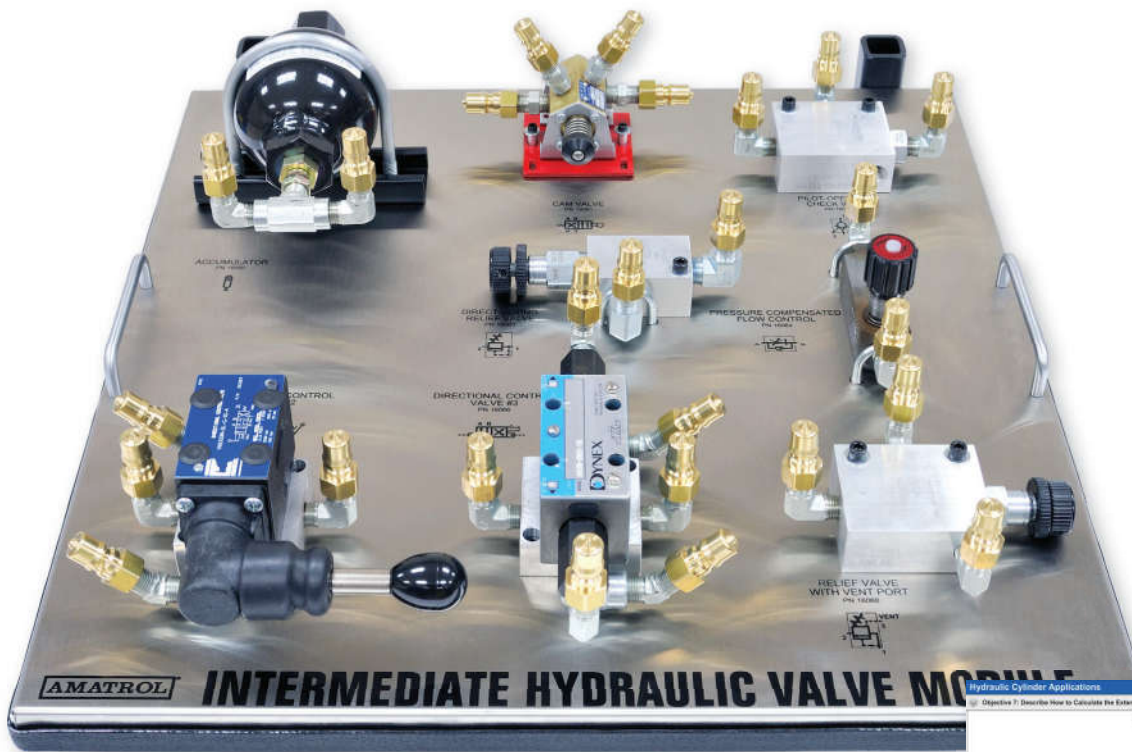


Intermediate Hydraulics Learning System

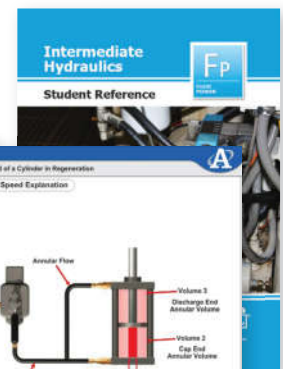
85-IH

Fp

FLUID
POWER



85-IH



Interactive Multimedia Curriculum and Student Reference Guide

Learning Topics:

- Hydraulic Directional Control Valve Applications
- Hydraulic Cylinder Applications
- Regeneration Circuits
- Synchronization Circuits
- Hydraulic Relief Valve Operation
- Remote Pressure Control
- Hydraulic Check Valve Applications
- Pressure Port Check Valve Circuit
- Accumulator Applications
- Accumulator Circuits

Amatrol's Intermediate Hydraulics training system (85-IH) introduces advanced hydraulic components (pilot-operated check valves, two-position directional control valves, telescoping cylinders, etc.), explains how each works, and then shows how they are used in real-world applications like elevators, punch presses, backhoes, and many more. Learners will study concepts like pressure intensification and cylinder regeneration while also being able to operate, install, design, and troubleshoot hydraulic components.

