Chapter 4
Brake and Wheels

Notes

Chapter 4 Brakes

Your Gillig Chassis is equipped with a dual circuit air brake system which fully complies with the applicable requirements of Federal Motor Vehicle Safety Standard, Number 121 (FVMSS 121). The brake system is comprised of an air compressor with governor, air dryer, reservoir tanks, a treadle valve, regulator valves, relay valves, and brake chambers, all of which function to activate and apply the brake shoes to the brake drums at each wheel (Figure 4.1)

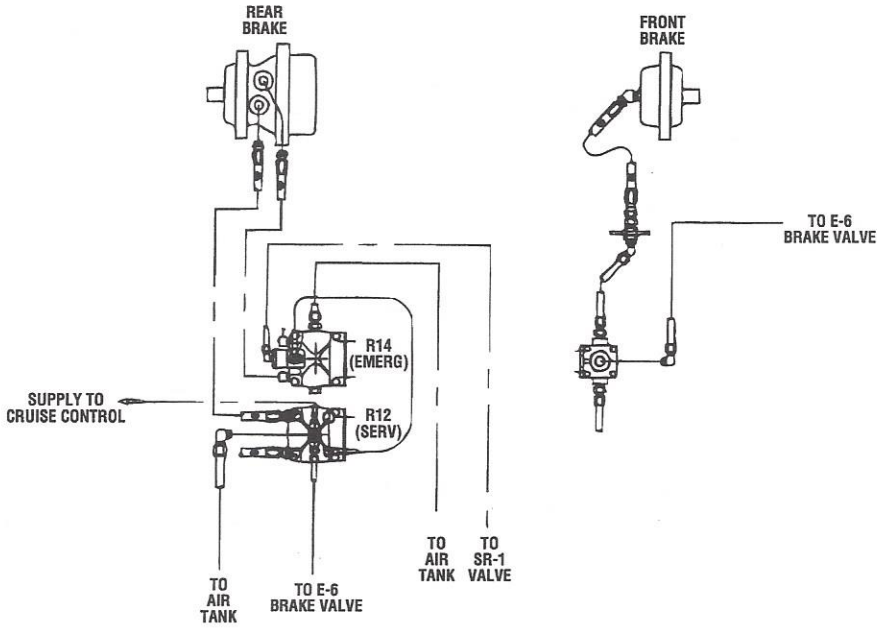

Figure 4.1. Brake System Schematic

SERVICE BRAKES

The service brakes are operated when the brake treadle valve is activated by depressing the brake pedal. Compressed air is then routed through front and rear brake relay valves to the individual brake chambers. The brake chambers use a mechanical linkage to apply the brake shoes to brake drums to slow and stop the motor home.

Brake Adjustment

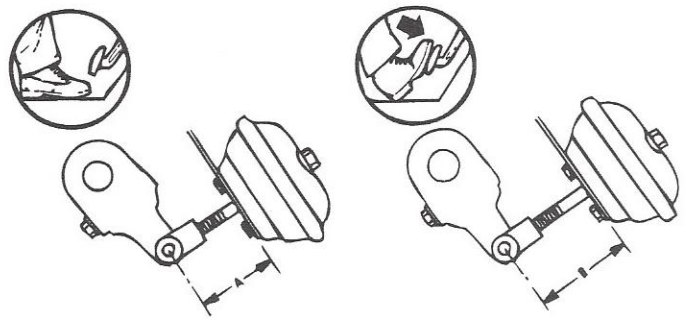

Figure 4.2. Brake Adjustment **PA-05-029**

Brakes can be adjusted by using the brake slack adjuster assembly located between the air brake chamber and the brake cam at each wheel. Follow the procedure below to perform the adjustment.

1. Tighten the adjusting screw until full resistance is encountered, then back off one third revolution (two flats). The brake cam must rotate in the same direction as it does when the brakes are applied. The brake chamber rod will push the end of the slack adjuster away from the brake chamber, causing the cam to rotate. This is the direction that must be duplicated when turning the adjusting screw. If the cam rotates in the opposite direction, you are LOOSENING the brakes! Reverse the direction of the adjustment.

