

Workbook

Air Brake Systems

Video Training

Part 1 - 4

Introduction

This workbook is intended for use in conjunction with Parts 1 through 4 of the Bendix video presentation covering the operation of air brake systems and components. It can be used as an effective means of taking notes on the more important points because the material presented is in the same order as it is viewed. It can also be used as a quiz to indicate areas requiring further review. Sectional views and system schematics are taken from the video tape and all questions can be answered from the material presented.

For additional copies of this workbook contact your local Bendix authorized parts outlet and order form BW1678.

The schematics, component drawings and description of operation presented in the video tapes and in this workbook are representative only and are presented for the purpose of training. This material should not be used for design or application of air brake systems or components without prior consultation with Bendix Engineering.



Workbook

Air Brake Systems

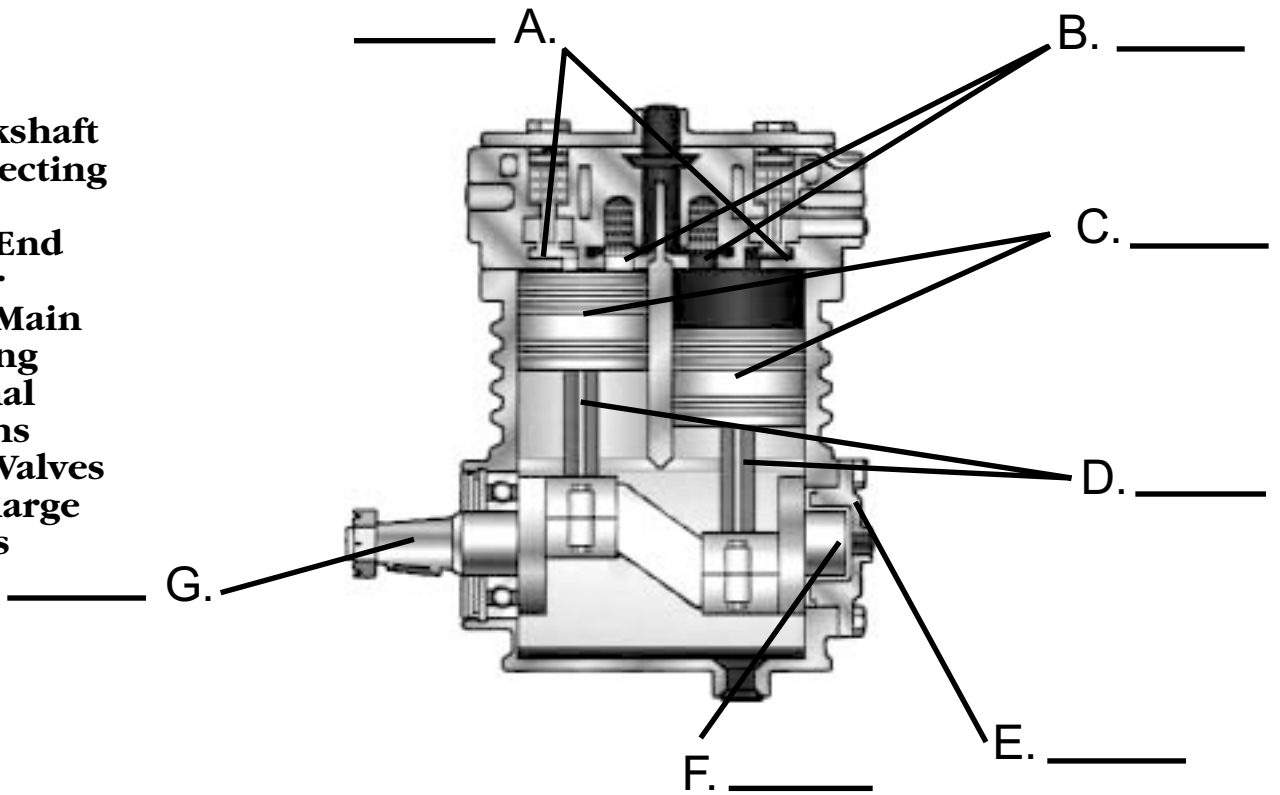
Video Training

Part 1

Air Generation System

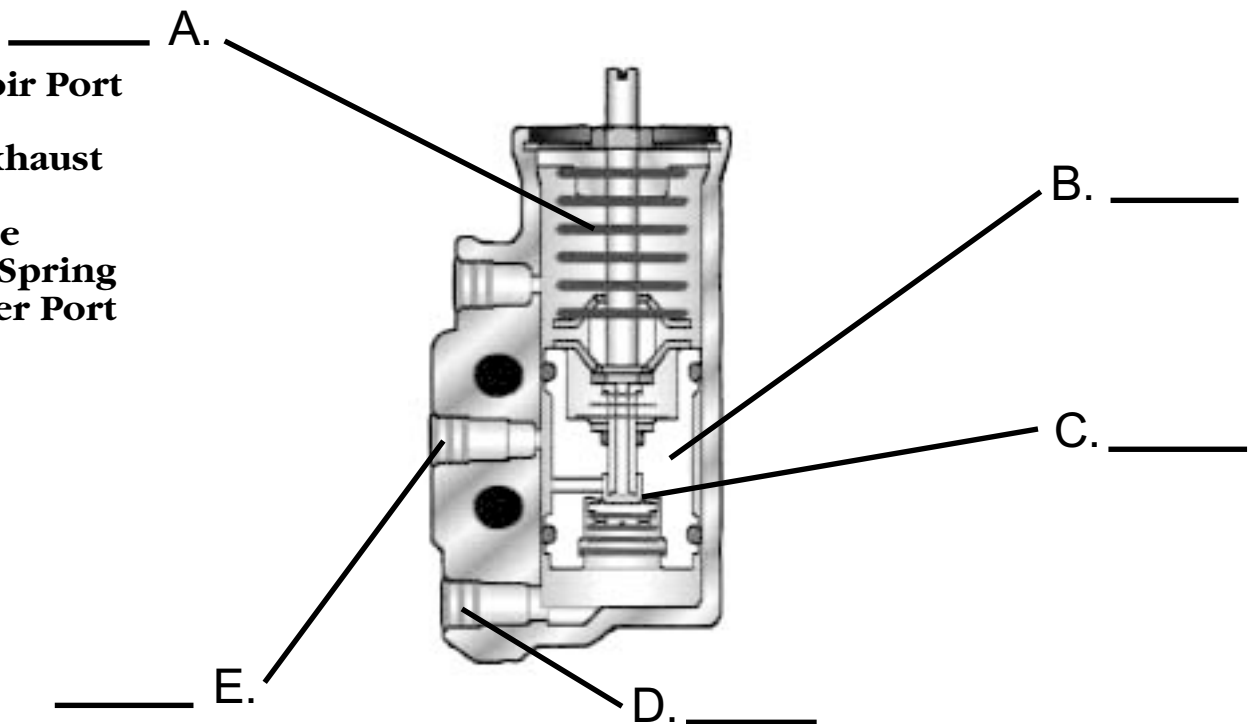
Compressor

- 1. Crankshaft
- 2. Connecting Rods
- 3. Rear End Cover
- 4. Rear Main Bearing Journal
- 5. Pistons
- 6. Inlet Valves
- 7. Discharge Valves



Governor

- 1. Reservoir Port
- 2. Piston
- 3. Inlet Exhaust Valve
- 4. Pressure Setting Spring
- 5. Unloader Port



Compressor

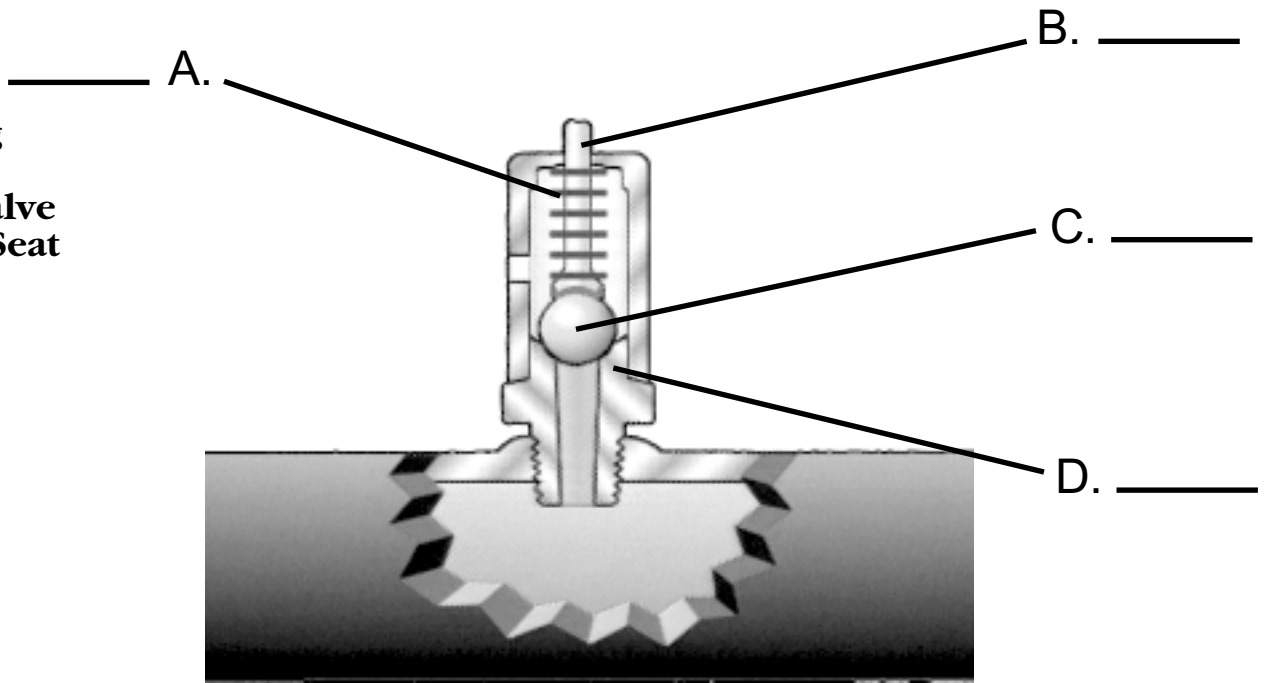
1. After pressurized oil flows to the connecting rod bearings, it is conducted through an internal oil passage in the connecting rod to the piston wrist pin.
True False
2. When the compressor piston begins the compression stroke, the inlet valve opens and the discharge valve closes.
True False
3. Rapid build up of air pressure depends upon proper opening, closing and sealing of both the inlet and discharge valving and the unobstructed flow of air into the cylinder bores.
True False
4. An obstruction on the air intake side of the compressor (ie; a dirty air filter) can cause compressor oil passing.
True False
5. An obstruction in the compressor discharge line can cause the compressor to run hot and build carbon deposits.
True False
6. A slight pressure above the piston causes the compressor inlet valve to open during the intake stroke.
True False
7. Define the term "crankcase flooding" as it applies to the compressor.

Governor

1. Reservoir air enters the governor unloader port and as pressure builds the piston moves down.
True False
2. Air from the governor's reservoir port flows to the compressor's unloader mechanism which causes the compressor to speed up or slow down, depending upon the air requirements of the air system.
True False
3. When supply reservoir pressure drops to the "cut-in" pressure of the governor, typically 100 psi, the governor will exhaust air from the compressor unloader mechanism and system air pressure will be replenished.
True False
4. The governor's function in the air system can be summarized by stating that, "it is responsible for maintaining air brake system pressure between a pre-set maximum and minimum".
True False
5. During the unloaded cycle of the compressor, with the compressor unloader mechanism pressurized by the governor, air is "shuttled" from one cylinder of the compressor to the other. This occurs because the compressor unloader pistons hold the inlet valves off their seats and because the crankshaft has 180 degrees, opposed connecting rod journals.
True False
6. Describe what would occur if the governor failed to function.

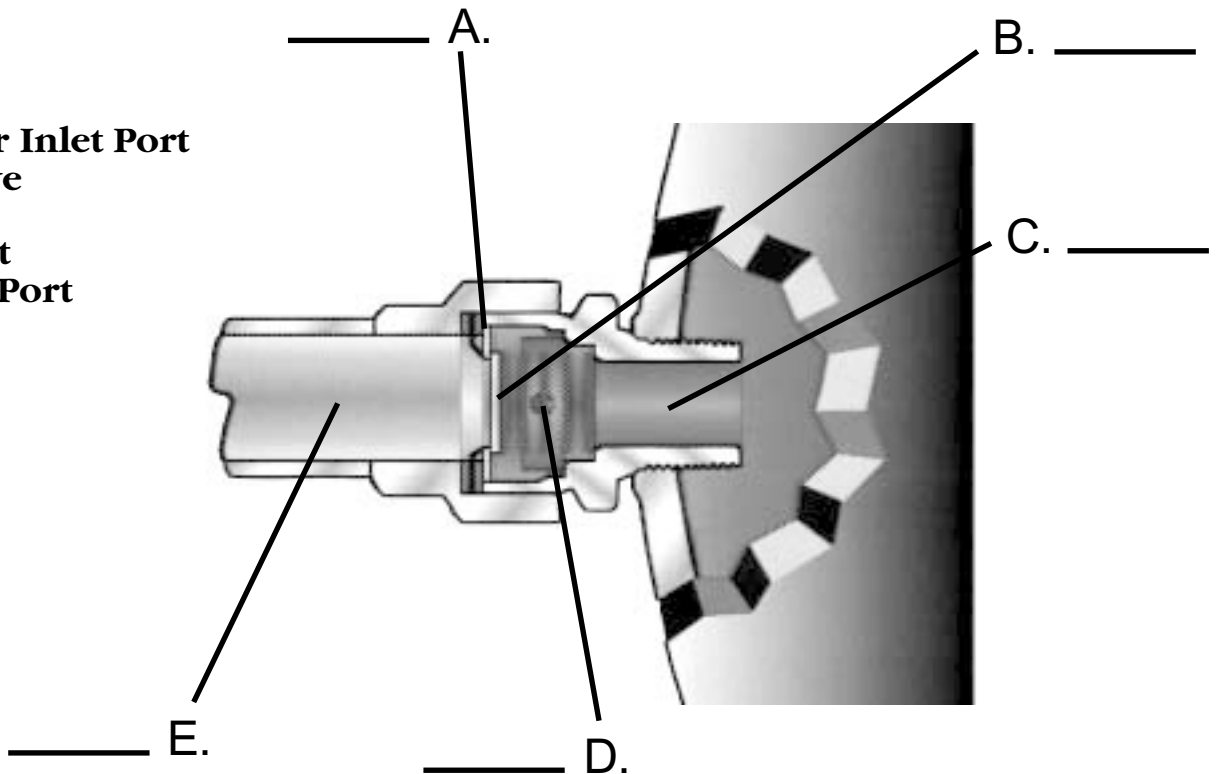
Safety Valve

- 1. Spring
- 2. Stem
- 3. Ball Valve
- 4. Valve Seat



Reservoirs and Check Valves

- 1. Supply or Inlet Port
- 2. Inlet Valve
- 3. Spring
- 4. Valve Seat
- 5. Delivery Port



Safety Valve

1. Safety valves can be obtained with various settings but are generally set to open and exhaust at 150 psi.

True	False
------	-------
2. The safety valve is installed in the compressor discharge line.

True	False
------	-------
3. The exposed stem allows the safety valve it to be tested or checked periodically.

True	False
------	-------
4. Working in conjunction with the governor, the safety valve exhausts the air from the discharge line when the compressor is in the unloaded state (not compressing air).

True	False
------	-------

Reservoirs and Check Valves

1. The single check valve is intended to protect the air pressure in the supply reservoir (the first reservoir that receives air) in the event air pressure in the service reservoir(s) is lost.

True	False
------	-------
2. The single check valve is located in the discharge line, between the compressor and air dryer.

True	False
------	-------
3. Air flow through a single check valve is in one direction only.

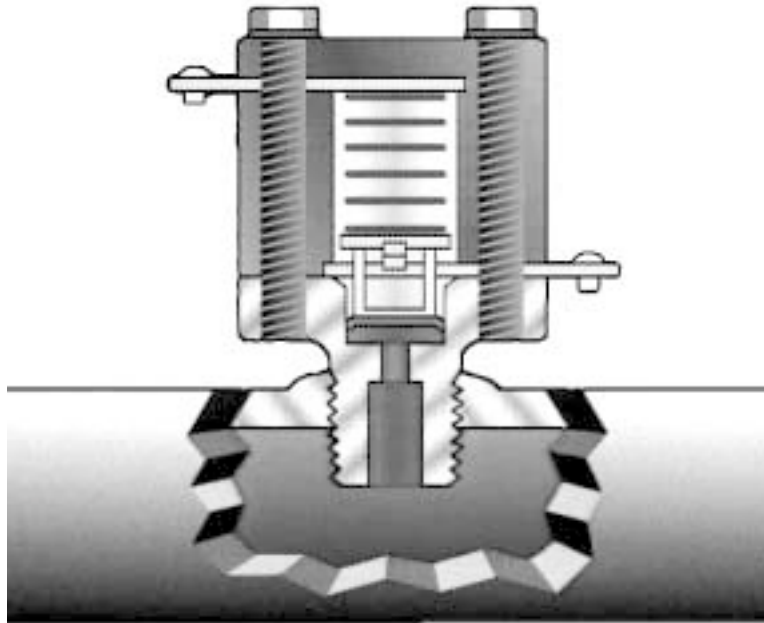
True	False
------	-------
4. The single check valve got its name from the fact that only one is used in the air brake system.

True	False
------	-------
5. A minimum of three reservoirs are generally used in a dual air brake system.

