

# Welcome to Parker's Involvement Training Program

The Training Department at Parker Hannifin was established in the early 1970's and is recognized today as the industry leader in the development and presentation of training materials and programs.

The Department's charter states that the primary focus of activity shall include all phases of technical training for hydraulic and pneumatic industries. The charter also states that this would be non-commercial and involve state-of-the-art methodology.

The Parker approach is one of involvement training. In its full scope, involvement training is one of active participation. This participation results in excellent student retention as well as providing a comfortable way of learning.

Parker Catalog 0200 details the Training Department's current offerings. This catalog is presented in two parts: Training Materials and Training Programs.

## Training Materials

The training materials section contains the following mixed media components:

- Textbooks/Course Components
- Reference Books
- Computer Software
- Video Tapes
- Trainer Stands
- CD-ROMs

Parker offers seven textbook and course combinations designed for both industrial and educational applications. Topics range from Basic Fluid Power to the specifics of Hydraulic and Pneumatic Technology.

All materials needed for a complete classroom curriculum are available. Textbooks can be purchased separately or in combination with any number of additional course components including workbooks, instructor guide, multiple choice exams, answer book, course certificates and, where appropriate, digital transparencies and relevant reference books.

Parker currently has six reference books available. Led by the *Design Engineer's Handbook, Vol. 1 - Hydraulics*, all of the books are valuable tools for any Design Reference Library, whether for individual use or as an accompaniment to the courses.

Additionally, course subject matter can be further enhanced with related computer software, video tapes and trainer stands.

Parker's computer-aided software represents a strong commitment to advanced training technology. The *Industrial Hydraulic Training CD*, featuring animation and video, is the leading hydraulic computer based training program in the industrial market place.

The video tape library contains 14 complete modules for self-paced one-on-one or group learning activities. Both hydraulic and pneumatic training programs are available.

Parker's portable hydraulic, pneumatic trainer stands provide students with valuable hands-on experience. All training stands feature industrial grade components and provide "Real World" applications of principles and circuitry.

## Training Programs

In addition to training materials, Parker offers an ongoing schedule of classroom educational programs. The current list of classes includes ten 3-5 day programs. Each class is led by a Parker certified instructor(s). Students are provided all necessary materials to attain course certification.

Classes are held in strategic locations across North America and Europe. Download current training schedule for a complete list of scheduled class locations.

**Course fees cover all class room expenses. Meals, transportation and lodging are not included.**

However, Parker will be glad to assist you with lodging arrangements.

For the latest information on training materials or programs, please contact:

Parker Hannifin Corporation  
Training Department  
6035 Parkland Blvd.  
Cleveland, OH 44124-4141  
Tel: (216) 896-2495  
Fax: (216) 514-6738  
E-mail: [mctrain@parker.com](mailto:mctrain@parker.com)

or visit our website at:  
[www.parker.com/training](http://www.parker.com/training)

*The following section gives a brief overview of the training materials and classes with a hydraulic or electrohydraulic emphasis.*

## **INDUSTRIAL HYDRAULIC TECHNOLOGY**



### **Industrial Hydraulic Technology**

**2nd Edition, Bulletin 0232-B1**

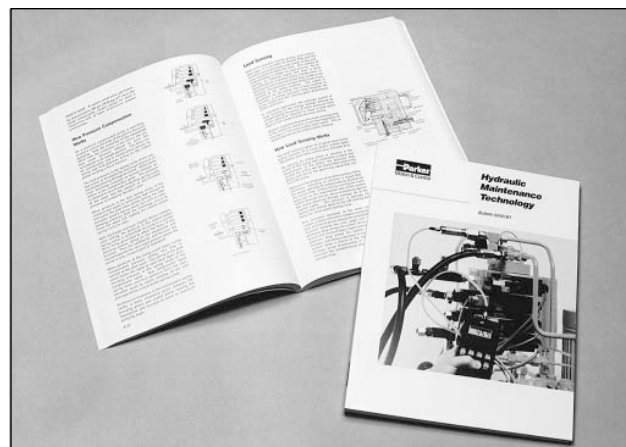
**ISBN 1-55769-025-1**

The *Industrial Hydraulic Technology* textbook is designed to introduce a student to hydraulics as it relates to industrial machinery. The 330-page text is organized into fifteen chapters which include:

*The Physical World of a Machine*  
*Hydraulic Transmission of Force and Energy*  
*Petroleum Base Hydraulic Fluid*  
*Fire Resistant Hydraulic Fluid*  
*Operation at the Suction Side of a Pump*  
*Hydraulic Actuators*  
*Control of Hydraulic Energy*  
*Check Valves, Accumulators and Cylinders*  
*Flow Control Valves*  
*Directional Control Valves*  
*Pressure Control Valves*  
*Pilot Operated Pressure Control Valves*  
*Hydraulic Pumps*  
*Hydraulic Motors*  
*Reservoirs, Coolers and Filters*

- Circuit illustrations are in six-color to aid the student in visualizing what is happening in a circuit.
- Each chapter incorporates an exercise reviewing the lesson's main points.

## **HYDRAULIC MAINTENANCE TECHNOLOGY**



### **Hydraulic Maintenance Technology**

**Bulletin 0240-B1**

**ISBN 1-55769-019-7**

The *Hydraulic Maintenance Technology* textbook provides detailed maintenance and troubleshooting information for the user of industrial hydraulic equipment. The 148-page text contains ten chapters which include:

*Hydraulic Maintenance Introduction*  
*Hydraulic Graphic Symbology*  
*Power Unit Maintenance*  
*Pump Maintenance*  
*Pressure Control Valve Maintenance*  
*Directional Control Valve Maintenance*  
*Flow Control Valve and Check Valve Maintenance*  
*Cylinders, Motors and Accumulator Maintenance*  
*Leakage Elimination in Hydraulic Systems*  
*Fluids and Filter Maintenance*

- Contains troubleshooting charts with lists of common problems, causes and possible remedies.
- This text is also a valuable reference for designers of industrial hydraulic equipment

## FLUID POWER BASICS



### **Fluid Power Basics**

**Bulletin 0239-B1**

**ISBN 1-55769-029-4**

The *Fluid Power Basics* textbook is designed to introduce students to hydraulics and pneumatics as it relates to industrial machinery. The 174-page text is organized into fifteen chapters which include:

*The Physical World of a Machine*  
*Force Transmission Through a Fluid*  
*Energy Transmission Using a Hydraulic System*  
*Control of Hydraulic Energy*  
*Energy Transmission Using a Pneumatic System*  
*Control of Pneumatic Energy*  
*Hydraulic Pumps and Compressors*  
*Check Valves, Cylinders and Motors*  
*Flow Control Valves*  
*Directional Control Valves*  
*Simple Pressure Control Valves*  
*Pilot Operated Pressure Control Valves*  
*Hydraulic Fluid Conditioning*  
*Air Preparation*  
*Fluid Conductors and Connectors*

- Each chapter incorporates an exercise reviewing the lesson's main points.

## FILTRATION TECHNOLOGY



### **Filtration Technology, 2nd Edition**

**Bulletin 0247-B1 (Softcover)**

**ISBN 1-55769-030-8**

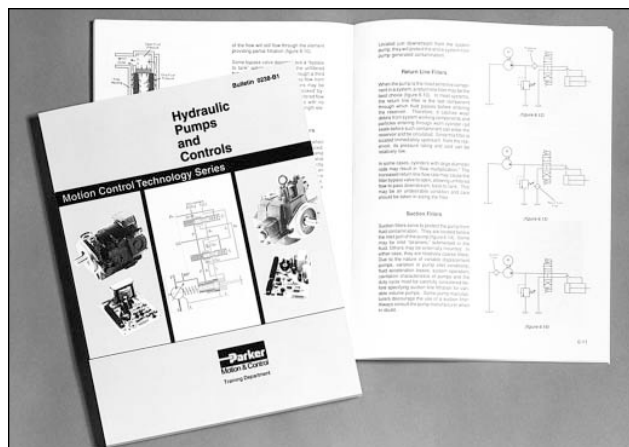
**Bulletin 0250-B1 (Hardcover, Not Shown)**

