Plasmasonic® 1.3 DRSSTC
Musical Tesla Coil
Instruction Manual

Specifications

The following table outlines the electrical and mechanical specifications of the Plasmasonic DRSSTC Musical Tesla Coil.

Specification	Value
Input Voltage Range	100VAC to 120VAC (See note 1)
Max. Input Voltage	120VAC (See note 1)
Line Frequency Range	50-60Hz
Dimensions	15" x 15" x 36"
Toroid Dimensions	18" DIA x 4.5" Height
Weight	45 LBS
Max. Input Current (Pulse Mode)	TBD
Max. Input Power (Pulse Mode)	TBD
Inrush Current (Start-up)	TBD
DC Capacitor Discharge Time (Active discharge circuit)	5s (discharge to 30V) 8s (discharge to 5V)
DC Capacitor Discharge Time (Passive discharge circuit)	3.5 min (discharge to 30V) 5.0 min (discharge to 5V)

Note 1: Higher input voltages are possible with user modifications, however higher input voltages do require a change in the Power Distribution control transformer and possibly a separate AC feed for the AC cooling fans. Also, these types of user modifications void all warranty and technical support.

Replacement Fuse Specifications

The following table lists all the replacement fuse sizes for the Plasmasonic DRSSTC system. All fuses are located on the Power Distribution board assembly.

Fuse	Type
Control Power – F1	1A, Fast Acting, 1 ¼" x ¼", Glass
Fan Power – F2	2A, Fast Acting, 1 ¼" x ¼", Glass
DC Bus Power – F3	20A, Fast Acting, 1 ¼" x ¼", Glass

WARRANTY / TAMPER INFORMATION

PLEASE NOTE THAT ANY WARRANTY PROVIDED BY EASTERN VOLTAGE RESEARCH IS PROVIDED UNDER THE CONDITIONS THAT THE EQUIPMENT SOLD IS OPERATED UNDER THE PRE-PROGRAMMED OPERATIONAL CONDITIONS AS SHIPPED. THE REMOVAL OF ANY TAMPER PROOF DECALS, ON BOTH THE PLASMASONIC HANDHELD MIDI CONTROLLER AND/OR PLASMASONIC ADVANCED CONTROLLER MODULE, OR ANY MODIFICATION OF ANY COMPONENT WITH THE PLASMASONIC DRSSTC SYSTEM WILL VOID ALL WARRANTIES. TECHNICAL SUPPORT MAY ALSO BE REFUSED IF MODIFICATIONS OR CUSTOMER REPAIRS ARE MADE AND THAT THE TAMPER PROOF DECALS ARE REMOVED OR ALTERED IN ANY WAY FROM THE ASSEMBLIES THEY ARE AFFIXED TO.

WARRANTY INFORMATION

Plasmasonic Systems – Limited Warranty Statement

Eastern Voltage Research will repair or replace any failed component or assembly , with the listed exceptions below, that Eastern Voltage Research has determined to be a result of a manufacturer defect.

To ensure a reliable product, all Plasmasonic systems are thoroughly tested, including a minimum 1 hour burn-in test. Customers can be assured that they will receive a product that has been rigorously tested with the probability that all latent manufacturer defects have been tested out through high power burn-in testing.

What is covered:

Any component that has been proven by Eastern Voltage Research to be the result of a manufacturer defect with the exceptions below. Eastern Voltage Research will review each component failure to determine if it is covered.

What is not covered:

Because these are high power commercial Tesla Coil devices, and that we cannot control the manner and method in which a customer uses them, the following components are not covered:

- IGBT Modules
- DC Bus Capacitors
- Rectifier Modules
- Secondary Coil
- Fiber Optic connectors and cables

User Modification / User Repair

Any user modification or user repair will void any warranty offered.

US Shipping and Warranty Repair Service

Customers are responsible for all shipping costs for returning failed components back to us for evaluation and in the determination of warranty service. If a component failure has been determined to be a result of a manufacturer defect, Eastern Voltage Research will cover return shipping costs for individual components or small assemblies. If service requires a full Plasmasonic assembly to be shipped, the customer is responsible for all shipping charges to and from our facility.

International Shipping and International Warranty Repair Service

International customers are responsible for all shipping costs, including export fees, taxes, and duties, for any warranty or repair services.

AGE DISCLAIMER

THIS KIT IS AN ADVANCED, HIGH POWER SOLID STATE POWER DEVICE. IT IS INTENDED FOR USE FOR INDIVIDUALS OVER 18 YEARS OF AGE WITH THE PROPER KNOWLEDGE AND EXPERIENCE, AS WELL AS FAMILIARITY WITH LINE VOLTAGE POWER CIRCUITS.

BY PURCHASING, BUILDING, USING, OR OPERATING THE PLASMASONIC DRSSTC SYSTEM, YOU ACKNOWLEDGE THAT YOU ARE OVER 18 YEARS OF AGE, AND THAT YOU HAVE THOROUGHLY READ THROUGH THE SAFETY INFORMATION PRESENTED IN THIS MANUAL.

THIS PRODUCT SHALL NOT BE USED AT ANY TIME BY INDIVIDUALS UNDER 18 YEARS OF AGE OR BY ANYONE UNFAMILIAR WITH THE SAFETY ASPECTS OF THIS DEVICE.

EMI CONSIDERATIONS

IT IS THE RESPONSIBILITY OF THE END USER / CUSTOMER TO COMPLY WITH ALL FCC OR RELATED EMI / EMC REGULATIONS AND TO ENSURE THAT PROPER FILTERING AND SHIELDING IS UTILIZED TO PREVENT AND / OR MINIMIZE THE EFFECT THE PLASMASONIC DRSSTC SYSTEM HAS ON OTHER ELECTRONIC, INCLUDING COMPUTER, EQUIPMENT IN THE VICINITY OF OPERATION.

EASTERN VOLTAGE RESEARCH IS NOT RESPONSIBLE FOR ANY DAMAGE THE PLASMASONIC DRSSTC SYSTEM MAY CAUSE TO OTHER ELECTRONIC AND SIMILAR EQUIPMENT AND MAKES NO CLAIMS REGARDING THE COMPATABILITY OF SUCH EQUIPMENT WHEN OPERATING IN THE GENERAL VICINITY OF THE PLASMASONIC DRSSTC SYSTEM OR WHEN SHARING THE SAME ELECTRICAL CIRCUIT AS OTHER ELECTRONIC EQUIPMENT.

EASTERN VOLTAGE RESEARCH DOES HAVE EMI / EMC EXPERTS AVAILABLE IF YOU HAVE A PARTICULAR ISSUE OR CONCERN. FOR MORE INFORMATION AND / OR QUOTE OF THESE SERVICES, PLEASE CONTACT US THROUGH OUR SALES DEPARTMENT.

SAFETY AND EQUIPMENT HAZARDS

PLEASE BE SURE TO READ AND UNDERSTAND ALL SAFETY AND EQUIPMENT RELATED HAZARDS AND WARNINGS BEFORE ASSEMBLING AND OPERATING THE PLASMASONIC DRSSTC SYSTEM.

PACEMAKER WARNING

THIS DEVICE WHEN OPERATING WILL PRODUCE ELECTRICAL AND MAGNETIC FIELDS. EXPOSURE TO THESE FIELDS SHOULD BE LIMITED. DO NOT USE THIS KIT IF YOU HAVE AN IMPLANTED PACEMAKER OR OTHER BIOMEDICAL DEVICE OR ANY IMPLANTED METALLIC MATERIALS.

DANGER

HIGH VOLTAGE

ELECTRICAL HAZARD

This circuit utilizes dangerous line voltages up to 115VAC and a 340VDC DC power bus. Failure to handle this circuit in a safe manner may result in serious injury or death!

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POWER SEMICONDUCTOR HAZARD

**This is a solid state power device. Components may fail explosively at any time and eject high velocity projectiles.
EYE PROTECTION IS REQUIRED AT ALL TIMES!**

ELECTROMAGNETIC FIELD HAZARD

This device when connected to a resonator will produce strong electric and magnetic fields. Exposure to this field should be limited. DO NOT USE THIS KIT IF YOU HAVE AN IMPLANTED BIOMEDICAL DEVICE!

ENERGY STORAGE WARNING

This device contains high voltage energy storage capacitors. Please allow at least 5 minutes from the time the unit is unplugged to the time you handle or move the Plasmasonic DRSSTC system. There are two levels of bleed resistors installed in the system which are designed to safely and quickly bleed down the energy storage capacitors. The primary bleed resistor is a relay activated high power resistor designed to quickly bleed the energy storage capacitors upon removal of AC input power. The secondary bleed resistors are smaller resistors which are placed across each energy storage capacitor and will safely bleed the energy storage capacitors within 5 minutes after the removal of AC input power.

ACOUSTIC NOISE HAZARD

The Plasmasonic DRSSTC system during operation will produce extremely loud acoustic noise. Hearing protection is required during the operation, especially in small enclosed environments. Hearing protection may be dedicated hearing protection earphones, properly rated ear plugs, or simply by covering your ears with your hands.

FIRE HAZARD

Due to high power dissipations of the the various semiconductors devices attached to the heatsink, the heatsink may become extremely hot, especially during periods of continuous operation. Please ensure the heatsink is not installed on or near any flammable material and that a cooling fan is ALWAYS used during operation.

OZONE WARNING

Please note that the Plasmasonic DRSSTC system will produce ozone and other nitrous type gases during operation. For short durations, this should not be an issue, but for longer durations and for public demonstrations, we recommend using the Plasmasonic DRSSTC in a well ventilated room. If proper ventilation is not available, then runtimes should be kept to a minimum.

SAFETY GUIDELINES FOR LINE POWERED EQUIPMENT

The electronic kit you purchased utilizes line voltages (115VAC) and also contains circuitry that produces output voltages in excess of 340VDC. Normally, consumer electronics equipment are safely enclosed to prevent accidental contact. However, the kit you have purchased does not come with an enclosure, and must be handled and operated with this in mind. Voltages exceeding 35V pose a safety hazard and depending on overall conditions and your general state of health, voltage and current levels have the ability to serious harm or even kill.

The following guidelines are to protect you from potentially lethal electrical shock hazards as well as the equipment from accidental damage.

It is also important to note that the danger isn't limited to only your body providing a conductive path, namely your heart. Any involuntary muscle contractions caused by an electrical shock, while perhaps harmless in themselves, may cause the person to be injured by falling, hitting a body part on something sharp, etc….

The purpose of these set of guidelines is not to frighten you, but rather make you aware of the appropriate precautions needed to safely build and operate this electronics kit.