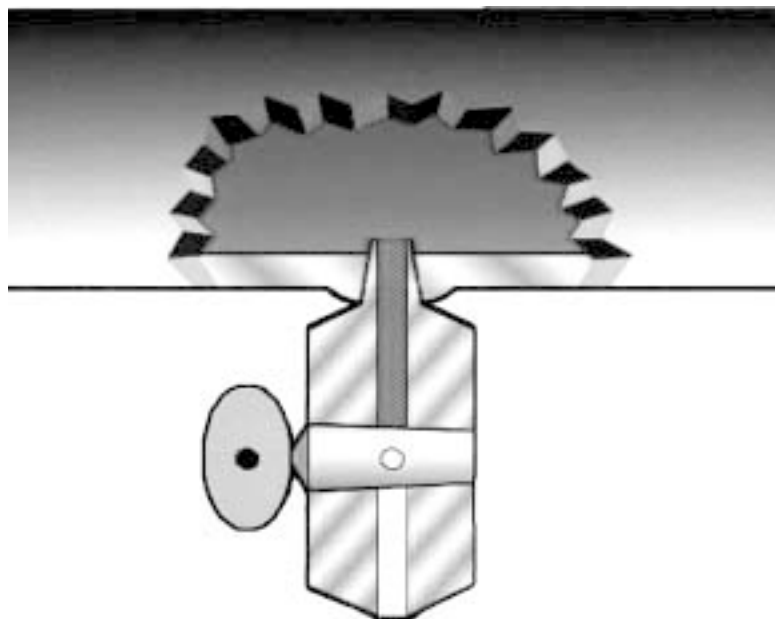
True	False
------	-------
6. The supply reservoir supplies air to the service reservoirs.

True	False
------	-------

Dash Gauge and Low Pressure Indicator



Reservoirs and Drain Cocks



Dash Gauge and Low Pressure Indicator

1. The dash gauge is required by federal regulations.

True	False
------	-------
2. Connected to the supply reservoir, the dash gauge provides the driver with a continuous “read out” of air pressure available for braking.

True	False
------	-------
3. If a single dash gauge is installed, there will be two “hands” or needles on the gauge. One “hand” indicates available air pressure in the service reservoir and the other registers the air pressure in the supply reservoir.

True	False
------	-------
4. The low pressure indicator switch is required by federal regulations.

True	False
------	-------
5. A low pressure indicator switch, like the Bendix® LP-3™, is generally mounted on the vehicle dash.

True	False
------	-------
6. When air pressure in the system falls to a preset safe minimum, the low pressure switch will “light up” and/or begin to “buzz”.

True	False
------	-------
7. The minimum air pressure setting for a low pressure indicator switch is typically 60 psi.

True	False
------	-------
8. If the low pressure indicator is set so that the electrical contacts close at/or below 60 psi, then they should open immediately when pressure rises above 60 psi.

True	False
------	-------

Reservoirs and Drain Cocks

1. Oil, water and vapor are contained in the air discharged from the compressor and will condense in the air lines and collect in the reservoirs.

True	False
------	-------
2. The drain cock, installed in the bottom of the reservoir, is used to remove the accumulated contaminants.

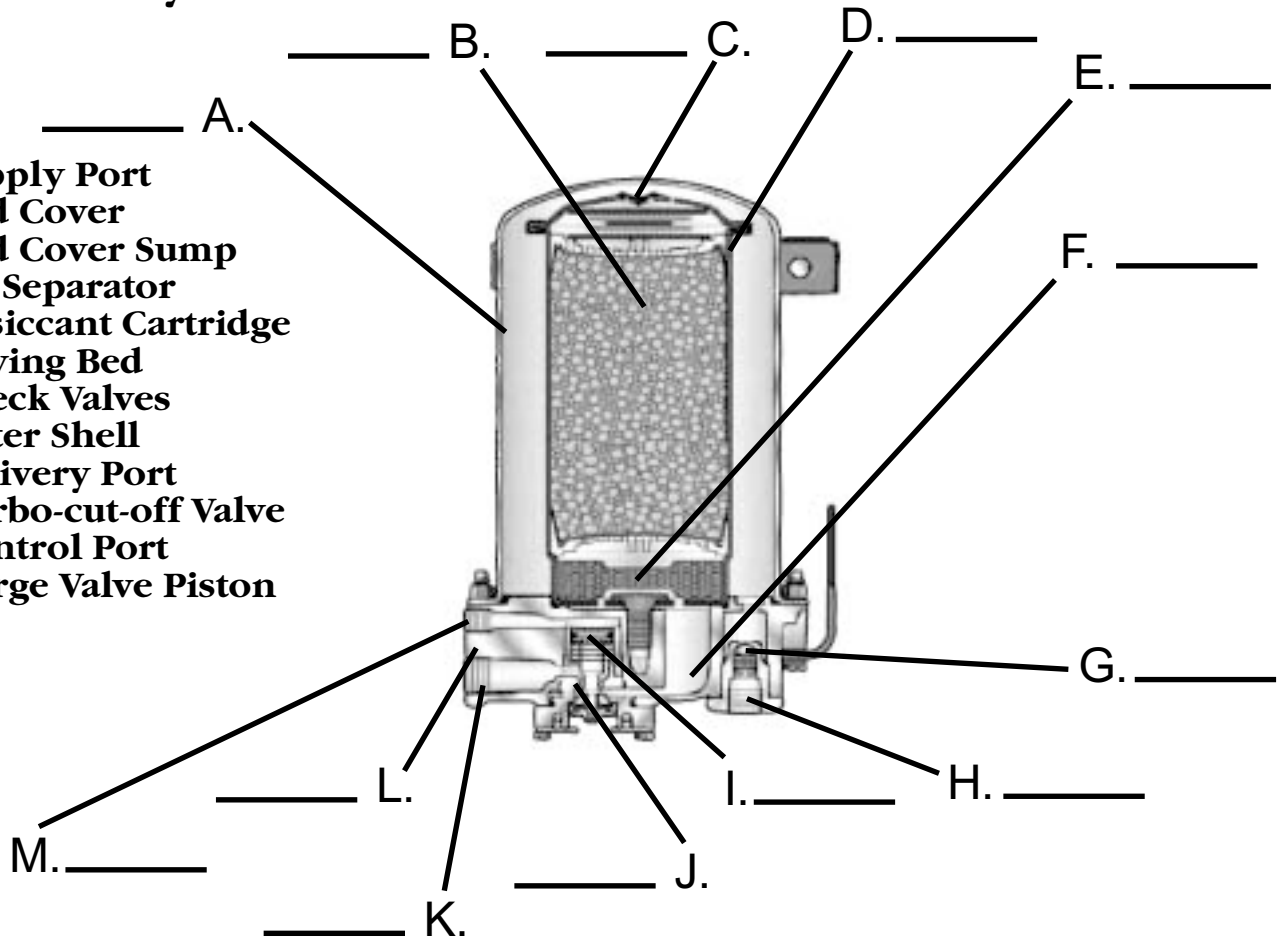
True	False
------	-------
3. The drain cock can be used to test the operation of the low pressure indicator switch and the single check valve.

True	False
------	-------
4. Once the contaminants are drained from the reservoir and the compressor stops “pumping” air, no further accumulation of water or contamination will occur.

True	False
------	-------

Air Dryer

1. Supply Port
2. End Cover
3. End Cover Sump
4. Oil Separator
5. Desiccant Cartridge
6. Drying Bed
7. Check Valves
8. Outer Shell
9. Delivery Port
10. Turbo-cut-off Valve
11. Control Port
12. Purge Valve Piston



Air Dryer

1. The oil separator removes not only oil droplets, but also removes solid contaminants and remaining water droplets.

True False
2. The desiccant material in the air dryer removes water vapor in a process known as adsorption.

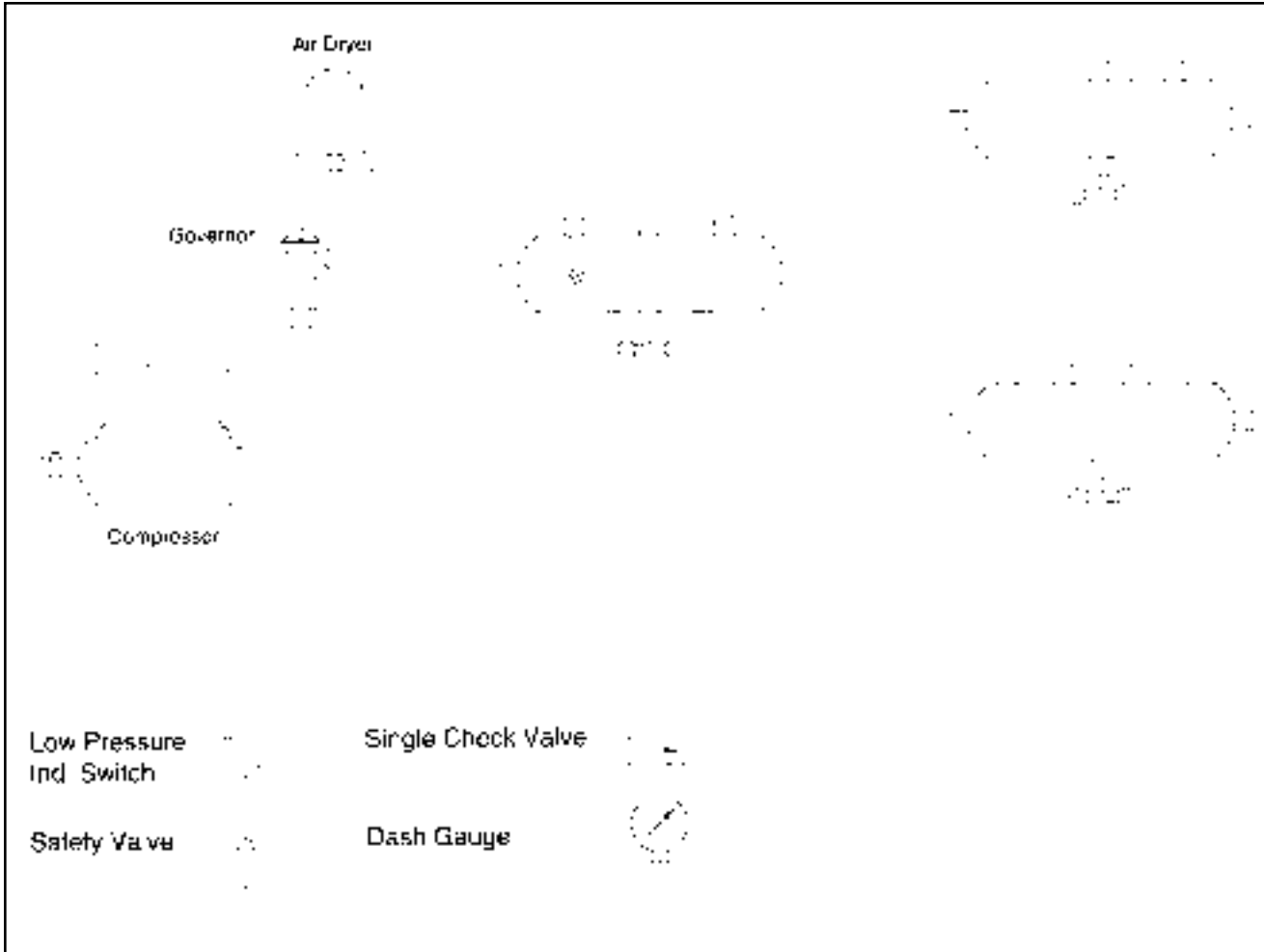
True False
3. Water and contaminants are collected in the purge volume and are expelled during the purge cycle of the air dryer.

True False
4. The check valve above the desiccant cartridge prevents the loss of air brake system pressure during the purge cycle of the air dryer.

True False
5. The turbo cut-off-valve in the air dryer prevents the loss of engine turbo charger pressure through the open purge valve of the air dryer during the purge cycle.

True False
6. The air dryer requires about 25 seconds to complete the purge cycle.

True False
7. Name the three air connections on the air dryer. Where and to what are they connected?
8. What is the purpose of the small orifice (hole) next to the check valve in the top of the desiccant cartridge?
9. Give one reason why the air dryer would constantly "cycle" between the charge and purge.



Air Supply System

1. Using the symbols shown in the schematic, draw the Low Pressure Indicator Switch, Safety Valve, Single Check Valve(s) and Dash Gauge(s) in their correct positions.
2. Draw in the air lines that connect the Compressor, Air Dryer, Governor and Reservoirs.
3. Indicate with an arrow and the number "3" air line(s) NOT CONSTANTLY filled with air pressure during normal vehicle operation.



Workbook
Air Brake Systems

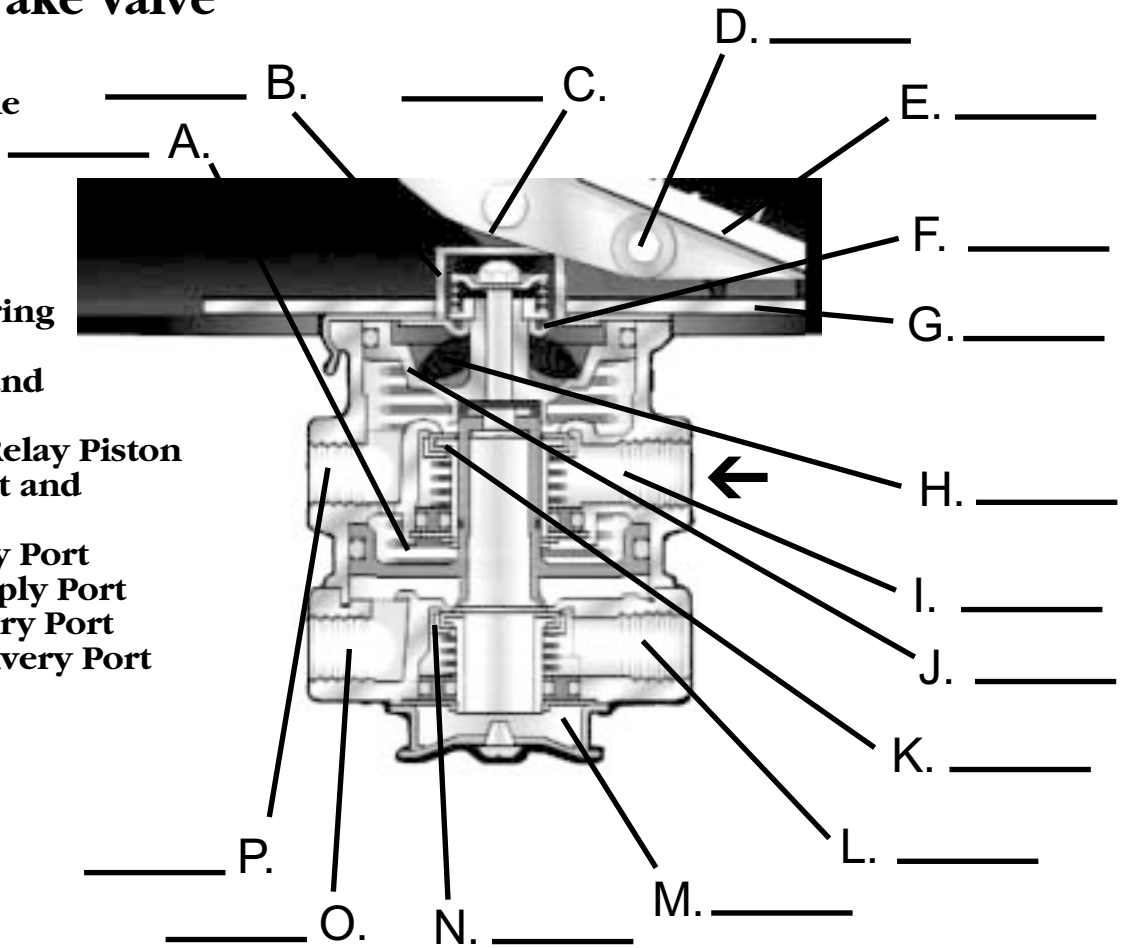
Video Training

Part 2

Service Brake System

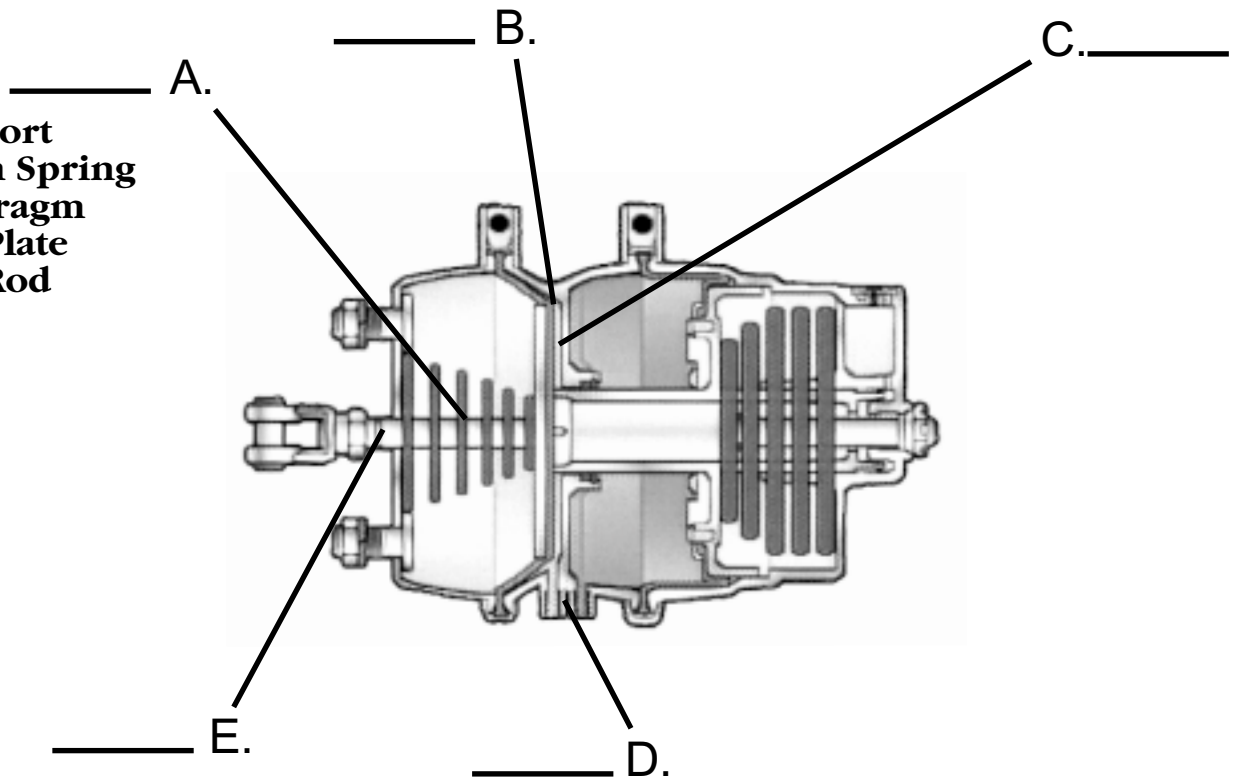
Dual Brake Valve

1. Pedal or Treadle
2. Plunger
3. Roller
4. Stop Button
5. Fulcrum Pin
6. Spring Seat
7. Graduating Spring
8. Primary Piston
9. Primary Inlet and Exhaust Valve
10. Secondary or Relay Piston
11. Secondary Inlet and Exhaust Valve
12. Primary Supply Port
13. Secondary Supply Port
14. Primary Delivery Port
15. Secondary Delivery Port
16. Exhaust Port



Brake Chambers and Spring Brakes

1. Inlet Port
2. Return Spring
3. Diaphragm
4. Push Plate
5. Push Rod



Dual Brake Valve

1. Generally all dual brake valves function the same way. The method of mounting in the vehicle can differ. The E-6™ dual brake valve is a fire wall mounted unit.

