

# Pressureaide® Pressure Differential Covered Hopper Railcar OPERATION & SERVICE MANUAL



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*THE*  
***GREENBRIER***  
*COMPANIES*

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# Table of Contents

Introduction .....	2
Pressureaide® Car Models .....	3
<b>Models PD3300, PD5001, PD5300 &amp; PD5750</b>	
Operating Equipment and Location .....	6
Operating Instructions .....	8
Operating Instructions .....	10
<b>Model PD3720N Single Compartment</b>	
Operating Equipment and Location .....	12
Operating Instructions .....	14
<b>Model PD5650N Single Compartment</b>	
Operating Equipment and Location .....	17
Operating Instructions .....	19
Standard Hatch Arrangements .....	22
Cleaning .....	24
Loading and Unloading Operations .....	25
Loading Operations .....	26
Unloading Operations .....	27
General Maintenance .....	29
Troubleshooting .....	31

## Introduction

The GBX Pressureaide® car is part of the GBX family of Centerflow® covered hopper cars. The Pressureaide® car is a pressure differential car, a self-contained transportation and unloading system uniquely suited to handle a wide spectrum of fluidizable, dry bulk materials ranging from cement and flour to popcorn and peanuts. GBX's Pressureaide® cars are equipped with all the required piping, operating valves and pressure relief devices necessary to operate the railcar. Upon arrival at the unloading site all that is required to unload is the connection of a product discharge hose and an air supply line.

Available in six popular sizes, the model number corresponds to the cubic capacity of the car; PD3300, PD5001, PD5300, PD5750, PD3720N & PD5650N. Depending on the model, the Pressureaide® car has 3, 4 or 5 hoppers. All 3 and 4 hopper Pressureaide® car models have bulkheads between compartments. The PD3720N & PD5650N are exceptions with a clean bore design without interior bulkheads that allow for "flood" loading of the entire car through a single hatch.

Unloading of the car is accomplished using a process called fluidization. In the bottom of each compartment is a permeable membrane. Air is fed to the underside of the membranes then "bubbles" up through the product. Product particles become suspended in the "bubbles" of air and take on fluid-like properties. Once in suspension, the product flows from the car through the product discharge piping. The air also pressurizes the car and provides the energy to push or convey the product to the receiver. The Pressureaide® car can unload up to 100,000 pounds per hour at car body operating pressures up to 14.5 psig.

Air flow and air quality are critical to the operation of the GBX Pressureaide® car. See "Requirements for Operating Air" on page 25 for detailed information.

Contact The Greenbrier Companies (GBX) for assistance in operating the Pressureaide® car when using automated unloading systems as this presents a special set of circumstances.

### Compartment Identification

The hoppers are identified using an alpha sequence beginning at the "B" end.  
"B" end = End of railcar with the handbrake.

For a 5 hopper car the designations are B – BC – C – AC – A.

For a 4 hopper car the designations are B – BC – AC – A.

For a 3 hopper car the designations are B – C – A.