- Perhaps, the number one rule – Don't work alone! If something does happen, it is extremely important to have someone nearby to render assistance or to call for help.
- When working on energized equipment (namely those that are line powered), always keep one hand in your pocket. This ensures there is not a complete electrical path through your heart providing you accidentally make contact with live voltage.
- Wear footwear with non-conductive (rubber) soles. Do NOT work on line powered or high voltage equipment in barefeet.
- Always wear eye protection. Power semiconductor devices, and capacitors do have the potential to explode unexpectedly and project sharp fragments across the room.
- Always work in a clean, open area. Avoid working in cluttered spaces, especially if there are grounded objects nearby that could complete a circuit path in the event you make accidental contact with live voltage.
- Avoid wearing any kind of jewelry or other articles that could accidentally contact circuitry.
- Never operate your PC boards on top of conductive tables, or other conductive objects. PC boards should ALWAYS be supported by the provided stand-offs or placed on top of a non-conductive tabletop or other material.
- ALWAYS allow proper time for any large electrolytic or other high voltage capacitors to discharge after removing power prior to working or touching any circuit. ALWAYS use a multimeter to measure the voltage across large

capacitors after power is disconnect to ensure the voltage has properly bled off.

- Use an isolation transformer if there is any chance of contacting line powered circuitry. A Variac is NOT an isolation transformer!

- Finally, if your kit involves a Tesla Coil – NEVER touch or attempt to draw an arc with an object from the output of a Tesla Coil. The output of a Tesla Coil poses not only an electrical hazard, but also a burn hazard. The output from even the smallest solid state Tesla Coil can cause serious burns. Always operate the Tesla Coil at a safe distance.

SAFETY GUIDELINES - SEMICONDUCTOR POWER DEVICES

- Always wear eye protection. Power semiconductor devices, and capacitors do have the potential to explode unexpectedly and project sharp fragments across the room.

- Power semiconductors may be extremely hot. NEVER touch any semiconductors during operation or after use. Always allow proper time for components to cool down prior to handling them.

SAFETY GUIDELINES – HIGH TEMPERATURE COMPONENTS

- Power semiconductors may be extremely hot. NEVER touch any semiconductors during operation or after use. Always allow proper time for components to cool down prior to handling them.

- The extruded aluminum heatsink will be extremely hot during and after use until it cools down to ambient temperature. NEVER place the heatsink on any material that is flammable such as wood, plastic, or paper. It is preferable to place the extruded aluminum heatsink onto a metal plate.

- NEVER operate the device without the use of a cooling fan. If you are using an extruded aluminum heatsink, be sure to blow fan parallel to the cooling fins of the heatsink to maximize the cooling effects of the fan. Always allow the cooling fan to continue running, even after power is removed, until the heatsink and board components are properly "cooled" down.

SAFETY GUIDELINES – ELECTROMAGNETIC FIELD OUTPUT

DO NOT USE THIS KIT if you have an implanted biomedical device such as a pacemaker!

- Electromagnetic fields are produced when the Tesla coil is operating. Ensure that you and others are always at least five feet away from the devices during operation (small kits), and farther away with some of the larger kits such as the miniBrute Tesla Coil kit.
- Avoid contact with metallic objects. This is mostly important for the smaller CW based Tesla coils such as the SSTC 1.0 or Class-E Audio Modulated Tesla Coil. What happens is that the electromagnetic fields cause charge to build up on your person and any contact with something metallic will initiate a potential RF burn to occur. The burns are on the magnitude of an electrostatic shock – they are rarely harmful, but they can surprise you and give you a small instant of localized pain – again similar in receiving a electrostatic shock. Maintaining at least five feet away from the Tesla coil will prevent his from occuring.
- DO NOT use this kit if you have an implanted biomedical device.

PLASMASONIC DRSSTC SPECIFIC ELECTRICAL HAZARDS

Solid State Tesla Coils utilize high voltages and energy storage devices, therefore the risk of death and injury is significant. The following guidelines are suggested when using and operating the Plasmasonic DRSSTC system:

1. Never adjust any aspect of the Plasmasonic DRSSTC system, including the RGB LED illumination system while power is applied or plugged in.

2. The DC bus electrolytic capacitors may hold a charge long after power is turned off. Always discharge capacitors and ensure they are fully discharged before making any adjustments or modifications to the Plasmasonic DRSSTC system.

3. Always wait a minimum of five (5) minutes to approach is handle the Plasmasonic DRSSTC system after power is disconnected. This allows all the charge in the DC bus capacitors to be discharged through the primary and secondary bleeder resistors which are located directly across the terminals of the DC bus capacitors and on the Power Distribution board.

4. Ensure that the Plasmasonic DRSSTC system is properly grounded. This means using only a compliant 3-conductor AC plug that connects to EARTH GROUND.

5. Make sure that you are far enough away from the high voltage discharge so that it cannot strike you. Do not come into contact with metal objects which might be subject to a strike from the secondary. Please follow the recommended safety boundary distances as shown in this manual anytime you are using and operating the Plasmasonic DRSSTC system.

6. The output of the Plasmasonic DRSSTC power supply is extremely dangerous. The voltages present and level of energy storage from the DC bus capacitors make the DC power supply potentially lethal!

7. Use adequate fusing and/or circuit breakers to limit the maximum current to your Plasmasonic DRSSTC system.

8. Never operate the Plasmasonic DRSSTC system in an area where there is standing water, or where a significant shock hazard exists.

9. Do not operate the Plasmasonic DRSSTC system when pets or small children are present.

10. Do not operate the Plasmasonic DRSSTC system outside when there is a chance of rain or adverse weather.

PLASMASONIC® DRSSTC System Instructions

Please read this manual in its entirety before building, testing, or operating your Plasmasonic DRSSTC system.

Pre-Setup Inspection

Pre-setup inspection must take place EACH and EVERY time you set-up and operate your Plasmasonic DRSSTC Tesla Coil system. This inspection process ensures that all connections are properly secured and that reduces the likelihood of a failure due to an improperly placed or connected component, wire, or other system component.

☐   1. Check and ensure that all cables, wires, and connections are properly secured and connected among all the subassemblies within the system. You will be looking for any loose wires, connectors, or terminals that may have come undone during the shipping / handling process. You should be making this check EACH and EVERY time before you assemble and operate the Plasmasonic DRSSTC.

☐   2. There are two thermistors components on the Power Distribution Assembly. These are labeled RT1 and RT2 on the Power Distribution board. It is extremely important to ensure that these components are vertical and that there is approximately 0.5" space between each of them. During handling, these components do have the tendency to move towards each other. Ensure there is adequate space between the components prior to powering up the Plasmasonic DRSSTC. <u>Also, be sure not to overly move these components, as excessive movement of the leads may cause them to break overtime.</u> The following photo shows the location of these two components and the proper spacing each should have. Failure to have proper spacing between the two components may result in arcing and ultimately failure of the components.
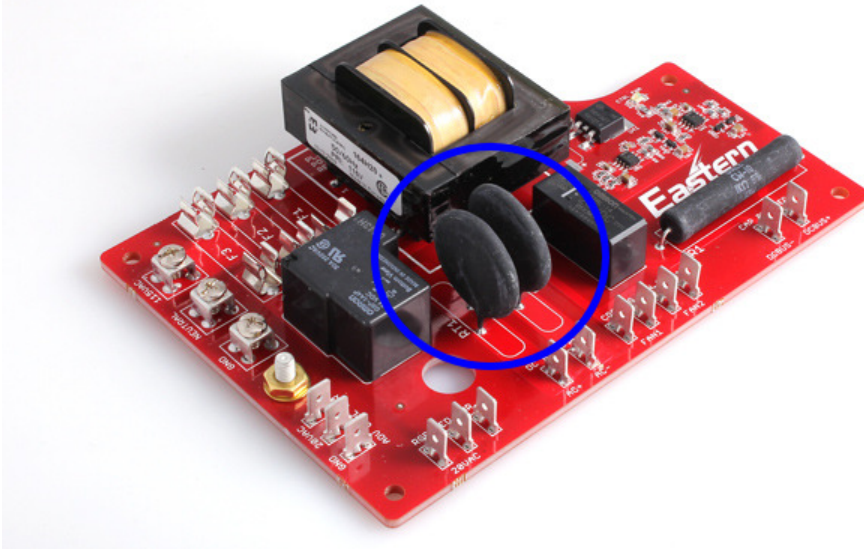
Figure 1 – Proper spacing and orientation of the thermistors, RT1 and RT2

Assembly Instructions

Please reference the following figures when setting up your Plasmasonic DRSSTC system. There are several options available to setting up and configuring your Plasmasonic DRSSTC system. The most common set-ups used are:

- One (1) Plasmasonic System (Pulse MODE operation) – Figure 2
- One (1) Plasmasonic System (MIDI Mode operation with Laptop) – Figure 3
- One (1) Plasmasonic System (MIDI Mode operating with Keyboard) – Figure 4
- Two (2) Plasmasonic Systems (MIDI Mode operating with Laptop) – Figure 5
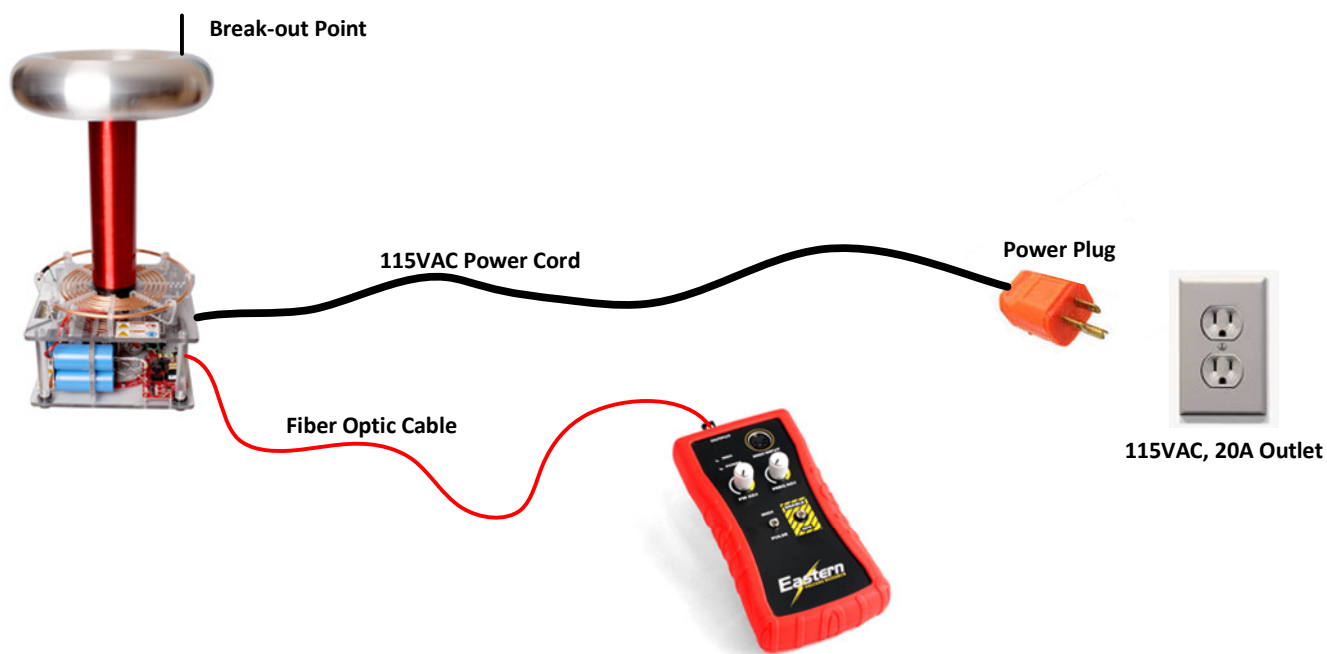