True False
2. With the brakes released, both the primary and secondary inlet valves are _____ (open closed) and both exhaust valves are _____ (open closed).
3. When a brake application is first made, the primary or rear axle service circuit begins to deliver air ahead of the secondary or front axle service circuit.

True False
4. The secondary or front axle service circuit of the dual brake valve is controlled by the air delivery from the primary circuit.

True False
5. In the balanced position, both the primary and secondary inlet valves are _____ (open closed) and both exhaust valves are _____ (open closed).
6. When the brake valve treadle is fully depressed, as in a “panic stop”, both the primary and secondary inlet valves are held open mechanically and full reservoir pressure is delivered to the brakes.

True False
7. What is the function of the primary piston graduating spring?

Brake Chambers & Spring Brakes

1. The number designation given to a brake chamber provides information about its “power” potential.

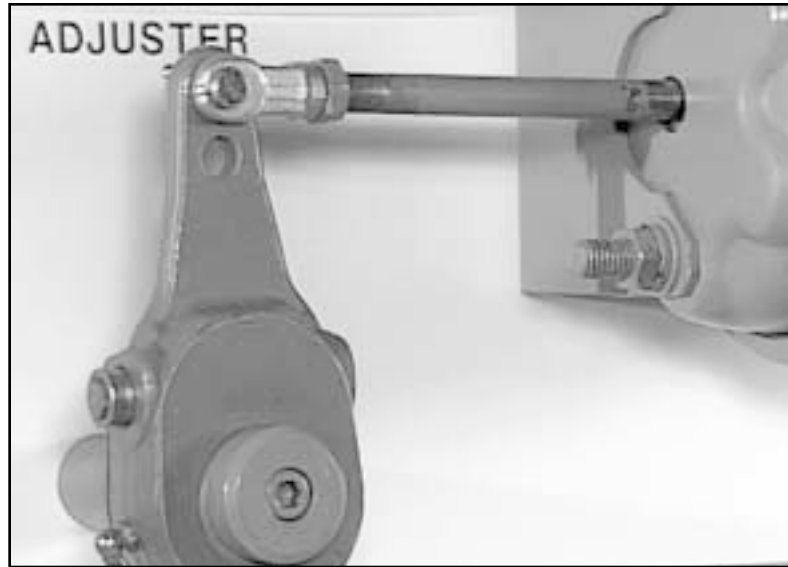
True False
2. What does the number designation given to a brake chamber actually mean?
3. The purpose of the brake chamber return spring is to “delay” or slightly reduce the force of the brake application in order to help balance the vehicle brakes.

True False
4. The service section of a spring brake functions and operates the same as a standard brake chamber.

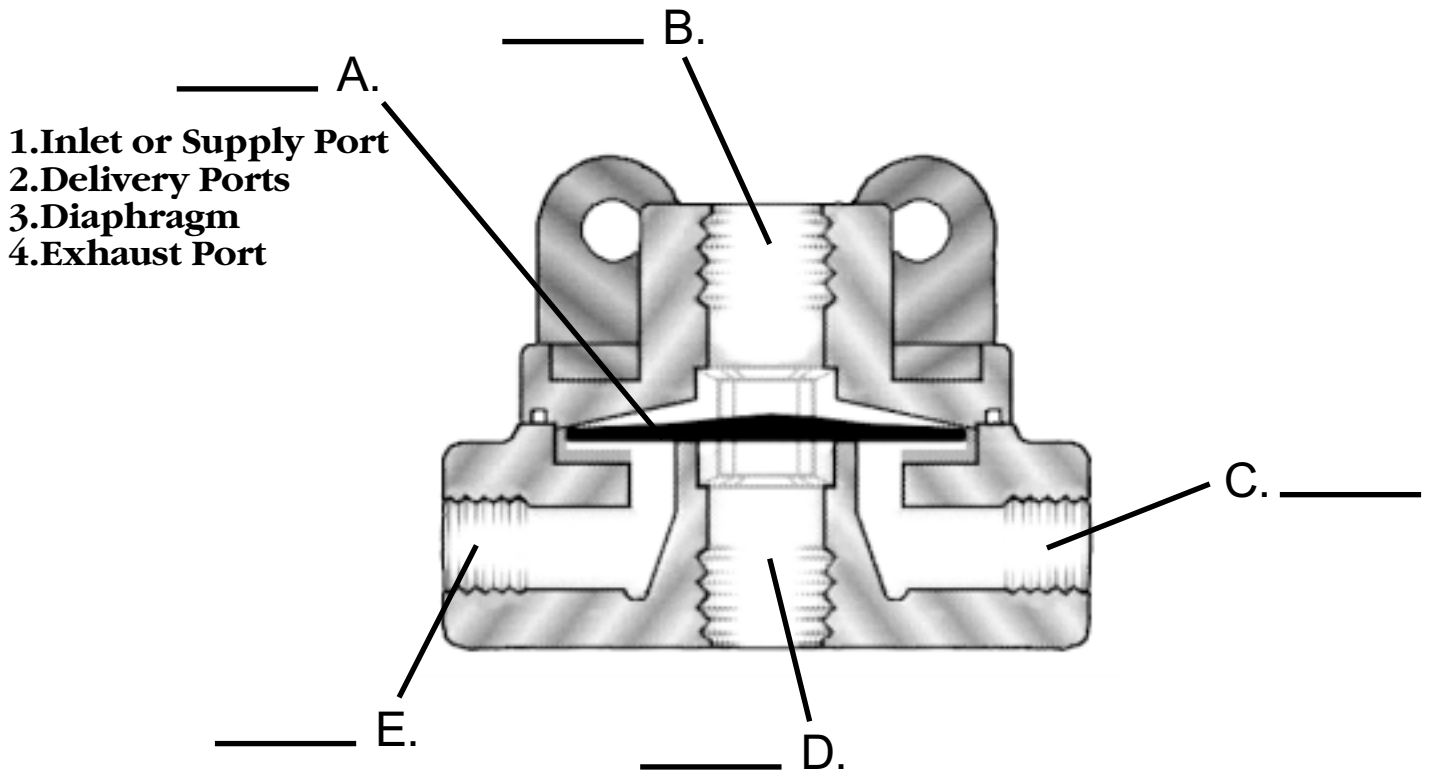
True False
5. What would the force be, (measured at the end of the push rod) if 30 psi air pressure was applied to a Type 20 brake chamber?
6. Spring Brakes can be used interchangeably with brake chambers, but are most often found on the front axle of the vehicle.

True False
7. What is attached to the end of the brake chamber push rod?

Slack Adjuster



Quick Release



Slack Adjuster

1. Although most often used on "S" cam foundation brakes, the slack adjuster can also be found on the less often encountered Wedge type foundation brakes.

True	False
------	-------
2. Describe as many of the basic functions of the slack adjuster as you can.
3. The number designation of the slack adjuster indicates the brake chamber number that is used with it. For instance; a type 20 slack adjuster should always be used with a type 20 brake chamber.

True	False
------	-------
4. If you answered TRUE in question 3, explain why.

If you answered FALSE in question 3, then explain what the slack adjuster number designation means.

5. The Bendix® ASA-5™ is an automatic slack adjuster.

True	False
------	-------
6. One important feature of the ASA-5™ automatic slack adjuster is that it constantly adjusts the brakes in very small increments each time the brakes are released.

True	False
------	-------
7. The ASA-5™ automatic slack adjuster monitors brake chamber stroke and will adjust the brakes when the stroke increases due to lining wear.

True	False
------	-------

Quick Release Valve

1. As air line length increases and air pressure decreases, the time required for air to return to the brake valve and exhaust to atmosphere will increase.

True	False
------	-------
2. A quick release valve, such as the Bendix® QR-1™ or QR-N™, is used to increase the time it takes to release the brakes.

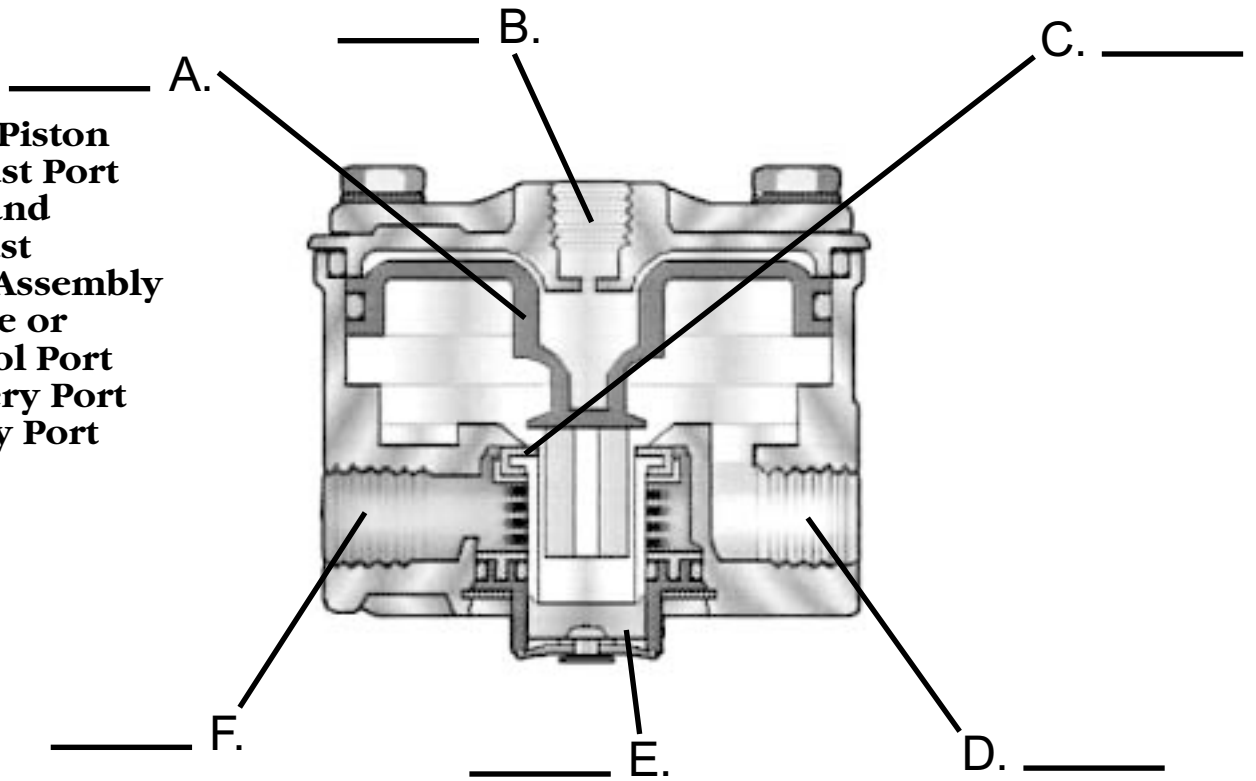
True	False
------	-------
3. Quick release valves can be used in several locations on the vehicle, however, one of the most common is on the front axle.

True	False
------	-------
4. In addition to increasing release times for the brakes, the quick release also speeds up the application of the brakes during emergency situations.

True	False
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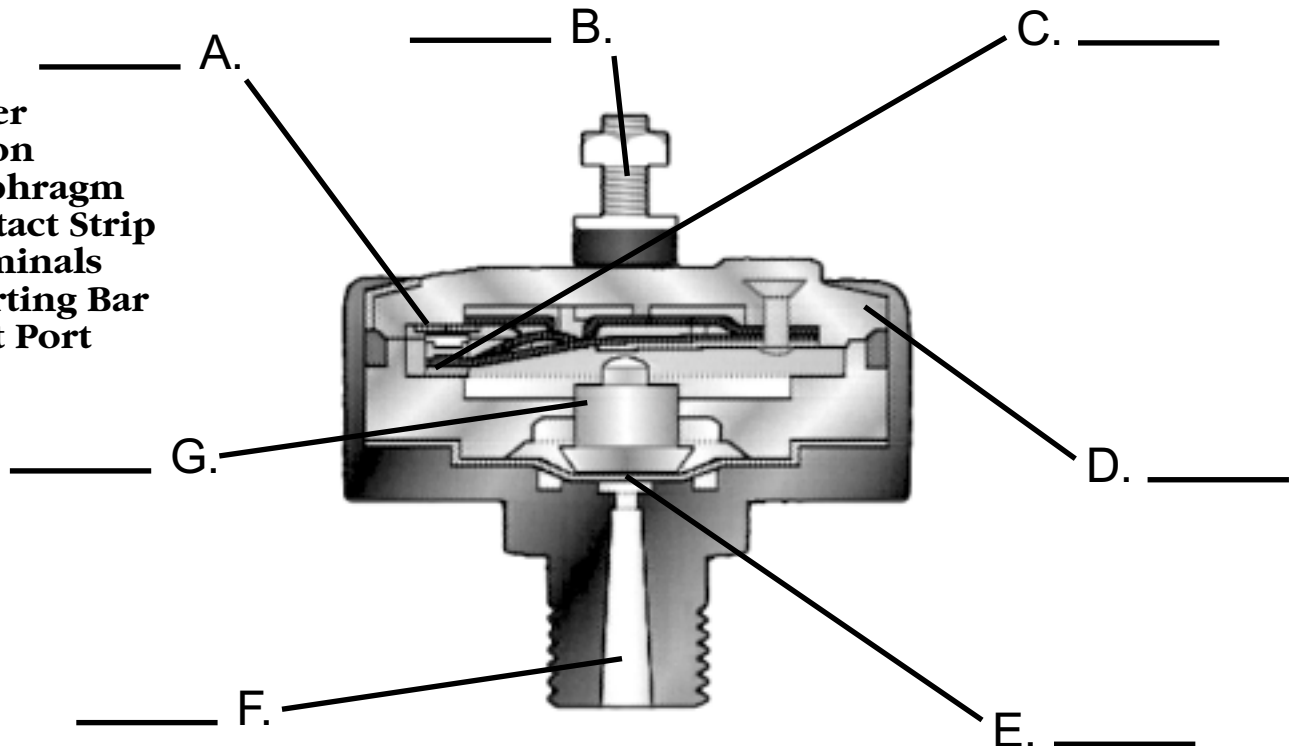
Relay Valve

- 1. Relay Piston
- 2. Exhaust Port
- 3. Inlet and Exhaust Valve Assembly
- 4. Service or Control Port
- 5. Delivery Port
- 6. Supply Port



Stop Light Switch

- 1. Cover
- 2. Piston
- 3. Diaphragm
- 4. Contact Strip
- 5. Terminals
- 6. Shorting Bar
- 7. Inlet Port



Relay Valve

1. Relay valves, such as the Bendix® R-12™, are usually installed on or near the rear axle(s), especially on long wheel base vehicles. The function of the relay valve is to assure the simultaneous application and release of the brakes most distant from the brake valve.

	True	False
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2. Brake application pressure from the foot brake valve enters the R-12™ relay valve supply port and is conducted directly to the under side of the piston.

	True	False
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3. With the brakes released the inlet valve is _____ (open closed) and the exhaust valve is _____ (open closed).

4. In the Balanced position, the inlet valve is _____ (open closed) and the exhaust valve is _____ (open closed).

5. When the R-12™ relay valve is in the Holding or Balanced position, the foot brake valve is also in the Holding or Balanced position.

	True	False
--	------	-------

6. It is best to replace a relay valve with the same or similar unit since different crack pressures are sometimes used. Different crack pressures can affect brake application timing.