This hydraulic training system includes directional control valves, relief valves, a flow control valve, a check valve, and an accumulator. Amatrol learning systems use industrial-grade components displayed on hand-welded, painted and silk-screened panels, and workbenches made from top-flight materials. The skills and principles offered in this hydraulics training system builds on the fundamentals taught by the Basic Hydraulics learning system (85-BH), but also leads to additional, more advanced learning systems such as Advanced Hydraulics (85-AH) and Electro-Hydraulics (85-EH).



Technical Data

Complete technical specifications available upon request.

Intermediate Valve Module

- Accumulator
- Cam Valve
- Pilot-Operated Check Valve
- Relief Valve
- Pressure-Compensated Flow Control
- Directional Control Valves
- Relief Valve with Vent Port

Interactive Multimedia Curriculum (MB832)

Instructor's Guide (CB832)

Installation Guide (DB832)

Student Reference Guide (HB832)

Additional Requirements:

- One of the following: 850-H1, 850-HD1, 850-C1, 850-CD1, or 85-BH

Accumulator Charging Assembly (79-552)

Utilities:

- Supplied by Required System

Real World Applications

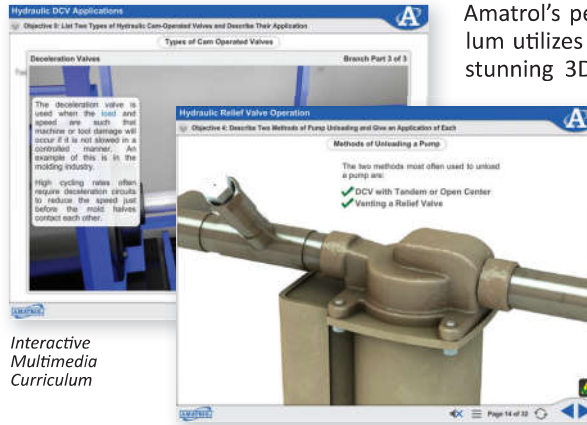
The 85-IH teaches how different valves and cylinders introduced by this learning system are implemented in real-world applications, such as on dump trucks, hydraulic presses, or conveyor drive systems used on soft drink bottling lines. As an example, learners will study two types of cam-operated valves, their construction, and how their designs are optimal for switching from a high flow to a low flow in order to operate a cylinder at a slow rate for the rest of the stroke. Learners will see how each of these valves are implemented in industry-relevant applications like an injection molding machine before practicing skills on a cam valve included with the 85-IH trainer.



850-H1 with 85-BH and 85-IH

World-Class Multimedia Curriculum for Hydraulics Training

From the physical practice of assembling accumulator circuits to the detailed equation for calculating the maximum pressure in a pilot-operated check valve, Amatrol's thorough and precise interactive hydraulics curriculum lends itself to both self-paced and traditional teaching methods. Within this course, learners will study topics like the function of a hydraulic cam-operated valve, the operation of a pressure-compensated flow control valve, methods of pump unloading, and how actuator relaxation occurs in a multi-actuator circuit.

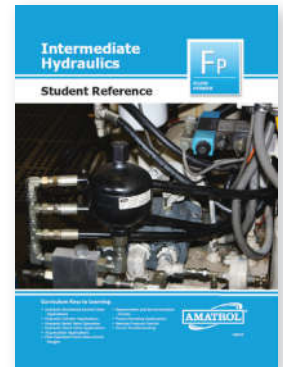


Interactive Multimedia Curriculum

Amatrol's peerless interactive multimedia curriculum utilizes text with voiceovers, pictures, videos, stunning 3D animations, and interactive quizzes and reviews that engage learners in theoretical knowledge and concepts. This thorough, detailed curriculum begins with the basics and advances to complex concepts. Through partnerships with key industry leaders and leading educators, Amatrol developed the right balance of knowledge to train learners to work in their chosen field.

Student Reference Guide

A sample copy of this course's Student Reference Guide is included with the learning system. Sourced from the curriculum, the Student Reference Guide takes the entire series' technical content contained in the learning objectives and combines them into one perfectly-bound book. If you would like to inquire about purchasing additional Student Reference Guides for your program, contact your local Amatrol Representative for more information.



INTERMEDIATE HYDRAULICS SYSTEM

This system shall include: (1) Intermediate-Hydraulic Valve Module, (1) Student curriculum, and (1) Instructor's Guide.

