SERVICE MANUAL SECTION

USPS 4400 MODEL LIFT AXLE SYSTEM: International Supplement and Hendrickson Owner's Manual

Vendor: Hendrickson

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GENERAL DESCRIPTION

The air system on the USPS truck is comprised of the following four subsystems:

A. the brake system,

B. the ride height (suspension) system,

C. the suspension dump system,

D. and the tag axle lift system.

A brief overview of each subsystem is provided in this description section. A more detailed description of the operation of each subsystem is located in the OPERATION section.

BRAKE SYSTEM

The air brake system provides ABS on the front and rear main axles. As part of the ABS system, traction control is also provided on the drive axle. The tag axle brakes are controlled by the rear axle brake lines, but are not part of the ABS system. The major air system components of the rear brake system are:

A. the ATR-1 valve,

B. the modulator valves,

C. the drive axle service brake chambers,

D. the Quick Release Valve (QRV),

E. the lift axle brake relay valve,

F. the lift axle air tank,

G. and the lift axle service brake chambers.

RIDE HEIGHT (SUSPENSION) SYSTEM

The air suspension is controlled by a ride height control valve to provide a constant frame height regardless of vehicle loading. The air ride suspension adjusts to load changes automatically, providing a low rate suspension with a light or no load condition, and a higher rate suspension with heavier loads. The main air system component of the ride height (suspension) system is the ride height suspension valve.

SUSPENSION DUMP SYSTEM

The suspension dump system allows the vehicle's air suspension to be deflated without affecting the vehicles air supply. This feature allows the vehicle to be loaded or unloaded while resting on its axle stops. This feature then allows the air suspension to be reinflated to the preset ride height. Normally, the suspension dump system is controlled by a dash mounted switch, and controls both the primary air springs and the lift axle air springs. Under certain conditions the state of the suspension dump system is controlled by the ESC. When these conditions exist the suspension can deflate or inflate automatically. The main air system component of the suspension dump system is the ride height control valve.

TAG AXLE LIFT SYSTEM

The lift axle system is an auxiliary suspension system that can be raised to provide better driveability during light load conditions, or lowered to provide increased carrying capacity during heavy load conditions. The lift axle is designated as a 'tag' axle due to its location behind the drive axle. Normally, the state of the lift axle is controlled by the driver using two dash mounted switches. The driver is prompted by the ESC to raise or lower

the lift axle based on the load weight detected by the ESC. The driver prompts are in the form of two indicators (RAISE AXLE and LOWER AXLE) located in the Electronic Gauge Cluster. Under certain conditions the state of the lift axle system may be controlled by the ESC. When these conditions exist the ESC can command the lift axle to be raised or lowered automatically. The major air system components of the lift axle system are:

A. the lift axle air supply regulator,

B. the lift axle inversion valve,

C. the lift axle air springs,

D. the lift axle relay valve,

E. and the lift axle lifting bags.

OPERATION

BRAKE SYSTEM

The purpose of this section is to describe how the lift axle brake system operates in conjunction with the vehicle's standard brakes system. The vehicle's standard ABS brake system is covered in existing manuals; therefore it will not be described here.

The vehicle's wet tank supplies pressurized air directly to the lift axle air tank whenever the vehicle air system is pressurized. Refer to FIGURE 1. The lift axle air tank provides the reserve air pressure capacity needed for the lift axle brakes. Air from the lift axle tank is supplied to the lift axle relay valve. The two outputs of the relay valve are routed to the lift axle service brake chambers. The relay valve operates like an electrical relay. The routing of pressurized supply air from the input, to the two outputs, is controlled by the control line air pressure.

When the brake pedal is not pressed, the control air line is not pressurized. The Quick Release Valve (QRV) connects the control line to both the drive axle ATR-1 valve, and the lift axle relay valve. Both valves recognize the lack of pressure in the control line as a non-braking condition. With no air pressure in the control line the lift axle relay valve blocks the supply air from the outputs. In this condition the lift axle brakes are not applied. During non-braking conditions the ATR-1 valve can provide traction control for the drive axle, if necessary.

When the brake pedal is pressed, pressurized air is routed through the control air line and the QRV to both the ATR-1 valve and the lift axle relay valve. Refer to FIGURE 2. The amount of pressure in the control line is proportional to the pressure applied to the brake pedal. Both valves recognize the pressure in the control line as a braking condition. The pressurized control line causes the lift axle relay valve to route supply air through the valve outputs to the lift axle service brake chambers at a pressure proportional to the pressure in the control line. In this condition the lift axle brakes are applied. During normal braking conditions the ATR-1 valve applies the brakes on the drive axle. During braking on slippery road conditions the ATR-1 valve can provide ABS controlled braking for the drive axle, if necessary. The lift axle brakes are not ABS controlled.

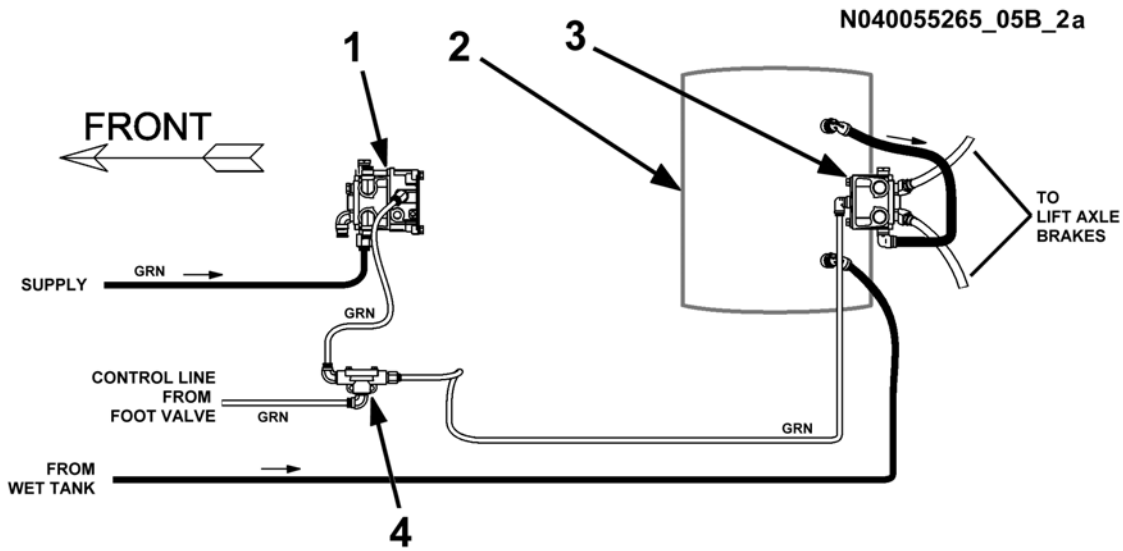


Figure 1 Brake System Without Brakes Applied

1. ATR-1 VALVE FOR DRIVE AXLE BRAKES
2. LIFT AXLE AIR TANK
3. LIFT AXLE RELAY VALVE (BRAKES)
4. QUICK RELEASE VALVE (QRV)

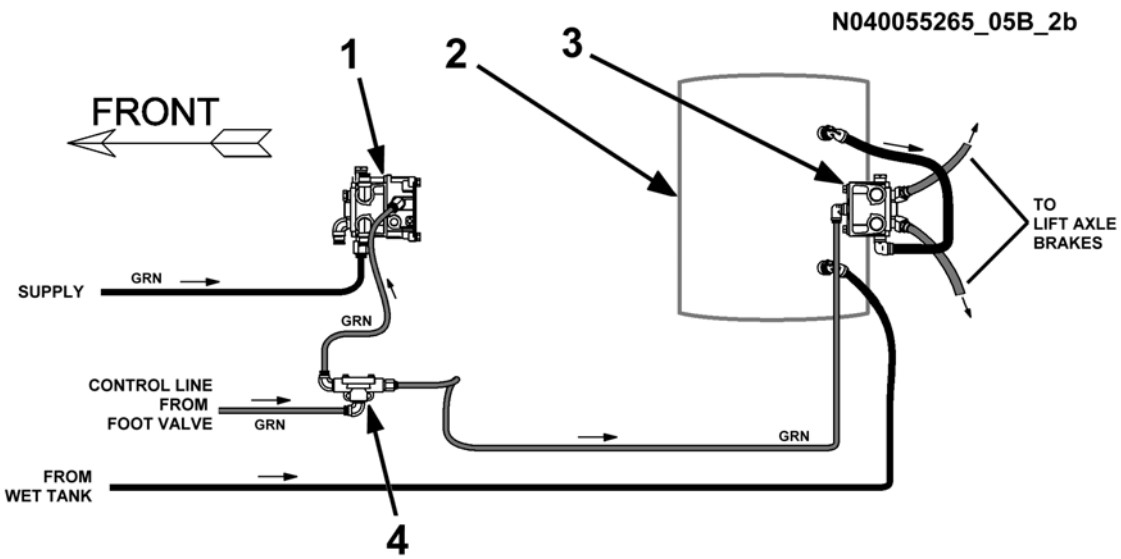


Figure 2 Brake System With Brakes Applied

1. ATR-1 VALVE FOR DRIVE AXLE BRAKES
2. LIFT AXLE AIR TANK
3. LIFT AXLE RELAY VALVE (BRAKES)
4. QUICK RELEASE VALVE (QRV)

AIR SUSPENSION AND TAG AXLE LIFT SYSTEMS

The ride height suspension system, suspension dump system, and tag axle lift system use many common components; therefore, the operation of those systems is covered in the following combined description. The lift axle and suspension dump systems may be controlled either manually, by the driver, or automatically, by the ESC. The specific conditions that initiate the operation of both systems will be described elsewhere. The following descriptions will concentrate on the operation of the air suspension and the axle lifting mechanism.