	True	False
--	------	-------

7. Crack pressure is the amount of control air pressure needed to open the inlet valve.

	True	False
--	------	-------

8. The standard R-12™ relay valve has a crack pressure of approximately 4 psi.

	True	False
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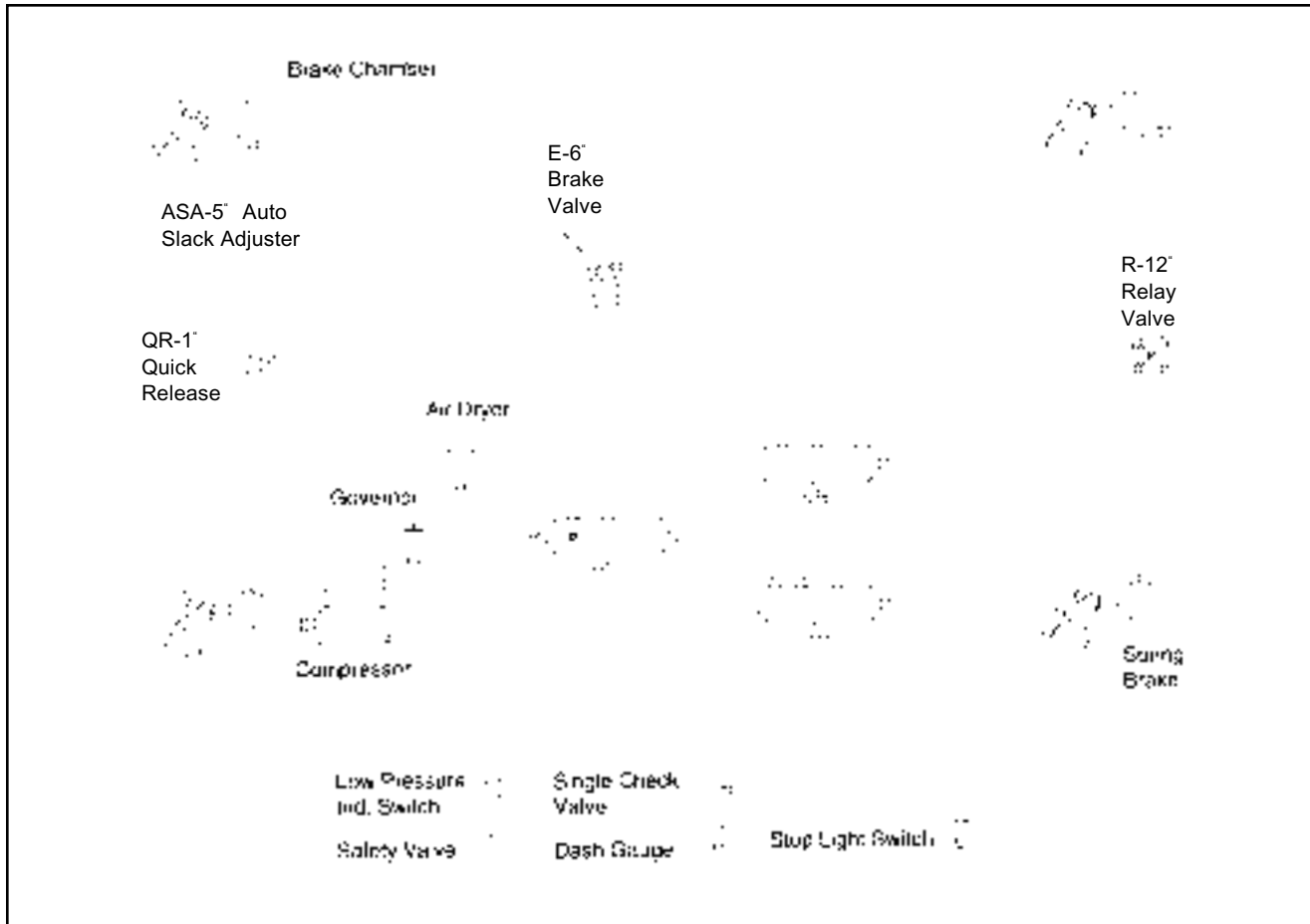
Stop Light Switch

1. The Bendix® SL-5™ stop light switch will activate the vehicle stop lights when brake application pressure reaches or exceeds;

	A	10 psi
	B	6 psi
	C	5 psi
	D	2 psi

2. The Bendix® SL-5™ stop light switch can be repaired using a maintenance kit, available from any authorized parts outlet.

	True	False
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Service Brake System

1. Using the symbols shown in the schematic, draw the Low Pressure Indicator Switch, Safety Valve, Single Check Valve(s), Dash Gauges and Stop Light Switch, in their correct positions.
2. Draw in the air lines that connect the Compressor, Air Dryer, Governor, Reservoirs, Brake Chambers, Spring Brakes, Quick Release Valve, Brake Valve and Relay Valve.
3. Indicate with an arrow and the number "3", the air lines that ARE NOT filled with air pressure when the brakes are released.



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Air Brake Systems

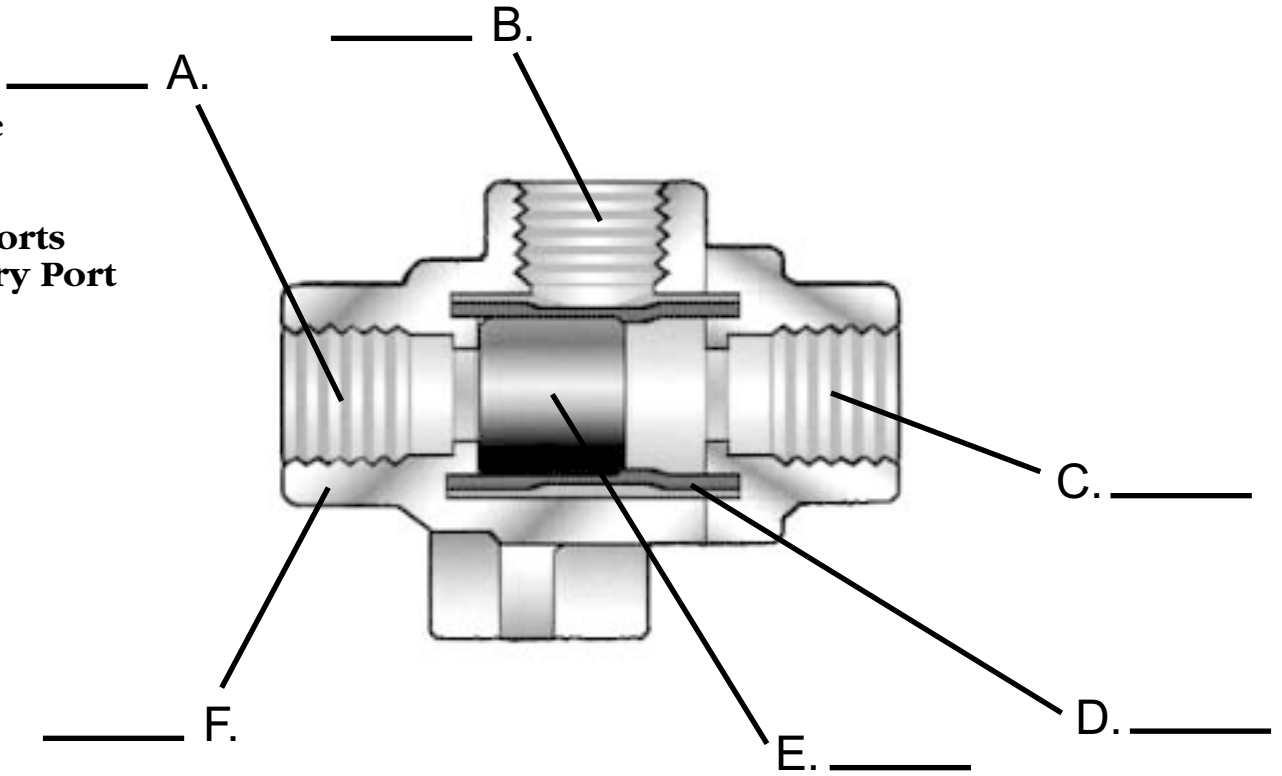
Video Training

Part 3

**Emergency and
Parking Brake System**

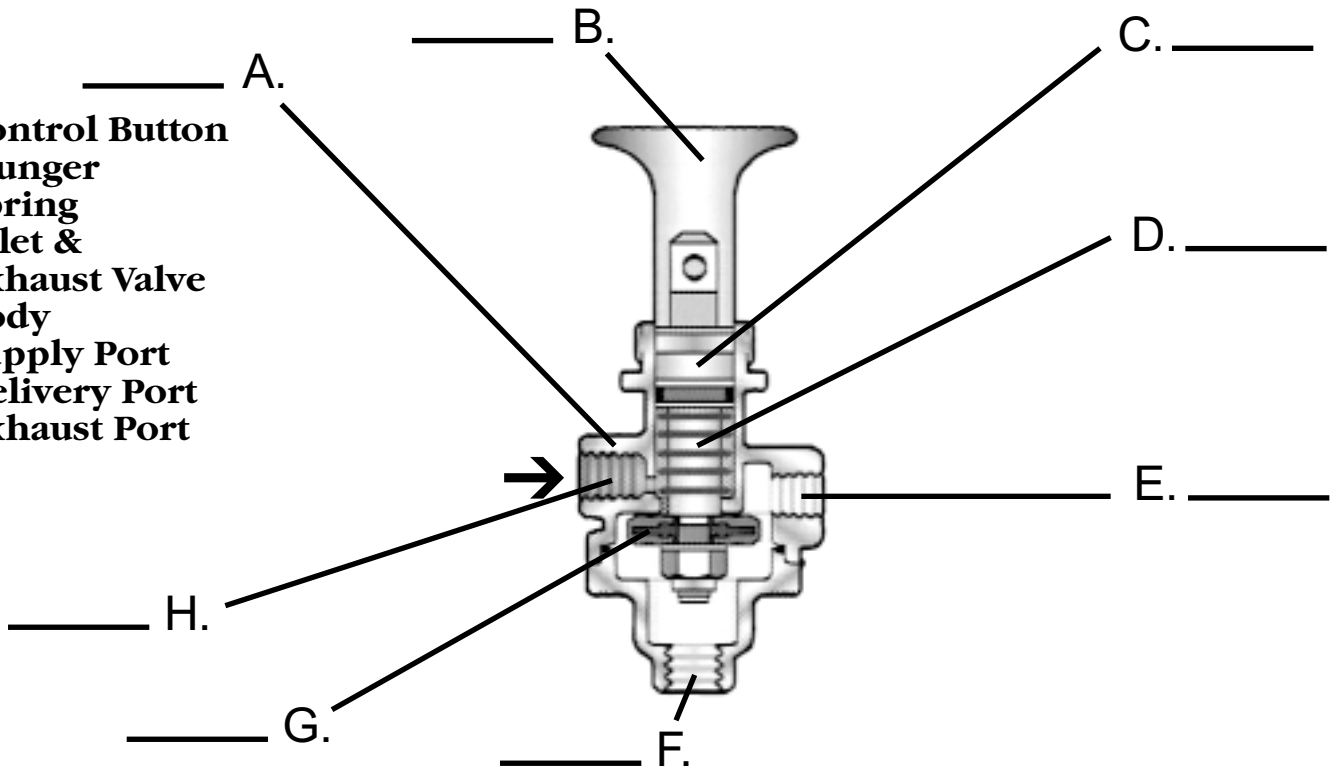
Double Check Valve

- 1. Shuttle
- 2. Guide
- 3. Body
- 4. Inlet Ports
- 5. Delivery Port



PP-1™ Push Pull Control Valve

- 1. Control Button
- 2. Plunger
- 3. Spring
- 4. Inlet & Exhaust Valve
- 5. Body
- 6. Supply Port
- 7. Delivery Port
- 8. Exhaust Port



Double Check Valve

1. Briefly explain the function and operation of the double check valve.

2. Double check valves can be used in a number of different ways in the air brake system. Describe how the double check shown in the video was used and what it was connected to.

3. In your own words, explain why the double check valve should be mounted horizontally (shuttle moving back and forth rather than up and down) when the difference in air pressure at the inlet ports is minimal.

PP-1™ Push Pull Control Valve

1. The PP-1™ push pull control valve button will automatically go in or pop out depending upon the available system pressure supplied to it.

True	False
------	-------

2. The PP-1™ is an on-off control valve, it does not modulate or graduate air pressure.

True	False
------	-------

3. With the button IN (plunger into body as far as it will go) the PP-1™ valve is in the exhaust position.

True	False
------	-------

4. The PP-1™ valve is available in a range of automatic settings, from about 20 psi to 60 psi. The typical setting is 40 psi.

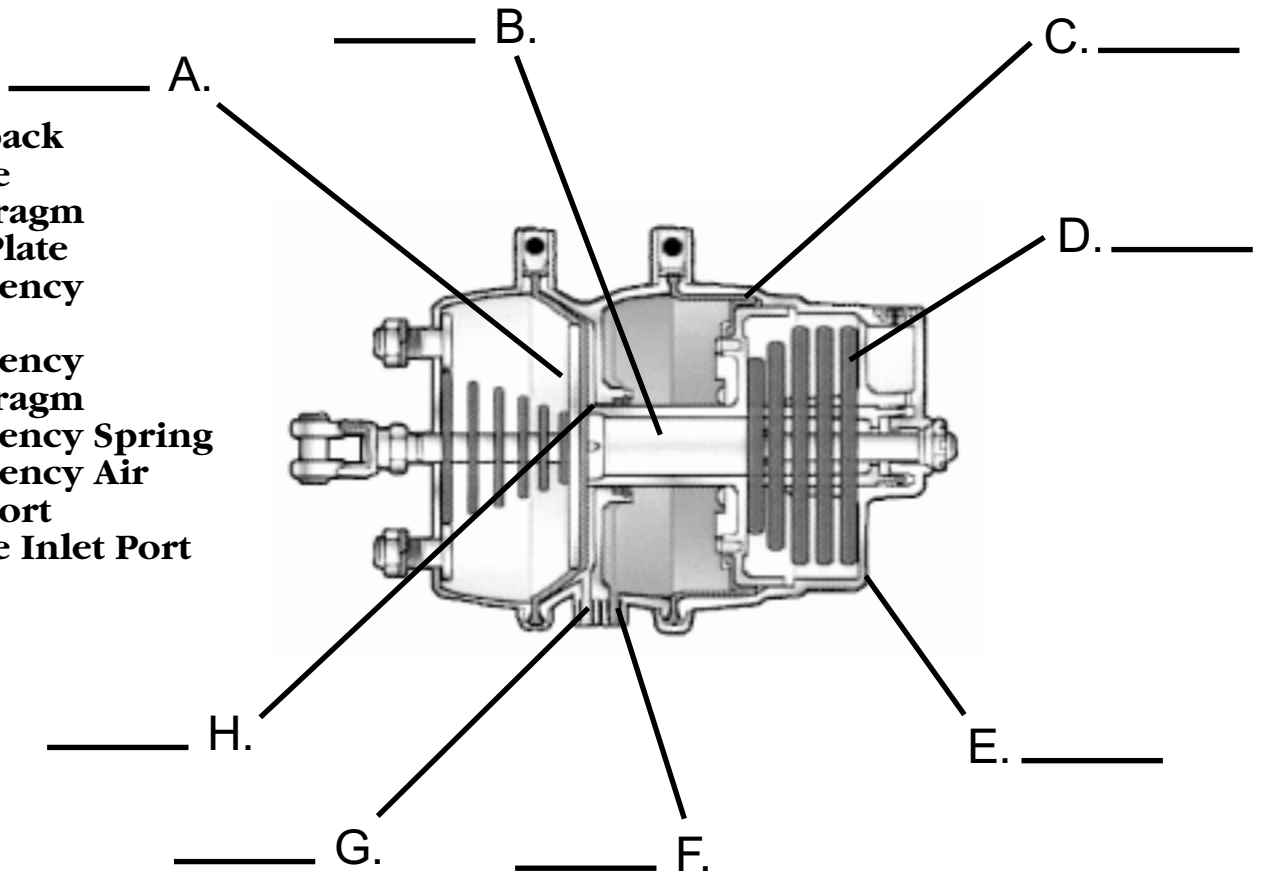
True	False
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5. When supply pressure falls to the automatic setting of the PP-1™ valve, the valve will move to the EXHAUST position.

True	False
------	-------

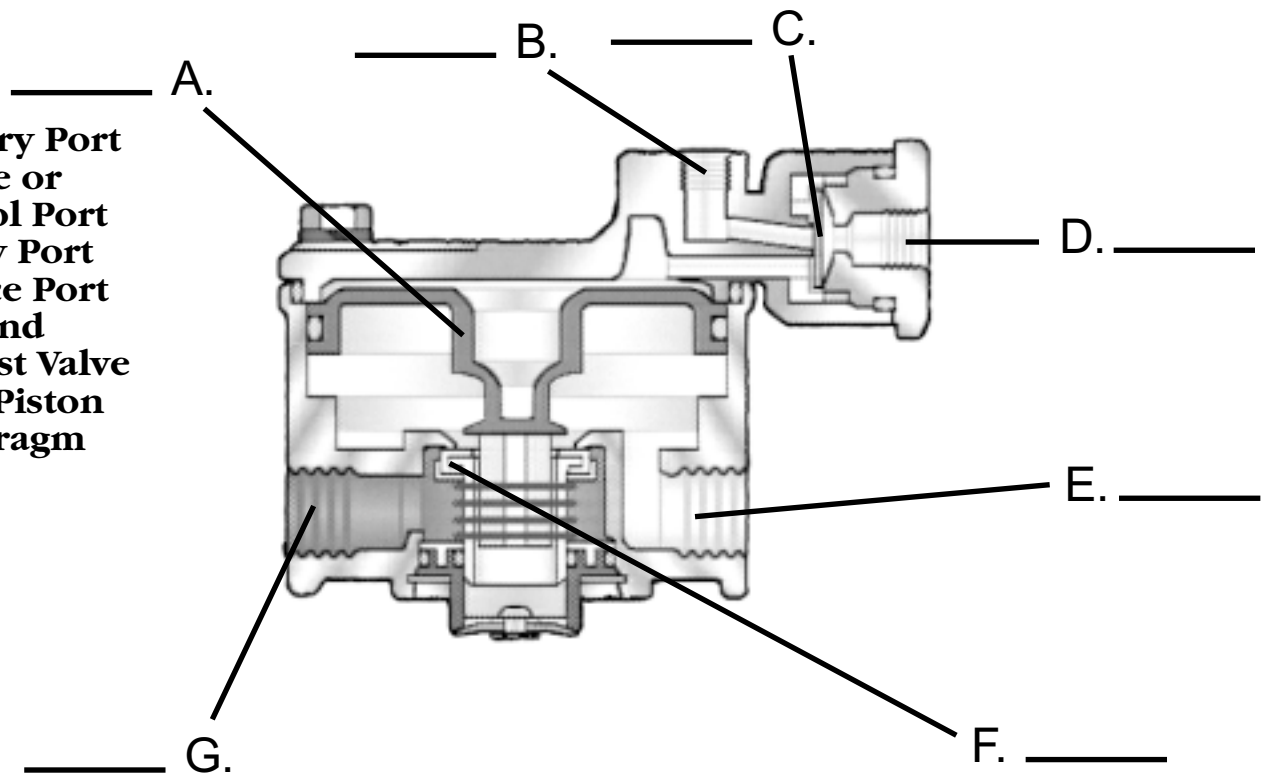
Spring Brakes

1. Piggyback
2. Service Diaphragm
3. Push Plate
4. Emergency Piston
5. Emergency Diaphragm
6. Emergency Spring
7. Emergency Air Inlet Port
8. Service Inlet Port



R-14™ Spring Brake Relay Valve

1. Delivery Port
2. Service or Control Port
3. Supply Port
4. Balance Port
5. Inlet and Exhaust Valve
6. Relay Piston
7. Diaphragm



Spring Brakes

1. The spring brake performs three braking functions on the vehicle. In addition to performing the normal service braking it also is the parking and _____ brake for the vehicle.

