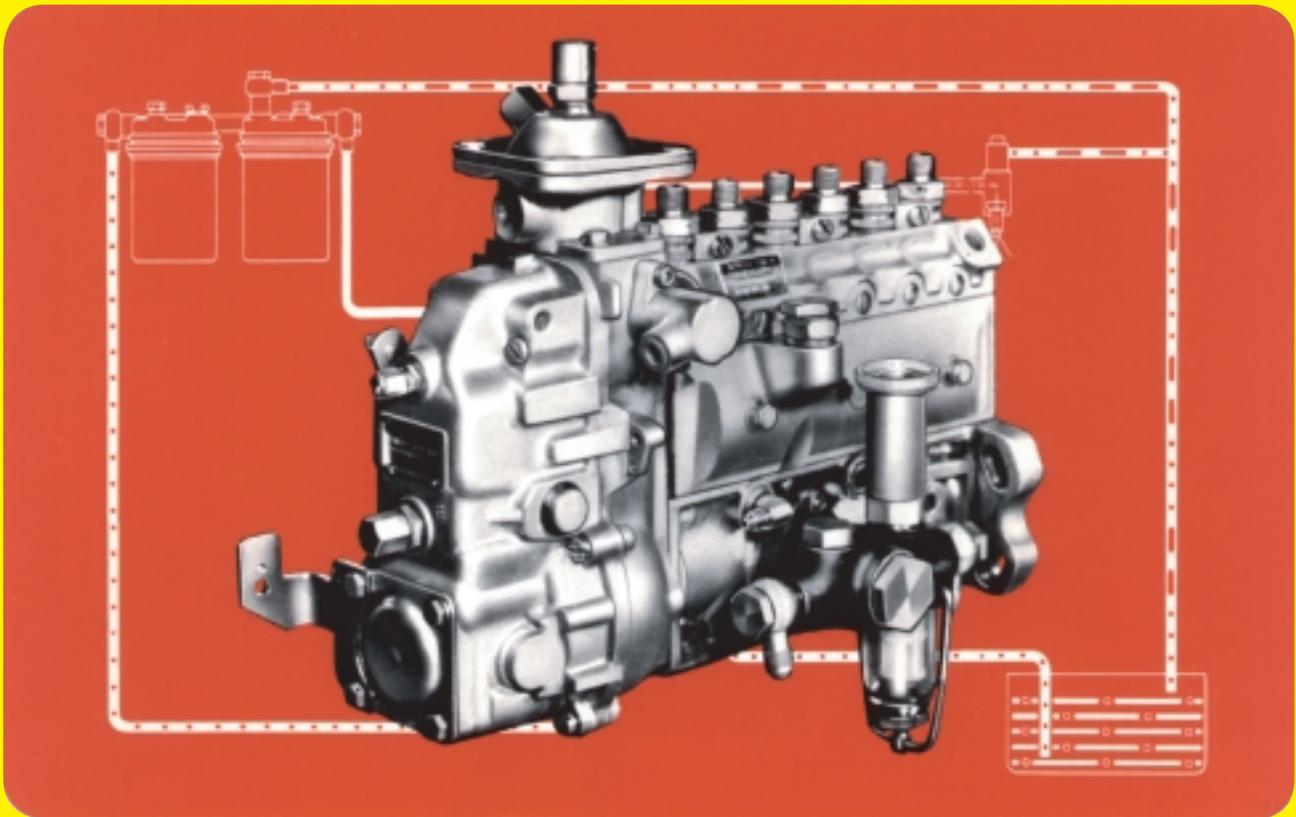




# BOSCH

## General Information Module



## Pre-Tech Service Training

**GENERAL  
INFORMATION  
MODULE**

# Pre-Tech Diesel Service Training CD-ROM

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### **NOTE:**

The audio-visual programs and microfiche referenced in this publication are not supplied with this CD-ROM and can be ordered separately via the Bosch Internet Website: [www.boschservice.com/](http://www.boschservice.com/) or by contacting Bosch Training Materials at 1-800-937-2672. The audio-visual programs are available in your choice of 1/2" NTSC VHS Videotape and 35mm Slide/Audio Cassette format. Film/Tape Cartridge and Filmstrip/Cassette Tape formats referenced in the various Modules are no longer available. The audio-visual programs and microfiche are listed on Page 8 under **Bosch Training and Reference Material**.

