers the installation of the Generation 3 Ignition system. It also covers the interface modifications of the Slick and Bendix magneto systems. Included is an overview of the concept and design philosophy, installation instructions, testing procedures, troubleshooting guidelines, and the repair and warranty instructions for these systems.
The Generation 3 Ignition system was designed to interface with one or two magnetos on home built experimental aircraft.

1.1 OVERVIEW:

Generation 3 Ignition is the first add-on, interfaced-based electronic ignition control system. The G3i module interfaces with most Slick & Bendix aircraft magnetos. The G3i system provides redundant magneto based ignition as a backup in case of electrical power outages or electronic ignition failure. The G3i module interfaces with the aircraft magnetos and with (MSD) ignition systems. G3i compliments the synchronized firing event in all naturally aspirated and supercharged Lycoming & Continental engines. The MSD amplifier uses multiple sparking technology, which lasts for 20° of crankshaft rotation.

The G3i system operates by switching the magnetos from their typical normal state to the more versatile electronic MSD ignition. When the G3i module is activated, it receives a primary signal from one of the existing magneto contact points or a magnetic crankshaft trigger, depending on the application. The most common setup is the left magneto is the timing signal for both magnetos when the system is active. The signal is picked up by the G3i module and then sent to the MSD 6a ignition. The MSD amplifier receives this information, processes it and sends primary spark energy back through the G3i module to excite the left and right magneto coils in perfect firing synchronization. Consequently the magnetos have all the benefits of an electronically controlled multiple spark discharge system. When the G3i system is turned off or looses its 12-volt power, the G3i module switches automatically to default (no required power) and the magnetos revert back to their normal, original configuration.

1.2 BENEFITS OF THE G3I SYSTEM:

On start up, the G3i module will receive the signal from the retard or normal contact points depending on whether or not there is a impulse coupler retard lag. The G3i module will automatically excite the MSD 6a ignition to serve as a hot multiple spark discharge to BOTH magnetos at 20° of crankshaft rotation while cranking. There is no need for a shower of sparks vibrator or Slick start. There are many start up and retard configurations to choose from. After the start up, there will instantly be a much smoother idle with the system on. Both magnetos will fire together in perfect sync. Fuel consumption will be reduced significantly in most cases 6% to 14%. Starting will be much easier, whether hot or cold, or with fuel fouled plugs. You'll see overall smoother engine operation, faster climb rates, less carbon build up in the cylinders and on the valves, plus better compression percentages. Spark plugs will burn much cleaner and be less susceptible to fouling. Additionally, there will be almost no magneto contact set (points) wear.

The G3i system can be activated by toggle switch. When powered up, the original functions of the aircraft ignition switching, key style or toggles, are not affected. The original switching will still control the left and right magneto operation. The G3i system power toggle can be turned on and off in flight without causing a miss-firing event. With the engine loaded and speeds above 1500 rpm's, switching the G3i system on and off line, it is normal to have a very slight interruption as the system switching occurs.

1.3 OPTIONS:
Generation 3 Ignition systems have the unique ability to be configured with many different MSD ignition-timing components and configurations. Utilizing the stock magneto contact points (most common), or with an optional crankshaft trigger sensor. The G3i system has auxiliary timing inputs for start up and run modes, which can be configured to your requirements.
See drawing configurations (Drawing1 thru Drawing ct.5) Terminal Connections & Application Descriptions

1.4 SPECIFICATIONS:

G3i MODULE:
Any number of cylinders
Drives 1 or 2 magnetos in synchronization
Aircraft ignition switching, LEFT, RIGHT, BOTH
Weight: 27 ounces
Size 6.5”L x 4.0”W x 2.25”H
Operating voltage: 9 –18 VDC, Negative ground
Current requirements: 0.7 AMPS
Recommended operating temperature: -40°f - +175°f.
Signal: Contact set (points), Magnetic Pickup, Crankshaft trigger wheel
Auxiliary timing & starting inputs

MSD AMPLIFIER:
Capacitive discharge, MSD 6 series ignition
Multiple spark duration: 20 degrees of crankshaft rotation
Weight: 44 ounces
Size: 8”L x 3.5”W x 2.25”H
Operating voltage: 9 –18 VDC, Negative ground
Current requirements: Average of 1.0 AMPS/ 1000 RPM
Voltage output: Primary 460 – 480 volts
Recommended operating temperature: -40°f - +185°f

SECTION 2 INSTALLATIONS:

Caution: *Operating the ignition without all connections completed can result in damage to the ignition system, other components and/or cause electrical shock.*

2.1 IGNITION AMPLIFIER:

The ignition amplifier of choice is the MSD 6a. The MSD 6a installation instructions can be used for additional reference with the installation of the G3i system. The G3i module will interface with most all MSD ignition configurations. ***Note:*** *Connecting power directly to the battery or the cold (switched side) of the master solenoid will reduce the chance of instrumentation/radio interference.*

2.2 SPARK PLUGS AND WIRES:

Original aircraft ignition harness and spark plugs can be used with the G3i ignition and MSD 6a. MSD recommends, “not to use solid core spark plug wires” these are of the automotive style “ they have no outer shielding”. The aircraft ignition harness (spark plug wire) is a solid core, and is designed with a high quality outer shielding with very minimal electro magnetic interference (EMI). This will not interfere with the operation of the G3i module or MSD 6a. The magneto ignition harness cap can be modified to accept automotive leads. Which will allow a wide range of spark plug boots and terminal ends and automotive type spark plugs with inserts. It is recommended to follow the spark plug manufacture’s specification for spark plug gaps. The most common total spark plug air gap is increased to .020” to .026” depending on the spark plug type and compression ratio.

2.3 MOUNTING AND LOCATION OF MODULES:

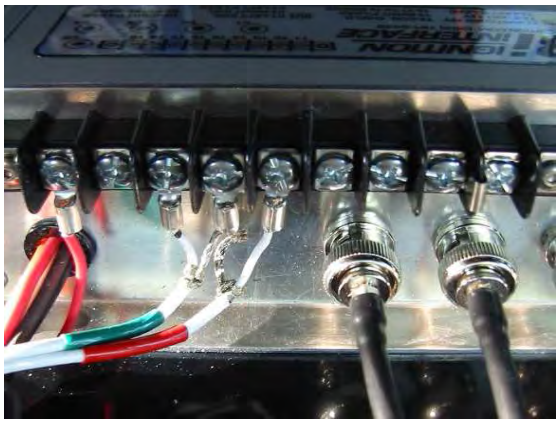
The G3i module and the MSD amplifier can be mounted together on an aluminum plate in a clean dry place away from engine heat. Preferably located on the backside of the engine firewall. For engine compartment mounting, connections of the G3i module should be orientated to the side or facing down. Depending on location in the engine compartment, a cover should be fabricated to protect the G3i module and MSD amplifier from water and solvents. Blast tubes can be added and routed for cooling concerns if necessary. The color-coded leads that come out of the G3i module connect as depicted in the drawing, to the same color and gage on the MSD 6a amplifier.

RV-6

SA750 with Timing Control

2.4 PRIMARY WIRING:

The primary wires supplied with the G3i module are of a high quality aircraft shielded wire. The P-Leads are shielded 18-gage and the primary ignition coil leads are RG400 coax. All leads are 6ft in length and are supplied with a BNC connection at one end. You will cut these to your specific lengths to route to the proper location on the magnetos. Then strip the center conductor for the ring terminal and fold back the braided shield to provide as a ground. ***Note:*** *If there is a need to extend the shield ground, slide on the solder heat shrink over the braided shield and install an extended ground wire pigtail.* Crimp the proper size ring end terminals to the center conductor and shield ground on the lead.



P-leads connected to G3i module.

Magneto ring terminal connections soldered-heat-shrink with the shielded ground pigtail.

WARNING

DISCONNECT BATTERY DURING INSTALLATION TO AVOID ANY POSSIBILITY OF AN ELECTRICAL SHORT OR SHOCK.

2.5 ELECTRICAL CONNECTIONS:

The G3i module and the MSD amplifier will pull an average of 3 to 6amps together. The G3i module draws .7amps, and the MSD will draw an average of 1.0amps per 1000 rpm. When connecting the power supply, use a 7.5A re-settable type circuit breaker to the battery positive side or to the cold (switched side) of the master solenoid. Connecting the power close to the battery will reduce the chance of instrumentation/radio interference.

Note: *Powering the complete system (all modules) through the avionics bus will possibly create radio and/or instrument interference.*

This is continued across the breaker for power up of the MSD amplifier heavy battery inputs (and toggle switch) connections. The toggle switch can also be wire independently with the use of 18-awg wire. Locate the supplied LED/lamp next to the G3i module power toggle or the instrument panel for displaying the G3i system on. See input wiring diagrams for your specific application. Over voltage protection must be used on any electrical system.

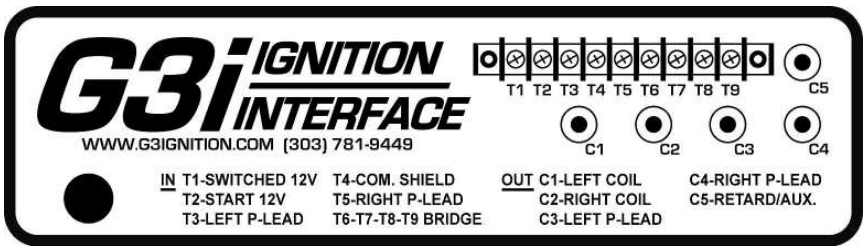
2.6 G3i MODULE TERMINAL BLOCK and WIRE LEAD DESCRIPTIONS:

Terminal block (T1 thru T9):

(T1) Switched 12-volt power in. Turn on/off G3i system (18-awg)

(T2) 12-volt switched power in from starter switch or starter solenoid. Only hot when starter switch is engaged. This will activate G3i system if main G3i toggle is off during starting only (18-awg).

(T3) Left in-put p-lead from original left p-lead ignition switch terminal or left ignition toggle terminal.
(T4) Common shield ground for left and right p-leads from ignition switch terminal or Left/Right ignition toggle terminals.
(T5) Right in-put p-lead from original right p-lead ignition switch terminal or right ignition toggle terminal.
(T6), (T7), (T8), (T9) Bridge terminals for configuring G3i module timing in-puts locations for different applications.



Module decal legend G3i

BNC Connections (C1 thru C5):
(C1) Left coil out-put BNC to left magneto coil stud terminal.
(C2) Right coil out-put BNC to right magneto coil stud terminal.
(C3) Left p-lead out-put BNC to left magneto capacitor terminal.
(C4) Right p-lead out-put BNC to right magneto capacitor terminal.
(C5) Auxiliary BNC for timing in-put. Starting retard contacts or advance contacts signal.

Wire Leads:
Orange lead: Coil in-put lead from MSD amplifier (18-awg).
White lead: Timing signal lead out to MSD amplifier (18-awg). (Contact set / points signal)
Red lead: Switched 12-volt power out to MSD amplifier (18-awg).
Black lead: Ground lead to small Black MSD amplifier (18-awg).
Brown lead: Negative lead for crankshaft trigger signal (18-awg).
Black heavy lead: Main G3i module ground in-put lead (16-awg).

2.7 MSD 6 SERIES IGNTION AMPLIFIER WIRE LEAD DESCRIPTIONS:

Refer to the MSD 6 Series Installation Instructions:
Heavy Red: In-put power to MSD, connects to CB or directly to switch side of master solenoid.
Note: *The MSD has an internal fuse (16-awg).*
Heavy Black: Connect to a good ground (-), or battery terminal (16-awg).
Red: To G3i Module Red.
Orange: To G3i Module Orange.
Black: To G3i Module Black (18-awg).
White: To G3i Module White.
Violet and Green: Magnetic pickup connector. Violet wire is positive (+); Green is ground (-).

2.8 G3i MODULE TERMINAL CONFIGURATION DESCRIPTIONS/ APPLICATIONS/ DRAWINGS:

Note: *All configurations will provide a signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up. There is no need for Slick Start or Shower of Sparks. The G3i module and MSD amplifier will provide Multiple Discharge Spark when starting.*

2.8.1 LEFT MAGNETO CONTACTS SET (POINTS) TRIGGER SIGNAL SOURCE:

Listed below are the different configurations using the Left Magneto as the trigger signal source to excite both magnetos. See drawings Section 8 (1 thru ct.5) for further explanation and detailed terminal connections.

Drawing 1: Left Magneto Normal Contacts are Trigger Source
Left Magneto Lag – Retard Impulse Coupler

Drawing 2: Left Magneto Normal Contacts are Trigger Source
Left Magneto Retard Contacts / Active in Start

Drawing 3: Left Magneto Normal Contacts are Trigger Source
Left Magneto Lag – Retard Impulse Coupler
MSD 8680 Adjustable Timing Control

Drawing 3a: Left Magneto Normal Contacts are Trigger Source
Left Magneto Retard Contacts / Active in Start
MSD 8680 Adjustable Timing Control

Drawing 4: Left Magneto Auxiliary Contacts are Trigger Source
Left Magneto Lag – Retard Impulse Coupler
Starting on Normal Contacts

Drawing 4a: Left Magneto Auxiliary Contacts are Trigger Source
Left Magneto Lag – Retard Impulse Coupler
Starting on Normal Contacts
MSD 8680 Adjustable Timing Control

Drawing 5: Left Magneto Normal Contacts are Start and Run Trigger Source
With or Without Left Magneto Lag – Retard Impulse Coupler
MSD 8982 Start/Retard Control Module

2.8.2 MAGNETIC CRANKSHAFT TRIGGER SENSOR SOURCE:

Note: *All configurations will provide a signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up. There is no for need Slick Start or Shower of Sparks. The G3i module and MSD amplifier will provide the Multiple Discharge Spark when starting.*

Listed below are the different configurations using a Crankshaft Trigger Sensor as the signal source to excite both magnetos. See drawings Section 8 (ct.1 thru ct.5) for further explanation and detailed terminal connections.