True False

2. The two sections of the spring brake use air pressure in an opposite manner. Air pressure applied to the emergency section applies the brakes, while air taken away from the service side releases the brakes.

True False

3. A release bolt is used in the emergency, or “piggyback”, section to cage the large, emergency spring.

True False

4. During a park or emergency application of the brakes, the expanding emergency spring supplies the force necessary to apply the brakes and holds them applied regardless of loss of air pressure in the brake system.

True False

R-14™ Spring Brake Relay Valve

1. The bottom half (body) of Bendix® R-14™ relay valve is exactly like the R-12™ relay valve and is interchangeable. The difference between the two valves is the cover.

True False

2. Although it can be used as a service relay, the R-14™ relay valve is used primarily as a spring brake relay. It provides rapid application and release of the parking and emergency brakes.

True False

3. The service or control port of the R-14™ spring brake relay valve is connected to the delivery of the _____ control valve.

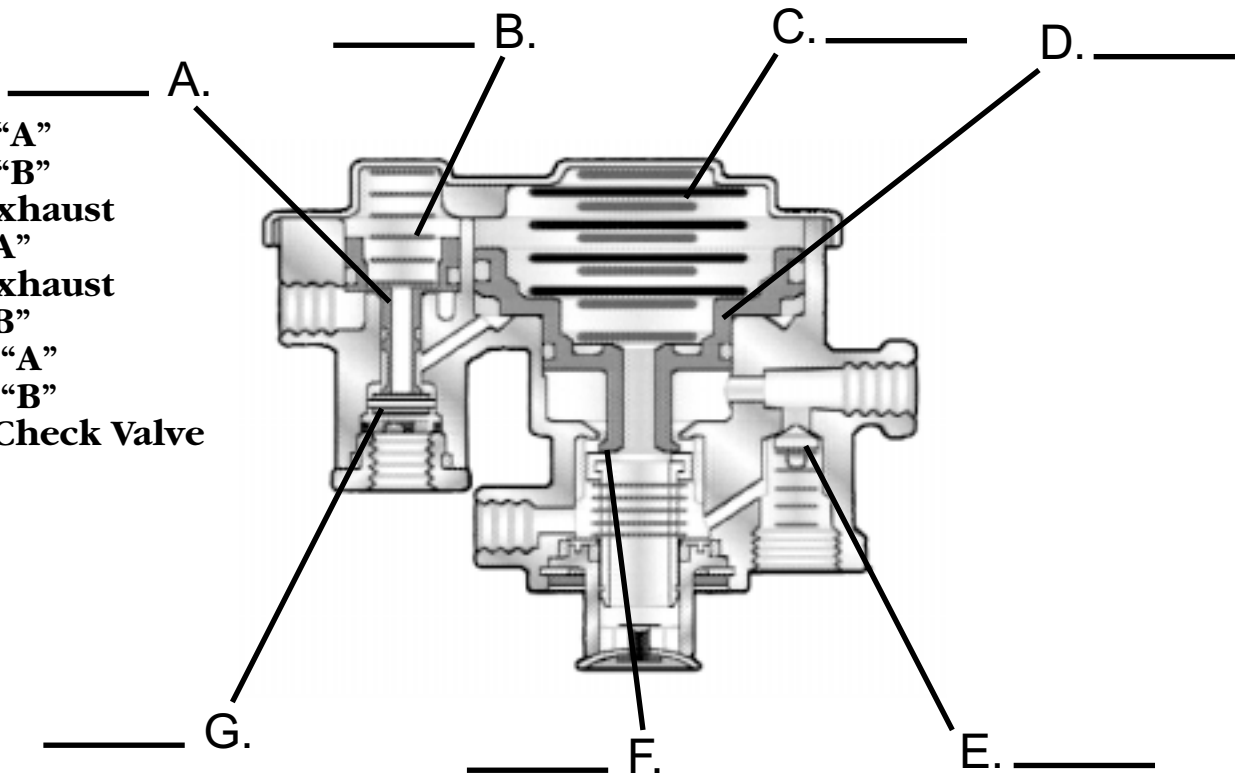
4. In your own words describe what the term “anti-compounding” means.

5. The balance port of the R-14™ relay valve is connected to the delivery side of the R-12™ service relay valve.

True False

SR-1™ Spring Brake Valve

1. Piston "A"
2. Piston "B"
3. Inlet/Exhaust Valve "A"
4. Inlet/Exhaust Valve "B"
5. Spring "A"
6. Spring "B"
7. Single Check Valve



SR-1™ Spring Brake Valve

1. The primary function of the SR-1™ spring brake valve is to maintain modulated rear axle braking if primary reservoir pressure is lost.

True False

2. The SR-1™ spring brake valve is used on longer wheel base vehicles, but can be used on straight trucks and tractors.

True False

3. The SR-1™ spring brake valve has four air connections, match the valve ports to the components connected to them.

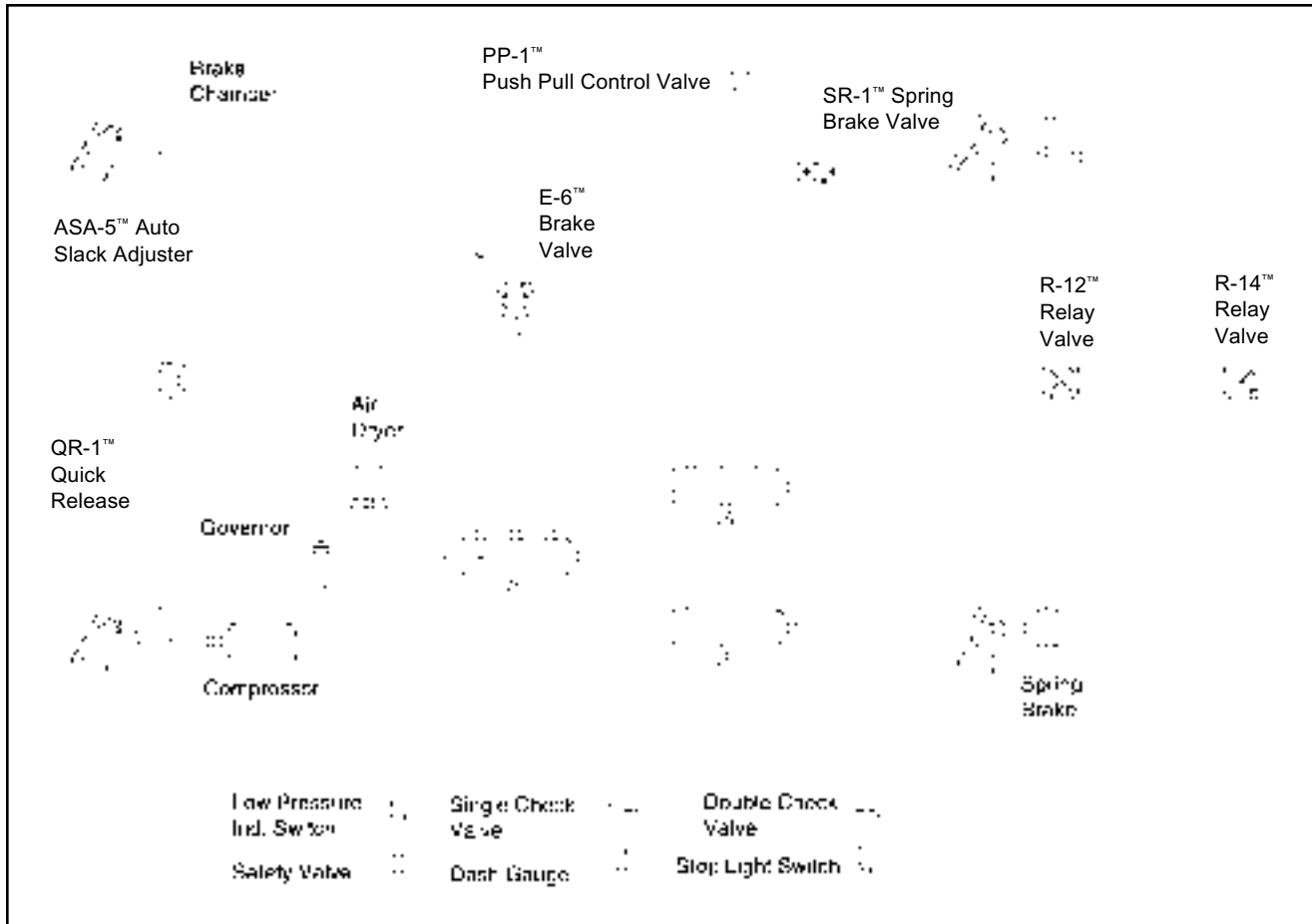
No. 1 Reservoir Port _____	A. Supply Reservoir
Control Port _____	B. Rear Service Reservoir
Supply Port _____	C. Front Service Reservoir
Delivery Port _____	D. Rear Axle Delivery of Foot Valve
	E. Front Axle Delivery of Foot Valve
	F. Spring Brake
	G. Delivery of PP-1™ Push Pull Control Valve
	H. R-14™ Valve Control or Service Port

4. When rear axle service reservoir (primary reservoir) pressure is lost, the SR-1™ spring brake valve will modulate the pressure in the spring brake emergency section and the rear brakes will be applied with spring force rather than air pressure.

True False

5. The SR-1™ spring brake valve allows the foot brake valve to apply and release (modulate) the spring brakes when primary reservoir pressure is lost.

True False



Emergency and Parking Brake System

- Using the symbols shown in the schematic, draw the Low Pressure Indicator Switch, Safety Valve, Single Check Valve(s), Dash Gauge(s), Double Check Valve and Stop Light Switch, in their correct positions.
- Draw in the air lines that connect all the air devices.
- Indicate with an arrow and the number "3" which air lines ARE NOT filled with air pressure when the service brakes are released and the spring brakes are applied (vehicle parked, engine running).
- Indicate with an arrow and the number "4" which air lines ARE FILLED with air pressure when both the service and spring brakes are applied (vehicle parked, engine running, foot brake valve depressed).



Workbook

Air Brake Systems

Video Training

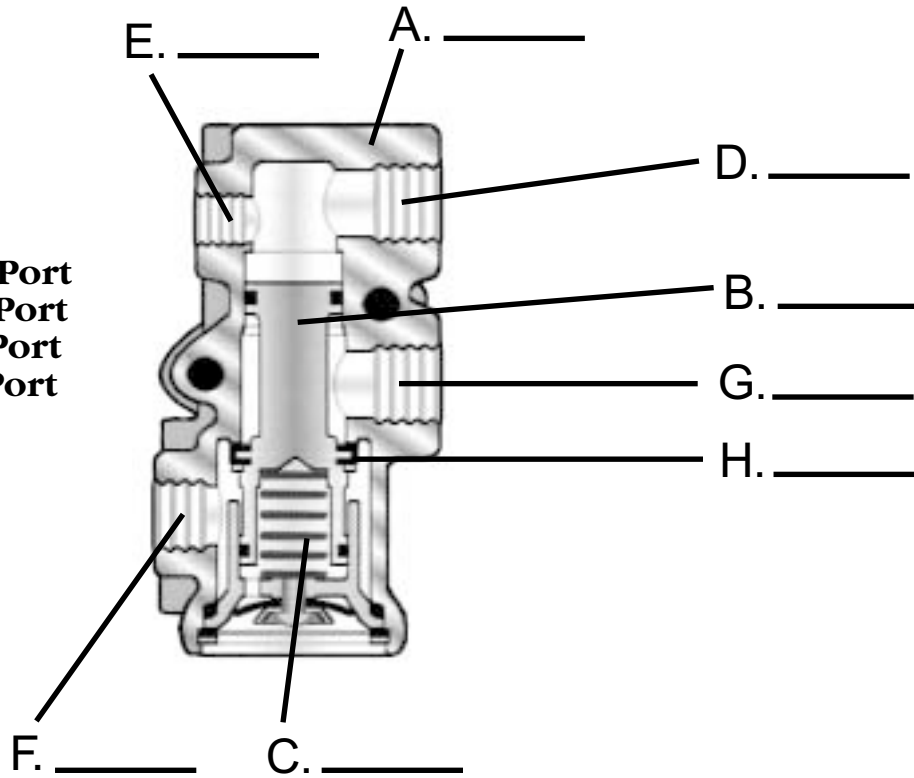
Part - 4

Tractor/ Trailer

Brake System

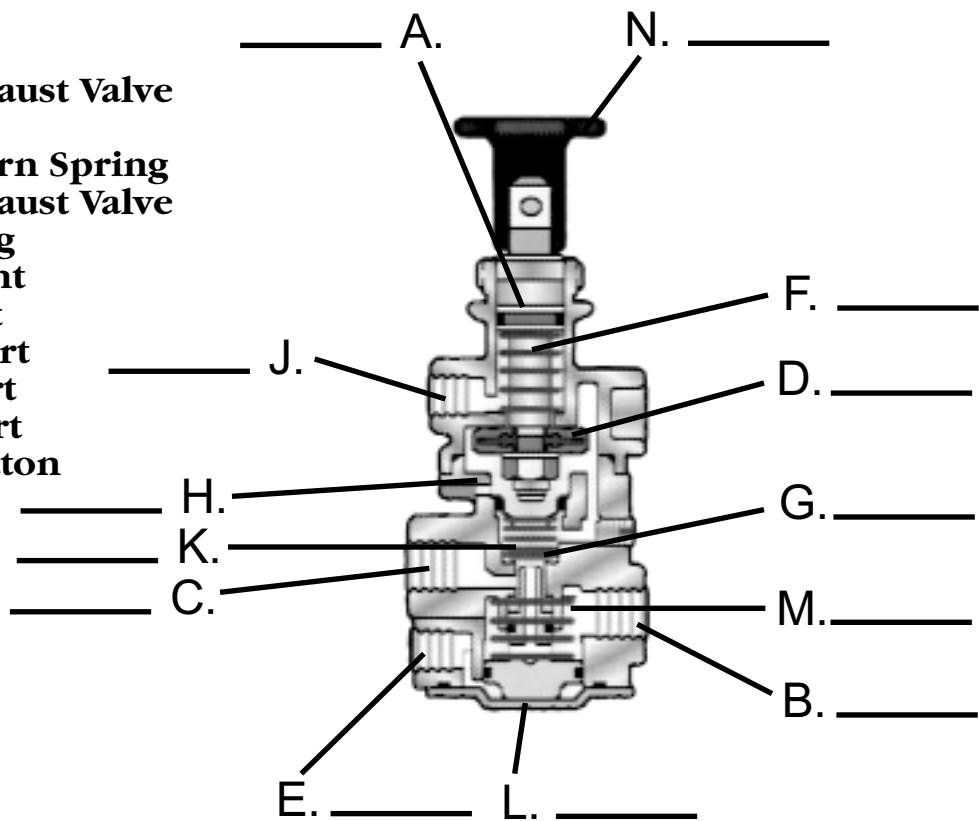
TP-3™ Tractor Protection Valve

- 1. Plunger
- 2. Service Valve
- 3. Body
- 4. Spring
- 5. Tractor Service Port
- 6. Tractor Supply Port
- 7. Trailer Service Port
- 8. Trailer Supply Port



PP-7™ Trailer Supply Valve

- 1. Plunger
- 2. Spring
- 3. Inlet & Exhaust Valve
- 4. Piston
- 5. Piston Return Spring
- 6. Inlet & Exhaust Valve
- 7. Valve Spring
- 8. Exhaust Vent
- 9. Supply Port
- 10. Delivery Port
- 11. Control Port
- 12. Exhaust Port
- 13. Control Button



TP-3™ Tractor Protection Valve

1. Briefly explain the function and operation of the tractor protection valve.

2. The TP-3™ tractor protection valve controls the flow of air through the two air lines that connect the tractor to the trailer.

True	False
------	-------

3. There are 2 separate valves in the TP-3™ tractor protection valve, one for each of the two air lines connected to the body.

True	False
------	-------

4. The tractor protection valve is mounted on the dash and has a red control button.

True	False
------	-------

PP-7™ Trailer Supply Valve

1. The PP-7™ trailer supply valve button will automatically go in or pop out depending upon the available system pressure supplied to it.

True	False
------	-------

2. The PP-7™ trailer supply valve has three (3) air connections. Put the letter of the correct connection next to the PP-7™ trailer supply valve port shown below.

PP-7™ trailer supply valve Supply port _____	A. Double Check Valve Outlet
PP-7™ trailer supply valve Delivery port _____	B. Tractor Service Port of Tractor Protection
PP-7™ trailer supply valve Control port _____	C. Tractor Supply Port of Tractor Protection
	D. Delivery Port of Park Control Valve
	E. Rear Axle Delivery of Foot Valve

3. When the driver pulls the PP-7™ trailer supply valve's control button, the tractor and trailer parking brakes apply.

True	False
------	-------

4. The PP-7™ trailer supply valve is responsible for charging the trailer air system and opening the service valve in the TP-3™ tractor protection valve.

True	False
------	-------

5. When the "System Park Control Valve (yellow diamond shaped control button)" is pulled: (Choose as many as are applicable)
 - A. Only the tractor parking brakes are applied
 - B. The tractor and trailer parking brakes are applied
 - C. Only the Trailer parking brakes are applied
 - D. Neither A, B, or C above.

