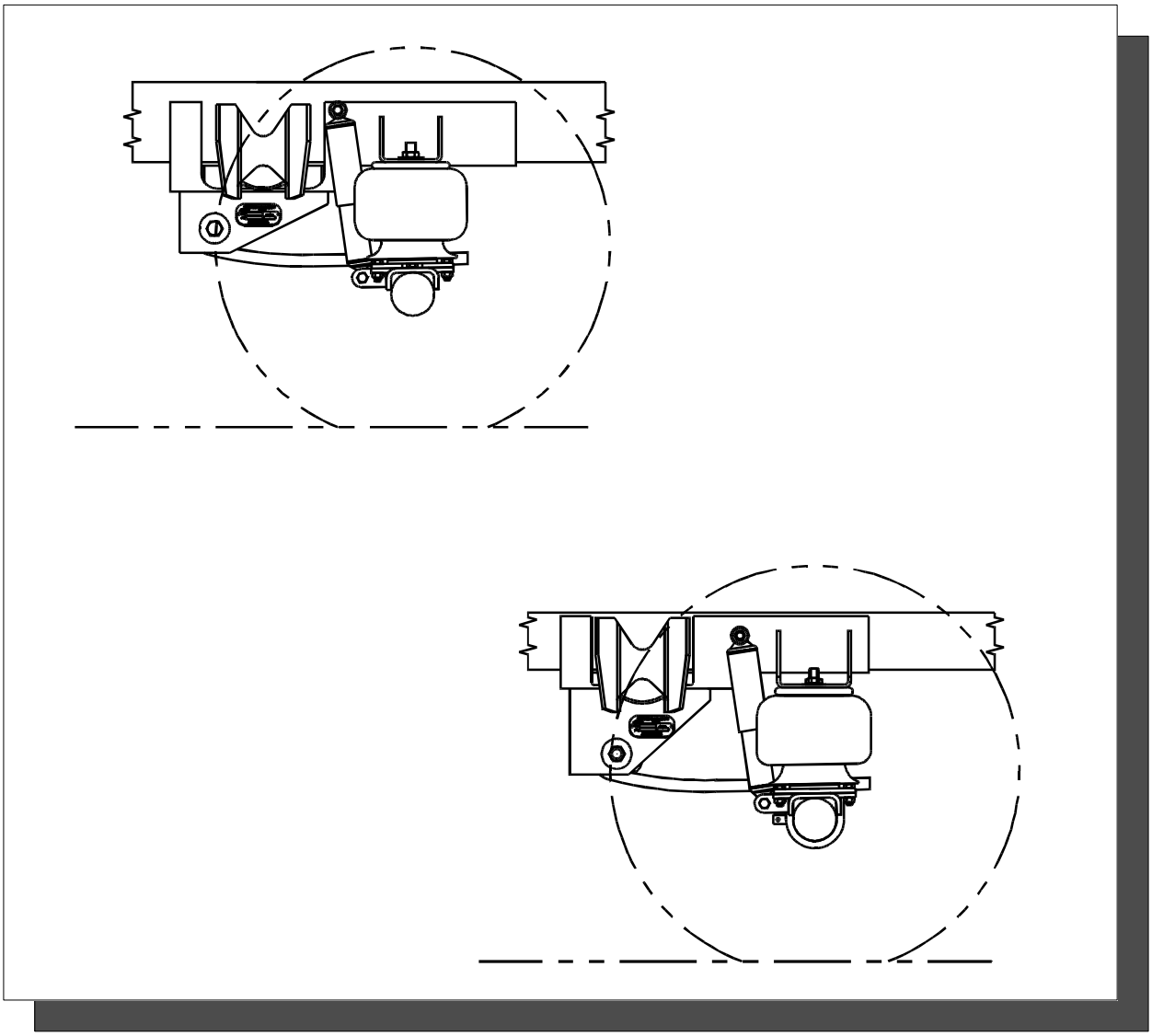
GRANNING AIR SUSPENSIONS

AIRGLIDE® TAG AXLE
AIR SUSPENSION



RT500F53E AND RT500C30E
OWNERS MANUAL

D9759 Rev. C
05/07/07

CONTENTS

INTRODUCTION

Congratulations on your purchase of a Granning ***AIRGLIDE***® tag axle air suspension system. Founded in 1948 by one of the pioneers of air suspensions, Granning Air Suspensions supplies drive and tag axle air suspension systems to a variety of original equipment manufactures as well as to the aftermarket industry. The R-Series, trade named ***AIRGLIDE***®, are utilized by OEM customers in applications such as recreational vehicles, shuttle bus, trailer, chassis builders, Type I and III ambulances and class 3 through 8 truck applications. This product line now exceeds 25 models that cover all major chassis utilized in the above applications.

What is a Tag Axle Air Suspension

A tag axle suspension is an auxiliary non-driving axle used in conjunction with the rear driving axle. A tag axle, always located behind the drive axle, is added to a vehicle to increase payload capacity, while maintaining the optimal drive and steer axle load distribution.

A Granning ***AIRGLIDE***® tag axle air suspension system consists of an axle, a vacuum/ hydraulic brake system, an air control system, air springs, shock absorbers, trailing arm beams, brackets, and mounting hardware. In general, the air suspension works by maintaining a constant ride height by adjusting the amount air pressure in the air springs. This allows the vehicle to remain level, regardless of loading. By varying the amount of air pressure in the springs, a comfortable ride is maintained whether lightly or heavily loaded. This is the major difference between an air suspension and a conventional steel spring suspension. The steel spring suspension is usually designed for heavily loaded condition and thus yields a harsh ride in lightly loaded conditions. In addition, the steel spring suspension does not maintain a constant ride height under varying load conditions.

By maintaining a constant ride height, the horizontal center of gravity, steering geometry, and even the headlights remain level. The benefits of an air ride are:

1. Driver/passenger comfort,
2. Protection of cargo, chassis and body components,
3. Reduced stress fatigue to chassis frame rails.
4. Greater stability and control.

Air Control Systems

At the heart of a Granning ***AIRGLIDE***® tag axle air suspension system is the air control system. Depending the actual system used, the air control system will either provide the ability to manually adjust the amount of air pressure in the air springs or automatically control the suspension ride height.

Automatic Air Control System

The major components of an automatic air control system consist of an air compressor, reservoir tank, height control valve, and air spring. The operation of the system is simple. The compressor supplies air to the tank which operates between 95 - 125 psi. Air pressure from the tank is reduced or "regulated" to 78 psi. to the height control valve. The height control valve supplies air to or depletes air from the air spring via a mechanical linkage based on a given load. The pressure changes in the air spring but the height remains the same, thereby giving the optimum ride regardless of load.

A system with a single height control valve supplies both air springs simultaneously while a dual height control valve system supplies each air spring separately. The dual system increases the sensitivity of side-to-side distributions of axle loading. A schematic of each system can be found in the Air Control System Parts List section. See Automatic Air Control System – Control Panels and Operation section.

Located on the bottom of the air tank assembly, is a heated moisture ejector valve. This valve automatically releases accumulated water whenever the air tank pressure drops 15 psi or more. To help eliminate any ice build up, the valve is also heated. However, in most applications, a drop of 15 psi or more in the air tank is not seen regularly. Therefore, a pull cable is provided to manually release accumulated water. The pull cable is usually found near the fuel filler or between the drive and tag axle tires, however, please check with your vehicle's manufacture for the exact location. Regardless of the vehicle application, this pull cable should be operated at least once a day to prevent water damaging the air system.

Optional "kneeler" or exhaust valve(s) may be plumbed between the air springs and the height control valve(s). When power is applied to these valves, they shut off air supply from the height control valve to the air springs and exhaust air from air springs.

As long as power is supplied to the “kneeler” valve, usually through the “exhaust” position of the “inflate/exhaust” switch, the air springs will remain deflated, unloading the tag axle. Removing power to the “kneeler” valve allows air to flow from the height control valve to the air springs and shuts off exhaust from the air spring, thus inflating the air springs. Systems with dual height control valves require two “kneeler” valves, one between each air spring and height control valve, if the exhaust option is equipped.

Another option available to automatic air control systems is a remote fill kit. This option may be plumbed between the height control valve and the air springs (or “kneeler” exhaust valves if equipped). If for any reason the compressor fails to operate, air, as supplied through any service station air fill, can be added to the air springs for “limp-home” capability. **Caution**: This is only to be used in emergency situations. Components must be serviced to prevent further damage.

Finally, optional warning light sensors or air pressure gages may be plumbed to one of the air springs.

Manual Air Control System

The major components of the manual air control system consist of an air compressor, fill valve and gage assembly, and air springs. Air pressure in the air springs is adjusted via the fill valve and gage assembly. Air pressure in air springs should be adjusted to maintain a specified ride height and must not exceed 78 psi. A schematic of a Manual Air Control System can be found in the parts list section. See Manual Air Control System -- Control Panel and Operation section.

Brake System

The basic tag axle brake system consists of a vacuum booster/master cylinder, synchronizing valve, and a plumbing kit, which includes all lines and fittings. Please refer to the Brake System Parts List section for identification of parts.

