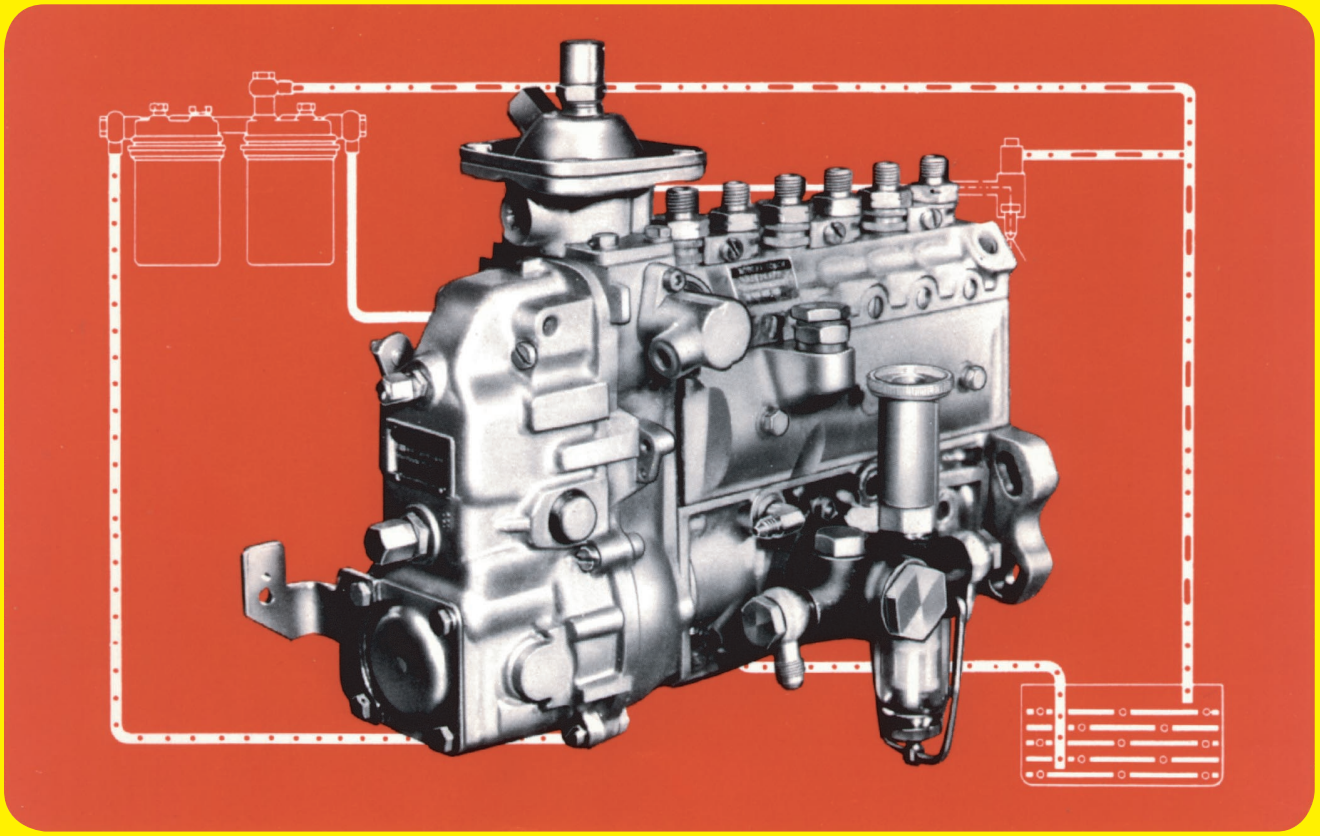
BOSCH

Module 2
Production Identification and Application



Pre-Tech Service Training

MODULE 2

PRODUCT IDENTIFICATION AND APPLICATION

STPR ID
10/89

INTRODUCTION

This is Module 2 of PRE-TECH, Product Identification and Application. You should have completed Module 1, Diesel Basics, before you begin this module.

In this module you will learn to identify some of the many diesel injection pumps and governors manufactured by Robert Bosch and the Original Equipment customers who use these products.

PROGRAM OBJECTIVES

When you have completed Product Identification and Application you will be able to:

1. Identify and describe the difference between PF, in-line, and distributor type injection pumps.

2. Identify upon sight these Robert Bosch products.

PF and PFR Pumps	RS, RSV Governor
A Pump	RQ, RQV Governor
M Pump	RQV . . . K Governor
MW Pump	RW, RWV Governor
P Pump	Aneroids, Top and Rear Mounted
VA Pump	
VE Pump	

3. When given the name of an Original Equipment (OE) customer, identify the products used by that customer.

REVIEW EXERCISE

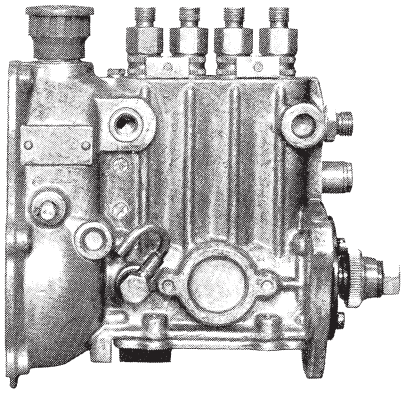
Review exercise 10 is the final review for the module. When you have completed this training book and the final exercise, and have reviewed your answers, show the completed exercise to your instructor or supervisor. Have your supervisor record your progress on your Student Progress Sheet. Then go on to Module 3, Nameplate Identification.

PREFACE

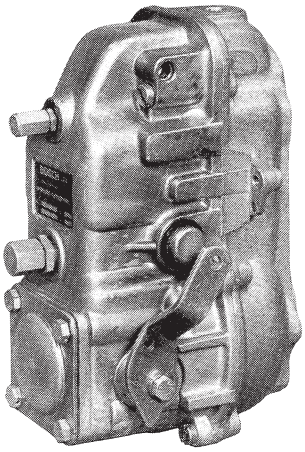
You'll need a lot of information to service Robert Bosch products. But you're in luck. The information is all stored and indexed for your reference. It's indexed by type of pump or governor and the name of the original equipment customer. All you need to be able to do is recognize the Robert Bosch fuel injection product, identify its OE customer and look up the information you want in the filing system. And, you're in luck again. When you complete this module, you will be able to do all these things.

In Module 1 you were introduced to pumps and governors. Would you know one from the other if you had one on your kitchen table? Here's a little quiz to test your knowledge. In the exercise on page 4, put a letter P or a G in each blank to indicate whether you believe the picture shows a pump (P) or governor (G). (You can use both letters if it shows both.) When you have finished, check your answers on page 5.

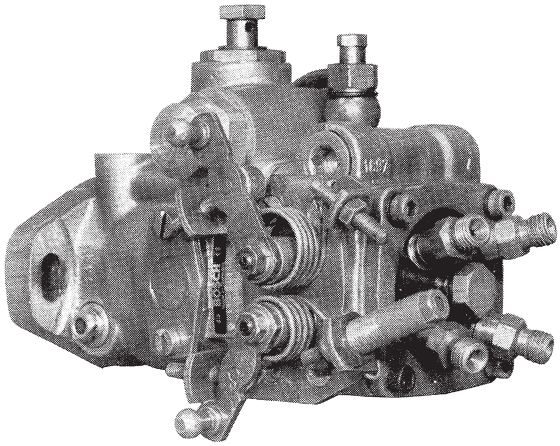
Exercise 1



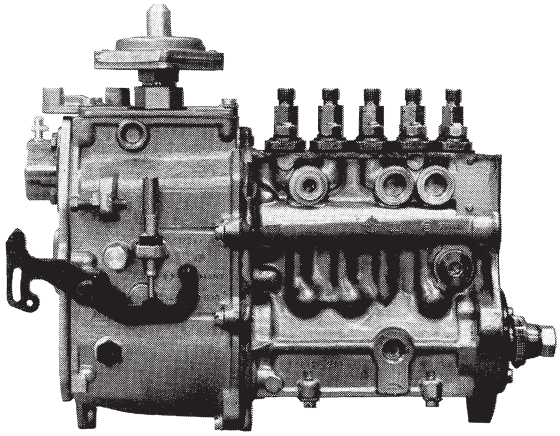
A _____



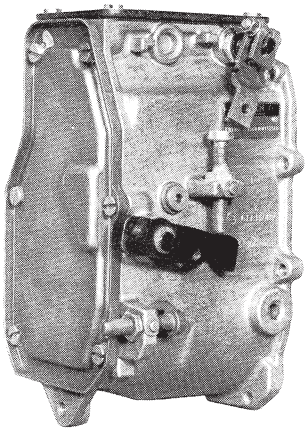
B _____



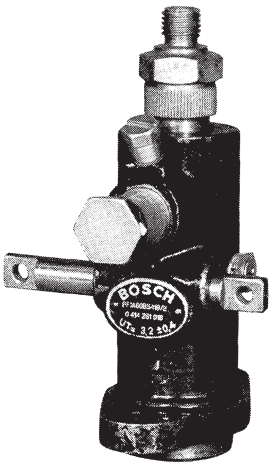
C _____



D _____



E _____



F _____

Answers, Exercise 1

A – Pump
B – Governor
C – Pump and Governor
D – Pump and Governor
E – Governor
F – Pump

If you did poorly, don't worry, you'll get 100% by the time you finish this module. If you did well, that's fine, but you can't take a vacation. There's still plenty to learn.

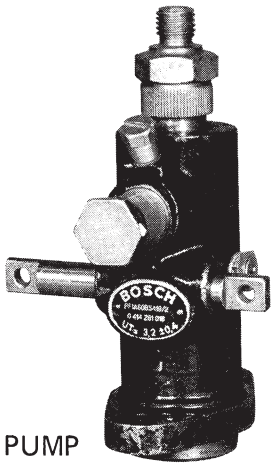
You'll need to learn to recognize several types and sizes of pumps and governors. This isn't so easy. The best way is to look for unique external features on each pump or governor – in other words, parts that set them apart.

Funny shaped do-hickey or little round gadget sounds pretty unprofessional. So the features that differ on pumps will be called names like delivery valve holder, cover plate, bottom plug, control lever and timing piston cover. You'll learn to distinguish governors by spotting things like shapes, control levers, and cover plates.

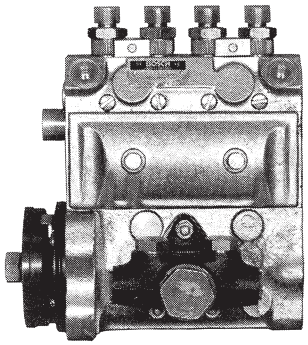
In the first part of this module, you'll learn to recognize each type of pump.

INJECTION PUMPS

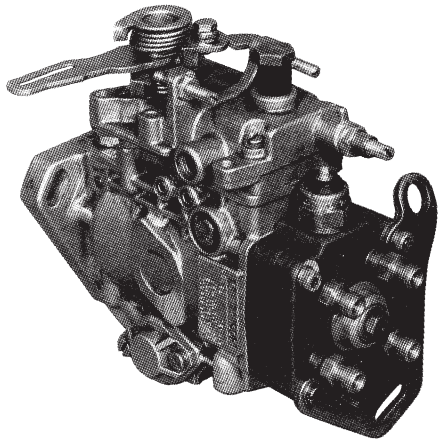
There are three basic types of injection pumps: PF, in-line (PE), and distributor (VA or VE).



PF PUMP

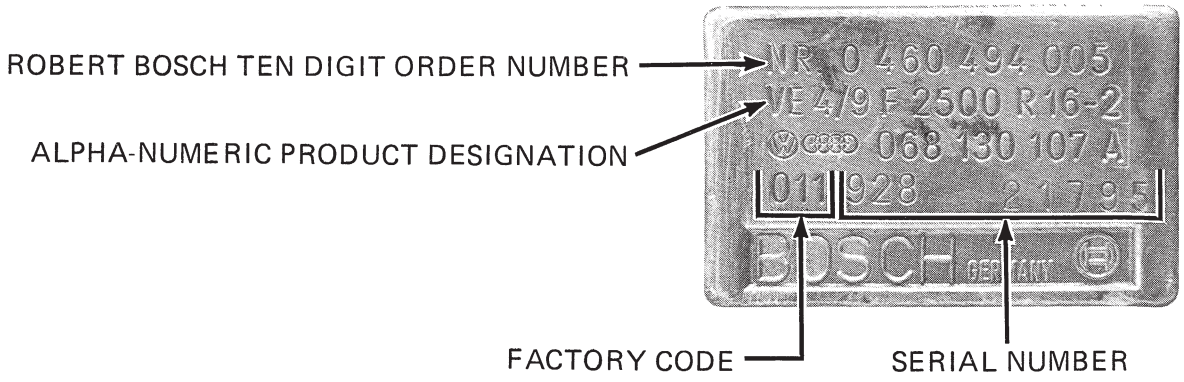


IN-LINE PUMP



DISTRIBUTOR PUMP

Each type of pump uses a set of letters, PF - PE - VA - VE as an identifier. These letters appear as the pump type designation on the product nameplate. Remember, each product has its own nameplate and the one shown here is only an example.



You'll learn all about the product nameplates and all of these numbers in Module 3. For now, lets concentrate on the pump type designation letters and what they stand for, starting with the PF type pump.

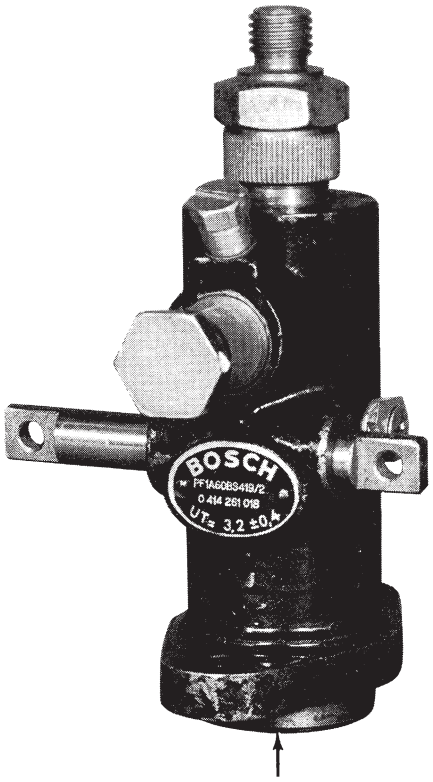
PF Type Pumps

When the pumps do not have their own camshafts, such as those shown here they are called PF pumps. The camshaft that operates a PF pump is usually a part of the engine itself. An easy way to remember the F is FOREIGN camshaft meaning that the camshaft is not an actual part of the PF type pump.

Notice the two types of tappets that these pumps have. PF pumps usually have a flat tappet. If a PF pump has a ROLLER tappet it is called a PFR pump. That adds another letter for you to remember. PF and PFR pumps are easily recognized by their exposed tappets.

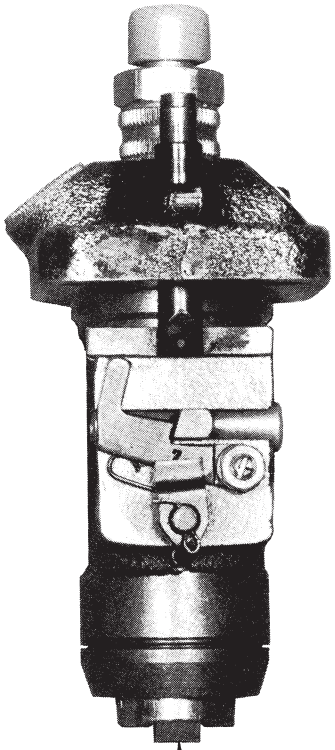
Well, we've talked about the F for a foreign (or separate) camshaft and the R for roller. What does the P stand for? Believe it or not, the P stands for pump.

PF PUMP



FLAT TAPPET

PFR PUMP



ROLLER TAPPET

PF pumps range in physical size depending upon their application and have from one to as many as four high pressure fuel outlets.

Let's move on now to in-line type pumps.

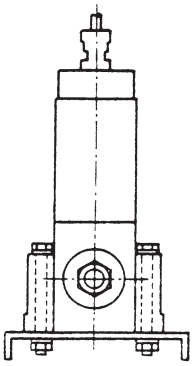
In-Line Type Pumps

When the pump's high pressure fuel outlets are arranged in a straight line and the pump has an internal camshaft we have an in-line pump, commonly referred to as a PE pump.

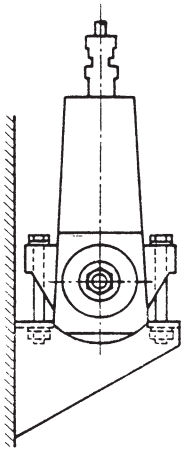
Notice we have replaced the letter F with a new letter - E. When an in-line pump has its own internal camshaft (an ENCLOSED camshaft) it is called a PE pump.

PE pumps come in many sizes and are used in small, medium, and large industrial, stationary, and marine engines, as well as in trucks, tractors, and automobiles.

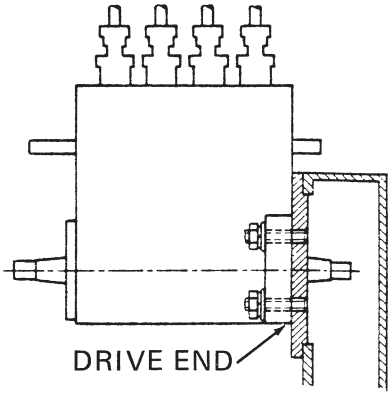
In-line pumps may be mounted in one of three ways: base, cradle, or flange. The type of mounting is determined by looking at the drive end of the pump as shown here.