2. Measure the distance from the center of the bolt (connecting the slack adjuster to the clevis) to the bottom of the brake chamber mounting plate. This is the A dimension (Figure 4.2) taken with no brake pedal pressure.

3. Have another person apply the brakes to simulate a panic stop. While the brakes are thus fully applied, make the measurement as in step 2 again. This is the B dimension (Figure 4.2)

4. Subtract dimension A from dimension B. For the front brakes, which have 24 square inch chambers, the B–A amount should be less than 1.5 inches. The rear brakes have 30 square inch chambers, and the B–A dimension should be less than two inches.

5. If the B–A dimension exceeds the minimum amount, repeat steps 1 through 4. If, after a repetition, the brakes still do not adjust, contact the Gillig Corporation Service Department or an authorized service facility.

WARNING
When working on or around the brake system and components, the following precautions should be observed.

1. Always block vehicle wheels. Stop the engine when working under a vehicle. Keep hands away from chamber push rods and slack adjusters; they may apply as system pressure drops.

2. Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or pipe plug unless you are certain all system pressure has been discharged.

3. Always wear safety glasses and never exceed recommended pressure.

4. Do not attempt to disassemble the brake chambers without having studied the manufacturer-supplied instructions. Brake chambers contain powerful springs which are normally compressed. Lack of care and appropriate knowledge could result in damage to the component or severe personal injury.

5. Use only proper tools and observe all precautions pertaining to use of these tools.

CAUTION
Brake adjustment must be performed at intervals described in the Maintenance Schedule. Failure to do so can result in reduced brake capacity or brake failure.

PARKING BRAKE

NOTICE
The parking brake is applied when the air pressure is exhausted. Air pressure is required to release the parking brake.

Like the service brakes, the parking brakes are also operated with compressed air. The parking brakes are operated through a separate set of brake chambers within the rear brake chambers and are controlled by the parking brake valve mounted in the driver's console.

When the parking brake valve is set to the PARK position, air pressure is released (or dumped) from the chambers, which allows the spring within to apply the brakes. There is an anti-compounding line between the rear brake relay valve and the spring brake relay valve to prevent both the rear service and parking brakes from being applied simultaneously.

Disabling The Parking Brake

WARNING
Block both sides of each wheel before disabling the parking brake or vehicle will roll.

If it is necessary to tow the vehicle after the parking brakes have been activated and there is no air pressure, the following procedures should be followed:

1. Position yourself between the rear wheels facing the rear of the vehicle.

2. Remove the plug from the end of each of the two brake chambers. If the plug is not attached to the chamber, save it for later use.

3. Locate the T-bolt caging tool on each chamber. It is in the top of the left chamber and on the bottom of the right chamber. Remove the tools.

4. Working on one chamber at a time, insert the tool, teeth end first, into the hole in the chamber and turn the tool 90° clockwise. Repeat with the other chamber.

5. Use a wrench to tighten the nut down on each chamber. This will compress the springs inside and cause the parking brake to release.

6. When air pressure is again available, loosen the nut and turn the tool 90° counter-clockwise to remove it. This will cause the brakes to apply. By using available air pressure the brake can be released from the driver's position.

7. Replace the tool in its storage position and replace the plug in the top center of the brake chamber. Repeat the procedure on the other wheel.

Emergency Braking Operation

The dual circuit air brake system includes an important safety feature: When air pressure is lost in both reservoirs, the parking brake relay valve automatically applies the parking brake.

If air pressure to the front brakes is lost, the rear service brakes continue to operate normally. If pressure is lost to the rear service brakes, the front brakes continue to operate normally and the parking brakes will apply and release with the foot treadle valve.

The parking brakes may also be applied by the operator during any of the above failures by manually activating the parking brake valve. This system will brake the motor home even if air pressure is lost in any, or all, of the brake systems.

