

## Course Descriptions

The courses listed below are offered on a regular basis at our Parker Hannifin Corporation Training Facilities located in Elyria, OH; Irvine, CA; Troy, MI; Atlanta, GA; and Toronto, Canada. Following are brief descriptions of our courses. Detailed daily outlines can be obtained by contacting the Motion & Control Training Dept. 216/896-2577, Fax 216/514-6738.

**Hydraulic Component Sizing (HCS)** - An in-depth study of hydraulic components, their performance and how available performance data should be interpreted to evaluate circuits for effectiveness, cost savings and energy conservation. In addition, students will learn to recognize and overcome problem areas related to individual component characteristics which can affect the total operation of a system.

**Cartridge Valve Systems (CVS)** - An integrated three-day course where the student will work with and discuss the principles, applications, formulae, and functional characteristics of "insert" or "DIN" style cartridge valves.

**Introduction To Electrohydraulics (EHD)** - A five-day course whereby students are introduced to the rapidly developing field of electrohydraulic proportional control valves. The course concentrates on how electronics are used to control hydraulic components. A typical circuit board is analyzed and explained. Fifty percent of the time is spent in the lab where voltage dividers, operational amplifiers, and two-stage proportional valves are all addressed.

**Electrohydraulic Feedback Systems (EFS)** - This course is a five-day advanced course in electrohydraulics. The course material concentrates on the proper design of feedback systems incorporating electrohydraulic valves to achieve a stable operating system. Approximately 50% of the class time is spent in the lab working with the various feedback control systems to gain a better understanding of their operating characteristics.

Major topics covered include: Servo valve sizing, basic positional servo system valves; position transducers, errors in positioning servo systems; speed transducers; frequency response curves; transfer functions; and speed control loops.

**Hydraulic Maintenance Technology (HMT)** - A four-day course which covers basic theory and methods for maintaining and troubleshooting hydraulic components and circuits. The student will receive actual hands-on experience with such things as pump set-up procedures, circuit assembly and troubleshooting, and graphic symbology reading.

**Hydraulic Pumps & Controls (HPC)** - A five-day course whereby participants learn the fundamentals of power transmission and how to properly use performance and engineering data of components. Students will also apply a logical circuit design procedure to any hydraulic application, and will achieve an efficient hydraulic design through many pumps and controls that are available in the class.

**Industrial Hydraulic Technology (IHT)** - This is an integrated five-day program including discussion and work with fundamental fluid power principles and formulae and actual experience with the functional characteristics of hydraulic components which include pumps, flow control valves, pressure valves, directional valves, hydraulic motors, filters, cylinders and accumulators.

**Industrial Pneumatic Technology (IPT)** - A five-day course designed to introduce participants to pneumatics as they relate to industrial machinery. In addition, students will learn how and why pneumatic components work and how to maintain pneumatic systems. Basic components covered include directional valves, cylinders, regulators, flow control valves, compressors, air preparation units and pneumatic circuits.

**Mobile Hydraulic Technology (MHT)** - A five-day course designed to introduce participants to the fundamentals of mobile hydraulic components, how to maintain and diagnose components within a system. Participants will also apply these fundamentals through the use of actual circuit assembly.