Pressurized air is supplied to the air solenoid module, the ride height control valve, and the lift axle relay valve whenever the pressure in the vehicle's primary air tank is high enough to open the Pressure Protection Valve (PPV). Refer to FIGURE 3.

Even though the lift axle system is controlled separately from the suspension dump system, there is some interaction between the systems. The control lines for both systems originate at an air solenoid module with a common air supply. The purpose of the air solenoid module is to provide a means of controlling the air pressure in the suspension control lines by means of electrical signals. The state of each control line is controlled by two air solenoids connected by a shuttle valve. During normal operation the solenoids are maintained in opposite states; when one solenoid is energized the other is de-energized. Energizing one solenoid pressurizes the control line; while energizing the other solenoid vents the pressurized control line air.

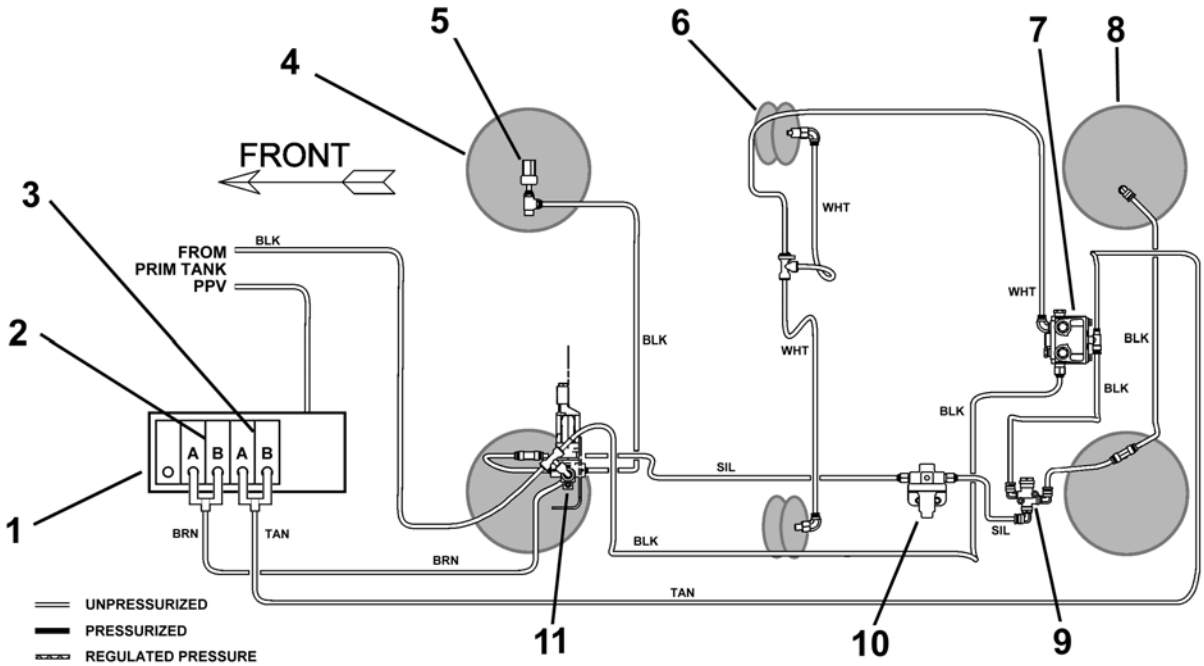


Figure 3 Air Suspension and Tag Axle Lift Systems

1. AIR SOLENOID MODULE
2. SOLENOID PAIR (SUSP. DUMP)
3. SOLENOID PAIR (LIFT AXLE)
4. PRIMARY SUSPENSION AIR SPRING
5. PRESSURE TRANSDUCER
6. LIFT AXLE LIFTING BAG
7. LIFT AXLE RELAY VALVE (LIFTING)
8. LIFT AXLE AIR SPRING
9. INVERSION VALVE
10. REGULATOR VALVE
11. RIDE HEIGHT CONTROL VALVE

The ride height control valve has two purposes. The first purpose is to maintain the vehicle's frame ride height at a preset value; and, the second purpose is to provide a means of dumping the air suspension. With no pressure at its control port, the ride height control valve routes the pressurized air at its supply input to the primary suspension air springs connected to its output ports. This action inflates the primary air springs until the preset frame ride height is achieved. Once the preset ride height is achieved, the valve blocks the supply port air to prevent the pressure at the output ports from increasing any further. As the vehicle load changes, the ride height control valve will automatically re-establish the correct ride height by controlling the air pressure supplied to the suspension air springs. When pressurized air is present at its control port, the ride height control valve blocks the pressurized air at its supply port. In addition, the valve vents its output ports, allowing both the primary air springs and the lift axle air springs to deflate (dumps the suspension). This action allows the vehicle to rest on its axle stops.

A pressure transducer is attached to the right primary suspension air spring. The transducer generates an electrical signal based on the air pressure in the air spring. When the primary suspension is inflated and the lift axle is raised, this transducer allows the ESC to **monitor** the amount of air pressure necessary to achieve the preset frame ride height. This tells the ESC the approximate weight of the vehicle load. This information is used by the ESC to determine when to light the RAISE LIFT AXLE or LOWER LIFT AXLE indicators in

the Electronic Gauge Cluster (EGC). This information is also used to determine when the lift axle must be lowered automatically, and when the suspension must be dumped automatically. Control of the suspension dump system and the lift axle system will be described in more detail elsewhere.

One of the outputs of the ride height control valve provides the supply air for the lift axle suspension air springs, through a regulator valve and an inversion valve. The purpose of the regulator valve is to restrict the air pressure at its output to 34 psi. The valve passes air pressure from its input to its output unchanged, until it reaches 34 psi. Once the output reaches 34 psi, the valve blocks any further air passage. This action establishes the maximum load carrying capacity of the lift axle suspension. The inversion valve is connected to act as a switch for the lift axle suspension. When air pressure is present at the valve's control port, the air at the input port is blocked from reaching the output port. If no air pressure is present at the valve's control port, the air at the input port is routed through the valve to inflate the lift axle suspension air springs.

The inversion valve and the lift axle relay valve are configured so that the lift axle suspension air springs and the lift axle lift bags will always be in opposite states. That is, when the suspension air springs are inflated, the lift bags will be deflated; and, when the lift bags are inflated, the suspension air springs will be deflated. To achieve this, the relay valve will block the pressurized air at its supply port when its control port is unpressurized. When the control port is pressurized, the valve routes the pressurized air at its supply port through the output ports to inflate the lift bags.

Only three operational modes exist for the air system that makes up the suspension and lift axle systems. The three modes are:

A. suspension inflated, tag axle down,

B. suspension inflated, tag axle up,

C. suspension dumped, tag axle up.

Suspension Inflated, Tag Axle Down

In this mode both the primary suspension and the lift axle suspension are inflated. Refer to FIGURE 4.

Due to the action of the air solenoids, both the 'suspension dump' control line and the 'raise axle' control line, are unpressurized. With no control line pressure, the ride height control valve routes the pressurized air at its supply input to the primary suspension air springs connected to its output ports. This action inflates the primary air springs.

One of the outputs of the ride height control valve provides supply air to the regulator valve and the inversion valve. With no air pressure at the control port of the inversion valve, the air at the input port is routed through the valve to inflate the lift axle suspension air springs. With no pressure at the control port of the lift axle relay valve, the pressurized air at the supply port is blocked, leaving the lift axle lift bags deflated.