# Pressureaide® Car Models

**PD3300**



**PD5001**





# Pressureaide® Car Models

**PD5300**



**PD5750**



## Pressureaide® Car Models

### PD3720N

N denotes without bulkheads



### PD5650N

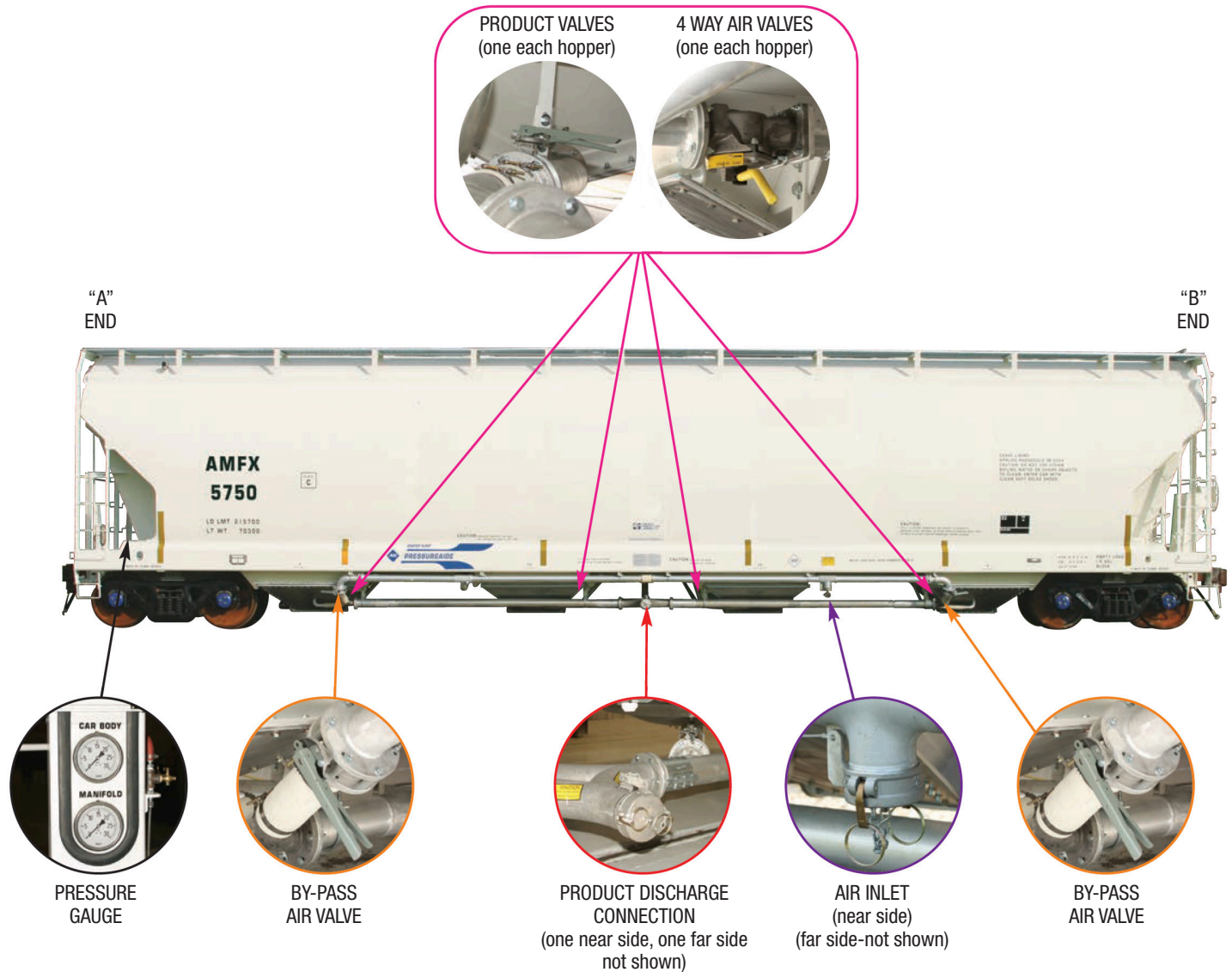
N denotes without bulkheads





# Operating Equipment and Location

For models PD3300, PD5001, PD5300 & PD5750

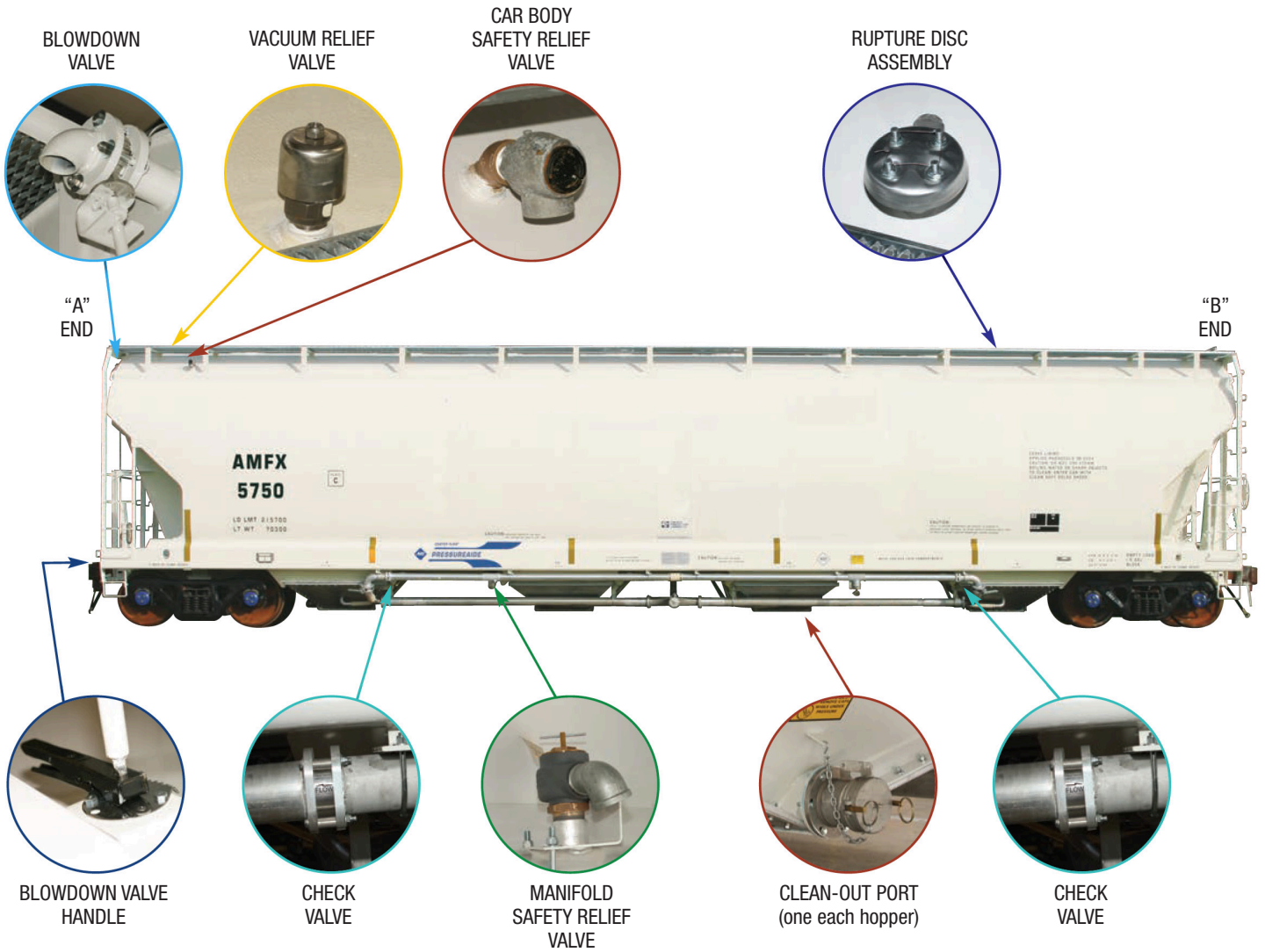


Note: Near side refers to the side of the car with the manifold piping.  
Far side refers to the side of the car opposite the manifold piping.



# Operating Equipment and Location

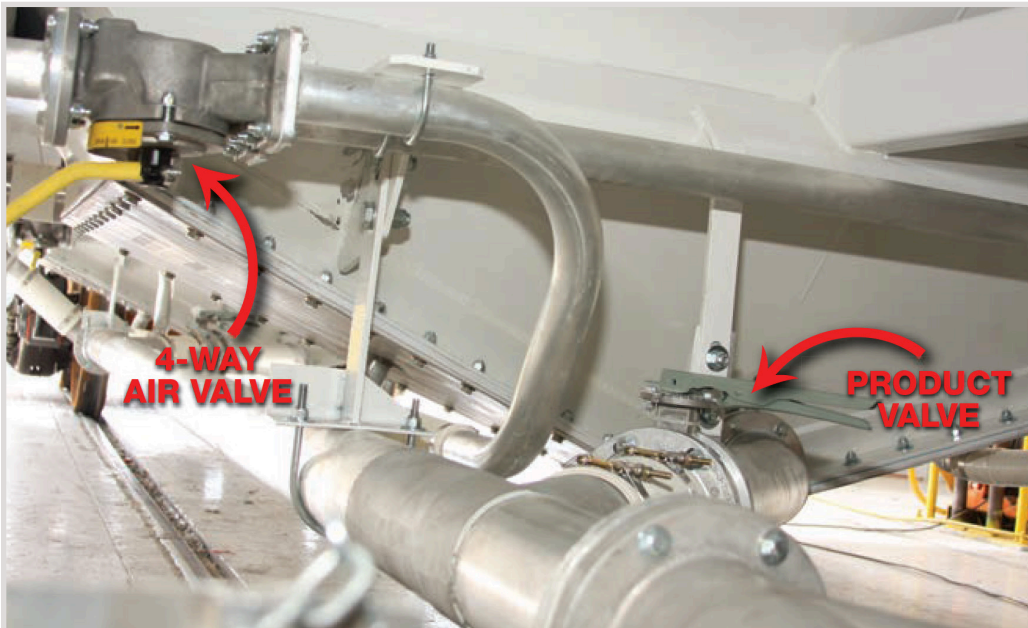
For models PD3300, PD5001, PD5300 & PD5750



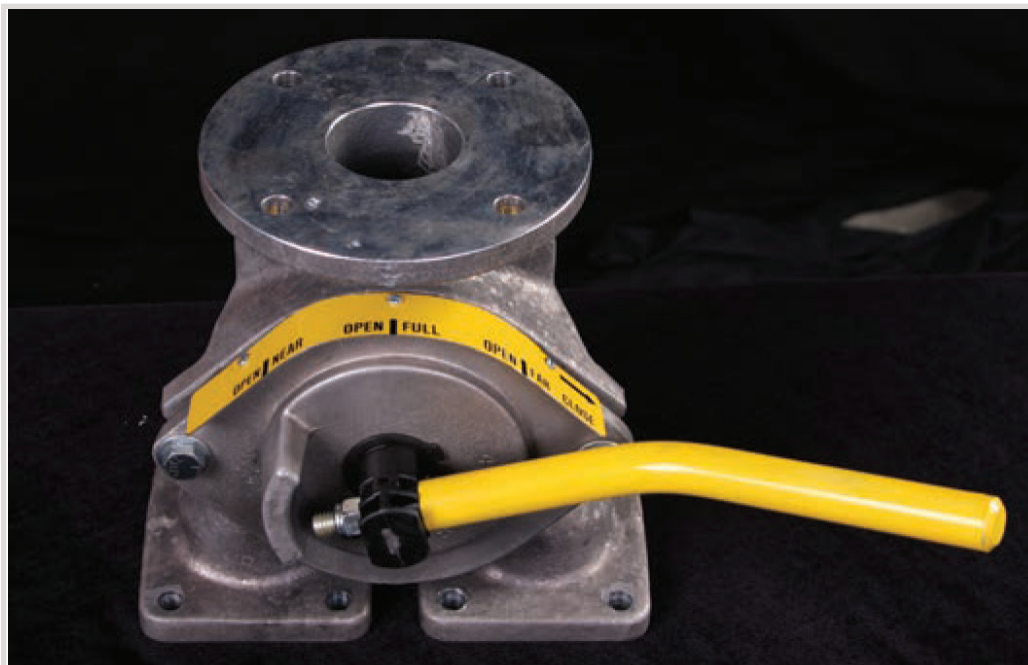
# Operating Instructions

For models PD3300, PD5001, PD5300 & PD5750

## UNLOADING CONTROLS



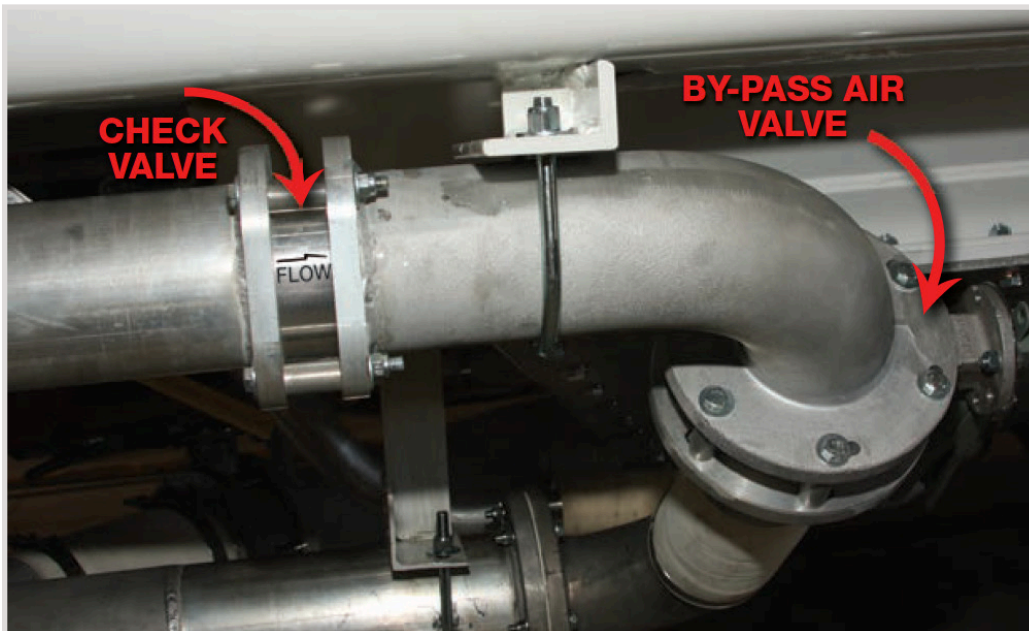
Each compartment is equipped with a product valve to regulate the flow of product entering the discharge manifold.