BASE MOUNTING



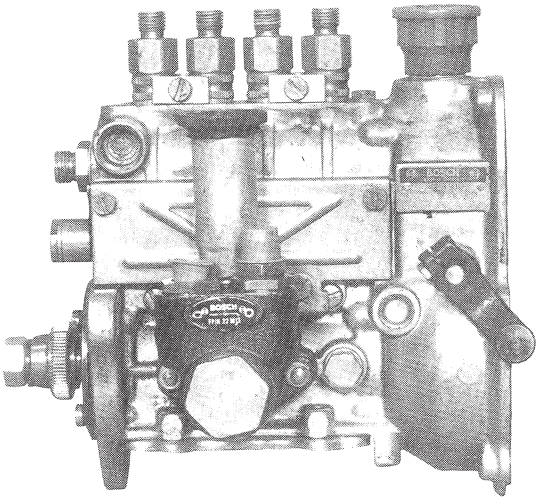
CRADLE MOUNTING

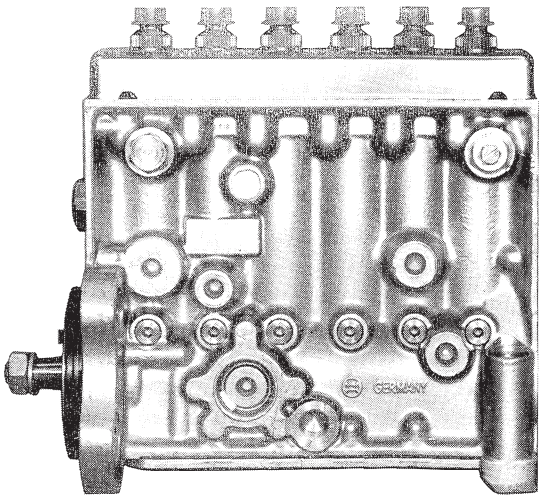


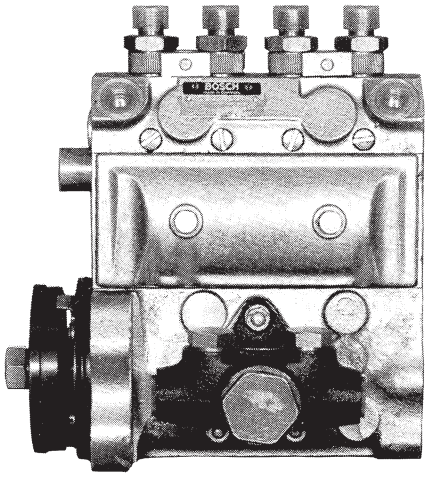
FLANGE MOUNTING

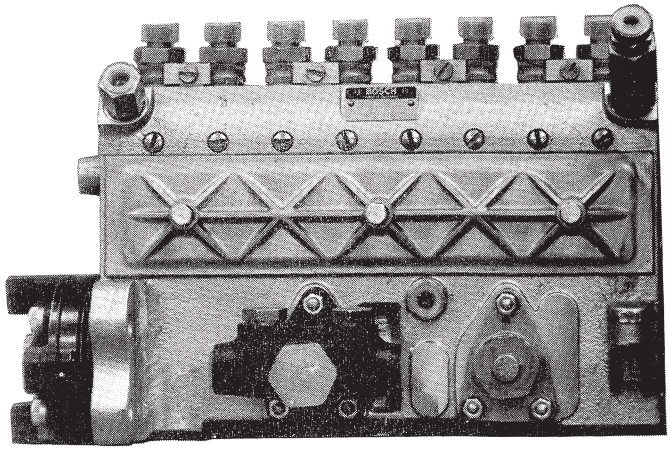
When a PE pump is flange mounted, a third letter, an S, is added to the designation. The product designation for a flange mounted pump becomes PES.

Some examples of in-line pumps are shown on the next page.





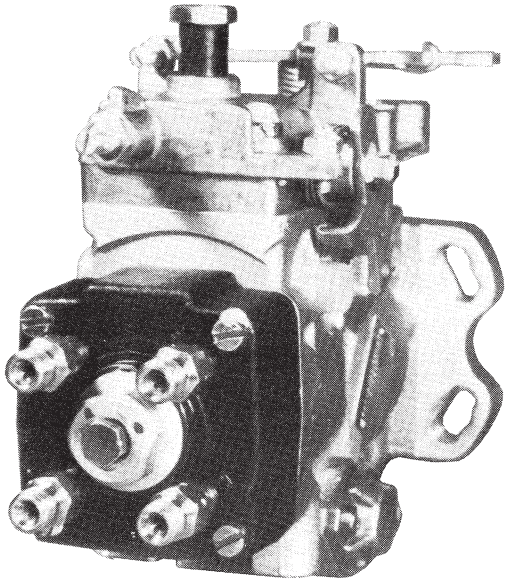




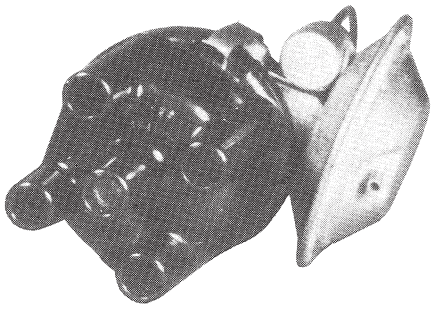
You'll be seeing a lot more of these pumps in the rest of this module and in other modules of the Pre-Tech Training Program. Let's look at the distributor type pump next.

Distributor Type Pumps

Distributor type pumps can be recognized by the way the high pressure fuel outlets (delivery valves) are arranged in a circular pattern on the end of the pump; much like the ignition distributor on a gasoline engine.

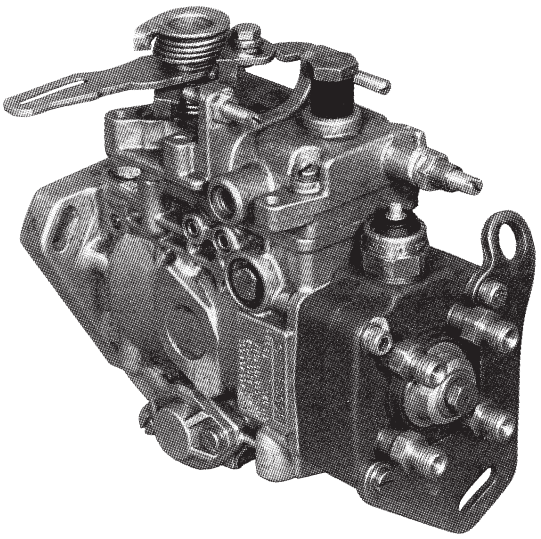


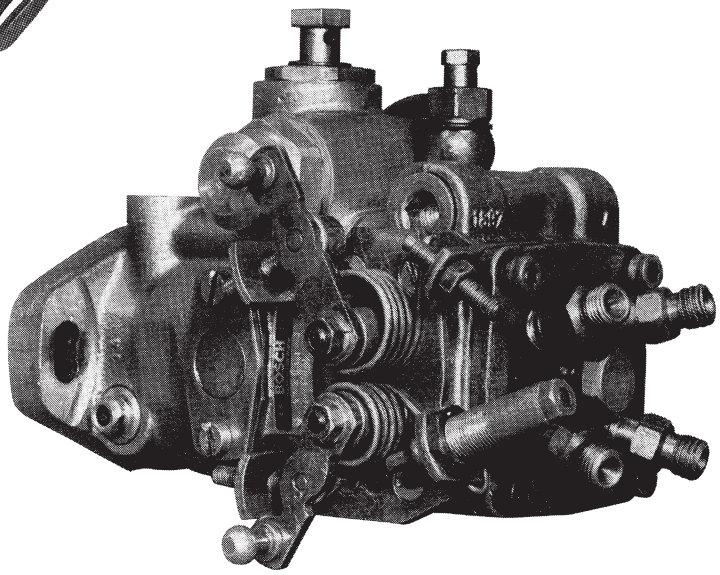
DISTRIBUTOR PUMP

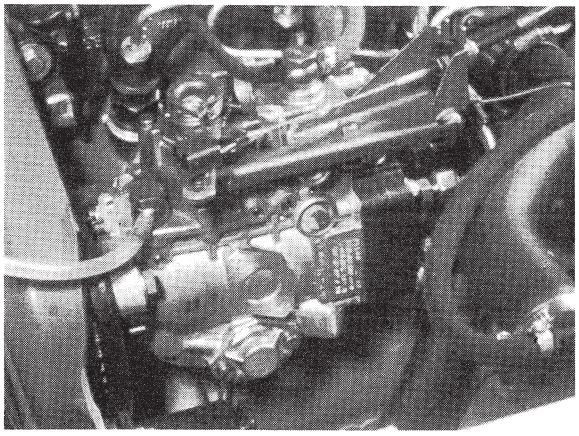


IGNITION DISTRIBUTOR

The product designation letters on the distributor type pump that we will be concerned with are VA and VE. You'll be seeing more of these pumps in this and other modules also. A few examples of distributor pumps are shown on the next page.

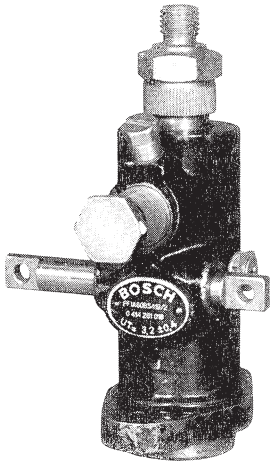




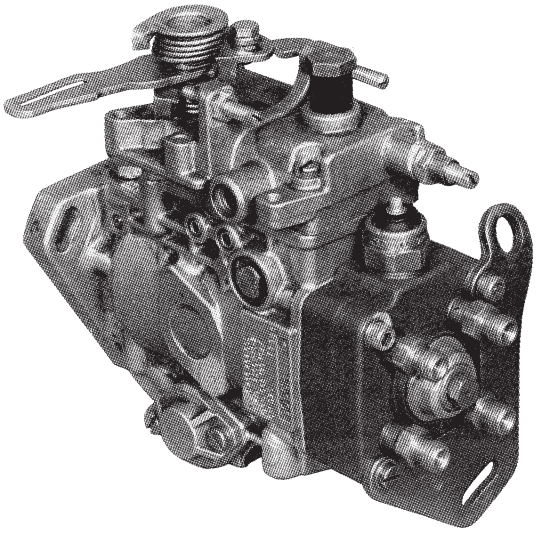


Exercise 2

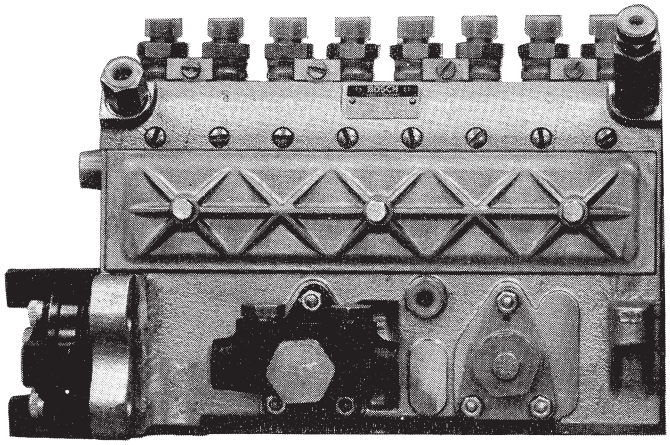
Label each pump shown as type PF, in-line, or distributor..



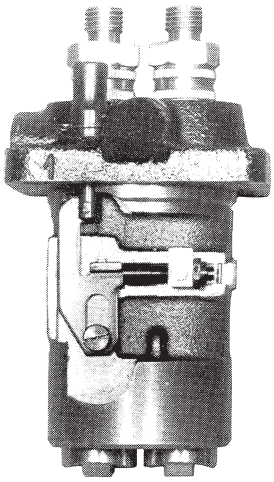
1. Type _____



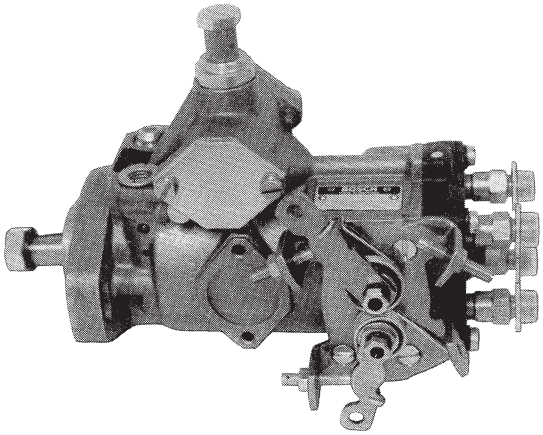
2. Type _____



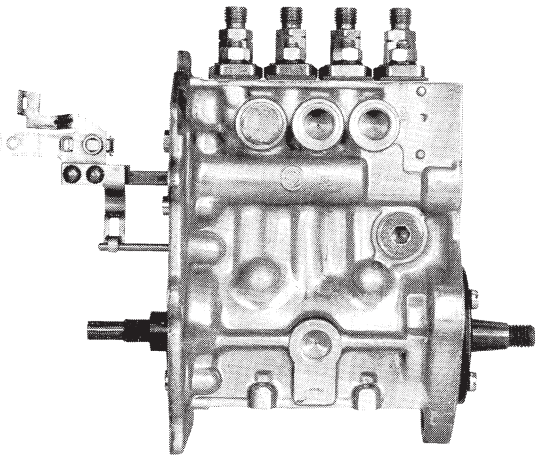
3. Type _____



4. Type _____



5. Type _____



6. Type _____

Exercise 2 (Continued)

Complete these statements

7. A pump without its own camshaft is called a _____ pump.

8. A pump without its own camshaft but with roller tappets is called a _____ pump.

9. In-line pumps that have their own camshafts are called _____ pumps.

10. In-line pumps can be _____ , _____ , or _____ mounted.

11. If the product designator for a pump is PES, the pump is an _____ type and is _____ mounted.

12. A VE pump is a _____ type pump.

You can check your answers on page 14.

Answers, Exercise 2

1. PF
2. Distributor
3. In-line
4. PFR
5. Distributor
6. In-line
7. PF
8. PFR
9. PE
10. Cradle, Base, Flange
11. In-line, Flange
12. Distributor

If you missed 4 or more questions, go back and review pages 3 through 12 before you continue with this module. If you missed fewer than 4 questions or have completed your review, go on to page 15.

IDENTIFYING INJECTION PUMPS

Now you can glance at a piece of fuel injection equipment and tell quite a lot about it. From what you have covered so far, you can recognize three basic kinds of pumps, their product designations, and mounting types.

But what you'll find most useful on the job is an ability to recognize any type of pump or governor and determine what OE customer uses it. With that information, you can locate details about the application.

In the following section you'll learn to recognize the identifying characteristics of each type of pump and governor you are likely to see.

You have already learned to identify one type of pump, the PF and its brother PFR. Remember? They're the pumps that DON'T have their own camshafts. Now we'll concentrate on PE pumps.

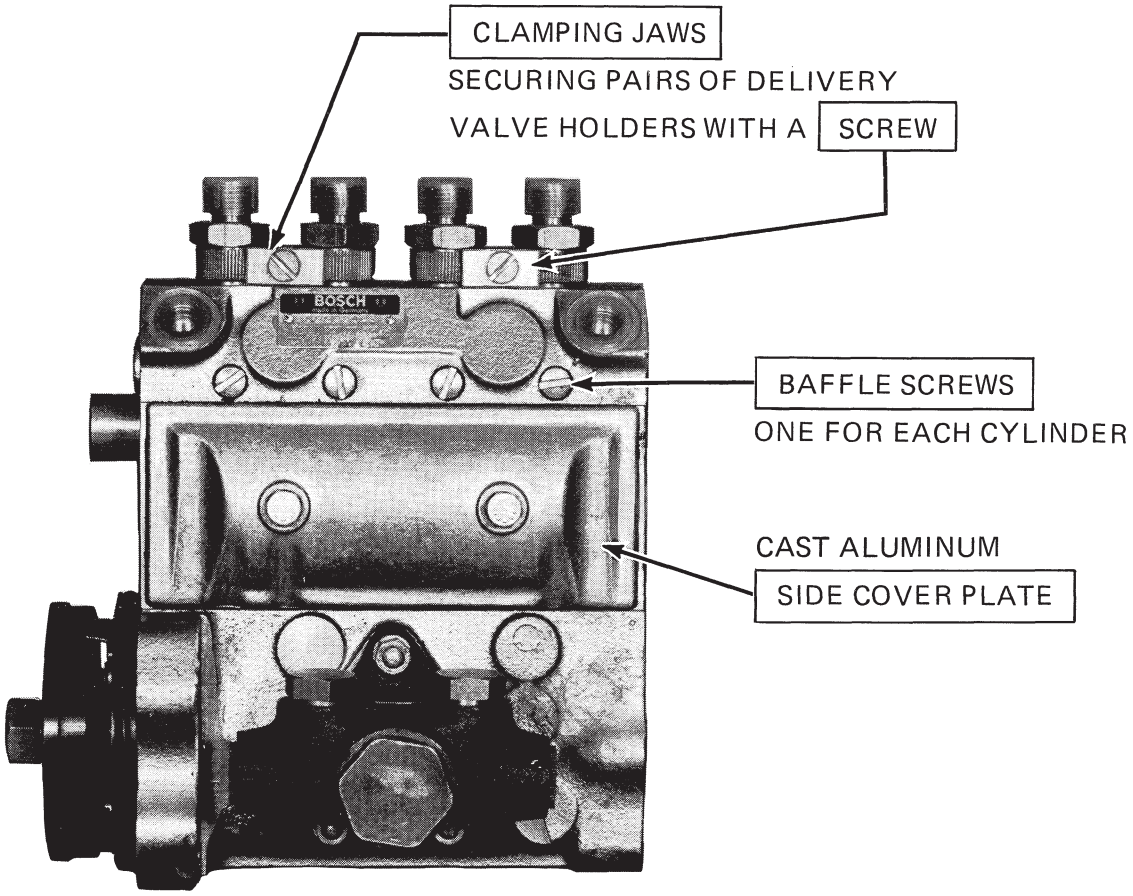
Identifying In-Line Pumps

While the term doesn't really tell you how big the pumps are, in-line pumps are referred to by the term SIZE. The four in-line pumps we will be concerned with here are the A Size, MW Size, M Size and P Size pumps. You'll find them installed on engines in a variety of applications for many OE (Original Equipment) customers. You'll see who these OE customers are for each size pump too.

The OE customers for each pump are shown on a chart as each size pump is discussed. This chart builds as each pump (and later each governor) is discussed. As each pump (or governor) is discussed the OE customers are identified by a black dot beneath the name of the customer. Previously discussed pumps (or governors) and their OE customers are identified on the chart by circles.

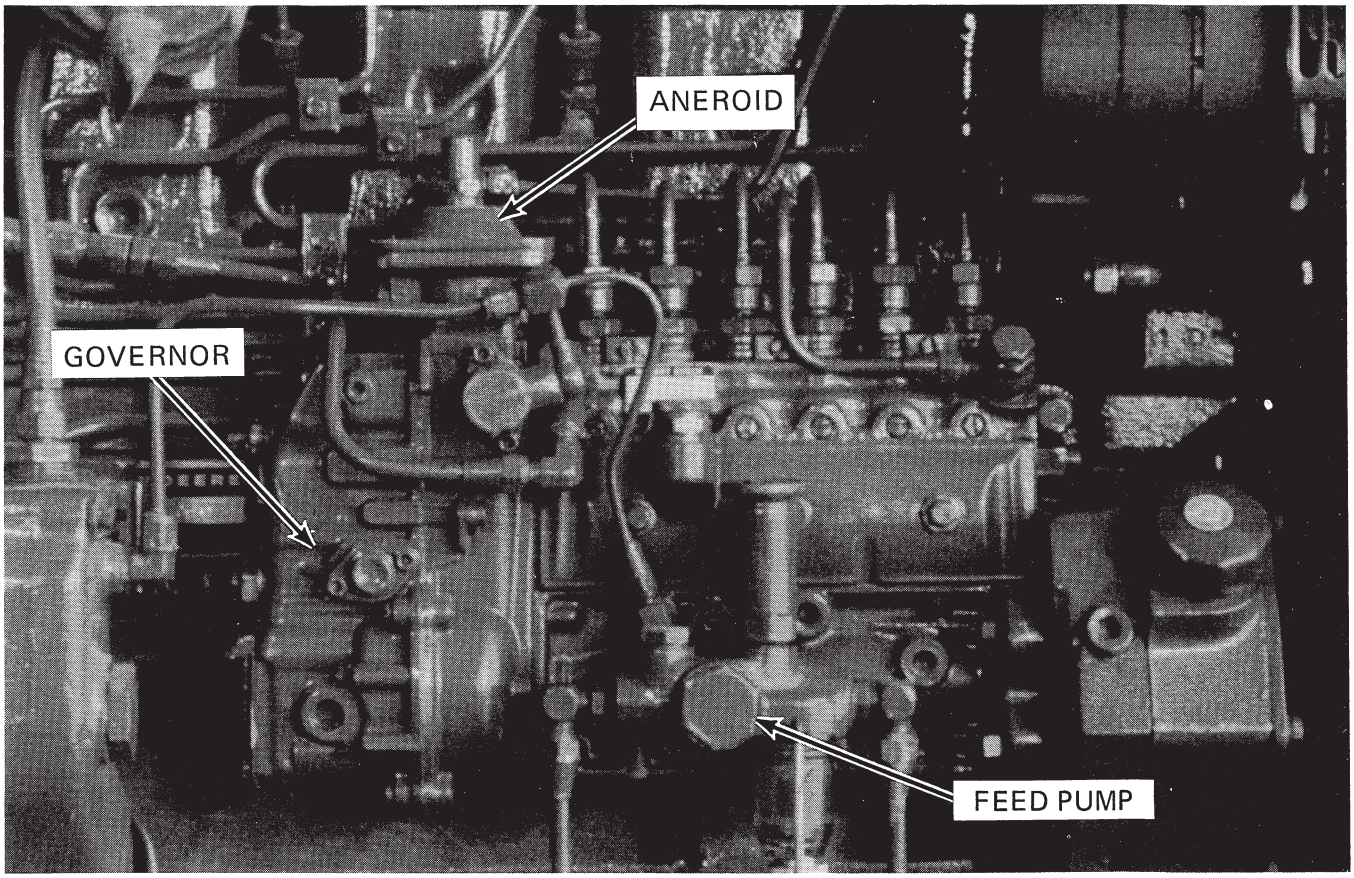
A Size Pumps

You'll find the A size pump on tractors made by John Deere and J. I. Case, on International Harvester and Mercedes Benz trucks and Deutz engines as well as many others. Features by which you can identify these pumps include:



Then, just when you think you know everything about identifying an A size pump, confusion may set in. You'll look at a pump and governor assembly on an engine. What you'll see looks like an A size pump. But you'll see several extra gadgets, too. Is it still an A size pump? Yes.

