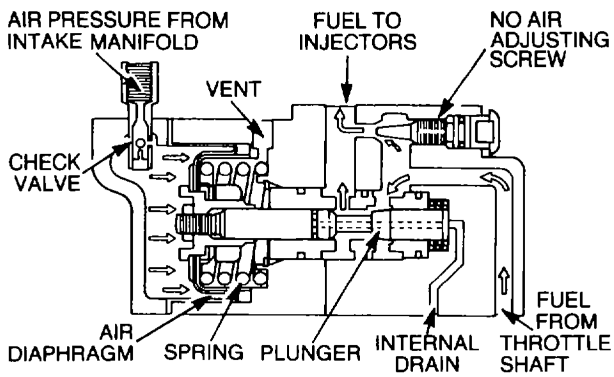


Figure 54 — AFC Assembly

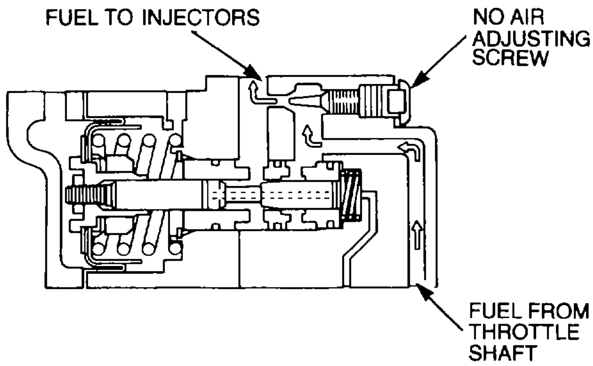


Figure 55 — AFC Operation — No Air Pressure

77. As the throttle is moved toward the full throttle position, the engine speed increases, as does the air pressure in the intake manifold due to the increased output of the turbocharger. The fuel requirement of the engine also increases. The pressurized air in the intake manifold acts on the diaphragm in the AFC assembly, compresses the diaphragm spring and moves the plunger to uncover a passage which allows extra fuel to flow to the injectors, enabling the engine to maintain the required rpm (see Fig. 56).

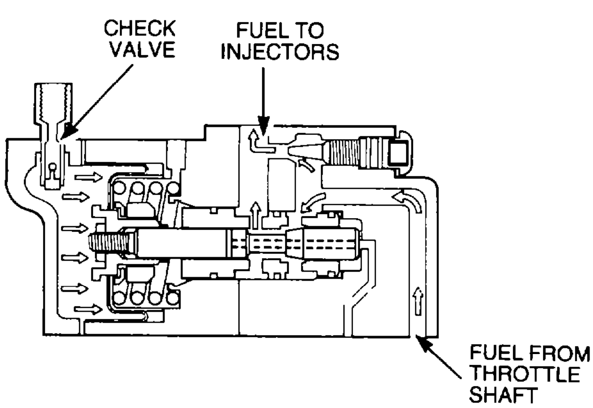


Figure 56 — AFC Operation — Air Pressure Applied

Shut-down Valve

78. The fuel from the AFC assembly flows through a passage to the shut-down valve before flowing to the injectors. The shut-down valve is controlled by a solenoid which is activated by the ignition switch. When the ignition is turned OFF (solenoid de-energised) a belleville spring (spring washer) seats a disc against the fuel ports, preventing fuel flow to the injectors (see Fig. 57), thus providing the driver with a means of shutting down the engine. When the ignition is turned ON, the solenoid becomes energised creating an electromagnetic force, which overcomes the force of the belleville spring and unseats the disc permitting fuel to flow to the injectors (see Fig. 58).

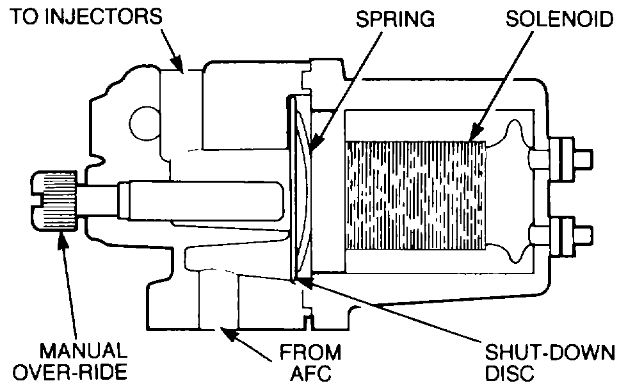


Figure 57 — Shut-down Valve — Solenoid De-energised

79. Fuel flows from the fuel pump, through a steel pipe to the rear of the rear cylinder head, where it enters a passageway in the cylinder head. Each cylinder head has two passageways, an injector supply passageway and an injector fuel return passageway, with crossover pipes connecting the passageways between the cylinder heads. Fuel flows into the injector, and depending on the position of the injector plunger, either flows into the injector cup to be injected into the combustion chamber, or flows through the injector and fuel return passageway to return to the fuel tank. This flow of fuel acts as a coolant for the injector.

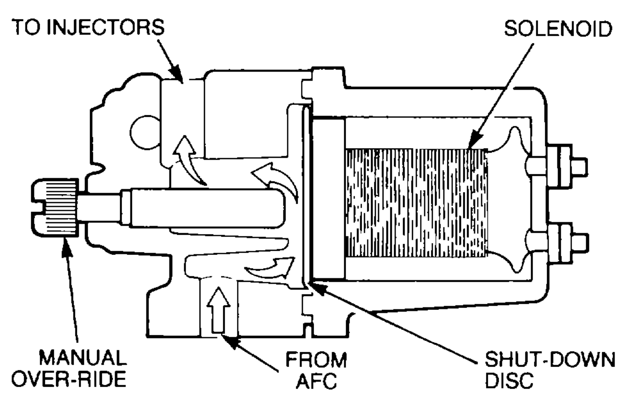


Figure 58 — Shut-down Valve — Solenoid Energised

Fuel Injectors

80. The fuel injectors are mechanically operated by means of the engine's camshaft, camshaft followers, push rods and rocker arms. The camshaft has additional lobes which are specifically machined for the correct operation of the injectors. When the camshaft follower roller travels down the retraction ramp to the inner base circle of the lobe (see Fig. 59), spring pressure raises the injection plunger, which blocks off the drain port and opens a metering orifice allowing fuel to flow into the injector cup. As the camshaft rotates and causes the camshaft follower to travel up the injection ramp, the injector plunger moves down the bore and injects the fuel, and at the same time uncovers the drain port, allowing fuel to flow through the injector to the fuel tank, cooling the injector as it flows (see Fig. 60).

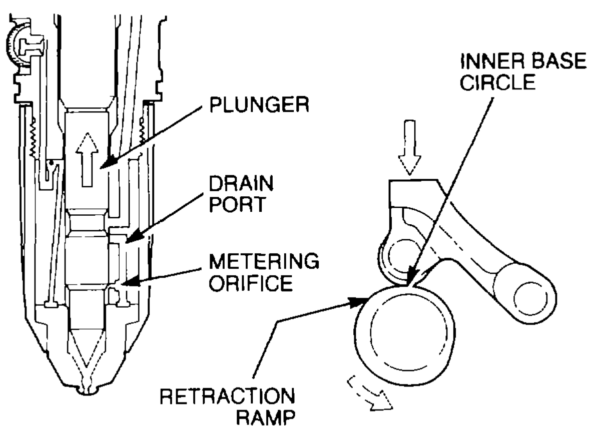


Figure 59 — Fuel Flow into Injection Cup and Blockage of Drain Port

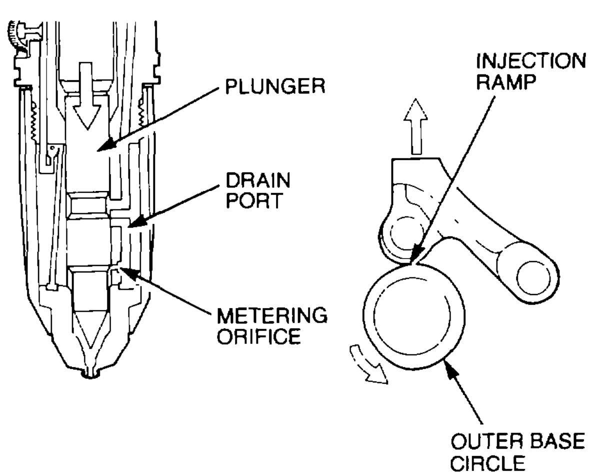
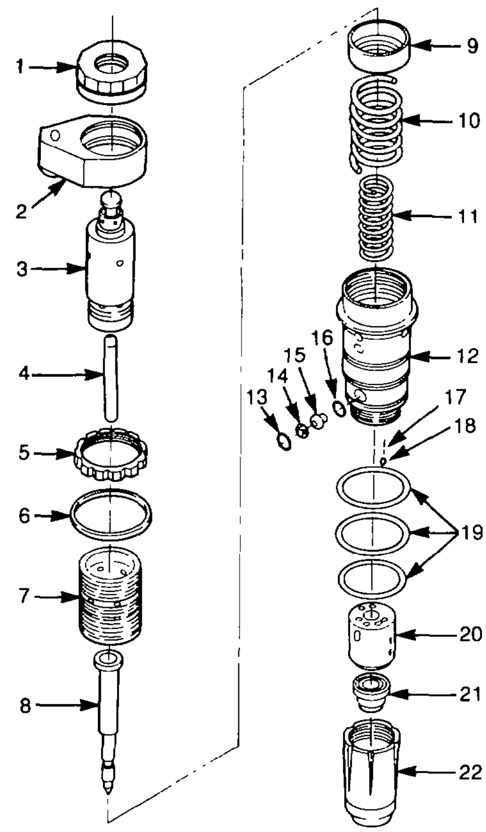


Figure 60 — Fuel Injection and Opening of Drain Port

81. Fig. 61 illustrates the components of the STC injector used on the engine.



1. Cap
2. Upper lock nut and STC oil inlet
3. STC tappet
4. Injector link
5. Locknut
6. Plain washer
7. Stop screw
8. Plunger
9. Spring retainer
10. Spring, plunger return (outer)
11. Spring, plunger return (inner)
12. Injector adapter
13. Screen retainer
14. Filter screen
15. Orifice plug
16. Gasket
17. Roll-pin
18. Ball check valve
19. O-ring seal
20. Barrel
21. Injector cup
22. Cup retainer

Figure 61 — STC Injector Assembly — Exploded View

Step Timing Control (STC)

82. The STC tappet assembly, incorporated with the injector, provides the means for advancing the injection timing to improve cold weather performance and light load economy. The tappet assembly is hydraulically operated and is actuated by means of the STC system control valve. The control valve is located on the left hand side of the engine (see Fig. 62) and utilizes both fuel pressure and spring pressure, or the engine lubrication oil pressure (from the C-brakes) to control the flow of engine oil from the control valve to the hydraulic tappet (see Fig. 63).

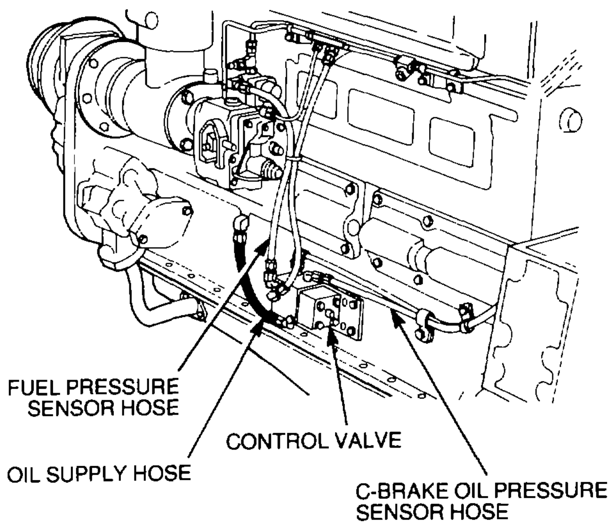


Figure 62 — STC System Control Valve — Location

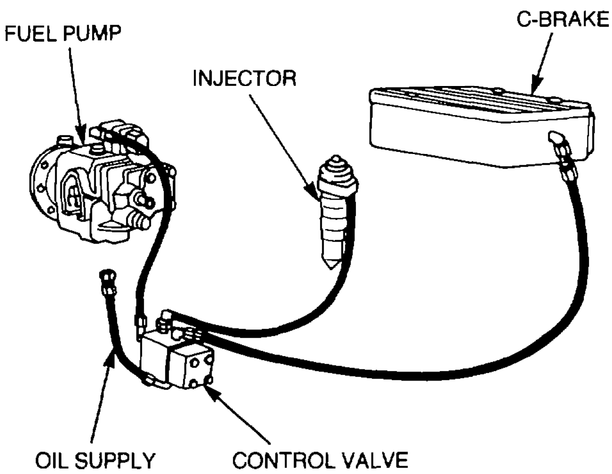


Figure 63 — STC System

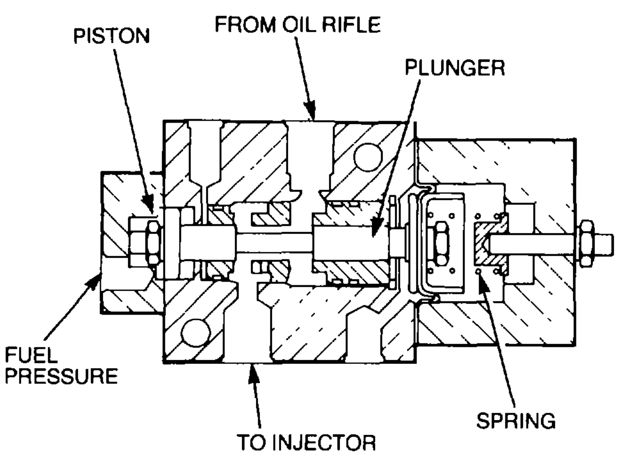


Figure 64 — STC System Control Valve — Sectional View

83. The STC system control valve comprises a plunger, a spring (with tension adjustment screw) and a valve body, which incorporates a fuel pressure sensing port, an oil pressure sensing port and two oil supply ports (one from the engine lubrication system and one to the injectors (see Fig. 64).

84. When the control valve is in the timing advance mode, spring force overcomes the low fuel pressure acting on the piston and moves the plunger to open a passage between the oil supply ports, allowing pressurized oil to flow to the hydraulic tappets and initiate timing advance (see Fig. 65).

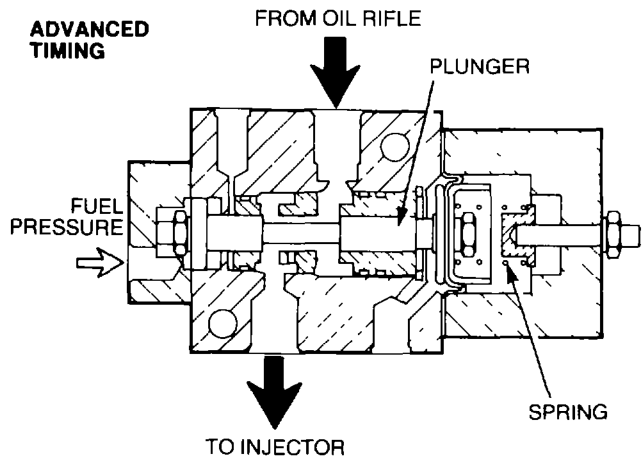


Figure 65 — Control Valve — Timing Advance Position

85. As the fuel pressure increases, the force applied to the piston overcomes the spring force and moves the plunger to block the passage between the oil supply ports, stopping the flow of oil to the hydraulic tappets (see Fig. 66), which causes the advanced timing to revert to normal timing. However, the timing will advance and return to normal in accordance with the lowering or the increase of fuel pressure.

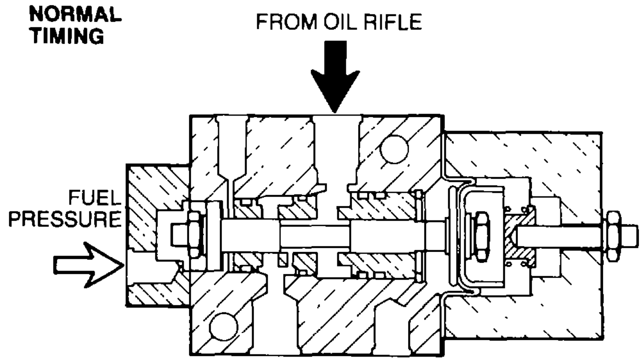


Figure 66 — Control Valve — Normal Timing Position

86. When the C-brake is activated, pressurized oil from the C-brake housing is directed through the hose to the control valve. This oil acts on the diaphragm and forces the plunger to move, against spring pressure, and block the passage between the oil supply ports, stopping oil flow to the hydraulic tappet and reverting the timing to normal, where it remains as long as the brake is activated (see Fig. 67).

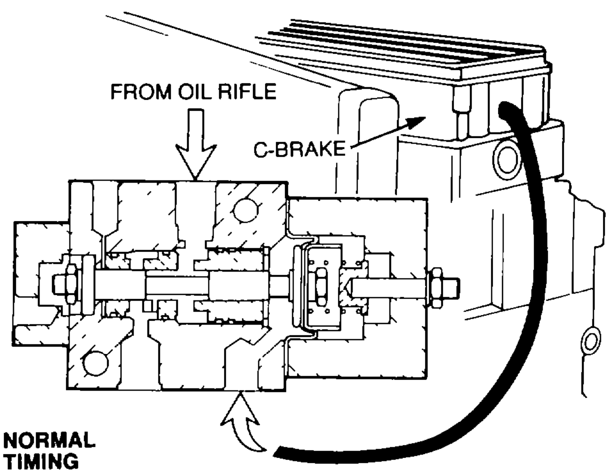
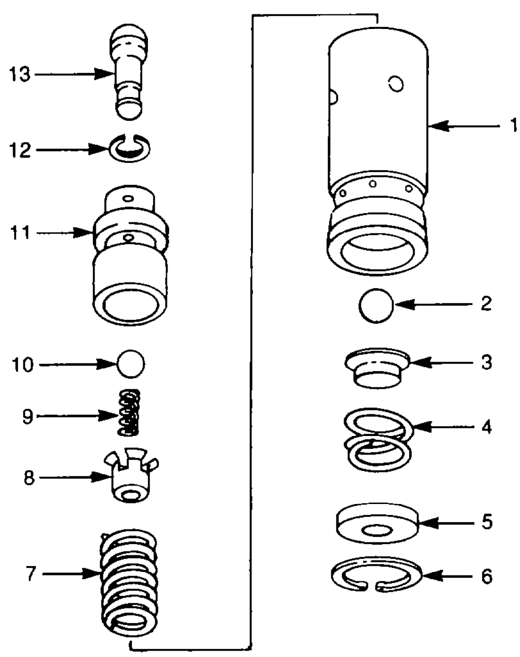


Figure 67 — Control Valve — C-brake Applied

87. Fig. 68 illustrates the various components of the hydraulic tappet assembly.



1. Tappet sleeve
2. Check ball
3. Spring guide
4. Spring
5. Tappet socket
6. Circlip
7. Spring
8. Spring guide
9. Spring
10. Check ball
11. Tappet plunger
12. Spring clip
13. Plunger link

Figure 68 — Hydraulic Tappet — Exploded View

88. When the STC system is operating in the normal timing mode, no pressurized oil is directed to the hydraulic tappet. The upward movement of the camshaft follower, as it moves up the injection ramp, is transferred to the injector rocker arm by the push rod, causing the rocker arm to pivot (or rock) on the shaft. As the rocker arm moves it acts on the injector plunger link, which is secured to the top of the inner piston of the hydraulic tappet assembly, pushing the plunger link and the inner piston downward. The inner piston moves down within the bore of the outer piston, overcoming spring pressure before butting against the shoulder of the outer piston. As the downward movement is transferred to the outer piston, the tappet socket, located in the base of the outer piston, pushes against the top of the injector plunger (see Fig. 69), and forces the injector plunger down, against the pressure of the injection plunger return springs, to inject fuel into the combustion chamber. When the camshaft follower moves down the retraction ramp, mechanical force is removed from the tappet assembly, allowing spring pressure to return the plunger and pistons to their no-load postion.