**ISBN 1-55769-033-2**

*Filtration Technology* is a must as a fundamental introduction to industrial filtration. The text covers topics such as fluids, contaminants, media selection and more. It is helpful to all personnel concerned with OSHA, safety and quality issues. This 250-page text is organized into twelve chapters which include:

*Introduction to Industrial Filtration Technology*  
*Fluids and Contaminants*  
*Contamination Dynamics*  
*Fluid and Filter Analysis*  
*Hydraulic Fluid Filter Selection*  
*Water Absorption in Hydraulic and Lubricating Oils*  
*Filter and Media Selection for Single-pass Systems*  
*Fuel Filtration*  
*Process Filtration Systems*  
*Compressed Air and Gas Filtration*  
*Coolant Filtration*

## HYDRAULIC PUMPS & CONTROLS



### Hydraulic Pumps & Controls

**Bulletin 0238-B1**

**ISBN 1-55769-031-6**

Hydraulic Pumps and Controls is a comprehensive text covering relevant pump topics from basic pump construction and operation to multiple controls, horsepower control and electronic pump controls. The book also contains sections on filtration and troubleshooting. This 185-page, multi-colored text is organized into nine chapters which include:

*Pressure Compensation*  
*Load Sensing Theory of Operation*  
*Input Power and Inlet Conditions*  
*Electrohydraulic Pump Control*  
*Troubleshooting*  
*Remote Compensation*  
*Horsepower (Torque) Limiting Control*  
*Hydraulic Filtration*  
*Energy Conservation*

For information on Course Components, refer to Catalog 0200.

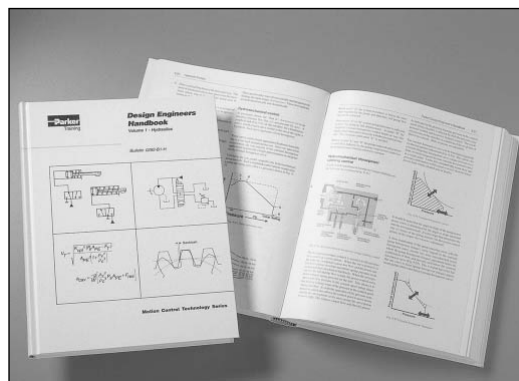
## Reference Books

### Design Engineers Handbook

**Bulletin 0292-B1 Volume 1 - Hydraulics**

**ISBN 1-55769-018-9**

To satisfy the demand for a simple and practical treatment of hydraulics and pneumatics, including components and system connectors, Parker Hannifin Corporation has published a one volume, 520-page text entitled *Design Engineers Handbook, Vol 1. - Hydraulics*. The information contained in this text is organized to assist the machine designer and manufacturer, as well as service and maintenance personnel. It should prove to be equally valuable to the college and vocational school student preparing to enter any of these fields.



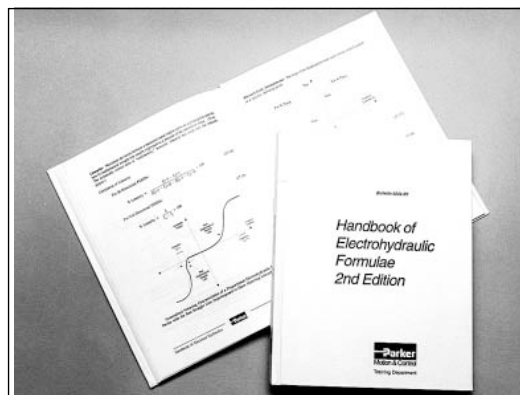
- Each section includes design data, reference material, charts and diagrams.