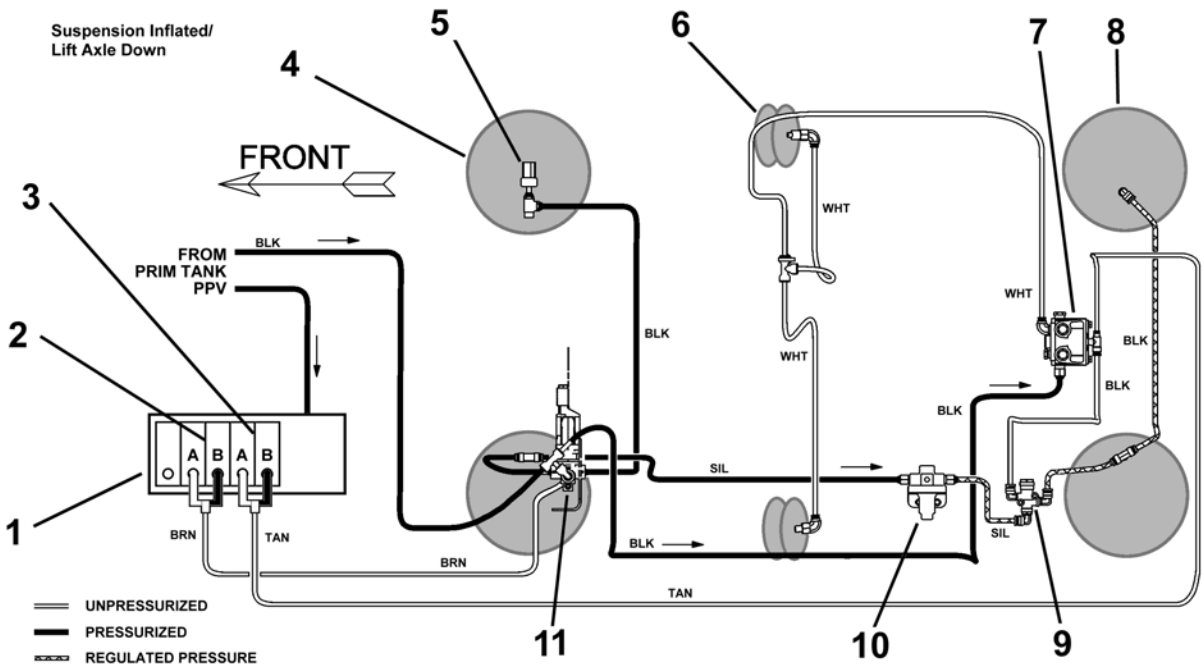


Figure 4 Air Suspension and Tag Axle Lift Systems (Suspension Inflated, Tag Axle Down)

1. AIR SOLENOID MODULE
2. SOLENOID PAIR (SUSP. DUMP)
3. SOLENOID PAIR (LIFT AXLE)
4. PRIMARY SUSPENSION AIR SPRING
5. PRESSURE TRANSDUCER
6. LIFT AXLE LIFTING BAG
7. LIFT AXLE RELAY VALVE (LIFTING)
8. LIFT AXLE AIR SPRING
9. INVERSION VALVE
10. REGULATOR VALVE
11. RIDE HEIGHT CONTROL VALVE

Suspension Inflated, Tag Axle Up

In this mode the primary suspension is inflated and the lift axle suspension is deflated. The lifting bags are inflated to raise the lift axle. Refer to FIGURE 5.

Due to the action of the air solenoids, the 'suspension dump' control line is unpressurized and the 'raise axle' control line is pressurized. With no control line pressure, the ride height control valve routes the pressurized air at its supply input to the primary suspension air springs connected to its output ports. This action inflates the primary air springs.

One of the outputs of the ride height control valve provides supply air to the regulator valve and the inversion valve. In the current mode, the control line to the inversion valve and the lift axle relay valve is pressurized. Air pressure at the inversion valve control port causes the valve to block the pressurized supply air at its input causing the lift axle suspension air springs to deflate. With pressurized air at the control port of the relay valve, the pressurized air at the supply port is routed through the valve to inflate the lift axle lifting bags.

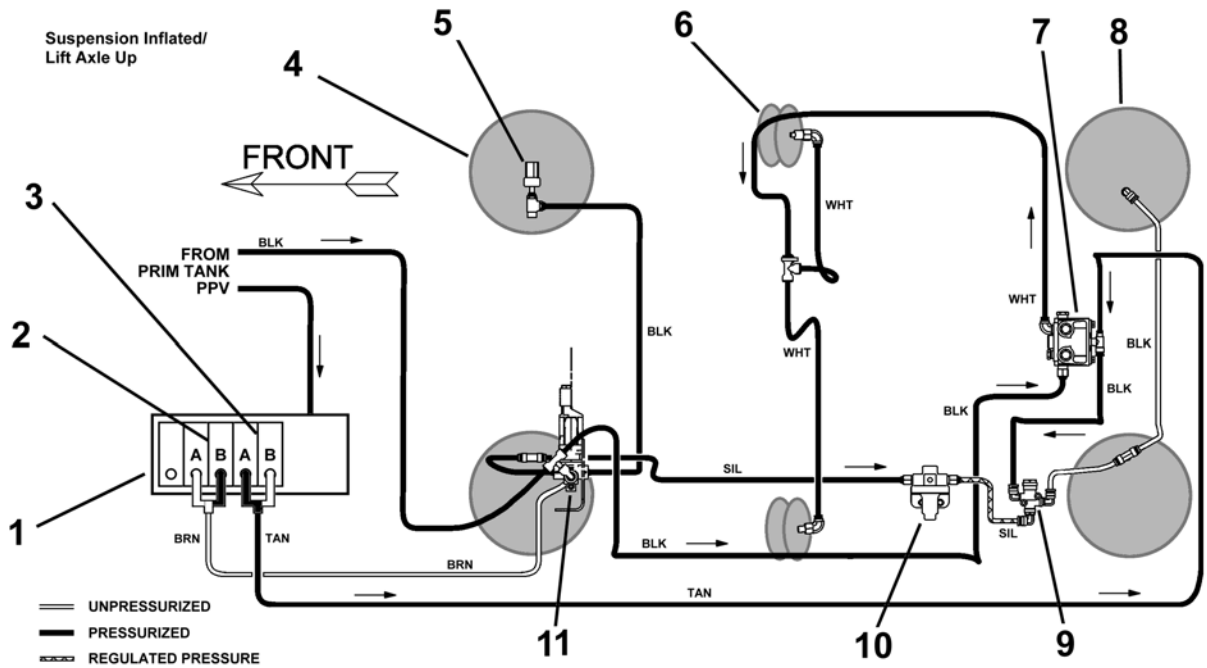


Figure 5 Air Suspension and Tag Axle Lift Systems (Suspension Inflated, Tag Axle Up)

1. AIR SOLENOID MODULE
2. SOLENOID PAIR (SUSP. DUMP)
3. SOLENOID PAIR (LIFT AXLE)
4. PRIMARY SUSPENSION AIR SPRING
5. PRESSURE TRANSDUCER
6. LIFT AXLE LIFTING BAG
7. LIFT AXLE RELAY VALVE (LIFTING)
8. LIFT AXLE AIR SPRING
9. INVERSION VALVE
10. REGULATOR VALVE
11. RIDE HEIGHT CONTROL VALVE

Suspension Dumped, Tag Axle Up

In this mode both the primary suspension and the lift axle suspension are dumped. When the suspension is dumped the lifting bags are automatically inflated (by the ESC) to raise the lift axle. Refer to FIGURE 6.

Due to the action of the air solenoids, both the 'suspension dump' control line and the 'raise axle' control line, are pressurized. With its control line pressurized, the ride height control valve blocks the pressurized air at its supply input and vents the lines connected to its output ports. This action deflates the primary air springs.

One of the outputs of the ride height control valve normally provides supply air to the regulator valve and the inversion valve. However, with the suspension dumped, this line is vented at the ride height control valve. With no air pressure at the control port of the inversion valve, the input and output ports are connected. This condition allows the lift axle suspension air springs to deflate through the ride height control valve, via the inversion valve and the regulator. With pressurized air at the control port of the relay valve, the pressurized air at the supply port is routed through the valve to inflate the lift axle lifting bags.