Here is an A size pump with typical associated equipment.



The aneroid is used to limit the amount of fuel delivered to turbocharged engines at low boost pressure. Too much fuel at the wrong time causes black smoke, wastes fuel and can damage the engine.

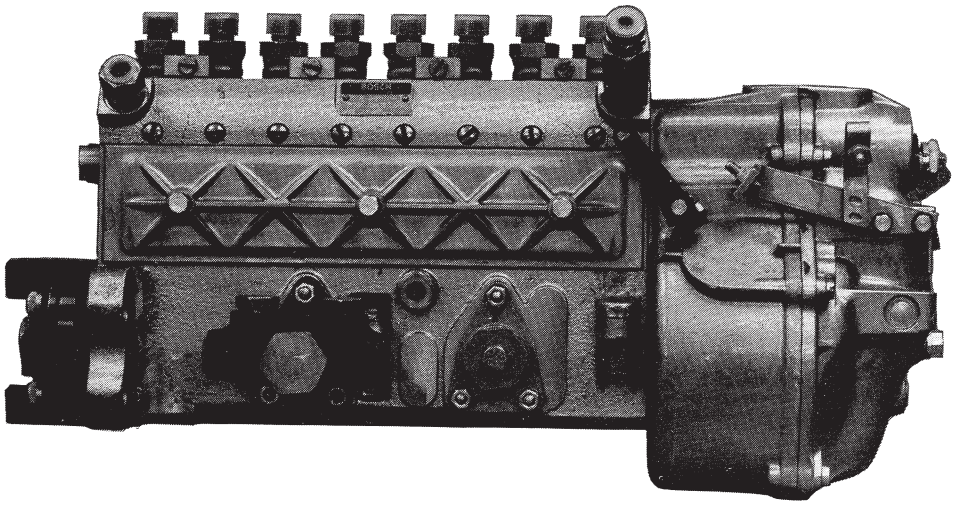
The fuel feed pump transfers fuel from the tank and delivers it through a filter to the injection pump.

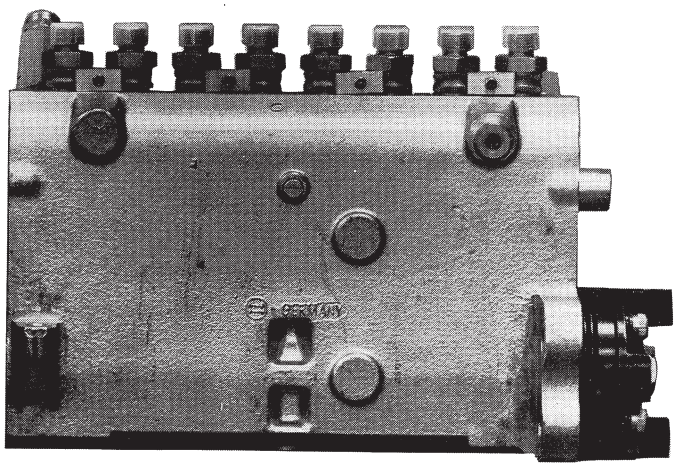
Governors control the engine speed, but more about governors later.

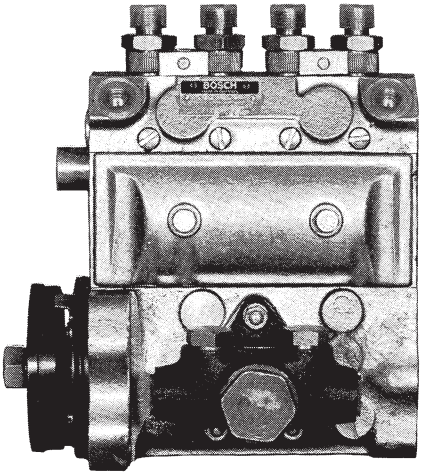
Other attachments, such as timing devices, starting and stopping equipment and drive couplings or gears may also be used on certain pumps. This equipment does not change the pump size. No matter what the pump is wearing, it's still the same underneath.

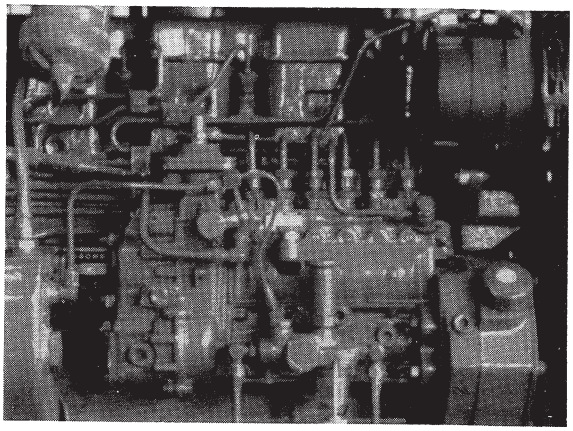
A Size Pumps

Here are several views of A Size pumps.



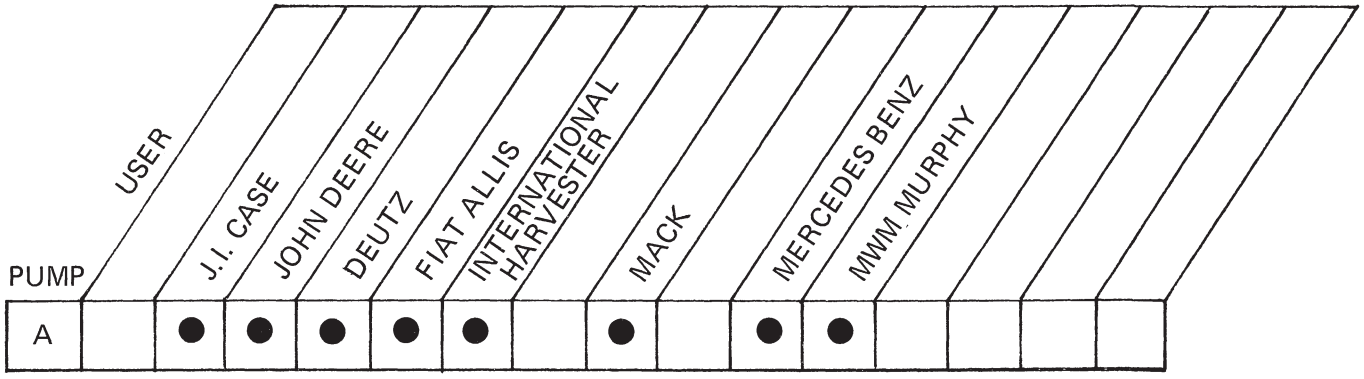






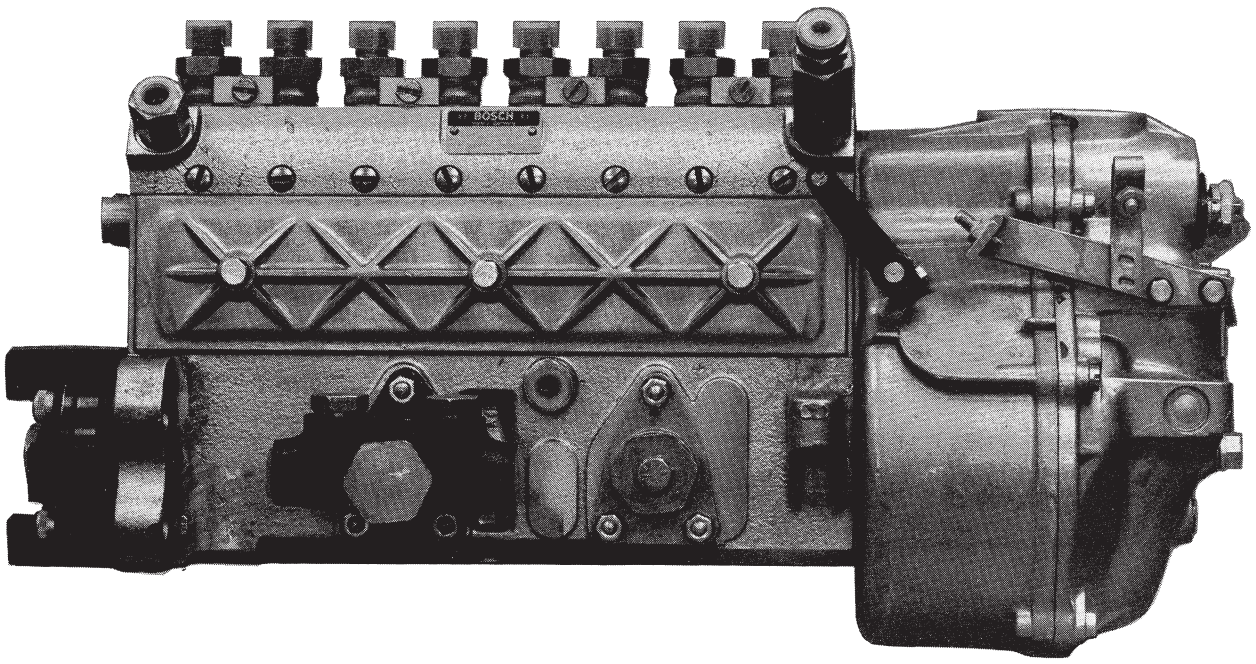
A Size Pumps

The A size pump is used by the following original equipment customers. These are the most common but there are many others.



Exercise 3

1. On the illustration below, draw arrows to the features that you can use to distinguish A size pumps from other sizes.



2. List three OE customers for A size pumps.

_____

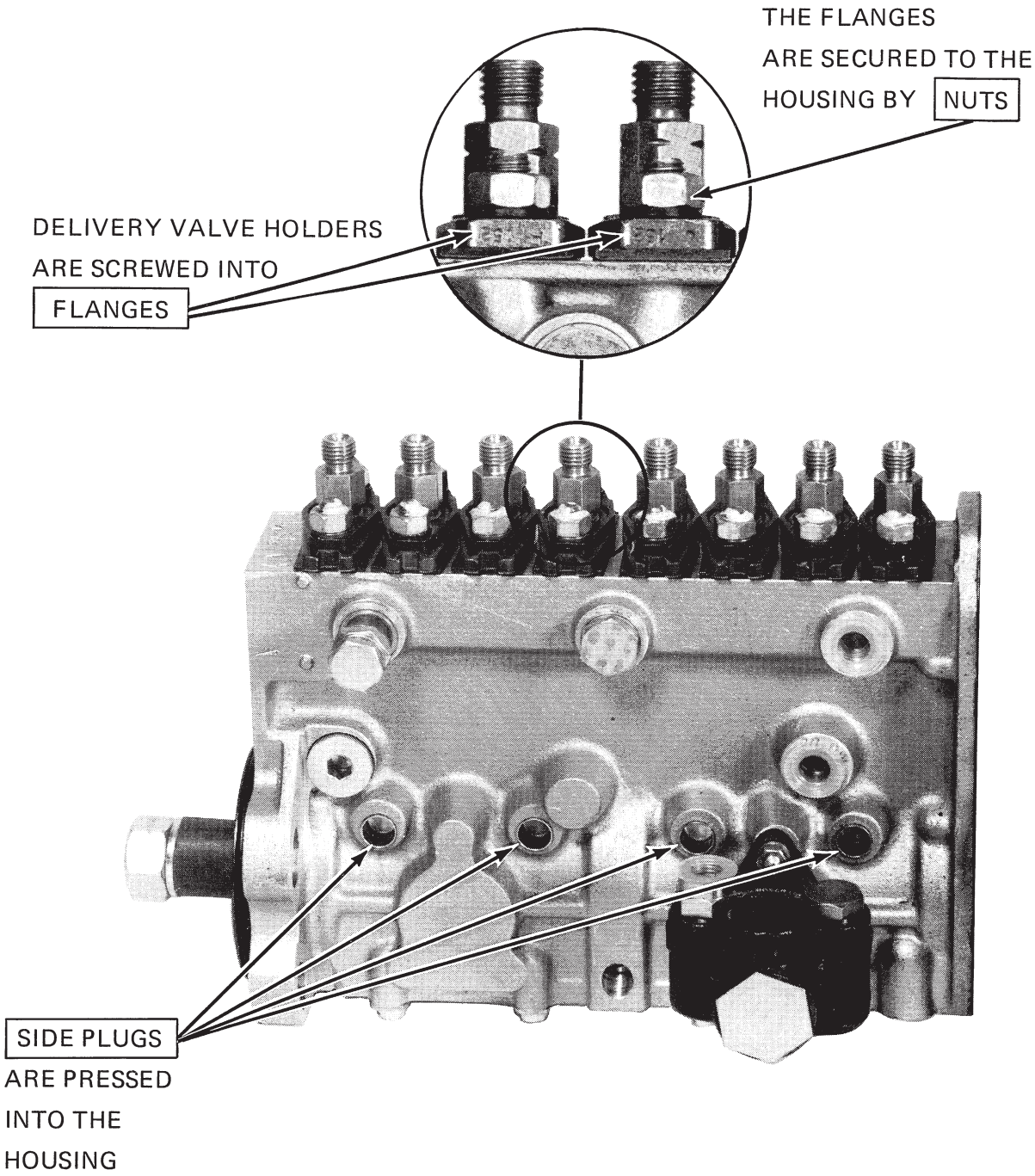
_____

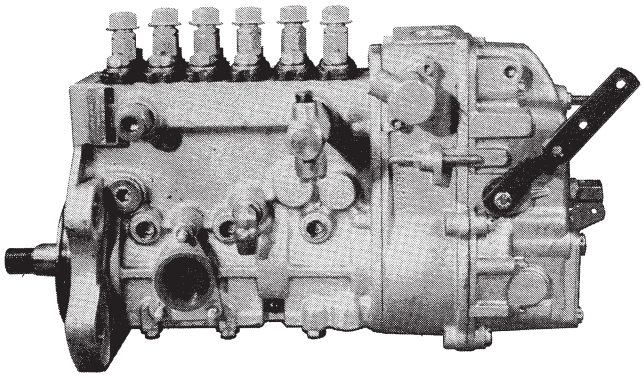
_____

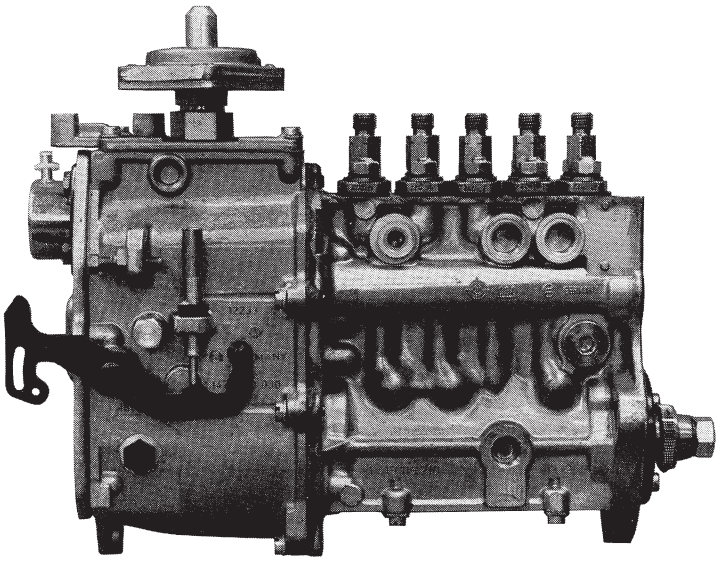
When you have completed this exercise, check your answers by referring to pages 16 through 19. If you have any questions about recognizing A size pumps, see your instructor or supervisor.