## **Introduction**

Welcome to the Bosch Pre-Tech Diesel Service Training CD-ROM.

Pre-Tech is an informational diesel fuel injection course designed for technicians and students alike. Pre-Tech provides the user with basic diesel theory, pump and governor operation, nozzle and nozzle holder (injector) operation and repair, parts identification and the use of metrics in the shop.

Before we go any further it may be helpful for you to have some understanding of the origin of Bosch products as they relate to the development of the diesel engine and their position in today's market place.

In 1886 Robert Bosch, a highly innovative technician and engineer, opened a workshop for precision mechanics and electrical engineering; "Werkstaette fur Feinmechanik and Electrotechnik," in Stuttgart, Germany. Within 12 months, working with one journeyman mechanic and one apprentice, Robert Bosch delivered the first low voltage magneto for a stationary gasoline engine. Fourteen years later, the Bosch Magneto Company opened its first factory, employed 45 people, and produced 1,015 magnetos. By 1910 over half a million Bosch magnetos had been produced.

Robert Bosch designed and produced his products to the highest degree of quality possible and the company prospered by following his motto: "It has always been an unbearable thought to me that someone could inspect one of my products and find it inferior. I have, therefore, always tried to ensure that only such work goes out as will stand any objective test; in other words, that it is superior in all respects."

With these operating principles in mind, Robert Bosch developed more complex electrical systems. In the late 1800's and early 1900's, Bosch manufactured the first successful high-tension ignition system for the automobile. The high-voltage magneto and spark plugs made the development of the compact high-speed gasoline engine possible. In the early 1900's, Robert Bosch established offices in Great Britain and New York, and opened manufacturing facilities in Paris, France and Springfield, Massachusetts.

Around 1920, Robert Bosch worked with Rudolf Diesel to develop a high-pressure fuel injection system for Diesel's new type of engine. In 1927 Bosch introduced one of the first successful high-pressure fuel injection pumps. It was the culmination of many years of development and research during which immense difficulties had to be overcome. Extremely small amounts of fuel at extremely high pressures had to be metered exactly, and exceptionally high standards of manufacturing accuracy had to be attained. The compact diesel engines made possible by the new Bosch pumps were experimentally installed in a few vehicles. By the end of the first year of manufacture more than 1,000 pumps had been sold. Sales of the pumps followed the path of the magneto and by the late 1930's hundreds of thousands of injection pumps had been sold. The company had now grown to a complement of more than 21,000 associates.

When Robert Bosch died on March 12, 1942, he left behind a company which in only 56 years had become a world leader in automotive electrical systems, diesel fuel injection systems, portable power tools, household appliances, radios, and much more. In the same year, the U.S. branch of the company separated and American Bosch became an independent company. It is important to know that there are now two separate companies which are not connected in any way.

In May of 1973, to better serve the expanding U.S. diesel marketplace, the Robert Bosch Corporation began manufacturing diesel fuel injection equipment near Charleston, South Carolina.

## Pre-Tech Diesel Service Training

The Bosch Pre-Tech Diesel Fuel Injection Service Training Program provides the information necessary to bring all technicians to a common level of competency and understanding. Pre-Tech can also be used to advance the product knowledge of experienced diesel service technicians and as support material for courses taught in vocational/technical institutions. Although a substantial amount of service information is presented in Pre-Tech, this training does not replace factory service schools nor does it qualify anyone as a service technician.

Users of Pre-Tech are expected to have a basic knowledge of automotive and diesel theory obtained through high school vocational/technical instruction, vocational/technical institutions, or through practical on-the-job experience.

At a minimum this should include:

- Two and four stroke engine cycles
- Ignition and electrical systems
- Shop practices
- Fuel systems
- Lubrication and cooling
- Shop safety

Pre-Tech presents important need-to-know information from an on-the-job standpoint.

A self-paced training format was selected for Pre-Tech because it offers the greatest amount of training in a minimum amount of time. Self-paced instruction allows the user to concentrate efforts on areas of difficulty and provides for more direct, one-on-one learning.

This Pre-Tech CD-ROM Based Diesel Service Training Program is made up of seven Modules consisting of eleven Audio-Visual Program Review Guides, and three Programmed Instruction Text booklets.

