



Course Information Letter ---- CT524

(GE) Mk-VI GAS TURBINE CONTROLS CT524

This course targets the need for technicians/engineers to operate, maintain, calibrate and troubleshoot control systems such that availability and reliability can be maximized. It has been HPC's experience that when plant personnel have a control system problem and they seek help (for example, using HPC services), the reason plant personnel had this problem troubleshooting was one of two explanations:

1. Lack of understanding of the "big picture", that is how the various control functions relate to one another.
2. Lack of understanding of how to use the tools that are available to troubleshoot the problem.

The overall benefit of this course is that the participant will walk away with this knowledge. This is accomplished by thoroughly understanding concepts of gas turbine control systems and how to use maintenance screens to quickly determine problems.

We are reminded that the gas turbine is the important asset. The Mk-VI control system is the human-machine-interface (HMI). This control system must be calibrated and maintained with the gas turbine needs kept in mind. HPC approaches this course in this manner. As seen by the course objectives, particular attention is given to the development of control systems important to the operation of a gas turbine.

Topical Outline includes: Review of Gas Turbine Fundamentals, Gas Turbine Control Concepts, Mk-VI Fundamentals and Hardware, Software Installation, HMI Documentation, Mk-VI Architecture, Blockware Functions, Introduction to the Toolbox Software, Protection Systems, Speed / Load Control, Alarm Troubleshooting – Process and Diagnostic, Temperature Control, IGV Control, NOx, Valve Position Control & LVDT Calibration, Sequencing Editing, Validation / Build / Download, Adding I/O, Forcing Signals, Changing Control Constants, Data Historian, Trending, Trip History

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, (GE) Mk-VI Gas Turbine Controls, drafted by Harold Parker.
2. A "Certificate of Completion" with 5.3 CEUs, authorized for issue by the International Associate of Continuing Education/Training. A "Certificate of Certified Completion", including a signed letter describing accomplishments, with 5.3 CEU, provided participants complete an examination.

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

1. Demonstrate an understanding of basic gas turbine operation.
2. Demonstrate an understanding of the concepts of gas turbine controls.

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3. Demonstrate an understanding of the protective systems' purpose, operation and test functions.
4. Demonstrate the ability to use OEM provided documentation that will include the Control Specifications, Programming, I/O Configuration, Application Manual, and P&IDs.
5. Demonstrate the understanding of the Mk-VI hardware components, the component function, how they are accessed, and how they communicate.
6. Demonstrate the ability to use "Toolbox" software.
7. Demonstrate the ability to calculate a speed error using the "Toolbox" software.
8. Demonstrate the ability to determine the speed/load demand signal, using "Toolbox" software.
9. Demonstrate the ability to determine the temperature control demand signal, using "Toolbox" software.
10. Demonstrate the ability to determine a stop speed ratio valve, gas control valve, and primary/secondary valve controlling signals, using "Toolbox" software.
11. Demonstrate the ability to troubleshoot an equipment alarm from the Mk-VI panel to the field device.
12. Demonstrate the ability to interpret the more routine diagnostic alarms and recognize appropriate actions.
13. Demonstrate the ability to trace the derivation of a command signal to the servomechanisms.
14. Demonstrate the knowledge necessary to calibrate turbine valve mechanisms.
15. Demonstrate the ability (or knowledge -- based upon equipment availability) to more efficiently use the Mk-VI screens for evaluating/calibrating systems.
16. Demonstrate the ability (or knowledge -- based upon equipment availability) to force logic to facilitate calibration.
17. Describe how to change constants or re-program ladder logic such as to add contact input/outputs, add alarms, and/or alter sequencing.
18. Given plant drawings, trace a signal to/from a field device through appropriate terminal boards, through circuit boards, to a digital "signal name".
19. Demonstrate an understanding of how a trip signal is derived and applied.

GAS TURBINE I&C CERTIFICATION:

There are two levels of certification (Both levels require this course):

1. Engineer
2. I&C Technician

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.

