

Solenoid Kite Generator Operation Manual

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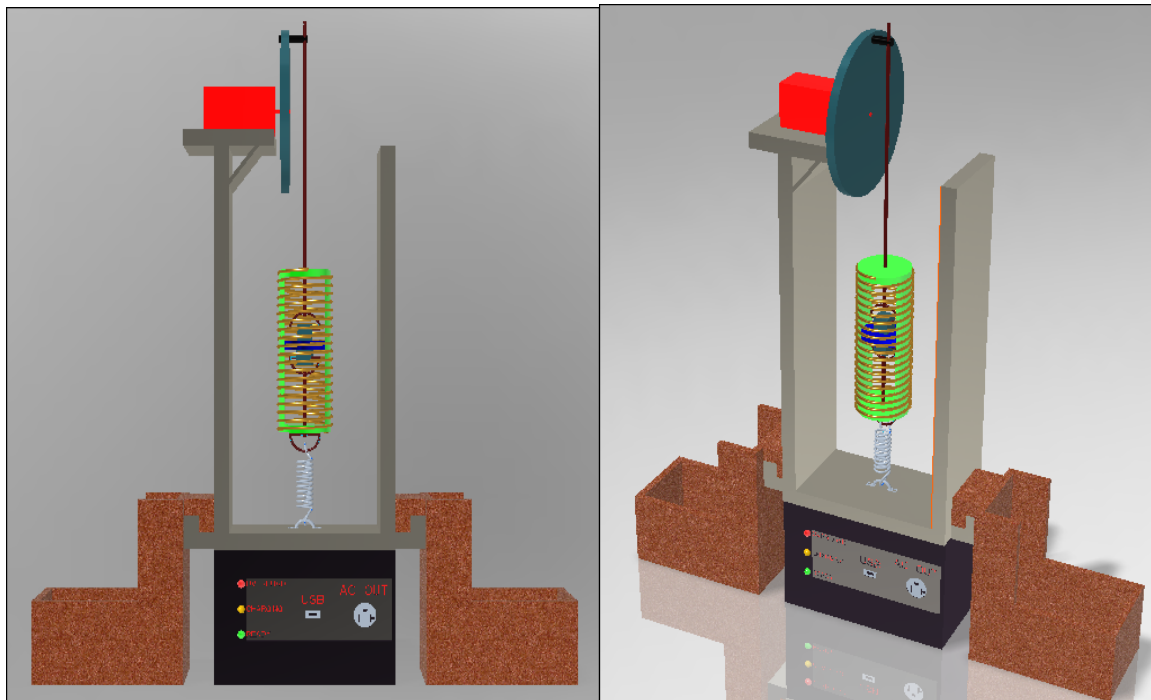
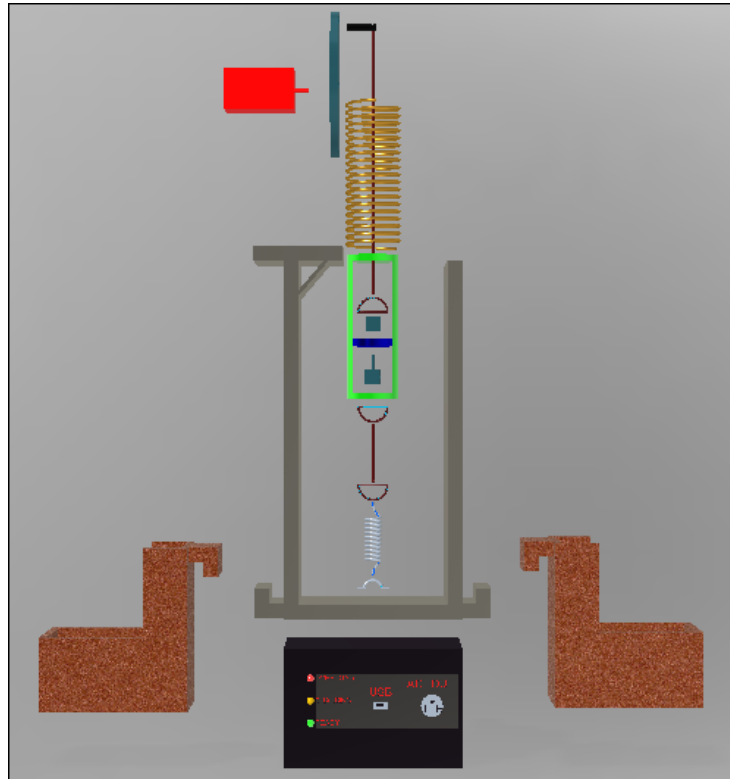