Plumbing

Vacuum supplied from the engine manifold, or vacuum pump, is routed through a normally closed check valve and then connected to one port of the top chamber of the synchronizing valve through flexible hoses. The check valve prevents depletion of vacuum in the synchronizing valve and booster due to temporary loss of supply vacuum. The other port of the upper chamber of the synchronizing valve is then connected to the master cylinder side of the vacuum booster. The rear of the booster and the lower chamber of the synchronizing valve are connected by a separate line. The synchronizing valve is connected to the service brake hydraulic supply. The master cylinder of the booster is connected to the tag axle with hydraulic lines.

Operation

With the engine running and with no brake pedal pressure, a vacuum exists throughout the system. When the brake pedal is applied, the hydraulic pressure in the synchronizing valve forces a poppet to open which allows atmospheric air to enter the bottom chamber of the valve. Note that the synchronizing valve does not actuate the tag axle brakes until a specified service brake pressure is realized and it regulates the brake actuation based on a service brake pressure. Since the bottom chamber of the valve is connected to the rear of the vacuum booster, the vacuum on this side of the booster chamber is lost. The vacuum on the front side of the booster chamber is maintained and this pressure differential causes a piston to move in the booster’s master cylinder which applies the hydraulic pressure to the brakes through the connecting hydraulic line. When the pedal is released, the poppet in the synchronizing valve is closed, and by internal passages, the air in the rear of the booster chamber is removed. This restores a vacuum which is equal to the vacuum in the front part of the booster chamber. The pressure balance allows the booster’s master cylinder piston to be forced back to its original position by a return spring and the hydraulic pressure to the brakes is released.

AUTOMATIC AIR CONTROL SYSTEM -- CONTROL PANELS

Description of the typical controls are found below. Note: some original equipment manufactures (OEM) will use controls integrated into the instrument panel. While the appearance may differ, the operation and description are consistent with below.

Power ON/OFF Switch

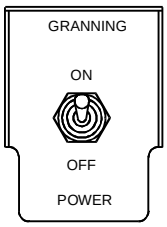


Figure 1: Control Panel Assembly, 5016, with Power Only

This master switch turns the power off and on to the compressor and other electrical components of the tag axle suspension. To activate the compressor and other electrical components, move the switch to "ON".

Exhaust/Inflated Switch (Optional)

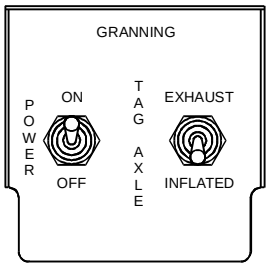


Figure 2: Control Panel Assembly, 4555, with Power and Kneeler Option

If the system is equipped with an optional "kneeler" exhaust valve(s), the control panel will have an Exhaust/Inflated switch. Moving the switch to "Exhaust" position, exhausts all air from the air springs. While the switch is in the "Exhaust" position, the air springs will remain deflated. Exhausting air from the air springs may be need to:

- Assist in maintenance.
- Transfer more weight to the rear drive axle for increased traction.
- Restrict interference with vehicle leveling during operation of leveling jacks, when parked.

Caution: Only operate the exhaust feature while the vehicle is parked. Never exhaust the system while the vehicle is in motion.

To inflate the air springs, place the switch in the on "Inflated" position.

Air Spring Pressure Gage/Warning Light (Optional)

Granning Air Suspensions offers several option to monitor the condition of the air control system:

- 5703 Air Pressure Gage with Warning Light/Buzzer Kit
- 5895 Air Pressure Gage Kit
- 7371 Red/Green Air Pressure Gage Kit
- 7870 Low Air Pressure Switch Kit

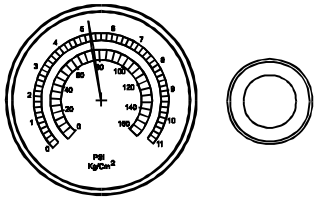


Figure 3: 5703 Air Pressure Gage Kit, with Warning Buzzer and Light

The 5703 Air Pressure Gage Kit will indicate air tank pressure. If air pressure falls below 20 psi, a warning light and buzzer will activate. Do not operate the vehicle in this condition. The buzzer/light will go off once 40 psi air pressure is reached.

The 5895 Air Pressure Gage Kit contains the same 0-160 psi gage found in the 5703 kit, but the warning light/buzzer are not included.

The 7137 Air Pressure Gage Kit notifies the vehicle operator of under inflated air springs. The gage will indicate two conditions: red zone for inadequate air pressure in the air springs, and green zone for adequate air pressure in the air springs. The vehicle should not be operated with the needle indicator pointing within the red zone.

A warning light or chime may be used with or in the place of the 7137 Gage Kit if the 7870 Low Air Pressure Switch Kit is used.

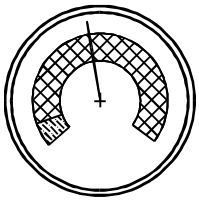


Figure 4: 7137 Air Pressure Gage Kit

AUTOMATIC AIR CONTROL SYSTEM -- OPERATION

Operation of the Granning ***AIRGLIDE***® tag axle suspension utilizing an automatic height control system is reached through various control panels. Depending upon options included with the suspension system, the control panel should be operated as follows:

Before operating the vehicle:

- Switch the power to "ON", if "OFF".
- Make sure the Exhaust/Inflate switch is in the "Inflated" position, if the suspension is so equipped.
- If equipped, check that the Air Spring Pressure Gage needle is in the green zone, or that the Low Pressure Warning Light is off.
- The vehicle is ready for operation.

Caution: Do not inflate the air springs over 78 psi and maintain a minimum of 5 psi at all times.

To exhaust the system, if the suspension is equipped with an exhaust option:

- Make sure the vehicle is parked.
- Move the Exhaust/Inflate switch to the "Exhaust" position.
- When exhausted, switch the power to "OFF" (if desired).

Note: The vehicle will remained kneeled only if the vehicle power remains on. Once vehicle power is shut off, the "kneeler" dump valve will switch back to the inflate position, thereby reinflating the air springs. If the vehicle needs to remain "kneeled" while parked, follow these steps:

- Follow the above steps to exhaust the system. Make sure to turn the suspension power switch to "OFF".
- While the vehicle power is still on and the suspension is off, release the air in the air tank by pulling the manual moiture ejection cable until the sound of air escaping ceases.
- Shut the vehicle's master power off.

Although the tag axle suspension master power switch can be left "ON", Granning recommends turning the system off while the vehicle is parked for an extended period to avoid battery drain.

To prevent water build up in the air system, operate the manual moisture ejection by pulling, and then releasing, on the pull cable at least once a day. The pull cable is usually found near the fuel filler, however, please check with your vehicle's manufacture for the exact location. Granning recommends to operation of this manual moisture ejection during vehicle refueling.

MANUAL AIR CONTROL SYSTEM -- CONTROL PANEL AND OPERATION

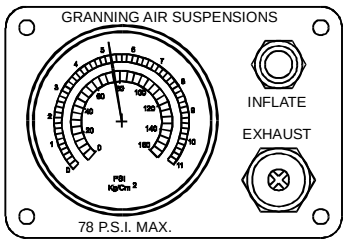


Figure 5: Control Panel Assembly with Push Button Controls

Power ON/OFF As described earlier, Granning offers a basic, manual alternative to the automatic systems. These suspension systems will not maintain a constant ride height, with varying load, and requires manual adjustment. The primary controls are as follow:

The power for this type of air control system is usually wired directly to the vehicle's master power. The system is active as long as the ignition is on.

Inflate Switch

This push button activates the compressor to add air to the air springs. Press this button until the desired ride height is achieved. Caution: Do not inflate to greater than 78 psi.

Release the button to begin vehicle operation.

Exhaust Switch

This push button releases air from the air springs. Press and hold to exhaust the air, using the adjacent air gage to indicate when all air pressure has been relieved. Exhausting air from the air springs may be needed to:

- Assist in maintenance.
- Transfer more weight to the rear drive axle for increased traction.
- Restrict interference with vehicle leveling during operation of leveling jacks, when parked.

Caution: Only operate the inflate or exhaust buttons while the vehicle is parked. Never adjust the system while the vehicle is in motion.

MAINTENANCE

General Maintenance	Service to be Performed	Mileage in Thousands								
		3	12	24	36	48	60	72	84	96
Front Pivot Connection	Check nut torque	X								
	Inspect for signs of looseness due to worn parts		X	X	X	X	X	X	X	X[2]
Axle Connection	Check "U"-bolt nut torque	X	X	X	X	X	X	X	X	X[2]
Shock Absorbers	Check mount nut torque	X								
	Inspect for signs of fluid leak, broken eye ends, loose fasteners, or worn bushings	X	X	X	X	X	X	X	X	X[2]
Air Springs	Inspect for proper clearance (1" minimum all around).	X								
	Check mount nut torque	X								
	Inspect for signs of chafing or wear	X	X	X	X	X	X	X	X	X[2]
	Check for air line fitting torque	X								
	Inspect for air leaks using soapy water solution	X								
Height Control Valve Linkage	Inspect for signs of bending, binding, or slippage	X	X	X	X	X	X	X	X	X[2]
Brake System	Inspect brake system, lines and hoses	X	X	X	X	X	X	X	X	X[2]
	Inspect tag axle brake fluid level	X	X	X	X	X	X	X	X	X[2]
Air Fittings and Air Lines	Inspect for air leaks using soapy water solution	X								
	Inspect for signs of chafing, cracking, or wear	X	X	X	X	X	X	X	X	X[2]
Wheels	Check lugnut torques[1]	X	X	X	X	X	X	X	X	X[2]
	Grease wheel bearings--use Texaco Starplex 2 or equivalent	X	X	X	X	X	X	X	X	X[2]

[1] Wheel lug nuts must be retightened to proper torque specifications as per the vehicle or chassis manufacturer's Owner Guide.