This module shall allow quick setup and easy inventory by providing: hydraulic components premounted on a circuit panel; silk-screened identifications next to each component showing each component's standard symbol, description and part number; and double-check quick connect fittings. To give equipment durability and realistic exposure all components shall be 1000 PSI min. rated - industrial grade and the circuit panel shall be of welded stainless steel construction.

Provisions shall also be made to allow the module to be used on a mobile workstation or as a satellite station on any standard work surface. These provisions shall include as a minimum: (2) permanent-mounted lift handles for mobility and mounting surface scuff protection. The components for this module shall include as a minimum:

- Directional Control Valve, double pilot-operated, detented, 2-position, 4-way
- Accumulator, diaphragm-type, 20 cubic inch size, with quick connect tee
- Relief Valve, pilot-operated, with vent port
- Check Valve, pilot-operated type
- Relief Valve, direct-acting type, adjustable
- Flow Control Valve, pressure compensated type with integral reverse free-flow check valve
- Cam Valve, 2-position, 4-way, spring return, assembled to track mounting device
- Directional Control Valve, lever-operated, 3-position, 4-way, tandem center, spring return
- Hose Assemblies (2)
- Nose Cam, long taper

Student Curriculum

The student curriculum shall consist of an interactive multimedia course divided into five (5) modules covering thirty-two (32) skills in intermediate hydraulic applications. The major topic areas covered shall include: hydraulic DCV applications, hydraulic cylinder applications, hydraulic relief valve operation, hydraulic check valve applications, and accumulator applications.

The student curriculum shall be designed in a skill-based format that focuses on teaching industry-relevant tasks. The objectives shall be accomplished by organizing the learning material into a series of interactive multimedia modules, which are further subdivided into three or more segments per module. All learning material needed shall be contained in the modules including text material, laboratory equipment activities, and multimedia directions. No external text sources shall be required. The specific cognitive skills taught by each text passage shall be identified next to the passage. Each lab activity shall be identified by the industrial task taught. All activities shall be highly detailed with step-by-step instructions to facilitate a self-directed learning environment. A combination of step-by-step enabling activities and creative, problem-solving activities shall be provided. A self-review of five to ten questions shall be provided after each segment. The curriculum must be capable of both self-directed and instructor directed study. All activities must correlate directly to the hardware supplied, with detailed illustrations and diagrams.

Teacher's Assessment/ Portfolio Guides

A teacher's guide shall be provided. It shall contain student data sheets, data sheet solutions, self-review answers, quizzes, quiz answers, student skill record sheets, and authentic assessment. A quiz shall be provided for each packet. A question shall be provided in each quiz for each cognitive objective taught. All tasks listed in the packet shall be listed on personalized student record sheets. The Instructor's Package shall include directions for authentic skill assessment.

Amatrol Model No. 85-IH or equal

85-IH
INTERMEDIATE HYDRAULICS LEARNING SYSTEM

LAP 1 HYDRAULIC DCV APPLICATIONS

SEGMENT 1	OVERVIEW OF THE DCV
OBJECTIVE 1	Describe and explain the terms used to specify DCVs
SKILL 1	Connect and operate a hydraulic DCV with a tandem center
SKILL 2	Select the spool option for a hydraulic DCV based on the application information
SEGMENT 2	TWO-POSITION DCVs
OBJECTIVE 2	Describe the function of a hydraulic 4/2 DCV and name one application
OBJECTIVE 3	Describe the operation of a hydraulic 4/2 DCV and give its schematic symbol
SKILL 3	Connect and operate a hydraulic 4/2 DCV
OBJECTIVE 4	Describe the function of a hydraulic 3/2 DCV and name one application
OBJECTIVE 5	Describe the operation of a hydraulic 3/2 DCV and give its schematic symbol
SKILL 4	Connect and operate a 4/2 DCV to function as a 3/2 DCV
SKILL 5	Design a hydraulic circuit using a 2-position DCV
SEGMENT 3	PILOT-OPERATED DCVs
OBJECTIVE 6	Describe the function of a hydraulic pilot-operated DCV and name one application
OBJECTIVE 7	Describe the operation of a hydraulic pilot-operated DCV and give a schematic symbol
SKILL 6	Connect and operate a hydraulic pilot-operated DCV
SEGMENT 4	CAM-OPERATED DCVs
OBJECTIVE 8	Describe the function of a hydraulic cam-operated valve and name one application
OBJECTIVE 9	List two types of hydraulic cam-operated valves and describe their application
OBJECTIVE 10	Describe the operation of a hydraulic 4/2 cam-operated valve and give its schematic symbol
SKILL 7	Connect, adjust and operate a cam-operated hydraulic valve
SKILL 8	Design a hydraulic sequence circuit using a cam-operated hydraulic valve
SKILL 9	Design a rapid traverse-slow feed hydraulic circuit using a cam-operated valve