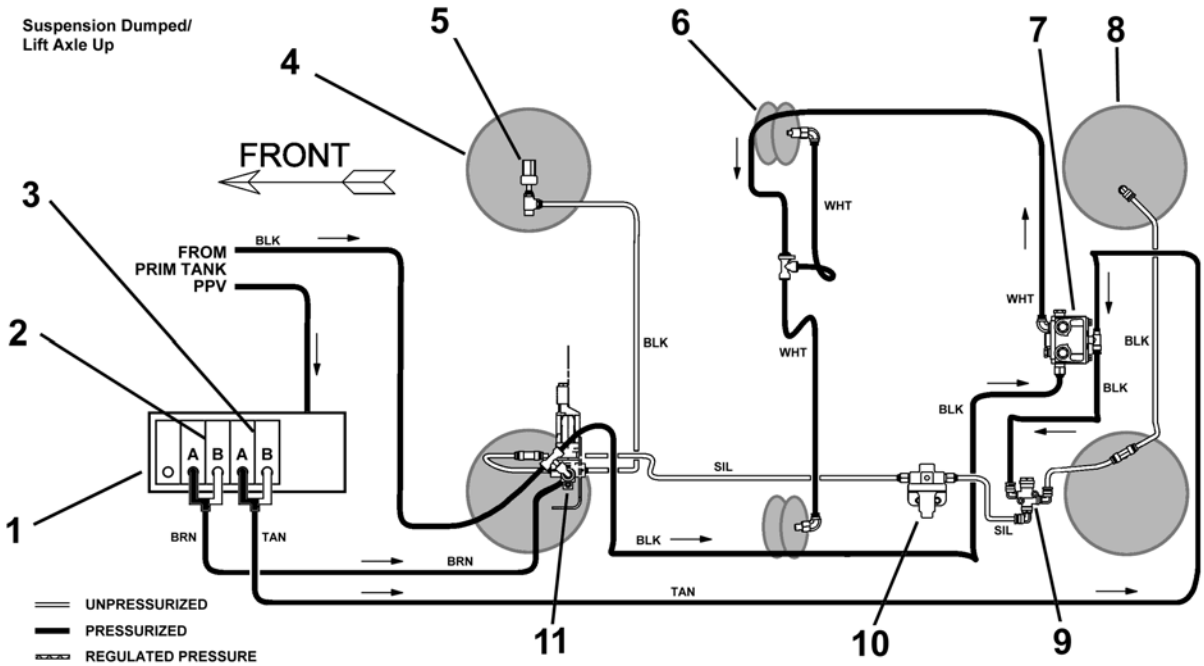


Figure 6 Air Suspension and Tag Axle Lift Systems (Suspension Dumped, Tag Axle Up)

1. AIR SOLENOID MODULE
2. SOLENOID PAIR (SUSP. DUMP)
3. SOLENOID PAIR (LIFT AXLE)
4. PRIMARY SUSPENSION AIR SPRING
5. PRESSURE TRANSDUCER
6. LIFT AXLE LIFTING BAG
7. LIFT AXLE RELAY VALVE (LIFTING)
8. LIFT AXLE AIR SPRING
9. INVERSION VALVE
10. REGULATOR VALVE
11. RIDE HEIGHT CONTROL VALVE

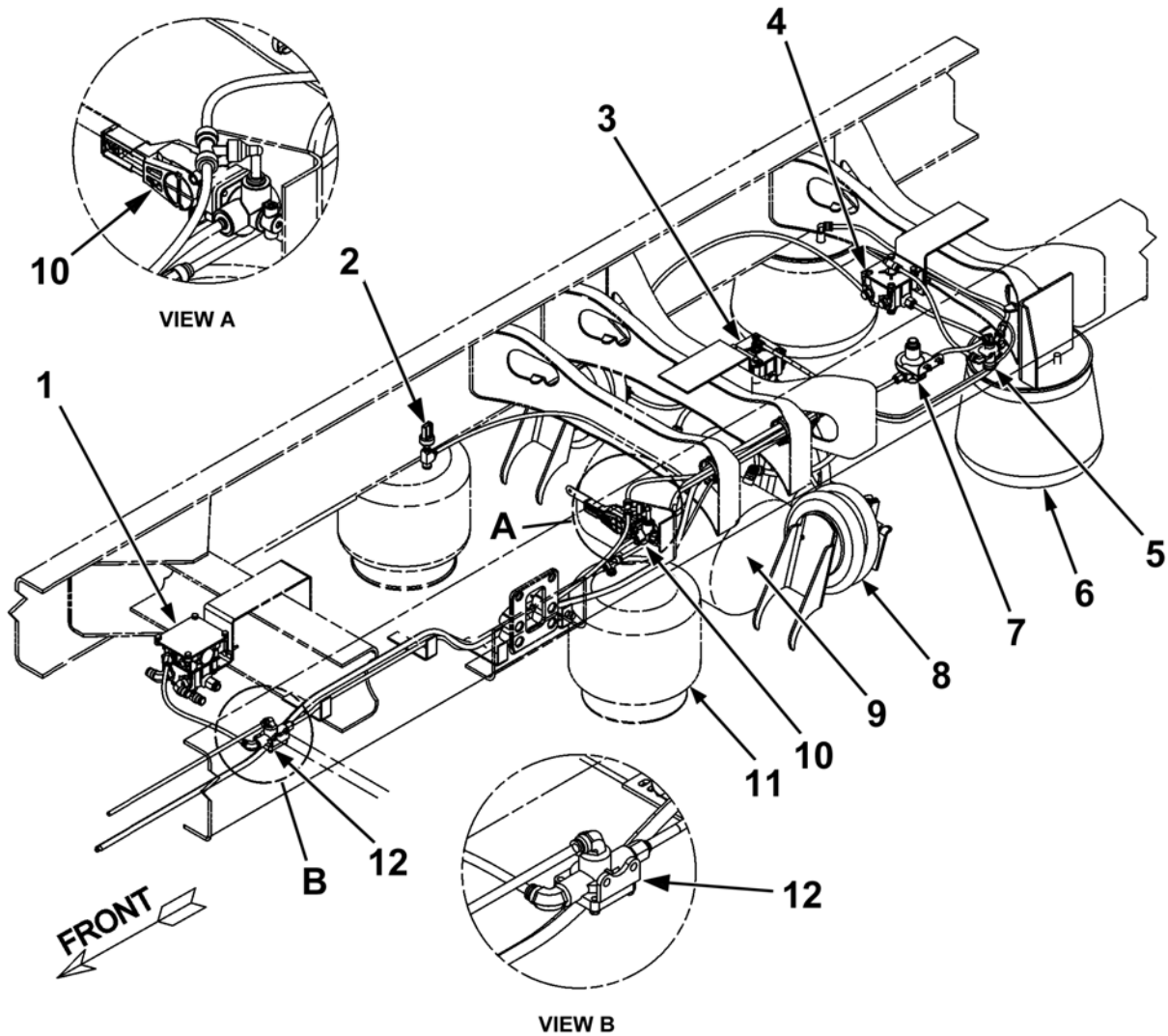


Figure 7 Component Location Diagram (View 1 of 4)

1. ATR-1 VALVE FOR DRIVE AXLE BRAKES
2. PRESSURE TRANSDUCER
3. LIFT AXLE RELAY VALVE (BRAKES)
4. LIFT AXLE RELAY VALVE (LIFTING)
5. INVERSION VALVE
6. LIFT AXLE AIR SPRING
7. REGULATOR VALVE
8. LIFT AXLE LIFTING BAG
9. LIFT AXLE AIR TANK
10. RIDE HEIGHT CONTROL VALVE
11. PRIMARY SUSPENSION AIR SPRING
12. QUICK RELEASE VALVE (QRV)

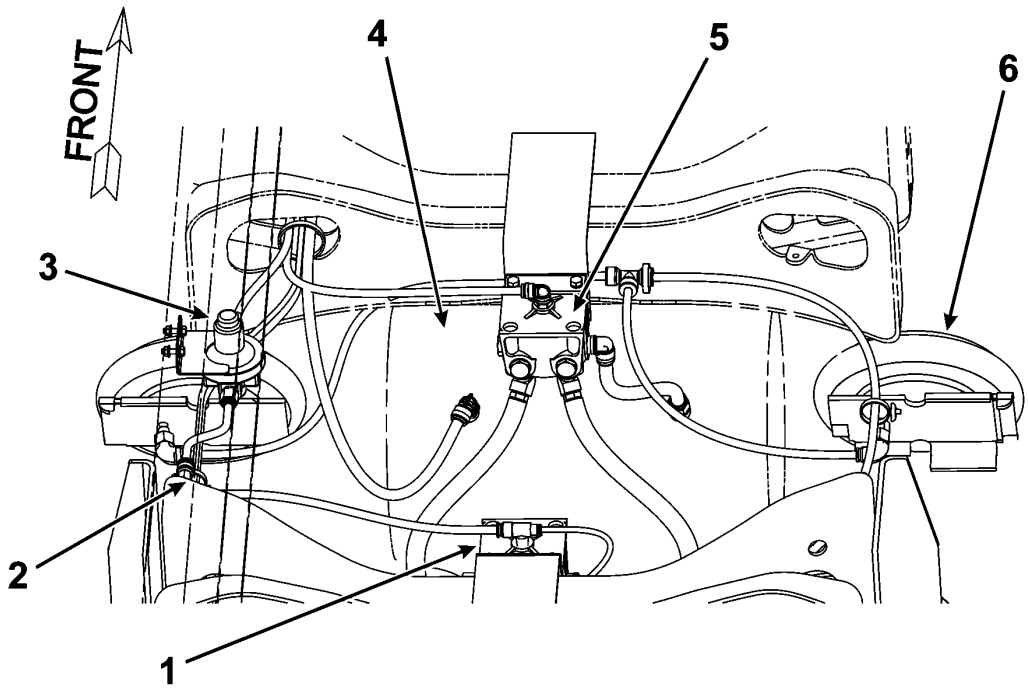


Figure 8 Component Location Diagram (View 2 of 4)