[2] Continue to perform specified maintenance every 12,000 miles.

MAINTENANCE RECORD

Name of Owner			Address of Owner
Date of Purchase	Name and Address of Dealer		
Model of Vehicle	Vehicle Identification Number		
Suspension Model Number:	Suspension Serial Number:		
Inspection and Maintenance Item	**Date**	**Mileage**	**Service Performed**

TORQUE SPECIFICATIONS

Most threaded fasteners are covered by specifications that define required mechanical properties, such as tensile strength, yield strength, proof load, and hardness. These specifications are carefully considered in initial selection of fasteners for a given application. To assure continued satisfactory vehicle performance, replacement fasteners used should be of the correct strength, well as the correct nominal diameter, thread pitch, length, and finish.

Most original equipment fasteners are identified with markings or numbers indicating the strength of the fastener. These markings are described in Figures 5 and 6. Attention to these markings is important in assuring that the proper replacement fasteners are used.

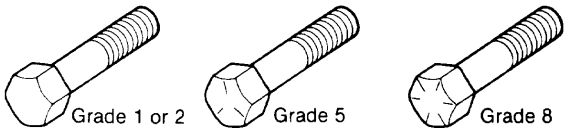
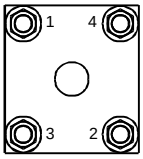
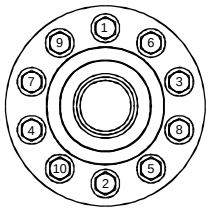
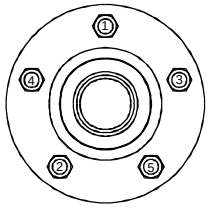


Figure 6: Grade Markings on Bolts

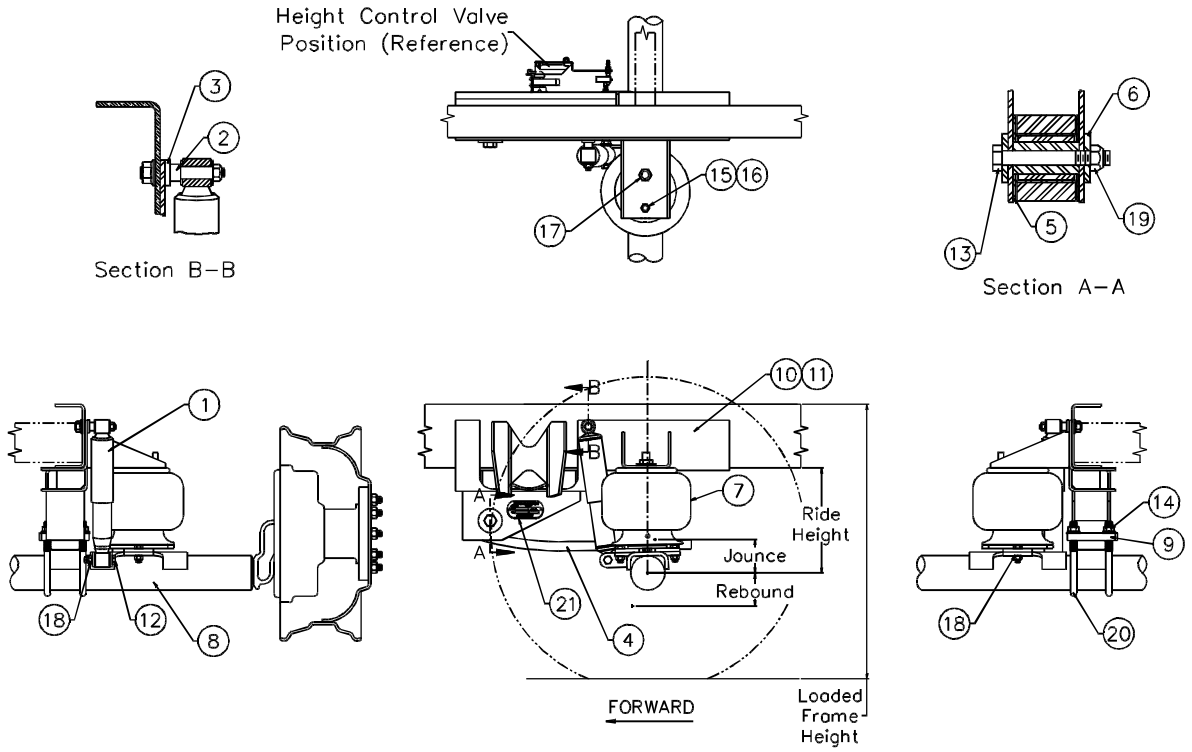
Grade	Lock Nut Grade B, F	Lock Nut Grade C, G
Identification	 3 Dots	 6 Dots

Figure 7: Grade Markings on Lock Nuts

Applications	**Nut Size**	**Torque Specification (Cleaned and Lubricated)**	**Torque Sequence (if required)**
Trailing Arm Beam Pivot	3/4-16 Grade C	200 ft.-lb.	N/A
Upper Shock Absorber Mount (frame attachment)	5/8-11 Grade G	180 ft.-lb.	N/A
Upper Shock Absorber Mount (shock attachment)	7/16-14 Grade C	40 ft.-lb.	N/A
Lower Shock Absorber Mount	1/2-20 Grade C	40 ft.-lb.	N/A
Air Spring Upper Mount	3/4-16 Grade 5 1/2-13 Grade 5	35 ft.-lb. 35 ft.-lb.	N/A
Air Spring Lower Mount Plate	1/2-20 Grade C	90 ft.-lb.	N/A
"U"-Bolt Nuts	5/8-18 Grade G	Step torque to: 50 ft.-lb. 100 ft.-lb. 150 ft.-lb. 180 ft.-lb. follow sequence for each step.	
Wheel Hub (RT500F53E)	9/16-18 Special	140 ft.-lb. (Dry Threads)	
Wheel Hub (RT500C30E)	5/8-18 Grade 8 90° Cone Nut Note: GM p/n 349071 clamping plate must be used.	Tighten in two steps: 140 ft.-lb. 175 ft.-lb. (Dry Threads)	

SUSPENSION PARTS LIST—RT500F53E

Item	Part No.	Description	Item	Part No.	Description
1	7489	Shock Absorber	12	113	1/2”-20 x 2-1/2”, Gr. 8, Hex Head Bolt
2	7081	Shock Absorber Mount Assembly	13	2405	3/4”-16 x 5-1/2”, Gr. 8, Hex Head Bolt
3	101510-P1	5/8” Hardened Flat Washer	14	4599	5/8”-18, Gr. G, Locking Flange Nut
4	7506	Spring Beam Assembly	15	8103323	1/2” Spring Lock Washer
5	4169	Bushing Spacer	16	8120378	1/2”-13, Gr. 5, Nut
6	4173	Washer Bearing	17	8129758	3/4”-16, Gr. 5, Jam Nut
7	7507	Air Spring and Mount Assembly	18	89422302	1/2”-20, Gr. C, Lock Nut
8	7490	Axle Assembly	19	89422308	3/4”-16, Gr. C, Lock Nut
9	7502	Clip Plate	20	6399	5/8”-18 “U”-Bolt
10	7492	Mounting Angle, Left Hand	21	2617	Serial Number Plate
11	7493	Mounting Angle, Right Hand			



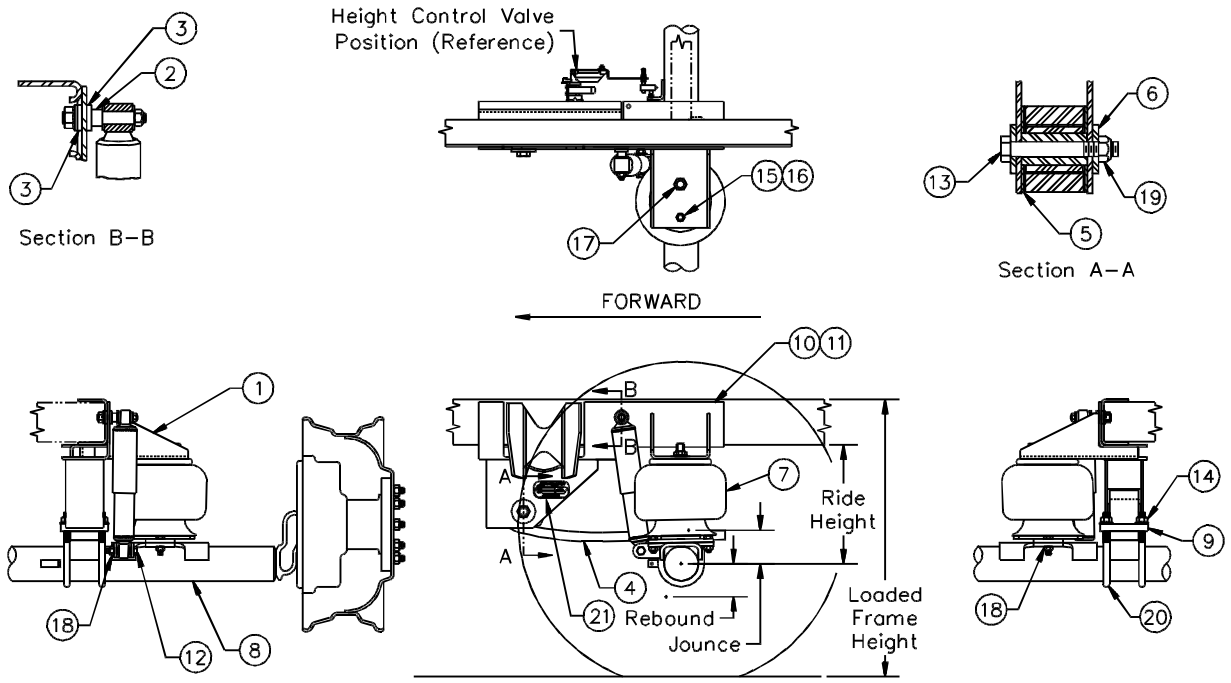
Note: The ride height is for the completed vehicle with body and components. See table below for correct vehicle dimensions.