### **Handbook of Electrohydraulic Formulae, 2nd Edition**

**Bulletin 0242-B1**

**ISBN 1-55769-034-0**

This handbook, written for technicians, engineers and designers, contains 25 chapters of commonly used formulas for the design of electrohydraulic motion control systems. All of the necessary information is centralized, making the design of electrohydraulic motion control systems easier. There is no other text available that offers this accessibility or breadth and depth of information.



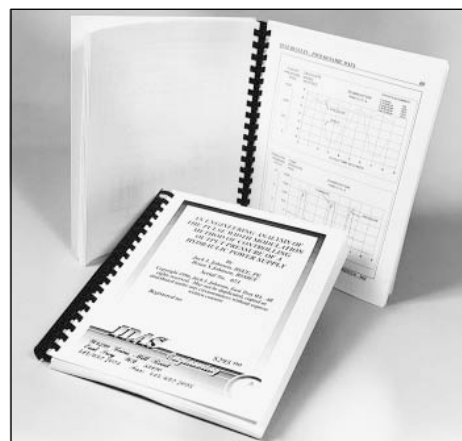
### **An Engineering Analysis of the Pulse Width Modulation**

**Bulletin 0244**

This research report contains over 100 pages of detailed engineering information and data regarding the design and evaluation of the pulse width modulation (PWM) method of controlling hydraulic pump outlet pressure. PWM offers a very efficient way for making regulated pressure power units using fixed displacement pumps instead of the more expensive, conventional pressure compensated pumps.

The report contains scores of graphical responses, representing hundreds of hours of labs and data analysis time. Concise Conclusions sections help the reader to quickly summarize the results and apply them immediately. A complete section is dedicated to Design Methodology so that users can learn the details needed to properly design and construct the power units.

Also included is a background on motion control and constant pressure. In addition, authors discuss equipment and principles of operation as well as the



method of investigation used.

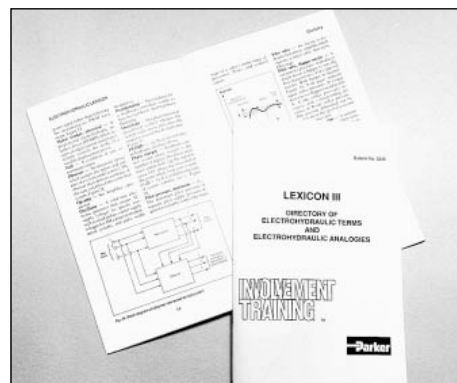
*An Engineering Analysis of the Pulse Width Modulation* is a must for anyone who uses, specifies, designs or builds hydraulic power units!

### **Lexicon III**

#### **Bulletin 0245**

The Lexicon III is a detailed bulletin of electrohydraulic terms and analogies. The book is laid out into two easy-to-use sections – a glossary of terms and a section on understanding electrohydraulic analogies. Many of the areas are represented by graphs and diagrams to further identify in detail the terms and analogies of electrohydraulics.

The author conveniently includes a chart of the SI prefixes, the Handy Conversions Factors Table and a listing of the Greek Letters. This bulletin is a must-have for engineers, students and anyone interested in electrohydraulics.



## **Video Tapes**

### **Industrial Hydraulic Technology**

#### **Bulletin 0299-T1**

The *Industrial Hydraulic Technology* course material is available utilizing an audiovisual tape training method. With all the training information stored on cassette tapes, the training sessions can be repeated as often as necessary, allowing each student to acquire the technical knowledge at his or her own pace.

The various tapes focus on enabling the user to interpret and read schematics, obtain a working knowledge of components that make up hydraulic systems and advance to trouble shooting techniques. (Refer to page 4 to see specific chapters covered).

- Video tapes are available in Beta, VHS or PAL.
- Individual chapters are also available.