Figure 2– Standard Plasmasonic DRSSTC Hook-up
(Pulse MODE operation)

Break-out Point

115VAC Power Cord

Power Plug

Fiber Optic Cable

115VAC, 20A Outlet

MIDI Output

Controller MIDI Channel = 1

MIDI Input (Not Used)

USB Cable

Yamaha UX-16
USB-to-MIDI Interface

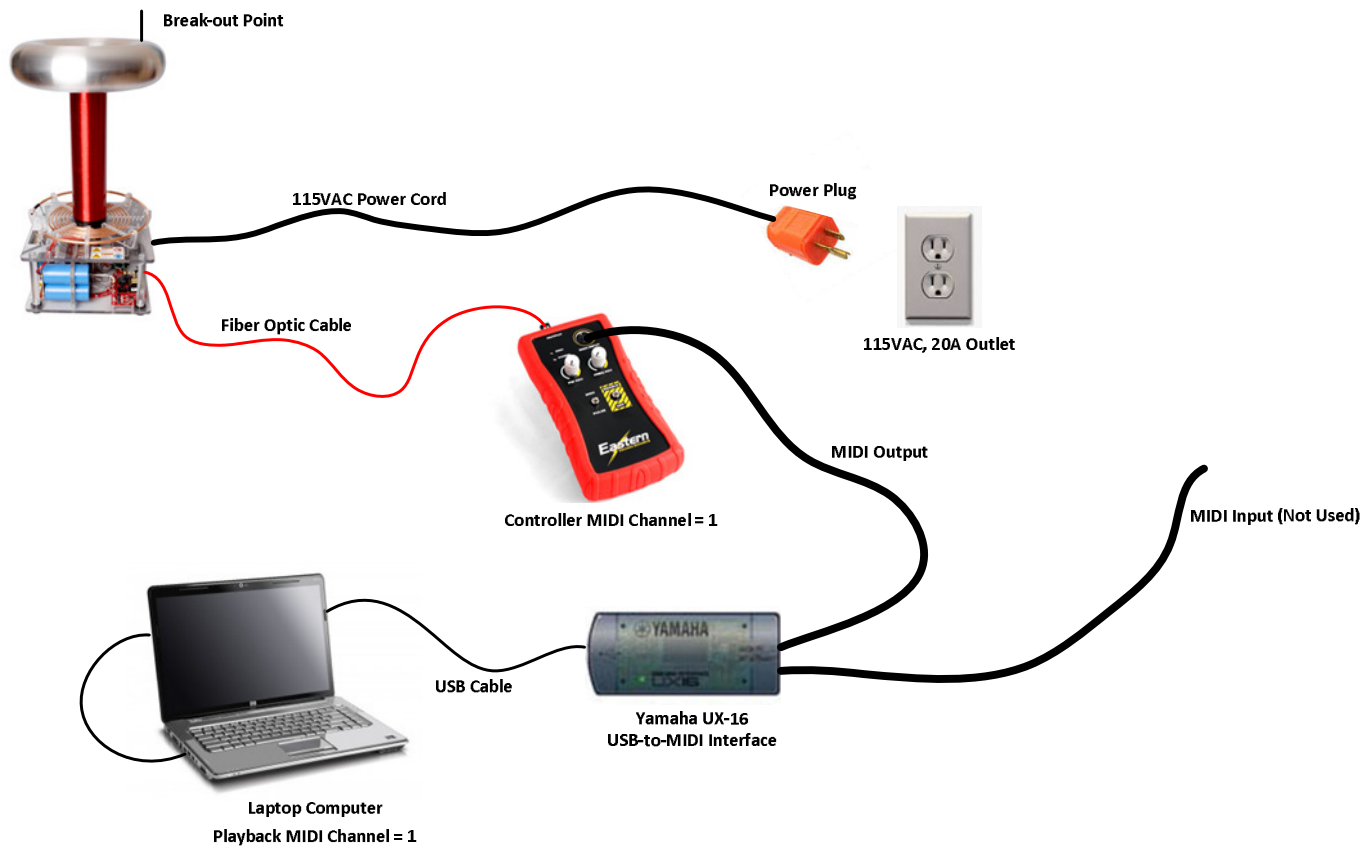Laptop Computer
Playback MIDI Channel = 1

Figure 3 – Plasmasonic DRSSTC Hook-up
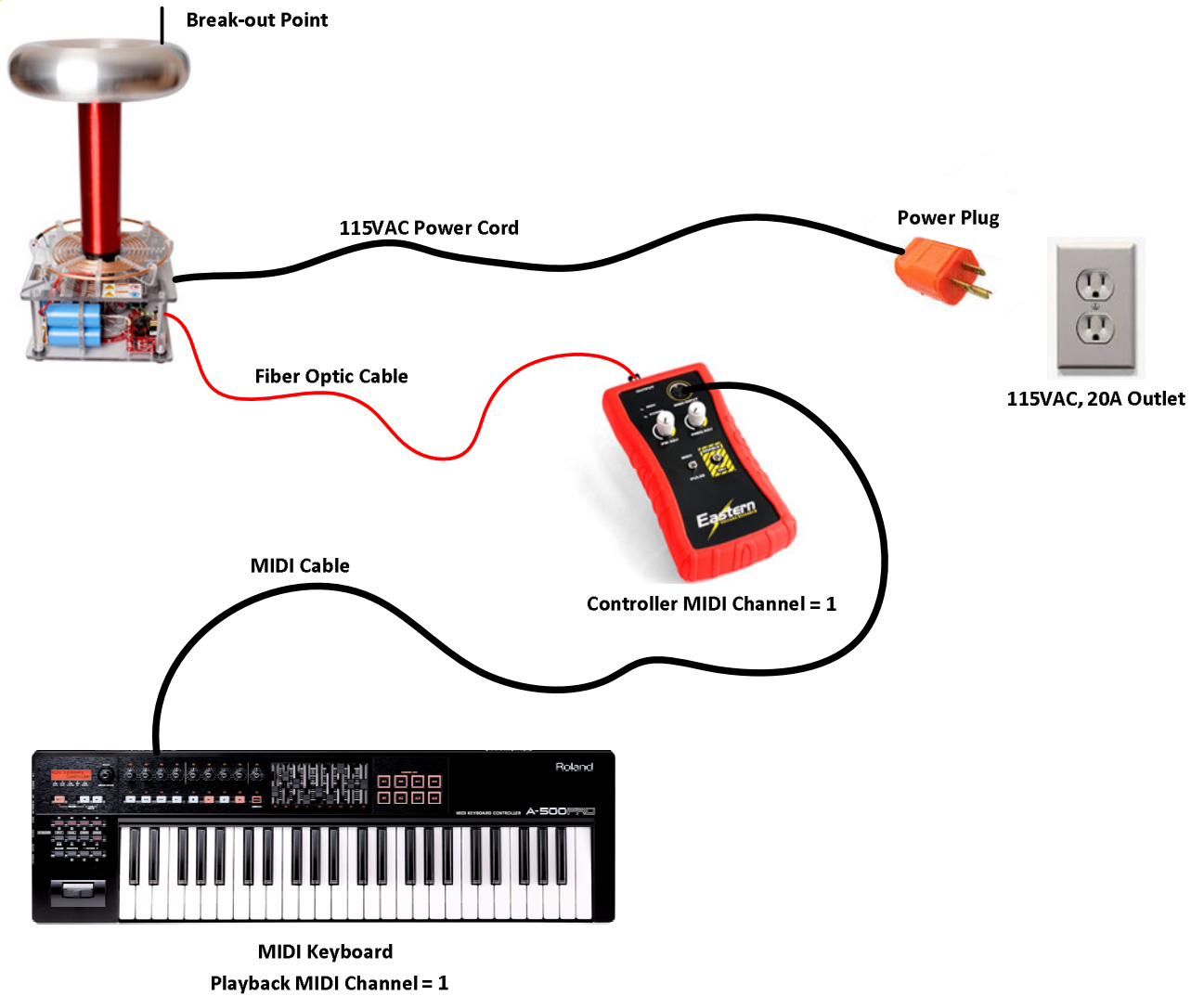(MIDI MODE operation)