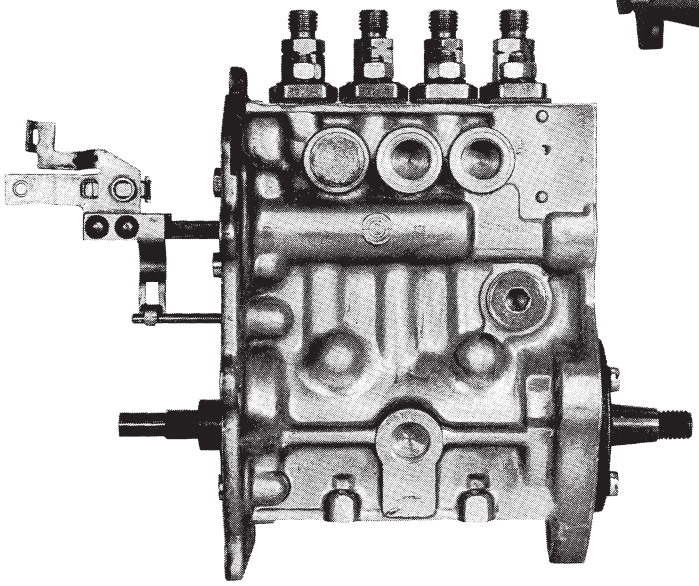
MW Size Pumps

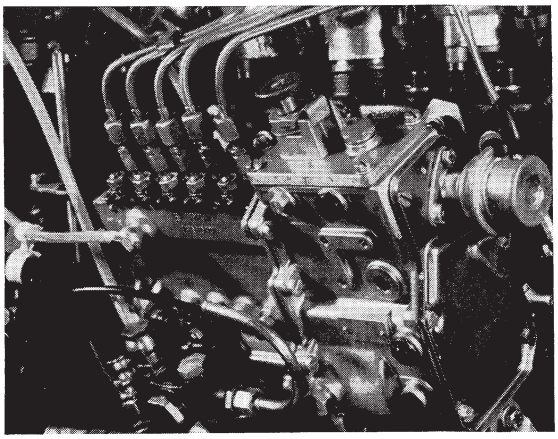
Mercedes Benz cars, Volvo truck and marine engines, International Harvester, Mack Trucks and Perkins diesels all use MW pumps. You can recognize these pumps by the following identifying features:





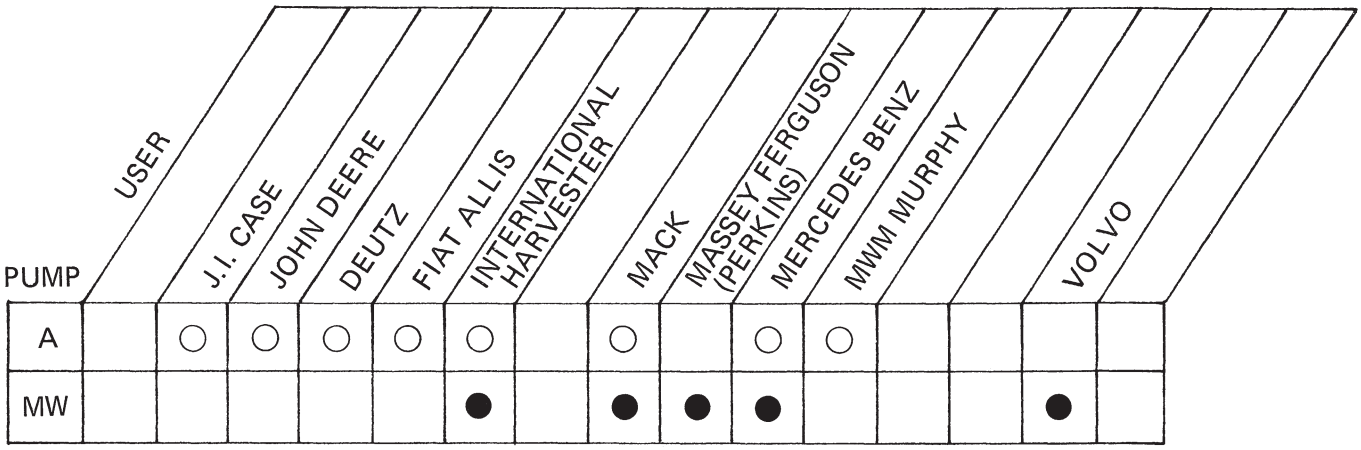






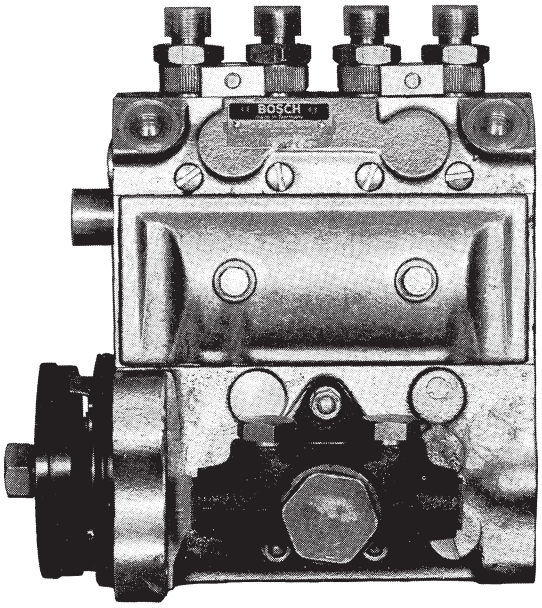
MW Size Pumps

The MW pump is used by the following original equipment customers.

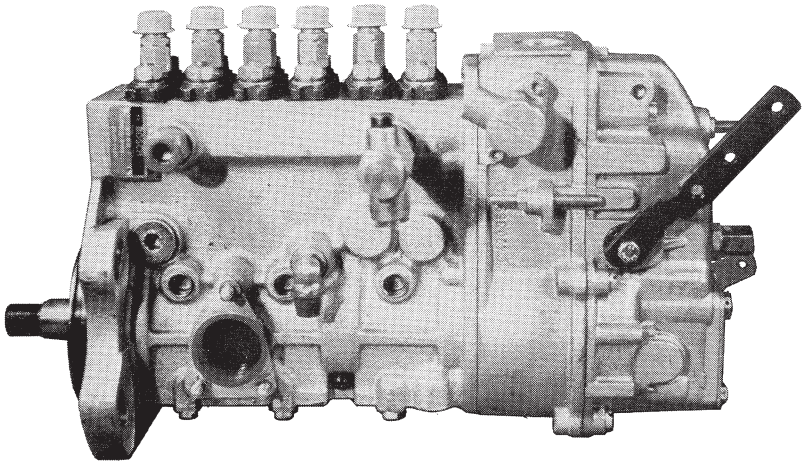


Exercise 4

1. The pump illustrated below is an_____ size pump.



2. On the illustration below, draw arrows to the features you can use to distinguish MW pumps from other sizes.

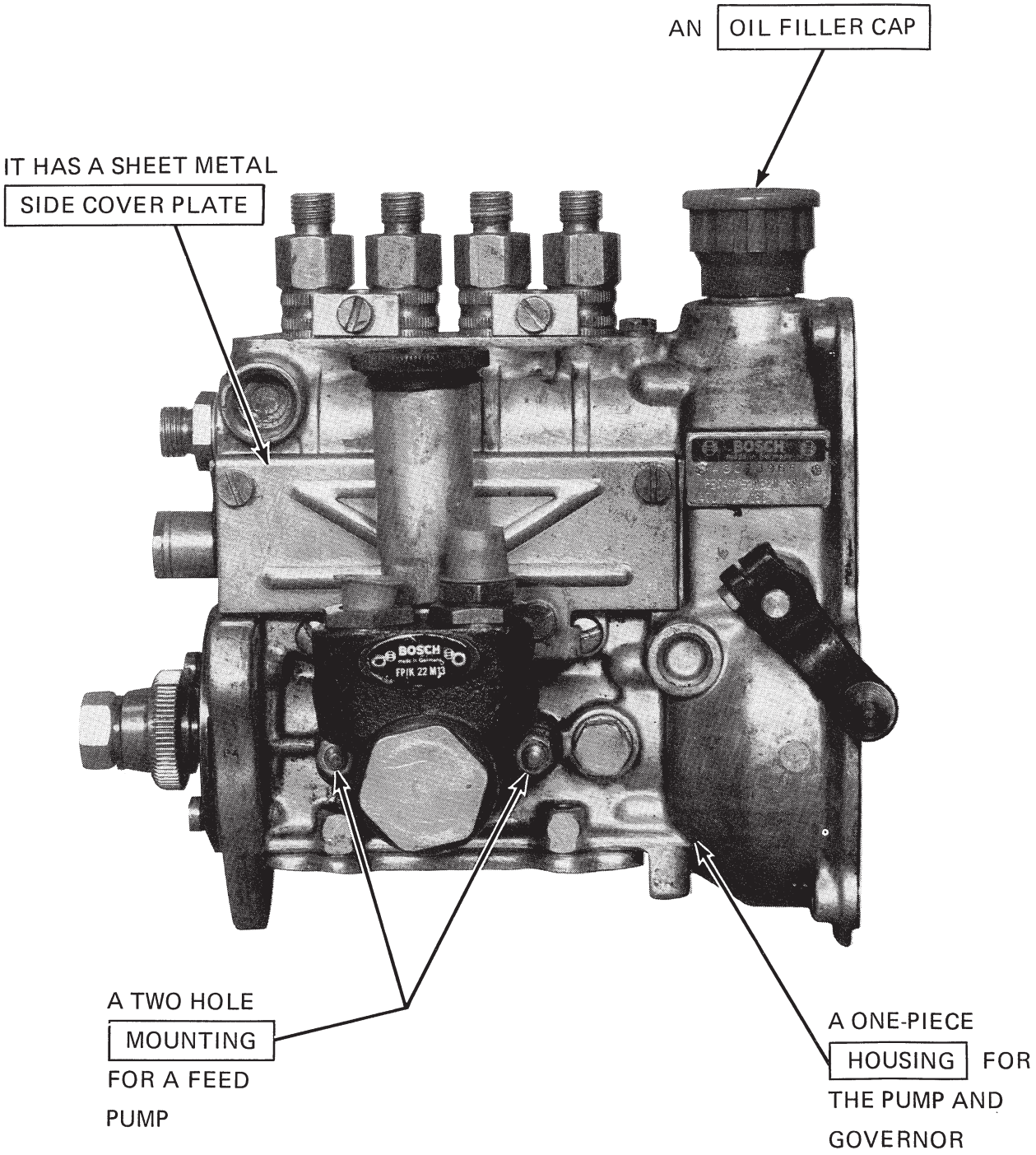


3. List two OE customers for MW pumps. _____ _____

When you have completed this exercise, check your answers by referring to pages 16 through 23. Remember if you have any questions about recognizing an MW pump or its users, see your instructor or supervisor.

M Size Pumps

Like the MW pump, the M pump is also used on Mercedes Benz cars. You'll also find it on the Mercedes Benz Unimog and Lombardini diesels. Its identifying features are shown below.



M Size Pumps

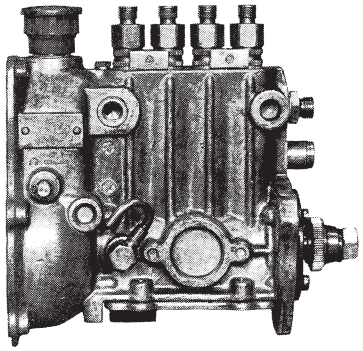
The M pump is used by the following original equipment customers.

PUMP \ USER	J.I. CASE	JOHN DEERE	DEUTZ	FIAT ALLIS	INTERNATIONAL HARVESTER	LOMBARDINI	MACK	MASSEY FERGUSON (PERKINS)	MERCEDES BENZ	MWM MURPHY			VOLVO	
A	○	○	○	○	○		○		○	○				
MW					○		○	○	○				○	
M	●					●			●					

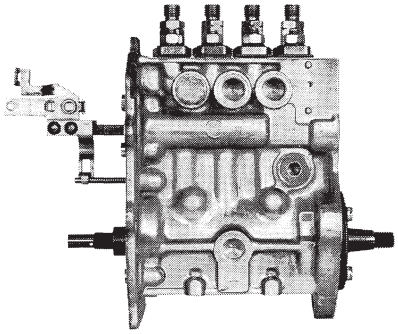
Exercise 5

1. In the blanks provided, identify the pumps shown below:

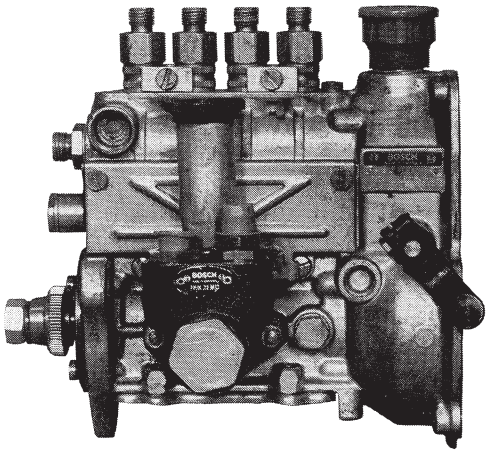
a. _____



b. _____



2. On the illustration below, draw arrows to features you can use to distinguish M pumps from other sizes.

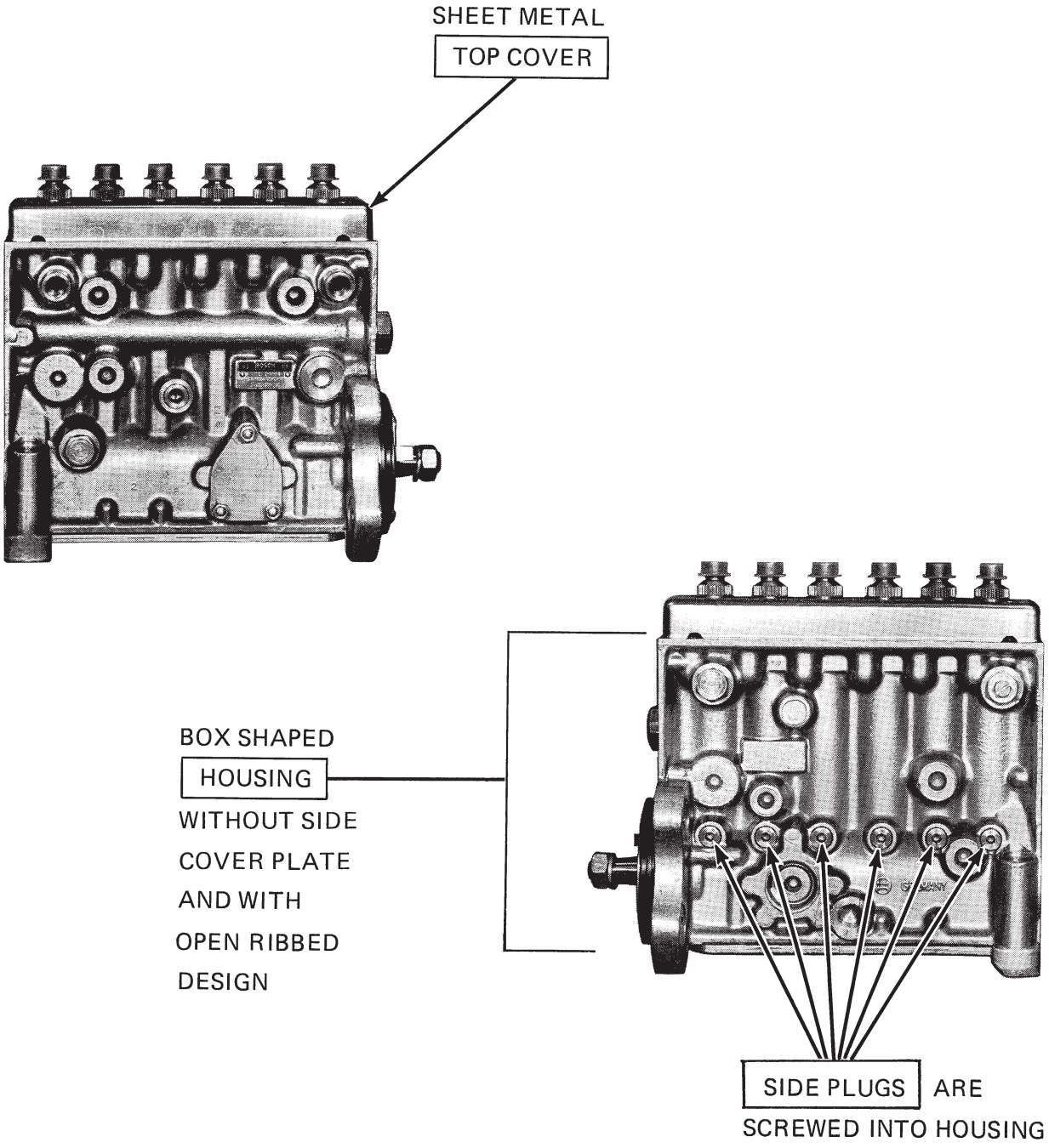


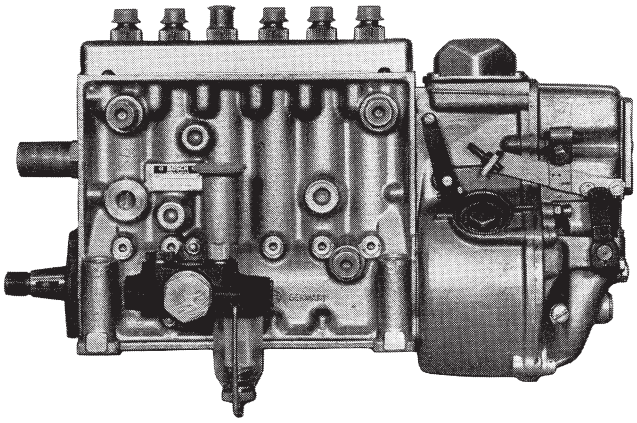
3. List two OE customers for M pumps. _____ _____

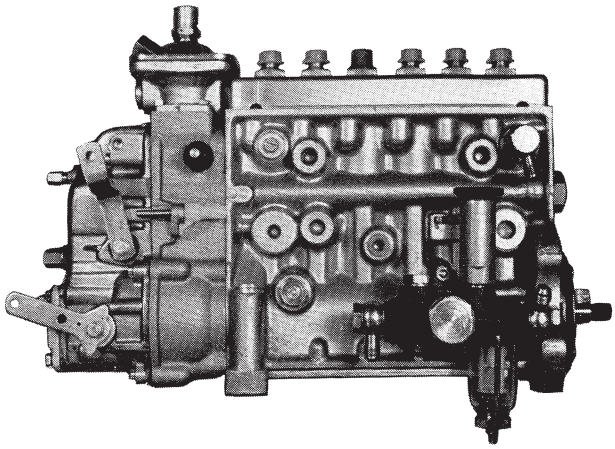
When you have completed this exercise, check your answers by referring to pages 21 through 26. If you are not sure about something, check with your instructor or supervisor.

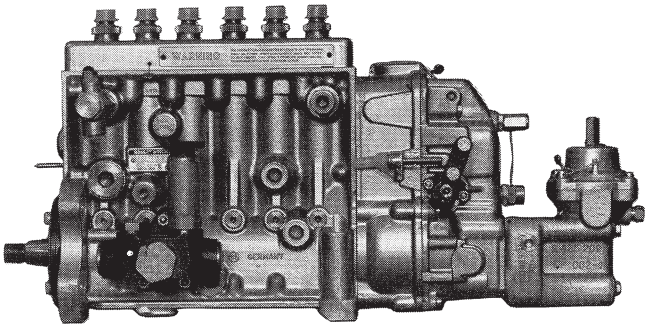
P Size Pumps

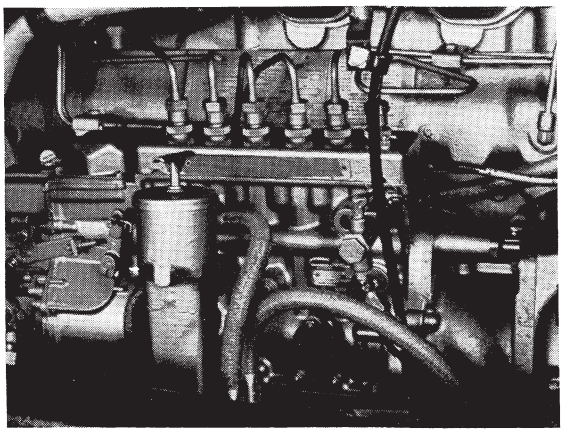
The P size pump is used by a number of OE customers. These include John Deere, Mack, Allis-Chalmers, Waukesha, International Harvester, and Volvo truck and marine engines. This pump is easy to identify because of the following distinguishing features and while it may look similar to an MW pump in real life it's noticeably larger.











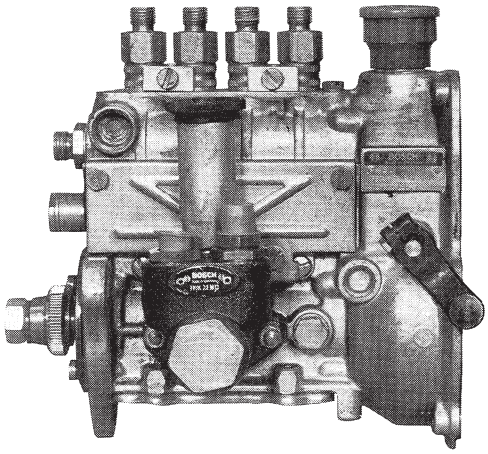
P Size Pumps

The P pump is used by the following original equipment customers.