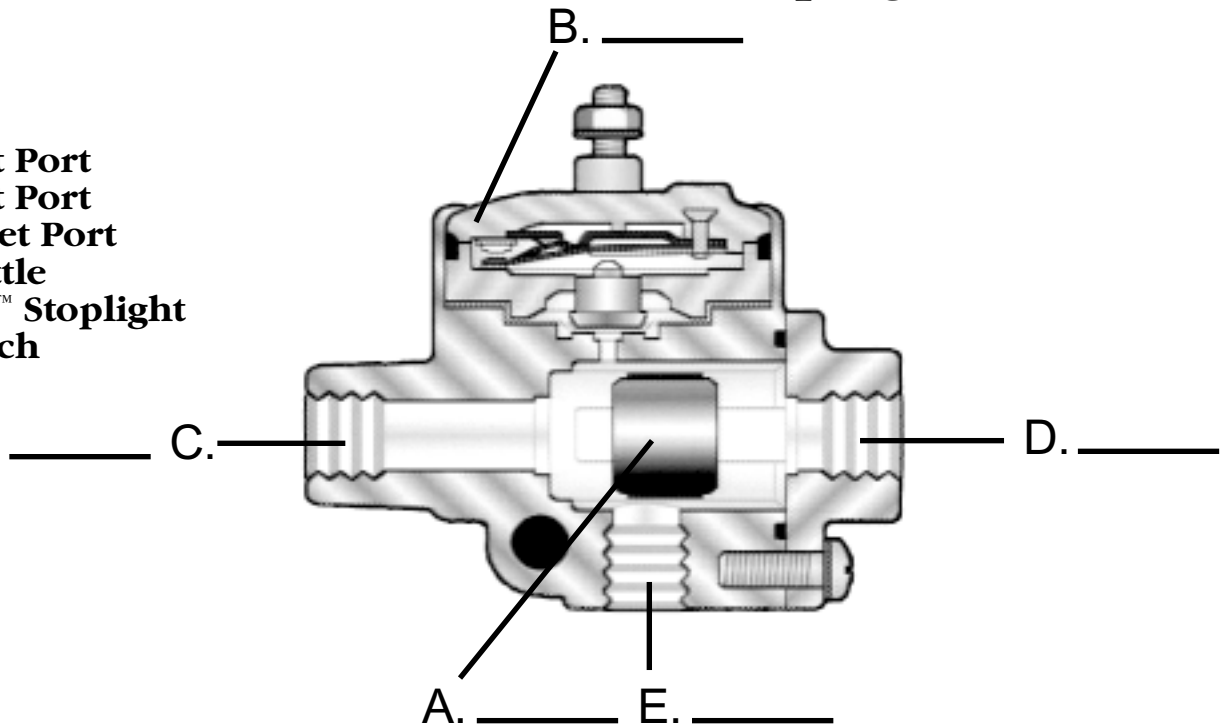
6. The PP-7™ trailer supply valve is actually two valves in a single housing. One of the valves is called a "synchro" or synchronizing valve and the other is:
 - A. Relay Valve
 - B. Brake Valve
 - C. Push-Pull Valve
 - D. SR-1™ Spring Brake Valve

7. The yellow, diamond shaped control button easily identifies the PP-7™ trailer supply valve on the vehicle dash.

True	False
------	-------

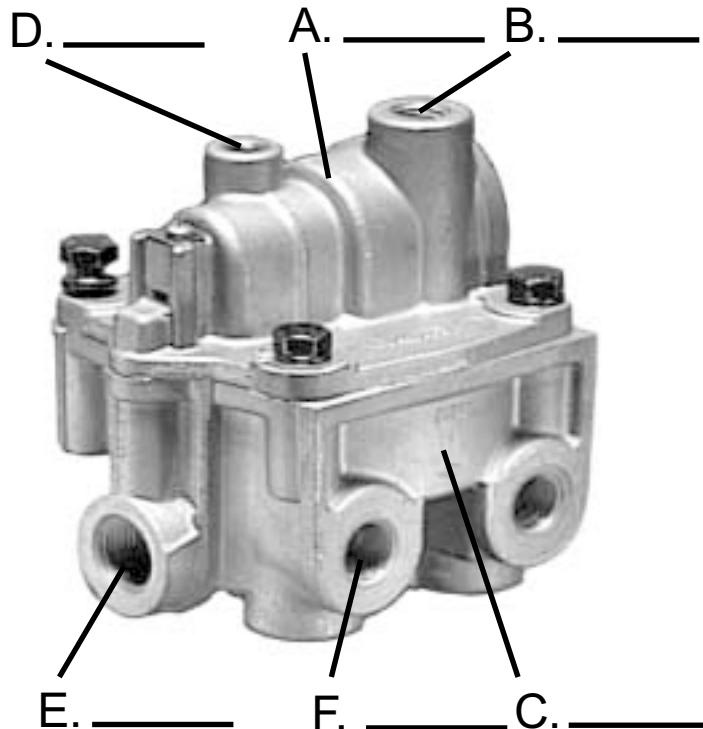
DS-2™ Double Check Valve and Stop Light Switch

- 1. Inlet Port
- 2. Inlet Port
- 3. Outlet Port
- 4. Shuttle
- 5. SL-5™ Stoplight Switch



BP-R1™ Bobtail Proportioning Relay Valve

- 1. Supply Port
- 2. Delivery Ports
- 3. Service or Control Port for the Relay
- 4. Control Port for the Proportioning Valve
- 5. Body
- 6. Cover



DS-2™ Double Check Valve and Stop Light Switch

1. The DS-2™ double check valve has three (3) air connections on it. Put the letter of the correct connection next to the PP-7™ trailer supply valve port shown below.

- | | |
|--|---|
| DS-2™ double check valve Inlet Port _____ | A. Delivery of the R-12™ service relay valve |
| DS-2™ double check valve Inlet Port _____ | B. Delivery of the front axle circuit of the foot valve |
| DS-2™ double check valve Outlet Port _____ | C. Delivery of the hand valve |
| | D. Delivery of the rear axle circuit of the foot valve |
| | E. The inlet or supply port of the R-12™ relay valve |
| | F. The tractor supply port of the tractor protection valve |
| | G. The tractor service port of the tractor protection valve |

2. The function of the Double Check Valve portion of the DS-2™ is;

BP-R1™ Bobtail Proportioning Relay Valve

1. Explain briefly what function the BP-R1™ relay valve performs.

2. The BP-R1™ relay valve is the combination of two separate valves in one body; an R-12™ relay valve and a proportioning valve.

True False

3. The BP-R1™ relay valve replaces the standard service relay valve on the vehicle.

True False

4. There are four “types of air connections” on the BP-R1™ relay valve. Put the letter of the correct connection next to the PP-7™ trailer supply valve port shown below.

- | | |
|--|---|
| BP-R1™ relay valve Supply Port _____ | A. The service brake chambers |
| BP-R1™ relay valve Delivery Port _____ | B. The delivery of the PP-7™ trailer supply valve |
| BP-R1™ relay valve Service Port _____ | C. The delivery of the Front Axle Circuit of the foot valve |
| BP-R1™ relay valve Control Port _____ | D. The delivery of the Rear Axle Circuit of the foot valve |
| | E. The Tractor Service Port of the tractor protection valve |
| | F. The inlet of the front axle proportioning valve |
| | G. Front axle Service Reservoir |
| | H. Rear axle Service Reservoir |

5. The BP-R1™ relay valve can replace the standard service relay on any vehicle and will reduce application pressure to the front axle brakes during “panic stops”.

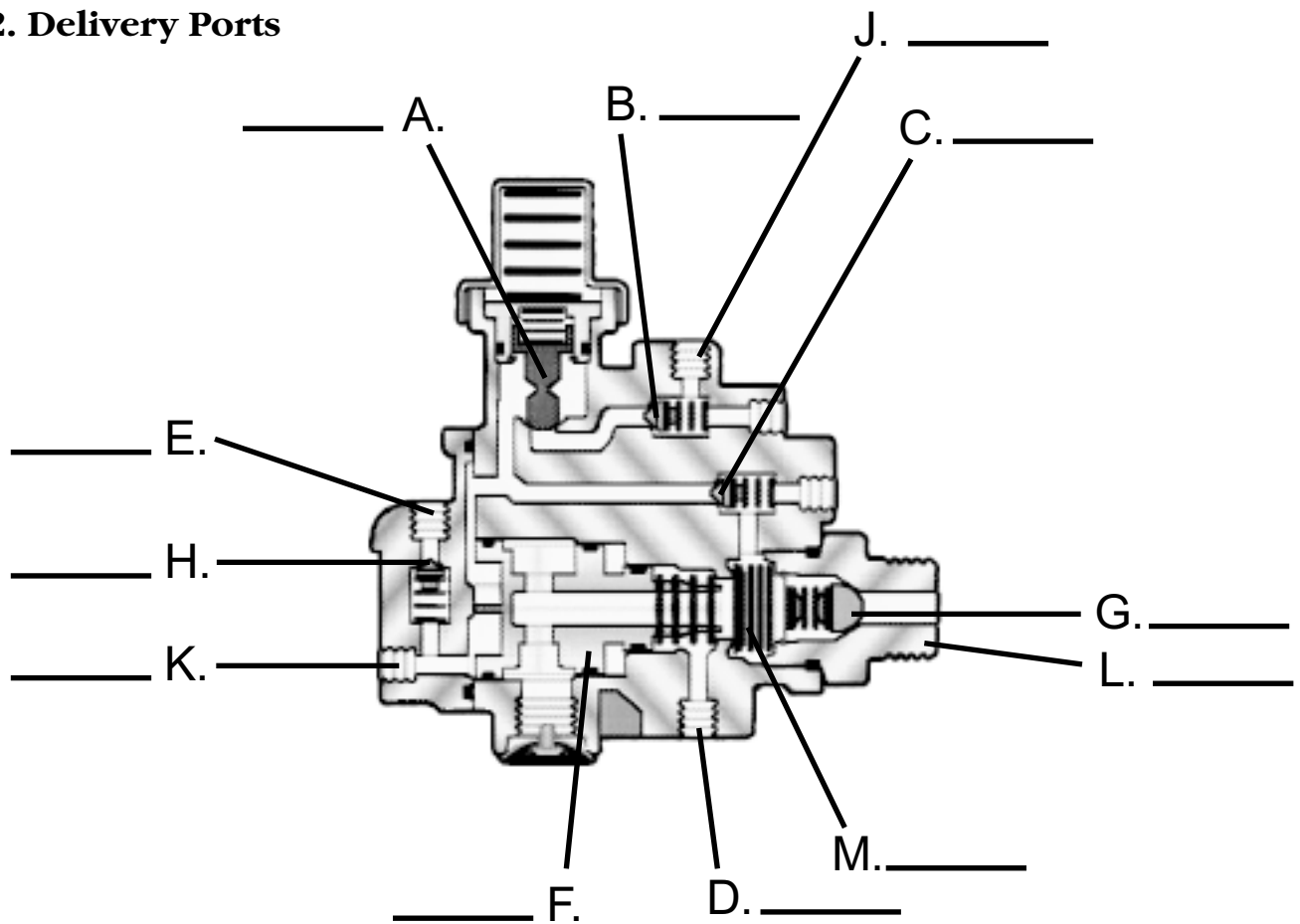
True False

6. During tractor - trailer operation the BP-R1™ relay valve reduces pressure to the tractor rear brakes and thereby stabilizes the entire combination during each stop. When operating in the “Bobtail” mode the BP-R1™ relay valve will allow full braking pressure to reach the tractor’s rear service brakes.

True False

SR-5™ Trailer Spring Brake Valve

1. Relay Piston
2. Inlet and Exhaust Valve
3. Single Check Valve
4. Single Check Valve
5. Single Check Valve
6. Single Check Valve
7. Pressure Protection Valve
8. Service Reservoir Port
9. Service Reservoir Mounting Stud
10. Trailer Supply Port
11. Trailer Service Port
12. Delivery Ports



SR-5™ Trailer Spring Brake Valve

1. The primary function of the SR-5™ trailer spring brake valve is to control the application and release of trailer spring brakes.

True False

2. If trailer reservoir pressure is lost, the SR-5™ trailer spring brake valve will automatically apply the trailer brakes and prevent a run-away.

True False

3. The SR-5™ trailer spring brake valve allows the use of trailer supply line air pressure for trailer service brake applications when all trailer reservoir pressure is lost.

True False

4. The SR-5™ trailer spring brake valve has five (5) air connections, match the valve ports to the components connected to them.

Service Reservoir Port _____

Reservoir Mounting Stud _____

Trailer Supply Port _____

Trailer Service Port _____

Delivery Port _____

A. Trailer Supply Line

B. Trailer Service Reservoir

C. Trailer Service Line

D. Service Side of the Trailer Spring Brakes

E. Emergency Side of the Trailer Spring Brakes

F. Control Port on Trailer Service Relay Valve

G. Delivery Port on Trailer Service Relay Valve

5. The SR-5™ trailer spring brake valve will automatically apply the trailer spring brakes in the event of tractor trailer break away.

True False

6. Like many of the valves presented, the SR-5™ trailer spring brake valve incorporates several individual valves in a single housing. In addition to the relay valve at the heart of the SR-5™ trailer spring brake valve, which of the following are also inside? Circle all that apply.