The Crankshaft Pickup Sensors used are the Magnetic type that requires ferrous studs mounted in the flywheel for the trigger signal. Most flywheels have machined holes every 30° that can be used for proper timing stud locations. The 4-cylinder engine requires 2 timing studs opposed at 180° from each another and the 6-cylinder requires 3 timing studs at 120° from each another.
Generation 3 Ignition does provide Magnetic Pickup Sensors in different sizes. Generation 3 Ignition does NOT provide a Magnetic Crankshaft Trigger Sensor mounting installation hardware kit. Due to the many different mounting locations and hardware configurations, only consulting and fabrication is available at this time.

Drawing ct.1: Crankshaft Trigger Signal
Left Magneto Lag – Retard Impulse Coupler
Left Magneto Normal Contacts are Trigger Source on Starting

Drawing ct.2: Crankshaft Trigger Signal
Left Magneto Retard Contacts are Trigger Source on Starting

Drawing ct.3: Crankshaft Trigger Signal
Left Magneto Lag – Retard Impulse Coupler
Left Magneto Normal Contacts are Trigger Source on Starting
MSD 8680 Adjustable Timing Control

Drawing ct.4: Crankshaft Trigger Signal
Left Magneto Retard Contacts are Trigger Source on Starting
MSD 8680 Adjustable Timing Control

Drawing ct.5: Crankshaft Trigger Signal
Crankshaft Trigger Signal on Start Up ands Run

2.9 MAGNETO MODIFICATIONS:

These following modifications must be done with good useable working magnetos. If the magnetos are in need of a rebuild or need disassembly inspection repair, then this must be done first before installing with the Generation 3 Ignition system. Magneto modifications, ignition parts and service are all available though Generation 3 Ignition if needed.

Before any work is done on the magnetos, determine the exact timing of BOTH mag's and make a note of it. Depending on the type of magnetos you have and obstructions to work around, this may require the removal of the magnetos to do the modification properly. Before the magnetos are removed, take a good look at the amount of space around the magnetos. Plan the location of the ignition coil drive stud before installing it to prevent interference with any existing engine accessories.

A qualified technician familiar with aircraft ignition systems should /can be consulted to do this modification. Follow the modification procedures for your specific magneto application. See illustrations (Section 3).

2.10 CONNECTING TO MAGNETOS:

The left and right ignition P-leads are removed from the original magneto connection and now routed to their perspective location on the G3i module terminal strip connection. The new BNC white shielded P-leads supplied with the BNC connectors are now routed back to the left and right magneto P-lead connections along with the RG400 coax cable to the coil driver stud on the

magneto. For the non-impulse coupling magneto with retard contacts, the retard terminal on the magneto will be the third BNC white P-lead will be routed to the AUX BNC (C5) connection on the G3i module. This is the retard signal for starting. AUX. BNC (C5) also can serve as an alternate timing input. There is no need for the Slick start or Bendix shower of sparks. The G3i system will excite both magnetos when in starting mode. The primary ignition wires/coax can be routed together. These are not affected by other engine wiring. See Section 8 (Drawing 1 thru Drawing ct.5) for specific applications.

2.11 MAGNETO TIMING:

After the magnetos have been re-installed, and with the spark plugs removed, switch the G3i system to OFF and the magnetos switched to hot. The magnetos can be re-timed as in a normal configuration with a dual magneto synchronizer timing light tweeter. Follow your engine manufacturer's timing specifications. BOTH magnetos MUST be in synchronization.

SECTION 3 MAGNETO MODIFICATIONS:

This section covers the most common modifications for Bendix and Slick magnetos. The main factor to keep in mind is the location of the coil terminal stud. Prevent any chance of the terminal grounding out on/in the magneto housing and/or other magneto components. Keep all wires clear of any rotating parts and where there is any chance of wire chafing. The following modification examples are performed off the aircraft. A qualified technician familiar with aircraft ignition systems should do this modification. Follow the modification procedures for your specific magneto application.

3.1 BENDIX S-20, S-200 SERIES MODIFICATION:

This section covers the most common modification examples for the installation of the ignition coil driver stud into the magneto contact points cover. These will usually not require coil lead wire to be lengthened or modified. **Example 1**: Top cover side modification. **Example 2:** Top cover retard cavity location. The main factor to keep in mind is to locate the coil terminal stud and connections away from any chance of grounding out on/in the magneto housing and/or other magneto components. Keep all wires clear of any rotating parts and where there is a chance of wire chafing. This is the most typical Bendix S-20, S-200 series modifications performed off the aircraft. A qualified technician familiar with aircraft ignition systems should do this modification. Follow the modification procedures for your specific magneto application

EXAMPLE 1: Cover Side location

1. Remove the contact cover to gain access to the coil lead that is connected to the contact points. Remove both leads from the contacts. (Image 1a, 2a)

Image 1a

Image 2a

2. The coil lead is long enough to re-locate to the specified terminal location on the cover without any splicing. ***Note:*** *If the coil lead pigtail is to short to reach the new coil terminal stud location. Splice the coil lead with 18 awg tefzel or similar wire.* Crimp/solder and insulate with heat-shrink. (Image 3a)

Image 3a

3. The gray area shown is the boundaries and is offset to the left for drilling the terminal hole to avoid spade terminal interference inside the cover. The coil terminal stud location is measured from the base of the cover. This distance is .375" to .875". From left screw casting edge measures .250: to .375". ***Note:*** *This is offset to the left. NOT centered between screw casting edges. This is a must for internal spade terminal clearance*. Drill a hole sized to .250" to accept the step washers and hardware. (Image 4a, 5a)

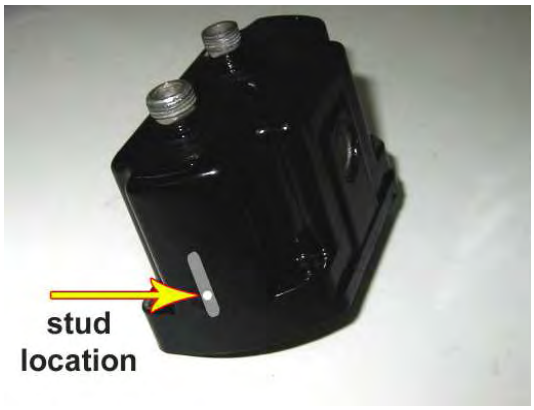


Image 4a

Image 5a

4. The hardware is layout in order for the ignition coil terminal stud into the contact covers side. The male spade stud terminal will need to be bent to a 90°angle. (Image 6a, 7a)

Image 6a

Image 7a

5. Coil terminal stud installed with male flag terminal. ***Note****: Between the two insulating shoulder washers at the housing place a small amount of two-part epoxy for extra rotation resistance on the coil terminal stud.* Tighten to 20 – 25 in.-lbs. (Image 8a, 9a)

Image 8a

Image 9a

6. Connect the coil lead to the new installed spade terminal and capacitor to the contact set. Route the coil lead away from the point's cam and any moving parts to prevent interference chafing. ***Note:*** *Sometimes a small wire anchor can be used in a spare tapped hole to help retain and route the coil wire if there is concern.* ***Note:*** *Clean magneto housing of all drill chips and any type of contamination with compressed air before reassembly.* Double check and close up, torque contact breaker cover screws 20 – 25 in.-lbs, ready to install. (Image 9a, 10a, 11a)

Image 10a

Image 11a

EXAMPLE 2: Cover Retard Cavity location

1. This hardware is laid out in order to use the existing retard cavity in the in the points breaker cover for the coil access. The male spade stud terminal will need to be bent to a 90° angle. (Image 1b)

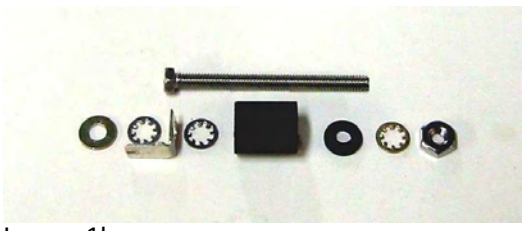


Image 1b

2. Prior to installing the hardware through the retard cavity, place a small amount of non-conductive two-part epoxy (JB weld or similar) can be placed in the cavity where the bushing top edge/side is slid into the cover to prevent rotation. On the top of the cover install the step washer, internal star washer, and nut. Tighten to 20 – 25 in.-lbs. (Image 2b, 3b)

Image 2b

Image 3b

3. Connect the coil lead to the new installed spade terminal and capacitor to the contact set. Route the coil lead behind the capacitor lead and away from the points cam and any moving parts to prevent interference chafing. ***Note:*** *Sometimes a small wire anchor can be used in a spare tapped hole to help retain and route the coil wire if there is concern.* ***Note:*** *Clean magneto housing of all drill chips and any type of contamination with compressed air before reassembly.* Double check and close up, torque contact breaker cover screws 20 – 25 in.-lbs, ready to install. (Image 4b, 5b)

Image 4b

Image 5b

3.2 BENDIX S-1200 SERIES MODIFICATION:

This section covers the most common modification examples on the installation of the ignition coil terminal stud into the magneto contact points cover. These will usually not require coil lead wire to be lengthened or modified. **Example 1:** The top cover retard stud location. **Example 2:** Top cover side stud location. The main factor to keep in mind is to locate the coil terminal stud away from any chance of grounding out on/in the magneto housing and/or other magneto components. All wires

keep clear of any rotating parts and where there is a chance of wire chafing. This is the most typical Bendix S-1200 series modifications performed off the aircraft. A qualified technician familiar with aircraft ignition systems should do this modification. Follow the modification procedures for your specific magneto application.

EXAMPLE 1: Top cover retard stud location

1. This is the location of the original retard stud terminal. If not already in use, this is a good place for access. Remove the top cover to gain access to the coil lead that is connected to the contact points. Remove both leads from the contacts. (Image 1c, 2c)

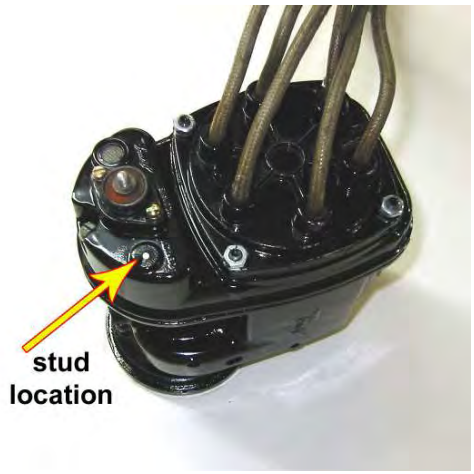


Image 1c

Image 2c

2. The coil lead is long enough to relocate to the specified terminal location on the cover without any splicing. ***Note:*** *If the coil lead pigtail is too short to reach the new coil terminal stud location. Splice the coil lead with 18 awg tefzel or similar wire. Crimp/solder and insulate with heat-shrink.*

3. Drill a hole sized to .250” in this location to accept the step washers and coil terminal stud hardware. (Image 3c, 4c)

Image 3c

Image 4c

4. The hardware is shown in lay out order for the ignition coil terminal stud into the magneto top cover. The male spade terminal will need to be bent to a 90° angle. Install the Coil stud terminal with male flag terminal. ***Note:*** *Between the two insulating shoulder washers at the cover housing place a small amount of two-part epoxy for extra rotation resistance on coil terminal stud.* Tighten to 20 – 25 in.-lbs. (Image 5c, 6c)

Image 5c

Image 6c

5. Coil stud terminal installed with male flag terminal. (Image 7c, 8c)

Image 7c

Image 8c

6. Connect the coil lead to the new installed spade terminal and capacitor to the contact set. Route the coil lead away from the point's cam and any moving parts to prevent interference chaffing. ***Note:*** *Sometimes a small wire anchor can be used in a spare tapped hole to help retain and route the coil wire if there is concern.* ***Note:*** *Clean magneto housing of all drill chips and any type of contamination with compressed air before reassembly.* Double check and close up, Install top cover housing screws and nuts, torque to 25-35 in.-lbs, ready to install. (Image 9c, 10c)

Image 9c

Image 10c

EXAMPLE 2: Top cover side stud location

1. Here is a good alternate coil stud terminal location on the side of the top cover. The gray area shown the boundary in this location. Install coil terminal stud hardware and bend male spade terminal as necessary for clearance. Follow the same assembly procedures as above. ***Note:*** *The main factor to keep in mind is to locate the coil stud and terminal away from any to grounding out on/in the magneto housing and/or other magneto components.* ***Note:*** *Clean magneto housing of all drill chips and any type of contamination with compressed air before reassembly.* (Image 11c)

Image 11c

3.3 SLICK 4000 & 6000 SERIES MODIFICATION:

This section covers two of the most common modification examples on the installation of the ignition coil terminal stud into the magneto top contact points cover and/or the magneto main housing side. Both are excellent locations. **Example 1:** The main housing side modification will not require coil lead wire to be lengthened or modified. **Example 2:** The top cover retard stud location will require the coil lead to be lengthened and a new female terminal installed. The main factor to keep in mind is to locate the coil terminal stud and terminals away from any chance of grounding out on/in the magneto housing and/or other magneto components. Keep all wires keep clear of any rotating parts and where there is a chance of wire chafing. These are the most typical Slick series modifications performed off the aircraft. A qualified technician familiar with aircraft ignition systems should do this modification. Follow the modification procedures for your specific magneto application.