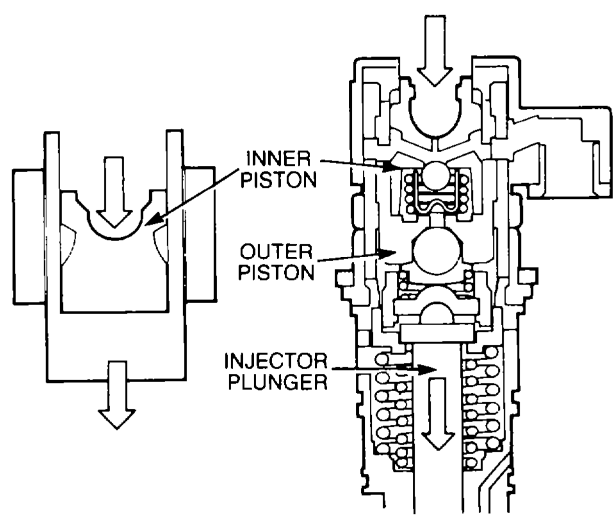


Figure 69 — Hydraulic Tappet Operation — Normal Timing Mode

89. During the advanced injection timing mode the STC system control valve directs oil to flow through a port in the top-stop lock nut, at the top of the injector assembly, through ports in the outer piston of the hydraulic tappet assembly into the inner piston. The pressurized oil unseats and flows past the ball in the upper check valve into the space between the base of the inner piston and the shoulder of the outer piston. When the camshaft follower begins to move up the injection ramp on the camshaft lobe, the downward movement of the inner piston, caused by the action of the rocker arm, now acts on the oil between the base of the inner piston and the shoulder of the outer piston. As the oil cannot be compressed, the outer piston is caused to move by the pressure of the oil, and in turn, the injector plunger is moved by the outer piston (see Fig. 70). In the advanced timing mode the injector plunger bottoms in the injector cup before the camshaft follower reaches the top of the injection ramp. To allow for the extra camshaft lift and prevent damage to the injector plunger and cup, the extra pressure exerted on the oil between the pistons, when the plunger bottoms, causes the lower ball valve to become unseated allowing the trapped oil to flow out and the tappet to collapse. When the camshaft follower moves down the retraction ramp, mechanical force is removed from the tappet assembly, allowing spring pressure to return the plunger and pistons to their no-load position.

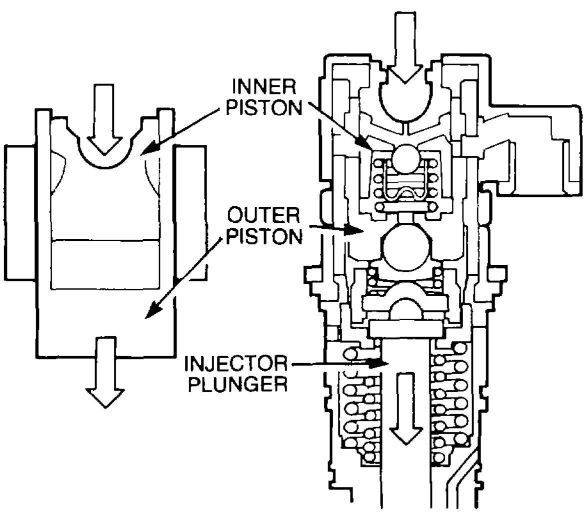
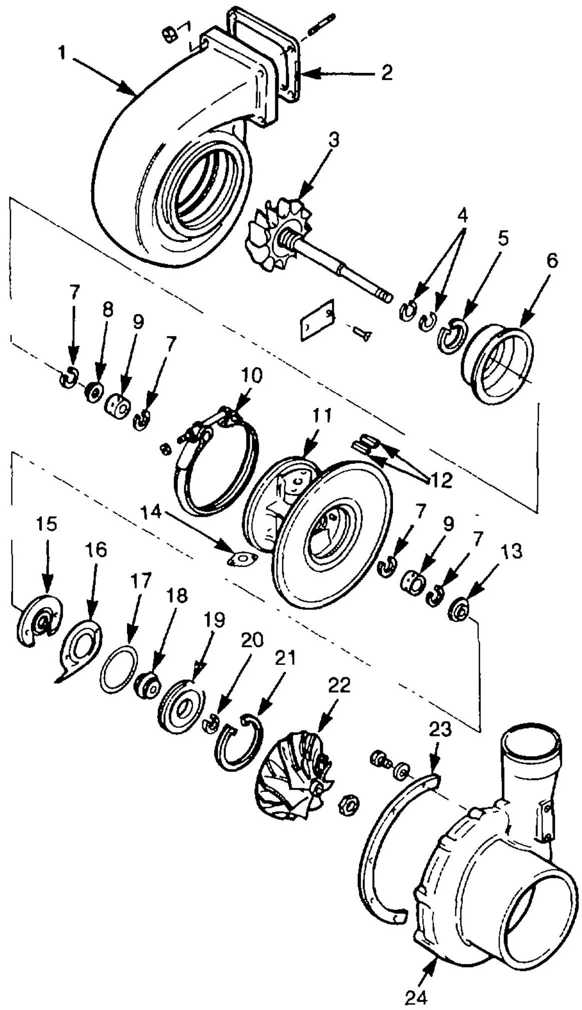


Figure 70 — Hydraulic Tappet Operation — Advanced Timing Mode

Turbocharger

90. Fig. 71 illustrates the components of the Cummins HT3B turbocharger.



1.	Turbine housing	13.	Thrust collar
2.	Gasket	14.	Flange gasket
3.	Turbine wheel and shaft	15.	Thrust bearing
4.	Split ring seals	16.	Oil baffle
5.	Circlip	17.	O-ring
6.	Heat shield	18.	Oil slinger
7.	Circlip	19.	Oil seal plate
8.	Oil control sleeve	20.	Split ring seal
9.	Bearing	21.	Circlip
10.	V-band clamp	22.	Impeller
11.	Bearing housing	23.	Clamp plate
12.	Roll pins	24.	Compressor housing

Figure 71 — Turbocharger — Exploded View

91. The turbocharger is utilized to supply additional air to the engine's combustion chambers, thus promoting more complete combustion of the fuel, which increases engine output and economy. Comprised of three main components, the turbine housing, the bearing housing and the compressor housing, the asembly is mounted on the exhaust manifold and is driven by the engine's exhaust gases. The exhaust gas enters the turbine housing, flowing around the housing in a decreasing spiral where it acts against the turbine wheel, causing the turbine wheel and shaft to rotate, before the gas is discharged through the centre of the turbine housing into the exhaust system.

92. The turbine wheel and shaft are manufactured in one piece, with the shaft being supported by sleeve type bearings located in the bearing housing, which is secured to the turbine housing by a V-band clamp. Pressurized oil from the engine's lubrication system is piped to and from the turbocharger bearing housing to provide lubrication and cooling for the bearings.

93. The impeller or compressor wheel is secured to the free end of the turbine wheel shaft and is located in the compressor housing which is bolted to the bearing housing. As the turbine wheel and shaft rotate in accordance with exhaust gas flow, the impeller is also caused to rotate, drawing air into the centre of the impeller, which then causes the air to flow rapidly outward through the diffuser in an increasing spiral. The cross-section area of the scroll increases to slow the air, converting air velocity into air pressure. The compressed air leaves the compressor housing through a tangential outlet and flows into the crossover tube where it is ducted to the aftercooler to be cooled before entering the combustion chamber.

94. The turbocharger is a precision machined assembly, with extremely fine tolerances. The delicately balanced turbine wheel and shaft together with the impeller, enable the turbocharger to operate at speeds of approximately 80000-90000 rpm. To enable these speeds to be maintained, adequate lubrication of the sleeve bearings is essential. However, damage to these bearings can occur during the period between engine start-up and the point where oil under pressure is available at the turbocharger bearings. This period is termed oil lag, and it is during this period that the engine is not to be accelerated. Always allow the engine to idle for several seconds before using the throttle. Bearing damage can also occur during engine shut-down. To avoid damage to the bearings, always allow the engine to idle for three or four minutes to allow time for the turbocharger to slow down and to dissipate the heat build-up. If the engine is shut-down immediately after operating at high rpm for extended periods, the turbocharger continues to rotate at high speed without lubrication, and when combined with the heat of the turbocharger, bearing damage results. A dashboard mounted engine idle timer control is incorporated to provide a means of idling the engine for approximately five minutes before shutting down the engine. When the timer is activated and the ignition is turned OFF, the timer maintains a current flow to the fuel pump solenoid, keeping the solenoid energised and maintaining fuel flow to the injectors. After approximately five minutes, the idler timer control opens the fuel pump solenoid circuit, causing the solenoid to de-energise and block the fuel flow to the injectors, causing the engine to shut-down.

Exhaust System

95. Fig. 72 illustrates the exhaust system and mounting arrangement.

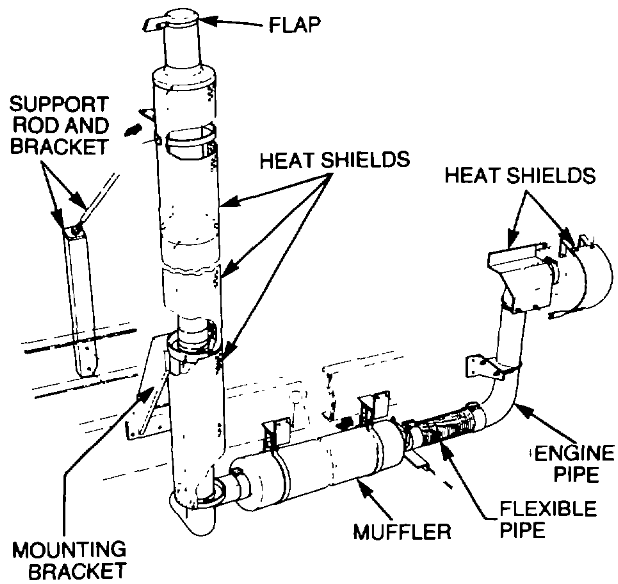


Figure 72 — Exhaust System and Mounting Arrangement

96. The vehicle's exhaust system, as shown in Fig. 72, comprises three tubular steel pipes, a flexible steel pipe and a cylindrically shaped muffler, all of which are joined together by steel broad-band clamps. The vertical section of the exhaust system is encased in a perforated steel heat shield. Special clamps secure the heat shield to the vertical section of the exhaust system, and also maintain the exhaust pipe centrally within the heat shield. A capping is positioned at the top to seal off the opening between the heat shield and exhaust pipe, and to hold the heat shield equidistant from the exhaust pipe. The flap fitted to the top of the exhaust pipe prevents moisture entering the exhaust system when the engine is not operating.

97. The front (engine) pipe is connected by a clamp, to the turbocharger exhaust outlet and held in position by a rigid mounting bracket attached to the side of the engine block. The flexible pipe connecting the engine pipe to the muffler, insulates the exhaust system from engine vibrations and also allows the muffler, which is shackle mounted to the chassis, to move independent of the movement of the engine or the distortion of the chassis. The vertical section, which comprises two pipes clamped together, is connected to the muffler outlet and is rigidly mounted on the chassis and held in the vertical position by means of a mounting bracket, connected to the lower section, and a support rod, connected to the upper section (see Fig. 73).

Clutch and Clutch Brake

98. The Spicer AS-1552 clutch shown in Fig. 74, is a dry disc, manual adjust, pull-type design, utilizing six angle springs which are centrally located and entirely isolated from the heat of the pressure plate. The pressure plate is secured to the flywheel ring by four expansion type coil springs. Mating lugs on both the flywheel ring and the pressure plate transmit drive from the flywheel ring to the pressure plate. Drive for the intermediate plate also comes from the flywheel

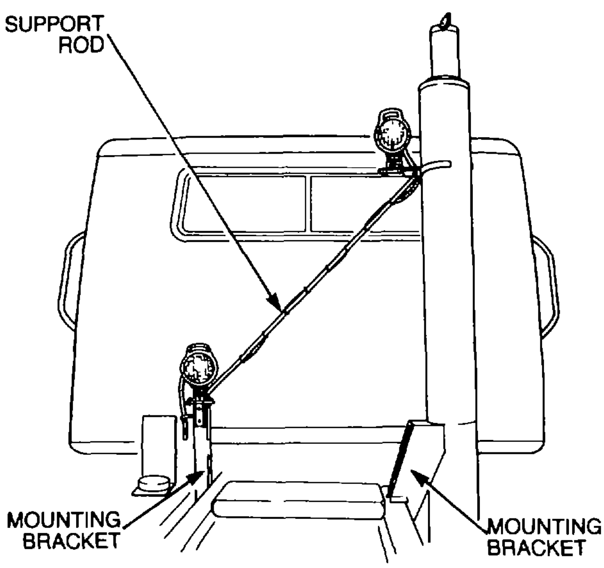


Figure 73 — Mounting Bracket and Support Rod — Exhaust Vertical Section

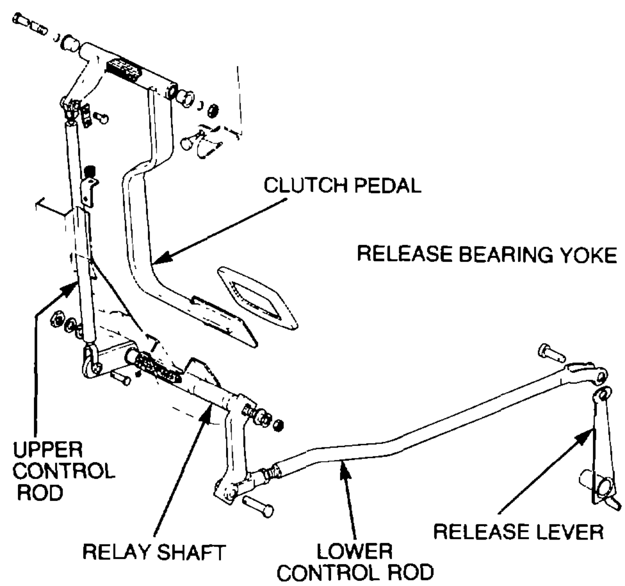


Figure 75 — Clutch Actuator Assembly

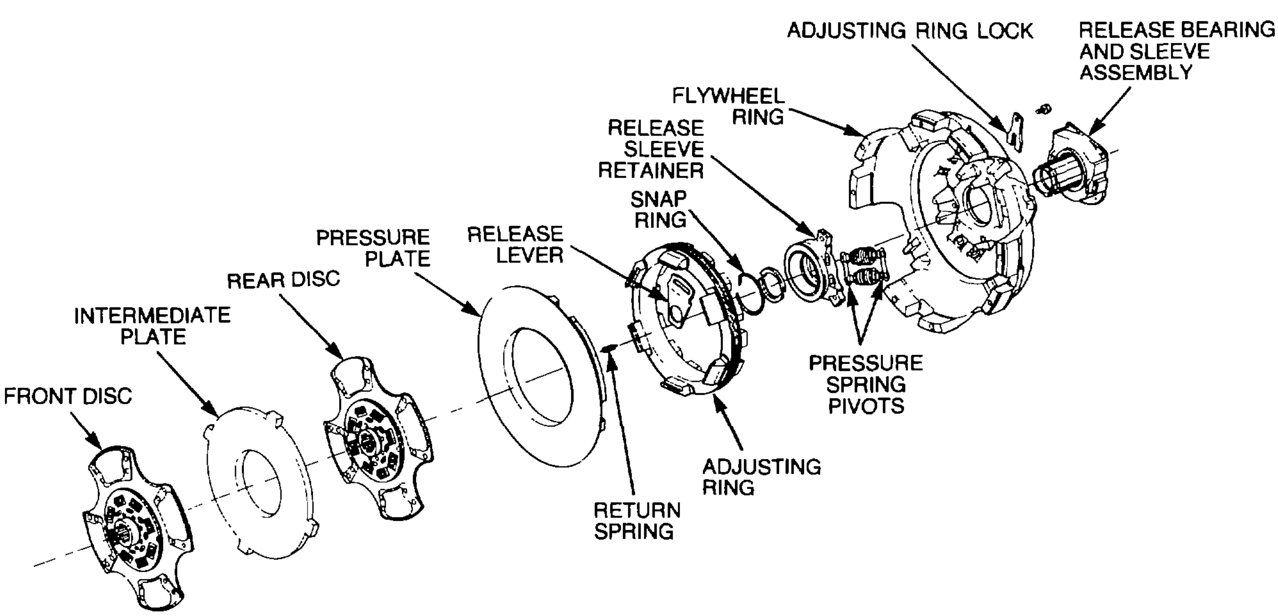


Figure 74 — Clutch Assembly — Exploded View

ring, via the slots in the flywheel ring and the lugs on the intermediate plate. Two ceramic type clutch discs are used, which have four ceramic buttons riveted to both sides of the disc. The hubs on the clutch discs are dampened by eight coaxial springs, i.e. spring within a spring, which help to absorb shock loads to the clutch and torsional vibrations in the drive train.