Chassis	Granning Suspension Model	Loaded Frame Height*	Ride Height	Jounce Travel	Rebound Travel
Ford F-Super Duty Stripped Motor Chassis	RT500F53E	28.00”	10.70”	3.40”	3.37”

- Loaded frame height is measured from the ground (flat and level) to the top of the vehicle frame at the rear drive axle.

SUSPENSION PARTS LIST—RT500C30E

Item	Part No.	Description	Item	Part No.	Description
1	7489	Shock Absorber	12	113	1/2”-20 x 2-1/2”, Gr. 8, Hex Head Bolt
2	7081	Shock Absorber Mount Assembly	13	2405	3/4”-16 x 5-1/2”, Gr. 8, Hex Head Bolt
3	101510-P1	5/8” Hardened Flat Washer	14	4599	5/8”-18, Gr. G, Locking Flange Nut
4	7506	Spring Beam Assembly	15	8103323	1/2” Spring Lock Washer
5	4169	Bushing Spacer	16	8120378	1/2”-13, Gr. 5, Nut
6	4173	Washer Bearing	17	8129758	3/4”-16, Gr. 5, Jam Nut
7	7507	Air Spring and Mount Assembly	18	89422302	1/2”-20, Gr. C, Lock Nut
8	7785	Axle Assembly	19	89422308	3/4”-16, Gr. C, Lock Nut
9	7502	Clip Plate	20	6399	5/8”-18 “U”-Bolt
10	7786	Mounting Angle, Left Hand	21	2617	Serial Number Plate
11	7787	Mounting Angle, Right Hand			



Note: The ride height is for the completed vehicle with body and components. See table below for correct vehicle dimensions.

Chassis	Granning Suspension Model	Loaded Frame Height*	Ride Height	Jounce Travel	Rebound Travel
General Motors P30 Stripped Motor Chassis	RT500C30E	23.65”	12.14”	3.41”	3.38”

* Loaded frame height is measured from the ground (flat and level) to the top of the vehicle frame at the rear drive axle.

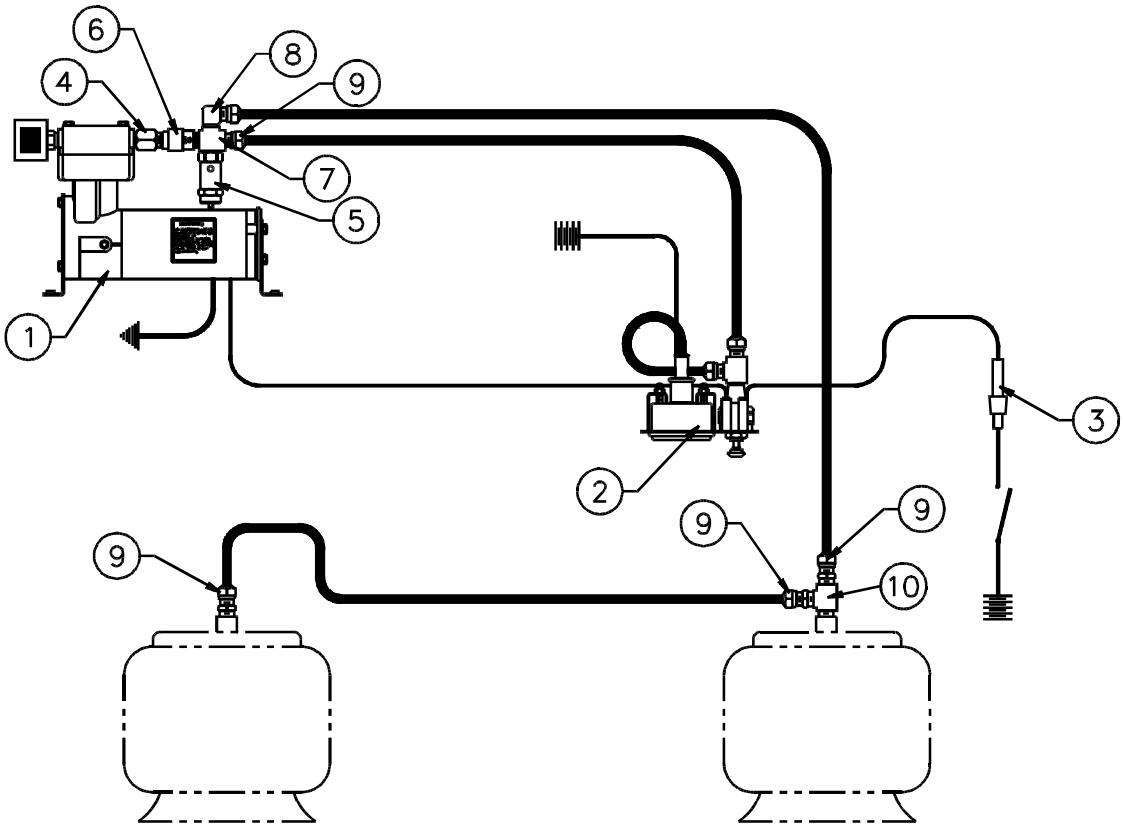
AIR CONTROL SYSTEM PARTS LIST

General Notes

1. Air line tubing should be 1/4" D.O.T. plastic air line tubing.
2. The tubing ends must be cut straight and inserted the full depth into the fittings, otherwise leaks will result. Check all connections for air leaks.
3. Protective air line loom is recommended.
4. All air line fittings to be brass air brake compatible--Parker NTA® or equivalent.
5. Check valve must be installed at the compressor air outlet with the arrow directed outward from the compressor head.

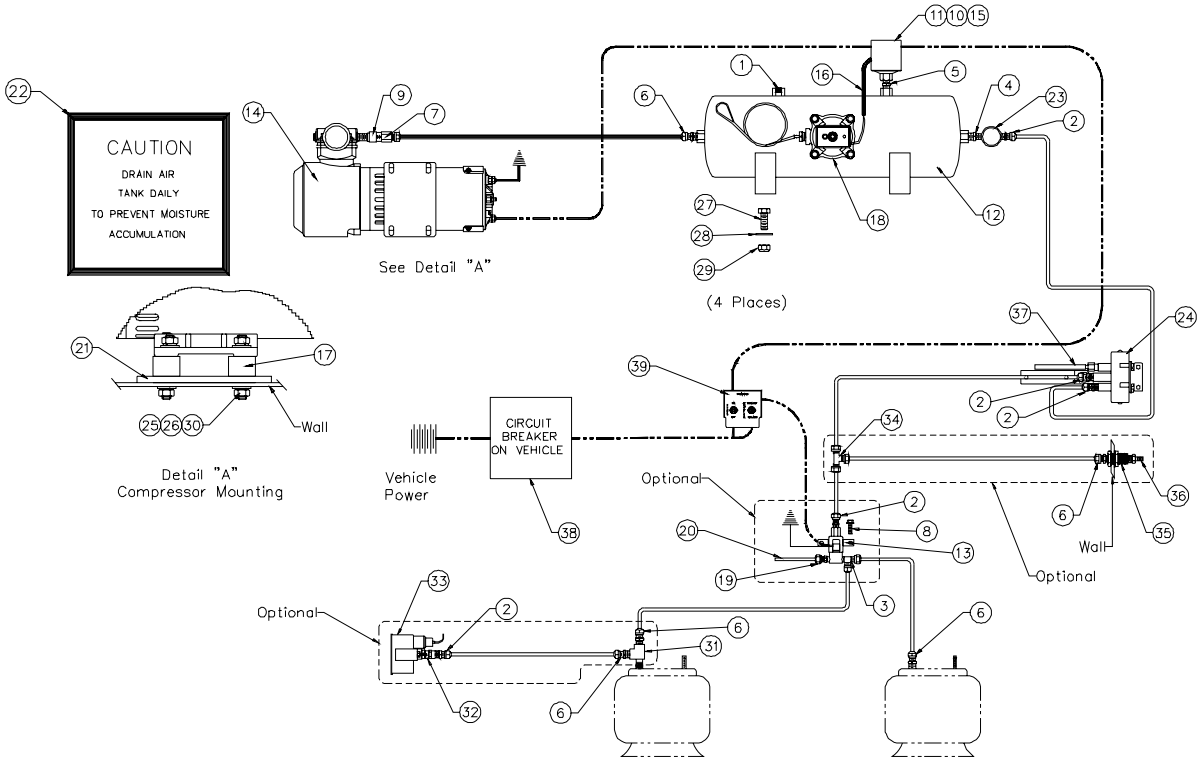
Manual System

Item	Part No.	Description	Item	Part No.	Description
1	2403	Air Compressor	6	4017	Check Valve
2	4306	Air Control Panel Assembly, Manual	7	0425	Cross, 1/4 FTP x 1/4 FTP x 1/4 FTP x 1/4 FTP
3	1926	40 Amp Fuse Assembly	8	0129	Elbow, 1/4 MPT x 1/4 Hose
4	0449	Adapter, 1/8 MPT x 1/4 FPT	9	0428	Connector, 1/4 MPT x 1/4 Hose
5	8076	Pressure Relief Valve	10	0441	Street Tee, 1/4 MPT x 1/4 FPT x 1/4 FPT