Figure 4 – Plasmasonic DRSSTC Hook-up
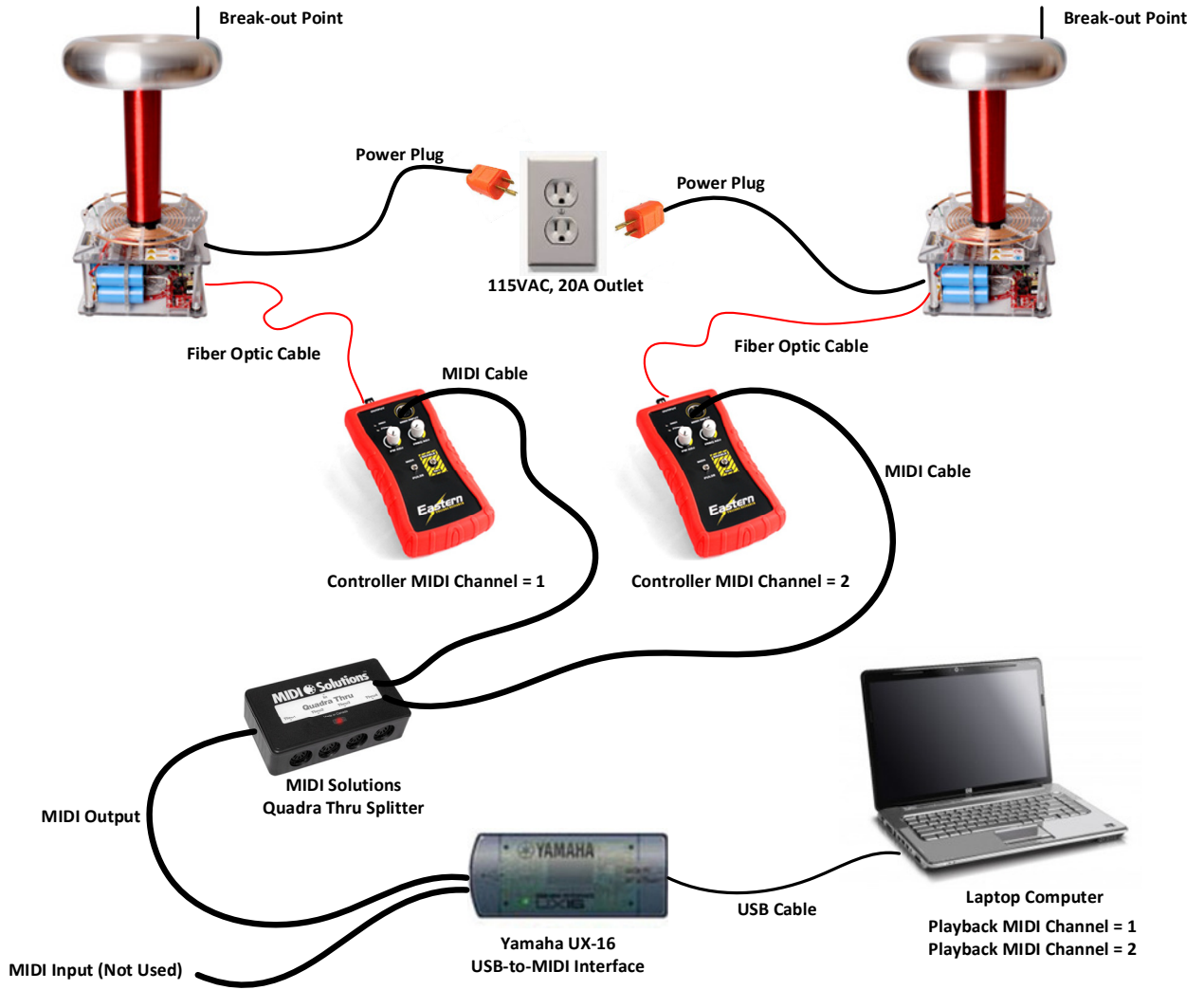(MIDI Mode operation with MIDI Instrument)

Figure 5 – Plasmasonic DRSSTC Hook-up
(Dual Coils MIDI Mode operation)

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Do NOT plug in the AC Power Cord at any time during the installation and assembly process of the Plasmasonic DRSSTC system!

☐   1. The first step in setting up your Plasmasonic DRSSTC system is to find a suitable area that is both safe, free of nearby obstacles and electrical / electronic equipment, and provides the minimum safe operation distance that operators and spectators must be away from the Tesla Coil during operation. Figure 6 below defines the minimum safe operating distances required for safe operation of the Plasmasonic DRSSTC system.

If using two Plasmasonic DRSSTC systems, then the minimum safe operating perimeter will overlap and apply to each of two Tesla Coils.

No Individuals within this perimeter!
No electronics within this perimeter!
No nearby objects within this perimeter!

Plasmasonic
Assembly

10 Ft Minimum

10 Ft Minimum

Power connect must be outside safety perimeter!

Controller must be outside safety perimeter!

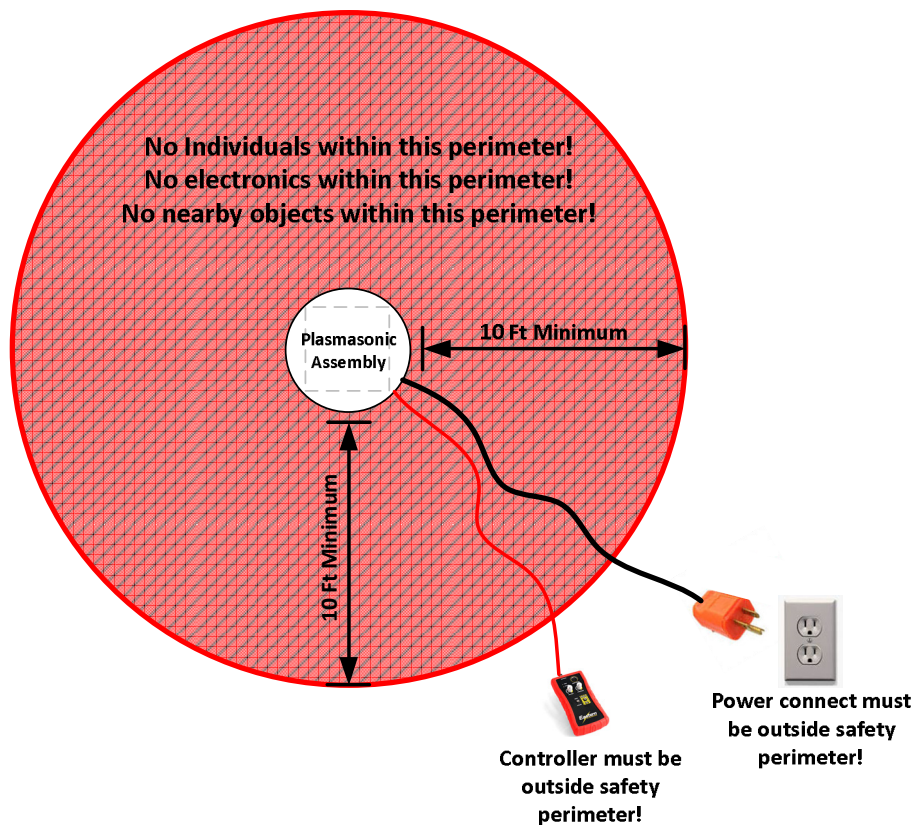Figure 6 – Minimum safe operating area

❒ 2. Connect the power cord to the terminals on the Power Distribution Board, as shown in Figure 7 below, labeled 115VAC, NEUTRAL, and GND. Connect the appropriate color wire to the terminal as shown below.

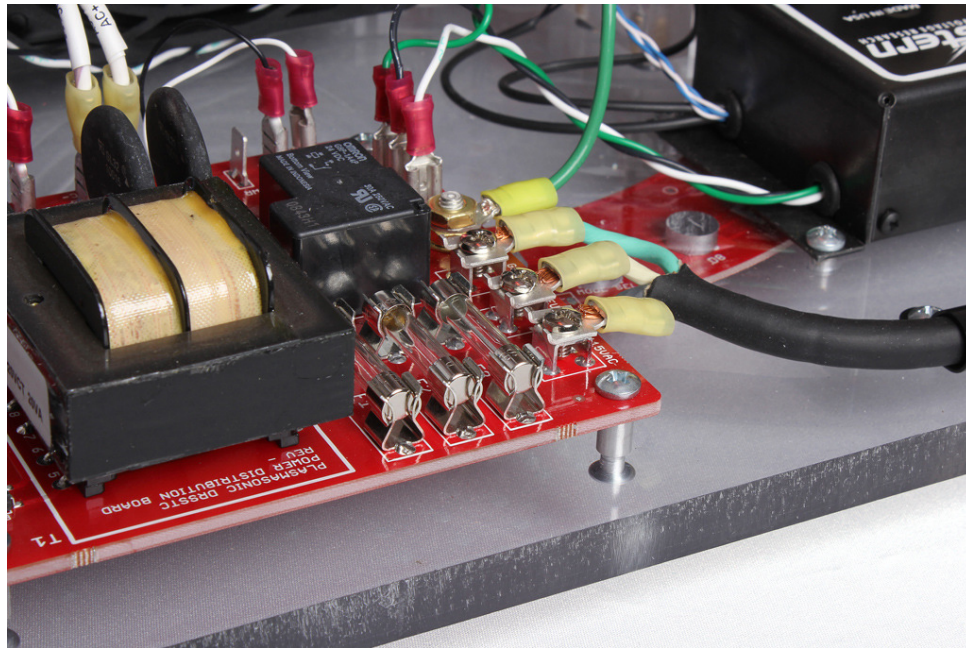| Power Cord Wire Color	Terminal
Black	115VAC
White	NEUTRAL
Green	GND

Figure 7 – Input Power Connections to Plasmasonic DRSSTC

❒ 3. Once the power cord is connected to the Power Distribution Board, please secure the power cord to the bottom base assembly using the provided two (2) cable clamps as shown above in Figure 7.

❒ 4. Check and ensure that all cables, wires, and connections are properly secured and connected among all the subassemblies within the system. You will be looking for any loose wires, connectors, or terminals that may have come undone during the shipping / handling process. You should be making this check EACH and EVERY time before you assemble and operate the Plasmasonic DRSSTC.

☐ 5. Install the secondary coil assembly to the top of the Plasmasonic base assembly. There are two mounting bolts and a secondary ground wire which must pass through their respective holes in the Plasmasonic base assembly. Secure the cecondary coil assembly to the top of the Plasmasonic base assembly using the provided ¼-20" nuts. DO NOT use nylon locknuts!

☐ 6. Connect the Secondary Coil Assembly ground wire to the heatsink GND terminal. There are two green wires that are attached to a single point via a hex screw on the heatsink. This is the heatsink GND terminal. Using the appropriate allen key or similar tool, unscrew this GND terminal screw, and connect the secondary coil ground wire to this point along with the two other green GND wires as shown in the photo below. Be sure that the three (3) ground wires are routed in a such a way that they do not come into close proximity with other high voltage or power wires in the base assembly. Do NOT overtighten this screw or you may stripped the aluminum threads in the heatsink!

Failure to properly ground the secondary coil will cause the Plasmasonic DRSSTC system to operate improperly and cause the system to fail.

☐ 7. Place the toroid on top of the secondary coil assembly. Secure the toroid with the provided nylon ¼-20 nut. Do NOT overtighten this nut. The mounting bolt is made from insulated fiberglass and may break if it is overtightened!