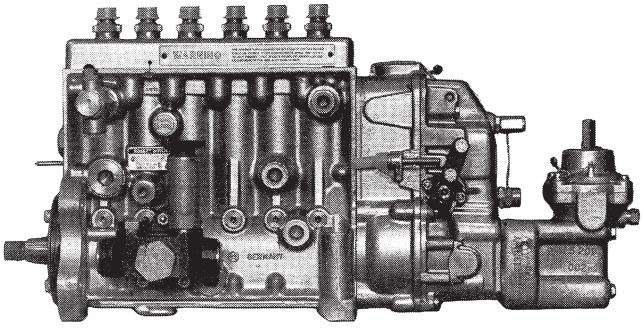
PUMP	USER	ALLIS CHALMERS	J.I. CASE	JOHN DEERE	DEUTZ	FIAT ALLIS	INTERNATIONAL HARVESTER	LOMBARDINI	MACK	MASSEY FERGUSON (PERKINS)	MERCEDES BENZ	MWM MURRAY	VOLVO	WAUKESHA
A		○	○	○	○	○		○		○	○			
MW						○		○	○	○			○	
M		○					○			○				
P	●	●	●	●	●	●		●		●	●		●	●

Exercise 6

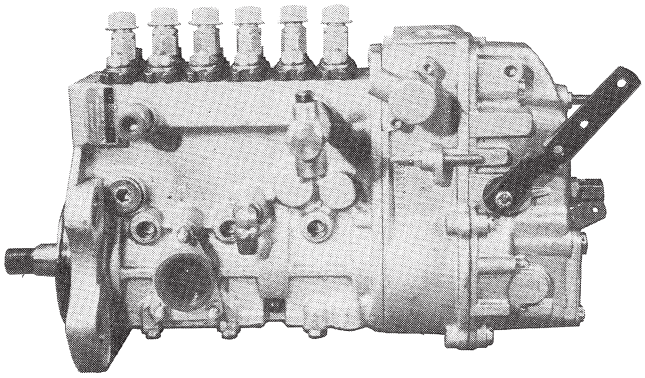
1. Identify the pumps below in the blanks provided.



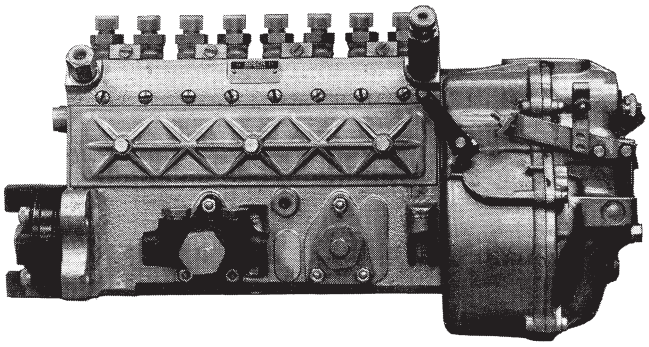
a. _____



b. _____



c. _____



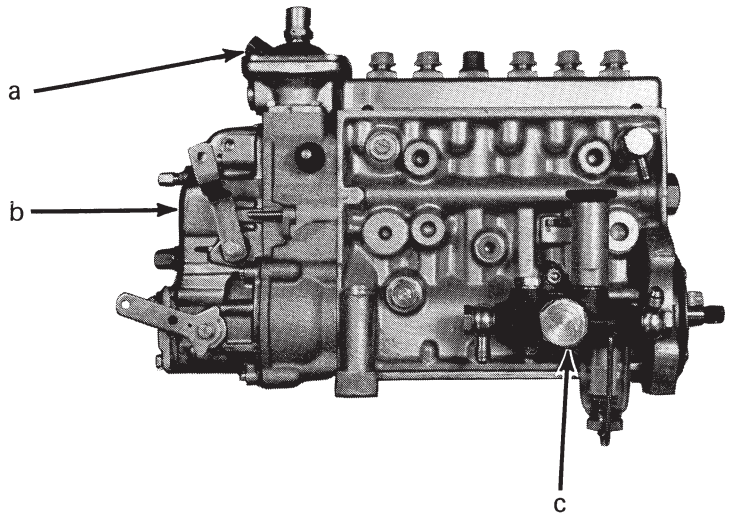
d. _____

2. The four pumps illustrated above are:

_____

(single plunger) (distributor) (in-line)

3. Name the three attachments shown in the illustration below.

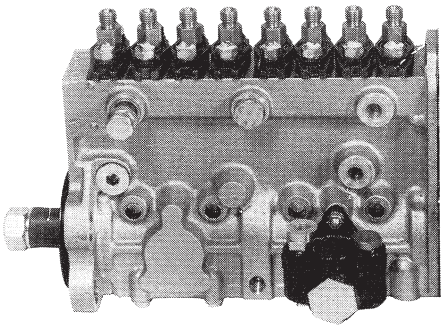


a. _____

b. _____

c. _____

4. Draw arrows to the distinguishing features on the pump below.



5. List three OE customers for P pumps.

_____

_____

Check your answers on the following page. Review previous material as needed.

Answers, Exercise 6

1. a. M, b. P, c. MW, d. A

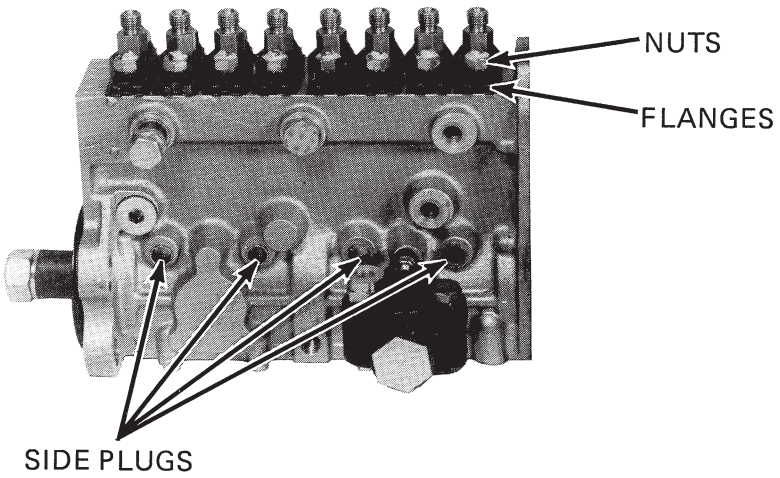
2. c. in-line

3. a. puff limiter or aneroid

   b. governor

   c. feed pump

4.



5. John Deere
   International Harvester
   Waukesha
   Mack
   Allis-Chalmers
   Volvo

   — Any three

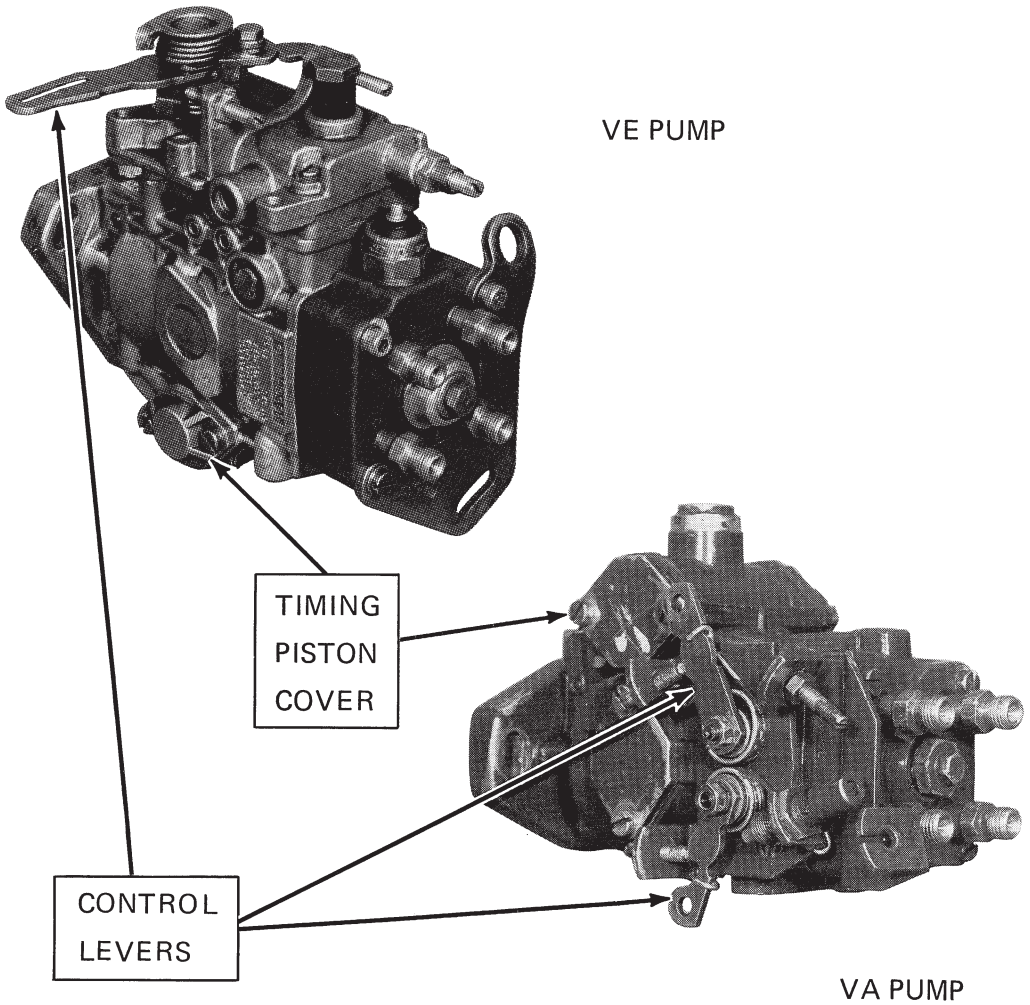
IDENTIFYING DISTRIBUTOR PUMPS

The two remaining pumps you will learn to identify in this program are the VE and VA distributor pumps. These pumps are used in Volvo and Peugeot cars, International Harvester, and Deutz tractors as well as other applications. Volkswagen uses the VE pump on their diesels.

It's easy to tell the distributor pumps from the in-line types, as you know. But discriminating between the VE and VA is a little harder. Both have the same basic parts; the differences are in where some of the parts are located.

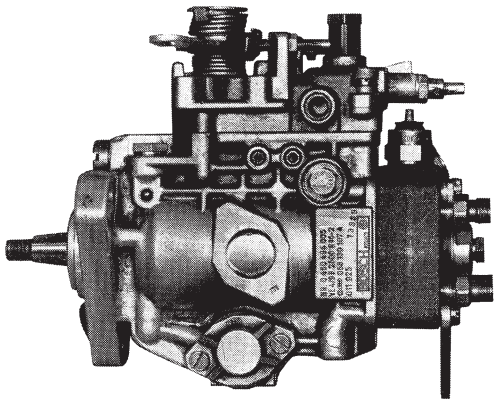
The differences in the appearance of the two pumps are in the position of the control levers and timing piston covers. The VE pump has a horizontal control lever and the timing piston cover is located near the bottom of the pump. The VA pump has two vertical control levers and the timing piston cover is located near the top of the pump..

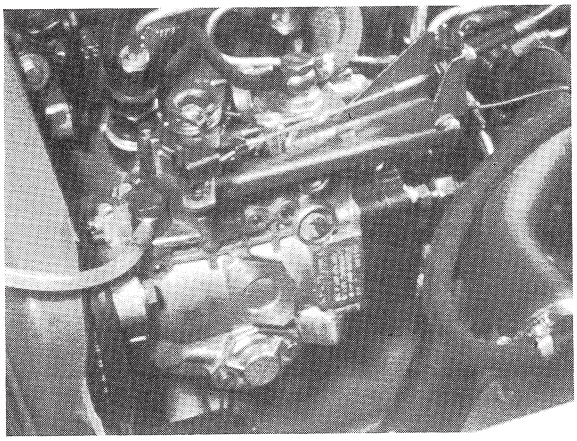
Here's a look at the two pumps and their identifying parts.

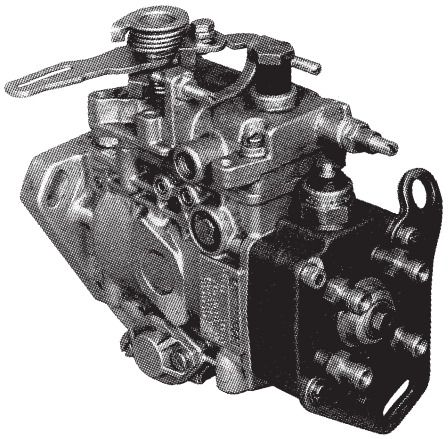


Distributor Pumps

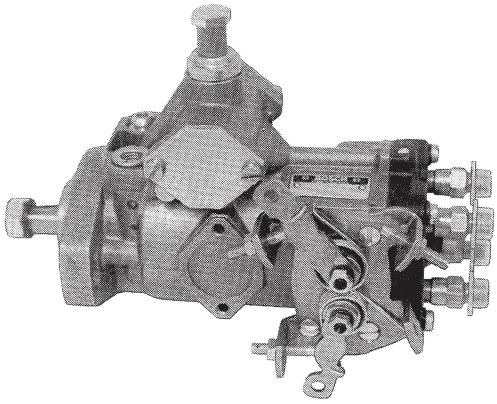
VE Pumps

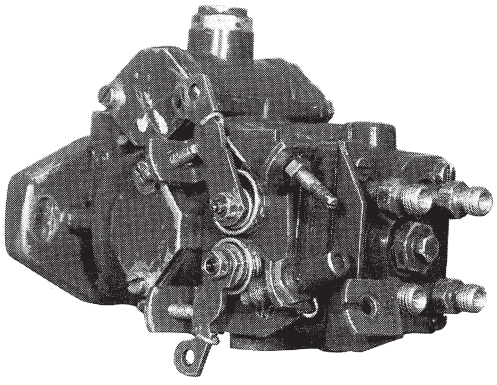


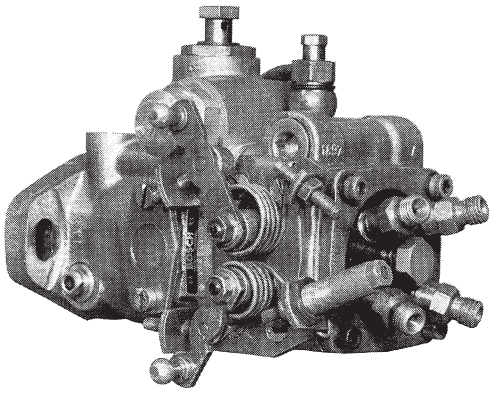




VA Pumps







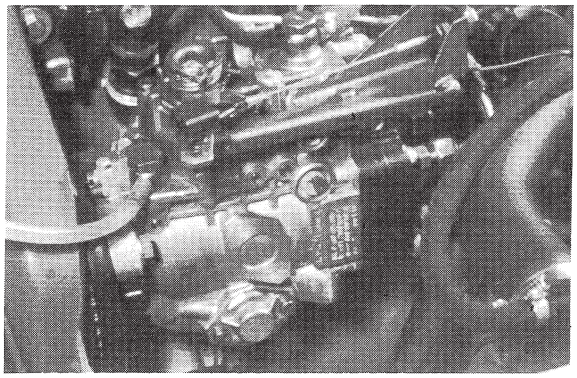
Distributor Pumps

VE and VA pumps are used by the following original equipment customers.

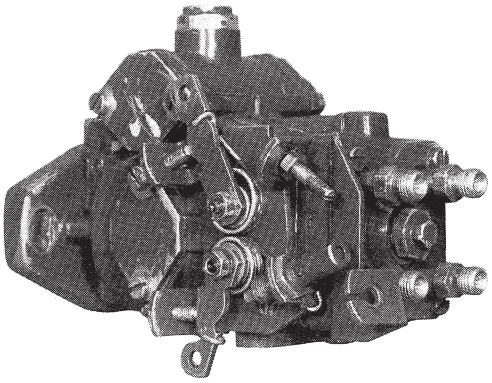
PUMP	ALLIS CHALMERS	J. I. CASE	JOHN DEERE	DEUTZ	FIAT ALLIS	INTERNATIONAL HARVESTER	LOMBARDINI	MACK	MASSEY FERGUSON (PERKINS)	MERCEDES BENZ	MWM MURPHY	PEUGEOT	VOLKSWAGEN	VOLVO	WAUKESHA
A		○	○	○	○	○		○		○	○				
MW						○		○	○	○				○	
M		○					○			○					
P	○	○	○	○	○	○		○		○	○			○	○
VA				●		●						●		●	
VE						●			●			●	●	●	

Exercise 7

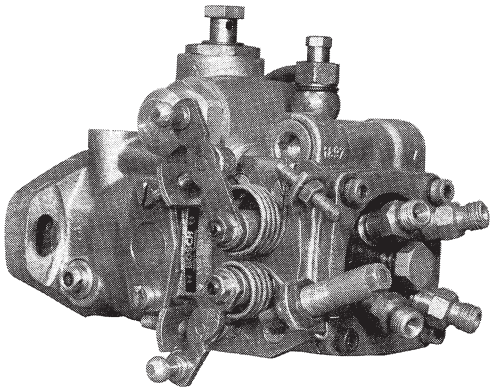
1. Identify each of the pumps shown below.



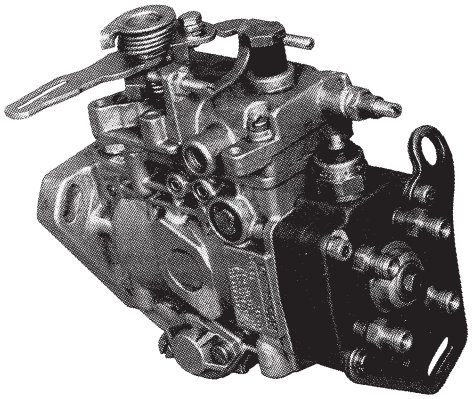
_____



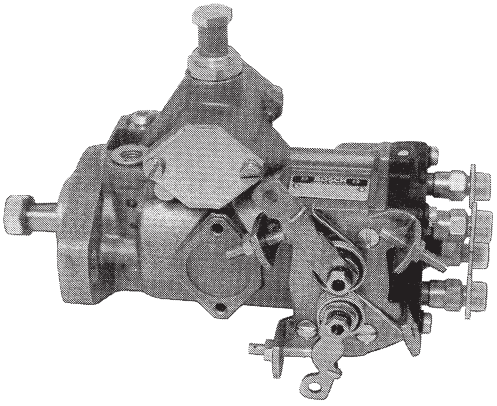
_____



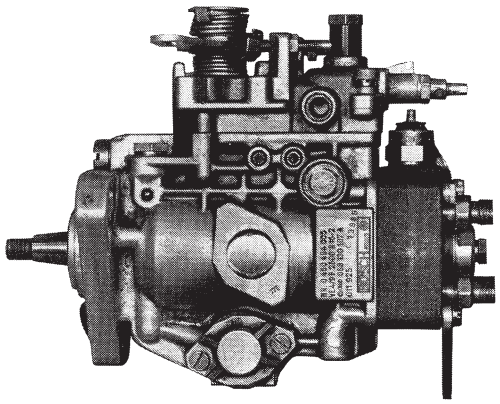
_____



_____



_____



_____

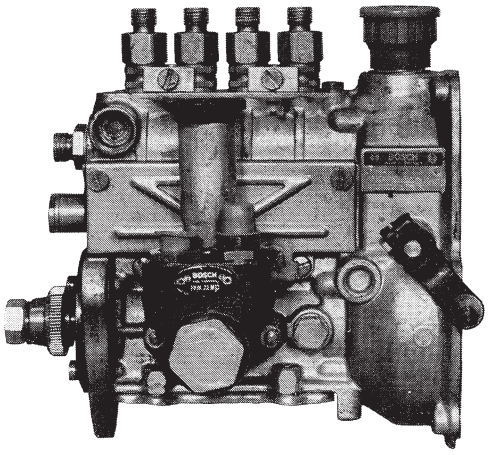
2. Volvo and Peugeot use both VE and VA pumps, but Volkswagen uses only _____ pumps.