Automatic/Single Height Control Valve System

Item	Part No.	Description	Item	Part No.	Description
1	0141	Plug 1/4" MPT	21	6595	Mounting Plate
2	0416	Connector 1/4 T x 1/8 MPT	22	6700	Warning Label
3	0418	Tee 1/4 T x 1/4 T x 1/8 MPT	23	7466	Pressure Regulator
4	0422	Nipple 1/8 MPT x 1/4 MPT	24	5608	Height Control Valve
5	0424	Nipple 1/4 MPT x 1/4 MPT	25	8120214	5/16" Spring Lock Washer
6	0428	Connector 1/4 T x 1/4 MPT	26	8120393	5/16" Flat Washer
7	0599	Connector 1/4 T x 1/4 FPT	27	8181429	1/2"-20 x 1-1/4" Gr. 8 Hex Head Bolt
8	206	1/4"-20 x 3/4" Self Tapping Screw	28	89415543	1/2" Flat Washer
9	4017	Check Valve	29	89422302	1/2"-20 Gr. C Lock Nut
10	4398	Pressure Switch	30	89429048	5/16"-18 Gr. 8 Nut
11	5094	Grommet	31	0441	Street Tee 1/4 FPT x 1/4 MPT x 1/4 MPT
12	5099	Air Tank	32	0419	Coupling 1/8 FPT
13	707413-01	Kneeler Valve	33	7147	Lighted Air Gage Assembly
14	5188	Compressor	34	0197	Tee 1/4 T x 1/4 T x 1/4 T
15	5371	Terminal Connector	35	0183	Frame Coupling 1/4 FPT
16	5372	5/16" Loom	36	5351	Schrader Fill Valve
17	5392	Vibration Isolator	37	----	HCV Exhaust Hose Assembly (included with 5608)
18	5442	Heated Moisture Ejector Valve	38	7463	40 Amp Circuit Breaker (may be provided by OEM)
19	6115	Connector 3/16 HB x 1/8 MPT	39	Special	Control Panel (see previous sections)
20	6120	3/16" Tubing			

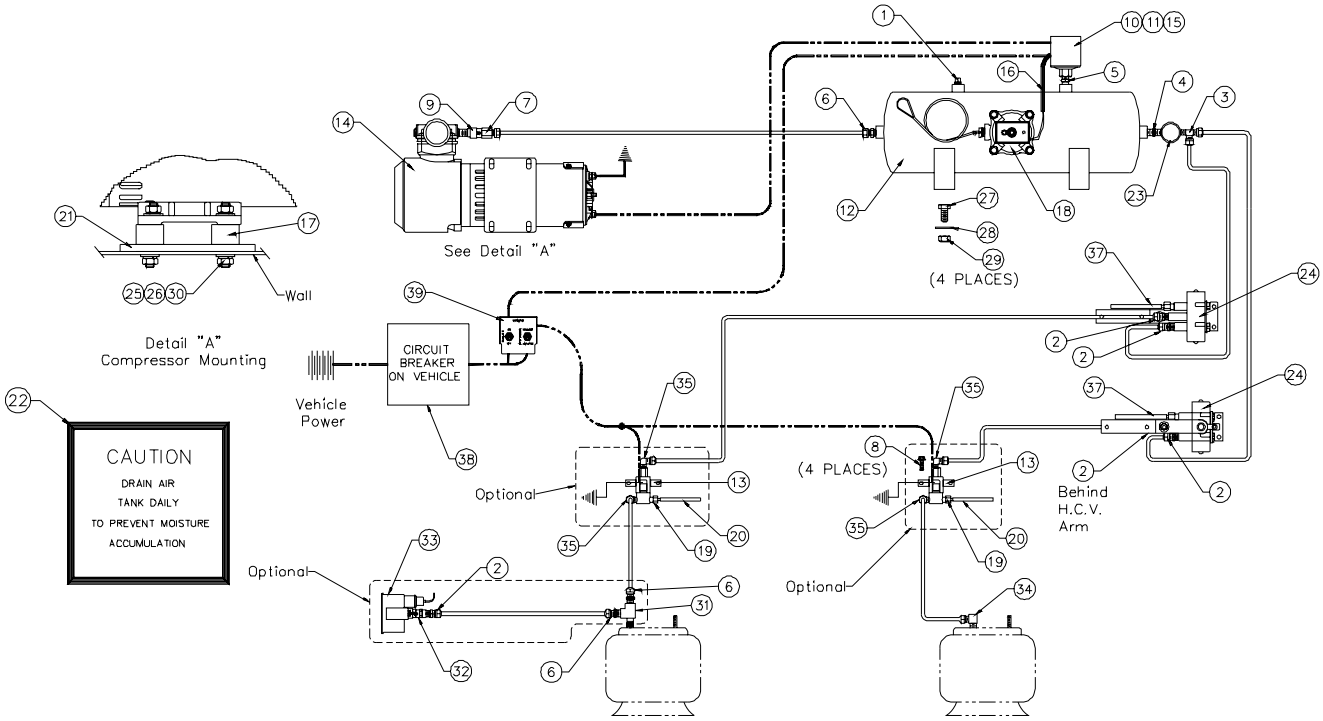


Options:

Remote Fill Kit, 6415, consists of items 6, 34, 35, and 36.
Pressure Gage Kit, 7371, consists of items 2, 6, 31, 32, and 33.
"Kneeler" Valve Kit, 5100, consist of items 2, 3, 8, 13, 19, and 20.

Automatic/Dual Height Control Valve System

Item	Part No.	Description	Item	Part No.	Description
1	0141	Plug 1/4" MPT	21	6595	Mounting Plate
2	0416	Connector 1/4 T x 1/8 MPT	22	6700	Warning Label
3	0418	Tee 1/4 T x 1/4 T x 1/8 MPT	23	7466	Pressure Regulator
4	0422	Nipple 1/8 MPT x 1/4 MPT	24	5608	Height Control Valve
5	0424	Nipple 1/4 MPT x 1/4 MPT	25	8120214	5/16" Spring Lock Washer
6	0428	Connector 1/4 T x 1/4 MPT	26	8120393	5/16" Flat Washer
7	0599	Connector 1/4 T x 1/4 FPT	27	8181429	1/2"-20 x 1-1/4" Gr. 8 Hex Head Bolt
8	206	1/4"-20 x 3/4" Self Tapping Screw	28	89415543	1/2" Flat Washer
9	4017	Check Valve	29	89422302	1/2"-20 Gr. C Lock Nut
10	4398	Pressure Switch	30	89429048	5/16"-18 Gr. 8 Nut
11	5094	Grommet	31	0441	Street Tee 1/4 FPT x 1/4 MPT x 1/4 MPT
12	5099	Air Tank	32	0419	Coupling 1/8 FPT
13	707413-01	Kneeler Valve	33	7147	Lighted Air Gage Assembly
14	5188	Compressor	34	0129	Elbow 90° 1/4 T x 1/4 MPT
15	5371	Terminal Connector	35	0417	Elbow 90° 1/8 MPT x 1/4 T
16	5372	5/16" Loom	36	----	This line intentionally left blank
17	5392	Vibration Isolator	37	----	HCV Exhaust Hose Assembly (included with 5608)
18	5442	Heated Moisture Ejector Valve	38	7463	40 Amp Circuit Breaker (may be provided by OEM)
19	6115	Connector 3/16 HB x 1/8 MPT	39	Special	Control Panel (see previous sections)
20	6120	3/16" Tubing			



