



## Course Information Letter ---- G533

# (GE) STATIC SCT-PPT EXCITATION SYSTEMS

G533

GE Static Excitation System reliability and availability can be a matter of skilled routine maintenance activity and proficient troubleshooting capability. Proficient troubleshooting is greatly aided by a solid operational understanding of the excitation system.

This course gives technicians and engineers the necessary knowledge to maintain, repair and calibrate GE Static Excitation System by:

1. Using effective routine maintenance practices.
2. Knowing what checks may be performed on-line and how to perform these checks without causing an equipment shutdown.
3. Increasing the likelihood of accurate problem diagnosis by thoroughly understanding how the equipment operates.
4. Increasing the likelihood of accurate problem diagnosis by understanding any given board's impact upon operations; ie., quickly linking the symptom(s) to the faulty board.
5. Verifying a suspected faulty board by analyzing voltage levels and/or signal traces.
6. Understanding the necessary calibrations, after the faulty part has been replaced, including how the calibrations are performed.

**Topical Outline** includes: Overview of generator controls function, Major Components, DC Regulator, Firing Circuits, AC Regulator, Relaying and Control Circuits, SCR, Routine Maintenance, Troubleshooting and Repair.

HPC's Excitation System course makes heavy use of prints, on which the participants are encouraged to take notes. This provides a valuable reference for future use. In addition, the student manuals contain a complete description of the excitation system operation.

## OBJECTIVES

Upon successful completion of this course the participant will be able to:

1. Discuss how an excitation system accomplishes voltage and VAR control.
2. Discuss the primary and secondary roles of an excitation system.
3. Discuss the major excitation system components, including limit and protective features.
4. Discuss the purpose and operation of the Power Potential Transformer (PPT).
5. Discuss the purpose and operation of the Saturable Current Transformers (SCTs).
6. Discuss the role of the linear reactors.
7. Discuss the purpose and operation of the DC Regulator, including voltage/signal levels.
8. Discuss the purpose and operation of the AC Voltage Regulator, including voltage/signal levels.
9. Discuss the purpose and operation of the Power Rectifier Bridge, Discuss the purpose and operation of the Firing Controls, Underexcited Reactive Ampere Limit (URAL), Reactive Current Compensator (RCC), Overexcitation Protection Circuit, Transfer & Tracking Circuit, Volts Per Hertz (V/Hz) Protection Circuit, Field Flash Circuit.
10. With the use of prints, trace a given signal change through the excitation system.
11. Discuss routine maintenance including what can and cannot be done on-line.
12. Discuss troubleshooting of the Excitation System, including expected voltage/signal levels.
13. For a given symptom, list the most probable fault location(s).
14. Discuss the options available to quickly narrow down the fault location.
15. Discuss the necessary calibration, for each board, following board replacement.

## COURSE OUTLINE

- I. **Introduction**
- II. **Major Components:** Power Potential Transformer (PPT), Saturable Current Transformers (SCTs), Linear Reactors, DC Regulator, AC Regulator, Rectifier Section
- III. **DC Regulator:** Purpose Operation, Voltage Levels, Motor Operated Volts Adjuster (MOVA)
- IV. **Firing Circuits:** Purpose, Role and Function of Magnetic Amplifiers, Operation
- V. **AC Regulator:** Purpose, Operation, Voltage Levels, Interface with other Circuits (Reactive Current Compensator - RCC, Under-excited Reactive Ampere Limit - URAL, Transfer and Tracking)
- VI. **Relaying And Control Circuits:** Field Flash, Over-excitation Protection Relay, Volts per Hertz Protection Relays, Field Ground Relay
- VII. **SCR Rectifier Bridge:** Purpose, Operation, Expected Voltage Levels/Waveforms
- VIII. **Routine Maintenance**
- IX. **Troubleshooting & Repair:** Six-step Troubleshooting Method, Symptom Analysis, Expected Voltage/Signal Levels, Most Common Failures, Post Replacement Calibration

## COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, [www.hpcnet.com](http://www.hpcnet.com).

## FREQUENTLY ASKED QUESTIONS

- Will HPC Technical Services bring this course to our location for our personnel only? YES, call or email Stephen Parker, [stparker@hpcnet.com](mailto:stparker@hpcnet.com) for a price quotation.
- Will HPC Technical Services customize the presentation at our site to suit our particular needs? Yes.
- Is HPC Technical Services' textbook available for purchase as a reference document? No, this course depends greatly on print reading.
- What is the cost for HPC Technical Service to deliver this course at our location? Well, of course that can vary, but generally speaking, if you're planning on having 6+ attend, when considering your T&L, it is to your advantage to perform the course at your plant (office). You gain from the customization and price.
- Can HPC Technical Services provide "Technical Assistance" in the maintenance troubleshooting of your excitation system? Yes we can. Call or contact Harold Parker, [hparker@hpcnet.com](mailto:hparker@hpcnet.com) for our rate sheets and any further information required.