A 4-way air valve controls the flow of air into each compartment. The valve operating positions are: Closed, Open Near Side, Open Far Side and Fully Open. An internal check valve is installed in the 4 position valve and prevents blowback in the event of a blower shut down.

# Operating Instructions

For models PD3300, PD5001, PD5300 & PD5750



A check valve and by-pass valve are installed in series in the air supply line where the air supply connects to the discharge manifold. This arrangement permits conveying air to be metered into the discharge line.

## BLOW DOWN VALVE



The car is equipped with a blow down valve to depressurize the car body. The valve is located on the "A" end of the car and is operated from ground level with a handle extension. The valve is closed when the handle position is parallel to the valve body.

Note: This valve discharges air and dust at high velocity. Personnel must stand clear.



# Operating Instructions

For models PD3300, PD5001, PD5300 & PD5750

## PRESSURE RELIEF DEVICES



The Pressureaide® car is equipped with two self-closing pressure relief valves: a car body pressure relief valve and a manifold relief valve for the air inlet manifold. The car body pressure relief valve is set to open at  $14.5 \pm 0.5$  psig. The valve automatically closes when the pressure inside the car body is relieved. The relief valve in the air inlet is set to open at  $16.0 \pm 0.5$  psig and will reseal when the pressure is relieved.



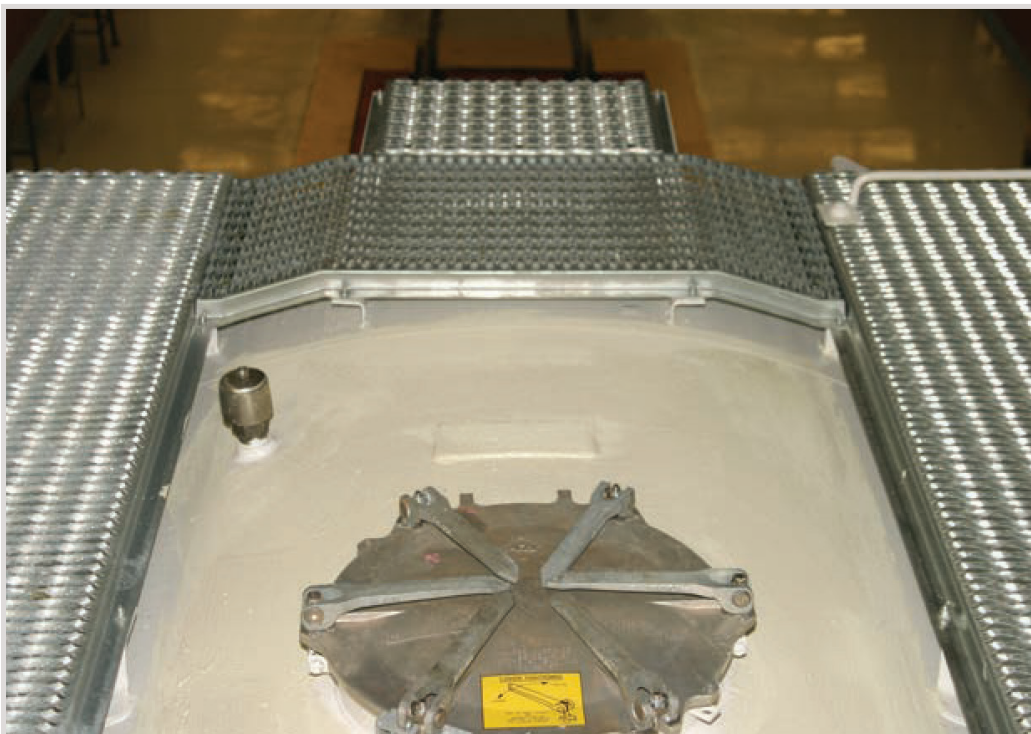
# Operating Instructions

For models PD3300, PD5001, PD5300 & PD5750

## PRESSURE RELIEF DEVICES



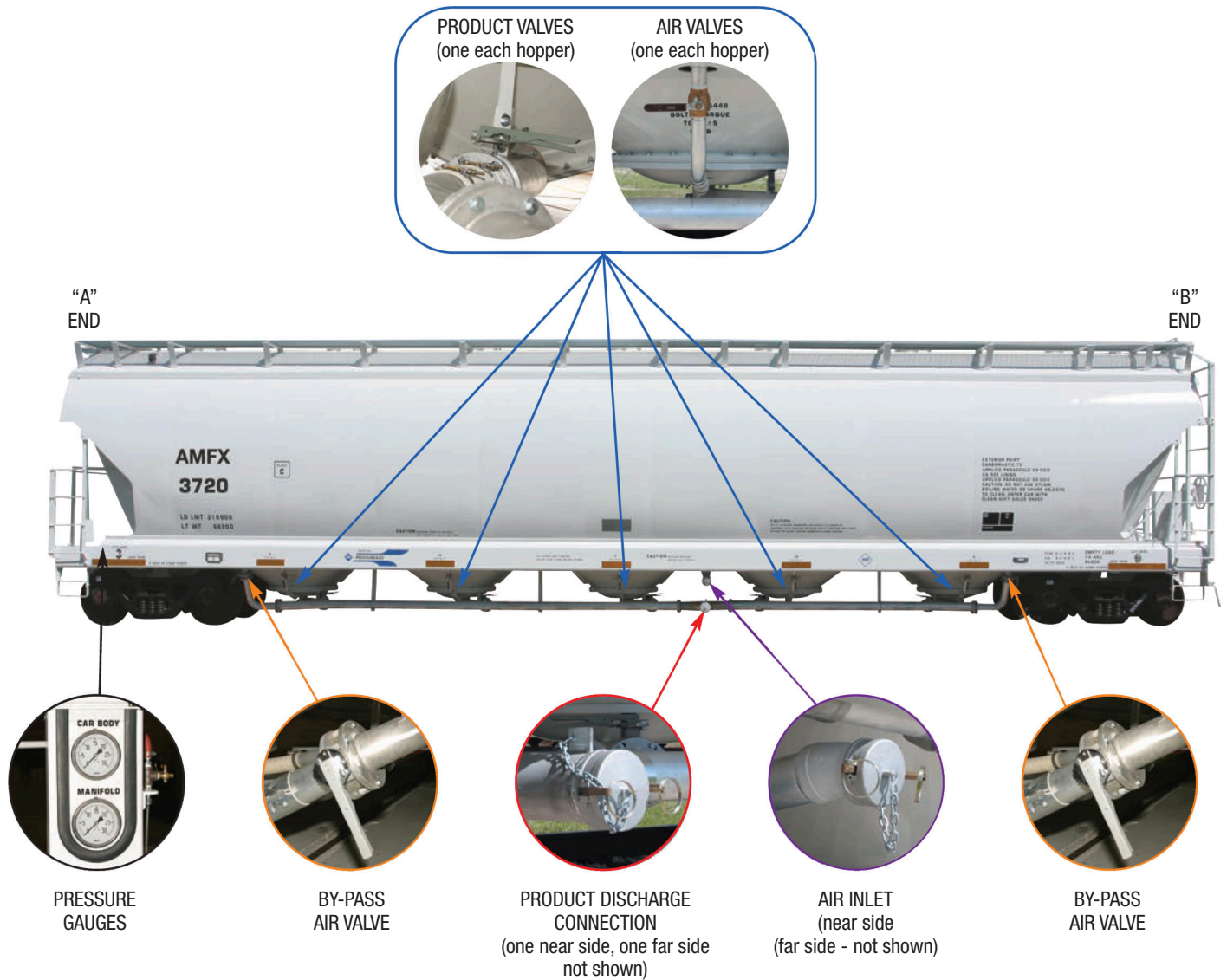
A rupture disc assembly on the car body is a standard feature. The rupture disc is a device that functions only once. It is set to burst at 20.0 psig. Once the rupture disc bursts it is necessary to replace the burst disc inside the assembly.



The vacuum relief valve balances pressure inside the car with outside conditions due to atmospheric changes. This safety device is a self-closing device that opens at -0.25 psig or -0.5 inches Hg. Its purpose is to protect the railcar's body from deformations due to atmospheric pressure changes. It will not protect the railcar's body in the rare event the railcar must be vacuum unloaded. If the railcar must be vacuum unloaded, contact The Greenbrier Companies.