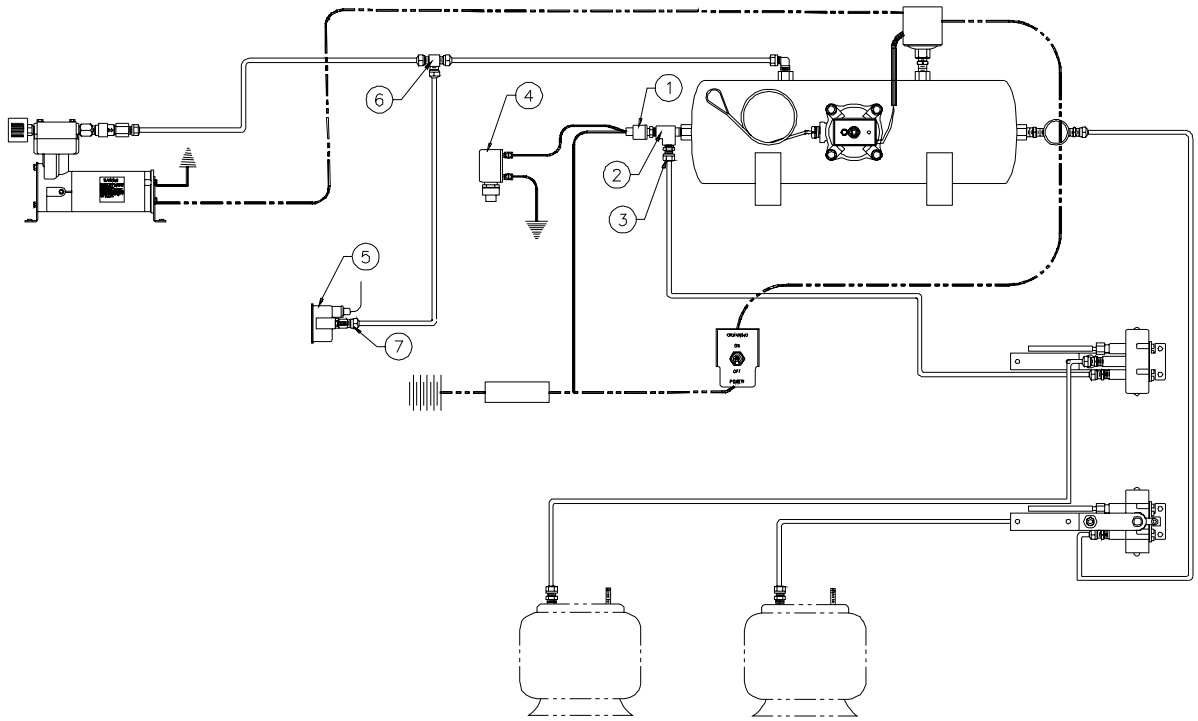
Options:

Pressure Gage Kit, 7371, consists of items 2, 6, 31, 32, and 33.

"Kneeler" Valve Kit, 5100, consist of items 2, 3, 8, 13, 19, and 20 (note, 2's are included in place of 35)

Optional Air Pressure Gage with Warning Light/Buzzer Kit

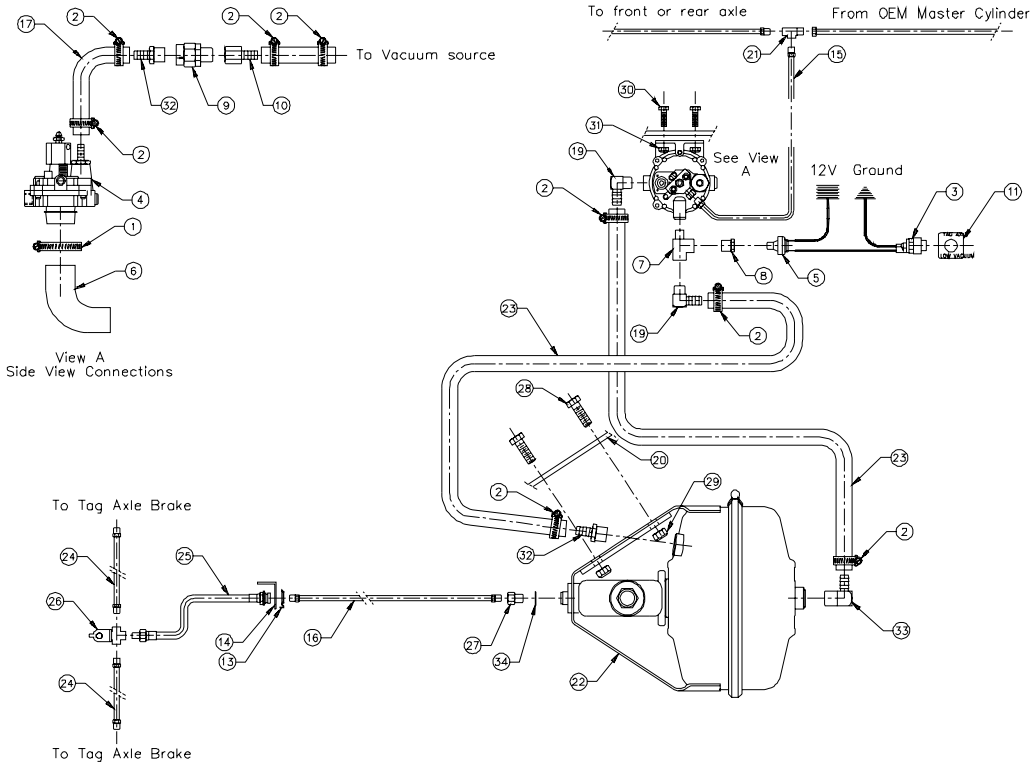
Item	Part No.	Description	Item	Part No.	Description
1	5402	Pressure Sensor, 25/40 psi	5	1069	Gage, Air Pressure 0-160 psi, Lighted
2	0441	Street Tee, 1/4 FPT x 1/4 FPT x 1/4 MPT	6	0197	Union Tee, 1/4 T x 1/4 T x 1/4 T
3	0428	Connector, 1/4 T x 1/4 MPT	7	0131	Connector, 1/4 T x 1/8 FPT
4	5401	Alarm, Dual (Light and Buzzer)			



BRAKE SYSTEM PARTS LIST –
BRAKE KITS: 9776, 9777, 9778, AND 9779

Item	Part No.	Description	Item	Part No.	Description
1	104955	Hose Clamp 1 1/4" - 2 1/4"	19	6086	Hose Barb, 90°, 3/8" MPT
2	2016	Hose Clamp 3/4"	20	6087	Booster Bracket
3	400108	Indicator Light (Red)	21	6088	Tee, Inv. Flare, 1/4" MPT x 1/4" F x 3/16" M (Ford F53 front hook up), or
4	4871M	Vacuum/Hydraulic Synchronizing Valve		0619	Tee, Inv. Flare, M10 x 3/8"-24 F (Ford F53 rear axle hook up), or
5	5953	Low Vacuum Switch		6112	Tee, Inv. Flare, 1/2" M x 1/2" F x 3/16" F (GM C30 hook up)
6	6764	Hose, 90°	22	4816	Vac./Hyd. Brake Booster/Master Cylinder
7	6909	Street Tee, 3/8" MPT x 3/8" FPT x 3/8" FPT	23	4872	Vacuum Hose, 1/2" Dia. (48")
8	6910	Reducer, 3/8" MPT x 1/8" FPT	24	2984	Brake Line, 3/16" Dia. (40")
9	6911	Check Valve	25	2015	Flexible Brake Hose, (18")
10	6913	Hose Barb, 1/2" FPT x 1/2" T	26	0401	Brake Line Tee with Bracket
11	7134	Label (Low Vacuum)	27	0120	Master Cylinder Adapter
12	0630	Nipple, 3/8" MPT x 2" Long	28	8455028	1/2"-20 x 1 1/2", Gr. 8, Hex Head Bolt
13	5359	Brake Line Clip	29	89422302	1/2"-20, Gr. C, Lock Nut
14	6077	Frame Bracket	30	211	5/16"-18 x 1", Gr. 5, Hex Head Bolt
15	6078	Brake Line, 3/16" Dia. (66")	31	89422275	5/16"-18, Gr. B, Lock Nut
16	7696	Brake Line, 3/16" Dia. (318")	32	6912	Hose Barb, 1/2" MPT x 1/2" T
17	6080	Vacuum Hose, 1/2" Dia. (132")	33	0404	Hose Barb, 90°, 1/2" MPT x 1/2" T
18	6085	Union Tee, 3/8" FPT	34	4873	Copper Gasket

Note some components shown below may have been provided by the vehicle manufacture.