The Audio-Visual Program Review Guides are a complete copy of the visuals and narration from the Audio-Visual programs. The Review Guide for each audio-visual module, or lesson within a module, contains: an Introduction briefly describing the module or lesson, a statement of Program Objectives, a list of required Special Equipment, any Special Instructions and a Review Exercise. The answers to the Review Exercises are located at the end of each module or lesson.

The Programmed Instruction Texts have basically the same format as the Review Guides. However, information is presented in place of the visuals and narration and an Exercise is used in place of the Review Exercise. The Exercise answers are located after each Exercise.

The audio-visual programs and microfiche are not supplied with the CD-ROM and can be ordered separately via the Bosch Internet Website: [www.boschservice.com/](http://www.boschservice.com/) or by contacting Bosch Training Materials at 1-800-937-2672. The audio-visual programs and microfiche are listed on Page 7 under **Bosch Training and Reference Material**. Film/Tape Cartridge and Filmstrip/Cassette Tape formats referenced in the various Modules are no longer available.

### Pre-Tech Objectives

The overall objectives of Pre-Tech are to bring prospective diesel fuel system technicians to a common level of competency and understanding and to improve the product knowledge of experienced fuel system technicians. Specific Objectives are listed in each of the Programmed Instruction Texts and Audio-Visual Program Review Guides. While no specific criterion has been established for these objectives, we believe students should achieve a minimum passing score of 70% on the Exercises and Review Exercises when they are administered as open-book tests.

## **Pre-Tech Training Module Overview**

### **Module 1: Diesel Basics**

This module consists of a Review Guide and an audio-visual program (not included on this CD-ROM); Introduction to Diesels and Diesel Injection and Governing. The first program, Introduction to Diesels, explains the basic differences between gasoline and diesel engines, describes diesel fuel, and lists the advantages of diesel engines over gasoline engines. Program two, Diesel Injection and Governing briefly explains the operation of a diesel engine, injection pumps, governors, and injectors.

### **Module 2: Product Identification**

This module is a Programmed Instruction Text from which you learn to identify: PF and PFR type injection pumps; A, MW, M, and P-size inline injection pumps; VA and VE distributor injection pumps; and RSV, RQV, RQV . . . K, RW, and RWV governors. In addition, you are introduced to the original equipment manufacturers that use these pumps and governors on their engines. Users are also briefly introduced to the Robert Bosch Microfiche System (not included on this CD-ROM).

### **Module 3: Nameplate Identification**

This module is a Programmed Instruction Text from which you learn to identify the various sets of numbers (Product Designations, Bosch Order Numbers, Serial Numbers, Date Codes, and Factory Codes) found on product nameplates or on the product itself. In addition, you learn how to break these numbers down into useful information and how each number is used (parts ordering, completing forms, etc.).

### **Module 4: Pump and Governor Operation**

This module consists of eight Review Guides and eight audio-visual programs (not included on this CD-ROM): A-Pump Operation, P-Pump Operation, MW-Pump Operation, VE-Pump Operation, RQV Governor Operation, RQV-K Governor Operation, RSV Governor Operation, and RW Governor Operation. These programs explain the operating principles and basic adjustments for each of these pumps and governors.

### **Module 5: Metrics in the Shop**

This module consists of a Review Guide and an audio-visual program (not included on this CD-ROM), Metrics in the Shop. The program introduces the metric system and the metric measuring tools needed to service diesel injection equipment. At periodic intervals in the program, you are required to complete workbook exercises by performing hands-on tasks using various metric measuring tools and a series of shims (not included).

### **Module 6: Injector Operation, Service, and Testing**

This module consists of a Review Guide and an audio-visual program (not included on this CD-ROM): Injector Operation, Servicing, Reconditioning, and Testing Injectors (Nozzle Holders & Nozzles). These programs explain how pintle and hole type injectors (nozzles) operate, how to troubleshoot and correct injector (nozzle) related fuel system problems, how to recondition pintle and hole type injectors (nozzles), and how to test injectors (nozzles) for proper operation. At the completion of this module, you will be able to find the opening pressure specification, test, disassemble, clean, reassemble, and retest a typical KCA injector (nozzle holder) assembly.

