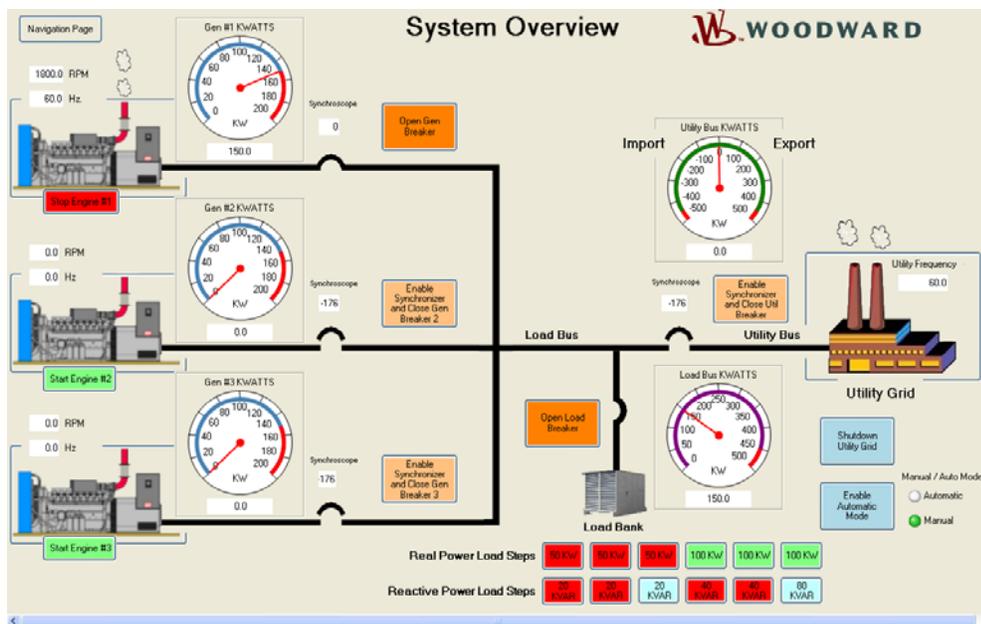


Power Generation Learning Module

Description

The Power Generation Learning Module provides the student with an interactive learning environment that covers Power Generation and Power Generation Control Modes. Fundamentals of speed controls and the dynamic tuning of a PID (proportional, integral, derivative) type speed control algorithm are also included.

The system module consists of three engine / generators and associated breakers to connect them to a load bank and the utility grid (mains). Below is a screenshot of the System Overview screen:



Students will learn the fundamentals of Speed Control, Speed Control Tuning, Power Generation, and Power Generation Control modes. This provides the student with a higher confidence level by developing practical skills and increased knowledge retention. The system module allows the student to start / stop engines, synchronize generators, add / subtract load, all through a realistic simulation model.

This learning module presents the basics of:

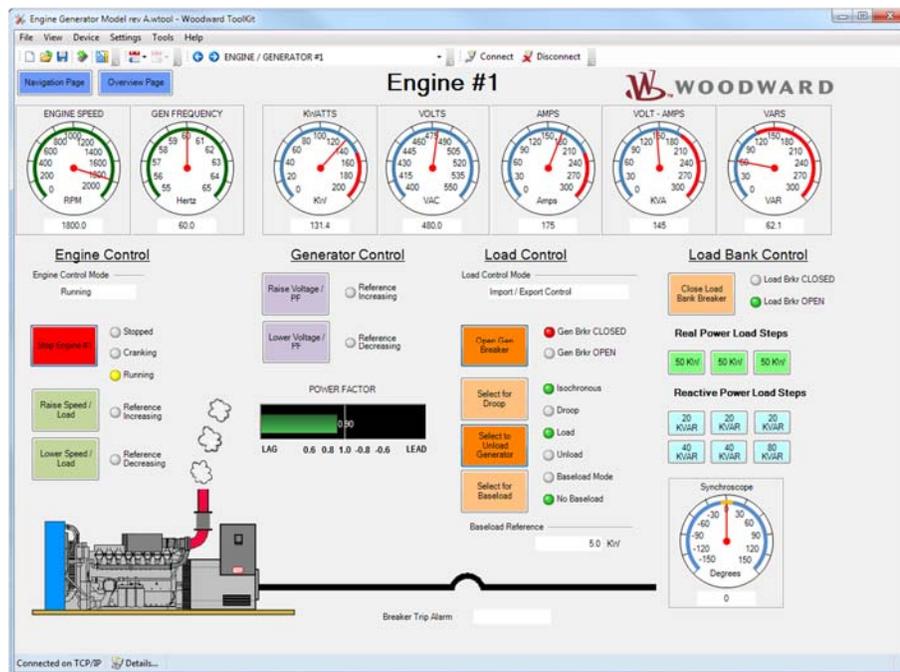
- Engine speed control fundamentals
- Speed control dynamic tuning
- Automatic voltage regulation fundamentals
- Electrical power generation fundamentals
- Power factor and VAR (volt-amp-reactive) control fundamentals
- Synchronizing of generators to each other and to the utility grid