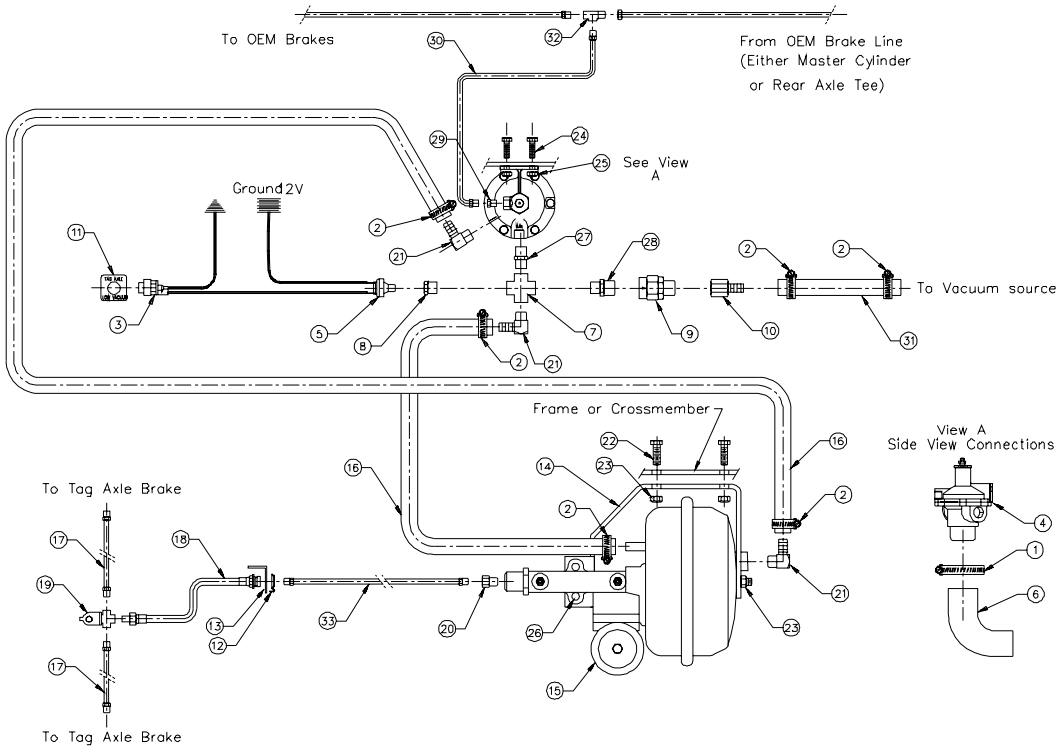


Note: The large 90° hose, item 6, attached to the bottom of the synchronizing valve, item 4, should be directed rearward and away from the rear tires to prevent road spray entering the synchronizing valve.

BRAKE SYSTEM PARTS LIST –
BRAKE KITS: 9769, 9770, 9773, AND 9774

Item	Part No.	Description	Item	Part No.	Description
1	104955	Hose Clamp, 1 1/4" - 2 1/4"	19	0401	Brake Line Tee w/ Bracket
2	2016	Hose Clamp, 3/4"	20	0400	Adapter, 1/4" MPT x 3/16" FPT Inv. Flare
3	400108	Indicator Light (Red)	21	0408	Hose Barb, 90° 3/8" MPT
4	7573	Synchronizing Valve	22	8455028	1/2"-20 x 1 1/2" Grade 8 Hex Head Bolt
5	5953	Low Vacuum Switch	23	89422302	1/2"-20 Grade C Lock Nut
6	6164	90° Hose	24	211	5/16"-18 x 1" Grade 5 Hex Head Bolt
7	7270	Cross, 3/8" FPT	25	89422275	5/16"-18 Grade B Lock Nut
8	6910	Reducer, 3/8" MPT x 1/8" FPT	26	8181666	7/16"-20 x 1" Grade 5 Hex Head Bolt
9	6911	Check Valve	27	7241	Nipple, 3/8" MPT
10	6913	Hose Barb, 1/2" FPT x 1/2" T	28	7636	Reducer, 3/8" MPT x 1/2" MPT
11	7134	Low Vacuum Label	29	0403	Connector, 1/8" MPT x 3/16" Inverted Flare
12	5359	Brake Line Clip	30	6078	Brake Line, 3/16" (66")
13	6077	Frame Bracket	31	6080	Vacuum Hose, 1/2" I.D. (DOT) (132")
14	7572	Brake Booster Bracket	32	6088	Tee, Inv. Flare, 1/4" MPT x 1/4" F x 3/16" M (Ford F53 front hook up), or
15	7574	Vacuum Brake Booster/Master Cylinder		0619	Tee, Inv. Flare, M10 x 3/8"-24 F (Ford F53 rear axle hook up), or
16	4872	Vacuum Hose, 1/2" I.D. (48")		6112	Tee, Inv. Flare, 1/2" M x 1/2" F x 3/16" F (GM C30 hook up)
17	2984	Brake Line, 3/16" (40")	33	7696	Brake Line, 3/16" Dia. (318")
18	2015	Flexible Brake Hose (18")			

Note some components shown below may have been provided by the vehicle manufacture.



Note: The large 90° hose, item 6, attached to the bottom of the synchronizing valve, item 4, should be directed rearward and away from the rear tires to prevent road spray entering the synchronizing valve.

BRAKE SYSTEM PARTS LIST -- 7490 AXLE COMPONENTS

Item	Part No.	Description	Item	Part No.	Description
1	4607	Spindle, 4” Drop (part of 7490 Axle Assembly)	*3C	4613	Inner Bearing Cup
2	6554	Kit--Hub & Drum Assembly, 10 Bolt	*3D	4617	Outer Bearing Cup
*2A	4613	Inner Bearing Cup	*3E	4618	Outer Bearing Cone
*2B	8455001	1/2”-13 x 2” Hex Head Bolt	*3F	4619	Spindle Washer
*2C	4647	Drum	*3G	4620	Spindle Nut
*2D	6552	Hub--10 bolt	*3H	8103388	Cotter Pin
*2E	3638	Mount Studs, 9/16”-18	*3J	4623	Grease Cap
*2F	4617	Outer Bearing Cup	4	4625	Brake Assembly, Left Hand (see Figure 8)
3	5485	Kit -- Bearing	5	4612	Brake Assembly, Right Hand (see Figure 8)
*3A	4611	Grease Seal	6	5697	9/16”-18 Wheel Nut
*3B	4610	Inner Bearing Cone			

Note: Part numbers marked by * are component parts of and available only in above kits.

BRAKE SYSTEM PARTS LIST -- 7785 AXLE COMPONENTS

Item	Part No.	Description	Item	Part No.	Description
1	7597	Spindle, 4” Drop (part of 7785 Axle Assembly)	*3C	4613	Inner Bearing Cup
2	6724	Kit--Hub & Drum Assembly, 10 Bolt	*3D	4617	Outer Bearing Cup
*2A	4613	Inner Bearing Cup	*3E	4618	Outer Bearing Cone
*2B	8455001	1/2”-13 x 2” Hex Head Bolt	*3F	4619	Spindle Washer
*2C	4647	Drum	*3G	4620	Spindle Nut
*2D	6723	Hub--5 bolt	*3H	8103388	Cotter Pin
*2E	6731	Mount Stud-5/8”-18	*3J	4623	Grease Cap
*2F	4617	Outer Bearing Cup	4	4625	Brake Assembly, Left Hand (see Figure 8)
3	5485	Kit -- Bearing	5	4612	Brake Assembly, Right Hand (see Figure 8)
*3A	4611	Grease Seal	6	190	5/8”-18 90° Cone Lug Nut (1” across flats)
*3B	4610	Inner Bearing Cone			

Note: Part numbers marked by * are component parts of and available only in above kits.

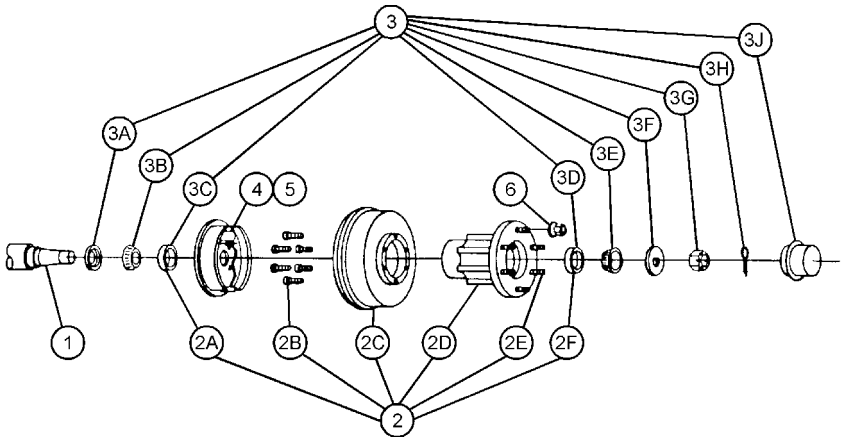


Figure 8: Hub and Drum Assembly

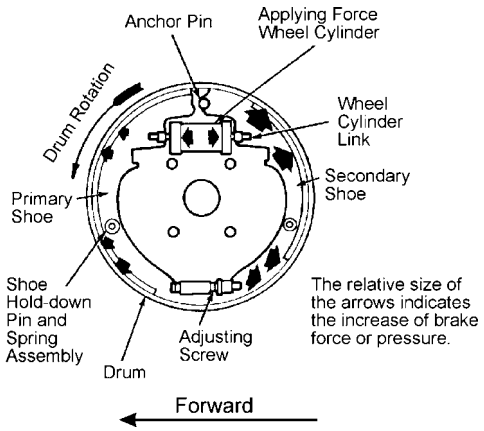


Figure 9: Brake Backing Plate Detail

Replacement Parts:

Part	Allied Signal/Bendix Part No.	
	Right Hand	Left Hand
Primary Shoe and Lining Assy.	3206499	3206498
Secondary Shoe and Lining Assy.	3206504	3206503
Wheel Cylinder Assy.	3203934	3203933

Note: A standard Bendix 12 x 3 Brake Kit can also be used.

BRAKE SYSTEM--BRAKE AND BEARING ADJUSTMENT

Bearing Adjustment:

1. Tighten the spindle nut to approximately 50 ft.-lbs. while rotating the hub to seat the bearings.
2. Loosen the nut one sixth of a turn or to the next locking position, whichever is less.
3. Make sure the hub turns freely with .001” to .010” of end play.
4. Install the cotter pin and bend the legs over to clear the grease cap.
5. Install the cap.