EXAMPLE 1: Main Housing Side location

1. Remove the top cover to gain access to the coil lead that is connected to the contact points. Remove both the capacitor and coil leads from the contacts. (Image 1d, 2d, 3d, 4d)

Image 1d

Image 2d

Image 3d

Image 4d

2. It will be necessary to remove the distributor cap/rotor assembly. (Image 5d)

Image 5d

3. For reference and showing the general area of the lower part of the main magneto housing. This is the area where the ignition coil terminal stud will be located. The depth to the casting shelf measurement is 1.00”. The distance from the casting step to the center of the distributor cap screw hole is also 1.00”. (Image 6d, 7d)

Image 6d

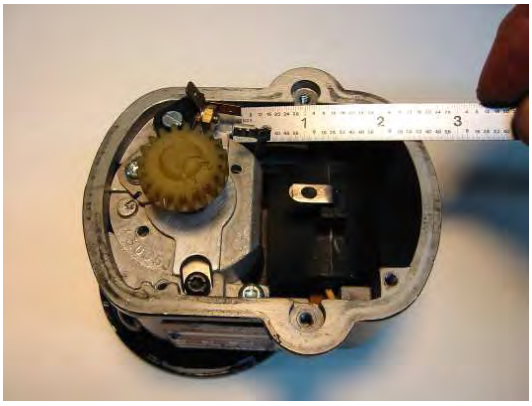


Image 7

4. The preferred location of the new coil terminal stud will be here. ***Note:*** *The indexed center punch mark for drilling.* The distance shown from the center of the distributor cap screw hole is .625”. Also the distance from the top face is .625” Center punch and drill a hole sized to .250” (Image 8d, 9d)

Image 8d

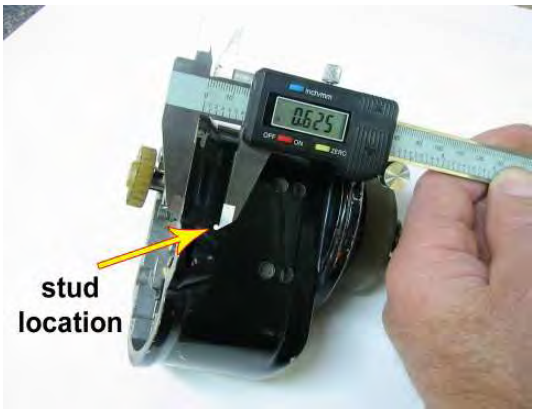


Image 9d

5. An outside/inside view of terminal location. (Image 10d, 11d)

Image 10d

Image 11d

6. The hardware is layout in order for the ignition coil terminal stud into the lower part of the main magneto housing. The male spade stud terminal will need to be modified. The male spade will need to be trimmed to a width of .187" to accept the original coil female terminal. Then bend the male spade to a 20°to 30 ° angle as shown. (Image 12d)

Image 12d

7. Coil terminal stud installed with male flag terminal. ***Note:*** *Between the two insulating shoulder washers at the magneto housing place a small amount of two-part epoxy for extra rotation resistance on stud.* Just snug, do not final tighten. (Image 13d)

8. Install the coil female terminal to the male spade terminal. (Image 14d)

Image 13d

Image 14d

9. Rotate the connected coil terminals to the 3 o'clock position, gently routing the coil wire into a small loop. (Image 15d)

10. Now finish tightening the coil terminal stud assembly. Tighten to 20 - 25 in.-lbs. (Image 16d)


Image 15d


Image 16

11. Re-install the index distributor cap/rotor assembly to the shaft gear. ***Note:*** *If a Slick timing pin is not available, a #42 or .093" drill bit will do.* Torque distributor cap screws to 18-28 in.-lbs. (Image 17d)

12. Re-connect the capacitor lead to the contact set. This will be the only connection to the contact set. ***Note:*** *Clean magneto housing of all drill chips and any type of contamination with compressed air before reassembly.* Install top cover housing screws, torque to 18-28 in.-lbs ready to install. (Image 18d)


Image 17d


Image 18d

EXAMPLE 2: Retard Stud location

1. This is the location of the original retard stud terminal. If not already in use, this is a good place for access. Remove the top cover to gain access to the coil lead that is connected to the contact points. Remove both leads from the contacts. (Image 1e)

2. Drill a hole sized to .250" in this location to accept the step washers and coil stud hardware. (Image 2e)

Image 1e

Image 2e

3. The hardware is layout in order for the ignition coil drive stud into the magneto top cover. The male spade stud terminal will need to be bent to a 70° angle. Install the Coil stud terminal with male flag terminal. ***Note:*** *Between the two insulating shoulder washers at the housing cover place a small amount of two-part epoxy for extra rotation resistance on stud*. Tighten to 20 – 25 in.-lbs. (Image 3e, 4e, 5e)

Image 3e

Image 4e

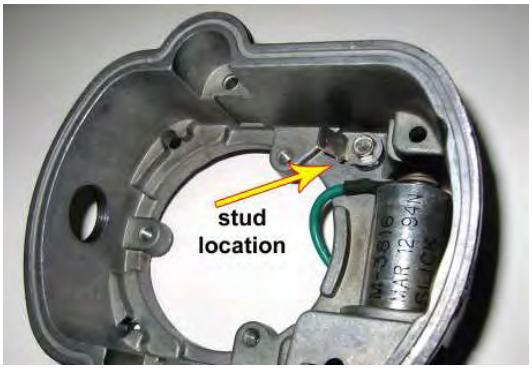


Image 5e

4. The coil lead is not long enough to reach to the new specified coil terminal stud location on the cover without splicing. Cut the original terminal flag off. Splice the coil lead with 18-awg tefzel or similar wire. The added splice with female terminal will add a total of 1.750” to 2.00” to primary coil lead. Install female spade terminal on coil lead end for spade connection. Crimp/solder and insulate with heat-shrink. (Image 6e, 7e, 8e, 9e)

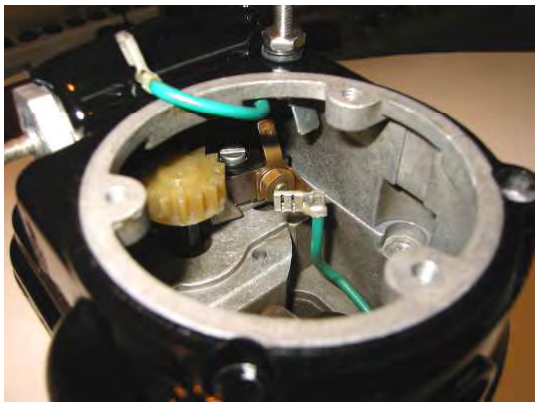


Image 6e


Image 7e


Image 8e


Image 9e

5. Connect the new coil lead to the new installed spade terminal and capacitor to the contact set. Route the coil lead away from the point's cam and any moving parts to prevent interference chafing. ***Note:*** *Clean magneto housing of all drill chips and any type of contamination with compressed air before reassembly.* Double check and close up, Install top cover housing screws, torque to 18-28 in.-lbs, ready to install. (Image 10e, 11e)


Image 10e


Image 11e

SECTION 4 OPERATIONAL TESTING:

Before starting, insure the wiring is securely fastened, and the modules are mounted securely and are in an area free of transmitted engine vibration. Check all routing and make sure leads are away from any chafing and exhaust heat. With the system connected and master switch on, G3i system toggle switched on, the green LED/lamp will illuminate. With the G3i toggle in the off position, the LED/lamp will illuminate when in crank/start mode if wired (terminal T2). This will show that the system is active when in start mode powering up both of the magnetos with the G3i system. This will provide both magnetos in proper retard time with a multiple discharge spark on each compression stroke at startup. The G3i system toggle can be on or off when starting. If the G3i toggle is off while starting, the ignition system will automatically revert back to the normal magneto mode once the starter switch is released. The engine will continue to run. At this time you can switch the G3i system on.

4.1 RUN-UP TESTING:

After the start up, there will instantly be a much smoother idle with the system on. Both magnetos are firing together in perfect synchronization. With the G3i system on during run up, go to the suggested specific rpm for setting the mixture and continue with the normal ignition cycling from both, left, right, checking for rpm drop. If the fuel mixture is near optimum, there will be much less rpm drop and the exhaust note will not sound as lazy. Next switch the G3i system off and repeat the ignition cycle, both, left, right, in normal magneto mode. Remember this is the back up mode.

4.2 IN-FLIGHT TESTING:

The G3i system can be turned on and off, and cycled left and right in flight. Turning off the system will verify that the magnetos are still functioning in their normal back up mode. When the G3i system is coming back on line it is normal to have a very slight rpm interruption as the system is powered up in the higher rpm range. Lean as normal as suggested by your engine manufacture settings. Verify that all cylinder head temperatures are within normal operating limits.

SECTION 5 HAND STARTING:

WARNING:

Do not attempt to hand prop start your engine. Do this only if you are completely trained and competent with hand prop starting procedures. The following is not a complete thorough guide or recommendation on how to safely hand prop start your engine.

Hand starting is to be used if your battery is low and you're not able to crank the engine. By using proper safe hand starting procedures, you can still use the benefits of the G3i's accurate multiple spark discharge on each compression stroke, as long as there are 8 volts available. If the voltage is too low and there is a retard lag impulse-coupling magneto, hand prop starting can be performed in a safe normal manner with the G3i system off.

WARNING:

Never turn the engine backwards with the magnetos and the G3i system hot!
The G3i system will see the pulse signal from the magneto trigger points and fire both magnetos resulting in a backfire and causing severe injury!

WARNING:

Initial spark can occur when the G3i system is turned ON and powers up the MSD Amplifier. This can result in a backfire and the of severe injury. Always remain clear of the propeller when turning on the G3i system.

WARNING:

Always turn on the G3i system FIRST, then both Magneto switches to on.
An initial spark can occur when the G3i system is turned ON and powers up the MSD Amplifier. Resulting in a backfire and possibility of severe injury. Always remain clear of the propeller when turning on the G3i system.

Follow all hand starting safety procedures when hand starting. Leave the magneto switches OFF and G3i system OFF until when ready to pull through the compression stoke to start. Always remain clear of the propeller when turning on the G3i system. Otherwise all switches remain off until ready. The G3i system will take the lag retard signal of the impulse magneto to provide an accurate retarded spark to both magnetos.

5.1 NON-STARTER EQUIPPED AIRCRAFT APPLICATION:

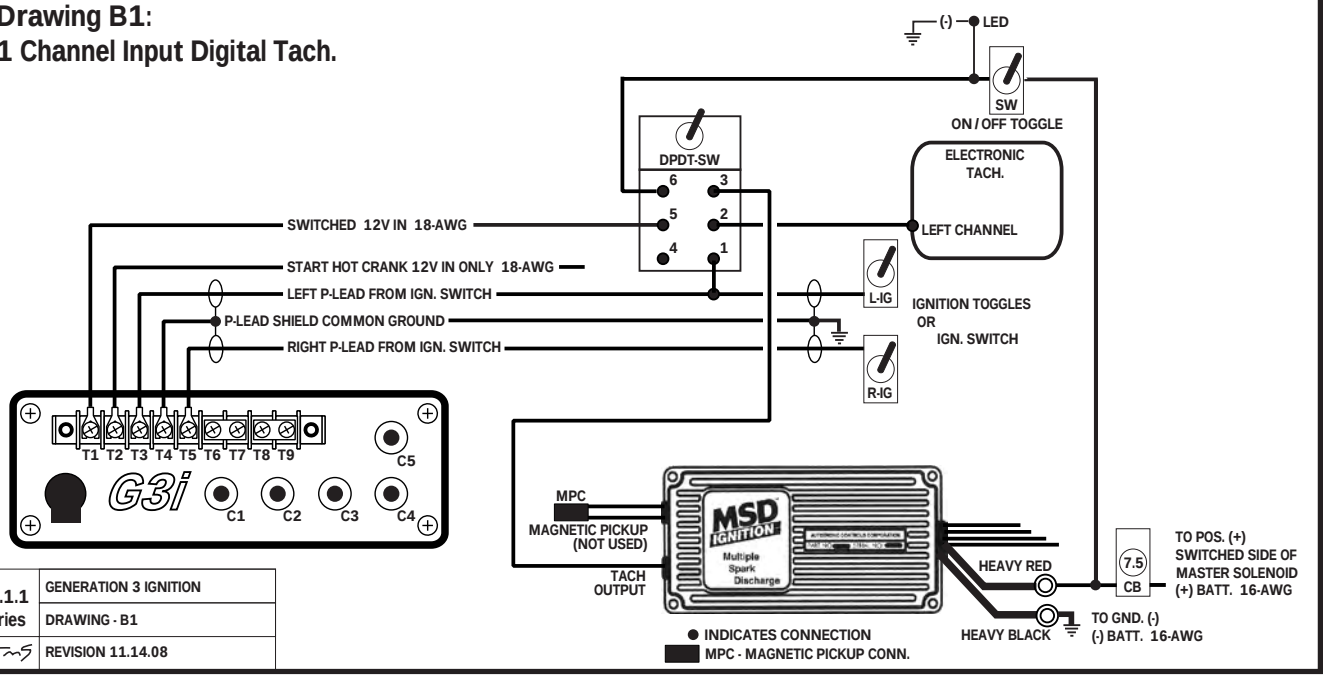
A. An impulse coupler magneto must be the trigger source. (Drawing 1)
Follow the same precautions and safety procedures as stated above when hand starting.