99. The clutch is pedal, rod and lever actuated. The clutch pedal rod connects the clutch pedal to the relay shaft and the lower control rod is the connection between the relay shaft and the release lever, which is secured to the cross-shaft (see Fig. 75). When the pedal is depressed the rods and relay shaft move the release lever, causing the release bearing yoke to pivot and move the release bearing rearward, releasing the clutch discs and stopping the drive being transmitted to the transmission.

100. A Spicer torque limiting clutch brake is fitted to the vehicle (see Fig. 76). This brake assists in preventing severe gear clash when initially selecting first or reverse gears. The brake comes into effect only when the clutch pedal is depressed through the last 25 mm of travel, causing the clutch release bearing to come into contact with the clutch brake disc, sandwiching the disc against the transmission input shaft bearing cover. This action creates a braking effect and either slows down or stops the rotation of the clutch brake disc. Because the disc is splined to the transmission main input shaft, the shaft rotation is slowed down or stopped allowing first or reverse gear to be selected without clashing or putting undue strain on the gears.

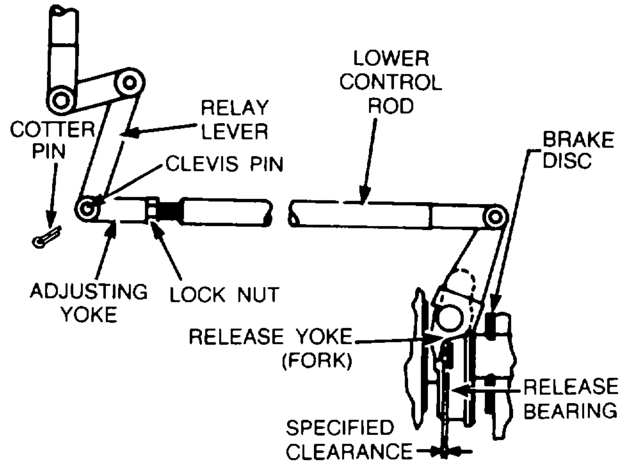


Figure 76 — Clutch Brake Operation

Transmission

101. The Spicer 1420-3B transmission provides the vehicle with twenty foward gears and four reverse gears, although the gear lever is only moved through five forward gear positions, and one reverse position. The various ratios required to give twenty forward and four reverse gears are obtained by means of splitter and range gears. A four position air control switch (valve), located on the gear lever enables the driver to select the desired ratios, as required, to maintain optimum engine performance. When hauling heavy loads or on steep gradients, both low and

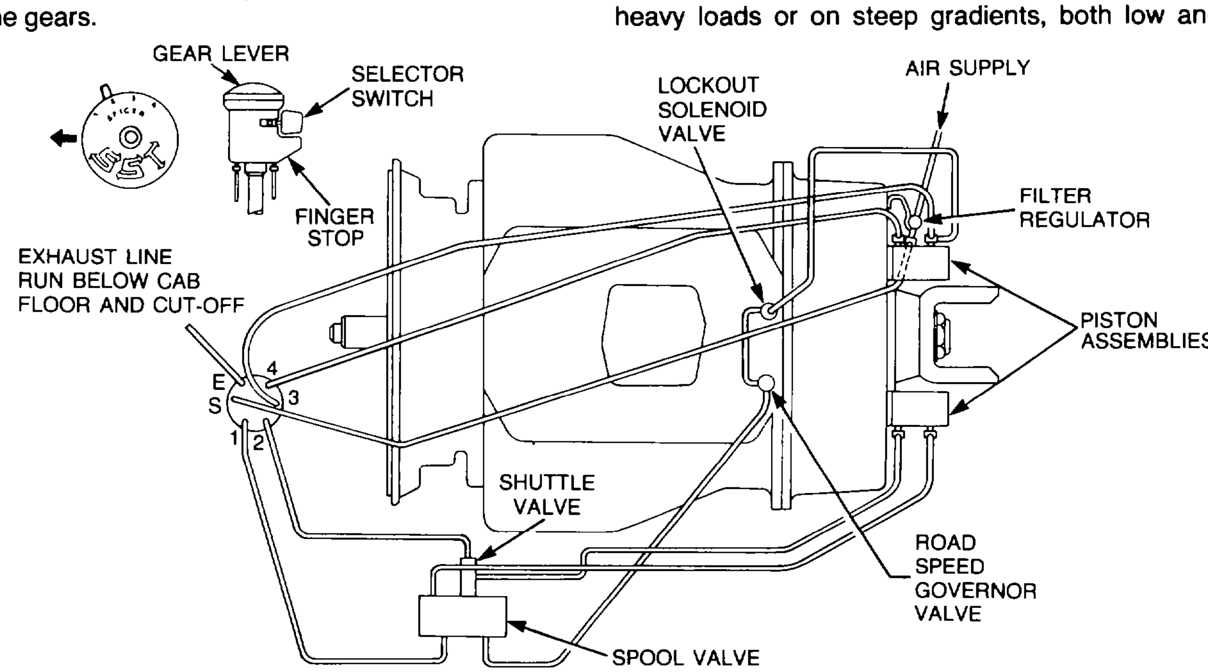


Figure 77 — Splitter Gear Air Control Switch and Air Circuit

high ratios are utilized for forward or reverse gears when initially moving off. The control switch directs air (under pressure) to the piston assemblies at the rear of the transmission (see Fig. 77), which controls the selection of the splitter and range gears. The left hand piston controls the selection of high or low ratio on the splitter gears, while the right hand piston controls the selection of high or low ratio on the range gears. Movement of the control switch left of position 3, causes the low ratio on the range gears to be engaged, while selection of positions 1 or 2 engages either low or high ratio of the splitter gears. When the control switch is moved right of position 2, the high ratio of the range gears is engaged and either the low or high input gears on the splitter gears is engaged when either position 3 or 4 is selected by the control switch.

102. The transmission comprises two (front and rear) cast iron housings. Located within the front housing are the input shaft, the mainshaft, and two countershafts. Located within the rear housing are the output shaft and two countershafts (see Fig. 78). All gears on the input shaft and mainshaft are in constant mesh with the gears on the countershafts. The gears on the mainshaft revolve independent of the mainshaft, so drive has to be transferred from the gears to the mainshaft via a sliding clutch, which is splined to the mainshaft and moved into mesh with the splines on the selected gear. Drive is now transferred from the input shaft, through either the high or low splitter gears to the countershafts, from the countershafts to the mainshaft, via the selected gear and sliding clutch and from the mainshaft to the output shaft, via the range gears.

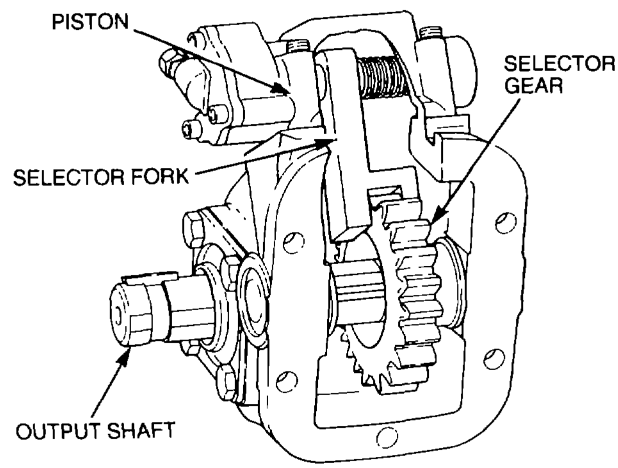


Figure 79 — Power Take-Off

Power Take-off (PTO)

103. The Powauto AH30BL11 series power take-off, is a single speed gear driven type mounted on an adapter plate, which is secured to the bottom of the transmission. When the dashboard mounted air control switch is placed in the ON position, compressed air is directed to the power take-off, where it actuates a piston, which operates the gear selector fork. The selector fork (see Fig. 79) moves the selector gear into mesh with both the gear in the transmission and the power take-off driven gear, which is splined to the output shaft. Drive is now transferred from the power take-off to the hydraulic pump by the output shaft.

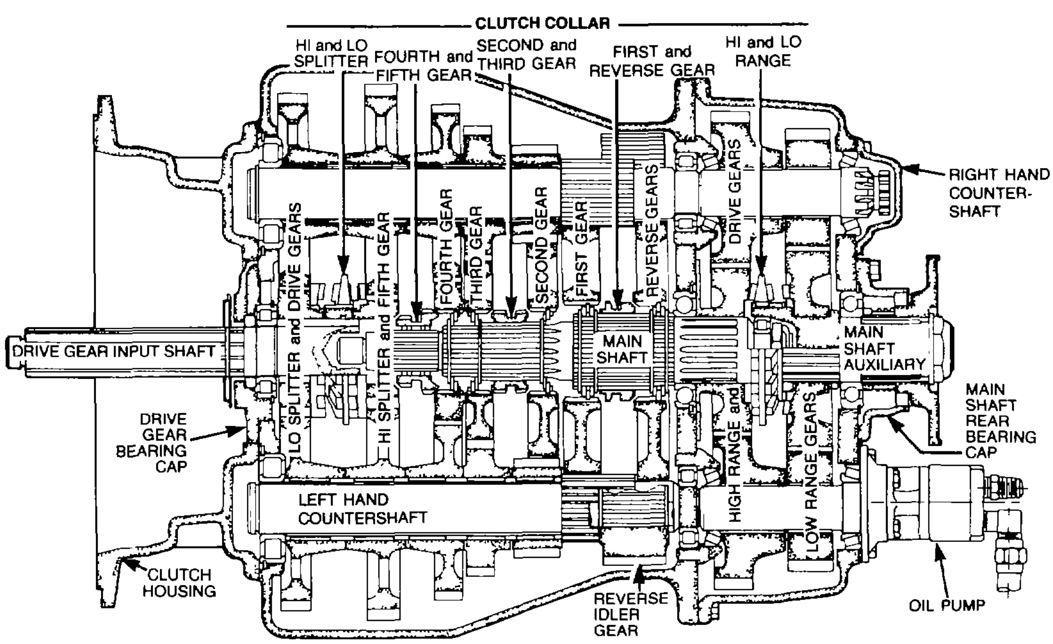


Figure 78 — Transmission Assembly — Sectional View

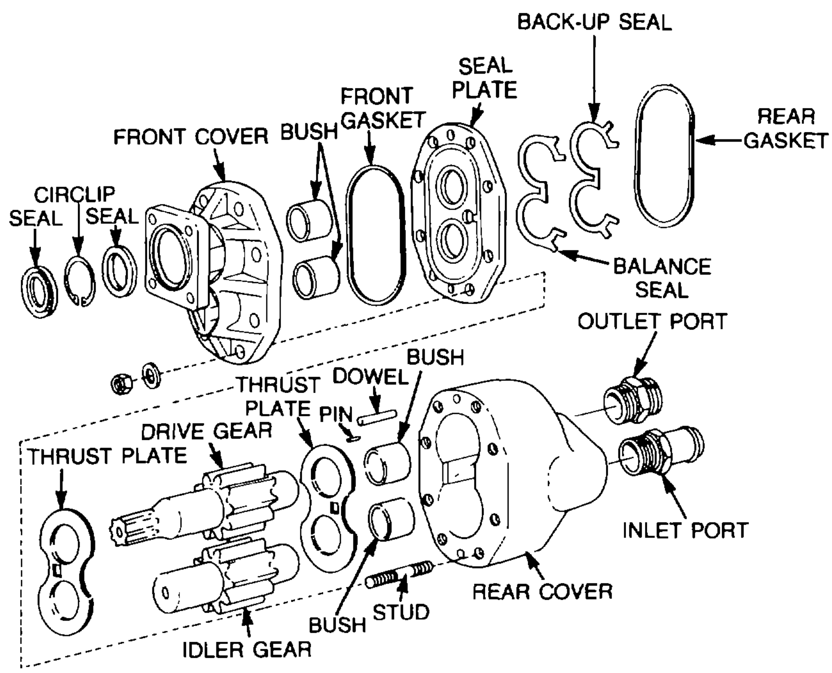


Figure 80 — Hydraulic Pump — Exploded View

Hydraulic Pump

104. The Powauto DO24 hydraulic pump consists of front and rear covers, which house a drive gear and an idler gear (see Fig. 80). The pump is flange mounted to the output shaft end of the power take-off. Splines in the bore of the power take-off output shaft mesh directly with the splines on the pump drive gear shaft, transmitting rotational force to the pump drive gear, which meshes with the idler gear, causing the idler gear to rotate.

105. When the pump is operating, the meshing action of the gears creates a low pressure area within the pump, causing hydraulic fluid to flow, under atmospheric pressure, from the reservoir to the pump. The rotating gears then displace the fluid through the outlet port to the winch drive, via hydraulic pressure hose. A second hose returns the hydraulic fluid from the winch drive to the reservoir. The hydraulic fluid also provides lubrication for the working components of the pump.

Propeller Shafts

106. Two 1810 series propeller shafts are used to transmit the drive from the transmission to the intermediate axle carrier. The first of the two shafts is the transmission (front) shaft, which is a fixed length shaft with two universal joint yokes, one of which is removeable to allow access to the centre bearing fitted to the shaft (see Fig. 81)

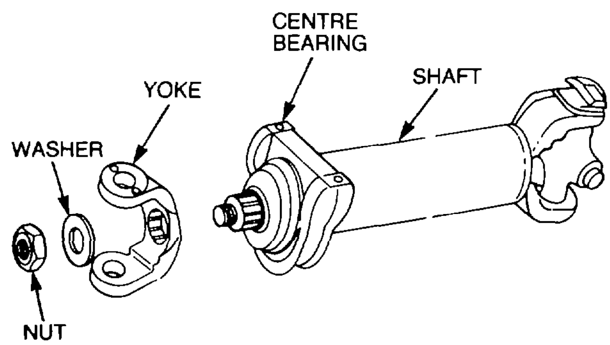


Figure 81 — Transmission Propeller Shaft and Centre Bearing

107. The centre bearing is a self-centring, twin-row ball type inserted in a rubber bush and installed on the propeller shaft toward the rear yoke. A metal bracket (see Fig. 82) fits over the rubber bush, enabling the centre bearing to be secured to the chassis crossmember. The rubber bush surrounding the bearing insulates drive line vibrations from the chassis and also absorbs transmission movement.

108. The second of the two shafts is the intermediate shaft (see Fig. 83), which is connected, by a universal joint, to the rear yoke on the transmission shaft and transmits the drive from the transmission shaft to the intermediate axle. The intermediate shaft is equipped with two universal joint yokes and a slip joint, which allows the length of the shaft to vary in accordance with the up and down movement of the intermediate axle.

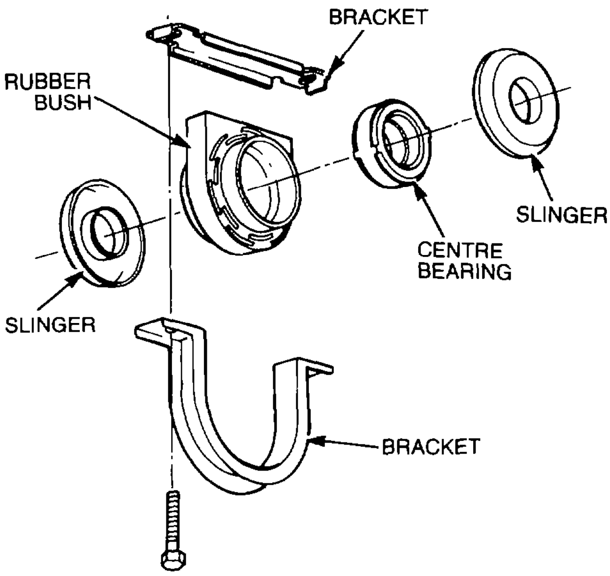


Figure 82 — Centre Bearing Assembly

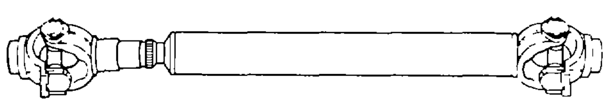


Figure 83 — Intermediate Propeller Shaft

109. A third propeller shaft, a 1710 series (see Fig. 84) is an interaxle propeller shaft, which transmits drive from the intermediate axle differential carrier to the rear axle differential carrier. The shaft utilizes two universal joint yokes and a slip joint, which allows for independant up or down movement of both the intermediate and rear axles.

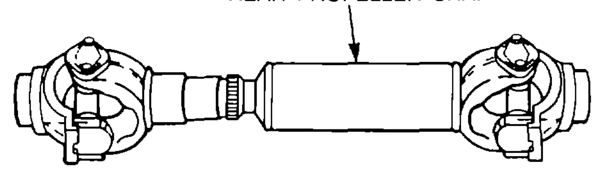


Figure 84 — Inter-axle Propeller Shaft

Tandem Rear Axles

110. The tandem rear axle (bogie) assembly is comprised of Rockwell six rod, multi-leaf single point suspension and a Rockwell SSHD hypoid, single reduction, tandem bogie (see Fig. 85). The bogie assembly has a load carrying ability of 20.9 tonne (46 000 lb).

111. The axle housings are constructed from hot forged steel and house the axle shafts. The differential carriers, secured to the axle housings, carry hypoid gear sets, which transmit drive from the propeller shafts to the axle shafts at a reduction of 4.89:1. An inter-axle differential (power divider) incorporated in the intermediate axle differential carrier (see Fig. 86), provides equal drive to both the intermediate and rear differentials and prevents drive line wind-up between the two differentials. A driver actuated lock-out is incorporated on the inter-axle differential to provide positive drive to both the intermediate and rear axles when the need arises.