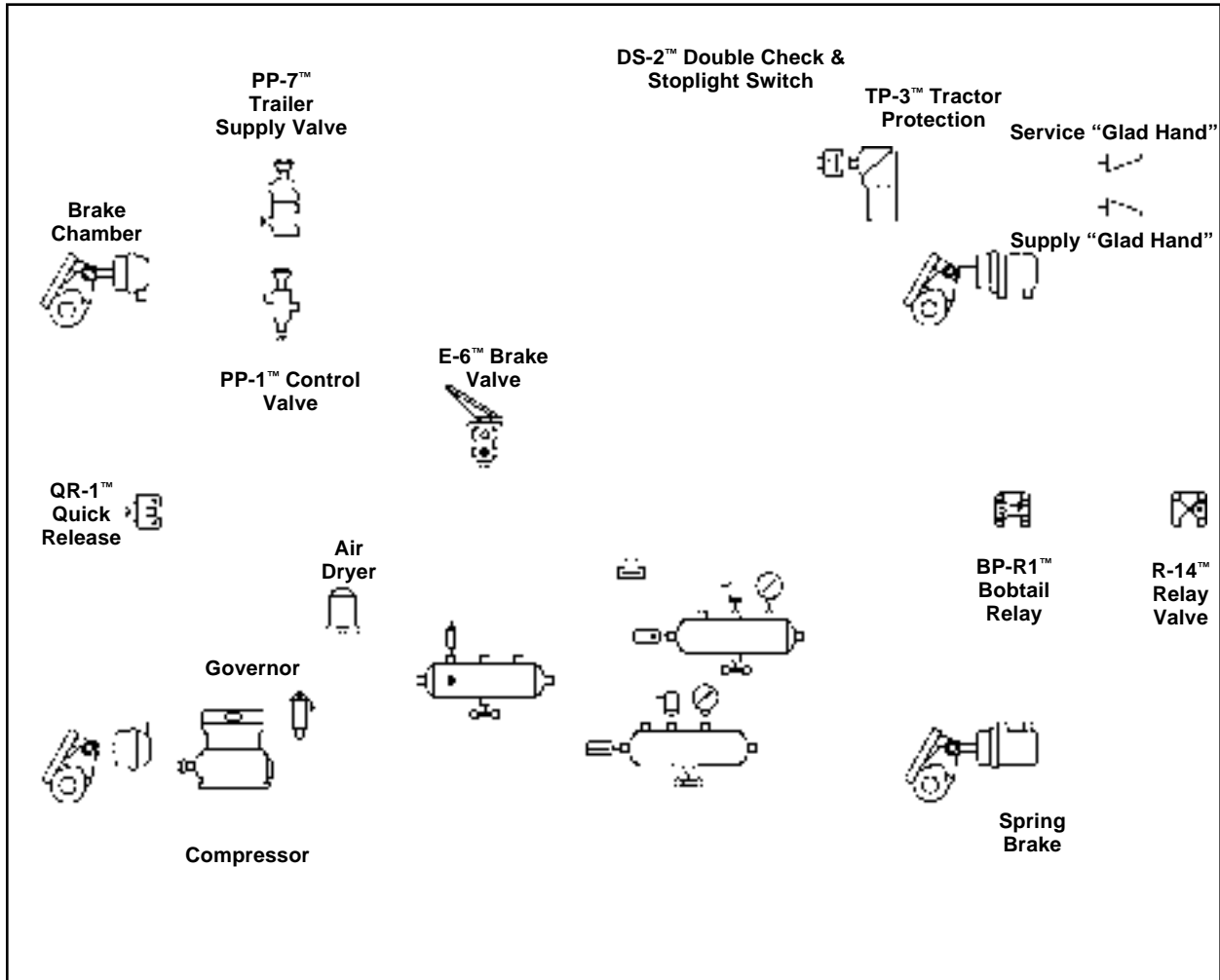
A. Single Check Valve

B. Double Check Valve

C. Synchro or Synchronizing Valve

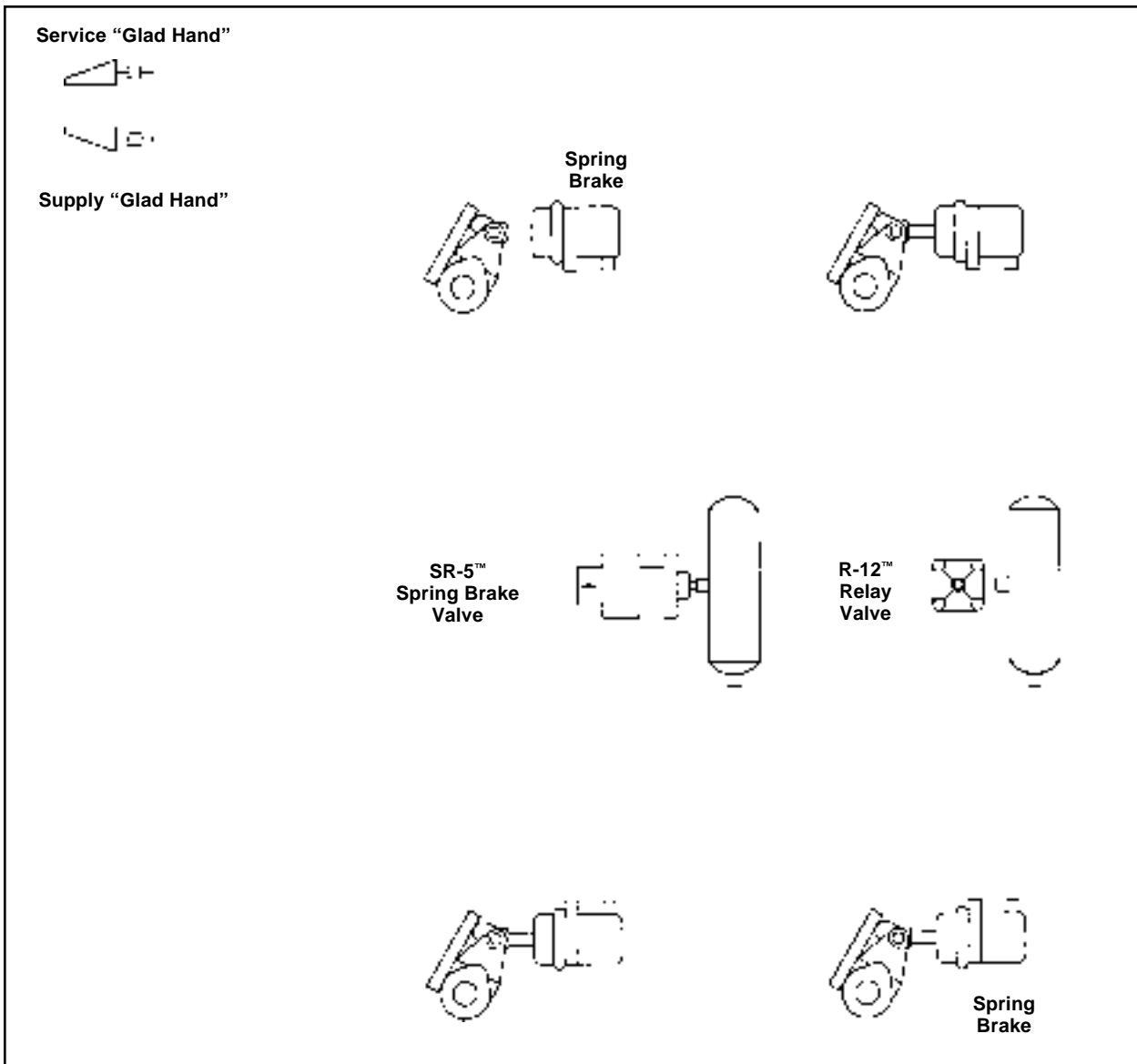
D. Pressure Protection Valve

E. Foot Valve



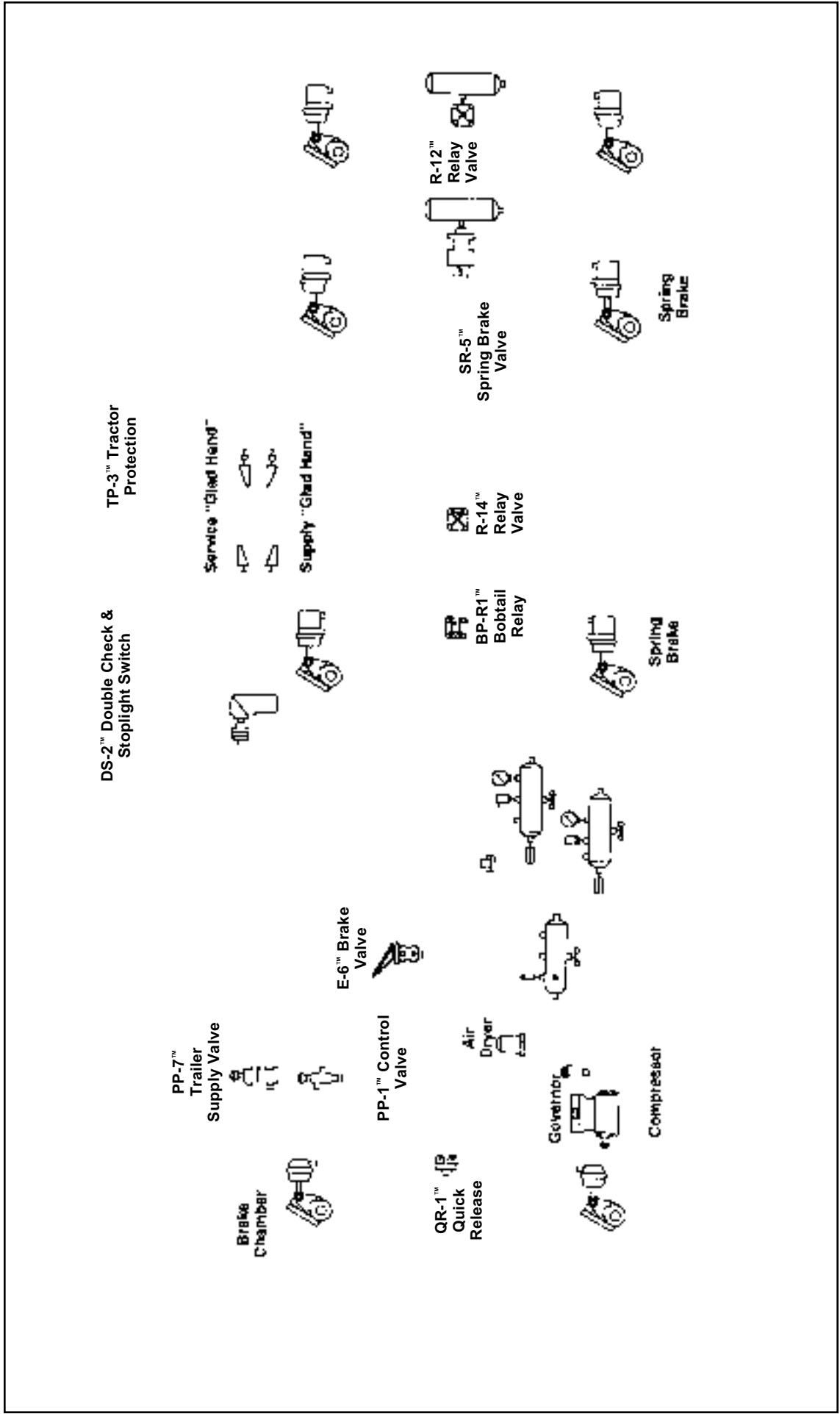
Tractor Air Brake System

1. Draw in the air lines that connect all the air devices.
2. Indicate with an arrow and the number "2" which air lines ARE NOT filled with air pressure when the tractor air system is fully charged to governor cut-out pressure and both the PP-1™ push pull control valve and the PP-7™ trailer supply valve are PUSHED IN.
3. Indicate with an arrow and the number "3" which air lines ARE FILLED with air pressure when the tractor air system is fully charged to governor cut-out pressure and the PP-1™ push pull control valve is PULLED OUT and the PP-7™ trailer supply valve is PUSHED IN.



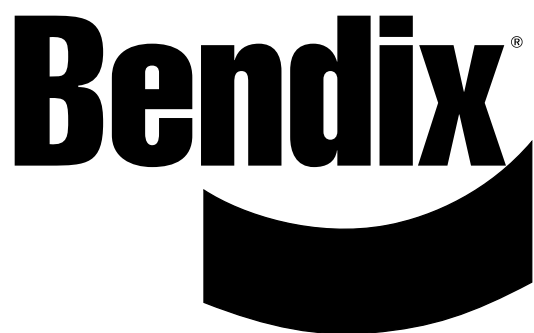
Trailer Air Brake System

1. Draw in the air lines that connect all the air devices.
2. Indicate with an arrow and the number "2" which air lines ARE NOT filled with air pressure when the tractor air system is fully charged to governor cut-out pressure and both the PP-1™ push pull control valve and the PP-7™ trailer supply valve are PUSHED IN.
3. Indicate with an arrow and the number "3" which air lines ARE FILLED with air pressure when the tractor air system is fully charged to governor cut-out pressure and the PP-1™ push pull control valve is PULLED OUT and the PP-7™ trailer supply valve is PUSHED IN.



Tractor Trailer Air Brake System

1. Connect the air lines to all air brake components on the tractor trailer air brake system.



Workbook
Air Brake Systems

Video Training
Answers Part 1 - 4

Answers for Part 1 Reservoirs and Check

Compressor (Page 1)

Illustration

- A. 6
- B. 7
- C. 5
- D. 2
- E. 3
- F. 4
- G. 1
- 1. False
- 2. False
- 3. True
- 4. True
- 5. True
- 6. False
- 7. Crankcase flooding is the build-up of an oil level in the compressor crankcase. It is caused by the failure of oil to rapidly return to the engine crankcase from the compressor crankcase.

Governor (Page 1)

Illustration

- A. 4
- B. 2
- C. 3
- D. 1
- E. 5
- 1. False
- 2. False
- 3. True
- 4. True
- 5. True
- 6. System pressure would continue to rise until the Safety Valve activated.

Safety Valve (Page 3)

Illustration

- A. 1
- B. 2
- C. 3
- D. 4
- 1. True
- 2. False
- 3. True
- 4. False

Valves (Page 3)

Illustration

- A. 4
- B. 2
- C. 5
- D. 3
- E. 1
- 1. False
- 2. False
- 3. True
- 4. False
- 5. True
- 6. True

Dash Gauge & Low Pressure Indicator (Page 5)

Illustration

- 1. True
- 2. False
- 3. False
- 4. True
- 5. False
- 6. False
- 7. True
- 8. False

Reservoirs & Drain Cocks (Page 5)

- 1. True
- 2. True
- 3. True
- 4. False

Air Dryer (Page 7)

Illustration

- A. 8
- B. 6
- C. 7
- D. 5
- E. 4
- F. 3
- G. 7
- H. 9
- I. 12
- J. 10
- K. 1
- L. 2
- M. 11
- 1. True
- 2. True
- 3. False
- 4. False

- 5. True
- 6. True
- 7. Supply (In from compressor), Delivery (Out to supply res.), Control (From governor unloader port)
- 8. Allows purge air (dry air) to flow back through the desiccant cartridge. OR Slows the flow of pressurized dry air back through the desiccant cartridge allowing it to expand to almost 0 psi.
- 9. Air pressure loss in general anywhere in the system. Remember loss of pressure in the Supply Reservoir which includes any device, line, or fitting up to the single check valve installed in the service reservoirs, WILL NOT BE REGISTERED ON THE DASH GAUGES.

Answers for Part 2

Dual Brake Valve (Page 11)

Illustration

- A. 10
- B. 2
- C. 3
- D. 5
- E. 1
- F. 6
- G. 4
- H. 7
- I. 12
- J. 8
- K. 9
- L. 13
- M. 16
- N. 11
- O. 15
- P. 14
- 1. False
- 2. Closed, Open
- 3. True
- 4. True
- 5. Closed, Closed
- 6. True
- 7. The Graduating spring modulates (graduates, feathers) air delivery in the primary or rear axle service system.

Brake Chambers & Spring Brakes (Page 11)

Illustration

- A. 2
 - B. 4
 - C. 3
 - D. 1
 - E. 5
1. True
 2. The brake chamber type number indicates the effective area of the diaphragm.
 3. False
 4. True
 5. 600 pounds force
 6. False
 7. The clevis or yoke assembly. The yoke assembly connects the brake chamber push rod to the slack adjuster.

Slack Adjuster (Page 13)

1. False
2. Convert linear stroke of brake chamber into rotational motion. Multiplies force developed by brake chamber. Rotates the cam shaft of the foundation brake.
3. False
4. False - The number designation of the slack adjuster indicates the amount of rotational torque the unit can withstand; a Type 20 slack adjuster can withstand 20,000 pound inches of torque.
5. True
6. False - The ASA-5™ slack adjuster adjusts on application, prior to the shoes contacting the drum.
7. False - The ASA-5™ slack adjuster monitors lining to drum clearance.

Quick Release Valve (Page 13)

Illustration

- A. 3
 - B. 1
 - C. 2
 - D. 4
 - E. 2
1. True
 2. False - The quick release valve decreases release time.
 3. True
 4. False

Relay Valve (Page 15)

Illustration

- A. 1
 - B. 4
 - C. 3
 - D. 5
 - E. 2
 - F. 6
1. True
 2. False
 3. Closed, Open
 4. Closed, Closed
 5. True
 6. True
 7. True
 8. True

Stop Light Switch (Page 15)

Illustration

- A. 4
 - B. 5
 - C. 6
 - D. 1
 - E. 3
 - F. 7
 - G. 2
1. B - 6 psi
 2. False

Answers for Part 3**Double Check Valve (Page 19)**

Illustration

- A. 4
 - B. 5
 - C. 4
 - D. 2
 - E. 1
 - F. 3
1. The double check valve is a device that receives air pressure from two sources and delivers the higher of the two.
 2. The double check in the video was used to maintain a constant source of air pressure for the parking or emergency brake system. Its inlet ports were connected to each of the two service reservoirs and its delivery was connected to the PP-1™ control valve and the R-14™ spring brake relay valve.

3. If mounted vertically, the lower inlet port air pressure would have to be much higher than the pressure at the top inlet port in order to lift the shuttle and seal the top inlet. In the horizontal position the weight of the shuttle rest on the guides and a lower pressure difference between the two inlet ports will allow it to move.

PP-1™ Push Pull Control (Page 19)

Illustration

- A. 5
 - B. 1
 - C. 2
 - D. 3
 - E. 7
 - F. 8
 - G. 4
 - H. 6
1. False
 2. True
 3. False
 4. True
 5. True

Spring Brakes (Page 21)

Illustration

- A. 3
 - B. 4
 - C. 5
 - D. 6
 - E. 1
 - F. 7
 - G. 8
 - H. 2
1. Emergency
 2. False - Air pressure applied to the emergency section releases the brake.
 3. True
 4. True

R-14™ Spring Brake Relay (Page 21)

Illustration

- A. 6
- B. 4
- C. 7
- D. 2
- E. 1
- F. 5
- G. 3

1. True
2. True
3. Delivery port of the PP-1™ (push-pull) control valve
4. “Anti-Compounding” refers to a system that prevents the service and parking (emergency) brakes from being applied at the same time.
5. True

SR-1™ Spring Brake Valve (Page 24)

- A. 1
 - B. 5
 - C. 6
 - D. 2
 - E. 7
 - F. 4
 - G. 3
1. True
 2. True
 3. No. 1 Reservoir Port **to** B. Rear Service Reservoir Control Port **to** E. Front Axle Delivery of Foot Valve Supply Port **to** G. Delivery of PP-1™ control valve Delivery Port **to** H. R-14™ relay valve Control or Service Port
 4. True
 5. True

Answers for Part 4

TP-3™ Tractor Protection

- A. 3
 - B. 1
 - C. 4
 - D. 8
 - E. 6
 - F. 5
 - G. 7
 - H. 2
1. Serves as ON-OFF control for Service or Control line running between Tractor and Trailer
 2. False
 3. False
 4. False

PP-7™ Trailer Supply Valve

- | | |
|-------|-------|
| A. 1 | G. 6 |
| B. 12 | H. 8 |
| C. 10 | J. 9 |
| D. 3 | K. 7 |
| E. 11 | L. 4 |
| F. 2 | M. 5 |
| | N. 13 |
1. False
 2. PP-7™ trailer supply valve Supply port **A**
PP-7™ trailer supply valve Delivery port **C**
PP-7™ trailer supply valve Control port **D**
 3. False

4. True
5. B
6. C
7. False

DS-2™ Double Check Valve and Stoplight Switch

- A. 4
 - B. 5
 - C. 1
 - D. 2
 - E. 3
1. DS-2™ double check valve Inlet Port **B**
DS-2™ double check valve Inlet Port **D**
DS-2™ double check valve Outlet Port **G**
 2. Allows operation of trailer brakes after a single failure of tractor service system has occurred

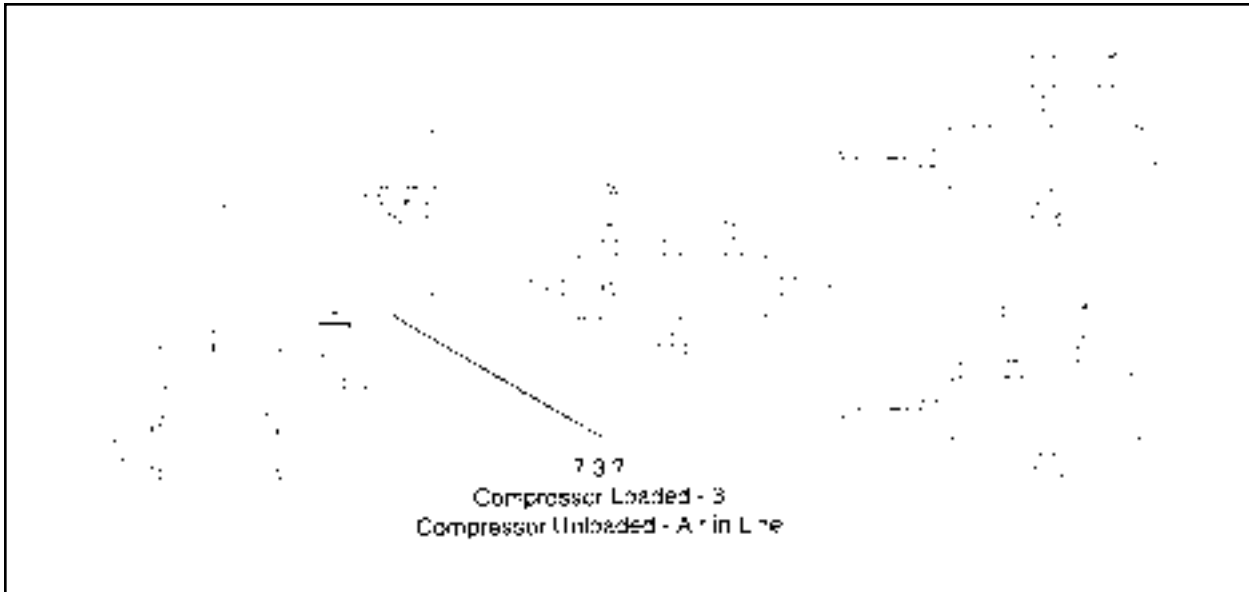
BP-R1™ Bobtail Proportioning Relay Valve