## Module 7: Diesel Service Microfiche

This module is a Programmed Instruction Text, which provides the learner with an overview of the Bosch Diesel Microfiche Service Information System (SIS). To properly service Bosch diesel components it is essential that the technician has a good understanding of both the SIS microfiche and CD-ROM based Electronic Service Information (ESI). These informational systems provide access to service bulletins, equipment lists, part number cross references, repair, test and calibration information. Microfiche and CD-ROM based ESI (not included on this CD-ROM) are available only to Bosch Authorized Diesel Service Dealers and Diesel Central Distributors. This Module does not contain any Exercises. See **Bosch Training and Reference Material** on Page 7 to order the optional Diesel Training Microfiche and Exercise Supplement.

### Special Instructions

Pre-Tech is a self-paced training program requiring little supervision. While designed as an individual study program, Pre-Tech can also be used to present instructor mediated, group-paced instruction in a classroom setting. Because of the nature of self-paced instruction, and varying user abilities, no exact time frame has been established for completion of each lesson or module. In scheduling, one to two hours should be allowed for completion of each lesson.

If this training is to be presented in a classroom situation be sure that all participants can see and hear the audio-visual presentation. Adequate equipment must be available to permit everyone to participate in hands-on training exercises without having to wait. Forming teams of two or three each can reduce the amount of equipment required but may reduce the effectiveness of the training unless each participant is allowed to perform the assigned task. Planned stops in the audio-visual programs provide opportunities for discussion and review of the information presented.

When presented as self-paced instruction, the satisfactory completion of Pre-Tech, in a timely manner, is the responsibility of the user. The instructor or supervisor must be available to respond to user questions and to provide assistance when necessary.

Exercises and Review Exercises are included in each lesson. The answers are included on the last page of the respective lesson Review Guide or after each Exercise in the Programmed Instruction Text.

Each Exercise or Review Exercise should be completed as an open book test after viewing the audio-visual program, Review Guide, or completing the Programmed Instruction Text.

It is recommended that if the score achieved is less than 70% correct, the user should review the lesson and re-take the Exercise or Review Exercise. If the user scores 70% or higher, any missed questions should be reviewed to reinforce the correct answers.

To keep track of the learner's Pre-Tech activities a User Progress Sheet is included at the end of this Module. As the user completes the various Pre-Tech Modules enter the requested data on the Progress Sheet.

## **Tips For Using Pre-Tech Audio-Visual Programs**

The Pre-Tech audio-visual programs are compact and rapidly paced, presenting a great deal of information in a rather short period of time. These tips for using the audio-visual programs will help achieve maximum learning.

1. Users are encouraged to view the audio-visual program prior to completing the Review Exercises. Let the color, motion sequences, and audio effects do the teaching.
2. In a classroom environment, encourage the participants to respond to questions that are asked in the program.
3. Where chapter stops occur in a program, encourage the user to think through the information just presented before proceeding. If the program is being used in a classroom situation, use the chapter stops for discussion and review.
4. While the Review Exercises are intended as open book check tests, encourage the user to answer as many of the questions as possible without referring to the program information.
5. Use the audio-visual programs as a form of introduction or review for other related subjects.

### **Special Equipment**

The following equipment, *not included with this CD-ROM*, is required to complete Pre-Tech.

#### **Required For all Modules:**

A Videotape Player or Slide Projector and Audiocassette Player depending on the audio-visual format selected.

**NOTE:** Bosch Microfiche is not included with this CD-ROM. A Microfiche Reader is required if the optional Diesel Training Microfiche and Exercise Supplement is utilized.

#### **Required For Module 5:**

Shim-Set, to be supplied by the supervisor or instructor, containing six assorted shims similar to those depicted in Module 5, Pages 23 and 24.

0-25 mm metric micrometer (capable of measuring 0.01 mm)

Metric vernier caliper (capable of measuring 0.1 mm)

Metric feeler gauge

#### **Required For Module 6:**

KCA Nozzle Holder Assembly (NOT a GM application)

Common Metric Hand Tools (to disassemble and assemble nozzle holder assembly)

0-25 mm Metric Micrometer

Bench Vise

Torque Wrench (to 80 Nm)

Nozzle Tester (Bosch EFEP60H or equivalent)

Test Line (Bosch EF8040/24 or equivalent)

Nozzle Cleaning Kit (Bosch KDEP 2900 or equivalent)

Commercial parts cleaning solvent

Calibration Oil

#### **Required For Module 7:**

Diesel Training Microfiche and Exercise Supplement: Part # PRE-FICHE

## **Bosch Training and Reference Material**

Additional Automotive and Diesel Training, Reference and Study material is available from Bosch. For more information or to order these materials, please contact your nearest Bosch Diesel Service Dealer (DSD), Central Distributor (CD) or logon to [www.boschservice.com](http://www.boschservice.com). A complete listing of Bosch DSDs and CDs is also available on the Bosch Website.