B. If there is no impulse coupler, and the trigger magneto has a retard set of contacts, the retard contacts can provide the retard signal while hand starting. A separate or a dual on-off-on SPDT toggle switch to activate the G3i module in start mode (terminal T2) can be installed. This will provide the 12 volts while starting. (Drawing 2: Supplement HS-1).
Note: *The system will remain in Start Retard mode until starting toggle is switched to OFF.*
Note: *Before initial starting in this mode, remove all spark plugs and verify that #1 compression stroke is retarded when being pulled through its compression stroke*. Either by a magneto timing light (G3i system off, retard trigger connected to timing light tweeter) or grounding #1 spark plug to see the initial spark at the spark plug (G3i system on and with retard toggle switch on). Then verify this with the timing marks on the flywheel.

SECTION 6 TACHOMETERS:

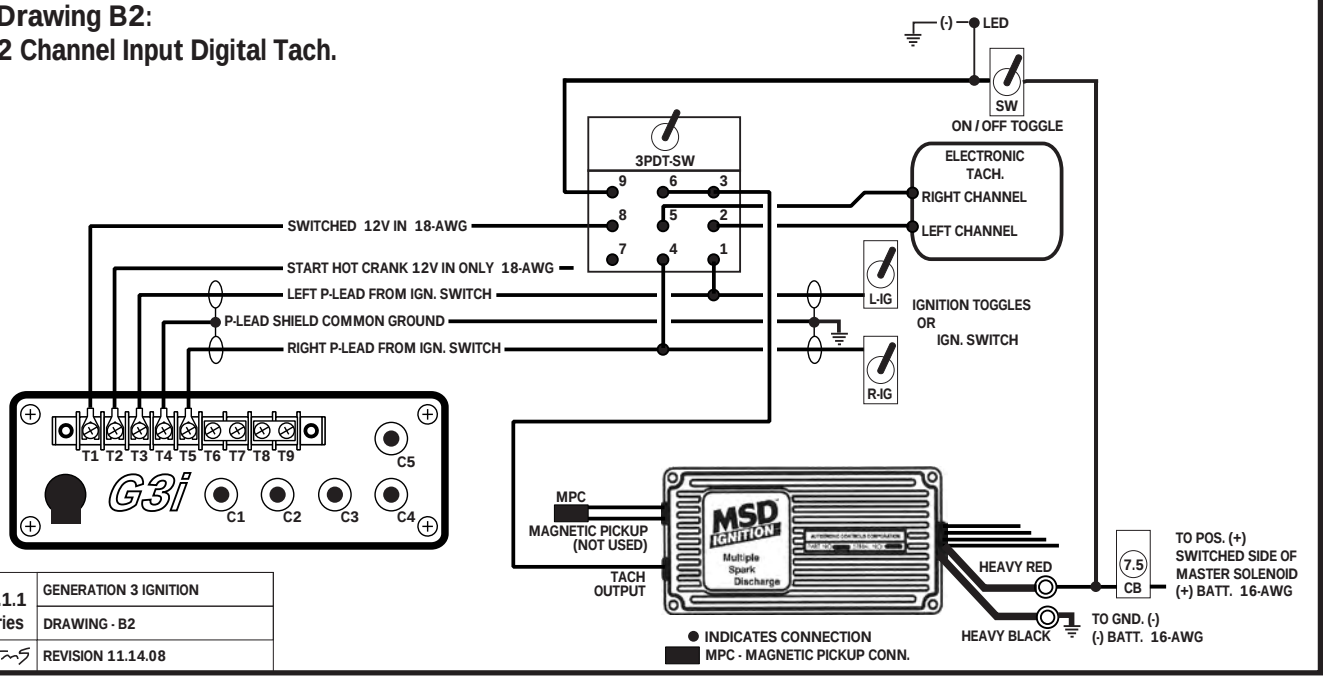
Tachometer signal supplied from the MSD 6a amplifier is a clean 12-volt, square wave signal with a 20% duty cycle. This reference signal is produced with every firing event. After completing the installation of the G3i system, when turned on the digital tachometer reading will usually display twice the engine rpm. Most late model engine instrumentation with digital tachometers are set up for magnetos and read every other firing event. This usually can be reprogrammed to accept this reference signal to get the correct rpm reading for the G3i system. Refer to your install manual or contact your specific engine-monitoring manufacturer for reprogramming procedures. See drawings B1 & B2 for additional wiring schematics on connecting 1 and 2 channel digital tachometers. DPDT-SW and 3PDT-SW power toggle switches are available through Generation 3 Ignition. We can only provide limited tachometer troubleshooting and/or customer support on this topic.

Drawing B1:
1 Channel Input Digital Tach.



1a.1.1 series	GENERATION 3 IGNITION
	DRAWING - B1
JMS	REVISION 11.14.08

Drawing B2:
2 Channel Input Digital Tach.



1a.1.1 series	GENERATION 3 IGNITION
	DRAWING - B2
JMS	REVISION 11.14.08

SECTION 7 TROUBLESHOOTING:

All Generation 3 Ignition systems and components undergo a series of functional tests prior to delivery. The G3i modules are dyno tested from 1 to 3600 crankshaft rpm with magnetos and a MSD 6a amplifier in all modes to ensure proper operation. If you have any question concerning your G3i ignition system, contact our tech support via email mail@g3ignition.com or at 303-781-9449, Monday thru Friday 7am - 3pm Mountain Time.

The most common installation failures are the incorrect connection of the BNC C-terminals on the G3i module and the signal P-leads and/or ignition coil treminal leads. Double check the wiring diagram and insure proper connection locations.

7.1 P-LEADS TO MAGNETO:

All P-lead and ignition coil terminal leads can be checked with the use of an ohmmeter when disconnected at both ends. The BNC center conductor will show no conductivity to the outer shield. Also on the center conductor of each lead from one to the other will have very little to no resistance.

P-lead center conductor from the magnetos will have continuity to ground when the points are closed and no continuity when the points are open..

7.2 IGNITION COIL LEADS TO MAGNETO:

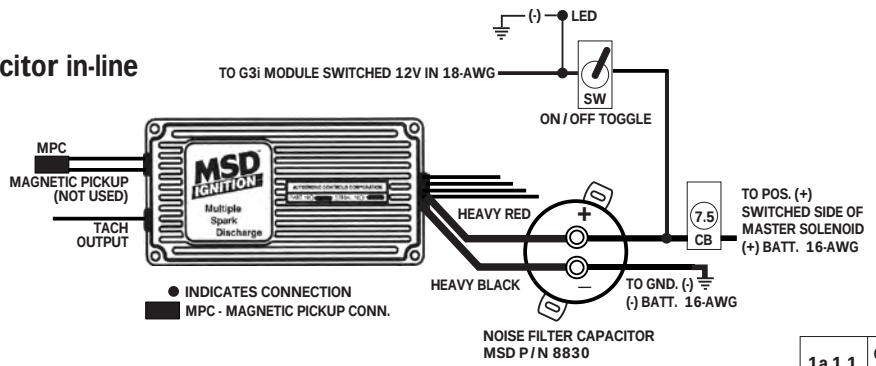
Ignition coil lead center conductor from the magnetos will have .4 to 1.0 ohm continuity (this will vary on type of magneto) to ground at all times through the coil primary windings when connected to the magneto. If this shows open, first check the ignition coil lead for open. If the lead checks out ok, then test at the coil terminal stud to ground to see if the open is there. Then there is an open between the coil terminal stud and primary lead to the coil inside the magneto.

Verify ignition coil lead grounded at all times. Check lead first for continuity to the shield. This will be open. Next check coil stud terminal to ground, if grounded, there is improper stud installation.

7.3 RADIO NOISE:

If there is radio interference and/or erroneous engine monitoring discrepancies that go away when the G3i system is turn off. The problem may be fixed by adding an MSD filter P/N 8830 that can be installed in series at the MSD 6a amplifier that will filter out most if not all the interference. (Drawing C2)

Drawing C2:
MSD P/N 8830
Noise Filter Capacitor in-line

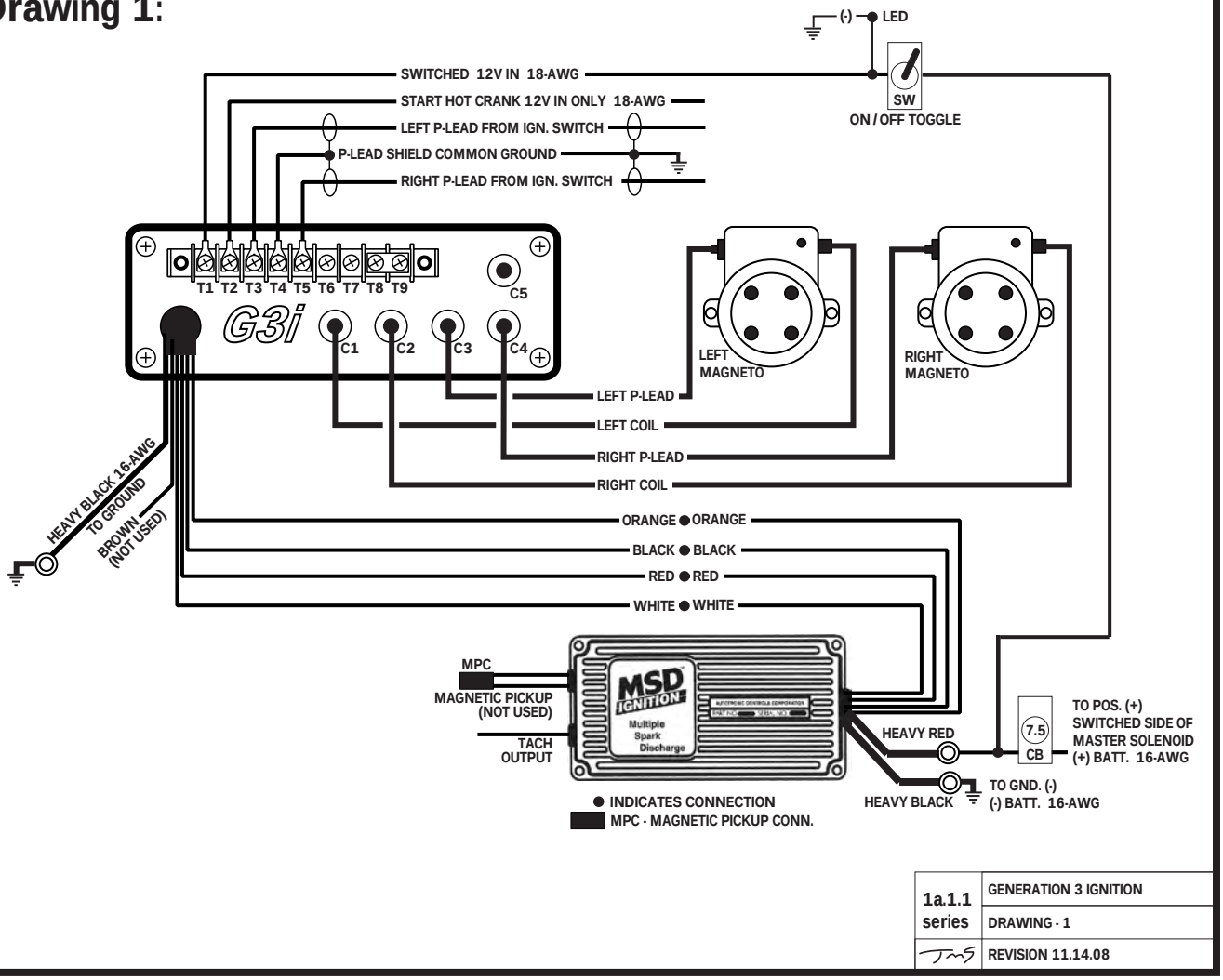


1a.1.1 series	GENERATION 3 IGNITION
	DRAWING - C2
TJ&S	REVISION 11.14.08

SECTION 8 DRAWINGS:

Drawings (1 thru ct.5):
Terminal connections and application descriptions:

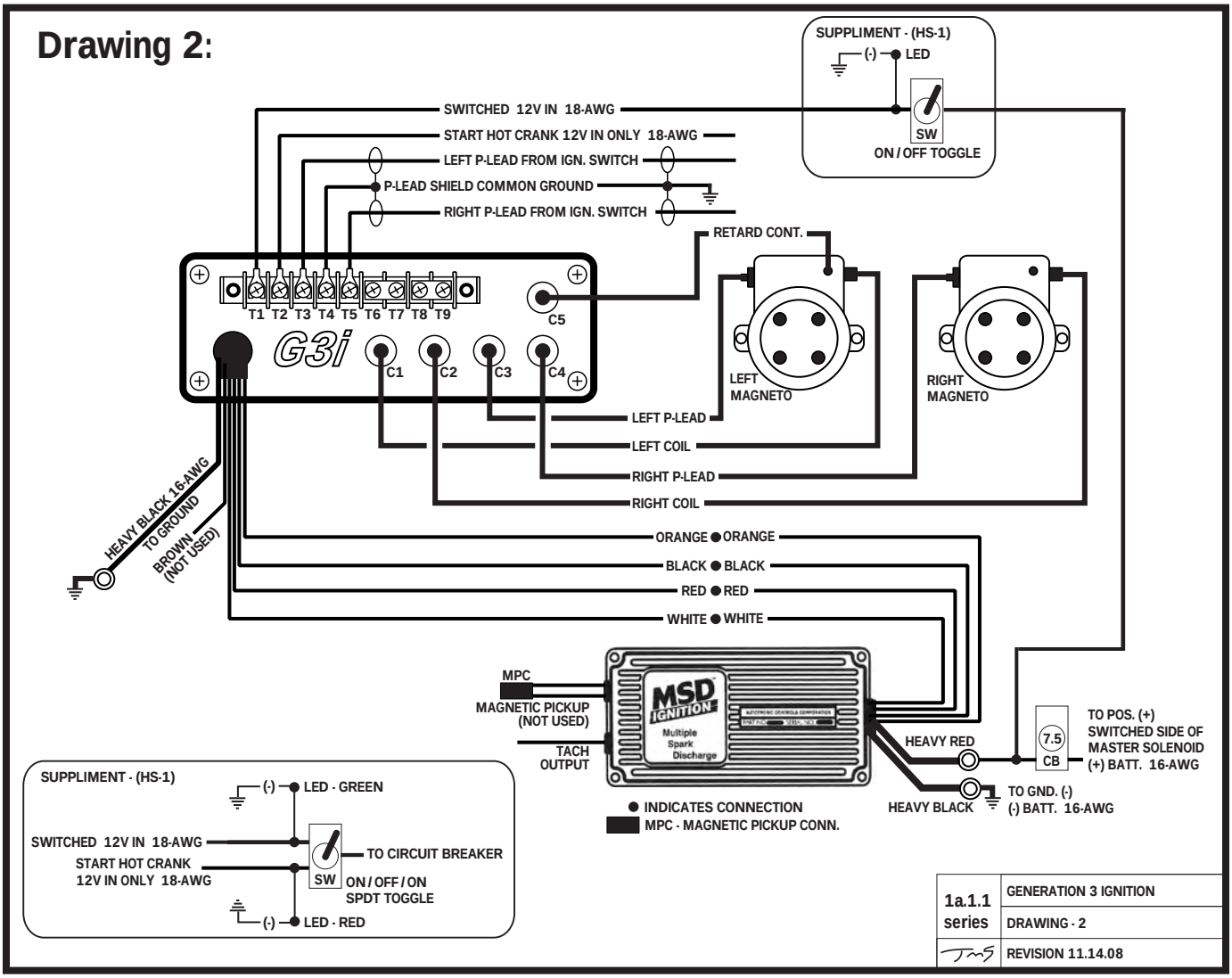
Drawing 1:



Left Magneto Normal Contacts are Trigger Source
Left Magneto Lag - Retard Impulse Coupler
Bridge terminals (T8 -T9)

The left magneto's normal contact set (points) will serve as the trigger source in the electronic ignition mode also. The Left magneto's impulse coupler on start up will retard the signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up.

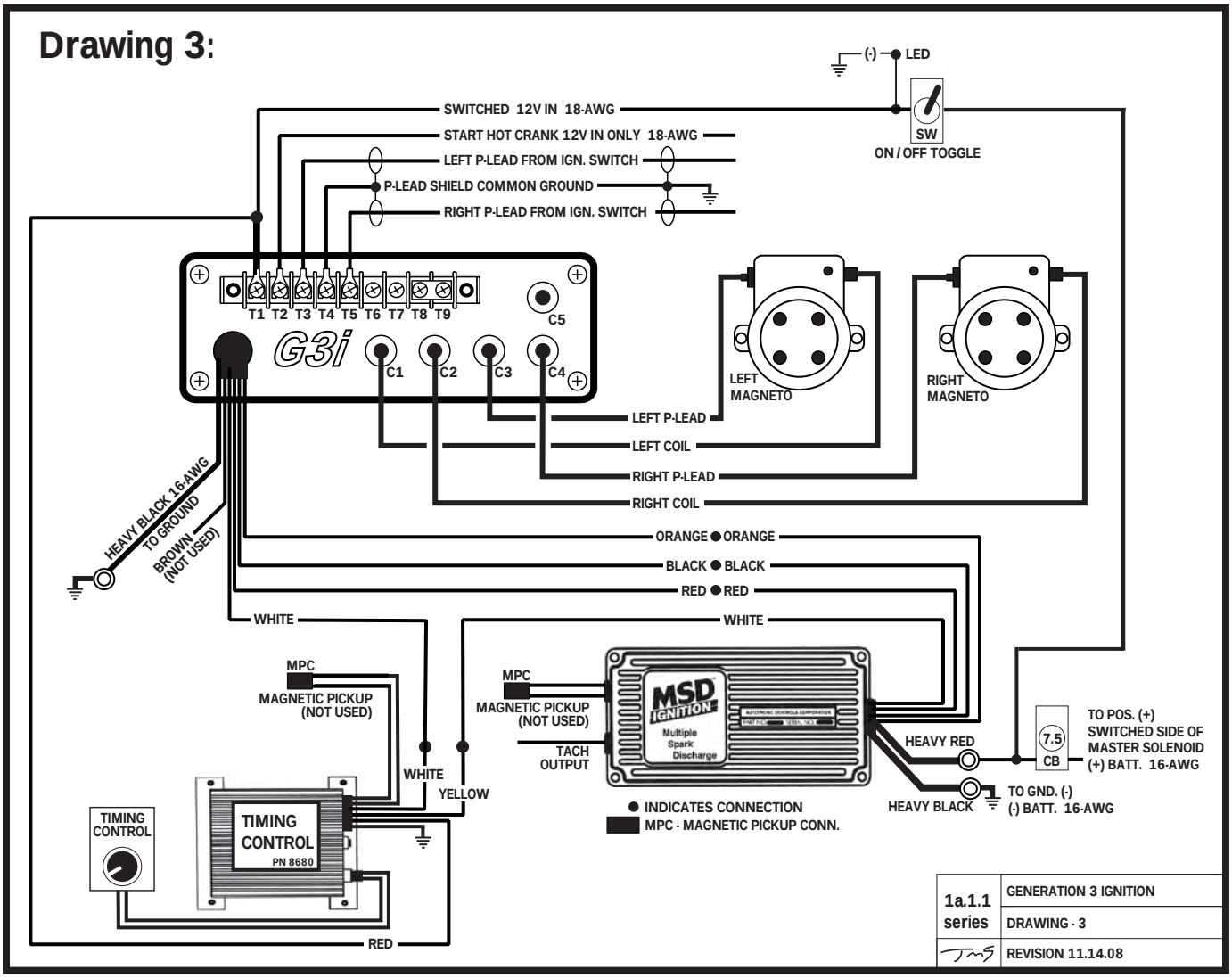
Drawing 2:



Left Magneto Normal Contacts are Trigger Source
Left Magneto Retard Contacts / Active in Start
Bridge terminals (T6 -T7) (T8 -T9)
Retard Contact P-Lead to BNC (C5)

The left magneto's normal contact set (points) will serve as the trigger source when the G3i system is in the electronic ignition mode also. The Left magneto's retard contact set (points) is only used on start up. This will provide the retard signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up.

Drawing 3:

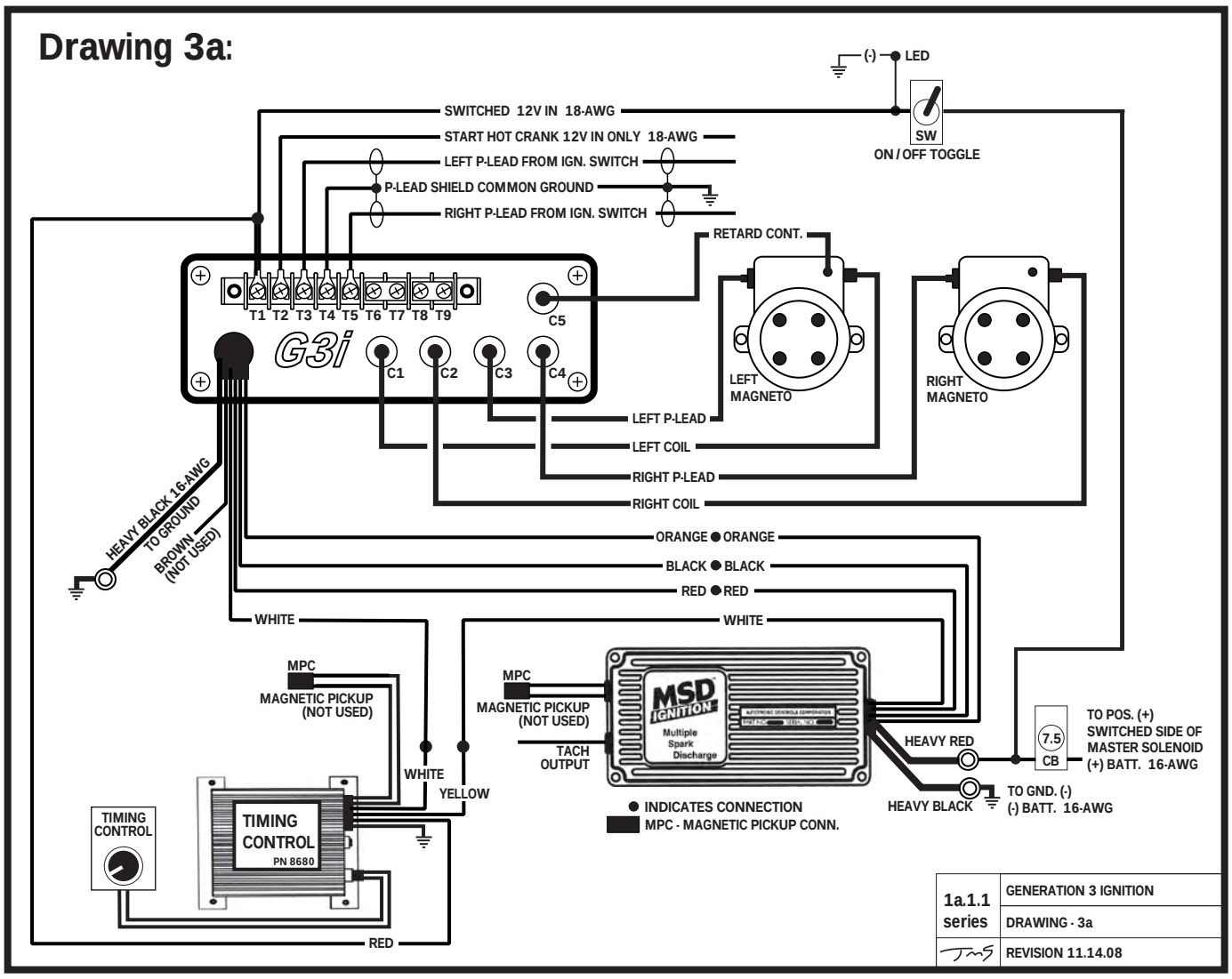


Left Magneto Normal Contacts are Trigger Source
Left Magneto Lag – Retard Impulse Coupler
MSD 8680 Adjustable Timing Control
Bridge Terminals (T8 -T9)
G3i White lead is routed to White lead on MSD 8680 Adjustable Timing Control.

This option allows the use of the MSD 8680 Adjustable Timing Control while maintaining the contact set (points) in the left magneto as the trigger source. The left magneto's normal contact set (points) and lag – retard impulse coupler will retard the signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up.

Note: Refer to the MSD 8680 Adjustable Timing Control installation instructions for your specific timing requirements and connections.