BRAKE INSPECTION AND MAINTENANCE

CAUTION
Hydraulic fittings are not interchangeable with air fittings.

The air brake system includes all of the latest safety features and is assembled from the best quality components available. The various fittings and hoses are made specifically for air applications. If replacement parts are purchased from suppliers other than Gillig, care must be taken to ensure that compatible air components are purchased.

CAUTION
Nylon or Synflex tubing should never be used in or near the engine compartment.

All components in the system must be subject to routine inspection and maintenance. All lines and fittings should be checked and tightened or replaced if found loose. All lines should be checked for cracking, chafing, or rubbing. Worn or chafed lines should be replaced. The source of the chafing or rubbing must be identified and eliminated.

A key component of the air brake system is the air compressor itself. It is of the utmost importance that the compressor receive a CLEAN supply of air. The air supply is received from the engine air cleaner. Regular inspection should be made to ensure that the hose and fittings are air tight and securely fastened. Refer to Chapter 5 for air compressor information.

CAUTION
If any front suspension component requires removal, ensure the vehicle is jacked up until all load is removed from the front suspension. Place jacks under the frame rail only; not under a body component or assembly. Use jack stands to secure the vehicle after adequate height is achieved.

WARNING
Jack stands must be of sufficient strength to support the vehicle.

WHEEL BEARINGS

The front wheel bearings should be removed, cleaned, inspected, and lubricated once each year or after 12,000 miles, whichever occurs first. See an authorized dealer or refer to the applicable shop manual, available from the manufacturer, for wheel bearing replacement information.

Wheel Bearing Adjustment

Rockwell Axles

Tapered wheel bearings have a slightly loose feel when properly adjusted. They must NEVER be preloaded; preloading causes damage to the roller ends. If there is less than 0.001 inch or more than 0.010 inch end play, the bearing is not properly adjusted. Use the following procedure to accurately adjust the front wheel bearings on the Rockwell axles.

NOTICE
Bearings must NEVER be "preloaded". Preloading causes premature failure of bearings and damage to the roller ends.

NOTICE
Failure to obtain end play as specified will cause bearing overload and premature failure.

1. Set the parking brake. Jack up the front wheels of the coach and properly block and secure the axles to jack mounts.
2. Remove the hub caps and loosen one of the large bearing nuts.
3. Using a torque wrench, tighten the adjusting nut to 100 lb ft (136 N•m) while rotating the wheel in both directions to be sure all bearing surfaces are in contact.
4. Loosen the nut completely and then re-torque to 50 lb ft (68 N•m) while rotating the wheel.
5. Back the adjusting nut off 1/6 turn to 1/8 turn to obtain a bearing end play of 0.001 to 0.010 inch. Tighten the locking nut back down to the adjusting nut.
6. Measure end play and readjust if necessary.
7. Replace the hub cap, unblock the vehicle, remove the jacks, and lower the vehicle to the ground.

Dana Axles

Tapered wheel bearings have a slightly loose feel when properly adjusted. If there is less than .003 inch or more than .009 inch end play, the bearing is not properly adjusted. Use the following procedure to accurately adjust the front wheel bearings on the Dana axles.

NOTICE
Bearings must NEVER be "preloaded". Preloading causes premature failure of bearings and damage to the roller ends.

1. Set the parking brake. Jack up the front wheels of the coach and properly block and secure the axle on jack mounts. Make certain the wheels rotate freely.
2. Remove the hub cap and the outer nut and lock or cotter pin and lock. On axles with a cotter pin and lock, replace the lock if tabs are broken or cracked from wear or during removal.

3. Torque the adjusting nut to 50 lb ft (68 N•m) while rotating the wheel in one direction, then while rotating in the other direction. Back off the inner wheel nut 1/4 turn. This establishes .003 to .009 inch (.076 to .228mm) end play in wheel bearings.