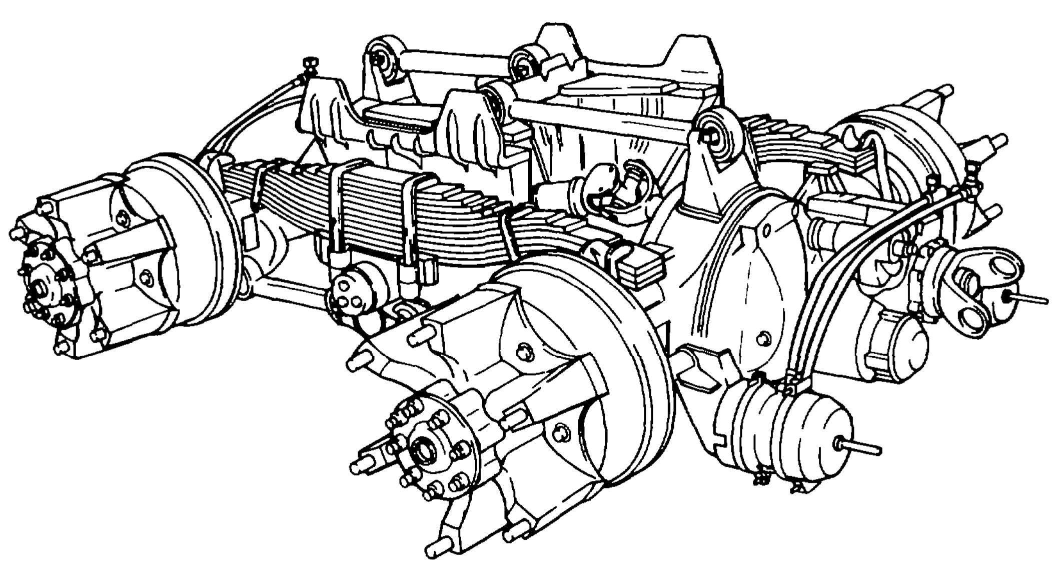


Figure 85 — Tandem Rear Axle (Bogie) Assembly

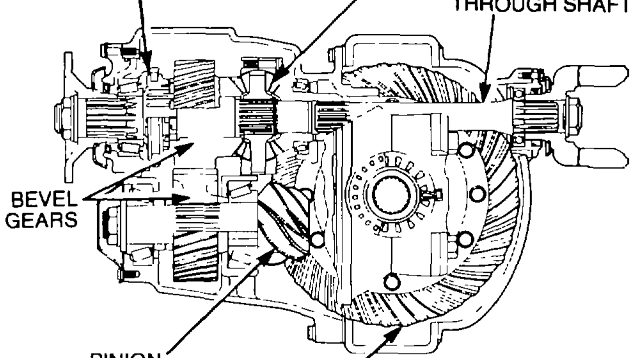


Figure 86 — Intermediate Differential with Inter-axle Differential

112. Drive from the intermediate propeller shaft is transmitted to the input shaft and to the cross-shaft in the inter-axle differential. Due to the action of the inter-axle differential, drive is transmitted to both the intermediate differential (via a pair of bevel gears, one of which forms a side gear on the inter-axle differential, the other bevel gear is splined to the pinion shaft), and the rear differential, via the through shaft and a propeller shaft. Drive for the rear differential is transmitted directly from the propeller shaft to the pinion shaft (see Fig. 87).

113. The axle shafts, which are splined (on the inner end) to the differential side gears and flange bolted to the wheel hubs (on the outer end), transmit the drive from the differentials to the hubs and wheels. The hubs (see Fig. 88) are supported on two tapered roller bearings and positioned on the axle housing spindles. Two nuts (an adjusting nut and a lock nut) secure each hub to the spindles.

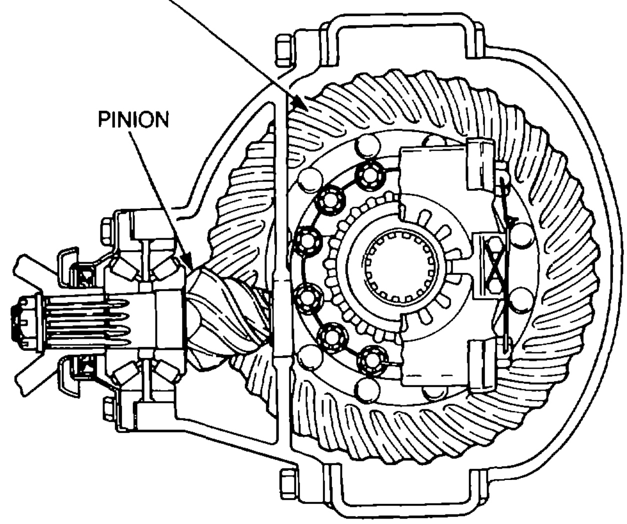


Figure 87 — Rear Differential — Sectional View

Front Axle

114. The front, non-driving, axle (shown in Fig. 89) is constructed from a heat-treated steel forging, with an I-beam section and integral spring pads. Steering knuckles are attached to each end of the axle beam by means of straight king pins, which are secured to the ends of the axle beam by tapered pins. The king pins form the fulcrum on which the steering knuckles pivot. Bushes installed in the upper and lower king pin bosses on the steering knuckle, enabling the steering knuckles to pivot freely about the king pins. A thrust bearing, which utilizes roller bearings, is positioned between the lower surface of the axle-end and the upper surface of the lower king pin boss on the steering knuckle, to take the load weight and

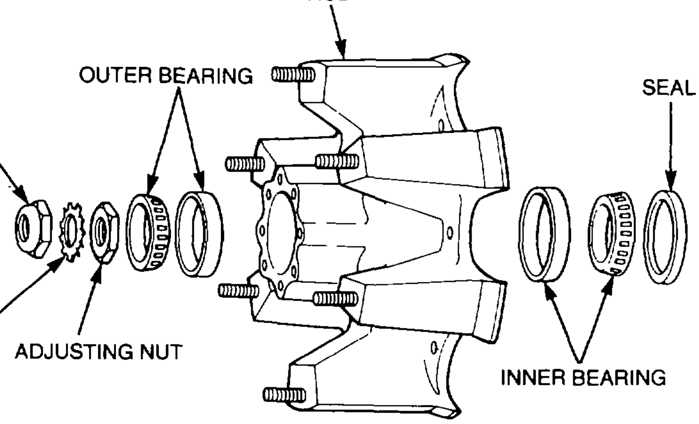


Figure 88 — Rear Hub Assembly — Exploded View

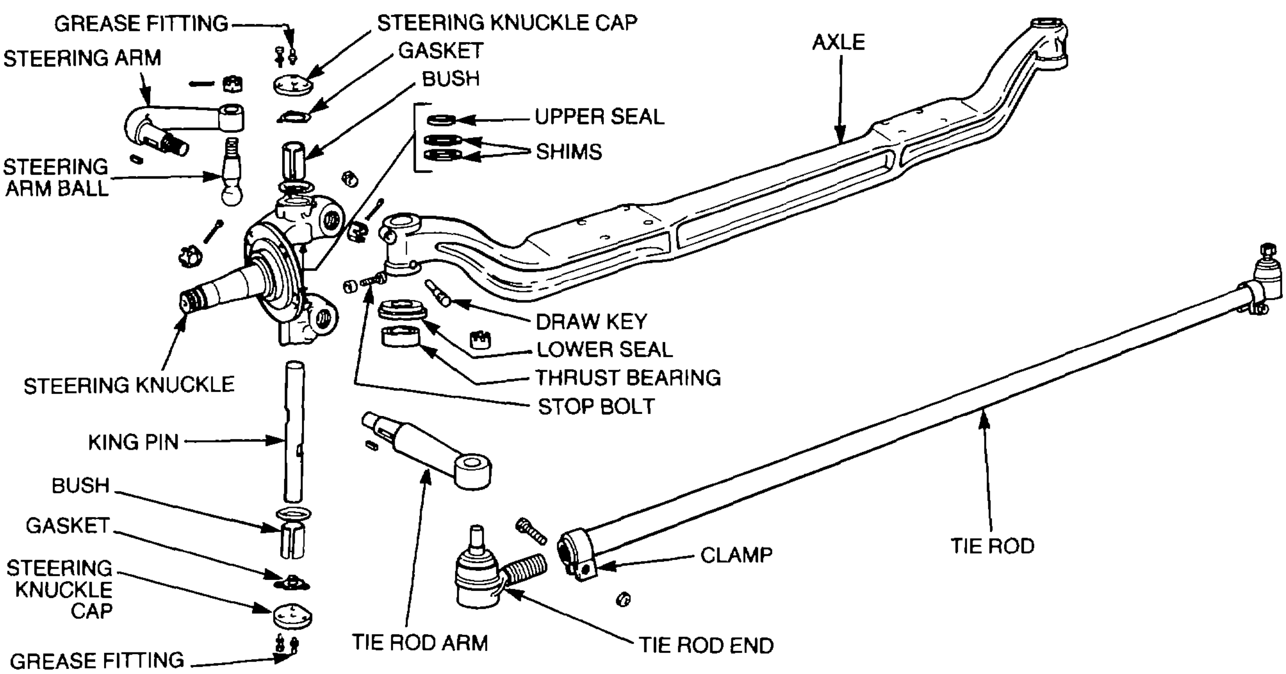


Figure 89 — Front Axle and Steering Knuckle Assembly

allow the steering knuckle to pivot freely on the axle-end.

115. The front hubs (see Fig. 90) are each supported on two tapered roller bearings and mounted on the steering knuckle stub axles. Two nuts (an adjusting nut and a lock nut) secure each hub to the stub axles.

Brakes

Service Brakes

116. The air required to operate the service brakes is supplied by the air compressor located on the left hand side of the engine and is stored in four separate tanks, two primary and two secondary (see Fig. 91). Part of the lower secondary tank is sectioned off to form the wet tank (item 1), which receives the air directly from the air compressor. The air, heated during compression, cools in the wet tank where the moisture in the air condenses and collects in the bottom of the tank. The cooled air then flows, via one-way check valves and hoses, from the wet tank to both the primary and the secondary storage tanks (items 2 and 3). The low air pressure switch (item 4), connected by air lines to the wet tank controls the operation of the low air pressure warning device in accordance with the pressure in the wet tank. When air pressure drops below 550 kPa (80 psi) the warning devices are activated and remain activated until the pressure builds up to above 550 kPa (80 psi). The operation of the air compressor is controlled by a governor, which monitors the air pressure in the wet tank and operates the compressor in accordance with the pressure. The air compressor begins to operate when air pressure drops below 725 kPa (105

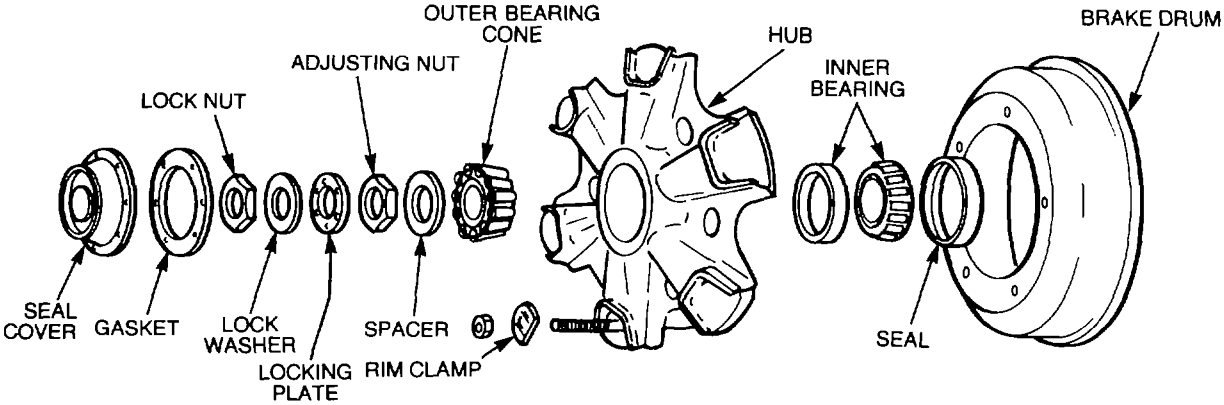


Figure 90 — Front Hub Assembly

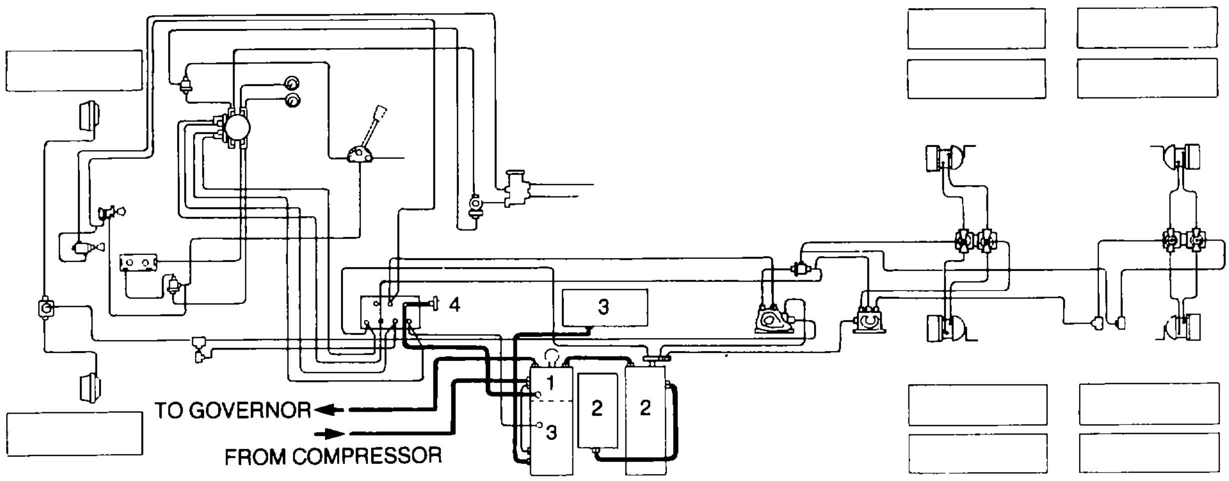


Figure 91 — Brake System Air Supply

psi) and ceases to operate when the air pressure reaches 860 kPa (125 psi).

117. The service brakes consist of two separate brake circuits, the primary and the secondary. The primary circuit actuates the brakes on the intermediate and rear axles and utilizes the pressurized air in the primary storage tanks (item 2). Pressurized air flows forward to a manifold (Fig. 92 item 5) and from the manifold to the lower section of the brake treadle valve (item 6), through the treadle valve to the air pressure gauge (item 7) and to a double-check valve (item 8). The air flows through the double-check valve to the parking brake control valve (item 9) and to the trailer brake hand control valve (item 10). Air also flows directly from the storage tanks to the service brake relay valve (item 11) and the spring brake inversion valve (item 12). When the parking brake control valve is in the RELEASE position, air flows through the inversion valve to the spring brake chambers (item 13), where it acts against a diaphragm in the spring brake chambers causing the actuating springs to be compressed and the brakes to be released.

118. The secondary circuit utilizes the air stored in the secondary tanks (Fig. 93 item 3) to actuate the front brakes. Air from the tanks flows forward to a manifold (item 5), and from the manifold to the upper section of the brake treadle valve (item 6), through the treadle valve to the air pressure gauge (item 14) and also to a manifold (item 15). At this manifold air is directed to the power divider control valve, the air horn control valve, the front seats' suspension and to the double-check valve (item 8). The air flows through the double-check valve

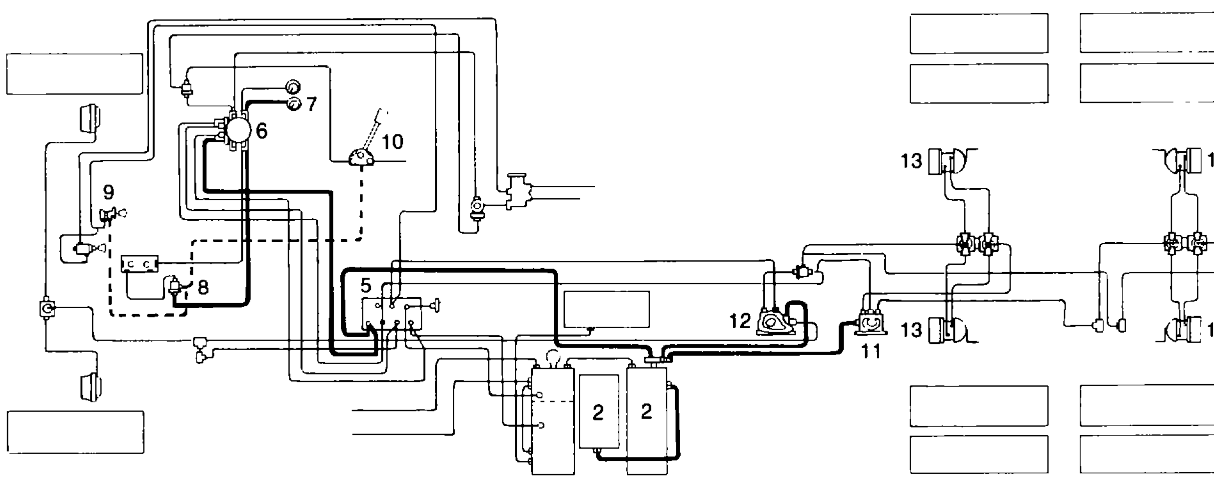


Figure 92 — Primary Brake Circuit

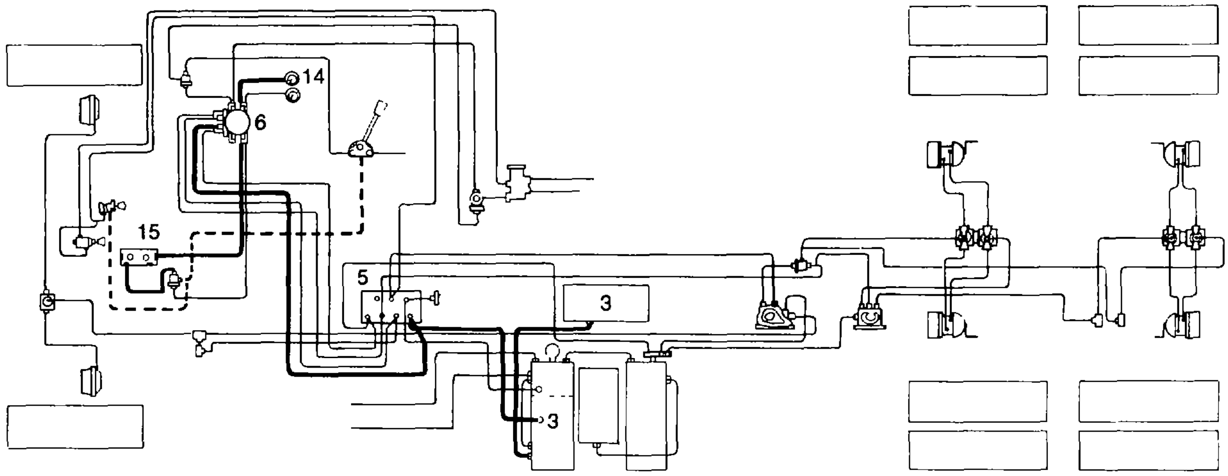


Figure 93 — Secondary Brake Circuit

to the parking brake control valve (item 9) and also to the trailer brake hand control valve (item 10).

119. When the brakes are applied, both the primary and the secondary circuits are activated. Air from the primary section of the treadle valve (Fig. 94, item 6) flows to the manifold (item 5), where it is directed to the double check valve (item 14) and the service brake relay valve (item 11) at the rear of the vehicle. This air supply at the relay valve acts as a signal, which causes the relay valve to open ports that allow air direct from the storage tanks (item 2) to flow through to the service brake chambers (item 15), via the quick release valves (item 16), on both the intermediate and rear axles, applying the brakes (see Fig. 94).