Drawing 3a:

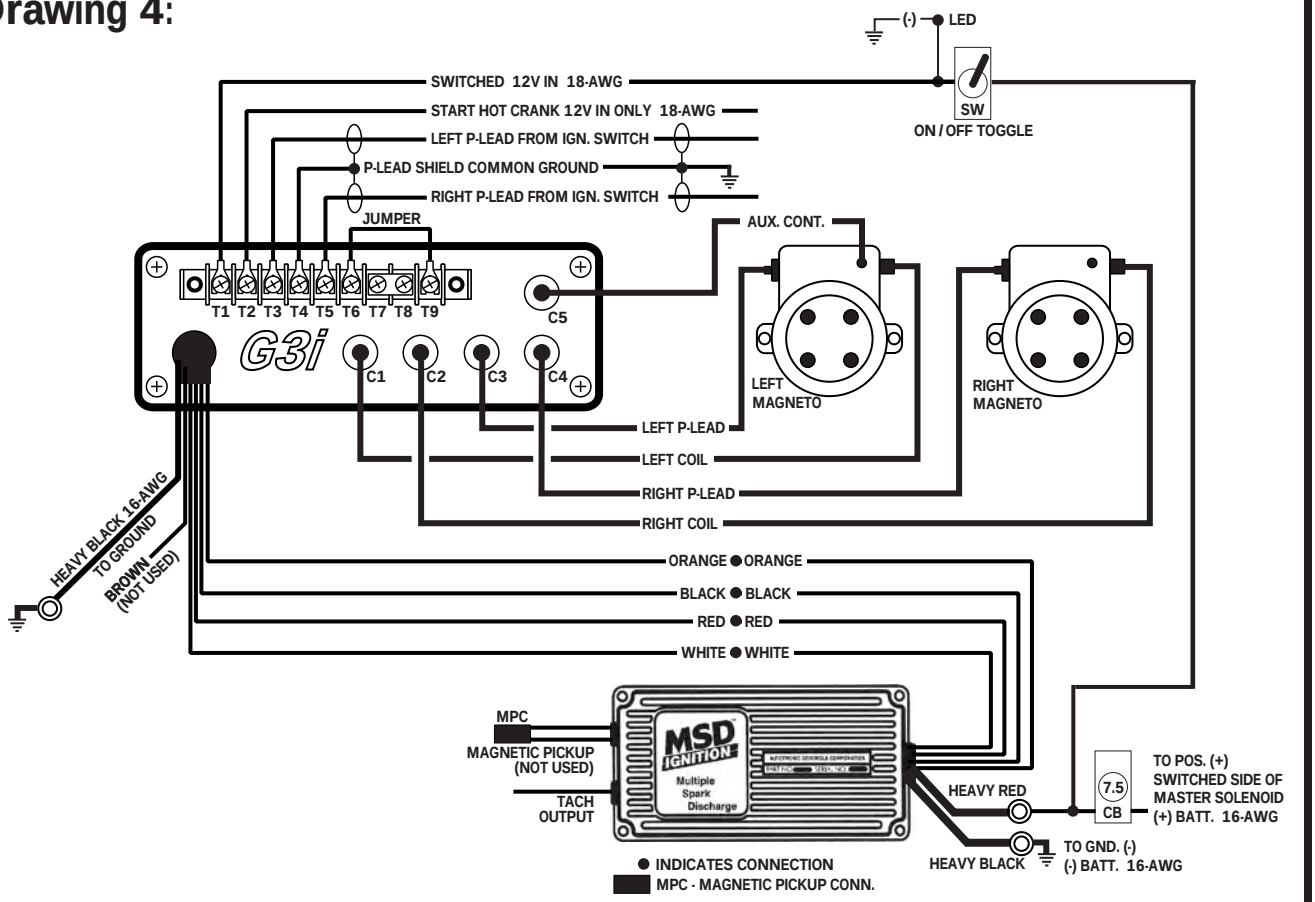


Left Magneto Normal Contacts are Trigger Source
Left Magneto Retard Contacts / Active in Start
MSD 8680 Adjustable Timing Control
Bridge Terminals (T6 -T7) (T8 -T9)
Retard Contact P-Lead to BNC (C5)
G3i White lead is routed to White lead on MSD 8680 Adjustable Timing Control.

This option allows the use of the MSD 8680 Adjustable Timing Control while maintaining the contact set (points) in the left magneto as the trigger source. The Left magneto's retard contact set (points) is only used on start up. This will provide the retard signal to G3i module that will excite the MSD amplifier to fire both magnetos in start up.

Note: Refer to the MSD 8680 Adjustable Timing Control installation instructions for your specific timing requirements and connections.

Drawing 4:

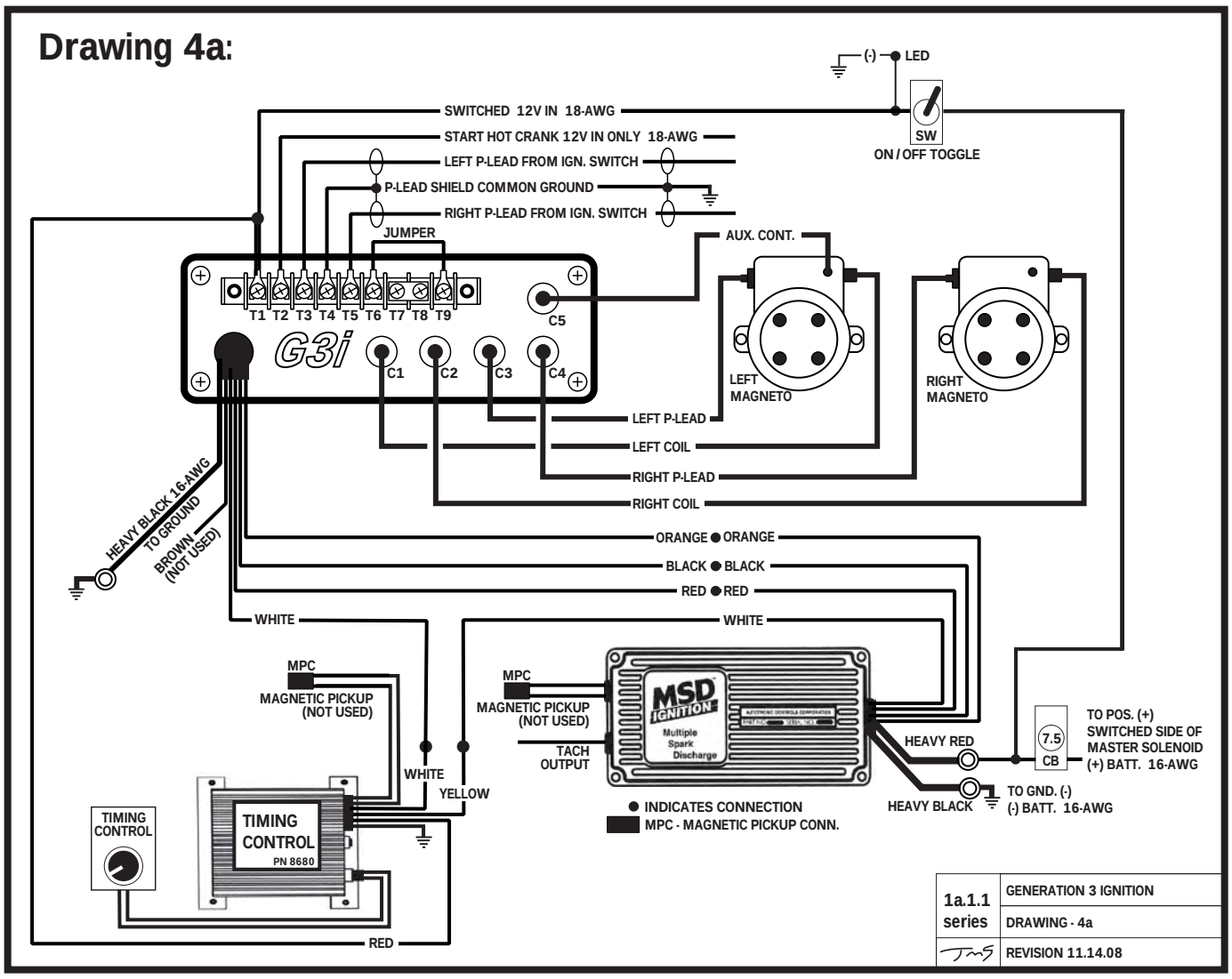


Left Magneto Auxiliary Contacts are Trigger Source
Left Magneto Lag – Retard Impulse Coupler
Starting on Normal Contacts
Bridge terminals (T6 -T9) (T7 -T8)
Auxiliary Contact P-Lead to BNC (C5)

The left magneto's Auxiliary contact set (points) will serve as the trigger source when the G3i system is in the electronic ignition run mode. This option allows the auxiliary contacts to be installed if there is a need to have an advanced or retarded timing signal while running in electronic mode. This leaves the left magneto's stock contact set (points) at their normal timing when the G3i system is off. The Left magneto's normal contact set (points) and lag – retard impulse coupler will retard the signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up.

Note: An extended jumper lead will be needed for the (T6 –T9) bridge.

Drawing 4a:

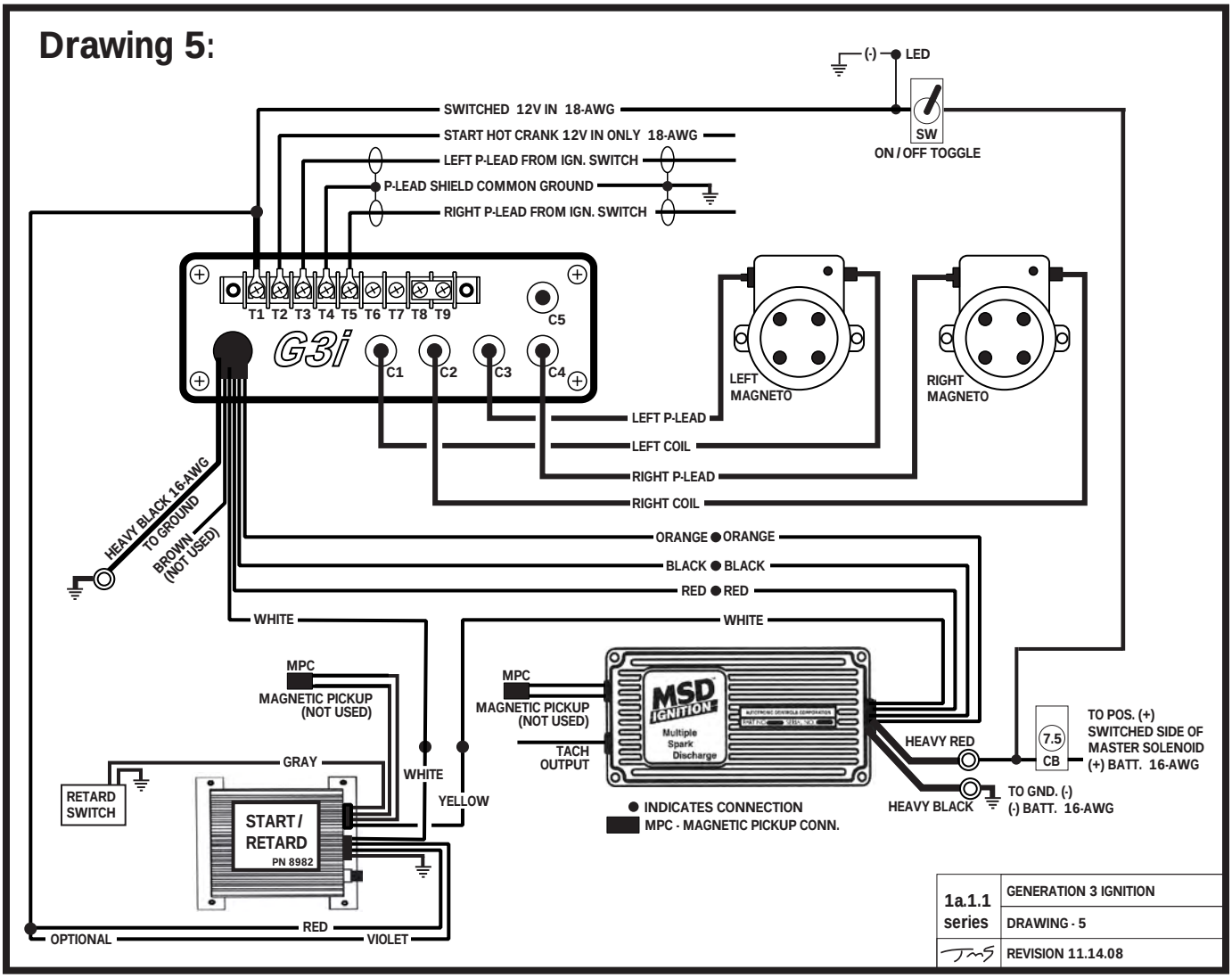


Left Magneto Auxiliary Contacts are Trigger Source
Left Magneto Lag – Retard Impulse Coupler
Starting on Normal Contacts
MSD 8680 Adjustable Timing Control
Bridge terminals (T6 -T9) (T7 -T8)
Auxiliary Contact P-Lead to BNC (C5)
G3i White lead is routed to White lead on MSD 8680 Adjustable Timing Control.

This option allows the use of the MSD 8680 Adjustable Timing Control with auxiliary contact set (points) in the left magneto as the trigger source while running in electronic mode The left magneto's normal contact set (points) and lag – retard impulse coupler will retard the signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up.

Note: An extended jumper lead will be needed for the (T6 –T9) bridge.
Note: Refer to the MSD 8680 Adjustable Timing Control installation instructions for your specific timing requirements and connections.