☐ 8. Using a 2-3" length piece of copper bus wire, create a break-out point as shown in Figure 8 below. Use either masking tape or adhesive aluminum tape to secure the copper bus wire to the toroid. <u>Do NOT use steel wire (i.e. paper clip, etc…) as a break-out point.</u> The steel wire will heat up excessively during operation and put a blemish on the toroid. Copper bus wire was provided as part of your kit. The leftmost configuration can be made by using a stiff piece of buswire or aluminum rod (i.e 0.062" thick) and secured using the nylon nut to hold in place. The rightmost configuration can be made by using a a short piece of buswire and securing to the top of the toroid using adhesive aluminum tape.
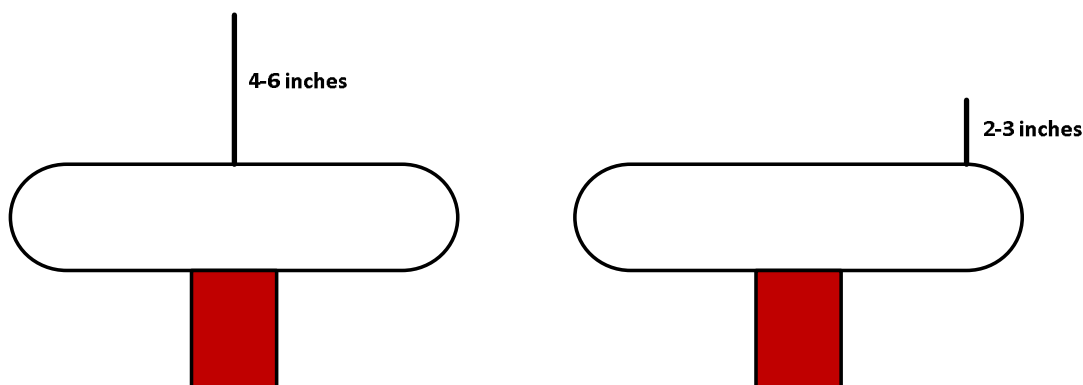
4-6 inches

2-3 inches

Figure 8 – Recommended break-out point configurations

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NEVER operate the Plasmasonic DRSSTC Tesla Coil without a break-out point installed. Failure due to use a break-out point may cause failure of the Plasmasonic DRSSTC Tesla Coil.

Note: The standard configuration provides an arc that propagates in a relatively vertical direction. We recommend this break-out point configuration for all operational scenarios including musical playback through the MIDI interface. As always, special care must be taken at all times to ensure that arcs do not contact the base of the assembly. A grounded strike rail above the primary coil is utilized to prevent arcs from striking the electronics in the lower base assembly, but this cannot be guaranteed. So anytime you start to see arcs striking close the bottom assembly, it is recommended that you adjust the position of the break-out point or add an external strike target to draw arcs away from the base assembly.

☐   9.   Plug in one end of the provided fiber optic cable to the input fiber optic connector of the Advanced Controller Unit as shown in the set-up figures above.

☐   10.   Plug in the other end of the fiber optic cable to the output fiber optic connector on the Handheld MIDI Controller Unit as shown in the set-up figures above.

☐   11.   Ensure that the primary wire output cable is properly and correctly attached to the point shown below in Figure 9 on the primary coil. Ensure the connection is tight. If the connection feels loose, please remove the wire from the primary coil, gently press the connector fingers together to allow a tighter fit, and replace the connection. <u>Do NOT use the Plasmasonic DRSSTC system if the fit of this connection is not tight or secure!</u>
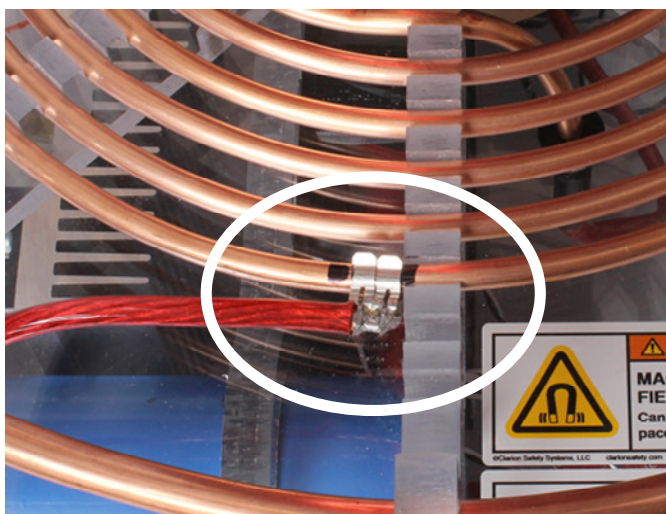
Figure 9 – Primary wire output cable attachment point

☐   12.   If you are planning to operate the Plasmasonic DRSSTC system in MIDI mode, please connect the MIDI devices to the Tesla Coil as shown in the figures above.

Congratulations! The Plasmasonic DRSSTC System is now assembled and ready for operation. Please review all the safety notes and warnings presented at the beginning of this manual again and be sure you understand each and every one before operating your Tesla Coil.

Operating Instructions – Pulse Mode

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**Please read and understand all safety instructions prior to operating your
Plasmasonic DRSSTC Musical Tesla Coil!**

☐   1.   Please read and understand all safety instructions prior to operating the Plasmasonic DRSSTC Musical Tesla Coil. This should be done EACH and EVERY time prior operating the Tesla Coil.

☐   2.   Be sure that all individuals in close proximity to the Plasmasonic system are wearing both safety glasses and hearing protection. If in a general audience setting, please announce to everyone to cover their ears with their hands at this time if they do not have readily available hearing protection.

☐   3. Verify that everyone is at a safe viewing distance away from the Plasmasonic system per the layout shown above in Figure 6.

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**At no time should anyone approach the Plasmasonic system while the unit is
plugged in and only approach the system after 5 minutes have passed once the
system is unplugged from the AC line power.**

☐   4. Set the Pulsewidth ADJ on the handheld controller to the minimum setting. This is done by turning the PW knob all the way to the left counterclockwise. The handheld controller should be OFF at this time.

☐   5. Set the Frequency ADJ on the handheld controller to the minimum setting. This is done by turning the PRF knob all the way to the left counterclockwise. The handheld controller should be OFF at this time.

☐   6. Switch the MODE switch to the PULSE position.

☐   7. Ensure the handheld controller power is OFF.

☐   8. Plug in the AC power cord to an appropriate 120VAC outlet which is rated for at least 20A. Again ensure that all individuals and pets are safely away from the Tesla Coil per the recommend safety layout shown above in Figure 6. Once the unit is plugged in, you should see the LED illumination turn on (if equipped) and the two (2) cooling fans should be operating. The LED on the power distribution board should be illuminated as are the two green STATUS LEDs on the Advanced Controller module.

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Please ensure that a non-GFCI outlet or circuit is utilized when operating the Plasmasonic DRSSTC system. This unit will not operate properly when using Ground Fault Circuit Interrupter (GFCI) outlets or circuit breakers.

☐   9. Once you have verified that LED illumination system is working, the STATUS LEDs on both the power distribution board and Advanced Controller are illuminated, and the fans are operating, you are ready to turn on the handheld controller.

☐   10. Turn the handheld controller power switch to ENABLE. You will see the POWER LED illuminate and the MIDI status LED flash several times showing the internal microprocessor is initializing. If the MIDI status LED continues to flash continuously, this means that the Pulswidth ADJ knob is not set to zero. This is a safety feature that prevents the system from operating as soon as the handheld controller is ENABLED.

☐   11. Now you are ready to begin operating the system. Verify again, that a break-out point is in position properly on the toroid and the handheld controller is initialized with the proper settings as shown above.

☐   12. Slowly turn up the PW knob until you hear a slight buzzing. This is the arc starting to form at the break-out point. Continue turning up the Pulsewidth ADJ knob until you start seeing arc output. Continue increasing the Pulsewidth ADJ knob until you get the desired length of output. Note, that there will be a point where arc length will no longer increase, the arcs themselves will begin to thicken as more average current is passing through each strike due to the increased pulsewidth output of the Tesla Coil. It is recommended to operate the coil at the smallest pulsewidth as possible to limit heating effects within the components in the system.

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If at anytime, you begin to see arcs striking the primary strike rail or close the bottom base assembly components, turn off the Plasmasonic system and reposition the break-out point or strike target to ensure that arcs do not strike the bottom base assembly components.

☐ 13. At this point, you can also start varying the Pulse Repetition Frequency, PRF, of the Tesla coil. As you increase the PRF using the Frequency ADJ knob on the handheld controller, you will hear an increase in frequency, and the amount of arcs produced per second will increase. The approximate range of the Frequency ADJ is 50 Hz through 250 Hz. We strongly recommend that for most applications, PRF is kept to 50% of less as higher PRFs will result in increased heating and stress of components and potentially reduce the overall reliability of the system.

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It is strongly recommended to operate your Plasmasonic at the lowest PW and PRF possible to achieve the desired effect you are looking for this. This will keep power consumption to a minimum, reduce heating of components, and ultimately increase the overall reliability of the system.

☐ 14. To turn off your Plasmasonic DRSSTC system, simply turn the Pulsewidth ADJ knob on the handheld controller all the way counterclockwise to the left to zero. The arc should completely disappear at this point.

☐ 15. Turn the handheld controller OFF by switching the enable switch to the OFF position.

☐   16.   Unplug and remove 120VAC input AC power from the Plasmasonic DRSSTC system.

Once 120VAC Input AC power is removed from the Plasmasonic system, wait AT LEAST FIVE (5) minutes before approaching or handling the unit. This will allow time for the energy storage capacitors on the unit to properly discharge to safe levels.

☐   17.   Wait at least five (5) minutes after the unit is unplugged before approaching or handling the Plasmasonic DRSSTC system. This ensures that the energy storage capacitors in the unit are safely discharged through the onboard bleed resistors which are located across each capacitor.

You have now successfully operated the Plasmasonic DRSSTC system in PULSE mode.