RECENT SATISFIED CLIENTS:

Doosan Heavy Industries, De Jong LTD (Netherlands), EPCOR Generation, Jacksonville Electric Authority, Korea East-West Power, Korea Southern Power, Korea Western Power, Wood Group (UK and Netherlands)

COURSE OUTLINE

Tuesday

Introduction
What a Controls Technician/Engineer Needs to know about Gas Turbine Fundamentals
Gas Turbine Control Concepts

Wednesday

Mk-VI Fundamentals and Hardware
Software Installation
HMI Documentation
Mk-VI Architecture

Thursday

Blockware Concepts and Architecture
Blockware Functions
Introduction to the Toolbox Software
Browsing Turbine Using Simulator

Friday

Protection Systems
Speed / Load Control
Alarm Troubleshooting – Process and Diagnostic

Monday

Temperature Control
IGV Control
NOx

Tuesday

Valve Position Control & LVDT Calibration
Sequencing Editing
Validation / Build / Download

Wednesday

Adding Analog Inputs
Adding Contact Outputs
Adding Analog Outputs
Forcing Signals
Changing Control Constants

Thursday

Data Historian
Trending
Trip History
Examination (if applicable)
Conclusion

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. When conducting an on-site course our clients (you) have several options. We could decrease the course length to 5-days or less by emphasizing hardware/software (de-emphasizing the signal path development) or emphasizing the use of “toolbox” software to troubleshoot I/O (de-emphasizing the hardware and software editing). In other words, we will build the course to your specifications.
- Is HPC Technical Services' textbook available for purchase as a reference document? No.
- 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 conducting functional checkouts or troubleshooting problems? Yes we can. Call or contact Harold Parker, hparker@hpcnet.com for our rate sheets and any further information required.

INSTRUCTOR (S):



Harold Parker is the founder & President of H Parker & Company, Inc. Mr. Parker has worked in the "Power Generation" industry for 36 years, 14-years with GE as a Field Engineer, Start-Up Engineer, Technical Training Specialist and Manager. In 1983 Mr. Parker resigned from GE and started a training company, Schenectady Learning Systems, in Schenectady NY, which evolved into H Parker & Company, Inc. today. During this post-GE period, Mr. Parker was briefly employed as Manager Turbine-Generator Services with General Physics (2-years) and as a Field Engineer with Mechanical Dynamics & Analysis (2-years). Mr. Parker holds a BSME ('69 from Lawrence Institute of Technology), a MBA ('81 from the State University of New York @ Albany) and is a member of ASME, IEEE, and ASTD.

Robert Johndrow. Bob Johndrow has 35+ years experience as a Field Engineer working on steam turbine generators. His experience includes steam turbine generator maintenance and testing, as well as considerable work on the steam turbine controls. He has worked on Mk-II, Mk-III, Mk-III+, Mk-IV, Mk-V and Mk-VI units as well as some of the Woodward controls. Bob earned a BS in Industrial Distribution from Clarkson University in Potsdam NY and also has GE Six Sigma Green Belt Certification. Bob accepted an early retirement package late 2003 and has worked as an independent as well as being associated with HPC Technical Services since then. He resides in Rhode Island.

Bill Lynn. Bill has 35+ years experience, almost all on gas turbine generators and the control systems. Bill "cut his teeth" on the Fuel Regulator Controls and the Mk-I system. Bill continued to develop experience on the Mk-II, -IV, -V, and the -VI systems. Installation, calibration, control checkout, application engineering, troubleshooting, and problem resolution are Bill's expertise. He worked for the GE international department, GE's Detroit District Office, and later the Gas Turbine Department. Bill accepted an early retirement about 4-years ago and has worked as an independent as well as with HPC Technical Services. Bill resides in the Fort Pierce FL area.

HPC TECHNICAL SERVICES
500 Tallevast Road, Suite 101, Sarasota, FL 34243
Telephone: 941-747-7733 FAX: 941-746-5374
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

- Familiar with HPC courses.
- Internet Search
- Received a fax.
- Received an email.
- Other: _____