# Operating Equipment and Location

For model PD3720N Single Compartment

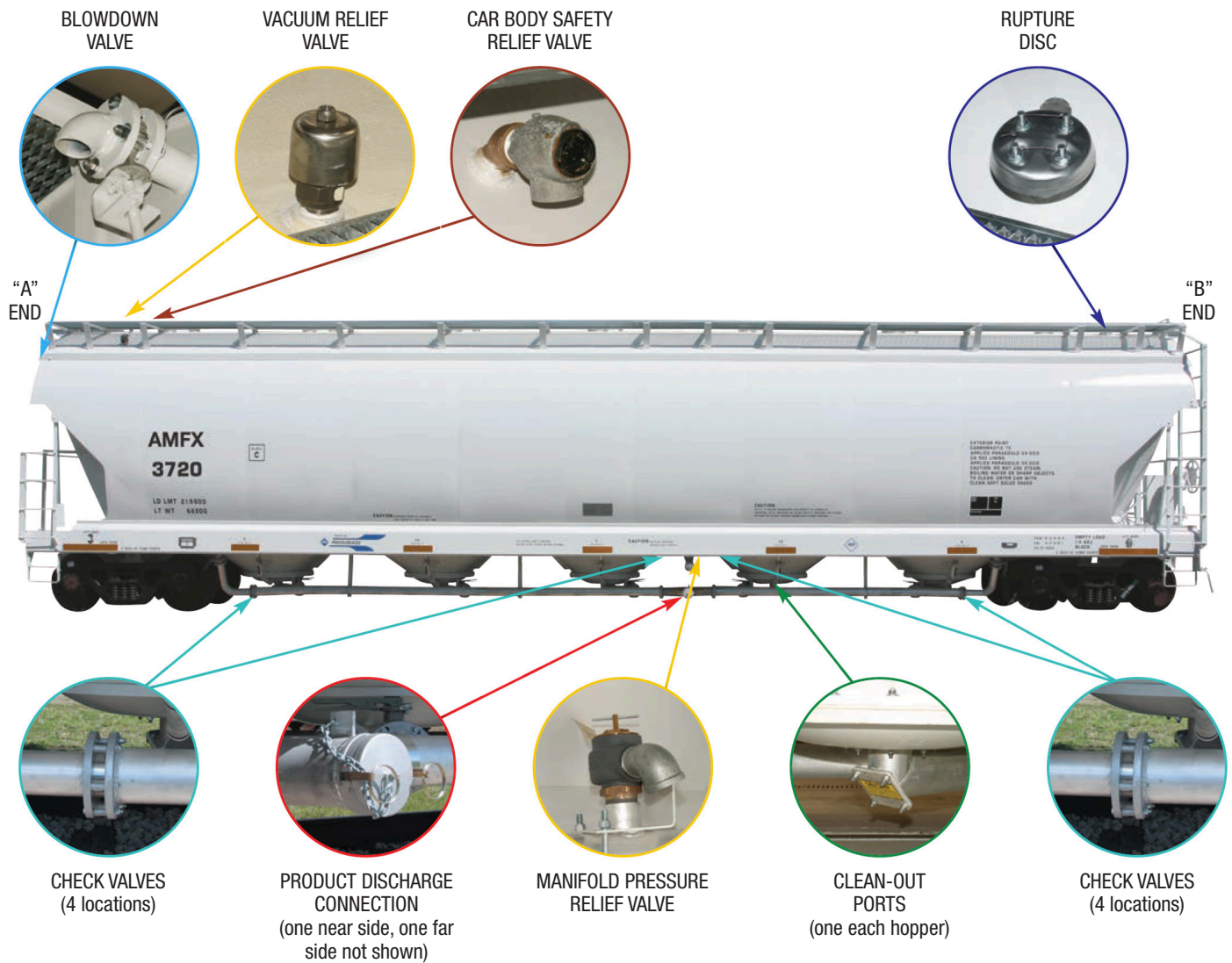


Note: Near side refers to the side of the car with the manifold piping.  
Far side refers to the side of the car opposite the manifold piping.



# Operating Equipment and Location

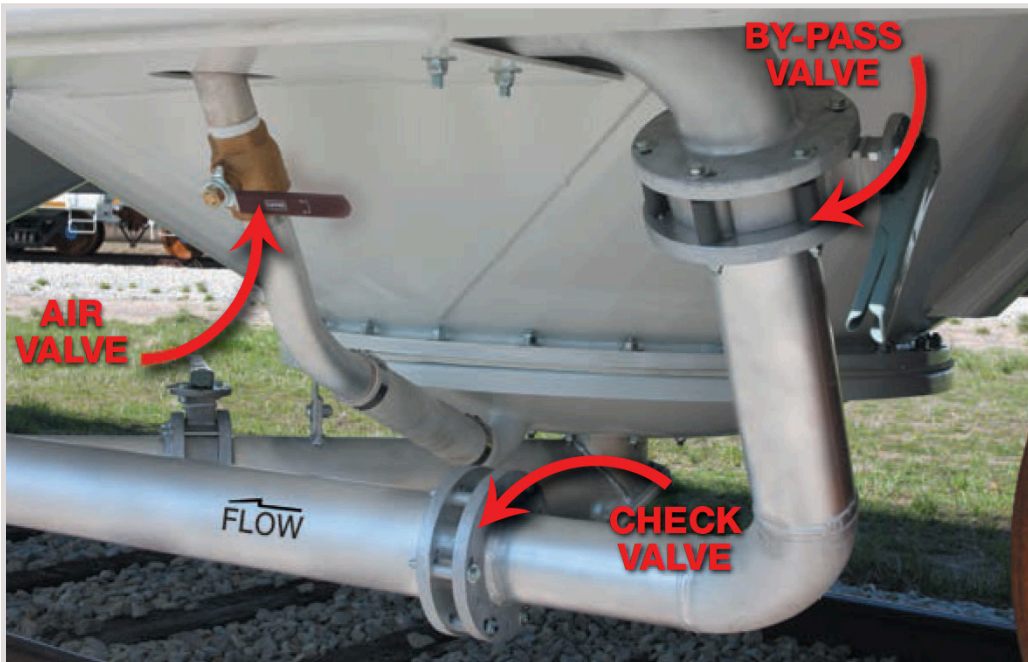
For model PD3720N Single Compartment



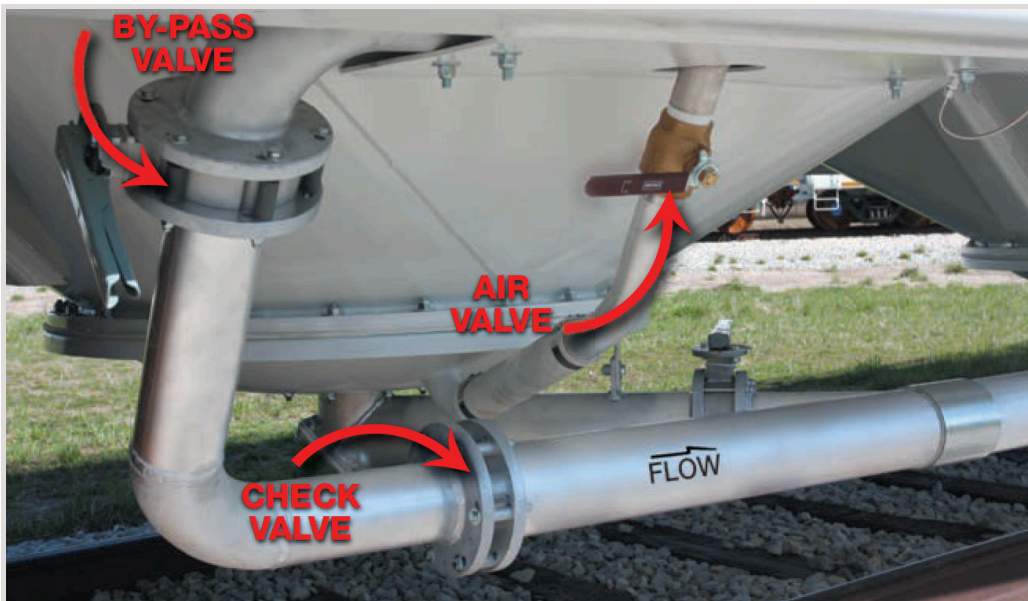
# Operating Instructions

## For model PD3720N Single Compartment

### UNLOADING CONTROLS



Each compartment is equipped with a product discharge valve to regulate the flow of product entering the discharge manifold and an inlet valve for controlling fluidizing air to each hopper.



A check valve and by-pass valve is installed in series in the air supply line where the air supply connects to the discharge manifold. This arrangement permits conveying air to be metered into the discharge line.

# Operating Instructions

## For model PD3720N Single Compartment

### BLOW DOWN VALVE



The car is equipped with a blow down valve to depressurize the car body. The valve is located on the “A” end of the car and is operated from ground level with a handle extension. The valve is closed when the handle position is parallel to the valve body.

Note: This valve discharges air and dust at high velocity. Personnel must stand clear.

### PRESSURE RELIEF DEVICES



The Pressureaide® car is equipped with two self-closing pressure relief valves: a car body pressure relief valve and a manifold relief valve for the air inlet manifold. The car body pressure relief valve is set to open at  $14.5 \pm 0.5$  psig. The valve automatically closes when the pressure inside the car body is relieved. The relief valve in the air inlet is set to open at  $16.0 \pm 0.5$  psig and will reseal when the pressure is relieved.