LAP 2 HYDRAULIC CYLINDER APPLICATIONS

SEGMENT 1	CYLINDER TYPES
OBJECTIVE 1	Describe the operation of four types of cylinders and give an application of each
OBJECTIVE 2	Describe the construction of two types of cylinders and give an application of each
OBJECTIVE 3	Describe three common cylinder mounting styles and give an application of each
OBJECTIVE 4	Describe three common cylinder feature options
SKILL 1	Select a cylinder mounting style for a given application

SEGMENT 2	REGENERATION CIRCUITS
OBJECTIVE 5	Describe the principle of cylinder regeneration and name an application
Activity 1	Principle of regeneration
OBJECTIVE 6	Describe the operation of a basic regeneration circuit
SKILL 2	Connect and operate a basic regeneration circuit
OBJECTIVE 7	Describe how to calculate the extend speed of a cylinder in regeneration
SKILL 3	Calculate the extend speed of a cylinder in regeneration
OBJECTIVE 8	Describe how to calculate the extend force of a cylinder in regeneration
SKILL 4	Calculate the extend force of a cylinder in regeneration
SEGMENT 3	PRESSURE-COMPENSATED FLOW CONTROL VALVES
OBJECTIVE 9	Describe the function of a pressure-compensated flow control valve and name one application
OBJECTIVE 10	Describe the operation of a pressure-compensated flow control valve and give its schematic symbol
Activity 2	Effect of upstream pressure on flow control valve operation
Activity 3	Effect of downstream pressure changes on flow control operation
SKILL 5	Connect and adjust a pressure-compensated flow control valve
SEGMENT 4	SYNCHRONIZATION CIRCUITS
OBJECTIVE 11	Describe the function of a double-rod cylinder and name one application
OBJECTIVE 12	Describe the operation of a double-rod cylinder and give its symbol
OBJECTIVE 13	Define cylinder synchronization and name three applications
OBJECTIVE 14	Explain why cylinders do not operate in synchronization
Activity 4	Operation of non-synchronized cylinders
OBJECTIVE 15	List and describe the operation of five methods used to synchronize cylinders
SKILL 6	Set up, adjust and operate a cylinder synchronization circuit using flow control valves
Activity 5	Effect of load changes on a cylinder synchronization
SKILL 7	Set up and operate a synchronization circuit using series actuators

LAP 3 HYDRAULIC RELIEF VALVE OPERATION

SEGMENT 1	PILOT-OPERATED RELIEF VALVE OPERATION
OBJECTIVE 1	Explain the advantage of a pilot-operated relief valve
OBJECTIVE 2	Describe the operation of a pilot-operated relief valve and give its complete schematic symbol
Activity 1	Relief valve performance
SEGMENT 2	PUMP UNLOADING APPLICATIONS
OBJECTIVE 3	Describe the function of the vent port of a pilot-operated relief valve
OBJECTIVE 4	Describe two methods of pump unloading and give an application of each
SKILL 1	Connect a pilot-operated relief valve to unload a pump by venting
SEGMENT 3	REMOTE PRESSURE CONTROL
OBJECTIVE 5	Describe the operation of a remote-controlled relief valve circuit
SKILL 2	Connect and operate a remotely controlled pilot-operated relief valve circuit
OBJECTIVE 6	Describe multiple pressure relief valve operation and give one application
SKILL 3	Design a circuit to provide a two-pressure control with unloading