1. LIFT AXLE RELAY VALVE (LIFTING)
2. INVERSION VALVE
3. REGULATOR VALVE
4. LIFT AXLE AIR TANK
5. LIFT AXLE RELAY VALVE (BRAKES)
6. LIFT AXLE LIFTING BAG

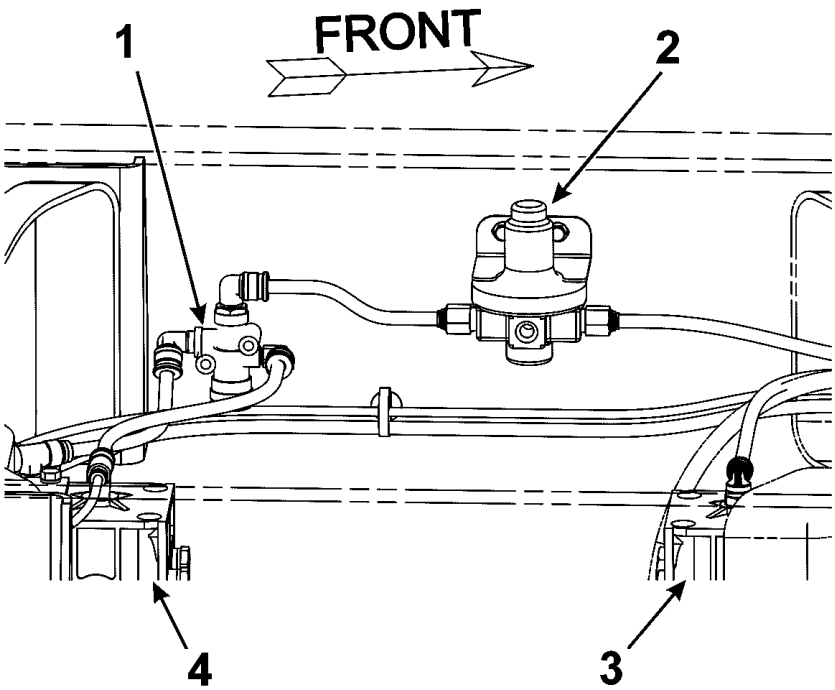


Figure 9 Component Location Diagram (View 3 of 4)

1. INVERSION VALVE
2. REGULATOR VALVE
3. LIFT AXLE RELAY VALVE (BRAKES)
4. LIFT AXLE RELAY VALVE (LIFTING)

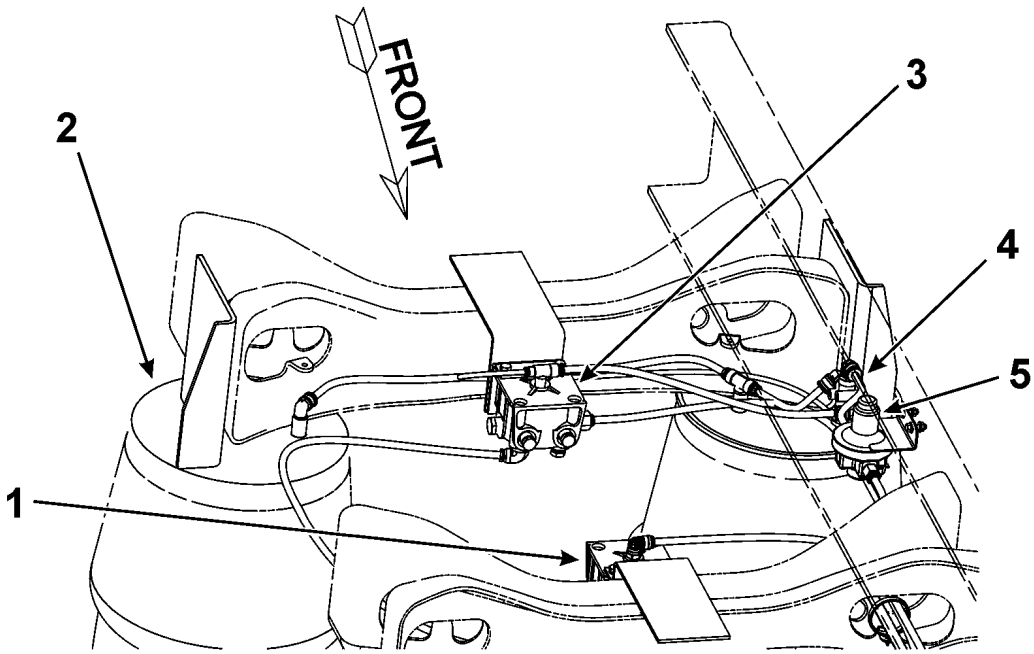


Figure 10 Component Location Diagram (View 4 of 4)

1. LIFT AXLE RELAY VALVE (BRAKES)
2. LIFT AXLE AIR SPRING
3. LIFT AXLE RELAY VALVE (LIFTING)
4. INVERSION VALVE
5. REGULATOR VALVE

SUSPENSION CONTROL SYSTEM

The suspension control system is designed to allow the vehicle to be safely operated under various load conditions. Another function of the system is to prevent damage to the primary suspension system of the vehicle. To accomplish these goals, both manual and automatic controls are provided for operating the suspension dump and lift axle systems. The operator interface for the suspension dump and lift axle systems consists of the following:

A. Indicators in the Electronic Gauge Cluster (EGC)

- RAISE AXLE
- LOWER AXLE

B. Dash mounted switches with indicators

- Suspension Dump switch (DUMP/SUSP). Indicator lights to indicate suspension is dumped.
- Lower Lift Axle switch (DOWN/LIFT AXLE). Indicator lights only **while** the axle is being lowered.
- Raise Lift Axle switch (UP/LIFT AXLE). Indicator lights only **while** the axle is being raised.

The suspension system is controlled by the programming in the Electrical System Controller (ESC). The ESC looks at its inputs, and generates outputs based on its programming. During vehicle operation various system conditions are monitored by the ESC. Refer to FIGURE 11. Based on the monitored conditions, the ESC

will either signal the operator to manually control the system; or, the ESC will perform the control function automatically. The ESC can prompt the operator by lighting either the RAISE AXLE or LOWER AXLE indicator. If the operator responds by actuating a lift axle switch, that action will be detected by the ESC. Regardless of how the control function is initiated, the ESC must send a signal to either the suspension dump solenoids or the lift axle solenoids, to perform the requested function. The following conditions are monitored by the ESC :