120. The air from the secondary section of the treadle valve (Fig. 95 item 6) to the manifold where it is directed to a two-way connector (item 17). One way it flows rearward to the spring brake inversion valve (item 12), the other way it flows forward to the quick release valve (item 18), through the release valve to the front brake chambers (item 19) to apply the brakes.

121. When the brake treadle valve is released, the pressurized air in the service brake relay valve signal line is released to the atmosphere, causing the relay valve to close the supply port and open a vent to dump the air from the lines between the relay valve and the quick release valves. The pressurized air in the service brake chambers now acts on the quick release valves, causing the valves to open and allow the air to escape to the atmosphere. Once the pressure is released from the rear service brake chambers the brakes are released. The same applies to the secondary brake circuit. Once the pressurized air in the circuit between the treadle valve and both

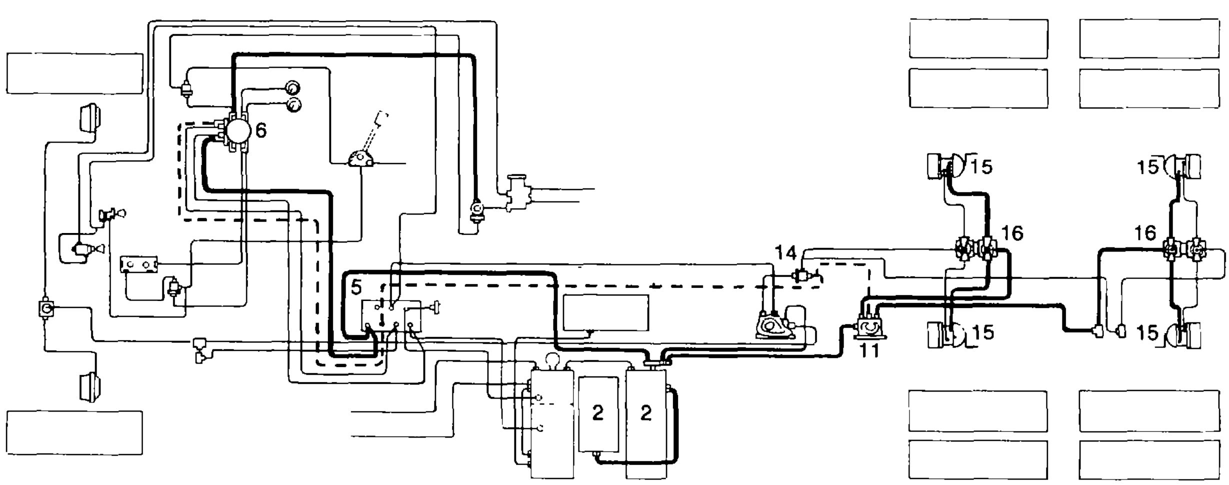


Figure 94 Primary Circuit — Brakes Applied

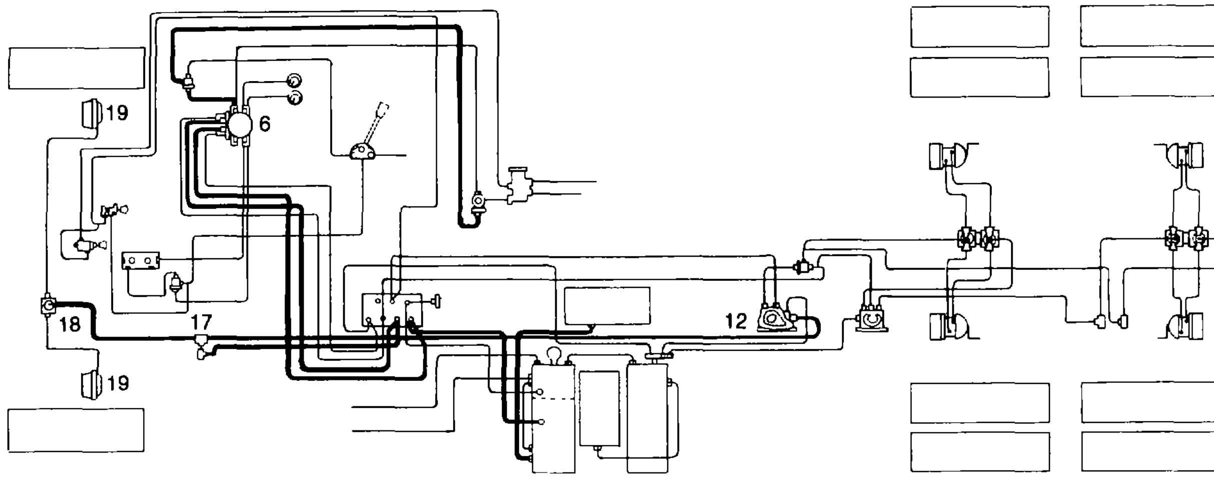


Figure 95 — Secondary Circuit — Brakes Applied

the quick-release valve and the spring brake inversion valve is released to the atmosphere, the pressurized air in the front service brake chambers acts on the quick-release valve, causing the valve to open, and allow the air to escape to the atmosphere. Pressure in the front brake chambers drops off and releases the brakes.

122. In the event of air pressure loss in the primary system alone, near normal braking can still be achieved through the secondary brake system.The vehicle's front brakes still operate as normal, but the spring brakes now apply the brakes at the rear. As the driver actuates the brake treadle valve to apply the brakes, secondary air flows to the front brake chambers, via the quick release valve, and also to the spring brake inversion valve. At the inversion valve, the secondary air flows through an inlet valve to the underside of the large piston, where it causes the piston to move up against spring pressure to open an exhaust port. The pressurized air between the inversion valve and the pressure holding valves is now vented to the atmosphere, via the exhaust port (see Fig. 96). With the reduction of air pressure at the supply port of the pressure holding valve, the pressure of the air in the spring brake chambers acts on the piston in the pressure holding valve which opens the exhaust port and allows air from the spring brake chambers to be vented to the atmosphere. The springs now apply the brakes in proportion to the amount of treadle valve application, i.e. the rate at which the air is vented and the amount of air vented.

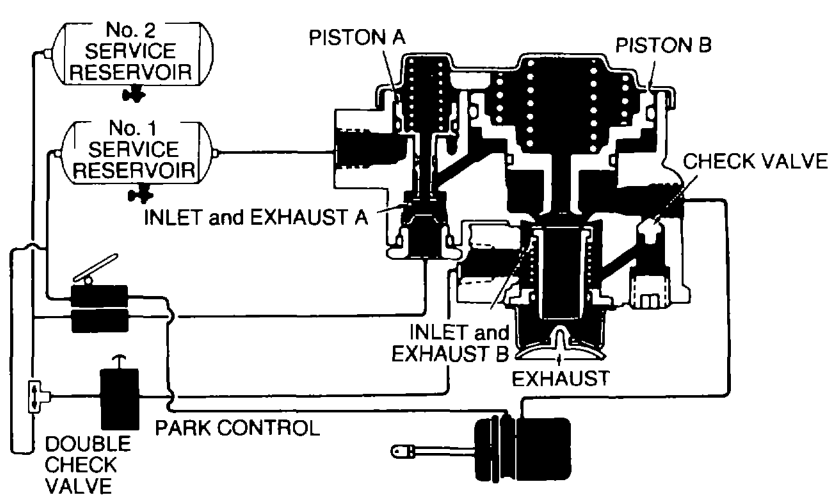


Figure 96 — Inversion Valve Operation — Secondary Brakes Only

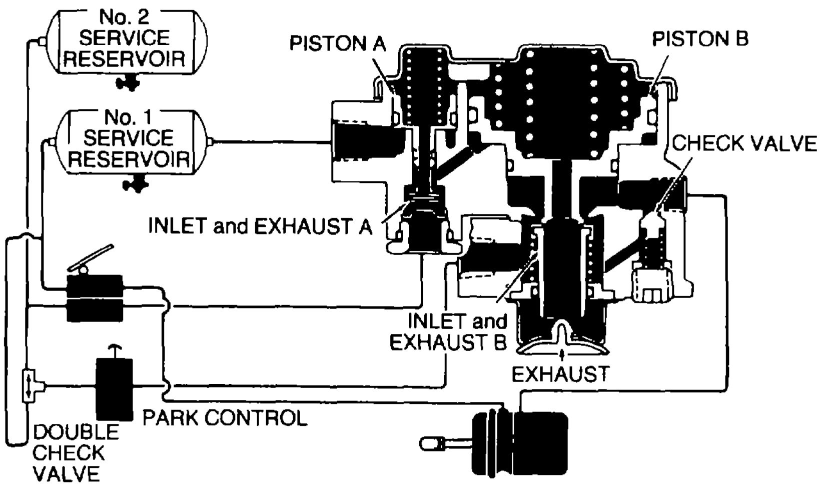


Figure 97 — Air Flow through Inversion Valve — Brakes Released

123. When the treadle valve is released, air pressure in the line between the treadle valve and the spring brake inversion valve, and the air below the large piston in the inversion valve is vented to the atmosphere, via the treadle valve. Spring pressure now moves the large piston down, closing the exhaust port and opening the inlet port (see Fig. 97). Air from the park brake control valve now flows through the inversion valve to the spring brake chambers, via the pressure holding valves. The pressurised air acts on the diaphragms in the spring brake chambers, compressing the spring and releasing the brakes.

124. If air pressure in the secondary system is lost or drained off, the brakes are not totally lost. The primary air system still supplies air to the brake treadle valve and to the tractor protection control valve. When the brakes are applied, the rear brakes (and trailer brakes if trailer is coupled) operate as normal, but the vehicle's front brakes do not operate.

Parking Brake

125. The vehicle's parking brake is controlled by a push-pull valve (Fig. 98 item 9) located on the dashboard. When the control knob (item 9) is pulled out, to apply the parking brake, the pressurized air in the parking brake circuit, between the control valve and the pressure holding valves (item 20), is vented to the atmosphere through the exhaust port in the control valve. When air pressure in the supply port of the pressure holding valves becomes

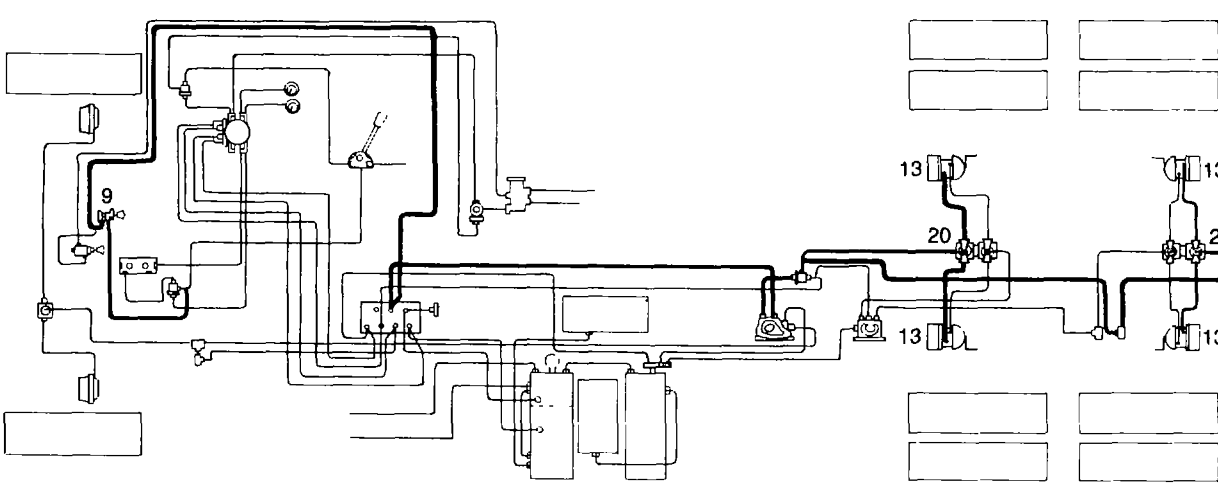


Figure 98 — Parking Brake Circuit — Brakes Released

less than the residual air pressure in the spring brake chambers (item 13), the pressure of the air in the spring brake chambers acts against the piston in the pressure holding valve, causing the piston to move and open the exhaust port. Pressurized air from the spring brake chambers is vented through the exhaust port in the pressure holding valves, allowing the springs in the spring brake chambers to expand and apply the brakes.

126. When the control knob is pushed in, to release the parking brake, primary/secondary air sourced from the double check valve flows through the open control valve and the spring brake inversion valve to the pressure holding valves. The air pressure in the supply port of the pressure holding valves, moves the pistons within the holding valves to close the exhaust ports. Air is now directed into the spring brake chambers where it acts against diaphragms causing the diaphragms to expand and compress the springs and release the brakes. The brakes remain in the released position, while pressurized air acting against the diaphragms holds the springs in compression.

127. To operate the trailer brakes, the tractor protection control valve located on the dashboard must be pressed in to supply air to the emergency port of the tractor protection (breakaway) valve. When air is supplied to the emergency port of the protection valve, it acts on the plunger within the valve, pushing the plunger against spring pressure and opening the emergency air outlet port. Air now flows through the protection valve to the air storage tanks on the trailer. As the plunger moves to permit air flow through the emergency ports, it also opens a passage joining the two service ports (see Fig. 99).

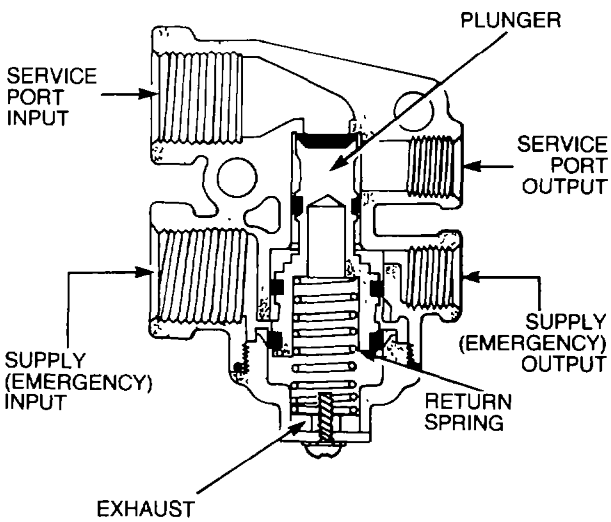


Figure 99 — Tractor Protection Valve Operation

128. When the treadle valve is operated to apply the vehicle's service brakes or the trailer brake hand control valve on the steering column is operated, primary or secondary air flows through the service ports of the protection valve to the relay valves on the trailer. This pressurized air acts on the relay valves, causing the valves to open ports to allow air from the trailer air storage tanks to flow to the brake chambers and apply the brakes.

129. When the brakes are released, air in the service line is exhausted through the actuating valve (either the treadle valve or the hand control valve), relieving the air pressure acting on the trailer relay valves. The relay valves close-off the brake chamber supply ports and open an exhaust port, allowing the air in the service brake chambers to flow back through the relay valve and out the exhaust port, releasing the service brakes.

Brake Treadle Valve

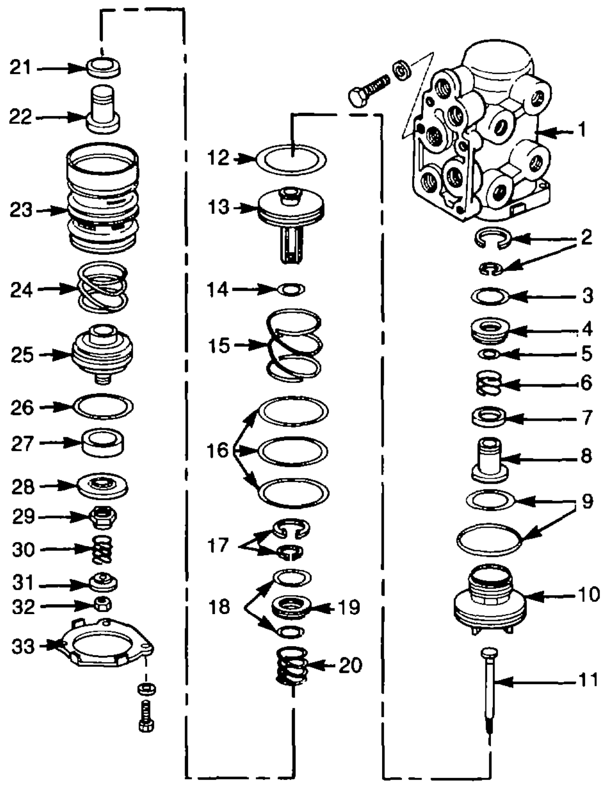
130. The foot operated brake treadle valve is a Bendix Westinghouse E-7 type, which controls the air pressure being delivered to the service brake chambers. The amount the brake pedal is moved to the fully applied position, or the position at which it is held, determines in relative proportion the pressure delivered to and held in the brake chambers. When the brakes are partially or fully released, air in the brake chambers is released through relay and quick release valves a proportional amount.

131. Fig. 100 illustrates an exploded view of the brake treadle valve

Relay Valve

132. The relay valve is a high capacity remote controlled brake valve used to supply air, direct from the storage tank, to the rear service brake chambers. The operation of the relay valve is controlled by the brake treadle valve. When the treadle valve is operated (to apply the brakes) pressurized air is directed to the control port of the relay valve. The air flows through the control port and into a cavity above the piston. Air pressure forces the piston down against the modulation tube to close the exhaust valve port. Further downward movement of the piston and modulation tube opens the inlet valve (see Fig. 101), allowing air from the brake system primary storage tank to flow through the supply port to the service brake chambers (via the quick release valves) to apply the brakes.

133. When the brakes are released, the pressurized air above the piston is vented to the atmosphere through the exhaust port on the brake treadle valve. A combination of the



1. Valve body
2. Circlips
3. O-ring
4. O-ring retainer
5. O-ring
6. Spring
7. Valve retainer
8. Inlet/exhaust valve
9. O-rings
10. Upper static piston
11. Valve stem
12. O-ring
13. Relay piston
14. O-ring
15. Relay piston spring
16. O-rings
17. Circlips
18. O-rings
19. O-ring retainer
20. Spring
21. Valve retainer
22. Inlet/exhaust valve
23. Lower static piston
24. Piston return spring
25. Piston
26. O-ring
27. Rubber spring
28. Spring seat
29. Spring seat nut
30. Spring
31. Spring guide
32. Lock nut
33. Retainer plate

Figure 100 — Brake Treadle Valve — Exploded View

modulation tube return spring pressure and air pressure in the circuit between the relay valve and the quick release valves, moves the piston and the modulation tube upward, closing the inlet valve and opening the exhaust valve (see Fig. 102). Air in the circuit between the relay valve and the quick release valves is now released through the exhaust valve port. With the air pressure relieved on the quick release valve supply port, air pressure in the brake chambers now causes the exhaust port in the quick release valve to open and release the air in the brake chambers to the atmosphere, releasing the service brakes.