**Includes:**

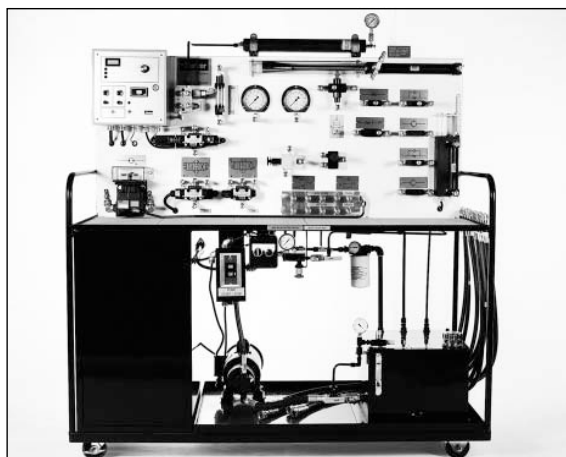
- 14 Video Tapes
- 1 Textbook
- 1 Instructor's Guide

## Portable Hydraulic Trainer

Based on Parker's long term experience in designing, manufacturing and servicing fluidpower components worldwide, the Portable Hydraulic Trainer is designed to be a tool for learning hydraulic technology principles and circuitry. It has been engineered for ruggedness, portability and ease of operation. The unit is completely self-contained and operates on standard 115 Volt AC single phase outlet electrical power.

The components on the trainer are all industrial grade components used in industry every day. This "real world" approach allows the student to learn what those components look like as well as how they operate.

All necessary connections are made with hoses and quick disconnects. No tools are required to arrange circuits. Simply plug in the components needed to arrange a circuit. In addition, all the hoses are stored in a rack to avoid misplacing "loose" components.



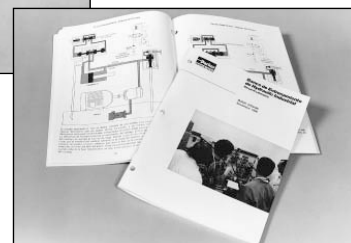
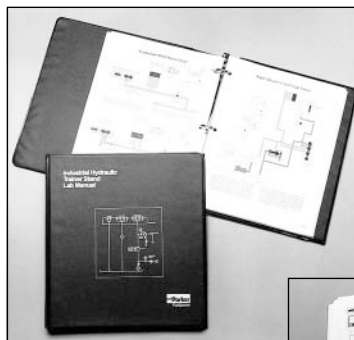
**For detailed information, see Bulletin 0203 online at [www.parker.com/training](http://www.parker.com/training) - click on Download Files**

Also available with the following options:

- **Electrohydraulic option** provides an introduction to both open loop and closed loop electrohydraulic systems.
- **Pneumatic option** transforms the hydraulic trainer into a complete fluidpower training stand.

## Bulletin 0249

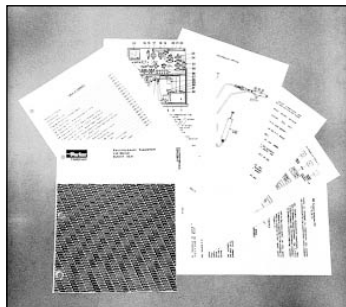
In order to aid the student in understanding hydraulic components and systems operation, Parker has developed this comprehensive lab manual for the Model HTU-00 Portable Hydraulic Trainer Stand. This manual contains circuit problems and demonstrations designed for use with the Parker trainer. These exercises are intended to supplement text material covered in the classroom. References are made in this manual to Parker textbook, Industrial Hydraulic Technology (page L3).



## EHD Supplement

**Bulletin 0231**

Contains exercises using the Electrohydraulic Option Kit (P/N 875279) on the Parker Portable Hydraulic Trainer Stand.



**Also available in Spanish!**  
**Bulletin 0229-B9**

## Industrial Hydraulic Technology 1 & 2



Parker Hannifin's **INDUSTRIAL HYDRAULIC TECHNOLOGY 1 & 2** (I.H.T. 1 & 2) are completely integrated three-day programs during which you discuss and work with fundamental fluid power principles and formulas, and actually experience the functional characteristics of the complete spectrum of hydraulic components.