Brake Adjustment:

1. Remove the rubber plug from the adjusting port on the bottom of the backing plate.
2. With a screwdriver or a standard adjusting tool, rotate the star-wheel of the adjusting screw “down” to expand the brake shoes. Adjust the shoes out until the pressure of its linings against the drum make the wheel very difficult to turn.
3. Rotate the star-wheel in the opposite direction, “up”, 10 to 12 “clicks”. The drum should turn freely.
4. Replace the rubber plug in the adjusting port.

HEIGHT CONTROL VALVE AND LINKAGE MAINTENANCE

If height control valve adjustment is required, please follow the listed steps:

1. Secure the vehicle by blocking all wheels.
2. Determine the correct ride height of the suspension. See Suspension Parts List section for a listing of correct ride heights. Note: The ride height is measured at the center of the axle to the bottom of the frame directly above the axle.
3. Loosen the lock clamp on the upper end of the linkage rod.
4. Slide the connector up or down the linkage rod to achieve the correct ride height. The height control valve arm must be in a horizontal orientation after the system has stabilized and the correct ride height is achieved.
5. Retighten the lock clamp.

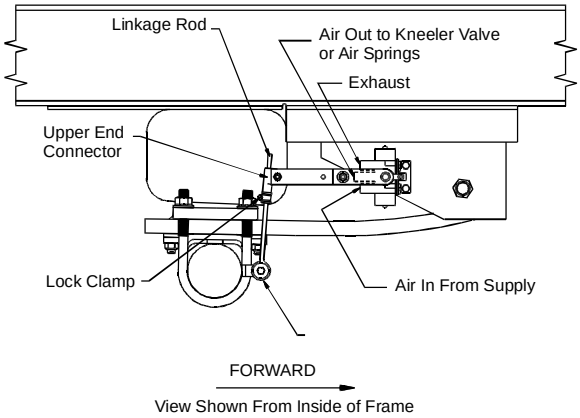


Figure 10: Height Control Valve

TROUBLESHOOTING

Tag Axle Suspension System--General

Symptoms	Possible Causes	Remedies
Excessive vehicle roll or lateral movement (side to side movement)	Loose or worn front pivot connection(s)	Tighten (see previous torque chart) or replace as required
	Worn out front pivot bushing(s)	Replace as required.
	Axle "U"-bolts loose	Tighten (see previous torque chart) or replace
Hard ride or axle bottoming out	Air suspension not turned on	Turn on air suspension
	Incorrect ride height	Adjust to current ride height (see previous section)
	Vehicle overload	Reduce drive axle load.
	Defective height control valve(s)	Replace height control valves are required
	Height control linkage disconnected or damaged	Reattach or replace are required
Tire hop or poor handling	Loose or worn shock absorbers	Tighten (see previous torque chart) or replace
Prematurely worn front tires	Incorrect ride height	Adjust to current ride height (see previous section)

Air Control System

Symptoms	Possible Causes	Remedies
Air compressor runs excessively	Air leak	Inspect all air lines, fittings, and air springs with a soapy water solution. Repair, retighten, or replace as required. Note: Plastic air lines must be cut square. See Air Control System Parts List (General Notes) for additional notes.
	Internal air leak in height control valve.	Insert exhaust tube into a cup of water and examine for bubbles. This will show evidence of both inlet and exhaust valve leaks. Replace components.
	Air tank pressure switch limits set incorrectly	Reset to instructions on inside cover of pressure switch located on the air tank or replace pressure switch. Limits should be 85 to 125 psi.
	Moisture ejector valve stuck open	Check and replace if necessary
	Check valve installed incorrectly	Arrow should point away from the air compressor head. Correct if necessary.
	Dump valve(s), or "kneeler(s)", leaking	Check and replace if necessary
	Height Control Valve stuck in the exhaust position.	Locate obstruction and remove or relocate interference.
Air compressor will not start	Inline fuse burnt or circuit breaker tripped	Replace or reset
	Pressure switch contacts burnt	Inspect and correct or replace as required
	Air compressor motor burnt out	Inspect and replace as required
	Disconnected or broken wire	Inspect and correct or replace if necessary

Brake System

Symptoms	Possible Causes	Remedies
When brakes are applied: - Brakes lock up - Brakes will not modulate - Brakes will not release - Brakes too harsh	Improper lining thickness or location	Install new shoes and linings
	Synchronizing valve piston stuck or binding	Replace synchronizing valve
	Brake adjustment not correct	Adjust brakes by backing off the adjustment screw
	Contamination in hydraulic system	Flush system and replenish brake fluid
	Improper brake fluid	Replace rubber parts (seals and cups) and fill with DOT 3 brake fluid
	Dirt under synchronizing poppet valve	Shield synchronizing valve air filter
	Incorrect booster	Install proper booster to be used on system.
	Synchronizing valve air filter restricted or clogged (bottom of valve)	Clean or replace air filter
	Blocked master cylinder	Open with compressed air or replace cylinder
	Loose, bent, or broken brake components	Replace components
	Out of round drums	Machine drums or replace
When brakes are applied: - Tag axle brakes not operating, - Insufficient braking force, - Slow response time	Air in tag axle hydraulic line	Bleed tag axle brake system
	Air in synchronizing valve supply line	Bleed line to synchronizing valve
	Check valve stuck closed or slightly open	Free up check valve or replace
	Booster vacuum lines reversed	Correct vacuum line connections
	Synchronizing valve air restricted or clogged (bottom of valve)	Clean or replace air filter
	Defective booster piston seals	Replace booster
	Defective booster diaphragm	Replace booster
	Moisture freezing in vacuum system	Shield synchronizing valve air filter and defrost.
	Low engine (gasoline) or pump (diesel) vacuum	Check all vacuum lines, vacuum tank, connections for leaks or pinched lines. Check vacuum pump (diesel). Repair or replace if necessary.
	Broken or kinked brake line	Repair or replace
	Brake adjustment not correct	Adjust brakes by backing off the adjustment screw
	Excessively worn brake linings	Replace shoe and linings
	Incorrect lining	Install correct shoe and lining
	Grease or fluid soaked lining	Repair grease seal or wheel cylinder. Install new shoe and lining.
	Seized master cylinder or wheel cylinder	Recondition or replace all cylinders and replace brake fluid
	Glazed lining	Reburnish or replace
	Excessive drum wear	Replace drum
	Overloaded vehicle	Reduce axle loading

Symptoms	Possible Causes	Remedies
When brakes are applied: - Brake make excessive noise	Brake shoes misadjusted	Adjust brake shoes
	Broken brake components	Replace components
	Incorrect brake components	Correct
	Brake shoes worn out	Replace brake shoes
When brakes are applied: - Brakes work initially, but gradually release, - Brakes work intermittently	Defective booster seals	Replace booster
	Defective vehicle master cylinder	Repair or replace vehicle master cylinder
	Defective booster diaphragm	Replace booster
	Moisture freezing in vacuum system	Shield synchronizing valve air filter and defrost
	Contamination in hydraulic system	Flush system and replenish brake fluid
	Out of round drums or cracked drums	Machine hubs or replace
	Grease or fluid soaked lining	Repair grease seal or wheel cylinder. Install new shoe and lining.
	Vacuum leak	Check all vacuum lines, vacuum tank, connections for leaks. Check vacuum pump (diesel). Repair or replace if necessary.

REPLACEMENT INSTRUCTIONS

NOTE: Due to the nature of service to be performed it is recommended that the work be done by a qualified mechanic.

For service parts, contact an authorized Granning service center.

WARRANTY

Granning warrants its R-Series suspensions to be free from defects in material and workmanship under normal use and service in the U.S. and Canada for 12 months or 24,000 miles whichever comes first.

As used herein, the term "normal use and service" means that the suspension will be installed, operated, inspected and maintained in accordance with the applicable Granning owner's manual, and any applicable vehicle owner's manual or instructions.

Adjustments

The starting date for the above warranty period is the date of purchase of the suspension by the first end user. Proof of such date is the responsibility of the first end user. If the purchase date is not established to Granning's satisfaction, the date of manufacture determined from the suspension system's serial number shall be used as the effective starting date. When adjustment is sought under this warranty, a claim should be made by contacting the distributor or manufacturer who installed the suspension, who will coordinate the fix, documentation, parts shipment, etc. directly with Granning.

Installer and End User Responsibilities

The installer is responsible for installing the product according to Granning's approved procedures; the installer is also responsible (either directly or through its agent/dealer) for providing a copy of Granning warranty and owner's manual to the end user, and for advising the end user of proper use, service and maintenance required for the product. The end user is responsible for operating, inspecting and maintaining the suspension according to the instructions in the Granning owner's manual and any applicable vehicle owner's manual, and for properly instructing all operators and maintenance personnel.

Limitations and Exclusions

No warranty applies in the event of: use of components, parts and/or accessories not obtained from or approved by Granning or which do not meet Granning quality and performance specifications; improper installation, maintenance or repair; misuse or abuse including but not limited to overloading; or unauthorized alterations or modifications.

The above warranties are subject to the “Warranty Limitations” and “Remedies” sections of Granning’s invoice terms and conditions.

This policy supersedes any previous warranty statements.

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