Operating Instructions – MIDI Mode

**Please read and understand all safety instructions prior to operating your
Plasmasonic DRSSTC Musical Tesla Coil!**

Prerequisites for MIDI Mode Operation

The following equipment and software is required prior to using your Plasmasonic
DRSSTC system in MIDI mode:

- MIDI Source – Laptop Computer (if using MIDI files for playback)
- MIDI Source – Keyboard with 5 pin standard DIN MIDI connector
- MIDI Cable
- MIDI Software (we recommend Anvil Studio Pro – available as free download)
- MIDI Files (we offer several free MIDI files available as a download on our
  website to get you started.)
- Yamaha UX-16 USB-to-MIDI interface (required if you are using a laptop to
  playback MIDI files)
- MIDI Solutions Quadra Thru Splitter (required if you plan to use dual channel
  outputs to drive two (2) or more Plasmasonic DRSSTC simultaneously)

Please note that the only device that we recommend as a USB-to-MIDI interface and a
MIDI splitter are the Yamaha UX-16 and MIDI Solutions Quadra Thru Splitter
respectively. We have not evaluated any other hardware at this time and only the devices
aforementioned are recognized by us as Plasmasonic DRSSTC compatible devices. The
use of any other devices must be done at your own risk.

Custom MIDI Channel

The handheld controller you received is set to MIDI Channel 1 as a default. If you wish
to have the handheld controller set to a different output channel, please contact us for
information at the following email address:

support@easternvoltageresearch.com

The only USB-to-MIDI device that we officially recognize as being compatible with the Plasmasonic DRSSTC system is the Yamaha UX-16. The use of any other MIDI interfaces is not recommended at this time and any use by those devices must be done at your own risk.

Please read and understand all safety instructions prior to operating your Plasmasonic DRSSTC Musical Tesla Coil!

☐ 1. Please read and understand all safety instructions prior to operating the Plasmasonic DRSSTC Musical Tesla Coil. This should be done EACH and EVERY time prior operating the Tesla Coil

☐ 2. Please assemble, inspect, and connect the Tesla Coil and MIDI musical devices and cables as shown in the Assembly Instructions section and figures above.

☐ 3. Be sure that all individuals in close proximity to the Plasmasonic system are wearing both safety glasses and hearing protection. If in a general audience setting, please announce to everyone to cover their ears with their hands at this time if they do not have readily available hearing protection.

☐ 4. Verify that everyone is at a safe viewing distance away from the Plasmasonic system per the layout shown above in Figure 6.

⚠

At no time should anyone approach the Plasmasonic system while the unit is plugged in and only approach the system after 5 minutes have passed once the system is unplugged from the AC line power.

☐ 5. Set the Pulsewidth ADJ on the handheld controller to the minimum setting. This is done by turning the PW knob all the way to the left counterclockwise. The handheld controller should be OFF at this time.

☐ 5. The Frequency ADJ knob on the handheld controller as no effect on MIDI operation, however we always recommend that this knob be turned to zero prior to powering up the handheld controller.

☐ 6. Switch the MODE switch to the MIDI position.

☐ 7. Ensure the handheld controller power is OFF.

☐ 8. Plug in the AC power cord to an appropriate 120VAC outlet which is rated for at least 20A. Again ensure that all individuals and pets are safely away from the Tesla Coil per the recommend safety layout shown above in Figure 6. Once the unit is plugged in, you should see the LED illumination turn on (if equipped) and the two (2) cooling fans should be operating. The LED on the power distribution board should be illuminated as are the two green STATUS LEDs on the Advanced Controller module.

⚠

Please ensure that a non-GFCI outlet or circuit is utilized when operating the Plasmasonic DRSSTC system. This unit will not operate properly when using Ground Fault Circuit Interrupter (GFCI) outlets or circuit breakers.

❒   9.   Once you have verified that LED illumination system is working, the STATUS LEDs on both the power distribution board and Advanced Controller are illuminated, and the fans are operating, you are ready to turn on the handheld controller.

❒   10.   Turn the handheld controller power switch to ENABLE. You will see the POWER LED illuminate and the MIDI status LED flash several times showing the internal microprocessor is initializing. If the MIDI status LED continues to flash continuously, this means that the Pulswidth ADJ knob is not set to zero. This is a safety feature that prevents the system from operating as soon as the handheld controller is ENABLED.

❒   11.   Now you are ready to begin operating the system. Verify again, that a break-out point is in position properly on the toroid and the handheld controller is initialized with the proper settings as shown above.

❒   12A.   (MIDI Keyboard) – If you have a keyboard set-up as the MIDI playback source, you should now be ready to start playing music using the keyboard. To start, first ensure that you have MIDI Channel 1 selected on the keyboard. If this is not done, you will not get any playback through the handheld controller as the handheld controller's default channel is set to MIDI Channel 1. With the Pulsewidth ADJ still set to zero, start pressing notes on the keyboard. You should see the MIDI Status LED blink everytime a note is pressed and released. If you are not seeing this, then it is likely that the keyboard is not set to the proper MIDI channel or you have a bad MIDI cable.

❒   12B.   (MIDI Keyboard) – Once you have verified that the MIDI Status LED is blinking when you are pressing keys on the keyboard, you are ready to start playing musical tones through the output arcs of the Tesla Coil. As you continue to press keys on the keyboard, start increasing the Pulsewidth ADJ knob on the handheld controller. The Pulsewidth ADJ controls the maximum output pulsewidth for each note being played back through the handheld controller. Continue playing notes on the keyboard and vary the Pulsewidth ADJ until you get an output arc length that is desirable.

CAUTION
If at any time, a note latches up, please turn the Pulsewidth ADJ knob to zero and turn off the Plasmasonic DRSSTC system as quickly as possible. Although a latch-up condition will not cause damage to your Tesla Coil, it is an abnormal operating condition and may blow the DC Bus power fuse. Please note that latch-up conditions are almost always a result of an interrupted MIDI stream from the originating MIDI source (i.e. keyboard) and is especially common with the lower priced economy MIDI keyboards – especially when multiple notes are being played at the same time. If you do find this to be a repeated issue, then it is strongly recommended to use a different MIDI keyboard or use a laptop computer using the recommended Yamaha UX-16 USB-to-MIDI interface.

☐ 13A. (Laptop Computer) – Once everything is connected, you have the MIDI playback software loaded, and an appropriate MIDI file opened, you are ready to start testing the MIDI connection to the handheld controller. To begin, first ensure that you have MIDI Channel 1 selected on your software playback program and that you have the proper MIDI device selected as an output. If MIDI Channel 1 is not selected, you will not get any playback through the handheld controller as the handheld controller's default channel is set to MIDI Channel 1. With the Pulsewidth ADJ still set to zero, start playing the MIDI file using your MIDI software. You should see the MIDI Status LED blink everytime a note is played. If you are not seeing this, then it is likely that the either the proper output device is not selected with your MIDI software program and/or the proper MIDI playback channel is not set. Troubleshoot the issue and do not continue until you can properly verify that the MIDI stream is getting sent to the handheld controller and being properly decoded.

☐ 13B. (Laptop Computer) – Once you have verified that the MIDI Status LED is blinking when you are playing back a MIDI file using the MIDI software program, you are ready to start playing musical tones through the output arcs of the Tesla Coil. As you continue to playback the MIDI file using the MIDI software, start increasing the Pulsewidth ADJ knob on the handheld controller. The Pulsewidth ADJ controls the maximum output pulsewidth for each note being played back through the handheld controller. Continue playing notes on the keyboard and vary the Pulsewidth ADJ until you get an output arc length that is desirable.

❒　　14. To turn off your Plasmasonic DRSSTC system, simply turn the Pulsewidth ADJ knob on the handheld controller all the way counterclockwise to the left to zero. The arc should completely disappear at this point.

❒　　15. Turn the handheld controller OFF by switching the enable switch to the OFF position.

❒　　16. Unplug and remove 120VAC input AC power from the Plasmasonic DRSSTC system.

Once 120VAC Input AC power is removed from the Plasmasonic system, wait AT LEAST FIVE (5) minutes before approaching or handling the unit. This will allow time for the energy storage capacitors on the unit to properly discharge to safe levels.

❒　　17. Wait at least five (5) minutes after the unit is unplugged before approaching or handling the Plasmasonic DRSSTC system. This ensures that the energy storage capacitors in the unit are safely discharged through the onboard bleed resistors which are located across each capacitor.

You have now successfully operated the Plasmasonic DRSSTC system in MIDI mode.

MIDI Mode Operation – Additional Information

The following paragraphs provide important additional information regarding the playback of MIDI based instruments using the Plasmasonic DRSSTC Musical Tesla Coil.

Recommended MIDI Playback / Editing Software

For playing MIDI files through a PC or MAC computer, we recommend using the Anvil Studio Pro MIDI software. This software is available as a free download from the internet. If you plan on editing MIDI files, we recommend purchasing the Anvil Studio Pro Combo Pack 1 which to date retails for $59.99 USD.

Recommended USB-to-MIDI Interface

When using a computer to playback MIDI files, we recommend using the Yamaha UX-16 USB-to-MIDI interface. Although other USB-to-MIDI interfaces may work satisfactorily, we have not evaluated any other interfaces, so we can only recommend this one specifically at this time.

Recommended MIDI Splitter

If using multiple Plasmasonic DRSSTC Tesla Coils in a demonstration set-up, you will need a proper MIDI splitter to split the single stream from the computer to multiple handheld controller units. For this purpose, we recommend the MIDI Solutions Quadra Thru 4-Way Splitter. This is a passive device that will split the incoming MIDI stream into four (4) identical output streams.

Recommended MIDI Keyboard

As there are literally thousands of different keyboards, synthesizers, and dedicated MIDI keyboards available on the market, we cannot recommend a single brand / model which is fully compatible with the Plasmasonic DRSSTC system. That said, we have found that many of the inexpensive MIDI keyboards found the market can pose problems in that they tend to lock-up or interrupt their respective output MIDI streams which in turn causes the handheld controller MIDI interface to lock-up. Our suggestion here is to simply try a few MIDI keyboards until you find satisfactory results, or simply use a laptop computer.

Using an IPAD as MIDI Playback Device

To date, we have learned that there are several IPAD to MIDI interfaces available on the market. Although these devices look promising, we have not yet tested the compatibility of those interfaces with the Plasmasonic DRSSTC system and cannot provide a recommendation.

Compatible MIDI Files

We have several examples of Plasmasonic compatiable MIDI files available as free downloads on our Plasmasonic DRSSTC ordering page on our website.

Creating MIDI Files

We will not cover the specifics of how to create and edit MIDI files for your Plasmasonic DRSSTC system here, but will cover some basics which should be followed when creating and editing your own MIDI files.