You will be studying and using pumps, flow valves, pressure valves, directional valves, hydraulic motors, filters, cylinders and accumulators. And, because its divisions actually manufacture and market all of these products, Parker Hannifin is uniquely qualified to give you an in-depth practical knowledge of how to best use them in your field. You will receive

the broadest and deepest exposure possible during a three-day period.

At least a fourth of the time you will be working at the Parker Hannifin hydraulic systems simulators. These units were designed and built by Parker Hannifin expressly for this program. They supply you with all the necessary components – valves, pumps, motors, cylinders, filters, power units, hoses and gauges – to hook up to working hydraulic circuits and then check flows, pressures and velocity. Unlike most other training apparatus, the Parker Hannifin simulators operate at pressures up to 500 psi so that you can closely simulate real system conditions.

The balance of your time will be devoted to classroom sessions. But, these too, are designed for maximum interest and involvement. There is plenty of lively discussion, questions, answers and practical problem solving.

## Hydraulic Pumps & Controls



In **HYDRAULIC PUMPS & CONTROLS** (H.P.C.), students learn a logical procedure for designing circuits, not just from the standpoint to make them work, but to make them work efficiently. This is accomplished by approaching the entire design with a view towards power transmission and ultimate circuit efficiency, concentrating on the power unit. Various variable volume pressure compensated pumps and numerous pump controls are examined in detail.

An important result of this new Parker design method is that the student can always obtain a very efficient circuit, making it possible for a group of designers to develop very similar circuits for each set of mechanical

requirements. The only variance will be in the sequential logic and the appearance, which depends upon which components are selected. This results in less expense to operate and maintain circuits.

Course attendees will have ample opportunity to practice their newly acquired skills. Approximately 40% of the class time is spent in the training lab utilizing Parker hydraulic power units and trainer stands. This familiarization with typical styles of variable volume pressure compensated pumps and their controls ties together the lecture material and the design problems. Students will also benefit from the instructor's many years of industrial fluid power experience.

To get the most from this course, it is necessary to establish prerequisites for attendance. This assures that everyone participating has approximately equal knowledge of fluid power and can work at a compatible pace.



## Introduction to Electrohydraulics



The **INTRODUCTION TO ELECTROHYDRAULICS** (E.H.D.) course is designed for the individual who requires an increased understanding of the rapidly emerging field of electrohydraulic proportional control valves and the electronics used to operate these valves. The individual must have completed the **INDUSTRIAL HYDRAULIC TECHNOLOGY** and **HYDRAULIC COMPONENT SIZING** courses or equivalent. Basic DC theory knowledge is helpful but not necessary as the topic is covered in the course.

In this five-day course we present fundamental electronic theory applicable to electrohydraulic proportional valve; help participants

understand how electrohydraulic proportional valves operate; examine in detail a typical circuit board used with a typical electrohydraulic proportional valve.

Approximately 30% of the class time is spent in the lab where the individual is familiarized with lab instrumentation, and various circuits on the printed circuit board are examined in detail.

## Hydraulic Component Sizing



**HYDRAULIC COMPONENT SIZING** (H.C.S.) is ideally suited for the new designer and the maintenance and service individual who needs that important step beyond fundamental circuit design; the step that provides a more comprehensive understanding of efficient power transmission.

This program, using standard formulas and catalog data creates a benchmark that allows the student to objectively analyze the quality of the circuit in terms of efficiency and energy conservation. You will learn how to overcome problem areas and also become aware of the proper conditions for selecting components such as pressure compensated valves and fixed versus compensated pumps.

Parker Hannifin has written a special textbook for this course, which you will use during the program as the basis for your discussions and practical problem solving.