- A. 6
 - B. 3
 - C. 5
 - D. 4
 - E. 1
 - F. 2
1. Reduces brake application pressure to rear tractor brakes during “bobtail” operation
 2. True
 3. True
 4. BP-R1™ relay valve Supply Port **H**
BP-R1™ relay valve Delivery Port **A**
BP-R1™ relay valve Service Port **D**
BP-R1™ relay valve Control Port **B**
 5. False
 6. False

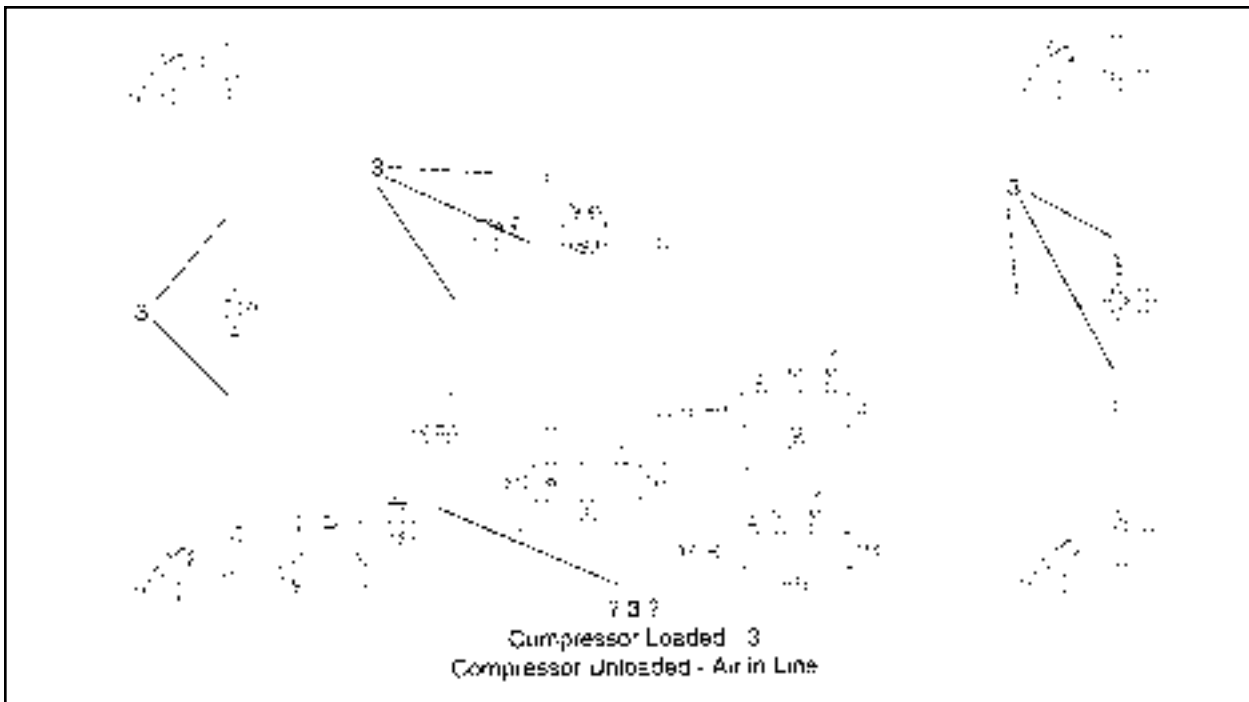
SR-5™ Trailer Spring Brake Valve

- | | |
|-------|-------|
| A. 7 | H. 6 |
| B. 4 | J. 8 |
| C. 5 | K. 10 |
| D. 12 | L. 9 |
| E. 11 | M. 2 |
| F. 1 | |
| G. 3 | |
1. True
 2. False
 3. False
 4. Service Reservoir Port **B**
Reservoir Mounting Stud **B**
Trailer Supply Port **A**
Trailer Service Port **C**
Delivery Port **E**
 5. True
 6. A, D

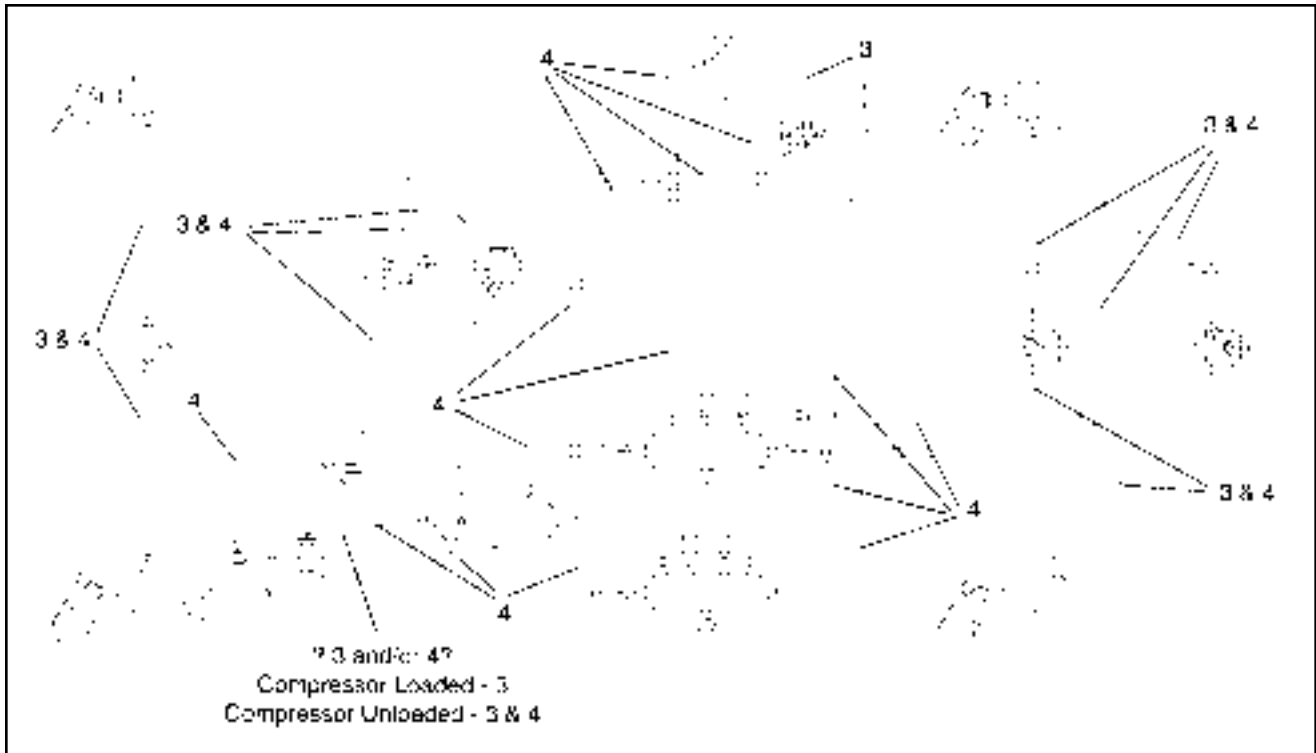
Part 1 Schematic (Page 9)



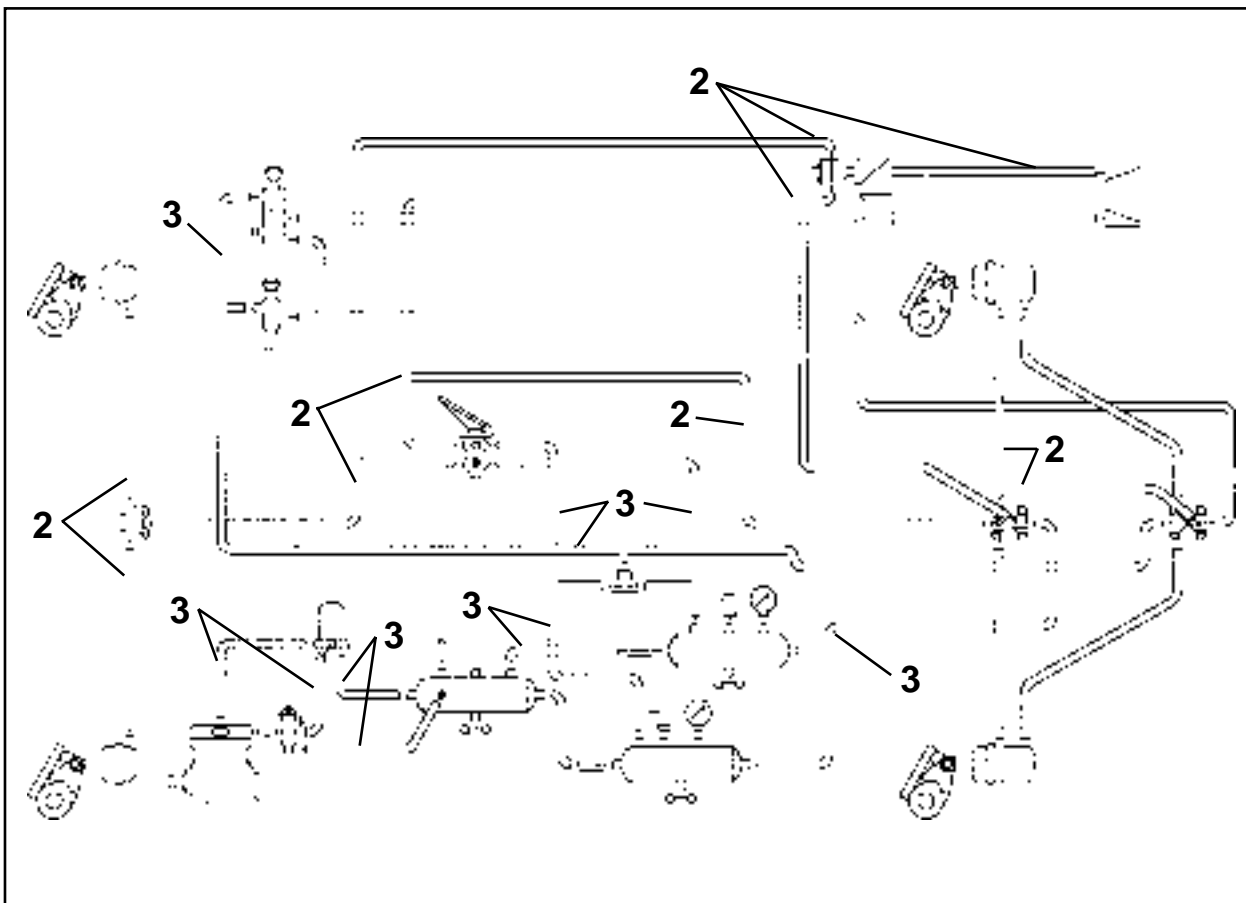
Part 2 Schematic (Page 17)



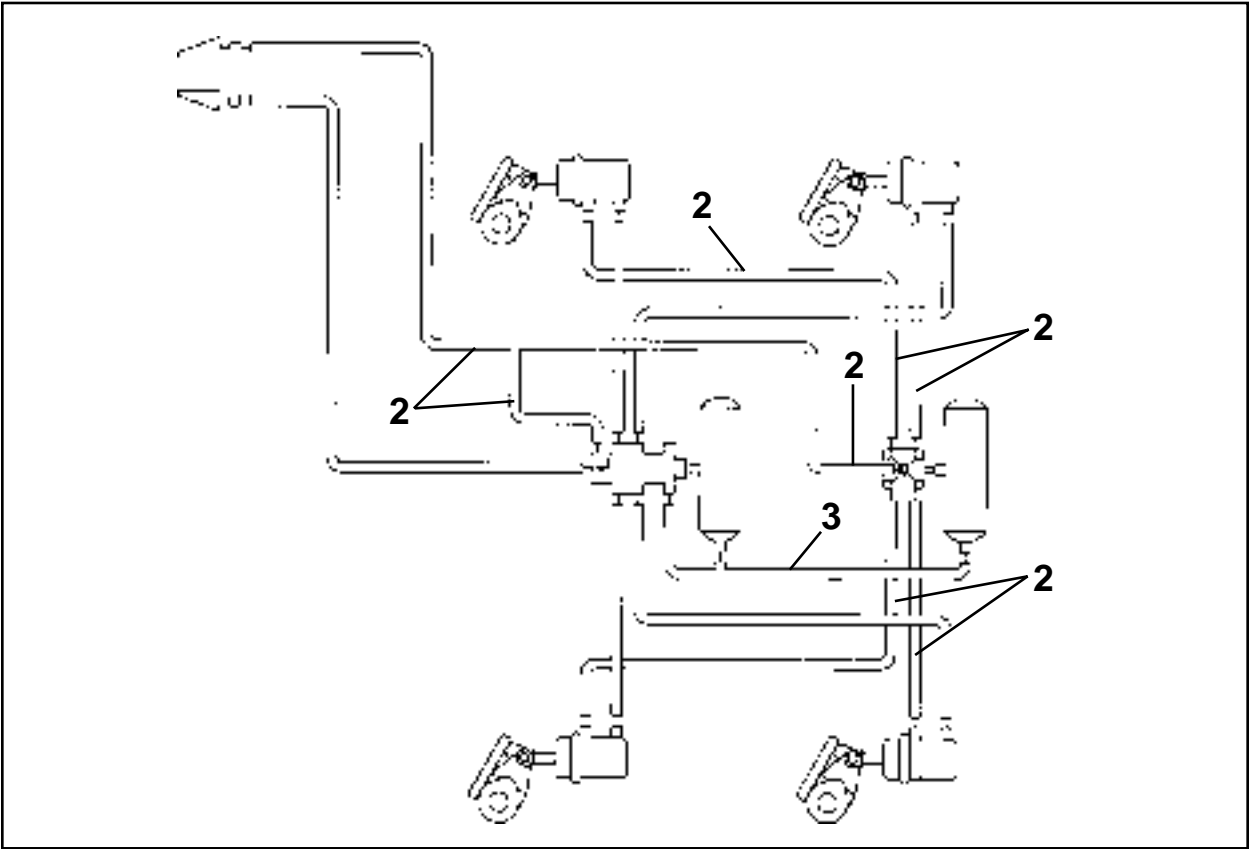
Part 3 Schematic (Page 25)

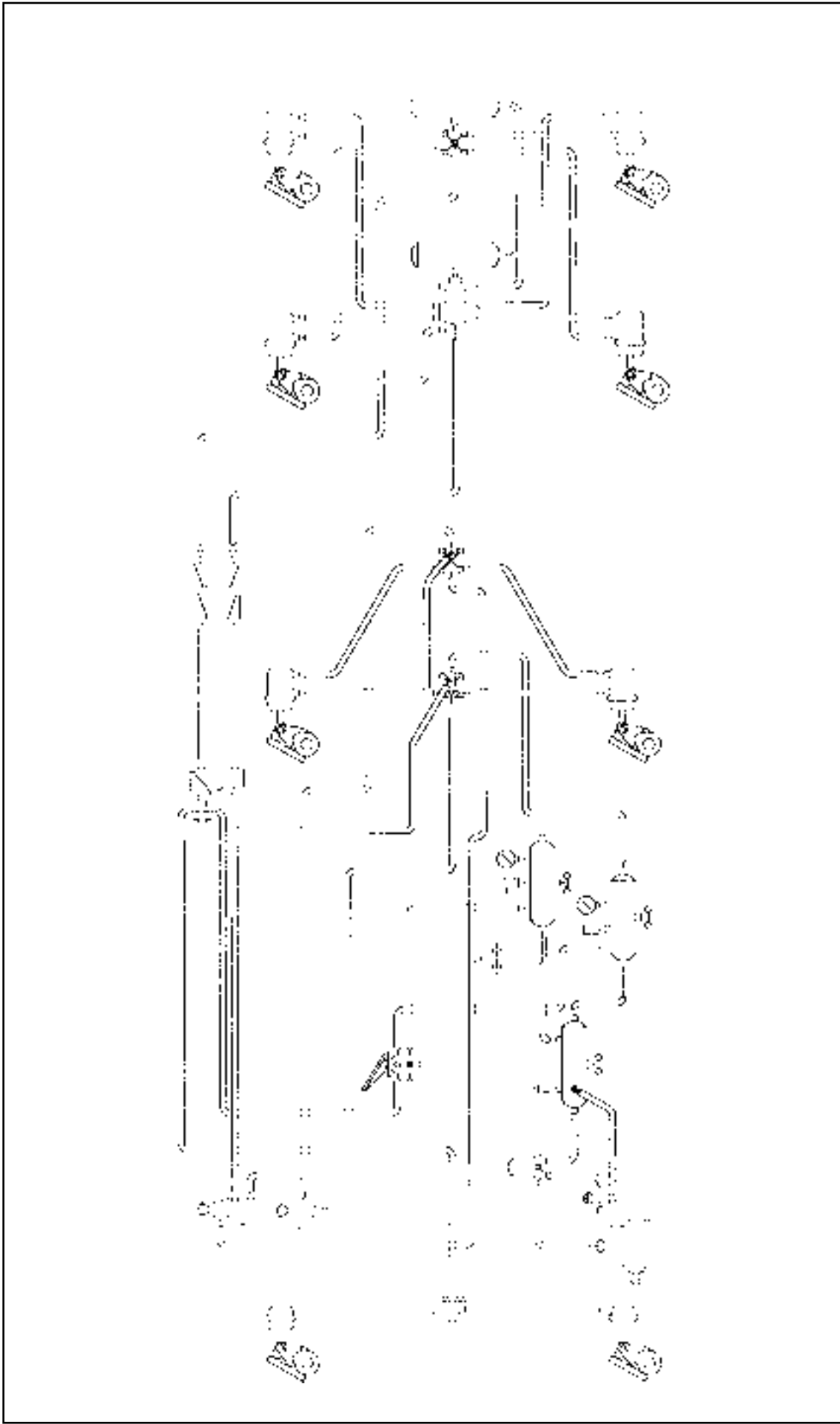


Part 4 Schematic (Page 33)



Part 4 Schematic (Page 34)





Part 4 Schematic (Page 35)