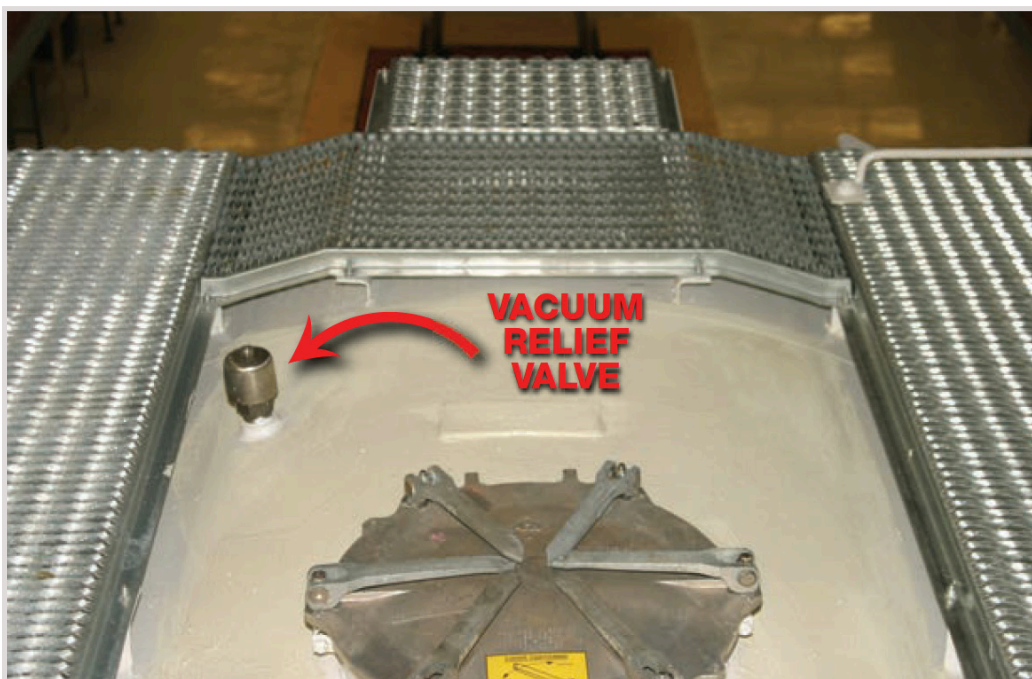
# Operating Instructions

## For model PD3720N Single Compartment

### PRESSURE RELIEF DEVICES



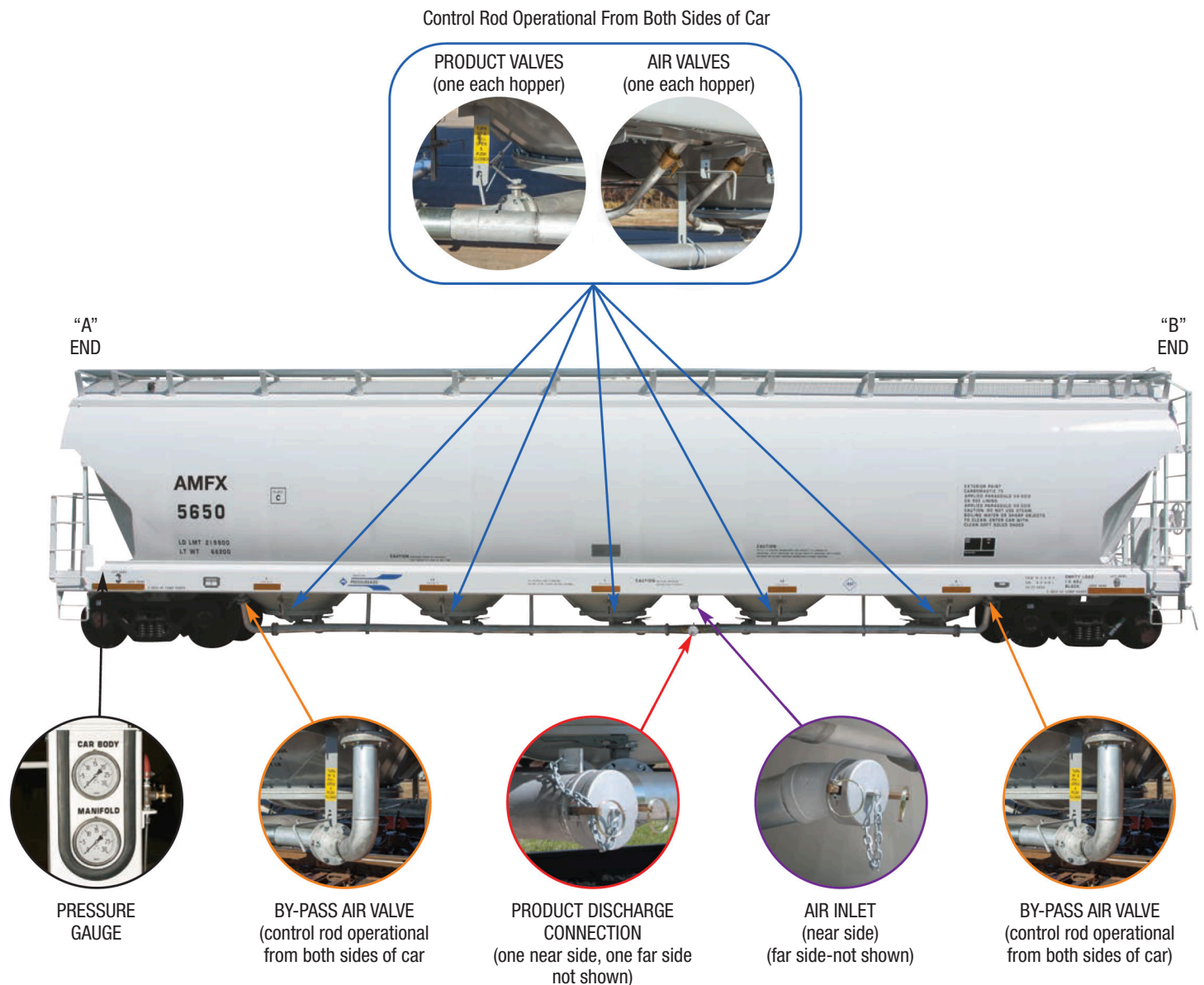
A rupture disc assembly on the car body is a standard feature. The rupture disc is a device that functions only once. It is set to burst at 20.0 psig. Once the rupture disc bursts it is necessary to replace the burst disc inside the assembly.



The vacuum relief valve balances pressure inside the car with outside conditions due to atmospheric changes. This safety device is a self-closing device that opens at -0.25 psig or -0.5 inches Hg. Its purpose is to protect the railcar's body from deformations due to atmospheric pressure changes. It will not protect the railcar's body in the rare event the railcar must be vacuum unloaded. If the railcar must be vacuum unloaded, contact The Greenbrier Companies.

