SNO-MOTION SOLUTIONS

Introduction to Electrohydraulics

I. Program Description

In the Electrohydraulics Course, the student is introduced to the rapidly developing field of electrohydraulic proportional control valves. The course material concentrates on how electronics is used to control hydraulic components and how electrohydraulic proportional valves operate. A typical printed circuit board (driver board) for a typical electrohydraulic proportional valve is analyzed and explained. Approximately 35% of the class time is spent in the lab where students connect, adjust, control and troubleshoot proportional circuits.

A. Aims/Objectives

In this course we:

- Learn fundamental electronic theory applicable to electrohydrulic proportional valves. Understand how electrohydraulic proportional valves operate Examine, in detail, a typical printed circuit board used with a typical electrohydraulic propor tional valve.
- Get hands-on experience connecting and using a proportional valve

B. Major Topics Covered

- Basic D.C. electronics
- Interpreting circuit board schematics
- Comparison of proportional valves to servo valves
- How proportional valves work
- Interpreting valve specifications
- Recognizing components on a circuit board
- Calculating the performance envelope of a system

II. Who Should Participate

Anyone requiring an increased understanding of the rapidly emerging field of electrohydraulic proportional control valves and the electronics used to operate these valves. Attendees should have an understanding of conventional hydraulic components as taught in our Industrial Hydraulic Technology course. A calculator is required for this course.

III. Session Information

Classes are conducted several times per year. For scheduled dates, contact our offices.

SNO-Motion Solutions
41 West Guest Avenue
Salt Lake City, UT 84115
Phone: 801.281.4SNO(4766)
Fax: 801.263.6404

To Apply forTraining Class on Line:
http:www.sno-motion/trainingsignup.html
and choose the appropriate class title.

Introduction to Electrohydraulics
Course Outline

I. First Day of Class

A. Overview of an Electrohydraulic system
   1. Open loop block diagram
   2. Closed loop block diagram
   3. Discussion of why proportional valves are used

B. Hydraulic to Electrical analogies and Introduction to basic D.C. electronic theory

   1. Basic electricity Ohm's Law, Kirchhoff's Voltage Law, Equivalent Resistance, Voltage Divider, RMS voltage, voltmeter, ohmmeter, ammeter
   2. Basic electrical Components Resistors, reostats, potentiometers, transformers, diodes, full wave rectifier, capacitors, DC power supplies, switches, LED's, transistors, pulse width modulation (PWM), feedback devices 3. Recognizing components both on a circuit schematic and on a circuit board

II. Second Day of Class

A. Discussion of proportional driver board circuits
   1. Basic operational amplifier circuits Open loop comparator, inverting with feedback, non-inverting with feedback, inverting summer with n inputs, differential amplifier, differentiator, integrator, unity gain follower
   2. Interpreting circuit board schematics Identifying op-amp circuits, power supply, tracing an input signal through the board and using testpoints, loading error, ideal sending device, ideal receiving device

B. How a proportional valve works Underlap, overlap, null, torque motor, jet pipe, jet diverter, pilot operation, proportional coils

III. Third Day of Class

A. Proportional valves
   1. Interpreting valve specifications Dead band, threshold, saturation, active region, saturation region, flow gain, hysteresis, linearity, pressure gain, valve coefficient, frequency response, step response

IV. Fourth Day of Class

A. Proportional valves
   1. Continue lab exercises
   2. Review lab results

V. Fifth Day of Class (1/2Day)

A. Valve Controlled Cylinder Motion (VCCM) design equations
   1. Calculating the performance envelope for a given system design
   2. Optimal sizing of components to meet force and speed requirements