When you have completed this exercise, check your answers by referring to pages 35 through 37.

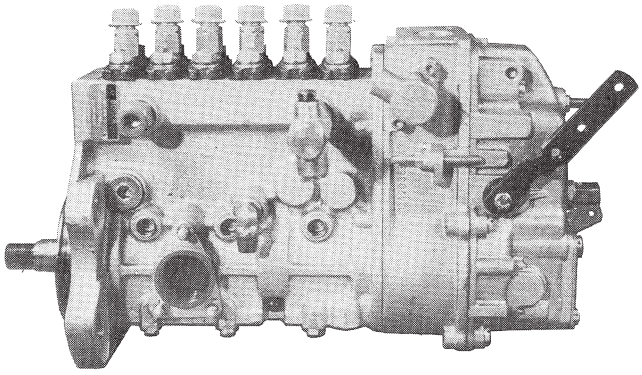
As a review of what you have learned so far about identifying pumps, test yourself with this exercise.

Exercise 8

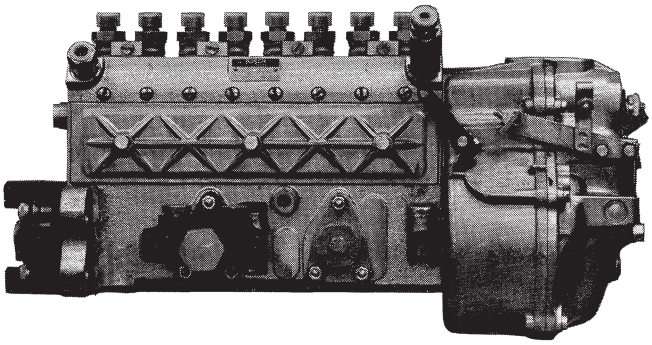
Identify each of the pumps shown. Check your answers on page 42 when you have completed the exercise.



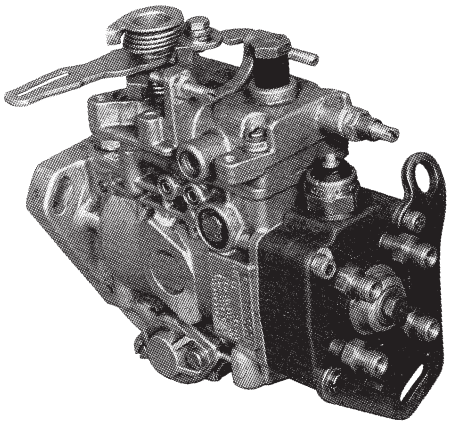
a _____



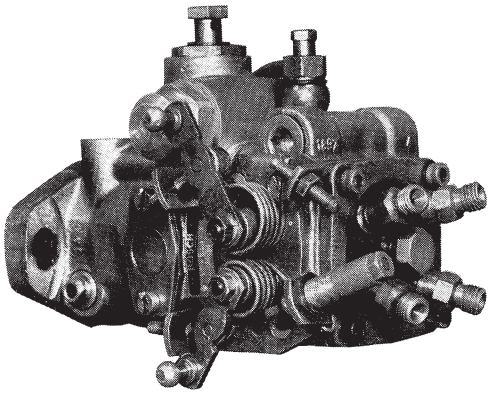
b _____



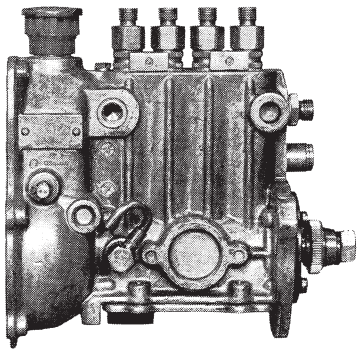
c _____



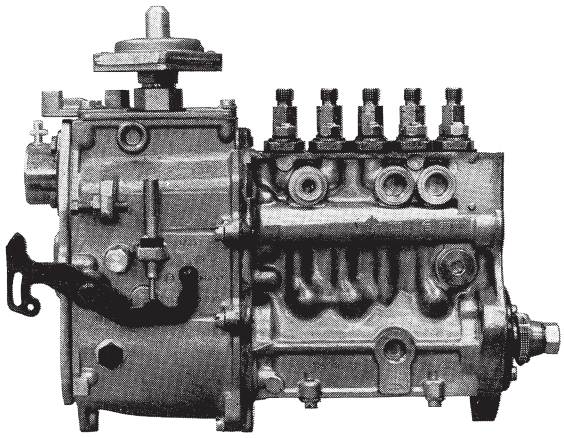
d _____



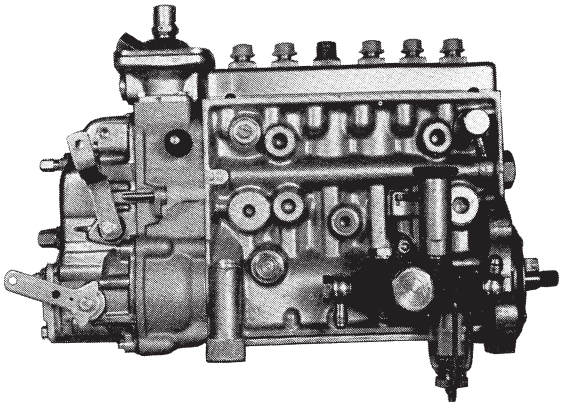
e _____



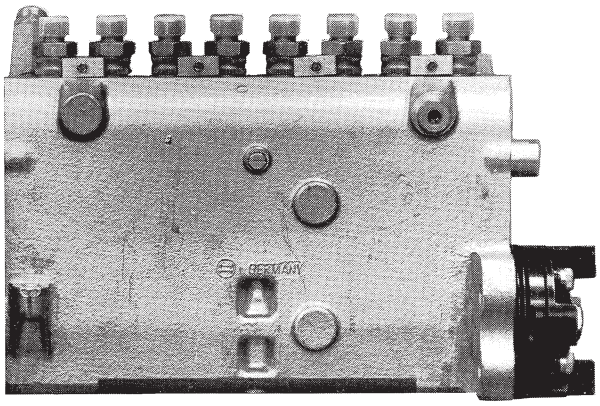
f _____



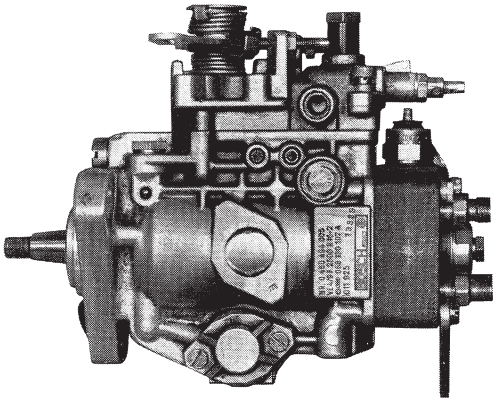
g _____



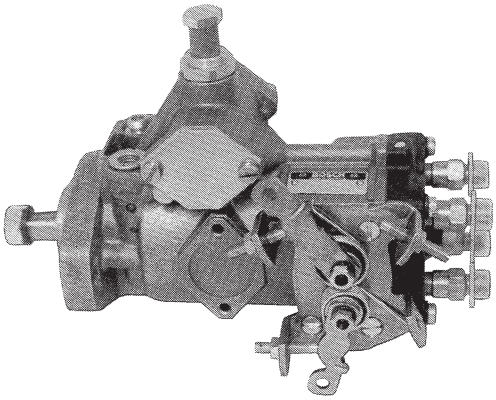
h _____



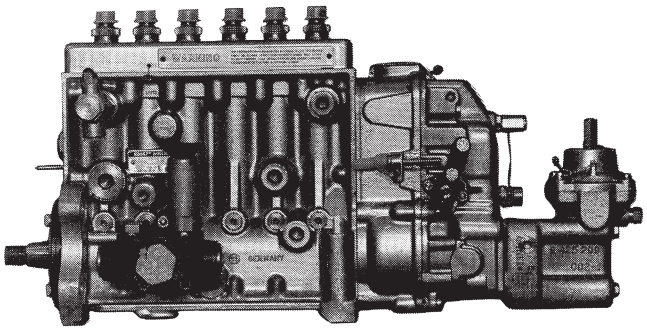
i _____



j _____



k _____



l _____

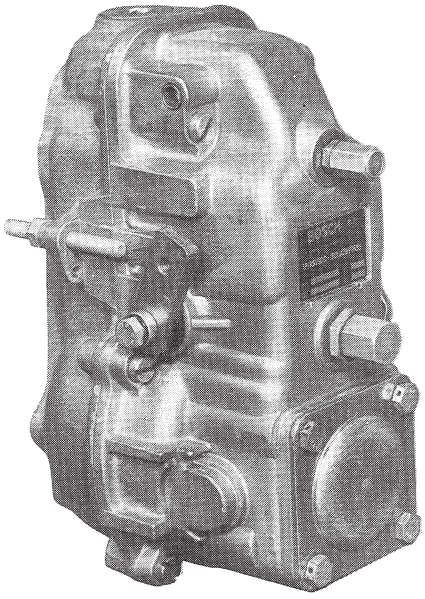
Answers, Exercise 8

a – M
b – MW
c – A
d – VE
e – VA
f – M
g – MW
h – P
i – A
j – VE
k – VA
l – P

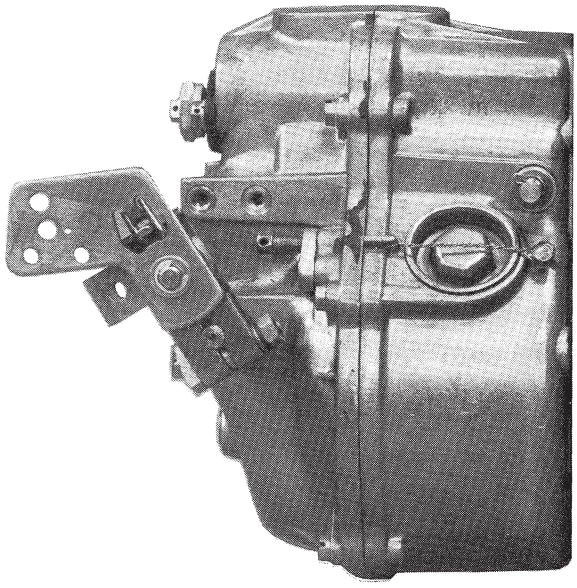
If you missed 4 or more of these questions, go back and review pages 14 through 37 before you go on to the next section of this module. If you still have questions or aren't sure about something, see your instructor or supervisor for help.

IDENTIFYING GOVERNORS

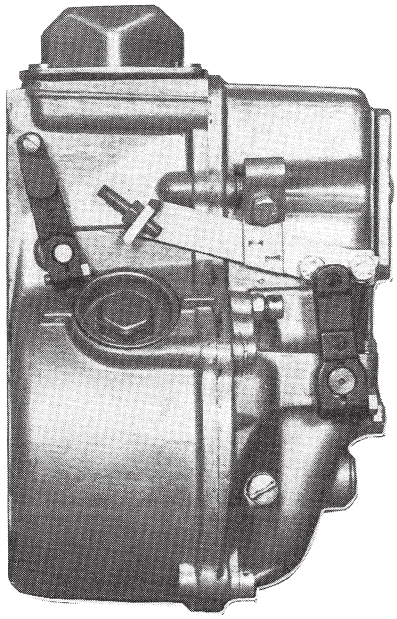
Each different governor has its distinguishing features. These features may be in the shape of the governor, access covers for various internal adjustments, and the location of various external adjustments. In the next few pages, you'll learn what the identifying features are to identify these governors.



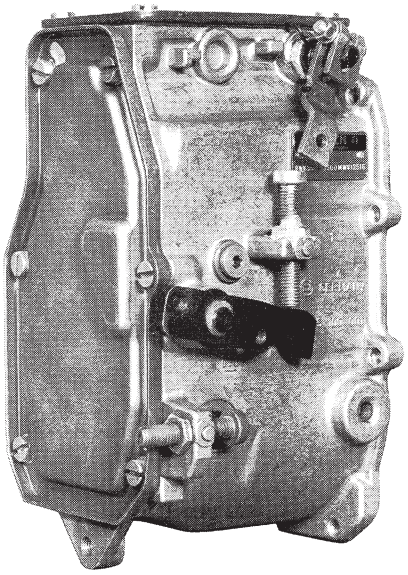
RSV



RQV



RQV . . . K



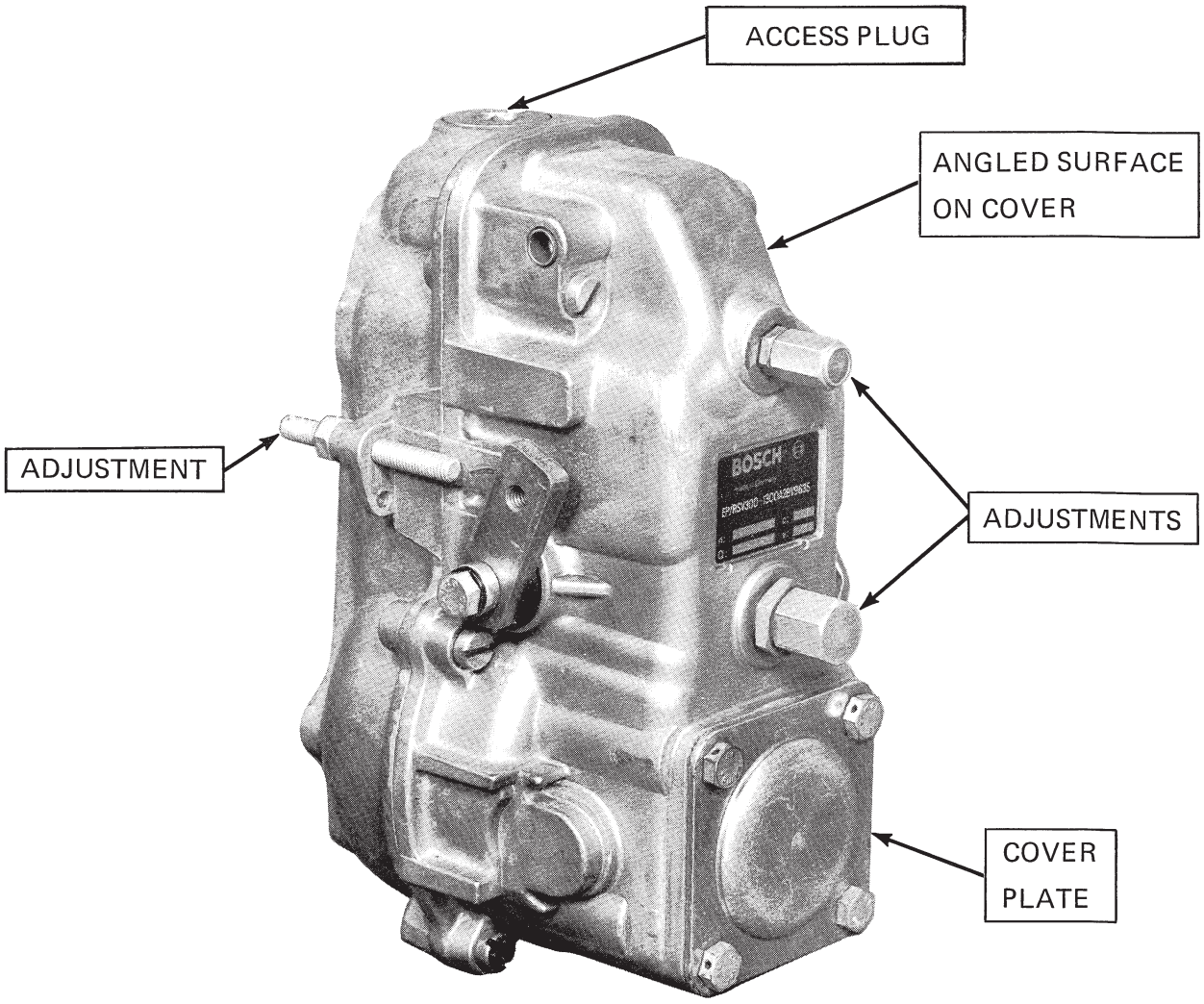
RWV

RS and RSV Governors

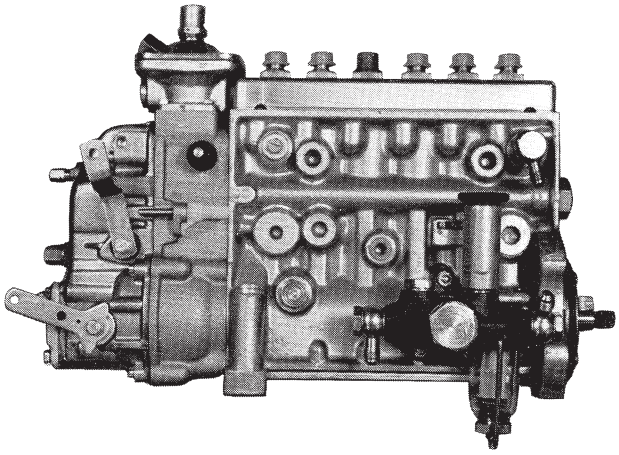
The RS governor regulates engine speed at the minimum and maximum limits but provides no speed control between these ranges. RSV governors provide regulation at any selected speed setting. The V stands for Variable-Speed.

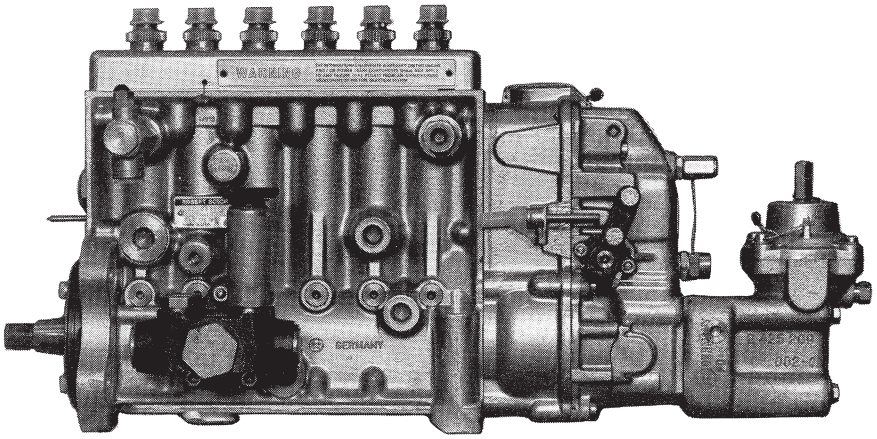
This allows the operator to select an engine speed somewhere between the minimum and maximum limits and expect the governor to keep it there.