Quick Release Valve

134. The quick release valve provides a localised means of releasing the air from the brake chambers the instant the treadle brake valve is released. The quick release valve is T-shaped and incorporates a supply port, two delivery ports, an exhaust port and a spring loaded diaphragm (see Fig. 103). When the brakes are actuated, air flows through the inlet (supply) port and

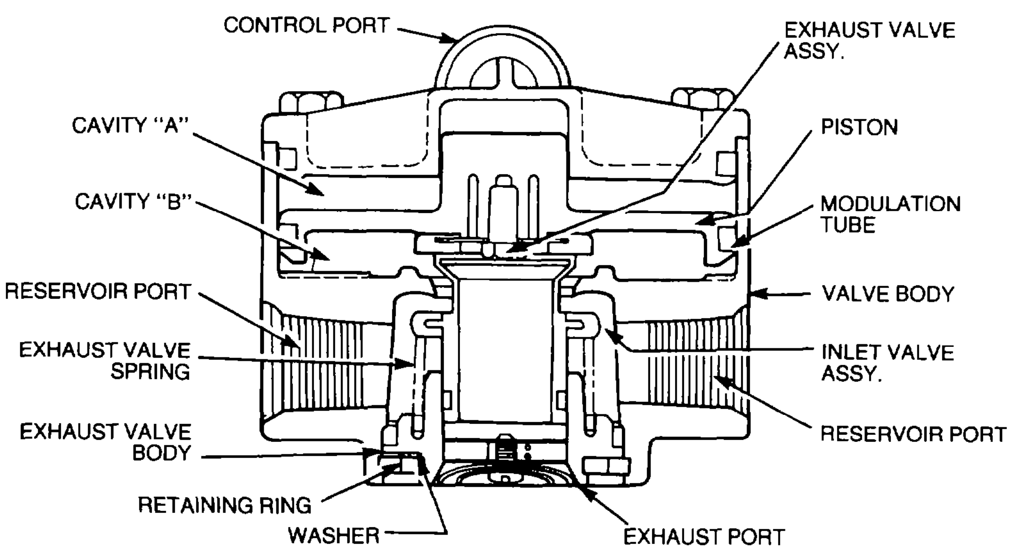


Figure 101 — Relay Valve Operation — Brakes Applied

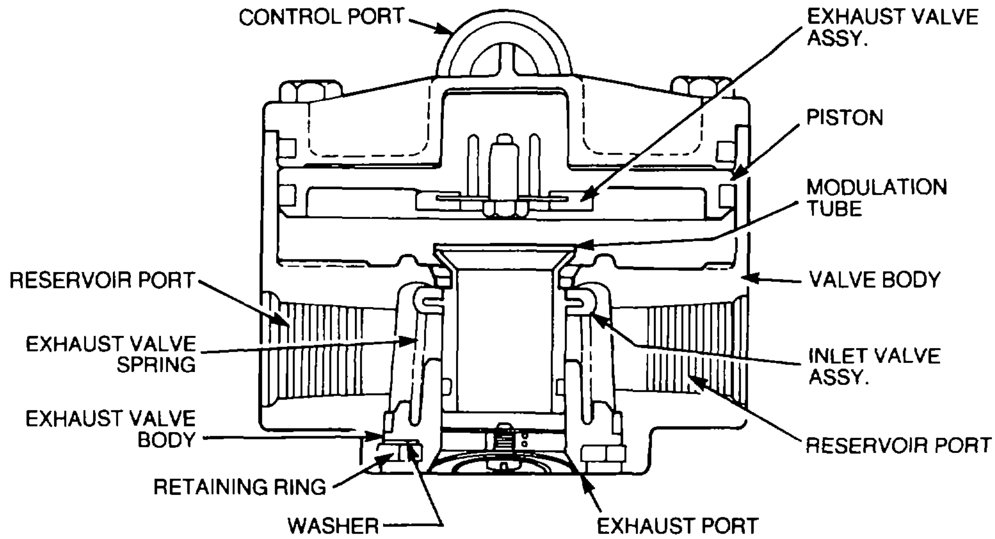


Figure 102 — Relay Valve Operation — Brakes Released

forces the diaphragm down, against spring pressure, to close the exhaust port. The air is now directed through the delivery ports to the brake chambers. When the pressure in the supply port is released, the force of the spring moves the diaphragm to open the exhaust port and allow the pressurized air in the brake chambers to be vented to the atmosphere.

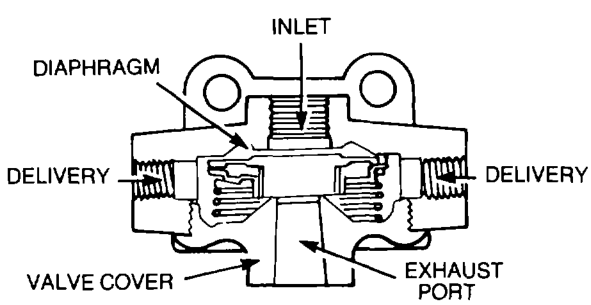


Figure 103 — Quick Release Valve — Sectional View

Pressure Holding Valve

135. The pressure holding valve is similar to the quick release valve in design and operation but utilizes a piston instead of a diaphragm. When the parking brakes are released, pressurised air delivered to the supply port of the holding valve, moves the piston down to block the exhaust port and open the delivery ports. The air flows through the delivery ports to the spring brake chambers to release the spring brakes.

136. When the spring brakes are operated, the pressurized air in the supply port is vented to the atmosphere. With no air pressure acting on the top of the piston, residual air pressure in the spring brake chambers acts against the piston, causing the piston to move up to block the supply port and open the exhaust port, allowing the air in the brake chambers to escape and the springs to expand and apply the brakes.

Slack Adjusters

137. The vehicle's brakes are equipped with slack adjusters, which not only provide a means of connecting the brake chamber push rod to the S-cam shaft, but also a means of adjusting the brake shoe to drum clearance. The slack adjuster is splined to the S-cam shaft and connected to the brake chamber push rod by clevis and pin. When the brakes are applied, the push rod acts against the slack adjuster causing the slack adjuster to rotate the shaft. The S-cam, which is welded to the shaft, rotates with the shaft and causes the brake shoes to expand against the drum to create the braking effort required to stop the vehicle.

138. The slack adjuster, shown in Fig. 104 comprises a lever, an adjusting screw and a wheel. The wheel is splined internally to mesh with the splines on the S-cam shaft, while the teeth machined into the outer circumference, mesh with the thread on the adjusting screw. Both the wheel and the adjusting screw are housed within the lever and held in position by two plates, which are riveted to the lever. A spring loaded sleeve incorporated in the lever, provides a means of locking the adjusting screw in position and preventing the brake adjustment slackening off due to road shocks or vibration. A grease fitting is installed in the lever to enable the components of the slack adjuster to be lubricated without the need to disassemble.

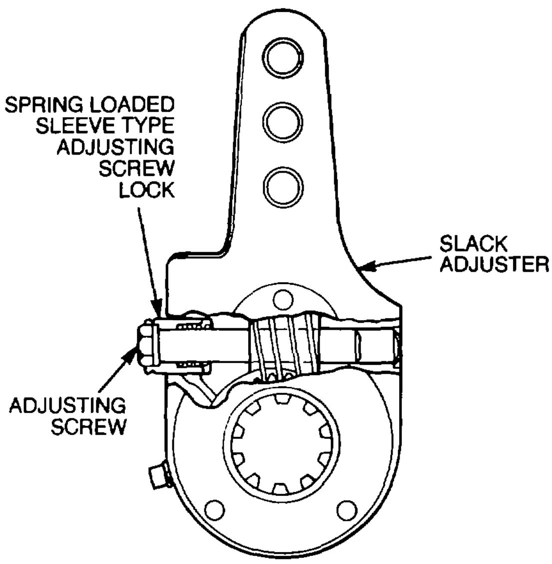


Figure 104 — Slack Adjuster — Sectional View

Hand Control Valve

139. The hand control valve provides the driver with a means of applying the trailer brakes independantly of the vehicles braking system, should the need arise. The control valve is triple ported at its base for supply, delivery and exhaust connections (see Fig. 105). The manually operated control valve is located on the steering column and provides brake application, hold and release positions within the 90 degrees of lever travel.

Air System

140. The vehicle is equipped with a Cummins single cylinder water-cooled compressor, which is mounted on the left hand side of the engine and driven by the engine's timing gears, via a splined coupling from the accessory drive shaft. The compressor has a piston displacement of 296 cm3 with bore and stroke dimensions of 92.05 mm by 44.45 mm respectively. Cooling of the compressor is accomplished by utilizing the engine's cooling system. Coolant is piped from the engine to the compressor cylinder head, where it circulates before being piped back to the engine. Lubrication of the compressor also comes from the engine. Oil is fed into the compressor through the accessory drive shaft opening and returned to the engine through a port below the accessory drive shaft.

141. The compressor runs continuously while the engine is running but the actual compression of the air is controlled by the governor which is located on the top of the air compressor. The governor acts in conjunction with the unloader valve in the compressor top cover and controls the operation of the compressor by either loading or unloading the compressor. When

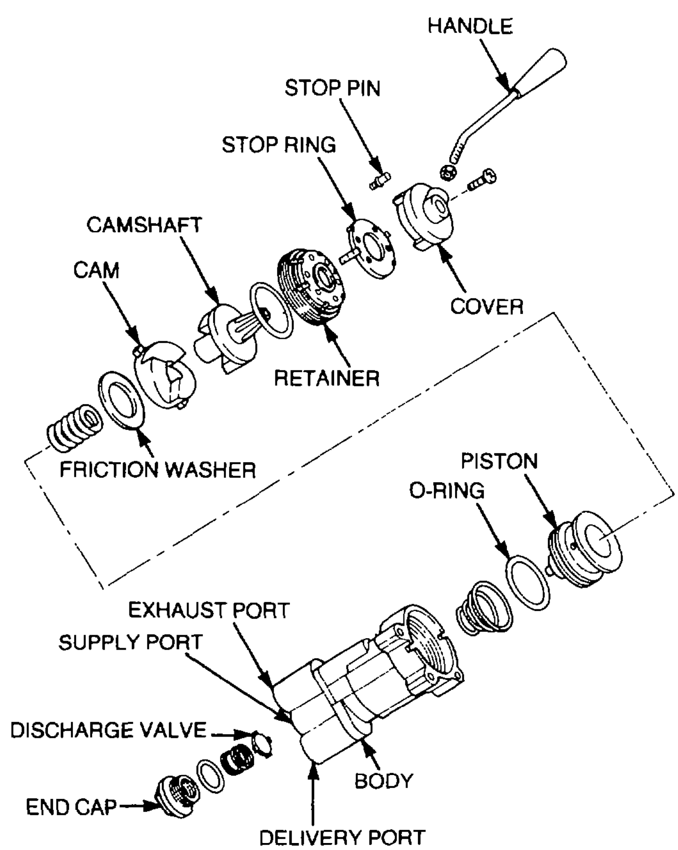


Figure 105 — Hand Control Valve — Sectional View

pressure in the air storage tanks falls below 550 kPa (80 psi), the governor loads the compressor, starting the compression of air. The governor body (see Fig. 106), upon which air pressure acts to overcome the pressure setting spring and control the inlet and exhaust valves, which either admit or exhaust air from the compressor unloading mechanism.

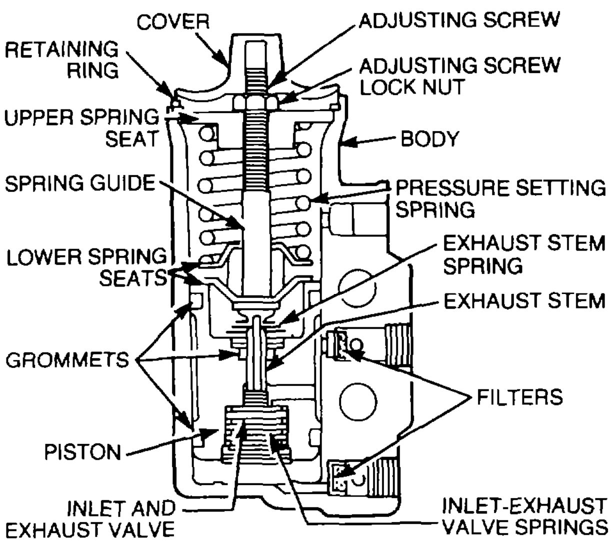


Figure 106 — Air System Governor — Sectional View

Suspension

Front Suspension

142. The front suspension comprises two semi-elliptic springs and two telescopic shock absorbers (see Fig. 107). Each spring consists of eight leaves held together by a centre bolt and kept in alignment by four clips. The springs are secured to the chassis by a fixed-shackle mounting bracket, at the front, and a swing-shackle mounting bracket at the rear. The front axle is slung under the springs and secured to each spring by two U-bolts. Two rubber bump-stops are bolted to the chassis and positioned above each spring to protect metal to metal contact of the springs with the chassis. The shock absorbers are a double acting hydraulic type used for absorbing shock loads and to dampen spring rebound rate. The shock absorbers are secured by bolts to a chassis mounted bracket at the top, and to a plate positioned between the spring and the axle at the bottom.

Rear Suspension

143. The rear suspension is a Rockwell AC6s, which is a six rod, multi-leaf, single point suspension (see Fig. 108). The six torque rods are rubber bushed at both ends to absorb shock

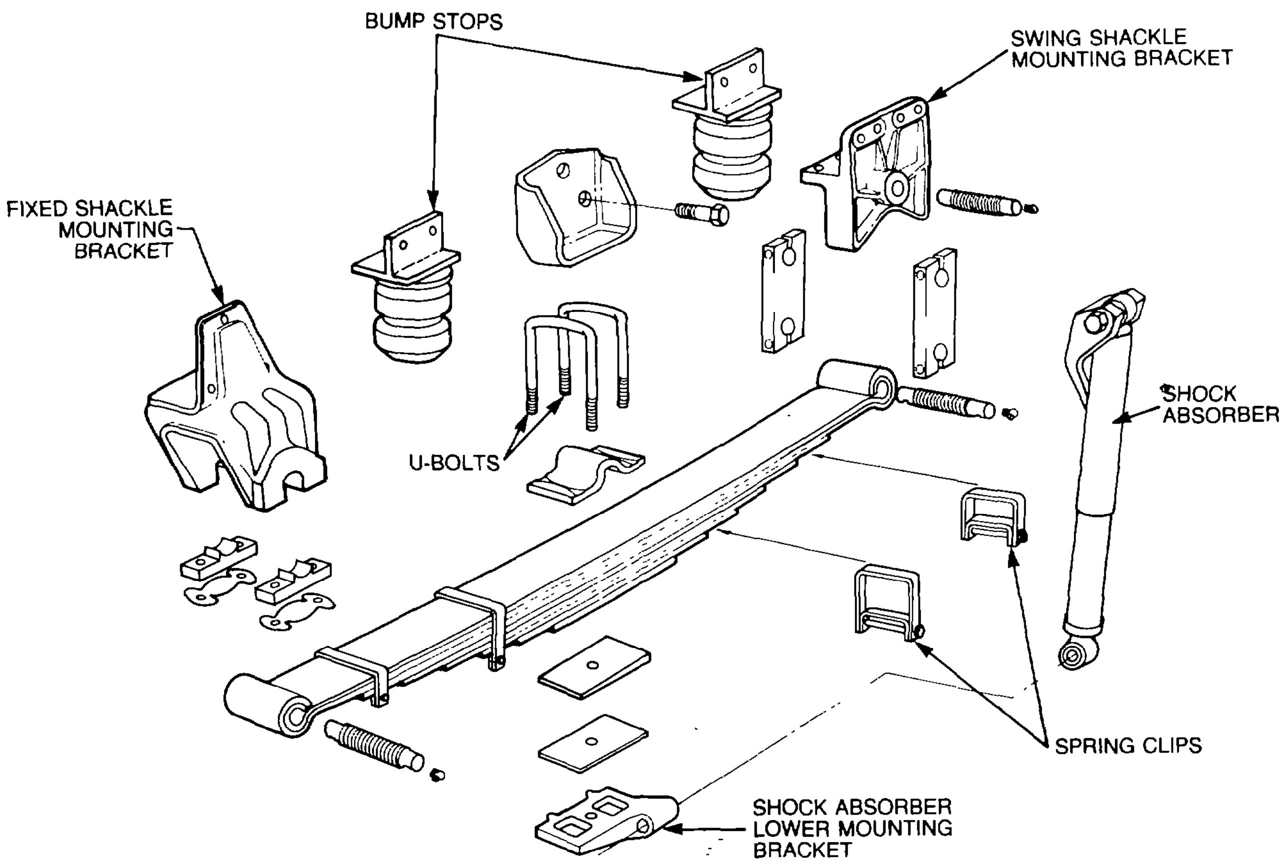


Figure 107 — Front Suspension

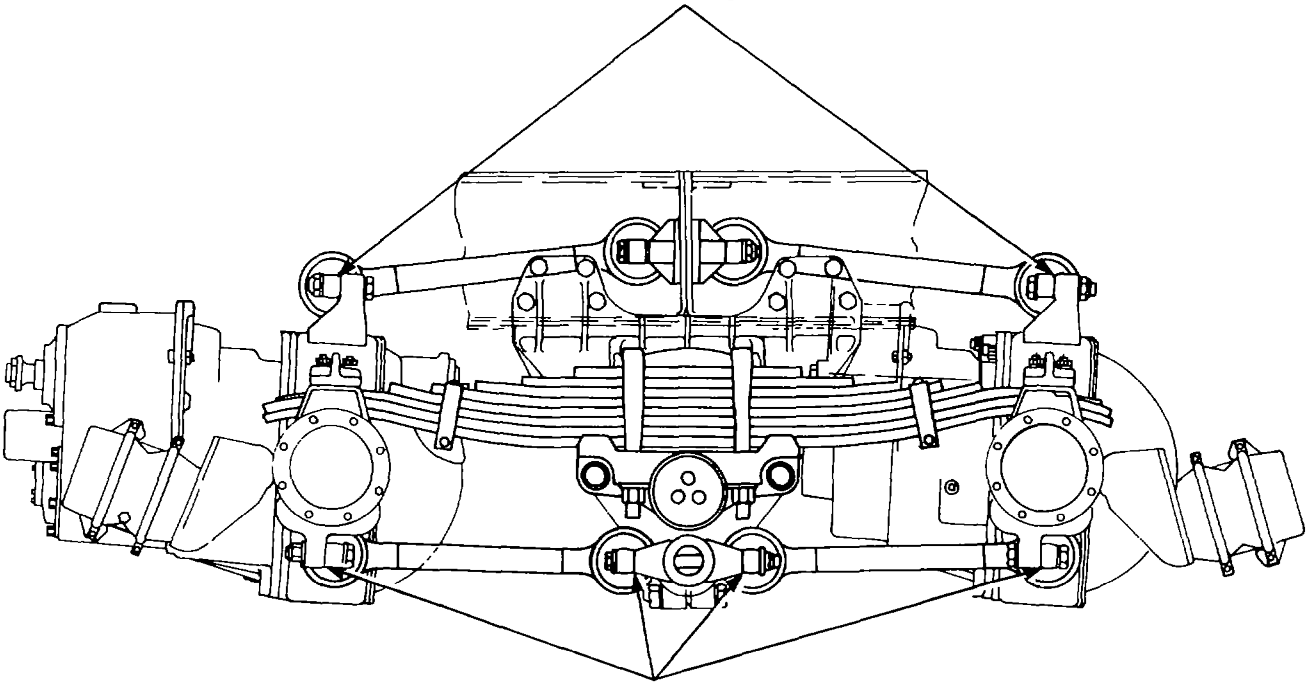
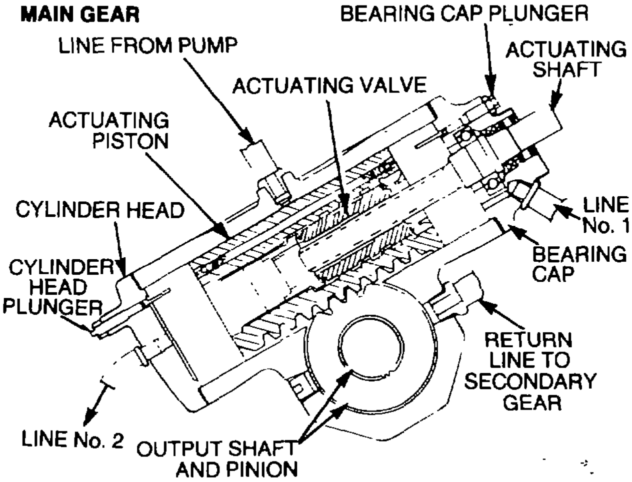