4. Install lock against adjusting nut, with locking portion on either the flat side of the adjusting nut or on the peak of the adjusting nut. If the lock does not align with the adjusting nut, tighten the nut to the first position of alignment and install the lock.

5. Install the outer nut and torque to 125-150 lb ft (169-203 N•m). Rotate the wheel in both directions. The wheel must rotate freely without binding. Bend the locking tab out against the flat side of the locking nut.

WHEELS AND TIRES

Use a proper sized torque wrench when installing wheels. Hand tightening or use of a power impact tool can result in improper installation torques. Proper torques will help prevent loosening of the wheel stud nuts and eliminate excessive stress placed on the stud bolts.

The factory installed tires and wheels are designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures. Correct tire pressures and driving techniques have an important influence on tire life. Heavy cornering, excessively rapid acceleration, unnecessarily sharp braking and failure to maintain correct suspension alignment contribute to increased tire wear and shortened tire life.

WARNING
The warranty extended on the tires installed on your chassis is that of the tire manufacturer. Claims or problems should be discussed with the manufacturer or a local representative.

Tire Inspection And Maintenance

Front and rear tires perform different jobs and can therefore wear differently depending on the type of roads driven, individual driving habits, loads carried, etc. To obtain maximum tire life, tires should be inspected regularly as shown in the Maintenance Schedule (Appendix D). If irregular tire wear is found, the tires should be inspected and rotated, and the cause of the uneven wear discovered and corrected. Be certain to check wheel nut tightness (using a torque wrench) and adjust tire pressures, front and rear, after rotation. Recheck the torque at 100 miles and again at 1,000 miles of operation after the tires are rotated. Wheel stud nut torques should be routinely checked every 6,000 miles.

The outer tire on a dual wheel will skid or drag in a turn because of the difference in the turning radii of the inner and outer tires. This results in faster wear on the outer tire. In general, the tire with the largest diameter (or least wear) should be positioned on the outside of each dual wheel. When your motor home is operated continuously on high crowned roads, increase air pressure from 5 to 10 PSI in the outside tire of each dual to improve tire life.

The "X" method of tire rotation is allowed with radial tires if rotation is necessary. Due to their design, radial tires tend to wear faster in the shoulder area, particularly on the front axles. This makes regular rotation especially important to maximize tire life.

With dual tire installations, it is recommended that the circumference of each tire being installed on the rear axle be measured with a steel tape. If all tires are not the same size, the two larger tires should be installed on one side and the two smaller tires on the other side.

Tire Inflation Pressure

Improper tire inflation pressures for the load that the motor home is carrying can adversely affect tire life and vehicle performance characteristics. Excessively low air pressure can result in tire overloading, abnormal tire wear, adverse vehicle handling, and reduced fuel economy. The tire flexes more and can build up excessive heat, weakening the tire and increasing susceptibility to damage or failure. Excessively high air pressure can result in abnormal wear, harsh vehicle ride, and increased susceptibility to damage from road hazards. Lower inflation pressures should be used only with reduced vehicle load.

The load figures are in pounds per tire. Factory installed tires are Michelin XZA radials with a 12 ply rating and an index of 133. The wheels are 22.5" by 6.75". The maximum pressure, with radial tires, is 95 PSI. An optional tire installed by Gillig is the Michelin 255/80R-22.5. The index is 135 and the maximum load is 5200 lbs.

The maximum cold inflation pressure for the factory installed tires is noted on the sidewall of each tire. Tires should be inflated to match the weight to be carried. For partial or uneven load distributions (front-to-rear) proper tire inflation pressure can be determined by following the next procedure.

To determine the load carried by each wheel and tire, weigh the motor home in two stages. First, position the vehicle with only the front wheels on the scale and take a weight reading. Divide this reading by 2 to determine the load carried by each front tire/wheel. Next, position the vehicle with only the rear wheels on the scale and take a second weight reading. Divide this second reading by 4 to determine the tire/wheel loads for the rear wheels. Now, inflate the tires to the proper pressures as determined by the load.