Drawing 5:

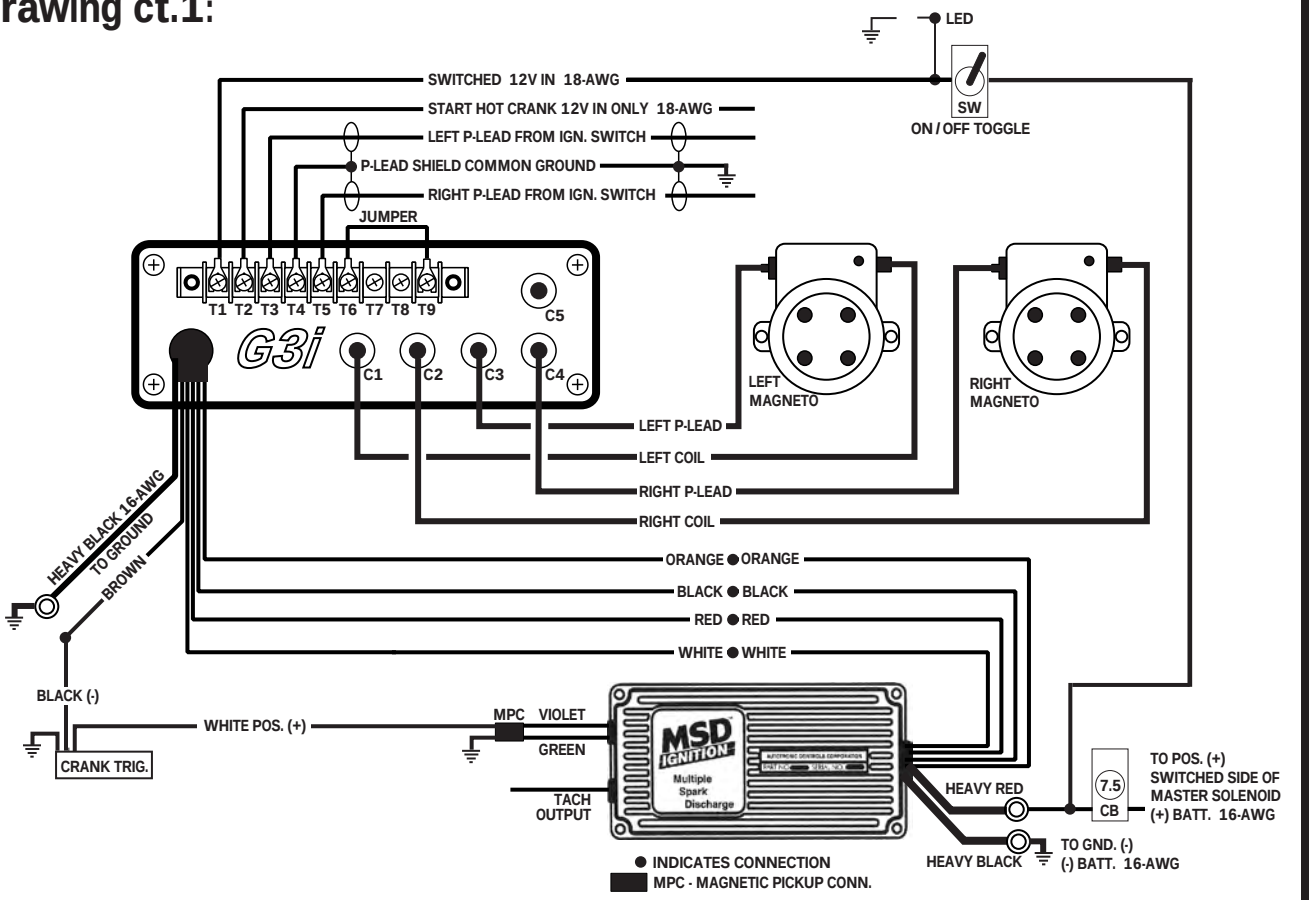


Left Magneto Normal Contacts are Start and Run Trigger Source
With or Without Left Magneto Lag – Retard Impulse Coupler
MSD 8982 Start/Retard Control Module
Bridge (T8 –T9)
G3i White lead is routed to White lead on 8982 Start/Retard Control.

This option allows the use of the MSD 8982 Start/Retard Control while maintaining the contact set (points) in the left magneto as the trigger signal. If the left magneto is a lag - retard impulse coupler, there is an added benefit of more retard on start up. The MSD Start/Retard Control provides a second retard signal when switched activated (boost retard etc.).

Note: The MSD Start/Retard Control module will remove an average of 2° of overall timing in run mode.
Example: If you want 25° when the G3i system is on. The Magnetos stock timing will need to be advanced 2° and timed @ 27°.
Note: Refer to the MSD 8982 Start/Retard Control installation instructions for your specific timing requirements and connections.

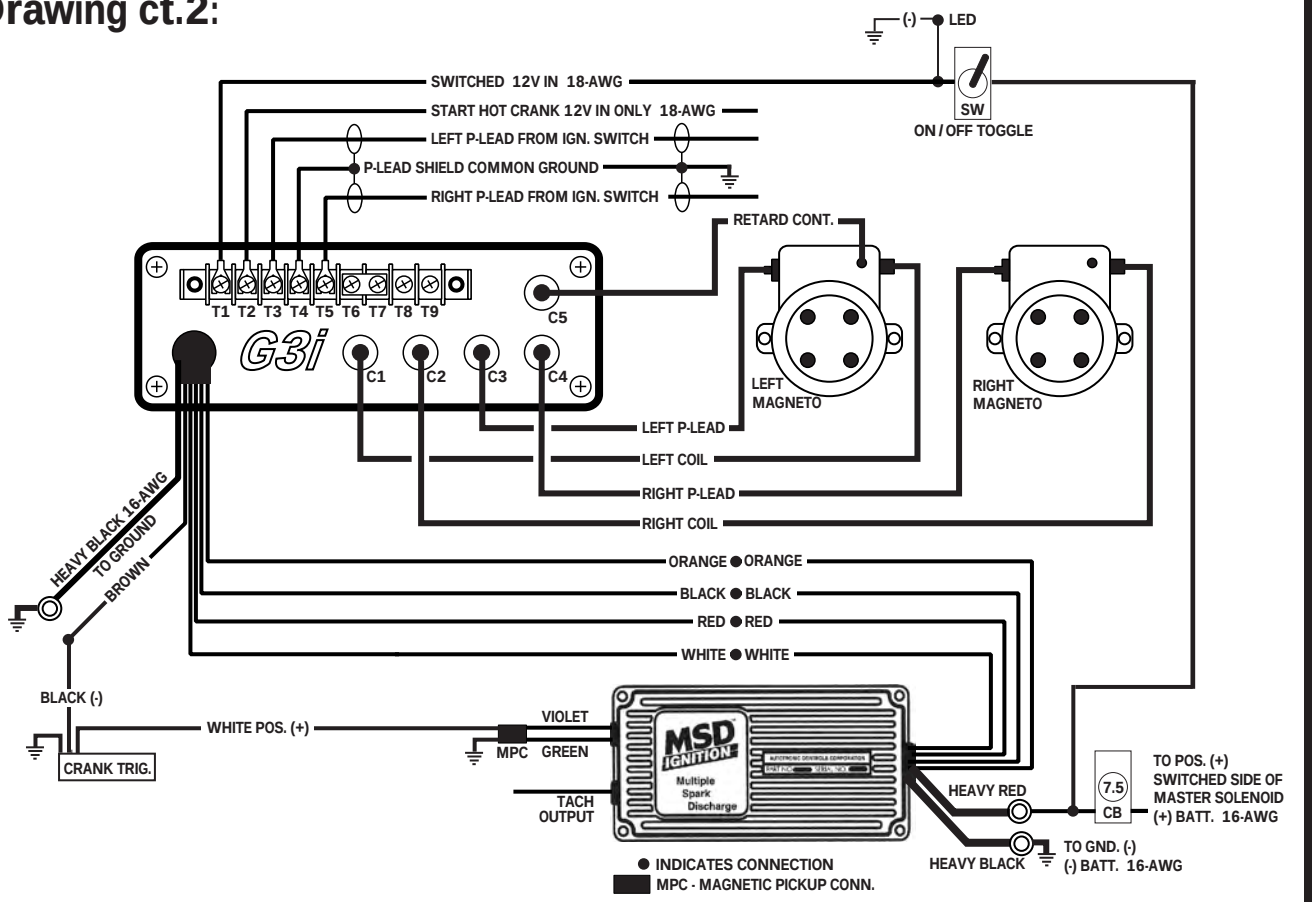
Drawing ct.1:



Crankshaft Trigger Signal
Left Magneto Lag – Retard Impulse Coupler
Left Magneto Normal Contacts are Trigger Source on Starting Bridge (T6 -T9)
G3i Brown lead to Black (-) lead on Crank Trigger
White lead (+) on Crank Trigger to Violet Lead (+) on MSD amplifier Magnetic Pickup connector
Bare lead on Crank Trigger connector to common ground (-)
Green lead on MSD amplifier Magnetic Pickup connector to common ground (-)

This option allows the use of a Magnetic Pickup Sensor on the Crankshaft/Flywheel for the timing signal. The left and right magneto contacts are timed as normal (25° etc.). The Crank Trigger must be within 15° of synchronization with the magneto timing. The left magneto normal contact set (points) and impulse coupler will serve as the retard on start up. This will provide the retard signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up.

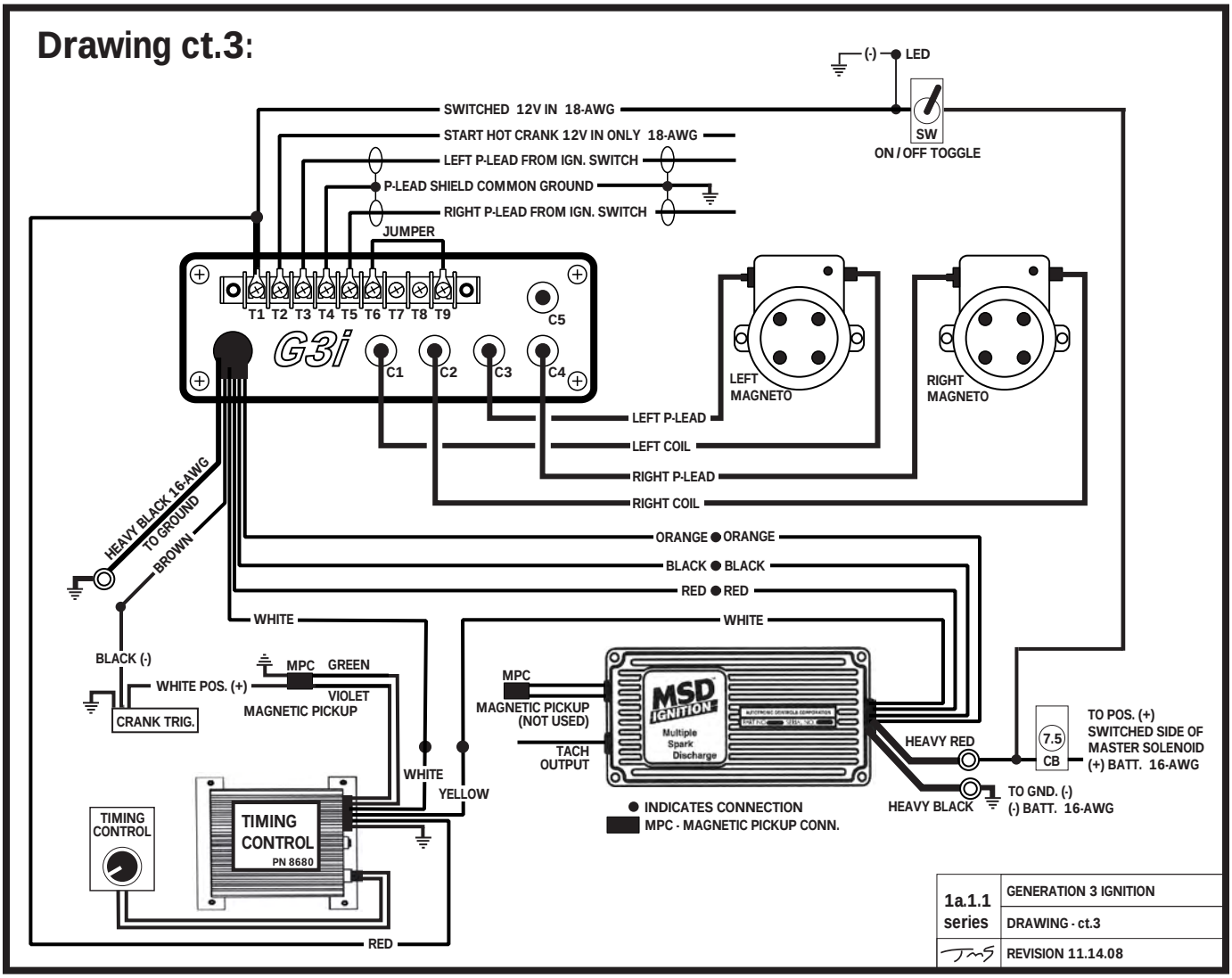
Drawing ct.2:



ODrawing ct.2: Crankshaft Trigger Signal
Left Magneto Retard Contacts are Trigger Source on Starting Bridge (T6-T7)
Retard Contact P-Lead to BNC (C5)
G3i Brown lead to Black (-) lead on Crank Trigger
White lead (+) on Crank Trigger to Violet Lead (+) on MSD amplifier Magnetic Pickup connector
Bare lead on Crank Trigger to common ground (-)
Green lead on MSD amplifier Magnetic Pickup connector to common ground (-)

This option allows the use of a Magnetic Pickup Sensor on the Crankshaft/Flywheel for the timing signal. The left and right magneto contacts are timed as normal. The Crank Trigger must be within 15° of synchronization with the magneto timing The left magneto retard contacts (points) are only used on start up. This will provide the retard signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up.