# Operating Equipment and Location

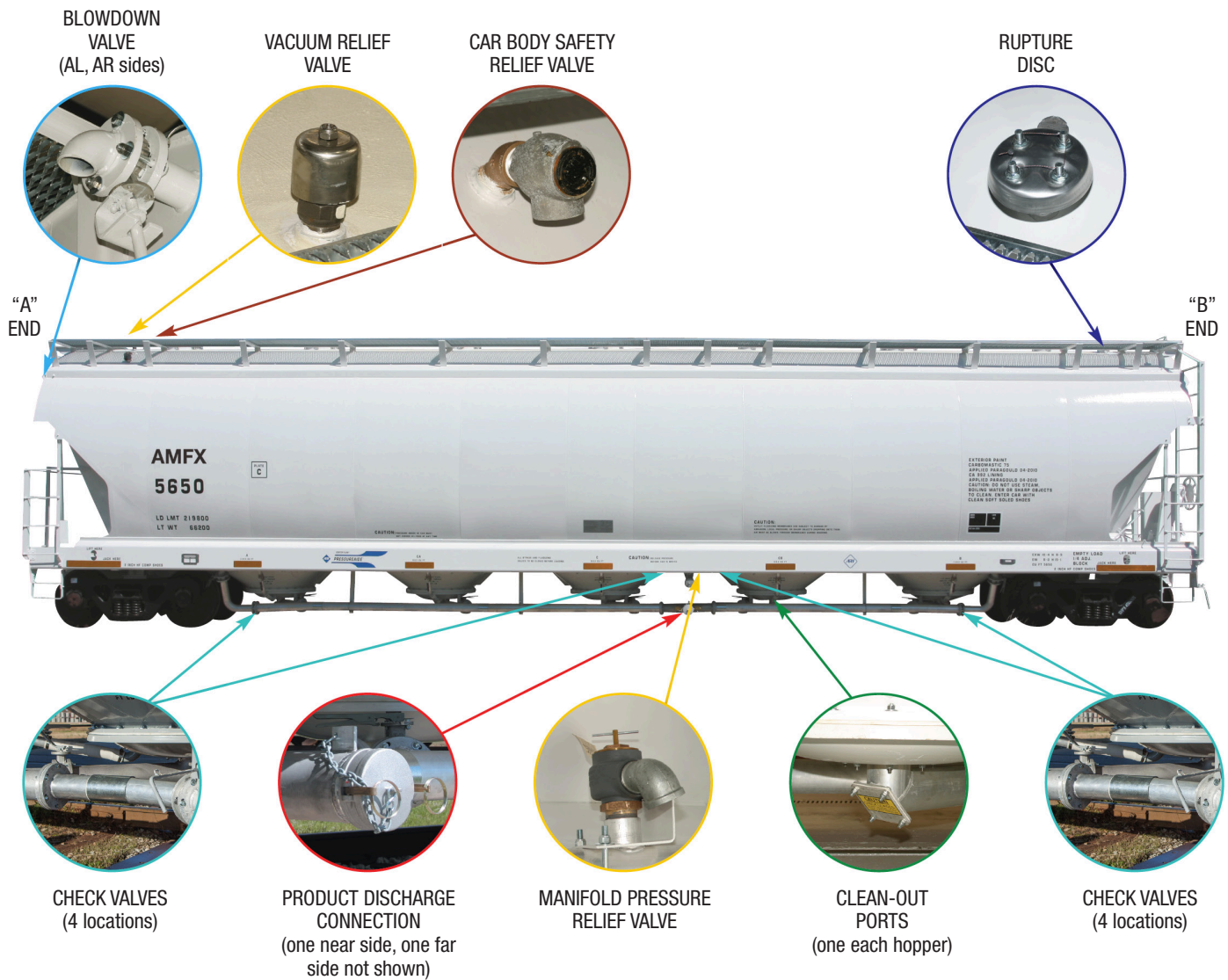
For model PD5650N Single Compartment



Note: Near side refers to the side of the car with the manifold piping.  
Far side refers to the side of the car opposite the manifold piping.

# Operating Equipment and Location

For model PD5650N Single Compartment

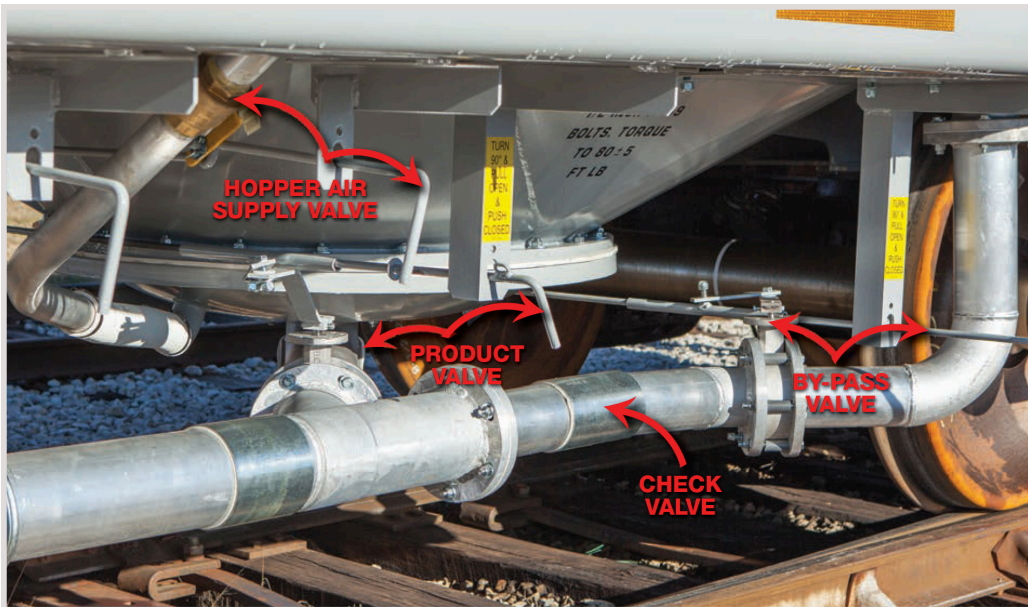




# Operating Instructions

## For model PD5650N Single Compartment

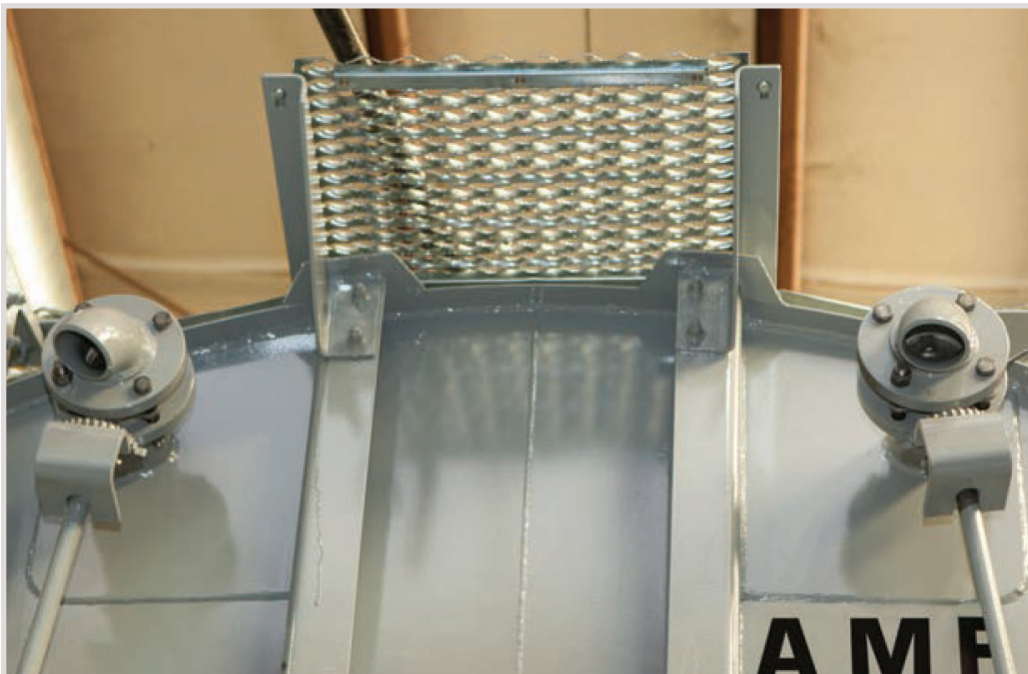
### UNLOADING CONTROLS



Each compartment is equipped with a product discharge valve to regulate the flow of product entering the discharge manifold and an inlet valve for controlling fluidizing air to each hopper.

A check valve and by-pass valve is installed in series in the air supply line where the air supply connects to the discharge manifold. This arrangement permits conveying air to be metered into the discharge line. (operation is the same for A and B ends)

### BLOW DOWN VALVES



The car is equipped with two blow down valves to depressurize the car body. The valves are located on the AL & AR end of the car and are operated from ground level with a handle extension. The valve is closed when the handle position is parallel to the valve body.

Note: This valve discharges air and dust at high velocity. Personnel must stand clear.

# Operating Instructions

For model PD5650N Single Compartment

## PRESSURE RELIEF DEVICES



The Pressureaide® car is equipped with two self-closing pressure relief valves: a car body pressure relief valve and a manifold relief valve for the air inlet manifold. The car body pressure relief valve is set to open at  $14.5 \pm 0.5$  psig. The valve automatically closes when the pressure inside the car body is relieved. The relief valve in the air inlet is set to open at  $16.0 \pm 0.5$  psig and will reseal when the pressure is relieved.





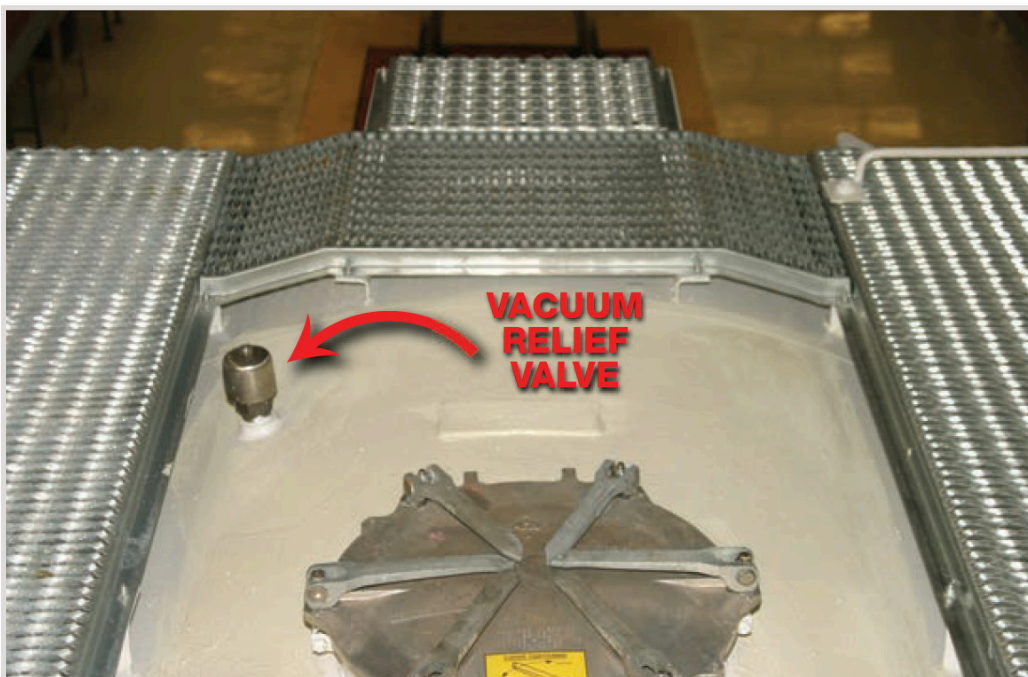
# Operating Instructions

## For model PD5650N Single Compartment

### PRESSURE RELIEF DEVICES



A rupture disc assembly on the car body is a standard feature. The rupture disc is a device that functions only once. It is set to burst at 20.0 psig. Once the rupture disc bursts it is necessary to replace the burst disc inside the assembly.