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System Overview

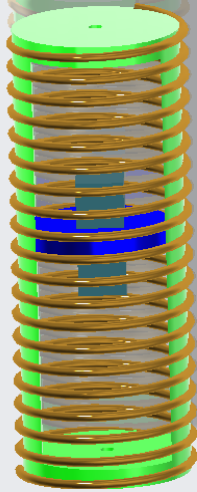
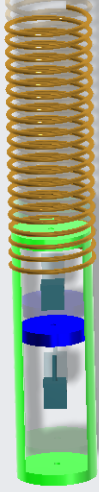

The Solenoid Kite Generator aims to harness the free energy of the wind into useful electrical power. A kite moving back and forth in the wind moves a magnet connected to a kite by a tether. The magnet moves inside of the solenoid which creates an electrical charge in the copper wire. The electrical charge is then used for powering machines and electrical devices. Depending on the size of the Solenoid Kite Generator, the entire system may act either as a portable or base power system. The Solenoid Kite Generator and all of its subsystems will be sized and produced based off of the power generation needs of the customer. With the Solenoid Kite Generator still in its early prototype phase, only the portable power sub-system will be included for this operation manual. It should be noted that in the place of the kite, a variable speed motor will be installed on the power subsystem to move the magnet inside of the solenoid. Before operation of the Solenoid Kite Generator begins, it is important for the consumer to review the entire operation manual. The user should verify that all necessary parts have been included and are properly sized from the manufacturer. The user should additionally familiarize themselves with system configuration, operation, safety information and storage. Failure to do so may result in a system malfunction which may lead to part failure or personal injury which the design team will not be liable for. In the event that the user has questions or concerns about the product, please contact the design team through the “Our Team” tab found on the following link or through the mailing address listed underneath.


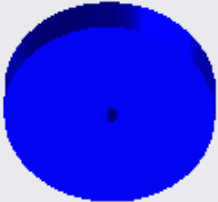
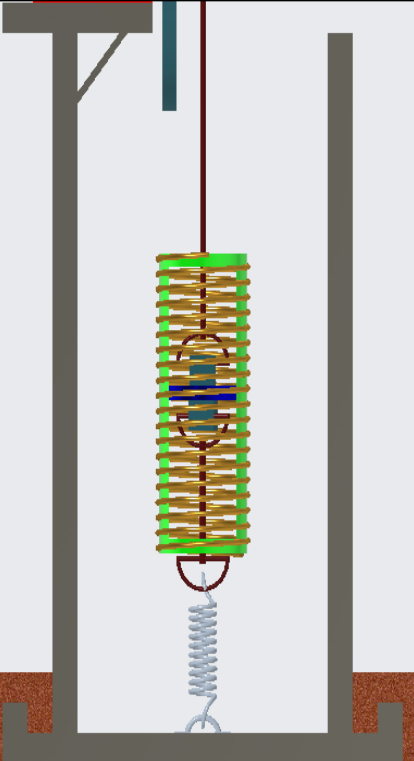

https://ww2.eng.famu.fsu.edu/me/senior_design/2018/team16/Our%20Team.html

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Part List

The Solenoid Kite Generator comes in variable sizes depending on the desired power output requested by the customer and the location of use. All parts are dependently sized off of each other. It is necessary for the user to verify that all parts will only be used for their designed Solenoid Power Generator. Since most Solenoid Kite Generators are uniquely designed, an identifying mark given by the customer will be placed upon each part so as to classify which parts are to be used by the respective solenoid power generator. As touched on before, only the parts for the Portable Solenoid Kite Generator Power subsystem will be included. The Portable Solenoid Kite Generator Power subsystem is composed from the following pre-manufactured parts:

1 Custom Solenoid Power Generator				
3 Return springs				

<p>1 DC Motor</p>			
<p>1 Custom permanent magnet disc</p>			
<p>1 Custom solenoid power subsystem housing</p>			
<ul style="list-style-type: none">• 1 Motor flywheel			

• 1 Return spring linkage	
• 1 Multimeter	
• 1 Custom spring housing	

Upon receipt of the Portable Solenoid Kite Generator, the customer should inspect all parts received to make sure all parts are intact and safe for operation. In the event that the delivered parts have been damaged through no fault of the consumer and as a result of one or more of the following:

- Shipping & handling
- Manufacturer Negligence
- Part Failure

The customer will be entitled to free replacement of said part. If there are any questions or concerns about the parts of the Solenoid Kite Generator, please contact the design team through any of the mediums found under the [System Overview](#) section if applicable.

Safety Information

In order to ensure proper operation of the Solenoid Kite Generator, several safety concerns will be addressed to the consumer. Since there is potential for exposure to high electrical voltages and current, the user should consult and follow electrical safety standards set forth by Occupational Safety and Health Administration (OSHA). The user should also follow the safety procedures for low-powered DC Motor equipment from OSHA. All of necessary national standards can be found on OSHA's website below:

www.osha.com

In addition to the national safety standards set forth by OSHA, federal, state, and local governments the Solenoid Kite Generator design team has provided a list of procedures to avoid injury or death.

- Do not touch the copper wire while the DC Motor is operating
- Do not touch the copper wire for 2 minutes after the DC Motor is disconnected
- Do not touch the motor drive-shaft while the DC Motor is operating
- Do not touch the flywheel linkage while the DC Motor is operating

For proper system setup and operation please refer to the [Assembly](#), [Clean up & Storage](#), and [Troubleshooting](#) sections. Below is a table of general specifications for the Solenoid Kite Generator. Components and their values are determined by the needed output power requested by the consumer.

Operation:

Since the Solenoid Kite Generator is still its prototype phase, the Solenoid Kite Generator Power Subsystem is to be operated inside a closed building or outside in favorable weather conditions (no rain/snow). Operation of the Solenoid Kite Generator Prototype should not surpass more than 5 consecutive minutes and should rest for a minimum of 2 minutes between uses. This allows the solenoid to dissipate its voltage and heat.

Solenoid Kite Generator Power Subsystem Prototype Specifications	
Wraps per layer	17
Layers	4
Total Wraps	68
Magnet Strength	1.32 Tesla
Max Voltage	XXX Volts
Max Current	XXX Amps

Power Subsystem Configuration

Assembly

Carefully read and gather all of the parts found under the *Part List*. Before every assembly and reassembly of the Solenoid Kite Generator, the user should carefully inspect each part to ensure that there are no visible defects and that it belongs to its proper Solenoid Kite Generator. Once all parts are found to be of safe condition, the user can then begin assembly. Please follow the steps listed below to ensure proper assembly of the Solenoid Kite Generator.

1. Place Custom Solenoid Power Subsystem Housing on a flat, stable surface
2. Select spring for experimental solenoid output power
3. Attach one hook of the spring to the eye hook found on Custom Solenoid Power Subsystem Housing
4. Attach the other spring hook to the bottom of the return spring linkage
5. Attach the top end of the return spring linkage to the bottom half of the base of the permanent disc magnet

6. Attach the base of the flywheel crank-slider return linkage to the top half of permanent disc magnet
7. Set complete system linkage aside
8. Attach and fix the custom spring housing to the custom copper wire wrapped solenoid
9. While holding the complete system linkage vertically, carefully slide the fixed custom spring housing and custom copper wire wrapped solenoid over the complete linkage
10. Once inside, fix the custom solenoid and spring housing to the custom solenoid power subsystem housing through the designed extrusion
11. Once the solenoid and spring housing are fixed, Let go of the complete linkage once making sure that the full linkage is sitting within reach
12. Attach and secure the DC motor to the top baseplate of the Custom Solenoid Power Subsystem Housing, making sure that the end of the drive shaft is directly above the center of the custom copper wire wrapped solenoid
13. Attach and fix the flywheel to the motor driveshaft
14. Grab the linkage inside of the solenoid and attach it to the flywheel
15. Fix DC motor to its supporting baseplate
16. Using unattached wire, connect the positive and negative wire terminals to the respective nodes of the DC Motor