## GENERATOR I&C CERTIFICATION:

Those who attend this course are automatically qualified to take HPC Technical Services' Certification Examination. This examination is offered at no additional expense to the participant. An 80% passing grade is required. The examination length will not exceed 2-hours. Those who complete this examination will receive a revised "certificate of completion" that recognizes this accomplishment along with two-copies of a "To Whom It May Concern" letter that states their accomplishment. (Two copies are provided, one for the participants' employer and one for the participants' personal file.)

Consult HPC's website, [www.hpcnet.com](http://www.hpcnet.com), for detail on this certification program.

## (GE) Static SCT-PPT Excitation Systems – G533

www.hpcnet.com

### WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, (GE) Static SCT-PPT Excitation Systems
2. A "Certificate of Completion" with 2.9 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

### HPC INSTRUCTOR / CONSULTANT (S):



**John Marshall.** Mr. Marshall, worked for GE 35 years in the power system service and installation business. 25 years of this time was in the international service business. During his career, Mr. Marshall's positions included Field Engineer, Service Supervisor, Technical Training Instructor and Senior Application Engineer. Mr. Marshall's work covered electrical power distribution and control of power generation equipment. His expertise is GE manufactured excitation systems for large and medium size generators used on gas and steam powered turbines. As a Technical Training Instructor for over 20 years, Mr. Marshall developed and presented training programs for GE manufactured excitation systems. As a Senior Application Engineer, Mr. Marshall's work included the upgrading/replacement of older excitation systems with GE's digital excitation system. His Field Service work was worldwide. BSEE degree from Virginia Polytechnic Institute and State University in Blacksburg, Virginia.

**Stuart Fasser.** Mr. Fasser earned his BSEE from Union College, Schenectady, NY, in 1967. He retired in 2002 after 37 years of service with GE, including an early career in factory and field testing of power generation equipment and concluded with 10 years of field engineering in the installation and service of excitation systems. As a field engineer assigned to GE International he installed new GE excitation systems on generators as well as trouble shooting and maintaining existing installations. His most recent installations included 21 EX2000 exciters on units in Egypt, Thailand, Korea and the United States. In these assignments he was responsible for installation of the exciters as well as their checkout and start-up. These activities included component checks, initial calibration, pre-roll simulation of operation and both off-line and on-line alignment and checkout. Stuart is associated with HPC Technical Services in the areas of generator maintenance, testing, excitation systems and instruction.

**HPC TECHNICAL SERVICES**  
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**REGISTRATION FORM**

Company: \_\_\_\_\_  
Plant: \_\_\_\_\_  
Address: \_\_\_\_\_  
City/State/Zip: \_\_\_\_\_  
Telephone: \_\_\_\_\_ FAX: \_\_\_\_\_  
Course Number/Title: \_\_\_\_\_  
Course Dates: \_\_\_\_/\_\_\_\_/\_\_\_\_ Thru \_\_\_\_/\_\_\_\_/\_\_\_\_  
Course Location: \_\_\_\_\_ Course Fee: \_\_\_\_\_

**Please enroll the following individual(s) listed below:**

Student #1: \_\_\_\_\_  
Student #2: \_\_\_\_\_

**Taking advantage of HPC's 3-4-2 Policy: Send 3, Pay for 2 when paying in advance.**

Student #3: \_\_\_\_\_

**Enrolled by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**METHOD OF PAYMENT**

Check to Follow: \_\_\_\_\_  
 Check Enclosed #: \_\_\_\_\_  
 MC/Visa/AMEX #: \_\_\_\_\_  
Expiration Date: \_\_\_\_\_ CV Code: \_\_\_\_\_  
 Purchase Order #: \_\_\_\_\_

**HOW DID YOU LEARN OF THIS COURSE?**

Attended HPC courses before  
 Received a fax  
 Received an email  
 Internet  
 Received info in the mail  
 Other: \_\_\_\_\_