After determining the load on each tire by weighing the vehicle on a scale, the cold inflation pressures for the actual tire loads can be obtained from the Tire/Wheel Load and Inflation Pressure Chart. (See Table 4-1).

Tire Size	Load Range	65	70	75	80	85T	90	95	100	105
Front 9R22.5 XZA	F	3320	3500	3700	3900	4050	4310	4500		
Rear	F	3110	3260	3470	3670	3835	4050	4220		
Front 255/80R-22.5 XZU	F			4130	4410	4740	4960	5200		
Rear	F			3815	4080	4320	4575	5810		
Front 10R22.5XZA	F			8510	8980	9450	9925	10300		
Rear	F			15655	16525	17395	18265	18960		
Front 10R22.5XZY	F			8510	8980	9450	9925	10300	10860	11020
Rear	F			15655	16525	17395	18265	18960	19980	20230

Table 4-1. Tire/Wheel Load and Inflation Pressure

Wheel And Tire Balancing

It is important for tire wear, vehicle ride, and handling ease, to maintain proper balance of wheel and tire assemblies. This may be accomplished by either type of balancing system in current use: "on the vehicle" or "off the vehicle" (dismounted). The "on the vehicle" type is the more desirable because all rolling components (brake drums, bearings, seals, hubs, etc.) are included in the balancing procedure and thereby any existing imbalance is corrected. Due to the specialized equipment required, wheel and tire balancing should be performed by a qualified service facility.

Tire Replacement

The use of the incorrect size or type tire may affect load carrying capacity, ride, handling, speedometer/odometer calibration, vehicle ground clearance, and tire clearance to the body and chassis components. If replacing only a single tire, it should be paired on the same axle with the least worn tire.

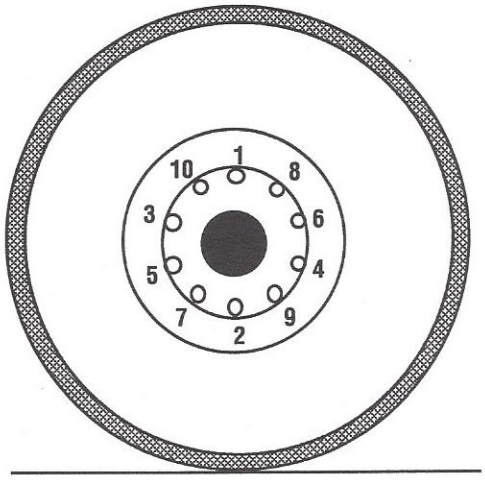

Figure 4.3. Lug Nut Tightening Sequence

WARNING
Do not mix different types of tires, such as radials, bias, and bias-belted tires on the same vehicle, except in emergencies. Vehicle handling may be seriously affected and may result in loss of control. Similar tread designs should be used.

Wheel and Stud Bolt Replacement

When one stud bolt is broken on an axle, the broken bolt plus the adjacent bolt on each side should be replaced. The additional stress placed on the adjacent bolts weakens them and is the reason for recommending their replacement.

WARNING
Do not change from polished aluminum wheels to steel wheels without first checking with the coach manufacturer or the Gillig Corporation. Failure to also change the mounting hardware when changing wheel types could cause an unsafe operating condition.

Lug nuts should be tightened with a torque wrench only, not by hand or with an impact wrench. The **proper torque is 425 lb-ft** on all lugs, front or rear, inside or outside. The proper tightening sequence is provided in Figure 4.3.

If you have polished aluminum wheels on your chassis be sure, when remounting wheels, to center and l tighten the first two or three lug nuts. This modified procedure is to prevent the steel lug nuts from dama and deforming the holes in the aluminum wheels. After the first three are hand tightened and seate remainder can be tightened down with a wrench.