Figure 108 — Rear Suspension

loads, and are installed onto the rods are rubber bushed at both ends, to housings in a parallelogram configuration to enable the load to be distributed equally between the intermediate and rear axles. The torque rods not only keep the axles in proper driving alignment, but also help to absorb tractive torque and braking forces. The drive shaft angles are adjusted by means of spacers between the torque rod ends and the axle housing. The rear bogie is suspended by multi-leaf camel back springs which are secured, at the centre, to the trunnion brackets by means of U-bolts. The trunnion brackets are mounted on the trunnion shaft and form a pivot about which the spring assembly oscillates. The free ends of the springs float in axle spring rebound and guide brackets located on top fo the axle shaft housings.

Steering

144. The Sheppard power assisted steering system utilizes two integral steering assemblies, an M392 main steering box and an M292 slave steering box. Both steering boxes are secured to the vehicle chassis, forward of the front axle, with the main steering box located on the right hand chassis rail and connected to the steering wheel by the steering column, while the slave steering box is located on the left hand chassis rail and connected to the main steering box by means of high pressure hydraulic pipes. Although both steering boxes are similar in



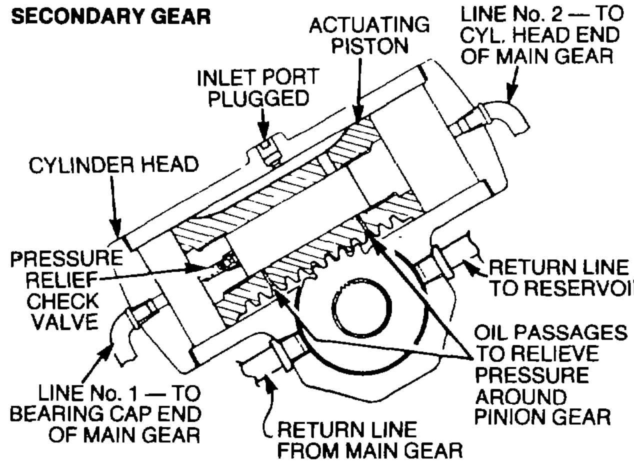


Figure 109 — Steering Boxes — Sectional Views

appearance, Fig. 109 illustrates the differences between the two.

145. When the steering wheel is turned in either direction, the steering column transmits the rotating action of the steering wheel to the actuating shaft in the main steering box. The actuating shaft has an Acme type, multiple start thread, which engages with a similar type thread in the actuating valve located within the bore of the actuating piston. Because linear movement of the actuating valve is limited (approx. 0.8 mm) within the piston, movement of the actuating valve also causes the actuating piston to move. The piston has a rack machined on one side, which meshes with a gear splined onto the output shaft. As the actuating shaft rotates, in accordance with the rotation of the steering wheel, the actuating valve is caused to travel along the actuating shaft, due to the design of the threads, taking the piston with it and causing the output shaft to rotate

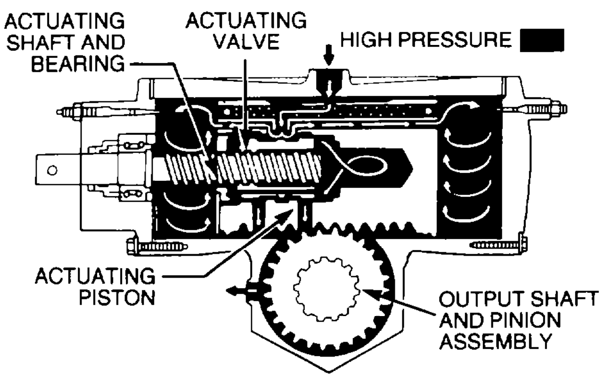


Figure 110 — Steering in Neutral Position

146. To operate the slave steering box, hydraulic pressure is required. This is provided by the Vickers V20F series pump which provides oil under pressure to the main steering box, which controls the oil flow to the slave steering box. Oil under pressure is delivered to the main steering box while the engine is running. Fig. 110 illustrates oil flow with the steering box in the neutral position. When the steering wheel has started to be turned the rotating action of the actuating shaft causes the actuating valve to move within the piston bore of the piston, opening a port to allow the pressurized oil to flow in through a drilling in the piston to the chamber behind the piston (see Fig. 111). The pressurized oil now assists the actuating shaft and valve to move the piston in the required direction. When power assisted steering is no longer required, return springs centralize the actuating valve within the piston, closing the port and stopping the flow of oil into the steering box. When the steering wheel is turned in the opposite direction, the actuating valve moves to open the port, but directs the oil to the other end of the piston, to assist the actuating shaft and valve to centralize the steering or turn towards the opposite lock. A relief valve is installed at each end of the piston, which is activated by an adjustable plunger. One plunger is installed in the bearing cap and the other in the cylinder head. When the piston nears the end of the housing, the plunger unseats the relief valve ball and allows pressurized oil to flow through to the non-pressurized end, thus relieving the pressure of the oil acting on the piston.

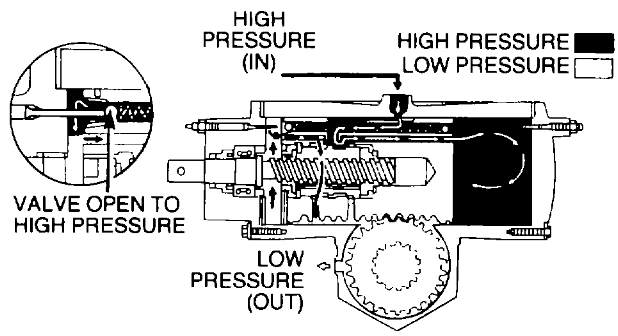


Figure 111 — Steering in Operating Position (Right Lock)

147. The operation of the slave steering box is controlled entirely by the flow of oil through the main steering box. The slave steering box also operates in the opposite direction to the main steering box, so oil from the bearing cap end (uppermost end) is directed to the lower cylinder head on the slave steering box and the oil from the cylinder head end (lowest end) of the main steering box is directed to the upper cylinder head on the slave steering box. The oil return line from the main steering box is connected to the slave steering box and is returned from there, together with the return oil from the salve steering box, to the power steering reservoir.

148. The Vickers V20F series pump is secured to the rear flange on the engine oil pump and is driven by the oil pump drive shaft. The V20F is a vane type pump consisting of a body, a cover, a drive shaft assembly, a pressure plate and a pumping cartridge (see Fig. 112). The pumping cartridge is comprised of the vanes, a slotted rotor and a ring. The inner rotor is splined to the drive shaft. When the pump is operating, centrifugal force causes the vanes to follow the contour of the ring. After hydraulic pressure is developed in the system, the vanes are held in contact with the ring by pressurised oil introduced behind the vanes. The oval contour of the ring forms two opposed pumping chambers. Oil from the reservoir is inducted into the low pressure areas formed at the point where chamber volume is greatest. This oil is carried around by the vanes and discharged through the outlet port located at the point of minimum chamber volume (see Fig. 113).

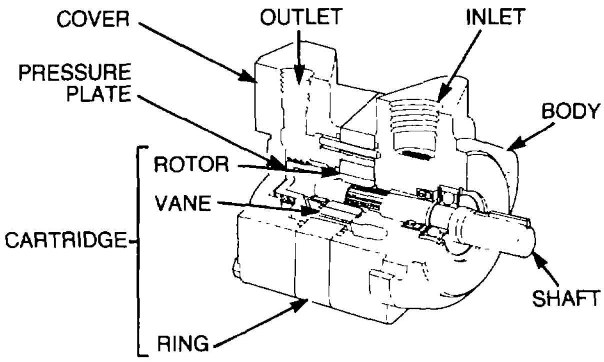


Figure 112 — Steering Pump — Sectional View

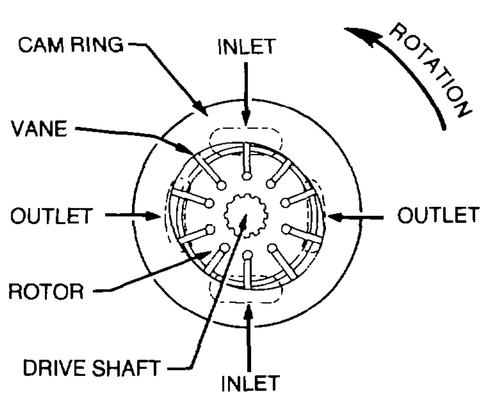


Figure 113 — Steering Pump Operation

Electrical

Starter Motor

149. The Delco Remy 42-MT series starter motor is a solenoid actuated drive type, i.e. the starter solenoid provides a means of engaging the drive pinion with the flywheel ring-gear for cranking the engine. The solenoid comprises a coil, a plunger and a lever. When the ignition is turned off and current ceases to flow through the windings of the solenoid, the plunger and lever are held in the released position by spring pressure (see Fig. 114). When the ignition is turned to the starting position, current flows through the coil in the solenoid, creating a magnetic field which overcomes spring pressure and draws the plunger through the centre of the coil. As the plunger moves, the lever which is connected to the plunger also moves. The pivoting action of the lever moves the starter motor drive pinion into mesh with the flywheel ring-gear (see Fig. 115). When the plunger reaches the end of its travel, it closes a set of contacts within the solenoid, permitting full current flow direct from the battery to the starter motor. The current creates magnetic fields in both the field and the armature windings. The magnetic fields created in the armature oppose the magnetic fields created in the field windings and cause the armature to rotate. As the armature rotates, the drive pinion, which is splined to the armature shaft, and the flywheel ring-gear, which is meshed with the drive pinion, are also caused to rotate.

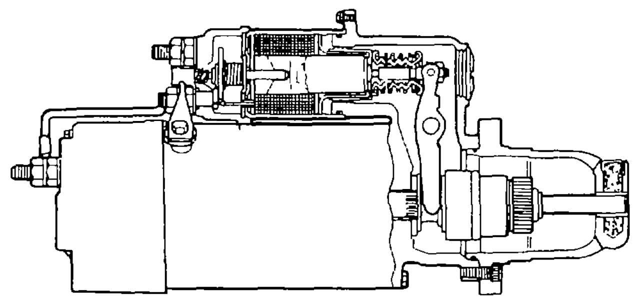


Figure 114 — Ignition Switch OFF

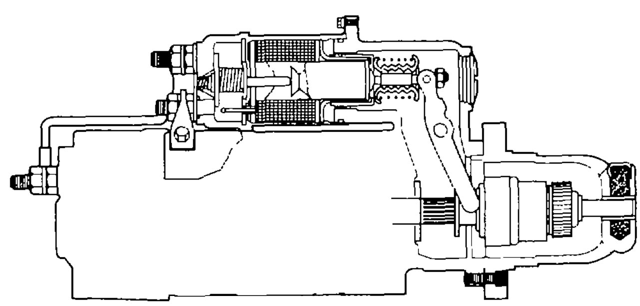
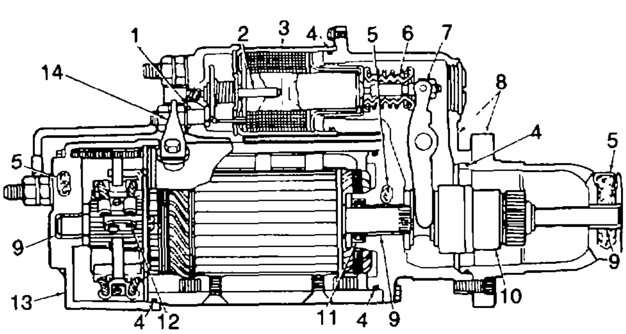


Figure 115 — Igntion Switch in START

150. Fig. 116 illustrates a sectional view of the starter motor assembly.



1. Gasket
2. Bush
3. Solenoid case
4. O-ring
5. Oil wick
6. Sealing boot
7. Shift mechanism
8. Housing
9. Bronze bearing
10. Drive pinion
11. Shaft seal
12. Brush
13. End cap
14. Connector strap

Figure 116 — Starter Motor — Sectional View

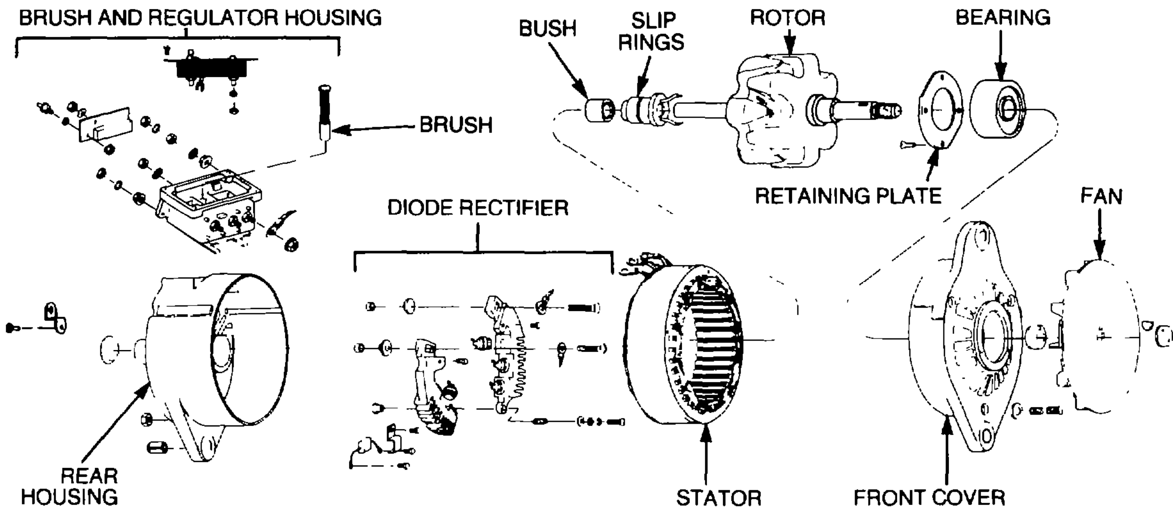


Figure 117 — Alternator Assembly — Exploded View

Alternator

151. The Leece-Neville alternator is a 14 volt self load limiting type, which is driven by the engine crankshaft pulley, via twin V-belts. The alternator has an output of 90 amps at 14.0 volts and can operate up to a maximum speed of 8000 rpm. A solid state voltage regulator is incorporated in the alternator.

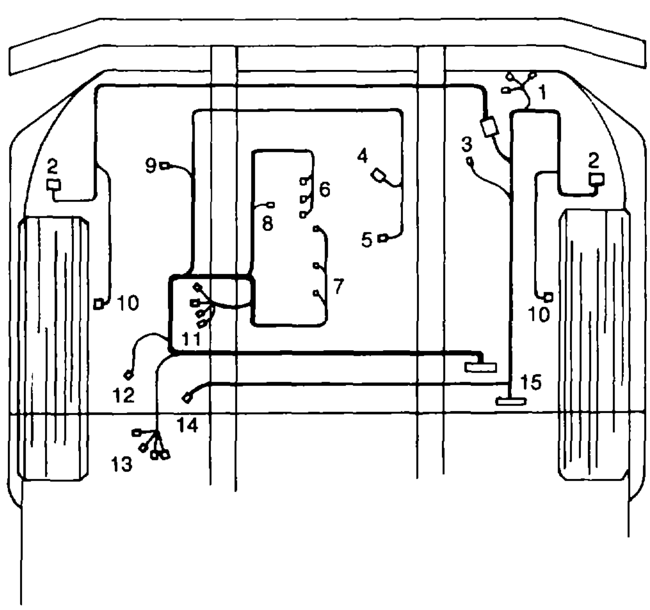
152. The rotor assembly is a dynamically balanced, heavy duty construction, which utilizes a 7/8 in. diameter straight shaft. The assembly is supported on two bearings, a sealed ball bearing at the drive-end and a heavy-duty roller bearing, which is enclosed at one end and equipped with a built-in seal to protect against contaminates at the slip-ring end. Both the rotor and stator coil windings are impregnated with varnish for maximum protection.

153. Six silicone diodes are used to rectify the alternating current (AC), created by the alternator, to a direct current (DC) for use in the vehicle's electrical system. The diodes are mounted in heat sinks, which dissipate the heat generated by the diodes during operation. A capacitor is connected between the two heat sinks to assist in supressing transient voltage spikes which could damage the diodes. The brushes and the voltage regulator are located in a waterproof housing.