How to turn the system on/off

- 1) Make sure Solenoid Power Generator has followed the steps in the **Assembly** connection.
- 2) Check and secure all linkages, pins and their connections
- 3) Connect the negative terminal lead of battery connection wire
- 4) Connect the positive terminal lead of battery connection wire
- 5) Plug in battery to connection wire slot
- 6) D/C motor will begin to rotate
- 7) Remove battery to terminate the rotation of the motor

In the event that the listed Assembly and How to turn on/off the system sections and their steps are not properly administered, the design team will not be held liable for any malfunction or injury witnessed as a result. If there are any questions or concerns about the assembly of the Solenoid Kite Generator, please contact the design team through any of the mediums found under the System Overview section if applicable.

Recording Data

It's recommended that the consumer/operator utilize a multimeter that is capable of real time data recording for the most accurate analysis.

- 1) Place Multimeter near the edge of the Solenoid Housing Baseplate
- 2) Select parameter(s) to be examined
- 3) Connect the positive(red) and negative(black) wire terminals to Multimeter

- 4) Attach negative and positive node clips of multimeter to solenoid wires
note it does not matter which nodes are connected to each other, the multimeter will just report a negative value
- 5) If Multimeter with cannot record real time data, please use one of the following setups to record data:
 - a) Videotape multimeter over specified time period
 - b) Record data manually over specified time period
- 6) Turn on DC Motor
- 7) Allow motor and system to reach constant experimental speed
- 8) Begin data recording of Multimeter over specified time period
- 9) Record Multimeter value for specified time period
More frequent recordings result in more accurate data gathered
- 10) Disconnect Motor
- 11) Allow Solenoid and Multimeter to dissipate charge for 2 minutes
- 12) If measuring other electrical components, repeat steps 2-11
- 13) If data collected is sufficient, please proceed to the Clean Up & Storage section

Clean Up & Storage

Carefully read through all steps before disassembling the Solenoid Power Generator. Once disassembly is complete, store components of Solenoid Power Generator in a cool, dry area. It is recommended to keep the packaging for storage as needed.

- 1) Remove the flywheel from the linkage attached to the solenoid
- 2) Remove flywheel from motor drive shaft and set aside
- 3) Remove the DC motor from the top baseplate of the Custom Solenoid Power Subsystem Housing and set aside
- 4) While holding the complete system linkage vertically, carefully slide the linkage out from the fixed custom spring housing and custom copper wire wrapped solenoid
- 5) Remove the solenoid from the spring housing and set aside
- 6) Detach the base of the flywheel crank-slider return linkage from the top half of permanent disc magnet
- 7) Detach the top end of the return spring linkage from the bottom half of the base of the permanent disc magnet
- 8) Detach spring hook from the bottom of the return spring linkage
- 9) Detach the other hook of the spring from the eye hook of the Custom Solenoid Power Subsystem Housing

Troubleshooting

During the use of this device, if problems occur, refer to this section of the operation manual for common questions and issues.

- My system is not reading the correct data

- Ensure that the negative and positive ends of the multimeter have a good connection with the solenoid wires.
- My solenoid simulation is not cycling properly
 - The D/C motor must be tightly secured to the solenoid shaft, or unbalanced motion and vibration will occur causing the solenoid to be not run smoothly
- My solenoid has too little resistance for the velocity I want to simulate so the magnet is going too far in the housing
 - Exchange the springs for a higher spring coefficient spring to for more resistance

These are a few troubleshooting tips that may commonly occur. These are not necessarily problems, more just fine tuning the systems for your specific use.