The audio-visual programs and microfiche are not supplied with this CD-ROM and can be ordered separately via the Bosch Internet Website: [www.boschservice.com/](http://www.boschservice.com/) or by contacting Bosch Training Materials at 1-800-937-2672. The audio-visual programs are available in your choice of 1/2" NTSC VHS Videotape and 35mm Slide/Audio Cassette format. Film/Tape Cartridge and Filmstrip/Cassette Tape formats referenced in the various Modules are no longer available.

<b>Required for Module</b>	<b>Title</b>	<b>Videotape Part No.</b>	<b>Slide/Cassette Part No.</b>
<b>Module 1: Diesel Basics</b>	Introduction to Diesels and Diesel Injection and Governing	STVV DB	STSC DB
<b>Module 4: Pump and Governor Operation</b>	A-Pump	STVV A	STSC A
	P-Pump	STVV P	STSC P
	MW Pump	STVV MW	STSC MW
	VE-Pump	STVV VE	STSC VE
	RQV Governor	STVV RQV	STSC RQV
	RQV-K Governor	STVV RQVK	STSC RQVK
	RSV Governor	STVV RSV	STSC RSV
	RW Governor	STVV RW	STSC RW
<b>Module 5: Metrics in the Shop</b>	Metrics in the Shop	STVV Metrics	STSC Metrics
<b>Module 6: Injector Operation, Service and Testing</b>	Nozzle Holders & Nozzles	STVV IN	STSC IN
<b>Module 7: Diesel Service Microfiche</b>	Diesel Training Microfiche and Exercise Supplement		Part # PRE-FICHE

### **Additional Reference Materials**

Many excellent reference and study materials are available in public and school libraries and from other diesel users and manufacturers. In addition to the references listed here, shop and service manuals from manufacturers such as Mack, J.I. Case, International Harvester, and others, provide additional reference and study material.

Additional reference sources:

Exploring Power Technology (with workbook): Walker, Goodheart Wilcox, South Holland, MI  
Diesel Fundamentals, Service and Repair: Tobolt, Goodheart Wilcox, South Holland, MI  
Diesel Mechanics (with workbook): Schulz, McGraw Hill, New York, NY  
Diesel and High Compression Gas Engines: Kabes and Luck, American Technical Society, Chicago, IL  
Diesel Engineering Handbook; Karl Stinson, Diesel Publications, Inc., Stanford, CN  
Internal Combustion Engines: Edward Obert, International Textbook Co., Scranton, PA  
Apprentice Training Recommendations, #985623, Cummins Engine Co., Columbus, IN  
John Deere FOS, FMO, and Technical Service Manuals Deere and Co., Moline, IL  
Metrics for Mechanics - A Self-Study Course (42-00-2815-1), Volkswagen of America, Englewood Hills, NJ  
Diesel Engine Repair: Dagel John Wiley and Son; New York, NY

**Please address any questions or comments regarding this CD-ROM program to:**

Robert Bosch Corporation  
Automotive and Diesel Service  
Training and Information Development  
P.O. Box 4601  
Carol Stream, IL 60197-4601

## Pre-Tech Progress Sheet

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Name

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Supervisor/Instructor

Keep track of your Pre-Tech progress by entering the data as required. As you work through each module, enter the date you started and completed each Review Guide and Programmed Instruction Text (Workbook). Ask your supervisor or instructor to check your work and provide comments as needed.

Module	Date Assigned	Date Completed	Module / Workbook Title	Comments
1			Diesel Basics (101 & 102)	
2			Product ID & Application	
3			Product Nameplates	
4			A Pump Operation	
			P Pump Operation	
			MW Pump Operation	
			VE Pump Operation	
			RQV Governor Operation	
			RQV-K Governor Operation	
			RSV Governor Operation	
			RW Governor Operation	
5			Metrics in the Shop	
6			Injector Operation	
			Servicing Injectors	
			Reconditioning Injectors	
			Testing Injectors	
7			Microfiche	