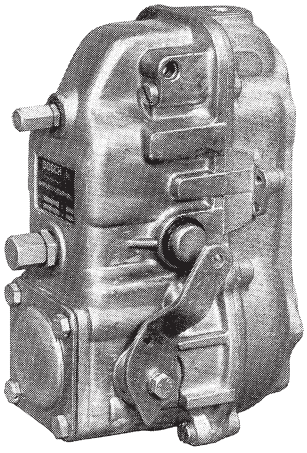
RS and RSV governors look similar on the outside. Several adjustments can be made at points outside the housing of the RSV. These adjustments and other features distinguish the RS and RSV from other governors.



RSV GOVERNOR




WARNING
GERMANY



RS and RSV Governors

RS and RSV governors are used by the following original equipment customers.

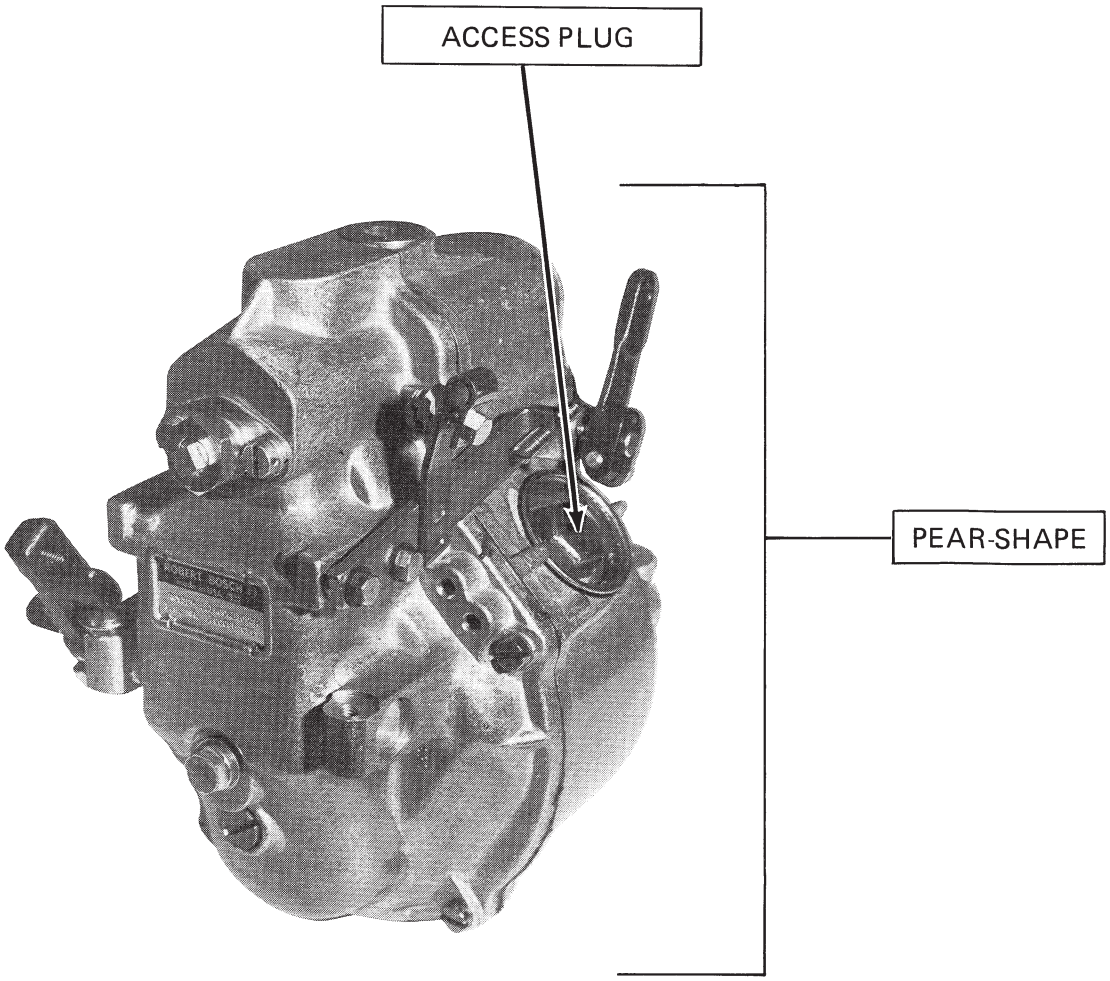
PUMP / USER	ALLIS CHALMERS	J.I. CASE	JOHN DEERE	DEUTZ	FIAT ALLIS	INTERNATIONAL HARVESTER	LOMBARDINI	MACK	MASSEY FERGUSON (PERKINS)	MERCEDES BENZ	MWM MURRAY	PEUGEOT	VOLKSWAGEN	VOLVO	WAUKESHA
A		○	○	○	○	○		○		○	○				
MW						○		○	○	○				○	
M		○					○			○					
P	○	○	○	○	○	○		○		○	○			○	○
VA				○		○						○		○	
VE						○			○			○	○	○	

GOVERNOR															
RS				●											
RSV	●	●	●	●		●	●		●	●	●			●	●

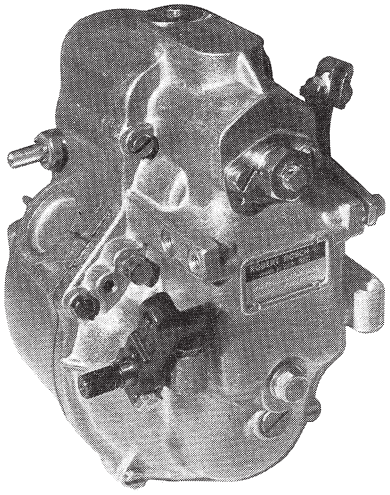
RQ and RQV Governors

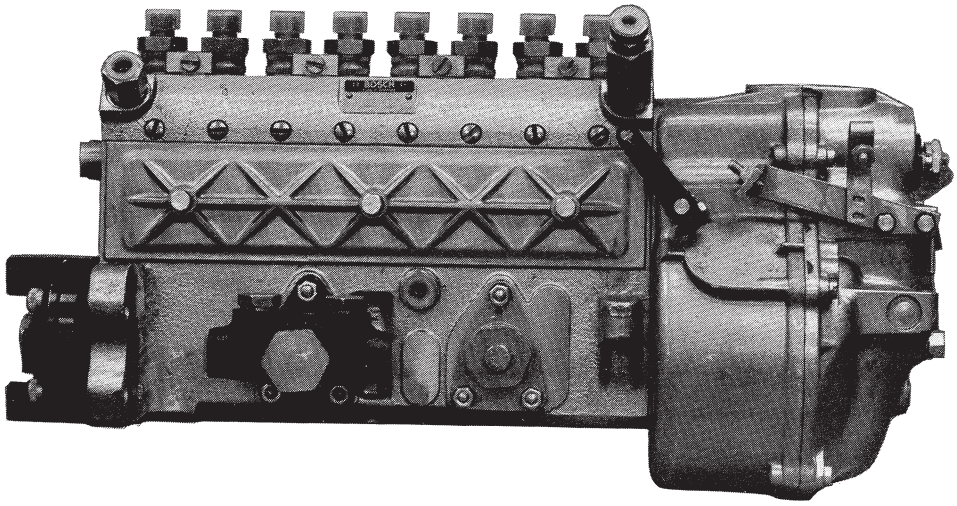
RQ and RQV governors also look basically alike on the outside. But like the RS and RSV, the V type provides governor control at any speed setting. The RQ, like the RS governor exerts regulation only at the lower and upper speed limits, frequently referred to as MIN-MAX governing.

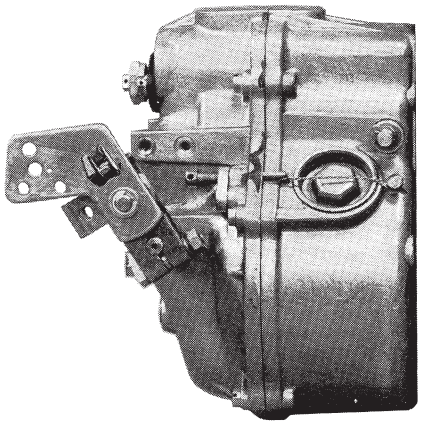
These governors can easily be recognized by their pear-shaped appearance on the outside. You'll also see an adjustment plug on one or each side of the housing to provide access to spring adjustment nuts inside.



RQV GOVERNOR







RQ and RQV Governors

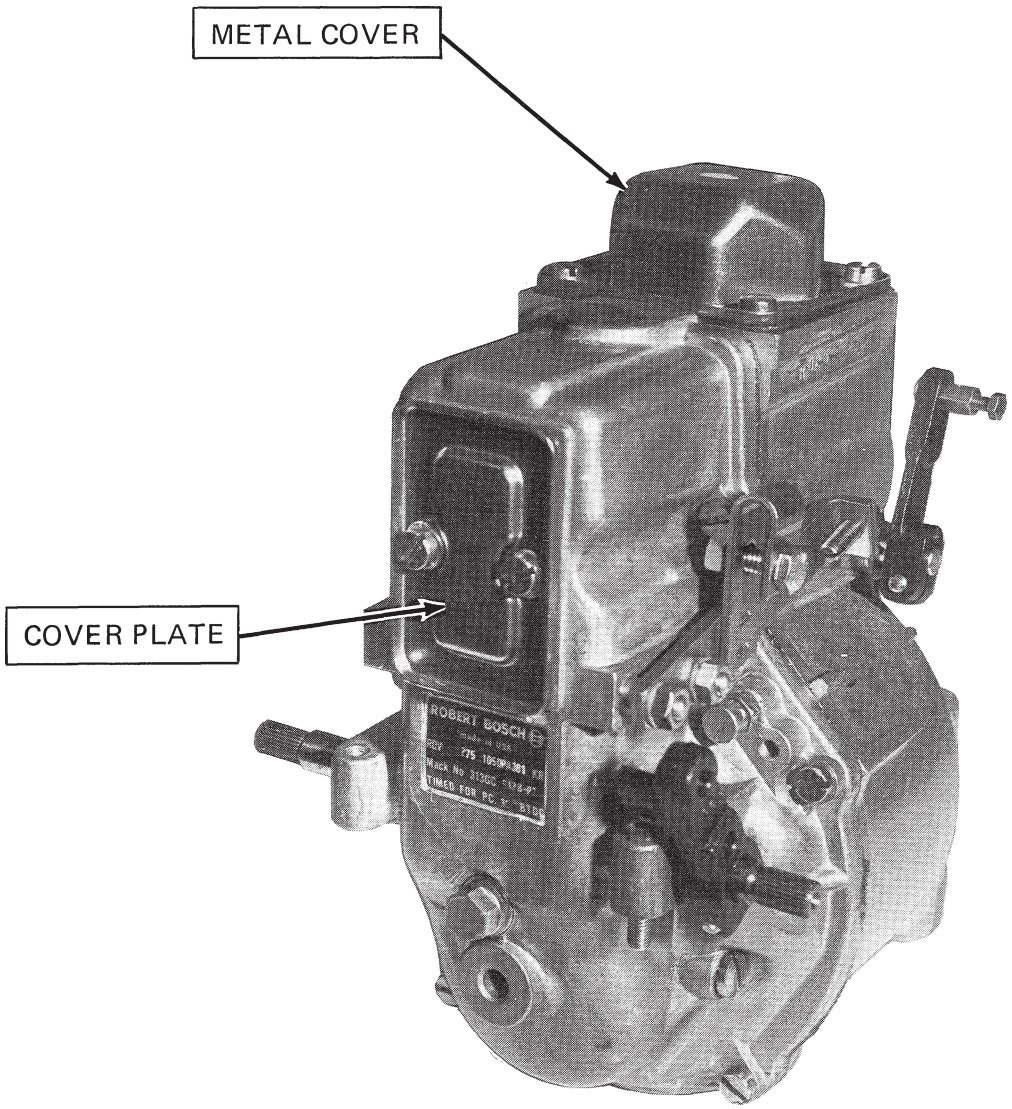
RQ and RQV governors are used by the following original equipment customers:

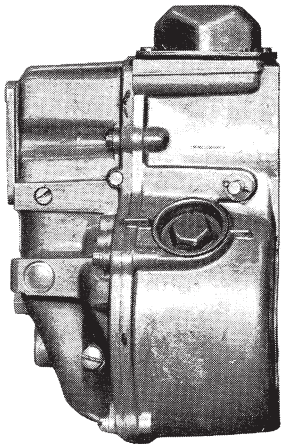
PUMP / USER	ALLIS CHALMERS	J.I. CASE	JOHN DEERE	DEUTZ	FIAT ALLIS	INTERNATIONAL HARVESTER	LOMBARDINI	MACK	MASSEY FERGUSON (PERKINS)	MERCEDES BENZ	MWM MURRAY	PEUGEOT	VOLKSWAGEN	VOLVO	WAUKESHA
A		○	○	○	○	○		○		○	○				
MW						○		○	○	○				○	
M		○					○			○					
P	○	○	○	○	○	○		○		○	○			○	○
VA				○		○						○		○	
VE						○			○			○	○	○	

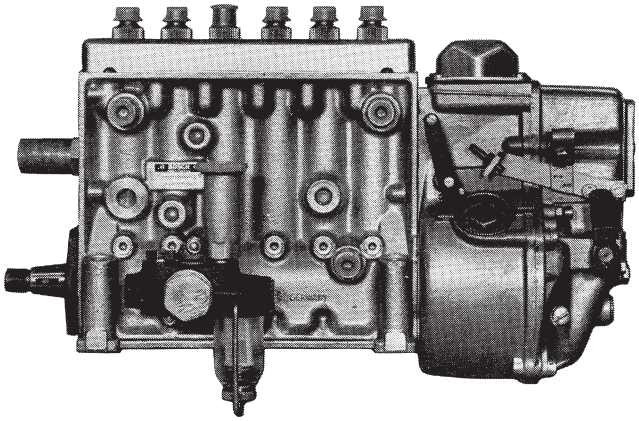
GOVERNOR

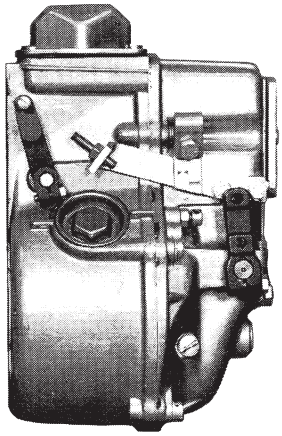
RS				○											
RSV	○	○	○	○		○	○		○	○	○			○	○
RQ				●		●		●		●					●
RQV				●	●	●		●	●	●	●			●	●

This governor has the same pear-shape as the RQ and RQV, but its control mechanism is a little different. It provides fine adjustments in fuel delivery to allow for different engine requirements. Access to these fine adjustments is under a metal cover on top of the housing and behind a cover plate on the governor cover.









RQV . . . K Governors

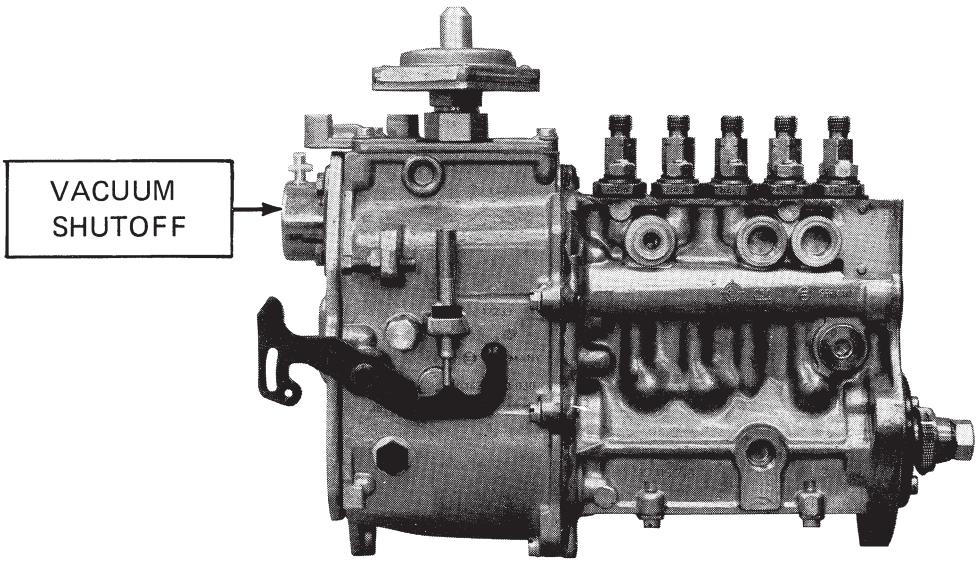
Type RQV . . . K governors are used by the following OE customers.

PUMP USER	ALLIS CHALMERS	J.I. CASE	JOHN DEERE	DEUTZ	FIAT ALLIS	INTERNATIONAL HARVESTER	LOMBARDINI	MACK	MASSEY FERGUSON (PERKINS)	MERCEDES BENZ	MWM MURPHY	PEUGEOT	VOLKSWAGEN	VOLVO	WAUKESHA
A		○	○	○	○	○		○		○	○				
MW						○		○	○	○				○	
M		○					○			○					
P	○	○	○	○	○	○		○		○	○			○	○
VA				○		○						○		○	
VE						○			○			○	○	○	

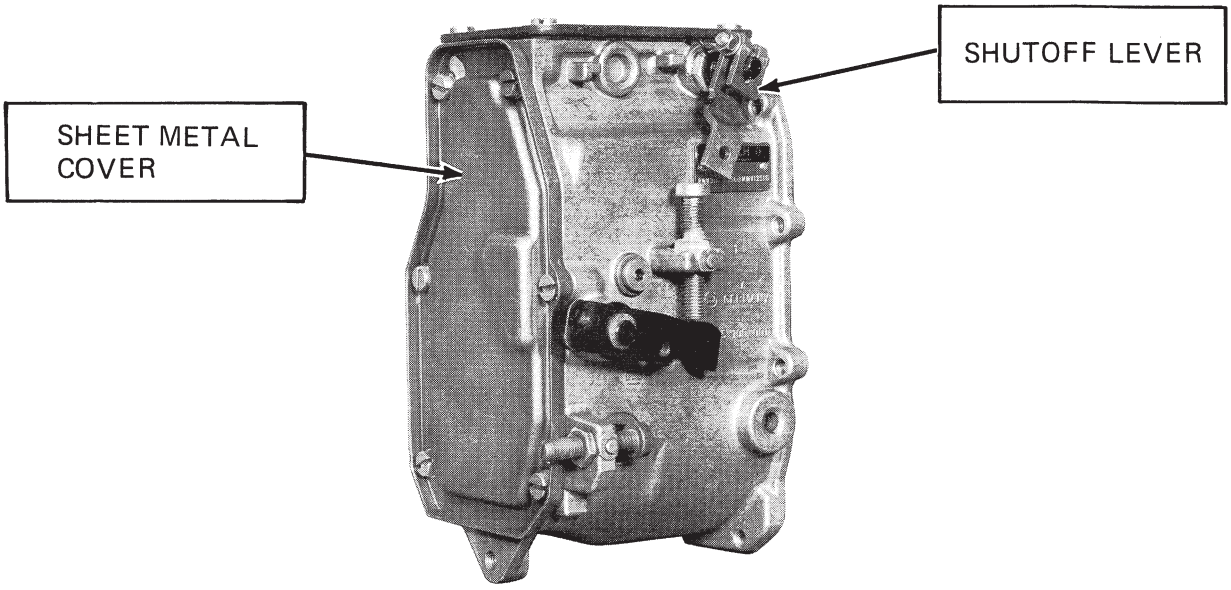
GOVERNOR															
RS				○											
RSV	○	○	○	○		○	○		○	○	○			○	○
RQ				○		○		○		○					○
RQV				○	○	○		○	○	○	○			○	○
RQV . . . K	●					●		●							

RW and RWV Governor

RW and RWV governors are easy to recognize by their box-like appearance. The distinguishing feature between the RW and RWV governors is the type of shutoff that the governors have. RWV governors have a separate shutoff LEVER. RW governors have a VACUUM shutoff.