- Download MIDI Files from the internet – There are literally millions of them for almost any piece of music you can think of !
- Download Anvil Studio Pro and purchase the Combo Package 1 for $59.99. This will provide you a very inexpensive way of editing your own MIDI files. The free version of Anvil Studio Pro is also an alternative, but it is difficult as you can only view one channel at a time using the free version of the software package. (Please note that Eastern Voltage Research is in no way affiliated with Anvil Studio Pro and our recommendation is for convenience only.)
- If you are using a single Tesla Coil for playback, you will only want to use a single track of audio. For dual Tesla Coils, you will want to have two playback tracks – one for each MIDI channel.
- Use multiple notes sparingly. Although the handheld controller can decode and playback up to three (3) notes simultaneously, multiple notes does increase the power output and duty cycle of the system considerable and may blow the input fuse.
- Transpose the musical piece to the lowest frequency possible. Not only is lower frequencies more pleasing to the ear, it also reduces power consumption of the system and places less stress on all the components. High notes operate at relatively high duty cycles and place greater stress on the various components.
- If using dual channels, try keeping the high frequency or melody notes on one channel, and the bass tones on the other channel.
- When testing MIDI files, the best way is to test them first on the laptop computer. When ready to test them using a Plasmasonic, simply keep the Pulsewidth ADJ to a minimum (almost to the point where you can't even see an output arc, but still hear audio), just to hear the tones and hear that they are playing back properly.

Playback of MIDI Files – Special Considerations

When playing back MIDI files using your Plasmasonic DRSSTC system, please take into account the following considerations:

- When playing back MIDI files or using a MIDI keyboard, please keep the Pulsewidth ADJ setting to a minimum level to get the desired performance you are looking for. This is especially important with a MIDI piece that has many high frequency notes or multiple notes as high notes and multiple notes can greatly increase the power consumption of the system.
- If you find that your Tesla Coil suddenly stops working during the playback of a MIDI song, it is most likely due to a blown input fuse. Recognize that the playback of high notes and especially multiple notes will greatly increase power consumption of the Tesla Coil and may cause this fuse to blow. If the Tesla Coil does stop working, please follow the shutdown instructions as outlined in the previous instruction steps and inspect the fuse.
- The instantaneous playback of a single MIDI note, especially high frequency tones, can present a very high step load to the Tesla Coil and may cause a very high electrical gradient that may cause output arcs to occur between the secondary coil and primary coil / strike rail, or cause the output arcs to strike near the base of the Plasmasonic assembly. If this occurs, simply lower the Pulsewidth ADJ knob until this effect disappears or use a strike target. A strike target is simply a grounded object that the arcs can strike to as opposed to randomly flying through the air.

MIDI Playback Latch-up Issues

An issue that sometimes arises is one where during the playback of a MIDI instrument, a note will simply latch up and continue to play on the Plasmasonic DRSSTC system. To understand this issue, it is first important to understand the nature of how the MIDI output works. For each note played, there are two commands. One command is a NOTE ON command, while to release the note, a second NOTE OFF command is sent by the output MIDI device. We have found that with some MIDI keyboards, this stream can sometimes get disrupted when playing either very fast or by playing multiple notes. If this occurs, you can sometimes release the latched note by playing the same note again on the keyboard, or simply resetting the handheld controller. In either case, if you find this to be an issue that repeats itself frequency, we strongly recommend finding a higher quality MIDI playback instrument. Also, note that when using a computer to playback MIDI files, this problem practically never exists.

PLASMASONIC® Handheld MIDI Controller

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Please read this manual in its entirety before building, testing, or operating your Plasmasonic DRSSTC system.

Fiber Optic Output

MIDI Input Connector

MIDI Active LED

Frequency Adjust

Power LED

Pulsewidth Adj

Power Switch

Mode Select

Figure 10 – Handheld MIDI Controller Functions / Connectors

The Plasmasonic MIDI Handheld Controller is what is used to control the Plasmasonic Musical Tesla Coil System. The controller can operate in both a standard pulse operational mode as well as playback music using the high voltage arcs with the MIDI mode enabled. The following chart outlines the various controls and status LEDs that are present on the MIDI Handheld Controller:

Function	Type	Description
Power Switch	Toggle Switch	This switch turns the unit ON and OFF.
Mode Select	Toggle Switch	This switch selects between standard PULSE and MIDI output modes.
Pulsewidth ADJ	Potentiometer	This potentiometer controls the output pulsewidth of the modulator. In PULSE mode, it controls the output pulsewidth, while in MIDI mode, it controls the overall output power of the musical notes being played.
Frequency ADJ	Potentiometer	This potentiometer controls the output frequency of the modulator. In PULSE mode, it controls the output pulse repetition frequency, or PRF, of the output. This knob has no function in MIDI mode.
Power LED	Indicator Lamp	When the controller is turned ON, this LED will illuminate.
MIDI Active LED	Indicator Lamp	This LED will illuminate whenever a valid MIDI command is received by the controller from a valid MIDI source. This LED will also flash repeatedly if the controller is turned ON with the Pulsewidth ADJ knob set at a value greater than zero, or when the Mode Select switch is switched from MIDI to PULSE mode with the Pulsewidth ADJ knob set at a value greater than zero. In each of these two cases, the MIDI LED will continue to flash until the Pulsewidth ADJ is turned down to zero.
MIDI Input	Connector	This is a standard 5-pin DIN connector that connects to a MIDI source.
Fiber Optic Output	Connector	This is a ST type fiber optic connector that connects the output of the controller to the Advanced Controller unit on the Plasmasonic DRSSTC system.

General Operation of the Plasmasonic MIDI Handheld Controller

Operation of the Plasmasonic MIDI Handheld Controller is straightforward and simple. Please use the following instructions below when operating and/or adjusting the output on your controller.

Battery Installation

Open the rear battery compartment of the unit and install a standard 9V alkaline battery. It is very important to ensure that a fresh 9V battery be used everytime the controller is operated. A 9V battery that is almost depleted will not have enough output voltage or current capability to properly drive the fiber optic output.

Powering up the Controller

The first step prior to powering up the controller is to ensure that the Pulsewidth ADJ and Frequency ADJ are set to zero (their leftmost positions.) This ensures that the Tesla Coil isn't turned on to a high power state. To turn the controller, simply turn the power switch to the ENABLE position. When you turn the controller ON, the Power LED will illuminate. Once the controller is turned ON, you will notice that the MIDI LED will begin flashing for a couple of seconds. This is normal and is indicating the microprocessor is initializing and working properly. If the MIDI LED continues to flash after two seconds, then this indicating that the Pulsewidth ADJ has not been set to zero and operation is locked out. Simply turn the Pulsewidth ADJ to zero and this bring the controller to a ready state.

Pulse Mode Operation

This mode of operation provides a standard pulse interrupter action. The output of the controller is a low duty cycle pulse which has a pulsewidth and pulse repetition frequency (PRF) that can be varied in real time by the user. In this mode of operation, the Pulsewidth ADJ knob adjusts the output pulsewidth, and thus output power, of the Plasmasonic DRSSTC system, while the Frequency ADJ knob controls the output pulse repetition frequency (PRF), and thus duty cycle, of the Plasmasonic DRSSTC system.

Please note, to ensure low term reliability of your Plasmasonic DRSSTC system, we strongly recommend using only the lowest pulsewidth and frequency settings necessary to achieve the desired output effect you are looking for. The higher the pulsewidth and frequency are, the more stress, both electrically and thermally, are placed on the various components of the Plasmasonic DRSSTC system.

MIDI Mode Operation

This mode of operation will take an incoming MIDI data stream and convert it to an output pulse of the appropriate musical frequency of the note being read in the MIDI data stream and output it to the Plasmasonic DRSSTC Tesla Coil and thus produce an output arc that has the frequency of that particular musical note. The controller MIDI interface supports polyphonic reproduction therefore can produce up to 3 notes at a single time.

Operating Instructions – RGB Illumination System

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NEVER attempt to adjust the settings of the RGB Illumination System while the DC bus power supply fuse is installed and AC line power is connected to the DC Bus capacitors!

The RGB LED illumination system provides a large number of illuminations for lighting up the Plasmasonic DRSSTC system. This includes a wide number of different color modes, flashing modes, slow cyclic modes, strobe modes, and steady state illumination mode.

Because the RGB LED illumination system is tied in with the same AC input power that provides power to the other components in the system, adjusting the modes of the RGB LED illumination system must only be made with the DC bus power supply disconnected. The ensures that the system is completely disabled and allows the user to safely adjust the operational modes of the RGB LED illumination system. The following instructions describe how to safely disconnect the DC bus power supply from the AC input line power and to safely adjust the RGB LED illumination system.

❒ 1. Remove the 120VAC AC Input power from the Plasmasonic DRSSTC system by unplugging the AC power cord.

❒ 2. Wait at least 5 minutes to ensure that all energy storage capacitors have properly been discharged by the safety bleed resistors.

☐   3. Once power has been removed and have waited at least five minutes to allow the energy storage capacitors to be discharged through the bleeder resistors, please remove the 20A power fuse which is installed in the F3 location on the Power Distribution board as shown below in Figure 11.
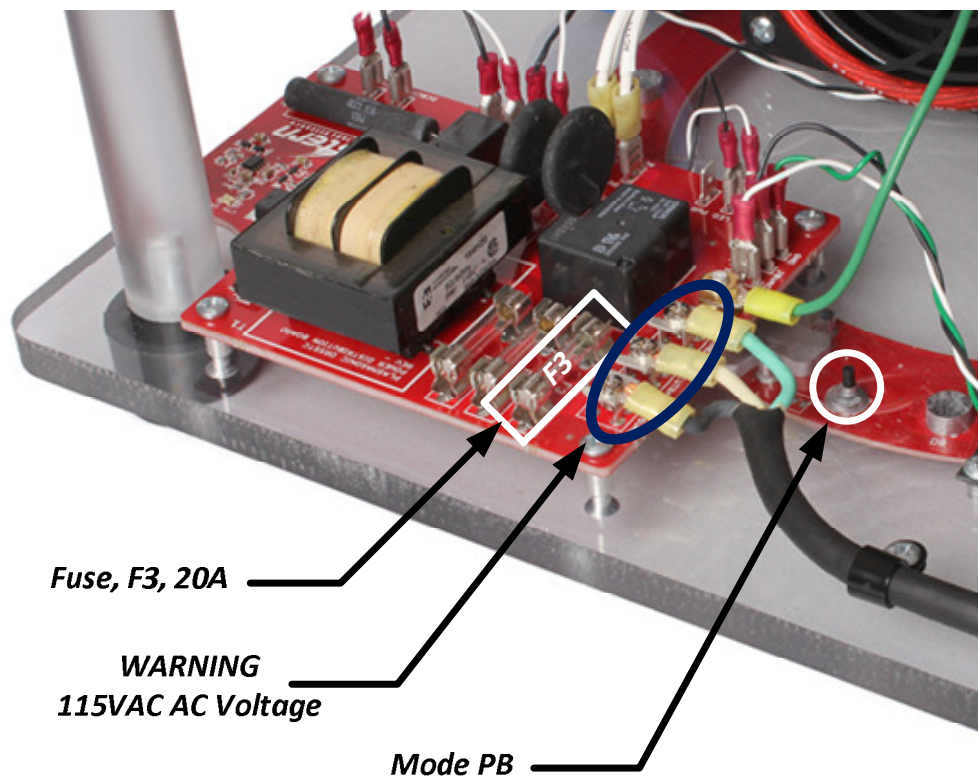