- Interactive learning using realistic active simulation engine / generator models
- Engine speed control fundamentals
- Speed control dynamic tuning
- Automatic voltage regulation fundamentals
- Electrical power generation fundamentals
- Power factor and VAR fundamentals
- Synchronizing
- Various load control schemes
- Acronyms and definitions list
- Exercises for each topic
- Part number 8447-1012

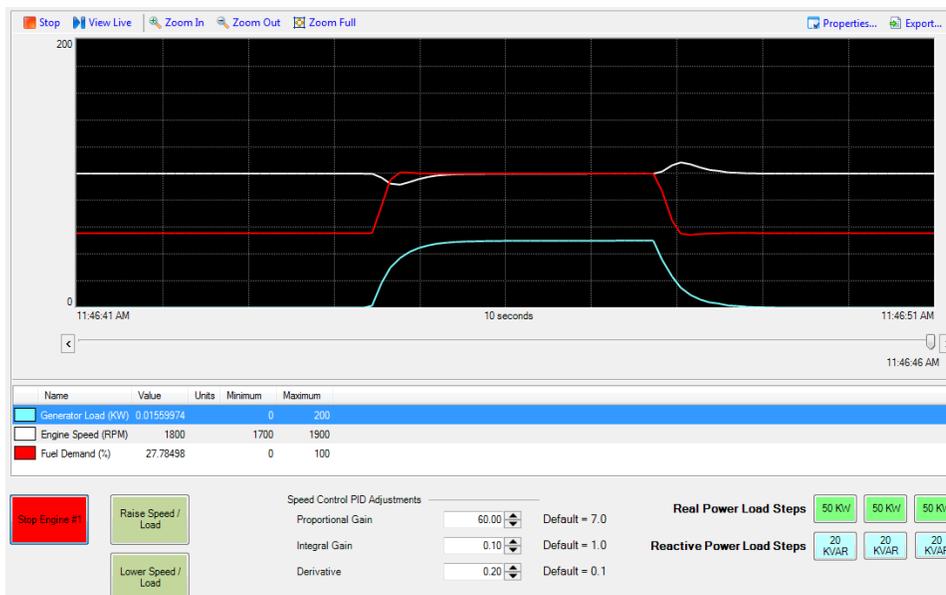
Generators can be controlled in many different loading schemes, each of which is explained and demonstrated in the module:

- Isochronous
- Droop
- Droop – Droop Load Control
- Isochronous Load Sharing
- Droop Baseload
- Isochronous Baseload
- Import Control, Export Control, and Zero Power Transfer
- Fully automatic control for emergency backup generators

Each generator has a page with analog meters displaying all of the information usually seen in a generator control room:



An electronic strip chart displays a trend of the stability of engine #1:



Learning Objectives

Numerous studies show that interactive learning takes less time, is more enjoyable, and increases learning. This learning module can be used at work or at home on any personal computer. Topics are presented in standalone sections, allowing the student to spend as much time as needed to fully understand that topic and to re-visit the topic to reinforce knowledge.

Studies have also shown that students retain information longer if they perform hands-on learning. This module is a life like representation of an engine / generator system.

Installation

All the files necessary to install, run, and view this learning module are on the USB flash memory stick. The software is licensed to the flash drive, therefore must be installed on the computer in order for the simulation module to operate properly. The student must have a computer with Windows XP, Windows Vista, or Windows 7 or 8. The files included on the USB memory stick are:

- Woodward manual 26736, *Power Generation Learning Module Guide* (English only)—This manual steps the student through each of the topics and exercises.
- Woodward application note 51474, *Power Generation Learning Module Quick Start Guide*—This manual provides a starting guide for loading the required software and starting the learning module.
- An install program that will install all of the necessary files on your computer, part number 9927-2187.exe.
- A quick start guide (Woodward Application Note 51474) is available with each USB flash memory stick to assist in the installation of the software.



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