Drawing ct.3:

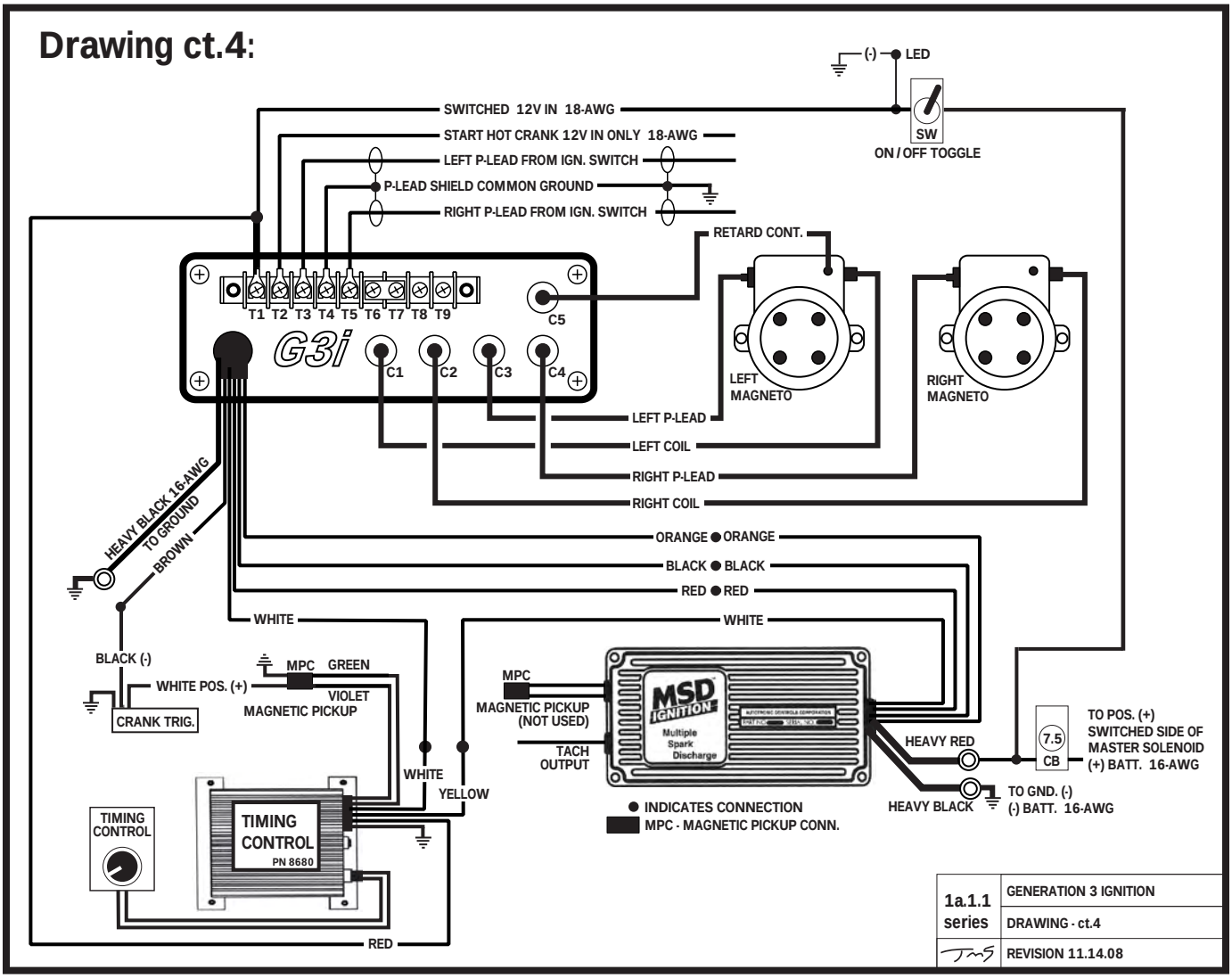


Crankshaft Trigger Signal
Left Magneto Lag – Retard Impulse Coupler
Left Magneto Normal Contacts are Trigger Source on Starting
MSD 8680 Adjustable Timing Control
Bridge (T6 -T9)
G3i White lead is routed to White lead on MSD 8680 Adjustable Timing Control
G3i Brown lead to Black (-) lead on Crank Trigger
White lead (+) on Crank Trigger to Violet Lead (+) on MSD 8680 Timing Control Magnetic Pickup connector
Bare lead on Crank Trigger to common ground (-)
Green lead on MSD 8680 Timing Control Magnetic Pickup connector to common ground (-)

This option allows the use of the MSD P/N 8680 Adjustable Timing Control Module with a Magnetic Pickup Sensor on the Crankshaft/Flywheel for the timing signal. The left and right magneto contacts are timed as normal. The Crank Trigger must be within 15° of synchronization with the magneto timing. The Left magneto contact set (points) and impulse coupler will serve as the retard on start up. This will provide the retard signal to G3i module that will excited the MSD amplifier to fire both magnetos at start up.

Note: Refer to the MSD 8680 Adjustable Timing Control installation instructions for your specific timing requirements and connections.

Drawing ct.4:

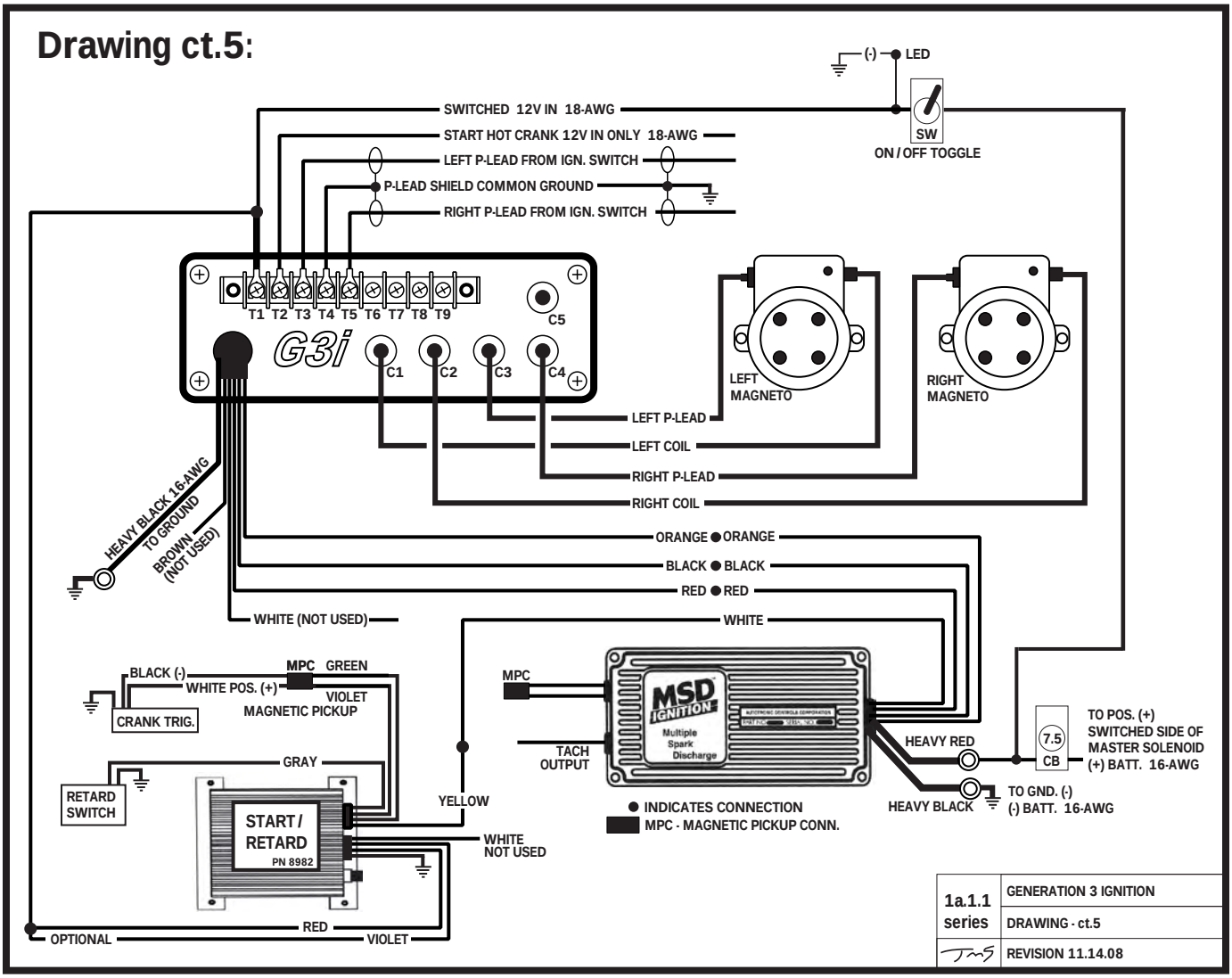


Crankshaft Trigger Signal
Left Magneto Retard Contacts are Trigger Source on Starting
MSD 8680 Adjustable Timing Control
Bridge (T6 –T7)
Retard Contact P-Lead to BNC (C5)
G3i White lead is routed to White lead on MSD 8680 Adjustable Timing Control
G3i Brown lead to Black (-) lead on Crank Trigger
White lead (+) on Crank Trigger to Violet Lead (+) on MSD 8680 Timing Control Magnetic Pickup connector
Bare lead on Crank Trigger to common ground (-)
Green lead on MSD 8680 Timing Control Magnetic Pickup connector to common ground (-)

This option allows the use of the MSD P/N 8680 Adjustable Timing Control Module with a Magnetic Pickup Sensor on the Crankshaft/Flywheel for the timing signal. The left and right magneto contacts are timed as normal. The Crank Trigger must be within 15° of synchronization with the magneto timing. The Left magneto retard contacts (points) are only used during start up. This will provide the retard signal to G3i module that will excited the MSD amplifier to fire both magnetos at start up.

Note: Refer to the MSD 8680 Adjustable Timing Control installation instructions for your specific timing requirements and connections.

Drawing ct.5:



Crankshaft Trigger Signal
Crankshaft Trigger Signal on Start Up ands Run
Bridge (T6-T7)
MSD 8982 Start/Retard Control
G3i Brown lead to Black (-) lead on Crank Trigger
White lead (+) on Crank Trigger to Violet Lead (+) on MSD amplifier Magnetic Pickup connector
Bare lead on Crank Trigger to common ground (-)
Green lead on MSD amplifier Magnetic Pickup connector to common ground (-)

This option allows the use of the MSD 8982 Start/Retard Control with a Magnetic Pickup Sensor on the Crankshaft/Flywheel for the timing signal. The left and right magneto contacts are timed as normal. The Crank Trigger must be within 15° of synchronization with the magneto timing. The Crankshaft Trigger Sensor provides the timing signal in all modes of electronic ignition operation (Starting and Run).
The MSD 8982 Start/Retard Control will provide the retard signal to G3i module that will excite the MSD amplifier to fire both magnetos at start up.

Note: Refer to the MSD 8982 Start/Retard Control installation instructions for your specific timing requirements and connections.

NOTICE

Generation 3 Ignition systems must be installed with good useable working magnetos. If the magnetos are in need of a rebuild or need disassembly inspection repair, then this must be done first, before installing the G3ignition system.
Magneto modifications, ignition parts sales and service are available though Generation 3 Ignition if requested.

WARNING

Failure of the G3i ignition system or products, or improper installation of the G3i ignition systems or products, may create a risk of property damage, severe personal injury or death.

WARRANTY and LIMITATION OF LIABILITY

Generation 3 Ignition systems are warranted to the original purchaser for one full year from the date of purchase against defects in material and workmanship. During this period, Generation 3 Ignition will repair or replace G3i modules within the warranty period that, in Generation 3 Ignition's sole opinion, that have not been subjected to abuse or any attempted field repairs. This warranty is limited to the purchase price of Generation 3 Ignition hardware and does not cover the engine or other engine components that may be affected by defects or failure of the system, and Generation 3 Ignition shall not be liable for any obligations or liabilities whatsoever, or any strict liability theory.
Generation 3 Ignition hardware is intended only for installation and use on experimental aircraft, which are licensed by the FAA in the "EXPERIMENTAL" category pursuant to a Special Airworthiness Certificate. All products must be installed and used in accordance with the current installation manual by experienced mechanics. The most current installation instructions are available from Generation 3 Ignition which are on the website at www.g3ignition.com

For further information on our products, contact us via e-mail at mail@g3ignition.com

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