The vacuum relief valve balances pressure inside the car with outside conditions due to atmospheric changes. This safety device is a self-closing device that opens at -0.25 psig or -0.5 inches Hg. Its purpose is to protect the railcar's body from deformations due to atmospheric pressure changes. It will not protect the railcar's body in the rare event the railcar must be vacuum unloaded. If the railcar must be vacuum unloaded, contact The Greenbrier Companies.



## Standard Hatch Arrangements

Each Pressureaide® car is equipped with 20" diameter pressure hatches for use in loading the car. For cars with bulkheads, a bulkhead cutout is provided to accommodate a "wye" chute for loading adjacent compartments through one hatch. The PD3300 has 5 hatches; one in the center compartment and two in each end. Models PD5001, PD5300 and PD5750 have 8 hatches, two per compartment.

The PD3720N is designed with 3 hatches and no interior bulkheads.

The PD5650N is designed with 7 hatches and no interior bulkheads.

This allows for "flood" loading of the cars.



The hatches are secured with 6 cam lever closures. A safety catch is applied to the lever opposite the hinge of each cover. The safety catch prevents opening the hatch when the car body is under pressure. This lever must always be the last one opened. The ends of two opposing levers are drilled for the application of a security seal.

The hatch cover assemblies and gaskets must be inspected prior to each loading. Any missing or damaged parts must be replaced and the cam levers checked for proper adjustment. The lever closing force must be 40 pounds. Inspect the gaskets to ensure they are clean and undamaged.

# Standard Hatch Arrangements

## Wrenchable Lever Adjustment

The levers are designed to function as a wrench providing the ability to adjust the closing force without additional tool.

1. Center the cover on the hatch ring.



2. Close the two levers at 90 degrees to the longitudinal centerline of the car.



3. With the lever in the open position, and the bolt upright, lift the lever to engage the "wrench" feature with the flats on the nut.



4. Turn the nut clockwise to increase the closing force, or counter clockwise to decrease.



5. Adjust the levers diagonally opposite.



6. Proceed to the next pair of levers.



8. Cable seals may be applied to either holes in levers or hatch cover and ring.



7. Confirm the closing force on all levers and readjust as required

## Hinge Block Lever Adjustment

1. Center the cover on the hatch ring.



2. Close the two levers at 90 degrees to the longitudinal centerline of the car.



3. Loosen the 5/16" setscrew on the hinge block with a 5/32" allen wrench. (older models may not have set screws)



4. Turn the cam lever clockwise to increase the closing force, or counter clockwise to decrease.

5. Adjust the levers diagonally opposite.



6. Proceed to the next pair of levers.



7. Confirm the closing force on the levers and readjust as required.

8. Tighten the setscrews in the hinge blocks.

9. Apply cable seals as required.

# Cleaning

## General Instructions & Cautions

1. In-plant confined space entry procedures must be followed to enter the car.
2. Ensure the car is not under pressure before opening hatches or removing caps. Open the blow down valve, air inlet valve, by-pass valve and product valves to depressurize the car body and manifold system, then check the pressure gauges to confirm all readings are zero.
3. If using ladders, they must be equipped with rubber feet to protect the interior lining.
4. Never place a ladder on the aeration membranes as damage will result.
5. Avoid direct impingement of high-pressure water on the safety relief valve, vacuum relief valve and the rupture disc inlets located in the roof of the “A” and “B” hoppers.
6. Do not direct high-pressure water at the membranes.
7. Steam cleaning or grit blast should never be employed on cars with interior linings.
8. The most common methods for cleaning the interior of an GBX Pressureaide® car is using either of two proven methods: wet washing or dry scraping. If dry scraping, use pliable plastic tools and use extreme care not to damage the lining or membranes.
9. Entry into the car is gained through the manway openings. Do not remove the plenum plate from the bottom of the car.

## Washing Procedures

### PREPARATION

1. In-plant confined space entry procedures must be followed to enter the car.
2. Before opening hatches or removing caps, open the blow down valve, air inlet valve, by-pass valve and product valves to depressurize the car body and manifold.
3. Open all hatches on top of the car.
4. Connect a positive displacement blower to the air inlet connection.
5. Attach product discharge hoses to each side of the car to direct the flow of air, water and residual product away from the personnel and the work area.
6. Close the two by-pass valves and open all of the fluidizing valves to the full open position.
7. Open all of the product valves.
8. Remove the quick disconnect cap or, in the case of the PD3720N or PD5650N, the bolted cover plates from the clean out port on each compartment.

### CLEANING PROCESS

1. Start the blower to establish airflow through the membranes. *It is critical to maintain airflow during the cleaning process.*
2. Wet washing can be accomplished using a hand held hose or a roto-jet inserted into an open hatch. Move from hopper to hopper, as necessary, to clean entire railcar.
3. After cleaning, continue the airflow through the membranes until dry.

### DRYING PROCESS

1. After all compartments have been cleaned, be sure all the fluidizing valves are in the full open position to allow airflow through all the membranes until the compartment is dry.
2. Shut down the blower and allow dry residual air to vent from the car to avoid any potential for pressure to build in the car or manifold.
3. Close and secure all hatches.
4. Close the product valves and re-install the caps or closure plates on the clean out ports.
5. Restart the blower and pressurize the car to 10 psig.
6. Open the product valve on an end compartment and allow airflow for two minutes to clear any remaining water from the product line. Close the valve and repeat the procedure on the next hopper.
7. After drying the last compartment, open the by-pass air and product valves, and allow airflow for two minutes.
8. Shut down the blower. The car will depressurize through the product valves. Ensure the pressure gauges read “zero” before going to step 9. Open blow down valve to ensure there is no pressure in the car body.
9. Remove the discharge hoses and dust caps or closure plates from the clean out ports.
10. Inspect the clean out ports. Swab out any remaining water and residue. Re-install the quick disconnect caps or closure plates.
11. Disconnect the air supply line.
12. Close all valves. Install and secure the quick disconnect caps on the air inlets and product discharge connections.



# Loading and Unloading Operations

## Requirement for Operating Air

The air supply should be clean and dry, and come from a positive displacement blower.

The GBX Pressureaide® car is designed to operate with airflows ranging from 450 scfm to 1,000 scfm. The Greenbrier Companies can provide technical assistance to determine the required airflow for a particular installation. A positive displacement blower operating at 14.5 psig provides the best results for unloading. When utilizing a high capacity blower, a by-pass valve must be installed in the in-plant piping system to limit air flow into the car body to 1,000 scfm, see sketch below.

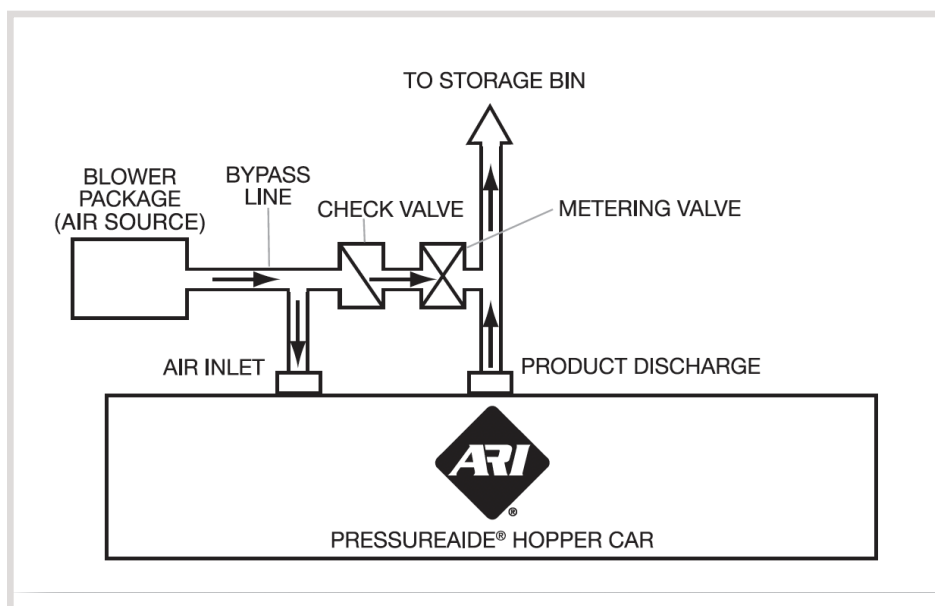
When air supply configurations incorporate a by-pass system, it is critical that a check valve and metering valve be placed in series between the air inlet and product discharge lines. This is to protect the blower and membranes in the event the blower shuts down during unloading. The check valve serves as protection for the air inlet and the blower. The by-pass valve allows for the adjustment of airflow into the product discharge line to help convey the product to the receiver.

