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Course Information Letter ---- G504, G531, G534

(W) WTA, 300B, PRX400 VOLTAGE REGULATORS

G504, G531, G534

These three topics are all covered within the same course conduct by an “expert” ex-W Engineer who has told HPC this is the way to best schedule these courses. He is the expert! So here is the course offering.

Each is one of those systems that can run for seemingly, forever. Then there is that “**one-day**”. That is the day you may wish you (or one of your plant's technicians/engineers) had attended this course. As stated above, equipment-experienced engineers present the course. Simply put, the overall objective is to develop the individuals responsible for plant operations, testing, calibration and maintenance of this system. To effectively work on these systems, the technicians must “honestly” understand the ‘big-picture’, he/she must fully appreciate the OEM drawing systems, and then practice use of these prints as it applies to their type of equipment.

A **topical outline** includes: Basic Excitation and Voltage Regulation, Voltage Regulator Components, Basic Regulation, Automatic Voltage Regulation, Limiting and Protection Modules, Maintenance Testing, Test Procedure Compliance:

This course is designed for Engineers, Technicians, and Electricians who have a need to maintain this system.

COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, www.hpcnet.com.

WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, WTA Excitation Systems
2. A "Certificate of Completion" with 2.6 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

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, for detail on this certification program.

Voltage Regulator – G504, 531, 534

www.hpcnet.com

OBJECTIVES: Upon completion of this course, participants will be able to:

1. State the function of the WTA300/PRX400 Voltage Regulator.
2. Describe the relationships between generator terminal voltage, excitation current, Megawatts and Megavars.
3. Identify the limiting components of the generator associated with exceeding the voltage rating of the machine or the limits established by the Generator Capability Curve.
4. Identify the limiting and protective features that protect against exceeding the voltage rating of the machine or the limits established by the Generator Capability Curve.
5. Identify the effects on the WTA300/PRX400 Regulator when the Regulator Control Switch is taken from OFF (MAN) to TEST.
6. Identify the effects on the WTA300/PRX400 Regulator when the Regulator Controls Switch is taken from TEST to ON (AUTO).
7. Identify the effects on the WTA300/PRX400 Regulator when a “Regulator Trip” occurs.
8. Identify the function of each device in the WTA300 Power Drawer and the PRX400 Fixed Power Bridge.
9. Identify the function of each module in the Firing Circuit Module.
10. Identify the function of each Logic and Limiter module.
11. Identify the function of each Protective module.
12. Identify the function of the Isolation Transducers, Adjuster Panels and the Input Intelligence Panel.
13. Identify which of the limiting and protective features are operable in each operating mode: OFF, TEST and ON.
 - Minimum Excitation Limiter
 - Maximum Excitation Limiter
 - Volts/Hz Limiter
 - Forcing Alarm
 - Over Excitation Protection
 - Volts/Hz Protection
 - Overcurrent Protection
 - Loss of Sensing
15. Describe the actions taken by each of the limiting and protective features when the device is activated.
 - Minimum Excitation Limiter
 - Maximum Excitation Limiter
 - Volts/Hz Limiter
 - Forcing Alarm
 - Over Excitation Protection
 - Volts/Hz Protection
 - Overcurrent Protection
 - Loss of Sensing
14. Identify the conditions, which extinguish the “Drawer Operative” lamps on the Power Drawer and Firing Circuit module.
15. Describe the effect on the operability of the WTA300/PRX400 Voltage Regulator if a “Blown Fuse” or “Loss of Pulse” condition occurs.
16. Given a set of plant operating conditions, analyze the conditions to determine the expected values on each meter on the Metering Panel.
17. Given a set of plant operating conditions and a set of meter values, analyze the values to determine which meter is inconsistent with the plant conditions.

COURSE OUTLINE

- I. INTRODUCTION:** Course Description and Goals, WTA/PRX400 Application
- II. BASIC EXCITATION AND VOLTAGE REGULATION:** General Requirements, Regulator Action
- III. VOLTAGE REGULATOR COMPONENTS:** Solid-State Components, Block Diagram
- IV. BASIC REGULATION:** Review of Excitation and Control Schematics; Power Amplifiers, Thyristor Operation, Control, Firing Circuit, Pulse Generation, Firing Circuit Module Analysis, DC Error Detector, Description and Purpose of Basic Regulation Circuits, Calibration
- V. AUTOMATIC VOLTAGE REGULATION:** Intelligence Input Panel, AC Isolation Transducer, Power Supply, AC Voltage Error Detector, Compensation, Excitation System Stabilizer, Signal Mixer, DC Isolation Transducer, Electronic Voltage Adjuster
- VI. LIMITING AND PROTECTION MODULES:** General Description, Minimum Excitation Limiter Test and Calibration Procedure (including Setting Calculations), Forcing Alarm Test and Calibration Procedure (including Setting Calculations), Maximum Excitation Limiter Test and Calibration Procedure (including Setting Calculations), Overexcitation Protection Test and Calibration Procedure (including Setting Calculations) Volts per Hertz Limiter Test and Calibration Procedure (including Setting Calculations), Volts per Hertz Protection Test and Calibration Procedure (including Setting Calculations).
- VII. Maintenance Testing**
- IV. Test Procedure Compliance:** Calibration of DC Error Detector Module, Calibration of AC Error Detector Module, Voltage Adjuster Settings, Excitation System Stabilizer Test, DC Isolation Transducer Calibration, Limiters - Test and Calibration, Protective Modules - Test and Calibration

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 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 is too dependent upon print interpretation.
- 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 for our rate sheets and any further information required.

HPC INSTRUCTOR / CONSULTANT (S):

Bob Fleming. Provides support in electrical engineering topical areas. Specifically instructs HPC voltage regulator courses such as the Westinghouse WTA, WMA, and WDR Exciters. Up until mid-2004 Bob was employed by TCSA and was responsible for developing voltage regulator upgrades, troubleshooting system problems, calibrating WTA/PRX systems as well as Basler systems. From 1969 thru 1996 Mr. Fleming worked for Westinghouse Electric Corporation, Power Generation Service Division. Here he was a Generator/Exciter Specialist with extensive experience with installation, testing, rewinds and repairs of generators from 1-MW to 1500-MW. As a Voltage Regulator Specialist Bob was

- Lead Project Engineer for excitation systems from 1990 to 1996.
- Main contact for all voltage regulator and static exciter projects.
- Estimating and preparing bid specifications for installation and service.
- Develop and conduct training programs.
- Develop field procedures.
- Placed first WTA in service in 1969.
- Placed first MGR in service in 1990.
- Placed first WDR2000 in service in 1993.

HPC TECHNICAL SERVICES
500 Tallevast Road, Suite 101, Sarasota, FL 34243
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Website: www.hpcnet.com

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 search
- Other: _____