Since **HYDRAULIC COMPONENT SIZING** is an analytical course, we want to insure that all participants have a solid relatively equal background in basic fluid power technology. Completion of Parker Hannifin's **INDUSTRIAL HYDRAULIC TECHNOLOGY** course is an ideal foundation for understanding and further pursuing the maximum energy savings approach that is key to the **HYDRAULIC COMPONENT SIZING** subject matter.

## Electrohydraulic Feedback Systems

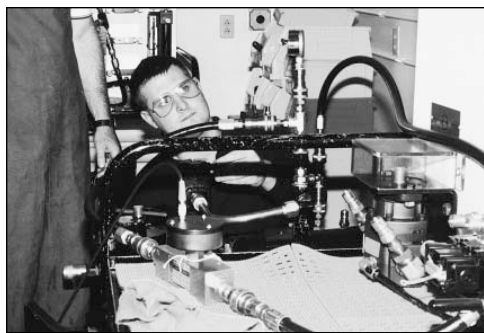


Parker's **ELECTROHYDRAULIC FEEDBACK SYSTEMS** (E.F.S.) course is designed for engineering oriented individuals requiring an in-depth understanding of electrohydraulic feedback control systems. Attendees should have completed the Parker **INTRODUCTION TO ELECTROHYDRAULICS** prior to attending this advanced course.

The following topics are covered in this course: servo valve sizing, basic positional servo valve systems, position transducers, speed transducers, frequency response curves, transfer functions and speed control loops.

Approximately 20% of the class time spent is in the lab working with various feedback control systems to gain a better understanding of their operating characteristics.

## Hydraulic Maintenance Technology



**HYDRAULIC MAINTENANCE TECHNOLOGY (H.M.T.)** is ideally suited for maintenance personnel, engineers, first line supervisors and anyone desiring an in-depth understanding and appreciation of hydraulic system component operation and troubleshooting techniques. Participants should have completed the **INDUSTRIAL HYDRAULIC TECHNOLOGY** course or equivalent.

The topics covered in this four-day program are graphic symbols of hydraulic components in which we utilize the International Standards Organization (ISO) System; troubleshooting common hydraulic components such as pumps, cylinders, valves, rotary actuators, hydraulic

motors; hose and tube fittings maintenance and assembly; and maintenance of fluid power systems.

There is plenty of “hands on” in this particular course. Everyone will get a chance to take apart and reassemble various pumps and valves as well as other typical hydraulic components.

## Cartridge Valve Systems



**CARTRIDGE VALVE SYSTEMS (C.V.S.)** is 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.

The student will learn the practical aspects of “insert” and “screw-in” style cartridge valves as they apply to industrial machinery. Principles of operation, functional characteristics, and typical applications for these valves are presented. The student also uses performance characteristics and fluid power formulae in realistic design problems. Valves studied include spool and poppet types, pilot operated valves, direct acting types,

and multistage valves, as well as proportional styles.

**CARTRIDGE VALVE SYSTEM** is recommended for maintenance personnel, technicians and engineering personnel. It is also suitable for sales and non-technical personnel who want to increase their knowledge and understanding of cartridge valve systems.

Parker's **CARTRIDGE VALVE SYSTEMS** course integrates classroom sessions with lab activities to give the student practical knowledge and skills that can be used in a workplace setting. In the labs, students get “hands-on” experience with typical valves and the circuits which utilize them.

## Mobile Hydraulic Technology



**MOBILE HYDRAULIC TECHNOLOGY (M.H.T.)** is a 4-day course on hydraulic principles as they apply to mobile equipment (loggers, waste hauling trucks, cranes, etc.).

Such topics as basic mobile circuitry, hydrostatic transmissions and power beyond are discussed throughout the course. Components – directional control valves, pumps and steering systems – are also covered. Labs include a demo on a wheel motor driving a rubber tire.

**MOBILE HYDRAULIC TECHNOLOGY** is recommended for maintenance technicians and engineering. Sales and non-technical personnel wishing

to increase their understanding of mobile hydraulics would find this class helpful.