A. the key switch position,

B. the state of the parking brake switch,

C. the state of the Suspension Dump switch,

D. the state of the Raise Lift Axle switch,

E. the state of the Lower Lift Axle switch,

F. the Vehicle Speed Signal (VSS) from the Engine Control Module (ECM),

G. the Accelerator Pedal Position (APP) from the Engine Control Module (ECM),

H. the pressure level in the primary air tank,

I. and, the pressure measured by the Load Monitoring Pressure Transducer.

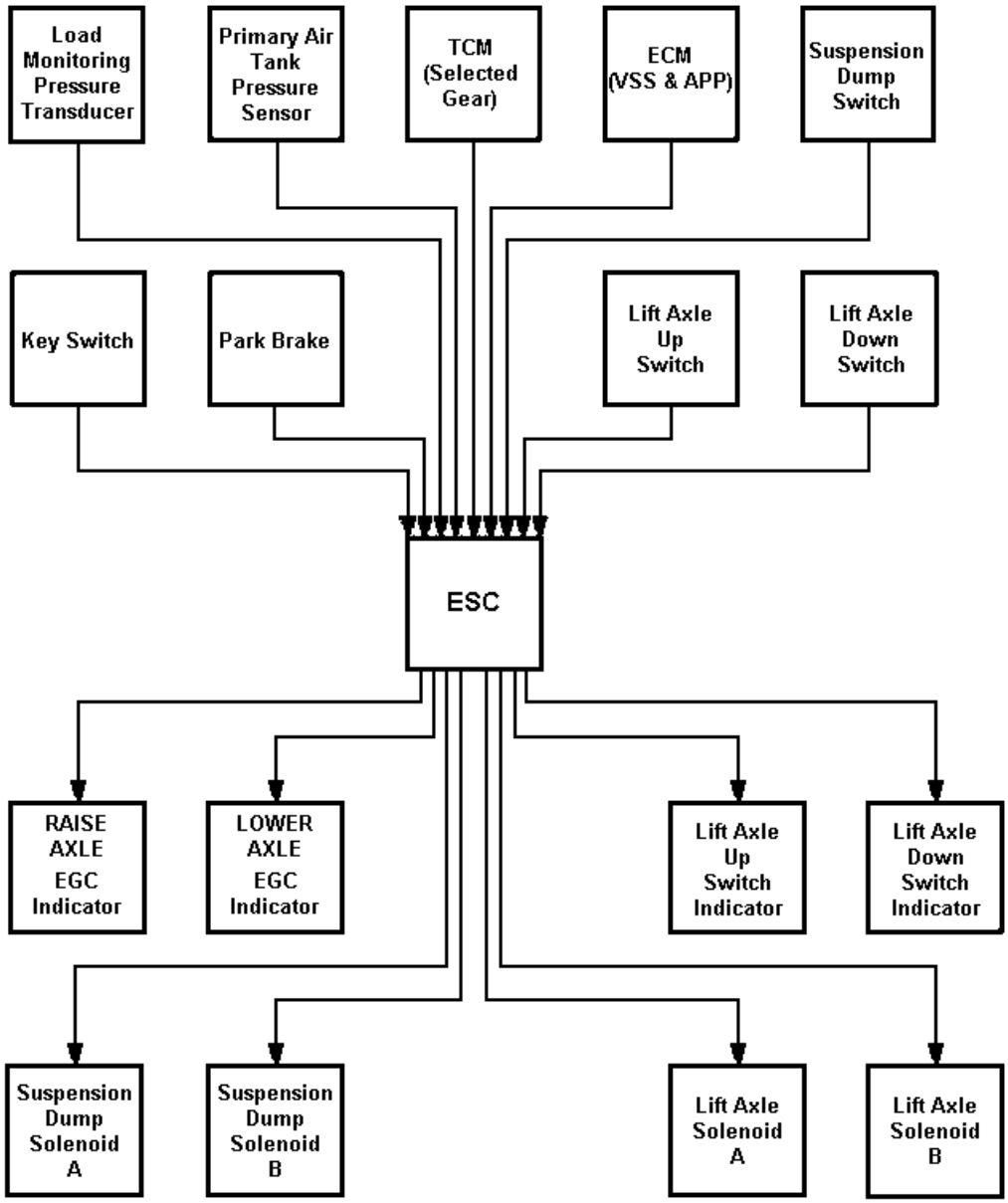


Figure 11 Suspension Control System – Inputs and Outputs

Typical Operation

After loading the vehicle, the ESC must 'read' the weight of the vehicle load. To do this the vehicle must be moved away from the dock (to a level surface) and the park brake must be released. The primary suspension must be inflated to ride height and the lift axle must be raised. The ignition key must remain on with the transmission in Neutral, and the vehicle should rest undisturbed for at least 1 minute. If the ESC determines that the load weight is below a preset threshold, no indicators will be lit and the vehicle is ready for normal operation. If the ESC determines that the load weight is above a preset threshold, the ESC will prompt the operator to lower the lift axle by lighting the LOWER AXLE indicator in the gauge cluster. When the driver pushes the LIFT AXLE/DOWN momentary switch, the ESC reads the switch actuation and sends a signal to the air solenoid that lowers the lift axle. While the lift axle is being lowered, the indicator in the LIFT

AXLE/DOWN switch will be lit. Once the lift axle is in its lowered position, the ESC will turn off both the LOWER AXLE indicator and the indicator in the LIFT AXLE/DOWN switch.

To unload the vehicle, it is pulled into position at the loading dock, the transmission is set to Neutral, and the parking brake is set. Setting the parking brake, or turning the ignition key off, will cause the ESC to raise the lift axle automatically. If the load weight is above a preset limit the ESC will also send a signal to the air solenoid that dumps the primary suspension. This will allow the suspension to deflate, placing the vehicle on its axle stops.

The programming of the ESC, and the conditions monitored by the ESC, are used to establish the following rules of operation for the suspension system.

A. The brake system pressure must be greater than 100 psi for the load monitoring pressure transducer to work accurately.

B. The driver can dump the suspension (using the suspension dump switch) with the ignition key in the ACC or ON position, only if the tanks have enough air to fill the suspension.

C. The driver can inflate the suspension to ride height only with the key in the ON position.

D. The ESC will automatically dump the suspension if the driver raises the lift axle **AND** the weight is above the preset threshold. (NOTE: This can also occur when the lift axle raises due to the ignition key being turned OFF.)

E. The ESC will automatically inflate the suspension to ride height if the vehicle speed is greater than 5 mph.

F. When the key is switched OFF, the suspension will remain in the last position selected by the SUSP/DUMP switch.

G. The driver can control the lift axle with the LIFT AXLE switches if vehicle speed is below 5 mph.

H. The red LOWER AXLE indicator in the EGC will only light when the ignition key is ON, **AND** the vehicle weight is above the preset threshold, AND the lift axle is up.

I. The red RAISE AXLE indicator in the EGC will only light when the vehicle weight is below the preset threshold **AND** the lift axle is down.

J. The ESC will automatically lower the lift axle if the vehicle weight is above the preset threshold weight **AND** the vehicle speed is equal to or greater than 5 mph.

K. The ESC automatically raises the lift axle to the “up” or resting position whenever the ignition key is turned OFF.

L. The ESC automatically raises the lift axle to the “up” or resting position whenever the Parking Brake is set.

M. The ESC will automatically raise the lift axle whenever the suspension is dumped.

ERROR/FAULT CONDITIONS

A. If the ESC inhibits the driver’s request to raise or lower the lift axle, the indicator in the actuated LIFT AXLE switch will flash slowly.

B. If there is a system malfunction, either switch indicator will flash rapidly.

C. If the ESC inhibits the driver’s request to dump the suspension dump when the vehicle speed is greater than 5 mph, and audio alarm is sounded.

D. If a malfunction of the load weight pressure transducer is detected, the ESC will light the LOWER AXLE indicator in the EGC.

Electrical Interconnection of System Components

The diagram in FIGURE 12 shows how the various components of the suspension control system are connected. As the diagram indicates, the electrical signals used by the system are carried on both discrete wires and datalinks. Understanding how each component is connected to the ESC may provide valuable diagnostic information in the event of a malfunction.