LAP 4 HYDRAULIC CHECK VALVE APPLICATIONS

SEGMENT 1	PRESSURE PORT CHECK VALVE CIRCUIT
OBJECTIVE 1	Explain how actuator relaxation occurs in a multi-actuator circuit
OBJECTIVE 2	Describe the operation of a P-port check valve circuit
SKILL 1	Connect and operate a P-port check valve circuit
OBJECTIVE 3	Describe the construction of an integral P-port check valve
SEGMENT 2	PILOT-OPERATED CHECK VALVES
OBJECTIVE 4	Describe the function of a pilot-operated check valve and give an application
OBJECTIVE 5	Describe the operation of a pilot-operated check valve and give its symbol
SKILL 2	Connect and operate a pilot-operated check valve
SEGMENT 3	PILOT-OPERATED CHECK VALVE APPLICATIONS
OBJECTIVE 6	Describe the operation of load-lock circuits using one POC valve
SKILL 3	Connect and operate a load-lock circuit
OBJECTIVE 7	Describe the operation of load-lock circuits that use two POC valves
OBJECTIVE 8	Describe the operation of a double-POC check valve
OBJECTIVE 9	Describe the function of a prefill valve and give an application
SEGMENT 4	PILOT-OPERATED CHECK VALVE CIRCUIT DESIGN
OBJECTIVE 10	Define POC valve pilot ratio and explain its importance
SKILL 4	Measure pilot-operated check valve pilot pressure
OBJECTIVE 11	Describe how to calculate the pressure required to open a POC valve
SKILL 5	Calculate the pilot pressure required to open a POC valve
OBJECTIVE 12	Define pressure intensification and explain its importance
OBJECTIVE 13	Describe how to calculate the maximum pressure in a POC valve circuit
SKILL 6	Calculate the maximum pressure in a POC valve circuit
Activity 1	Measurement of pilot pressure and pressure intensification in a POC valve circuit
OBJECTIVE 14	Describe the function and operation of a POC valve with decompression poppet
OBJECTIVE 15	List five application guidelines for POC valves
SKILL 7	Design a POC valve circuit

LAP 5 ACCUMULATOR APPLICATIONS

SEGMENT 1	ACCUMULATOR OPERATION
OBJECTIVE 1	Describe the function of an accumulator and give an application
OBJECTIVE 2	Describe the operation of three types of accumulators and give their schematic symbols
OBJECTIVE 3	Describe the operation of the four types of gas loaded accumulators
OBJECTIVE 4	Describe how to pre-charge a gas loaded accumulator
SKILL 1	Pre-charge an accumulator
SKILL 2	Determine accumulator pre-charge pressure
SEGMENT 2	ACCUMULATOR CIRCUITS
OBJECTIVE 5	List four accumulator safety rules
OBJECTIVE 6	Describe how to mount an accumulator
OBJECTIVE 7	Describe the function and operation of two types of safety bleed-down circuits
SKILL 3	Connect and operate an accumulator bleed-down circuit
OBJECTIVE 8	Describe the function and operation of two accumulator unloading circuits
Activity 1	Pump unloading in an accumulator circuit

SEGMENT 3	ACCUMULATOR APPLICATIONS
OBJECTIVE 9	Describe the operation of a circuit that uses an accumulator for auxiliary power
OBJECTIVE 10	Describe the operation of a circuit that uses an accumulator for emergency power
SKILL 4	Connect and operate an accumulator to safely provide auxiliary and/or emergency power
OBJECTIVE 11	Describe the operation of a circuit that uses an accumulator for pulsation dampening
OBJECTIVE 12	Describe the operation of an accumulator leakage/temperature compensation circuit
SKILL 5	Design an accumulator circuit to compensate for leakage
OBJECTIVE 13	Describe the operation of a circuit that uses an accumulator for fluid dispensing
OBJECTIVE 14	Describe the operation of a circuit that uses a accumulator for energy savings
SEGMENT 4	ACCUMULATOR SIZING
OBJECTIVE 15	Explain how bladder-type accumulators are specified
OBJECTIVE 16	Explain how to size a bladder-type accumulator
SKILL 6	Size a bladder-type accumulator
OBJECTIVE 17	Describe the effect of pre-charge pressure on accumulator operation
Activity 2	Measurement of accumulator oil storage