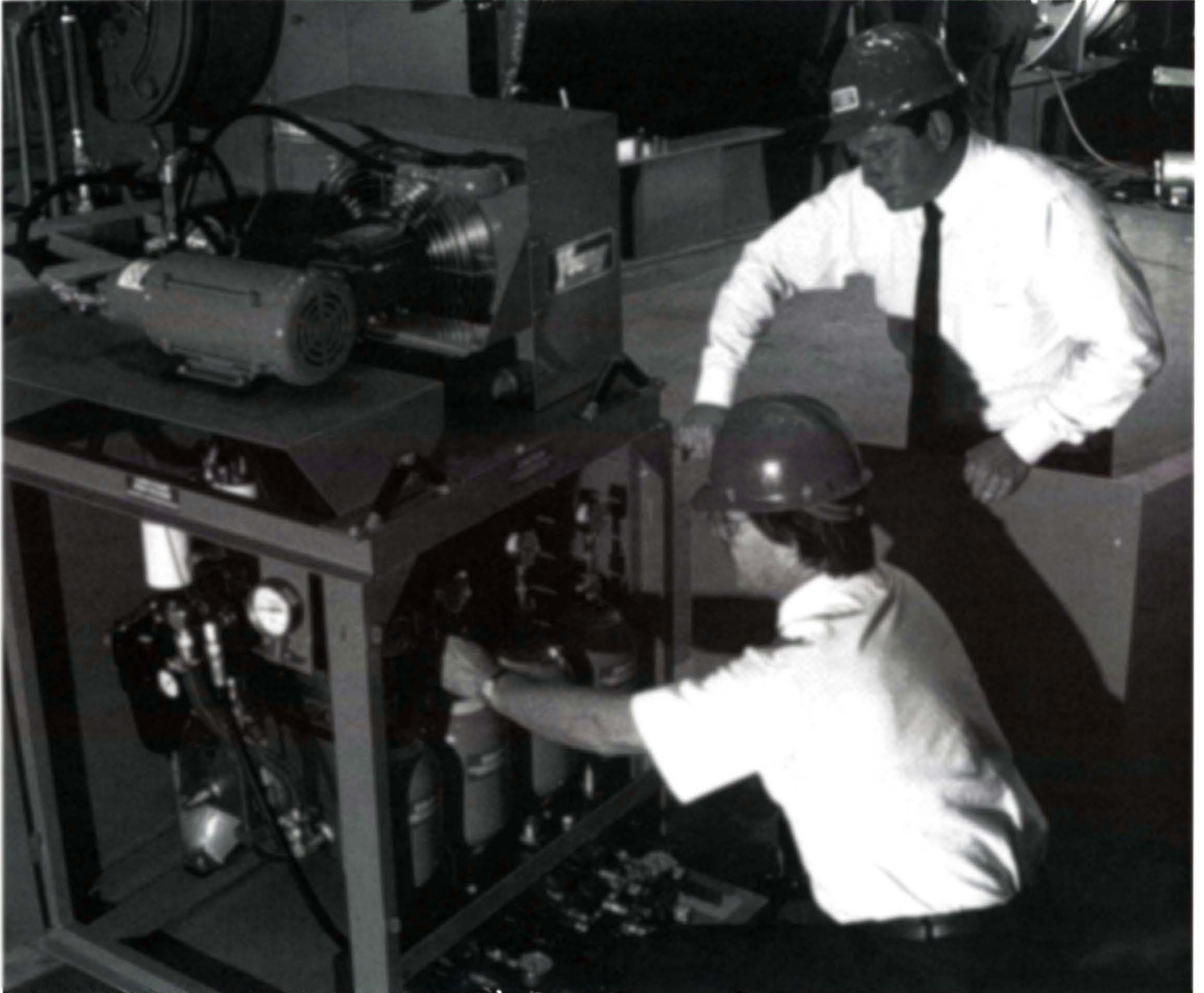
**Pneumatic Automation Technology (PAT)** - This is a four-day course that will introduce participants to pneumatic automation principles, component selection and basic programming of a PLC. Hands-on experience is provided through the programming and use of a five axis pick-and-place manipulator.



# ***Industrial Hydraulic Technology***

*Second Edition*

*Bulletin 0232-B1*



## Industrial Hydraulic Technology

First Printing	August, 1991
Second Printing	December, 1992
Third Printing	March, 1993
Fourth Printing	September, 1993
Fifth Printing	March, 1994
Sixth Printing	June, 1994
Seventh Printing	May, 1995
Eighth Printing	February, 1996
Ninth Printing	October, 1997
Tenth Printing	May, 1998
Eleventh Printing	November, 1998
Twelfth Printing	September, 1999
Thirteenth Printing	June, 2000
Fourteenth Printing	June, 2001
Fifteenth Printing	August, 2002

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Printed in the United States of America

## Preface

The technology of industrial hydraulics has been developing at a high rate for some time. With the beginning of World War II, hydraulics filled a need for an energy transmission and control system with muscle which could be easily adapted to automated machinery.

During this period, Parker Hannifin was also growing and today has evolved into a full-line manufacturer of motion control components. The material in this text is a by-product of Parker Hannifin's experience in the areas of design, manufacture, application, and servicing of hydraulic components and systems over the years. As a result, we feel the text material is pertinent and accurately describes industrial hydraulics as it is presently seen.

The organization of the text material is designed for the beginning student. Starting with "The Physical World of a Machine," the student is led through topics ranging from fluids and basic physical concepts to component operation and its typical system application.

In some instances, methods of verifying component performance and maintenance procedures are illustrated. The intent of these items is to indicate how individual components as well as system performance can be determined and/or improved. They are not intended to show how components are disassembled and serviced; that procedure is the concern of maintenance manuals.

Also, in some instances we have taken metric conversions and rounded them up to the nearest whole number. This was done for ease of calculation.

Exercises are placed at the end of the chapters. These exercises are designed to be a summary of the text high points and at the same time, to be interesting and self-checking.

We hope that the student will find the course of study logical and easily understood. If we have failed in this regard, your comments will be greatly appreciated.

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