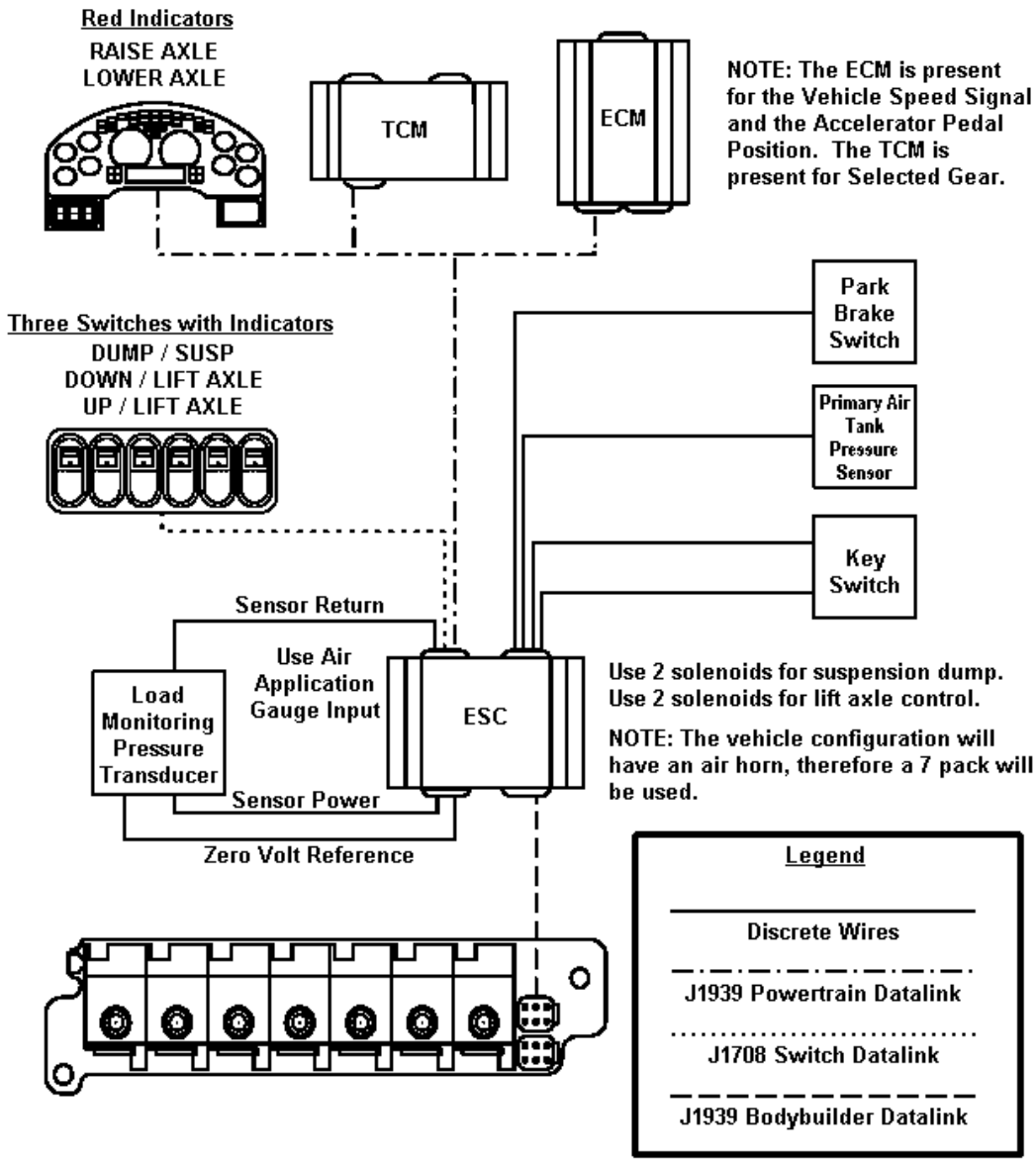


Figure 12 Suspension Control System Interconnect Diagram

OWNER'S MANUAL

Auxiliary Axle Systems

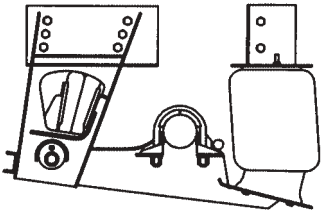
For The Road Ahead

HENDRICKSON

IDENTIFYING YOUR HENDRICKSON AUXILIARY LIFT AXLE

When identifying your Hendrickson Auxiliary Lift Axle visually, use the following drawings to compare with your suspension. **NOTE: All Hendrickson Auxiliary Lift Axles are manufactured with a serial number plate to help in identification. See page 3.**

Non-Steerable Models

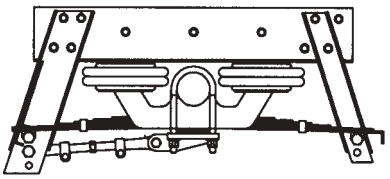


10" RIDE HEIGHT SHOWN

HLM-2

AVAILABLE RIDE HEIGHT

5.5" - 15"

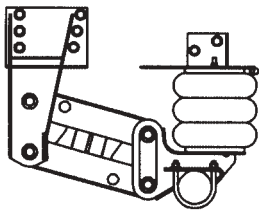


SHOWN IN LIFTED POSITION

HLQ-AH QuickLift

AVAILABLE RIDE HEIGHT

7.5" - 15.5"



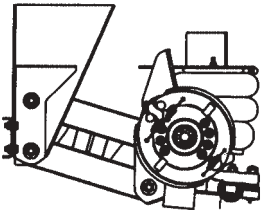
18" RIDE HEIGHT SHOWN

HLN ParaLift

AVAILABLE RIDE HEIGHT

13" - 23"

Steerable Models

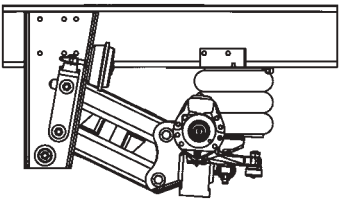


10.5" RIDE HEIGHT SHOWN

HLUS-2 ParaLift Ultra

AVAILABLE RIDE HEIGHT

10.5" - 18.5"

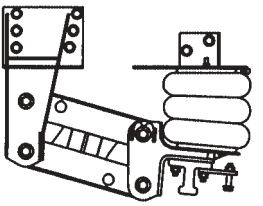


10.5" RIDE HEIGHT SHOWN

HLUR-2 ParaRev

AVAILABLE RIDE HEIGHT

10.5" - 18.5"



8.5" RIDE HEIGHT SHOWN

HLP ParaLift

AVAILABLE RIDE HEIGHT

8.5" - 18.5"

INSTRUCTIONS FOR SUSPENSION OPERATION

USING INSIDE OR OUTSIDE MOUNTED HLK AIR CONTROL KITS

Raising Your Lift Axle

1. If vehicle is already running, please proceed to #6.
2. Set parking brake of truck.
3. Turn your vehicle ignition to on position.
4. Press start switch and release when engine is started.
5. Allow truck to idle until the air pressure has reached compressor cut-out pressure (usually 120 psi).
6. If controls are **inside mounted**, move the Hendrickson air control panel's lever to the up position.

⚠ **WARNING! Do not raise or lower your lift axle if truck is moving in excess of 15 mph. Assure area surrounding lift axle is clear of all personnel.**

7. If controls are **outside mounted**, assure vehicle is stopped and parking brake is set. Exit vehicle, go to air control enclosure and open it. Move the control valve's lever to the up position.
8. Visually confirm that the axle is lifting.

⚠ **NOTE: Air pressure may drop during suspension lifting process.**

9. Axle should be completely lifted when truck's air pressure returns to the air compressor cut-out point (usually 120 psi).
10. You have successfully raised your Hendrickson Auxiliary Lift Axle and are ready for the road ahead!

Lowering Your Lift Axle

1. If vehicle is already running, please proceed to #6.
2. Set parking brake of truck.
3. Turn your vehicle ignition to on position.
4. Press start switch and release when engine has started.
5. Allow truck to idle until the air pressure has reached compressor cut-out (usually 120 psi).
6. If controls are **inside mounted**, move the control valve's lever to DOWN position.

⚠ **WARNING! Do not raise or lower your lift axle if truck is moving in excess of 15 mph. Assure area surrounding lift axle is clear of all personnel.**

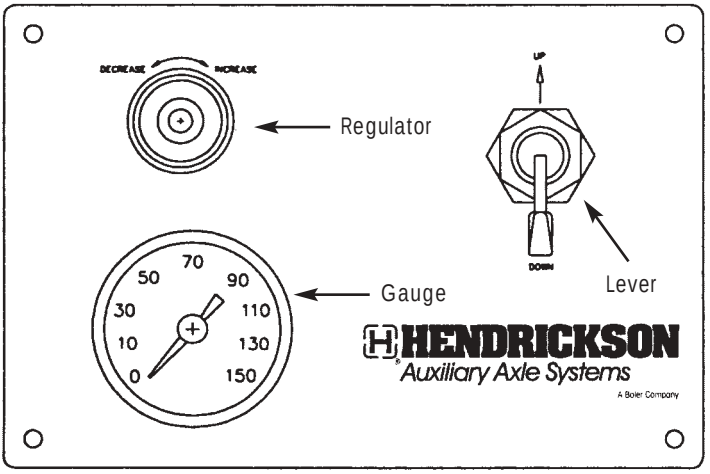
7. If controls are **outside mounted**, assure vehicle is stopped and parking brake is set. Exit vehicle, go to air control enclosure and open it. Move the control valve's lever to the down position.
8. Using the regulator, adjust air pressure on gauge to appropriate air pressure for vehicle load conditions. See performance charts pages 5 and 6.

⚠ **NOTE: Air system pressure may drop during suspension lowering process.**

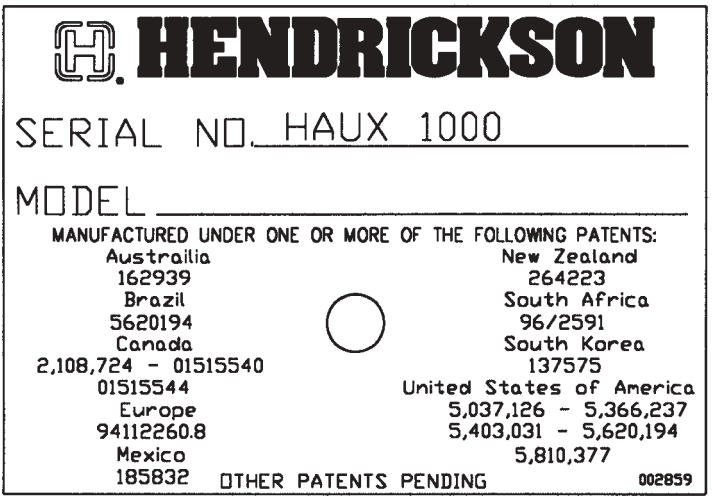
9. Axle should be completely lowered and supporting pre-determined load when system air compressor cut-out point is reached (usually at 120 psi).
10. You have successfully lowered your Hendrickson Auxiliary Lift Axle and are ready for the road ahead!

AXLE TAG IDENTIFICATION

TYPICAL HENDRICKSON AIR CONTROL PANEL



The serial number tag pictured below is a stainless steel label attached to the body of the suspension system. It contains a serial number unique to that particular suspension and the model identification number for the suspension system. These two numbers are important to use when contacting Hendrickson Customer Service for replacement parts.