154. Fig. 117 illustrates the various components of the alternator.

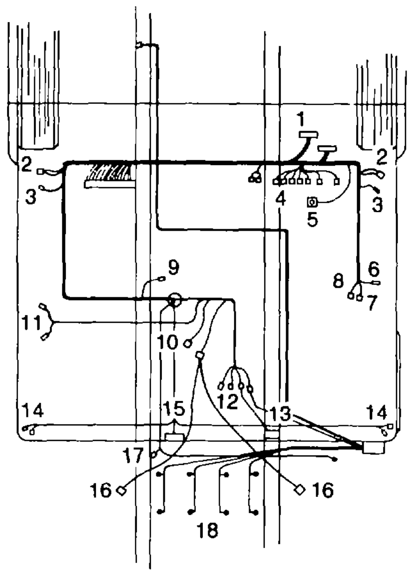
Lighting

155. The vehicle is equipped with three modes of lighting, normal, blackout and reduced. Selection of the required mode of lighting is controlled by



1. Driving and fog lights
2. Headlights
3. Horn
4. Alternator
5. Oil pressure switch
6. Temperature sensors
7. C-brake
8. Fuel pump solenoid
9. Throttle switch
10. Turn indicator and marker lights
11. Starter motor
12. Cooling system fan solenoid
13. Start (ignition) switch
14. Wiper motor
15. Wiring harness connectors

Figure 118 — Engine Compartment Wiring Harnesses



1. Wiring harness connectors
2. Mirror light and heater
3. Dome light door switch
4. Warning lights
5. Headlight dimmer switch
6. Work light switch
7. CB radio, map and dome light
8. Sleeper cab light
9. Low air pressure warning switch
10. Overdrive lockout solenoid
11. Fuel level sender unit
12. Tail ights and blackout lights
13. Back-up alarm
14. Wander light
15. NATO socket
16. Work lights
17. Isolation switch
18. Batteries

Figure 119 — Cab Wiring Harness

a three position switch located on the dashboard.

a. In the NORMAL position all regulation (on highway) lighting is operable, which includes the head, tail, stop, parking, number plate (included with the right hand tail light), turn indicator, reversing, clearance, width, dash instrument, map reading and cab courtesy lights.

b. In the BLACKOUT position all of the NORMAL lighting is switched off, with the exception of the dash instrumentation, warning and map reading lights. In this mode, the blackout marker lights, located at the front and rear of the vehicle, and the blackout stop lights, function.

NOTE

In both the blackout and reduced lighting modes, the CB radio can also be operated.

c. With the switch in the REDUCED position, the blackout lighting is utilized with the inclusion of the reduced headlights.

NOTE

The dash instrument lights are provided with a dimming switch, enabling the instrument lights to be dimmed or switched off, irrespective of which of the three modes of lighting is selected.

Table 2 — Globe Wattage

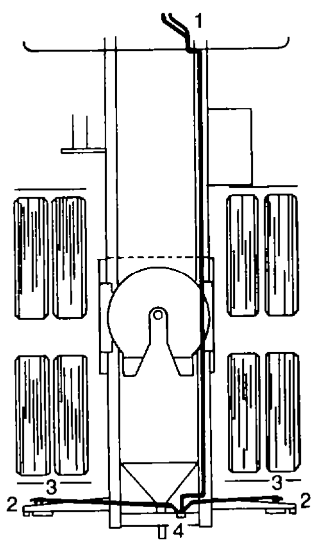
Light	Quantity	Wattage
External		
Headlights, high/low	2	100/55 watt, Halogen
Park Lights	2	3 watt
Driving lights	2	55 watt, Halogen
Fog lights	2	55 watt, Halogen
Turn indicator lights	4	32 candlepower
Stop lights	2	21 watt
Tail lights	2	5 watt
Front marker lights	2	3 candlepower
Roof clearance	5	3 candlepower
Mirror clearance lights	2	2 candlepower
Work lights	2	55 watt, Halogen
Internal		
Console light	1	12 candlepower
Map reading light	1	5 watt, Halogen
Dome light	1	12 candlepower
Tachograph	3	1.2 watt
Warning lights	7	2 candlepower
Air pressure gauges	2	1.2 watt
Other gauges	4	2 watt
Heater/air conditioner controls	1	32 candlepower
Sleeper cab	1	12 candlepower
Military		
Blackout lights	4	LED module
Reduced head lights	2	18 watt

Wiring Harnesses

156. The vehicle's electrical system comprises four main wiring harnesses. Two of the harnesses are located in the engine compartment, one of which is utilised by the horn, windscreen wipers and the various lighting at the front of the vehicle (see Fig. 118), while the other harness is connected to the alternator, starter motor and the various sender units, solenoids and switches on the engine.

157. The cab wiring harness, shown in Fig. 119, is joined to the engine compartment harnesses at the firewall by two multi-pin connectors. The cab harness not only transmits the signals from the switches and sender units on the engine to the various gauges and switches on the dashboard, but also provides the illumination of these dashboard instruments. This harness is also utilized by the heater air conditioner, the two radios, the cab interior lighting, the fuel level sender unit, the overdrive lockout solenoid, the stoplights, tail lights and the turn indicator/reversing lights.

158. The rear wiring harness interconnects the cab wiring harness to the lights at the rear of the vehicle (see Fig. 120).



1. Wiring harness connectors
2. Blackout lights
3. Stop, tail, turn indicator/ reversing lights
4. Junction box

Figure 120 — Rear Wiring Harness

Air Conditioning

159. The integrated air conditioning system, as shown in Fig. 121, comprises five basic components:

a. Compressor,

b. Condenser,

c. Receiver-Drier,

d. Expansion Valve, and

e. Evaporator.

160. The compressor is a belt driven reciprocating piston type located on the left hand side of the engine. A V-belt, connected to the accesory drive pulley transmits drive to the compressor pulley. An electro-magnetic clutch is built into the compressor pulley, which allows the pulley to rotate without driving the compressor until the air conditioner is turned on. The functions of the compressor are to raise the temperature of the refrigerant to a higher degree than the ambient temperature by compression, and to circulate the required volume of vapourized refrigerant through the system

161. The condensor consists of a tubular coil mounted in a series of thin cooling fins and is used to cool the very hot, high pressure refrigerant vapour to a warm high pressure liquid. The condensor is located in front of the vehicle's radiator to obtain maximum air flow over the cooling fins.

162. The receiver-drier acts as a storage tank for the liquid refrigerant, and provides a means of filtering and retaining foreign particles from the refrigerant. A desiccant (silica gel or other

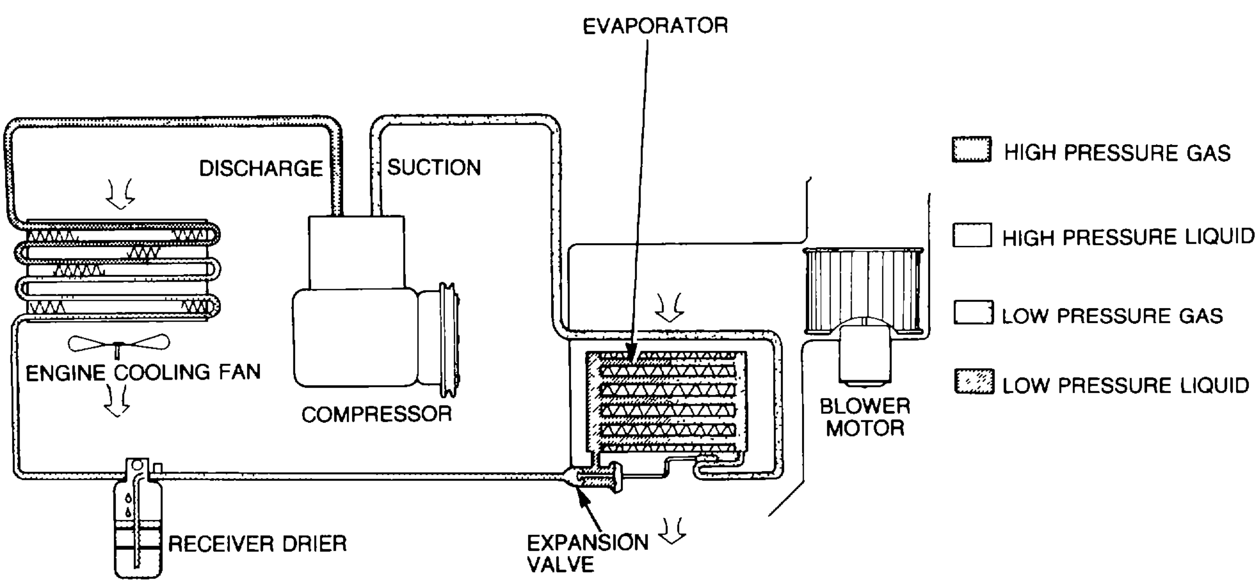


Figure 121 — Air Conditioning System

drying agent) is also incorporated in the receiver-drier to remove and retain moisture from the refrigerant

163. The expansion valve is a metering device incorporated in the system to change the pressure of the liquid refrigerant from a high pressure to a low pressure. The action of the metering device cools the refrigerant to a temperature lower than that in the cabin and also causes the liquid refrigerant to be atomized. The modulating action of the expansion valve regulates the volumetric flow of the liquid through the evaporator, and also ensures that the refrigerant reaches the compressor to be recycled.

164. The evaporator is a tubular coil mounted in thin fins and located in the housing on the left hand side of the cab The cold, low pressure atomized refrigerant from the expansion valve passes through the evaporator coils, where warm air, drawn in from the cab or outside the vehicle by the blower fan, is directed through the fins of the evaporator. As the air flows through the evaporator, the refrigerant absorbs the latent heat from the air, substantially lowering the temperature of the air while the refrigerant heats up and vaporizes. The blower fan disperses the cold air through ducting, into the vehicle's cab while the vaporized refrigerant is drawn into the compressor to be recycled through the system.

165. The refrigerant used in the air conditioning system is Freon 12 (Dichlorodiflouromethane) which readily vapourizes to absorb the latent heat of evaporation at temperatures between –12°C and 0°C while under a pressure in the range of 103-206 kPa (15-30 psi) at the evaporator. At higher pressures Freon 12 will condense and give off its latent heat of condensation at temperatures between 54°C and 65°C while at pressures between 1240-1585 kPa (180-230 psi) at the condenser.

Frame

Tow Coupling

166. The Holland tow coupling secured to the rear chassis crossmember is a pintle hook (see Fig. 122). The pintle hook section of the tow coupling has a vertical load capacity of 2700 kg (6000 lb) and a maximum gross trailer weight capacity of 13 600 kg (30 000 lb).

Fifth Wheel

167. Fig. 123 illustrates the Holland Hitch FW70-HC-P26 fifth wheel (turntable), which is fitted to the vehicle. The fifth wheel is constructed of cast iron and secured by two pivot bolts, to mounting brackets which are secured to the vehicle's chassis. The pivotting action of the fifth wheel allows the fifth wheel to tilt rearward, providing a ramp affect which assists when coupling or uncoupling the trailer to or from the fifth wheel. The fifth wheel is designed for use with 90 mm king pin trailer connections.

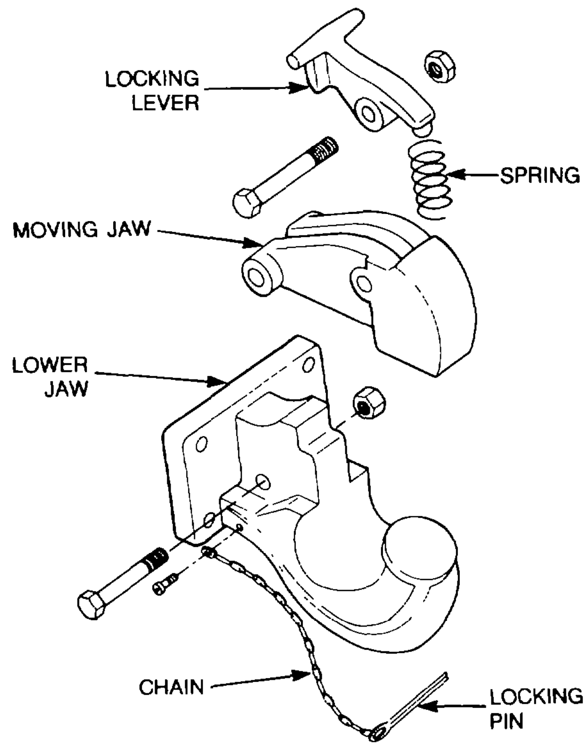


Figure 122 — Tow Coupling — Exploded View

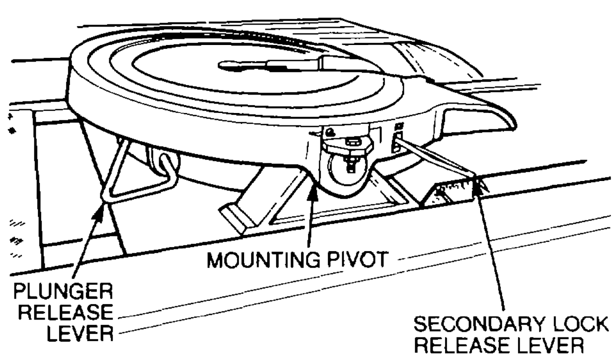


Figure 123 — Fifth Wheel

168. When a trailer is being coupled, the trailer king pin is guided into the open lock where it hits against the foot of the hinged lock causing the hinged lock to close behind the king pin. As the hinged lock moves behind the king pin it nudges a plunger, which is held open against spring pressure by the release handle. This slight movement of the plunger relieves the spring

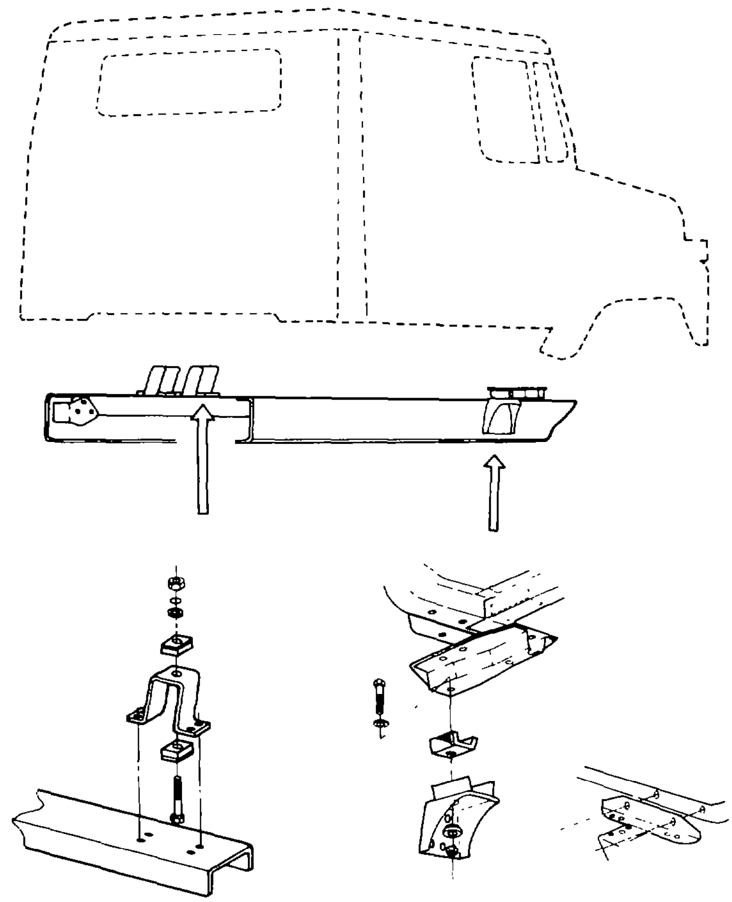


Figure 124 — Cab Mounting Locations

pressure acting on the release handle, which then causes the release handle to fall from the detent allowing the plunger to move behind the hinged lock, securing the hinged lock in the closed position, trapping the king pin. A secondary lock, which is a spring loaded pivoted arm, also controlled by a release handle, moves into position behind the hinged lock as the hinged lock snaps closed behind the king-pin. The secondary lock acts as a back-up to the hinged lock plunger.

Body

169. The body of the vehicle comprises a two-door enclosed type cab with an integral sleeper cab. The cab is constructed of pressed steel and mounted at three points to the chassis as shown in Fig. 124. U-shaped and circular insulators are used on the front mountings and four square shaped insulators are used on the rear mountings. The doors are constructed of pressed steel and incorporate window winder regulators to raise and lower the door windows. Each door is mounted on two hinges and each hinge has elongated bolt holes to enable the doors to be correctly aligned within the door opening, and to obtain a flush fit with the cab. A rubber weather strip is fitted to the doors which butts against the door surround, to effectively seal the cab when the doors are closed. Storage space is provided beneath the seat in the sleeper cab and this space is divided into three compartments, which are accesible from inside the cab. The two outer compartments can also be accessed through external lockable panels, which are unlocked by control knobs located inside the cab, at each end of the sleeper seat base

170. Two Bostrom air suspension seats (see Fig. 125), which are manually adjustable in height, seat back-rest angle, seat tilt and fore and aft movement. Weight adjustment is automatic by means of the air suspension. A small storage area is provided in the base of each seat. Seating at the rear of the cab is provided by a sponge-rubber seat and two back-rests.

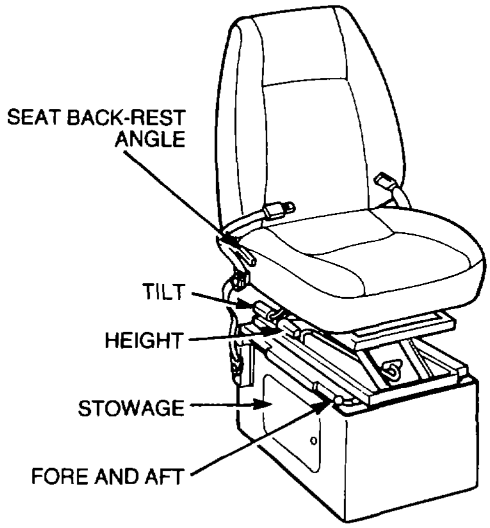


Figure 125 — Front Seat Adjustment Locations

171. Cab heating is provided by a heater core, located within the air conditioning housing. Heated engine coolant which is chanelled, via flexible rubber hoses to and from the heater core, provides the heating agent. The blower fan incorporated in the housing, draws air from outside the vehicle, and blows the air through the fins of the heater core. As the air passes through the core, heat is transferred to the air by conduction. The heated air is then ducted into the cab. The heater controls are combined with the air conditioning controls, located in the centre of the dashboard.

END