DISK WHEEL TROUBLESHOOTING

Problem	Appearance	Probable Causes	Repair
Bolt hole cracks.	Cracks starting at the bolt hole and radiate outward, usually in a 45° angle.	Loose wheel nuts; improper installation; use of improper attachment parts; mounting area of wheel not flat.	Do not return to service; review installation and service procedures; Inspect attachment parts for proper size and type, and for wear.
Bolt hole-to-bolt hole cracks.	Cracks run circumferentially from one bolt hole to adjacent hole.	Loose wheel nut; insufficient wheel support; improper mounting procedure; mounting area of wheel not flat; use of improper attachment parts.	Do not return to service; review torquing program and proper torque level; inspect hub drums and attachment parts for proper size, type, and wear.
Bolt hole to center hole cracks.	Cracks running from a bolt hole to the center hole of the disc.	Loose inner cap nuts contacting outer dual wheel; foreign material between wheel mounting surface and hub or drum preventing flush contact.	Do not return to service; loosen outer cap nut first when retorquing inner cap nut; make sure mating surfaces are flat & clean.
Bolt hole-to nave cracks.	Cracks starting in a bolt hole and progress toward nave of the disc.	Exceeding wheel load capacity.	Do not return to service; check load rating of wheel vs. actual service load.
Bolt hole to hand hole cracks.	Cracks that start in a bolt hole and progress toward a hand hole.	Exceeding wheel load capacity. vice; check load rating of wheel vs. actual service load.	Do not return to ser-
Hand hole cracks.	Crack beginning at hand hole.	Wheel load capacity exceeded.	Do not return to service; check load rating vs. actual service load.

Problem	Appearance	Probable Causes	Repair
Wallowed or elongated bolt holes.	A gross distortion of the bolt hole, typified by bolt hole elongation and extrusion of metal from chamfer surface.	Loose wheel nuts; improper torquing; use of previously damaged wheel; buildup of dirt, rust, or paint.	Do not return to service; review installation/service procedures and torque levels making sure mating surfaces are clean and flat; do not use previously damaged wheels.
Worn bolt hole chamfers.	A general worn condition in bolt hole chamfers.	Overtorquing; rust; extended use.	If chamfer contour mates with nut, clean wheel and place it back in service; if wear is severe, so that area between chamfers is worn away to less than 1/16 in. (about thickness of a dime), wheel should be scrapped; review torque program.
Circumferential cracks between bolt holes.	Cracks that begin between bolt holes and progress toward them, but do not extend from one bolt hole to next.	Improper installation; insufficient drum or hub backup; improper identification stamping; worn mating surface; corrosion and/or abrasive environments exaggerate this condition.	Do not return to service; review torque program; check mating surfaces and hub backup; review service application of wheel.
Circumferential cracks on mounting area of hub-piloted wheels.	Cracks that start at the edge of the flange nut.	Exceeding wheel load capacity; improper attachment hardware; insufficient hub or drum backup.	Do not return to service; review torque program; check for correct , worn, damaged hardware; check for proper hub for proper backup; check load rating of wheel vs. actual service load.
Distorted bolt hole chamfers.	Distortion or step in bolt hole chamfer.	Improper or worn attachment hardware; over-torquing or inner cap nut; improper installation; loose inner cap nuts contacting outer dual wheel.	Do not return to service; check retorquing program, torque levels, and attachment hardware; loosen outer cap nut before retorquing inner cap nut.

Problem	Appearance	Probable Causes	Repair
Burrs around bolt hole.	Raise metal around bolt hole.	Overtorquing of outer cap nut; improper attachement hard-ware.	If chamfer contour mates with nut, clean wheel, remove burrs, and place back in ser-vice; if chamfer is worn away, scrap wheel; review torque program.
Excessive wear or corrosion on disc face.	Abrasive wear, pitting, and corrosion on disc mounting surface.	Improper installation; insuf-ficient hub or drum backup; worn mating surface; corrosion and/or abrasive environments exaggerate condition.	Do not return to ser-vice; review torque program; check mating surfaces and hub bsckup; review service application of wheel.

Notes