RW GOVERNOR



RWV GOVERNOR

RW and RWV Governors

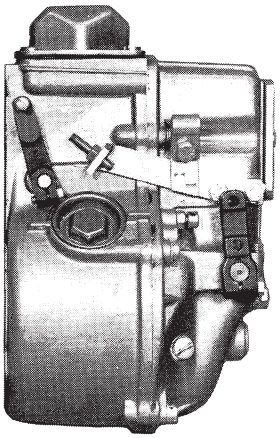
RW and RWV governors are used by the following OE customers.

PUMP / USER	ALLIS CHALMERS	J.I. CASE	JOHN DEERE	DEUTZ	FIAT ALLIS	INTERNATIONAL HARVESTER	LOMBARDINI	MACK	MASSEY FERGUSON (PERKINS)	MERCEDES BENZ	MWM MURPHY	PEUGEOT	VOLKSWAGEN	VOLVO	WAUKESHA
A		○	○	○	○	○		○		○	○				
MW								○	○	○				○	
M		○					○			○					
P	○	○	○	○	○	○		○		○	○			○	○
VA				○		○						○		○	
VE						○			○			○	○	○	

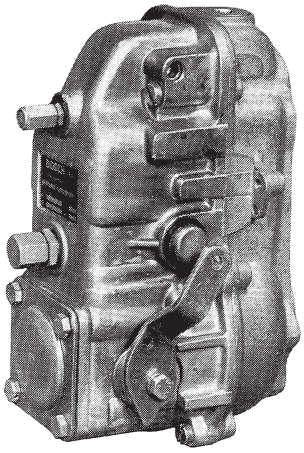
GOVERNOR															
RS				○											
RSV	○	○	○	○		○	○		○	○	○			○	○
RQ				○		○		○		○					○
RQV				○	○	○		○	○	○	○			○	○
RQV ... K	○					○		○							
RW										●					
RWV														●	

Exercise 9

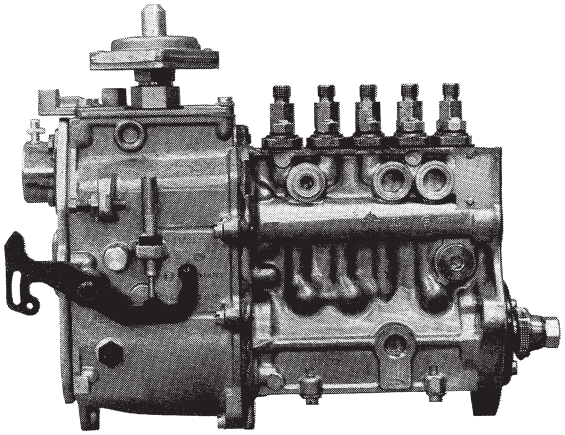
That's all there is to recognizing different governors. In fact, it is so easy that only one exercise is provided for review and this is it. You'll find a bunch of governors illustrated below. All you need to do is write the identifying letters below each one. If you get them all right, you get a perfect score. If you don't find it all that darn easy, review this section one more time. You know what they say about practice. The answers can be found on page 58.



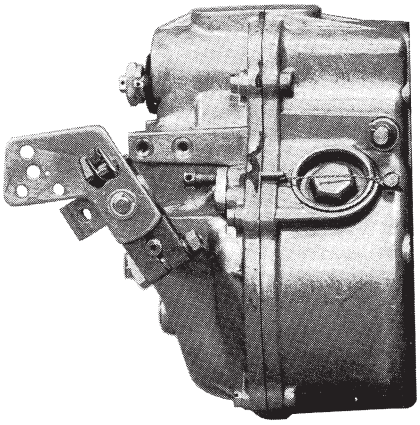
a _____



b _____

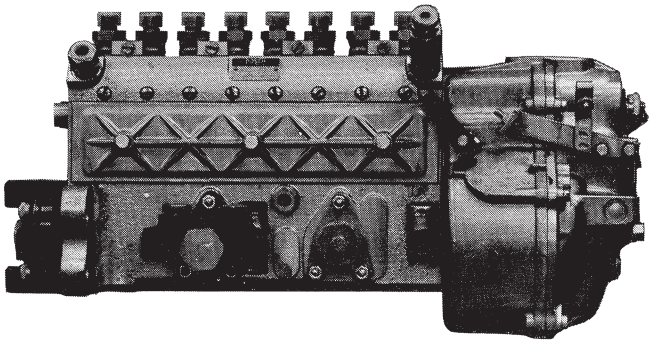


c _____

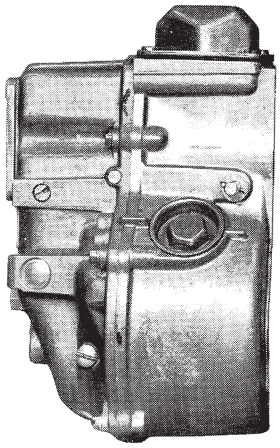


d _____

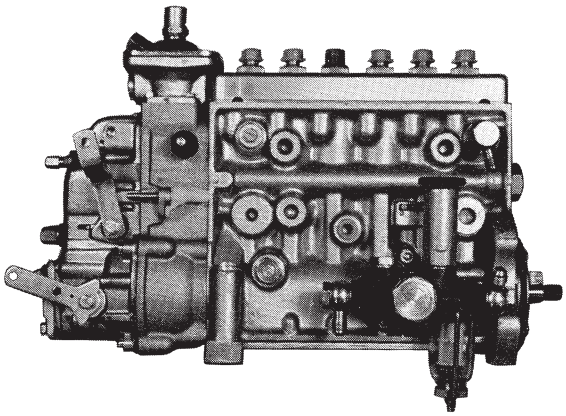
Exercise 9 (Continued)



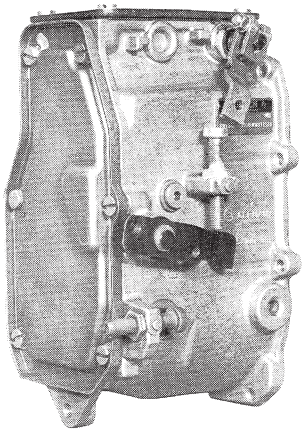
e _____



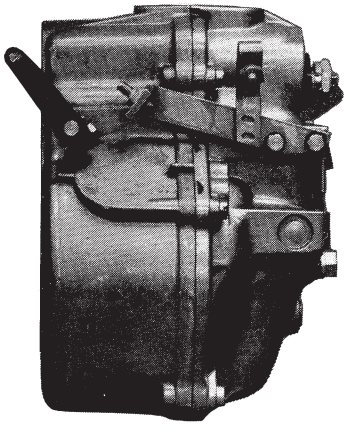
f _____



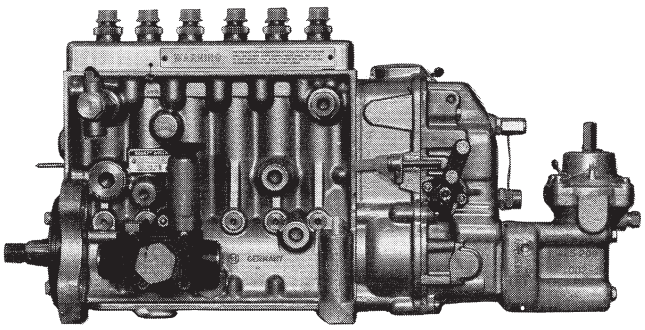
g _____



h _____



i _____



j _____

Answers, Exercise 9

a – RQV-K, b – RS/RSV, c – RW
d – RQ/RQV, e – RQ/RQV, f – RQV-K
g – RS/RSV, h – RWV, i – RQ/RQV, j – RS/RSV

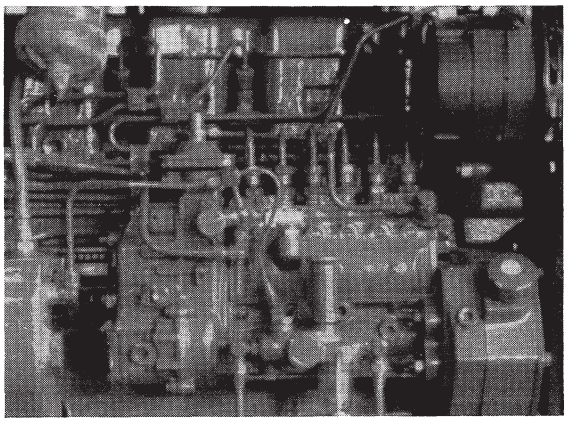
If you missed 4 or more of these, go back and review pages 43 through 54 before continuing on to the final exercise.

FINAL EXERCISE

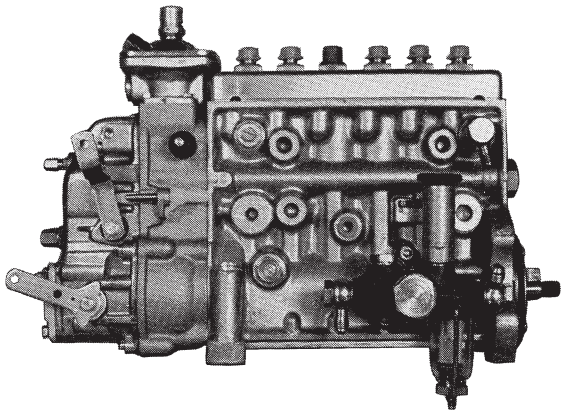
Before you go out on the job and try to impress people with your uncanny ability to recognize any pump or governor, you may want to give yourself one last check. This exercise will give you the chance to prove to yourself that you can recognize the pumps and governors. Good luck. When you have finished, check your answers with your instructor (or supervisor) or with the answers given on the last page of this book.

Exercise 10

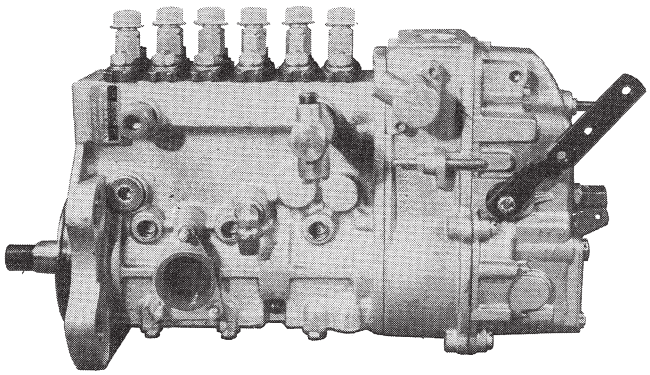
Identify the pump and/or governor in each illustration below. You may use the training booklet to find the answers if necessary.



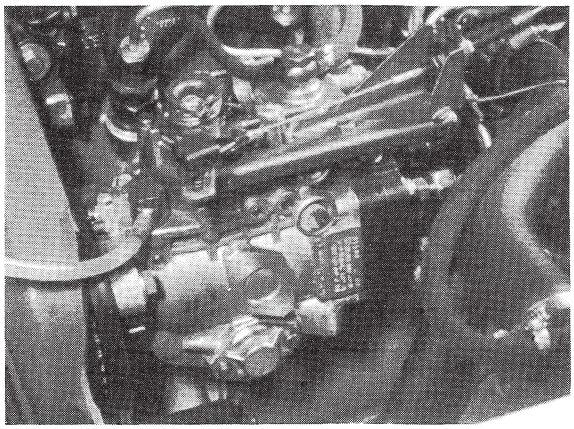
1 _____



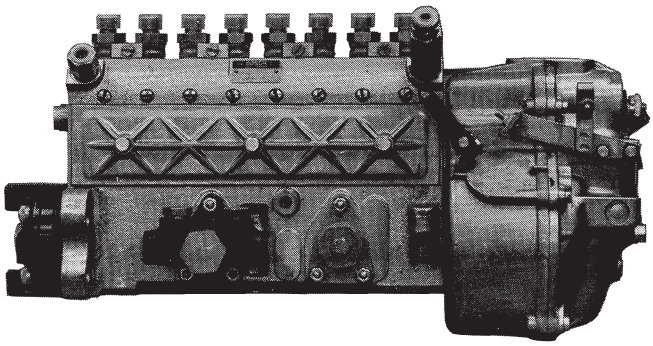
2 _____



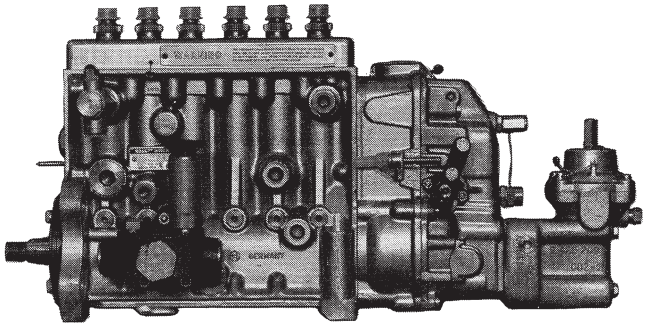
3 _____



4 _____

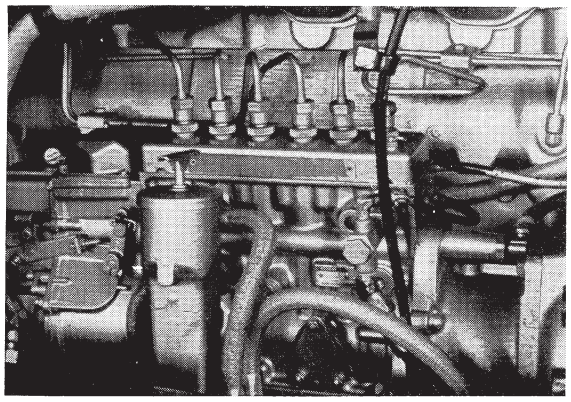


5 _____

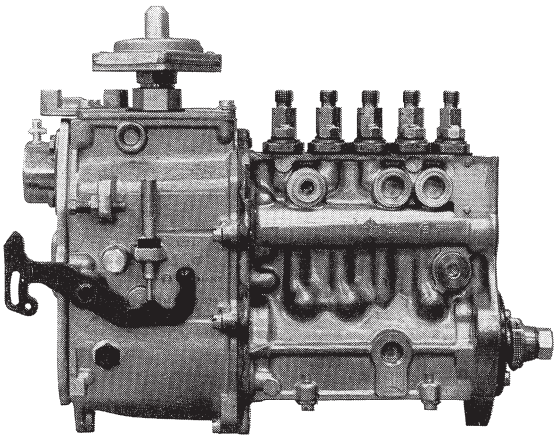


6 _____

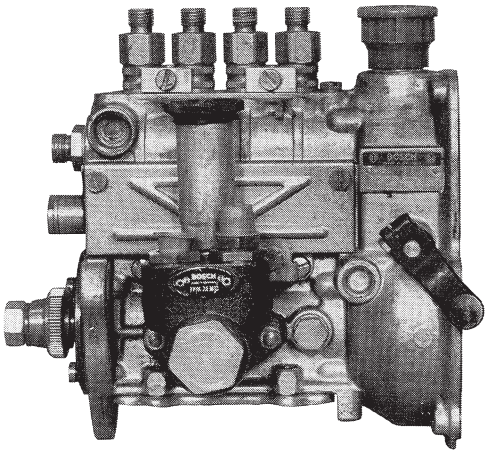
Exercise 10



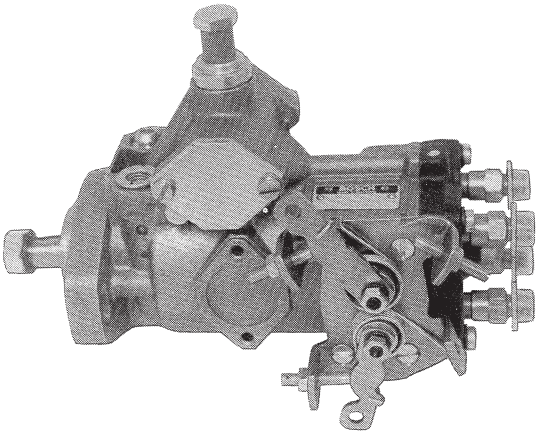
7 _____



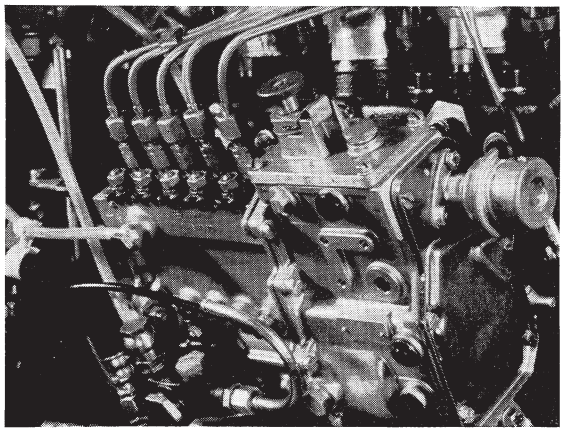
8 _____



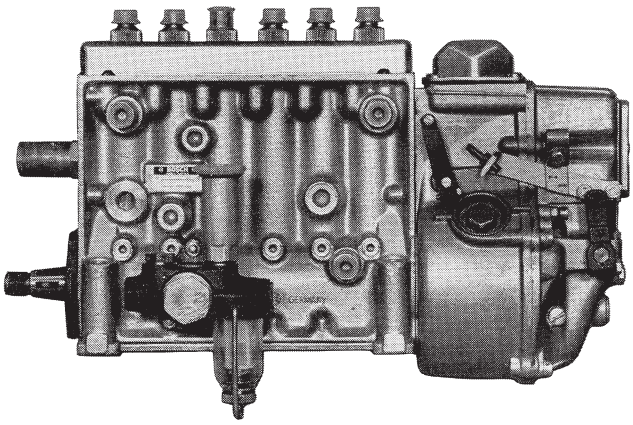
9 _____



10 _____



11 _____



12 _____

SUMMARY

Congratulations! You've made it to the end. Now you know how to recognize PF and PFR type pumps, in-line (PE) type pumps and the governors they use, and distributor pumps. You're ready to move on to Module 3, Nameplate Identification. GOOD LUCK!!

Answers, Exercise 10

1. A Pump/RSV Governor
2. P Pump/RSV Governor
3. MW Pump/RSV Governor
4. VE Pump
5. A Pump/RQV Governor
6. P Pump/RSV Governor
7. P Pump/RQV . . . K Governor
8. MW Pump/RW Governor
9. M Pump
10. VA Pump
11. MW Pump/RW Governor
12. P Pump/RQV . . . K Governor