Fuse, F3, 20A

WARNING
115VAC AC Voltage

Mode PB

Figure 11 – RGB LED Illumination board adjust set-up

☐   4. Disconnect the primary connector as shown below in Figure 12. This will ensure that the output of the Tesla Coil is completely disabled.
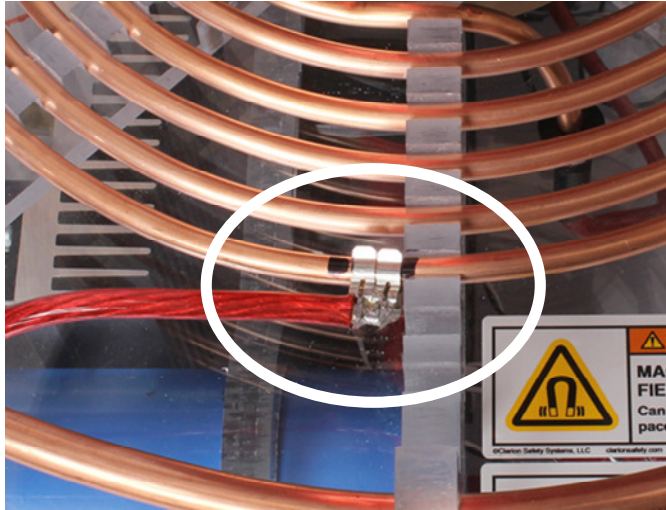
Figure 12 – Primary connector disconnection

☐   5. Visually verify that the Fuse, F3 is removed from the Power Distribution board.

☐   6. Visually verify that the primary connector as shown above in Figure 12 is disconnected.

☐   7. Now you are ready to adjust the RGB LED Illumination system. Plug in the 115VAC power cord. The fans and the RGB LED illumination should be operating and you should also see the STATUS LEDs on the advanced control module illuminated. Please read the warning below before proceeding.

CAUTION
When adjusting the RGB LED Illumination system using the onboard MODE selection pushbutton, be aware that there is exposed 115VAC input voltage at the input terminals to the Power Distribution board. Be sure to avoid this area with your hand when making any adjustments using the MODE selection pushbutton.

☐   8.   The RGB LED Illumination board has a single MODE pushbutton which allows the user to control the operation of the illumination and to select the various illumination modes.   The table below summarizes the functions of the MODE select pushbutton.   Use the pushbutton as required to make the illumination changes you require. Please note, that any changes you make will be stored in a non-volatile memory that will be remembered the next time the unit is powered up.

Function	Pushbutton Action	Description
Illumination Mode Change	Double PB Press	Pressing the pushbutton two quick times in succession will cause the illumination mode to cycle to the next mode of operation.
Pause Animation	Single PB Press	Pressing the pushbutton once will cause the illumination animation to pause. Pressing the pushbutton once again will unpause the animation.
Turn OFF Illumination	Hold PB for 2 seconds	If the illumination is active, holding the pushbutton for approx. 2 seconds will turn the illumination OFF.
Turn ON Illumination	Hold PB for 2 seconds	If the illumination is off, holding the pushbutton for approx.. 2 seconds will turn the illumination ON.

The following table lists all the available illumination modes. Please note that we can provide custom programming of whatever illumination modes you desire. Please contact us for more information regarding custom programming of your RGB LED Illumination system.

Mode Number	Colors	Description
1	Red	Pulsating ON / OFF – Slow
2	Red	Pulsating ON / OFF – Fast
3	Green	Pulsating ON / OFF – Slow
4	Green	Pulsating ON / OFF – Fast
5	Blue	Pulsating ON / OFF – Slow
6	Blue	Pulsating ON / OFF – Fast
7	White	Pulsating ON / OFF – Slow
8	White	Pulsating ON / OFF – Fast
9	White	Steady – 100% Brightness
10	White	Steady – 66% Brightness
11	White	Steady – 33% Brightness
12	Red	Steady
13	Green	Steady
14	Blue	Steady
15	Yellow	Steady
16	Magenta	Steady
17	Cyan	Steady
18	Infinite Colors	Slow cycling through all RGB Colors (Pattern 2)
19	Infinite Colors	Slow cycling through all RGB Colors (Pattern 2)
20	Red, Green, Blue	Strobe – Fast
21	Red, Green, Blue	Strobe – Medium
22	Red, Green, Blue	Strobe - Slow
23	Red	Strobe – Fast
24	White	Strobe – Fast
25	Police Strobe – Red / Blue	Strobe – Fast
26	Police Strobe – Red / Blue	Strobe - Slow

☐   9. Once the illumination is selected, you are now ready to re-assembly the system back to its original operating state. At this time, unplug the 115VAC AC input power from the outlet.

☐   10. Reconnect the primary coil connector as shown in Figure x above.

☐   11. Re-install the 20A fuse in the F3 location on the Power Distribution board.

☐   12. Re-inspect both the primary coil connector to ensure that it properly and tightly connected. Verify that the 20A fuse is re-installed.

The RGB LED Illumination adjustment procedure is now completed.

Custom LED RGB Illumination Modes

Eastern Voltage Research can provide you with any number of custom programmed illumination modes for your Plasmasonic DRSSTC system. We can program any color combination, flash mode, strobe mode, pulsating mode that one can think of. If you are interested in obtaining a custom programmed illumination chip, please contact us at:

sales@easternvoltageresearch.com

Plasmasonic Reliability Information

The following table outlines a variety of different tips and methods to maximum the reliability and longevity of your Plasmasonic DRSSTC system:

Tip / Method	Description
Minimize Pulsewidth	Operate your Tesla Coil using the lowest Pulsewidth ADJ setting possible to achieve the desired effect you are looking for. Note that after a certain value, arc length will not increase more with increased Pulswidth ADJ and will only increase power consumption of the system. Longer pulsewidths will increase the stress of components with the system and potentially reduce long term reliability.
Minimize Frequency	Operate your Tesla Coil using the lowest Frequency ADJ setting possible to achieve the desired effect you are looking for. Note, that Frequency ADJ will not increase the overall length of the output arc after about 50% adjustment and will only increase the operational duty cycle and power consumption of the Tesla Coil which increases the overall stress on components within the system. Increasing the Frequency ADJ past 50% greatly increases overall power consumption and should be used infrequently if long term reliability is required.
MIDI Playback – Minimize High Notes	High frequency notes have the same effect as turning up the Frequency ADJ knob and will greatly increase duty cycle and overall power consumption. It is recommended to use high notes as sparingly as possible and if using a lot of high notes to reduce the Pulsewidth ADJ to a minimum.
MIDI Playback – Minimize Muliple Notes	Multiple note playback will greatly increase the duty cycle and power consumption of the Tesla Coil. It is recommended to use as minimum a Pulsewidth ADJ setting as possible when playing back multiple notes to maximize long term reliability.

High Ambient Temperature	If ambient temperatures are higher than 70degF, especially outside during hot summer days, it is recommended to keep runtimes to a minimum. This is especially important if the coil is placed on asphalt where surface temperatures could exceed 120degF on a hot sunny summer day.
Runtimes	Runtimes should minimized if long term reliability is desired. We recommend keeping run times to a minimum (several minutes at most) with cool down periods in between.
Operational Duty Cycle	Please note that the Plasmasonic system is not designed to be operated in a continuous fashion. It is designed for light duty demonstration purposes only. To maximum reliability, we recommend a 25% ON / OFF duty cycle with a maximum ON time of 2 minutes followed by 6 minutes of off (fans still enabled for cooling)

Plasmasonic Operational Duty Cycle

Please note that the Plasmasonic DRSSTC System is classified as a light-duty demonstrational unit only. It is not intended for continuous operation or for exhibit or performance use where long duration operational times are required. Our general recommendation for light demonstration use is a two minute demonstration followed by at least a 5 minute OFF period where the fans are still operating to cool down components. The main component that limits continuous operation is the primary coil itself. To design a coil that is capable of continuous operation given the size and power output of this particular coil, would require a water cooled primary. However, adding a water cooled primary coil to this unit would greatly increase the cost, size, and complexity of the unit.

Troubleshooting Guide

Please use the following table to troubleshoot simple issues with the Plasmasonic DRSSTC system.

Issue	Solution
Handheld Controller – MIDI Status LED constantly flashes	Turn the Pulsewidth ADJ knob to zero. This condition is caused by a safety routine which ensures that the handheld controller will never turn on into a condition where it will output arcs. Upon power-up, the handheld controller will also default to zero pulsewidth output and if the Pulsewidth ADJ knob is not set to zero, it will be disabled until the knob is set to zero.
Handheld Controller – MIDI Status LED does not flash or detect incoming MIDI streams	Verify that the proper channel is set in your MIDI instrument or MIDI software. By default, the handheld controllers are shipped with the MIDI channel set to Channel 1.
Handheld Controller – Power LED does not illuminate when turned ON	Battery is likely bad. Please replace with an appropriate 9V alkaline battery.
Handheld Controller – MIDI LED does not flash when powered up	If the MIDI Status LED does not flash when the handheld controller is turned ON, then it could potentially be a microcontroller issue. Please contact Eastern Voltage Research support for additional assistance.

User Serviceable Assemblies

Please note that there are no user serviceable assemblies on the Plasmasonic DRSSTC Musical Tesla Coil System. Any tampering or modification of any of the subassemblies within the Plasmasonic DRSSTC system including the Handheld MIDI Controller will void any and all warranties.

Eastern Voltage Research reserves the right to refuse technical support for any equipment that has been modified or tampered with by the end user.

Technical Support

For all technical support issues, please contact us at the following email address:

support@easternvoltageresearch.com

Training / Field Support

Eastern Voltage Research can provide hands-on training and field support for the Plasmasonic DRSSTC Musical Tesla Coils. For more information, including quotes, please contact us at the following email address:

sales@easternvoltageresearch.com