MAINTENANCE

COMPONENT	INTERVAL	PROCEDURE
Wheel bearings (break-in)	5,000 mi. or as needed	Adjust and grease or oil
Kingpin (break-in)	5,000 mi. or as needed	Lubricate
Tie rod ends (break-in)	5,000 mi. or as needed	Lubricate
Pivot connections	Every 5,000 mi. or as needed	Verify torque
Bushings	Every 6 months	Check for excessive wear/movement
Wheel bearings	8,000 mi. or every 2 months	Oil as needed
	70,000 or annually	Change oil
Kingpin	20,000 mi. or every 10 months	Grease as needed
Tie rod ends	20,000 mi. or every 10 months	Grease as needed
Shift chamber	3,000 mi. or monthly	Inspect for leaking
(reverse caster only)	20,000 mi. or every 10 months	Inspect shift chamber components for wear

RECOMMENDED LUBRICANTS

Kingpin	NLGI-1 or NLGI-2 grease	
Tie Rod Ends	EP-1 or EP-2 grease	
Wheel Bearing	NLGI-1 or NLGI-2 grease	GL-5 gear lubricant

⚠ **WARNING! Failure to lubricate the wheel bearings can result in bodily injury or death.**

KINGPIN BUSHING INSPECTION

The kingpin bushings are replaceable items that demonstrate wear over time. This wear could lead to improper camber setting and reduced tire life. However, with proper maintenance and lubing, the kingpin connections should be trouble-free for many years of use.

To check the amount of wear in the bushings, do the following:

1. With tires raised off the ground, support the axle beam at its outer ends eliminating any rocking motion.
2. Apply the brakes to eliminate any motion of the wheel assembly relative to the knuckle.
3. At a 17.5 inch radius down from the centerline of the spindle, measure the movement of the tire when a force is inwardly applied to the tire above the centerline of the spindle.
4. If the measured movement is greater than .063 inches, the kingpin bushings need replacing. Contact Hendrickson Auxiliary Axle System's Customer Service for part number.

PERFORMANCE CHARTS

PERFORMANCE CHART HLM-2 Non-Steer

AXLE LIFT (inches)	REQUIRED AIR PRESSURE (PSI)						
	30 psi	40 psi	50 psi	60 psi	70 psi	80 psi	90 psi
4.50	8,350	10,850	13,100	15,650	18,050	20,780	——
5.50	8,250	10,650	13,000	15,500	17,825	20,375	——
6.50	8,200	10,500	12,650	15,000	17,350	19,500	21,850

PERFORMANCE CHART HLQ QuickLift Non-Steer

AXLE LIFT (inches)	REQUIRED AIR PRESSURE (PSI) @									
	5,000 lbs.	6,000 lbs.	7,000 lbs.	8,000 lbs.	9,000 lbs.	10,000 lbs.	11,000 lbs.	12,000 lbs.	13,000 lbs.	20,000 lbs.
4.00	46	49	54	58	61	65	68	72	76	101
4.50	53	54	60	64	68	71	75	79	83	109
5.00	61	65	70	73	77	81	85	89	93	120

PERFORMANCE CHART HLN - ParaLift Non-Steer

AXLE LIFT (inches)	REQUIRED AIR PRESSURE (PSI) @								
	5,000 lbs.	6,000 lbs.	7,000 lbs.	8,000 lbs.	9,000 lbs.	10,000 lbs.	11,000 lbs.	12,000 lbs.	13,000 lbs.
4.50	30	36	43	49	55	62	68	75	82
5.00	31	38	45	51	58	65	72	78	85
5.50	33	40	46	53	59	66	72	79	85
6.00	35	41	48	55	61	68	75	82	88
6.50	37	44	51	58	65	72	79	86	93
7.00	38	46	54	61	68	75	83	90	97
7.50	42	49	56	63	71	78	85	92	100
8.00	42	50	57	65	72	80	88	95	103
8.50	45	53	60	68	76	83	90	98	106
9.50	47	55	63	71	79	87	95	103	110

Shaded area designates nominal ride height.

PERFORMANCE CHARTS / SAFETY DO'S AND DON'TS

PERFORMANCE CHART HLUR -2 ParaRev Steerable

AXLE LIFT (inches)	REQUIRED AIR PRESSURE (PSI) @								
	5,000 lbs.	6,000 lbs.	7,000 lbs.	8,000 lbs.	9,000 lbs.	10,000 lbs.	11,000 lbs.	12,000 lbs.	13,000 lbs.
6.00	34	41	49	57	64	73	83	93	103
7.00	40	48	56	65	73	84	96	108	110
8.00	50	59	67	76	84	93	101	110	117

PERFORMANCE CHART HLUS-2 ParaLift Ultra Steerable

AXLE LIFT (inches)	REQUIRED AIR PRESSURE (PSI) @								
	5,000 lbs.	6,000 lbs.	7,000 lbs.	8,000 lbs.	9,000 lbs.	10,000 lbs.	11,000 lbs.	12,000 lbs.	13,000 lbs.
7.00	34	42	49	56	64	72	79	87	94
8.00	45	54	62	71	79	88	92	104	113
9.00	47	56	64	73	81	90	94	107	115

PERFORMANCE CHART HLP PARALIFT 13K Steerable

AXLE LIFT (inches)	REQUIRED AIR PRESSURE (PSI) @								
	4,000 lbs.	5,000 lbs.	6,000 lbs.	7,000 lbs.	8,000 lbs.	9,000 lbs.	10,000 lbs.	11,000 lbs.	12,000 lbs.
7.00	29	38	45	52	60	68	74	82	89
7.50	30	39	47	55	63	71	79	87	94
8.00	32	40	50	58	67	75	84	93	100
8.50	35	44	53	62	70	78	87	96	105
9.00	38	48	57	65	73	82	90	100	110

SAFETY DO'S AND DON'TS

⚠ **WARNING** When lifting or lowering your suspension, assure that all personnel are a safe distance from the actuating suspensions. Failure to do so can result in bodily injury or death.

⚠ **WARNING** Be careful during suspension operation as suspension components move at a rapid rate.

⚠ **WARNING** All steerable suspensions except the HLUR ParaRev Reverse Caster need to be lifted when truck is traveling in reverse or locked out.

⚠ **NOTE** Always check state laws in all states through which you will be traveling for legal allowable weight and axle configurations.

⚠ **NOTE** Trucks equipped with HLUR ParaRev Reverse Caster suspension systems must be **in gear** in order for the reverse castering mechanism to operate.

⚠ **WARNING** Do not travel at greater than 15 mph when raising or lowering your lift axles.

⚠ **WARNING** Do not actuate reverse lockout while truck is turning. (option)

⚠ **WARNING** Do not lower HLUR ParaRev suspension while truck is moving in reverse.

⚠ **WARNING** When traveling in reverse, make certain that gear selector is in reverse.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY
Not getting the desired load on axle.	Not having the proper air pressure to load bags	Increase or decrease air pressure at regulator valve (see performance guides pgs. 5 and 6.).
	Air control system not properly installed.	Check piping of air system Refer to literature H-605.
	Mounted too high.	Check installation with factory installation drawing.
Insufficient air pressure to system.	Defective brake protection valve or truck compressor.	Replace brake protection valve and check air compressor.
Unit not getting the correct lift.	Lift air bags not getting proper air pressure.	a. Check system's pressure. b. Check air system plumbing drawing. Refer to literature H-605. c. Check pressure at air bags.
	Interference with chassis, drive line, or other components.	Inspect for interference.
	Unit not installed properly.	Check installation with factory installation drawing.
Unit has vertical hop.	Not running sufficient load on axle.	Increase air pressure.
Axle shimmy.	Improper caster setting.	Readjust caster if possible.
	Toe setting incorrect.	Readjust toe setting.
	Axle bolt connection loose.	Re-torque to factory torque values (see page 8).
	Pivot bolt connection loose.	Re-torque to factory torque values (see page 8).
	Axle out of alignment.	Re-align axles.
	Tires different size on each side.	Use same size tires.
	Tires unbalanced.	Balance tires.
	Air pressure in tires different side to side.	Equalize air pressure side to side.

TROUBLESHOOTING HLUR

PROBLEM	POSSIBLE CAUSE	REMEDY
Axle does not track forward.	Toe setting.	Set toe.
	Hanger bracket mounted incorrectly on frame rail.	Check installation with factory installation drawing.
Axle does not track in reverse. (ParaRev Only)	Inadequate psi to reverse shift chambers.	Increase psi minimum (100 psi).
	1 or both reverse chambers damaged.	Replace chamber(s).
	Hanger bracket mounted incorrectly on frame rail.	Check installation with factory installation drawing.
Axle in reverse caster when lifted.	Incorrect air line plumbing.	Correct air plumbing.

RECOMMENDED BOLT TORQUE VALUES

DESCRIPTION	SIZE	TORQUE[1] (ft. lbs.)
Pivot Bolt/Shift Arm	7/8"	450
Frame Attachment	3/4"	420
Air Spring Bolt (Bottom)	3/8"	25
Air Spring Nut (Top)	1/2"	25
Air Spring Nut (Top)	3/4"	45
Tie Rod Clamp Bolt Nut	1/2"	50
Shift Chamber Attachment	5/8"	108
Shift Chamber Yoke Attachment	5/8"	38

[1]Torque values are specified for the fasteners in the condition in which they are supplied by Hendrickson Auxiliary Axle Systems.
DO NOT APPLY ANY ADDITIONAL LUBRICANTS.

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