For in-plant systems that provide air from a high pressure/high volume compressor, it is imperative that pressure regulators limit air pressure to 20 psig and have adequate water traps and filters in place to ensure a continuous supply of clean, dry air.

Unloading rates are a function of product to air ratios and the configuration of the unloading site conveying system. As a general guide, the air flow requirement is 450 scfm for a 4 inch product line, 600-680 scfm for a 5 inch diameter and 800-1,000 scfm for a 6 inch. As cautioned above, air flow into the car body must never exceed 1,000 scfm @ 14.5 psig.

### Operational Notes:

- All supply air must be clean and free of oil, foreign matter and moisture.
- Air volume is scfm@14.5 psig
- Air temperature to the car must not exceed 250° F.
- The unloading site air supply hose is to be clean and free of foreign matter and product.
- Failure to follow these recommendations will result in reduced efficiencies, damage to the fluidization membranes and possible product contamination



# Loading Operations

## Pre-loading Inspection

1. Inspect the hatches, locking mechanisms and safety catches. The gaskets should be clean and in good condition.
2. Operate all control valves: product flow, by-pass, fluidizing air and blow down. The valves should operate smoothly with minimal resistance. All valves should be left in the closed position for loading.
3. Remove and inspect all dust caps. The gaskets and cam levers must be in good condition and the attachment chains in place. Caps must be securely attached to the car with chains.
4. Inspect the pressure gauges, clear plastic cover and metal shipping cover for damage. Each gauge should be liquid filled. The gauges must read “zero” when the car is depressurized. Confirm the gauge lines are properly connected and the two gauge line petcocks are closed.
5. All rubber hoses and compression couplings must be in good condition. Hose clamps must be in place and properly tightened.
6. To vent the car during loading open either the blow down valve or a hatch. A filter may be placed over the opening to reduce dusting.

## Post Loading

1. Insure all valves are closed, including the blow down valve.
2. Check all dust caps for proper installation. Apply tamper evident seals.
3. Close the gauge box cover over the pressure gauges. Apply a tamper evident seal.
4. Close all hatches, ensuring that the hold-downs are properly engaged in the closed position. Apply tamper evident seals.
5. Apply additional tamper evident seals, as required.

# Unloading Operations

## Unloading Inspection and hook-up

1. Check to ensure both pressure gauges read “zero.” If a gauge reads above zero, open the blow down valve, then one by-pass valve, one air inlet valve and one product valve. Recheck the pressure gauges. If the reading is still above zero, replace the gauge. It is now safe to remove the dust caps for the air and product connections.
2. Confirm that all hatches are properly secured.
3. Close the blow down valve.
4. Close all product valves.
5. Close all fluidizing air and air by-pass valves.
6. Close both petcocks at the pressure gauges.
7. Connect air supply hose to the air manifold and the product line to the discharge manifold.
8. Attach grounding straps to the car body and the discharge manifold.

## Pressurizing the Car Body & Unloading For models PD3300, PD5001, PD5300 & PD5750

1. Open both by-pass valves, then start the blower to initiate air flow to the air manifold.
2. Confirm that air is flowing freely to the silo, truck or other receiving vessel. An increase in manifold pressure or the opening of a safety relief valve is evidence of a plugged line.
3. Open the 4-way air valve to the Full Open position for the compartment to be unloaded.
4. Close both by-pass valves to begin pressurizing the car.
5. As the car body pressurizes, check for leaks in the form of dusting at the clean-out ports, hatches, piping and hose connections and the bolted plenums. If dusting is observed, stop the blower and depressurize the car. Identify and correct the problem.
6. Once the car reaches operating pressure, open one of the by-pass air valves to its full open position for the compartment to be unloaded. Utilize the by-pass valve at the “A” end for compartments “A” and “AC.” For unloading the “B” and “BC” compartments utilize the by-pass valve on the “B” end of the car.
7. Open the product valve, and adjust it and the by-pass valve as required to establish the optimal unloading rate.
8. Monitor the car body pressure throughout unloading. Pressure requirements will vary with the commodity being shipped and the in-plant unloading system. The car body operating pressure must never exceed 14.5 psig.
9. *Should the car body pressure exceed 15.0 psig and the pressure relief valve fails to open, shut off the air supply and depressurize the car. The pressure relief valve must be replaced prior to proceeding with the unloading operation.*
10. Typically, optimum unloading rates are obtained when the air manifold pressure is 1.0 psig to 3.0 psig higher than the car body pressure. Monitor the pressure at the gauges and adjust valves as required. *(This is dependent on the product and unloading system.)* A series of adjustments, using the by-pass valve, may be required to obtain optimum product flow. In general, the longer the conveying distance, the more by-pass air is required.
11. As the compartment empties, one side may clean out before the other. This can be determined by rapping the side of the car with a rubber mallet and listening for a difference in sound. Using the 4-way valve, direct air flow to the loaded side’s membrane and continue normal unloading procedures.
12. Using the 4-way valve, alternate air between membranes until the compartment completely empties at which time a rapid drop in car body pressure will be observed.
13. Build up the car body pressure to 5 psig. Complete the clean out process by opening and closing the product valve four or five times in twenty second intervals.
14. Close the product discharge valve and the 4-way valve.
15. Move to the next compartment and open the 4-way valve to the Full Open position.
16. Close the by-pass air valve to begin pressurizing the car body.

continued on next page



17. Repeat the above process from step 3 for the next compartment to be unloaded.
18. When all compartments are unloaded, open both by-pass valves and close all other valves. Allow supply air to thoroughly clean out the car's manifold and plant's product conveying lines.
19. Shut down the blower after the car and conveying lines are blown clean. After the blower stops: depressurize the car body by opening the blow down valve. (An alternate method of depressurizing the car body is to open the product valves, bleeding pressure through the plant dust collection system.) When airflow has stopped, open one product valve and one fluidizing or by-pass valve. Ensure the pressure gauges read "zero," then disconnect the air supply and product hoses. Replace and secure the dust caps on the Product and Air Inlet connections.
20. Close all valves and hatches and apply tamper evident seals, if required.

## Pressurizing the Car Body & Unloading For models PD3720N & PD5650N

1. Open both by-pass valves then start the blower to initiate air flow to the air manifold.
2. Confirm that air is flowing freely to the silo, truck or other receiving vessel. An increase in manifold pressure or the opening of a safety relief valve is evidence of a plugged line.
3. Open the air valve to the Full Open position for the hopper to be unloaded.
4. Close both by-pass valves to begin pressurizing the car.
5. As the car body pressurizes, check for leaks in the form of dusting at the clean-out ports, hatches, piping and hose connections and the bolted plenums. If dusting is observed, stop the blower and depressurize the car. Identify and correct the problem.
6. Open one of the by-pass valves to its full open position to establish flow through the discharge manifold. Utilize the by-pass valve at the "A" end for hoppers "A, AC and C." For unloading, the "B" and "BC" hoppers utilize the by-pass valve on the "B" end of the car.
7. Open the product valve, and adjust it and the by-pass valve as required to establish the optimal unloading rate.
8. Monitor the car body pressure throughout unloading. Pressure requirements will vary with the commodity being shipped and the unloading system. The car body operating pressure must never exceed 14.5 psig.
9. *Should the car body pressure exceed 15.0 psig and the pressure relief valve fails to open, shut off the air supply and depressurize the car. The pressure relief valve must be replaced prior to proceeding with the unloading operation.*
10. Typically, optimum unloading rates are obtained when the air manifold pressure is 1.0 psig to 3.0 psig higher than the car body pressure. Monitor the pressure at the gauges and adjust valves as required. *(This is dependent on the product and unloading system.)* A series of adjustments, using the by-pass valve may be required to obtain optimum product flow. In general, the longer the conveying distance, the more by-pass air is required.
11. When the hopper empties, there will be a rapid drop in car body pressure.
12. Close the product discharge valve.
13. Move to the next hopper and open the air valve to the Full Open position.
14. After unloading a hopper, close the air valve and the by-pass air valve. The car body will begin to pressurize for unloading the next compartment.
15. Repeat the above process (steps 3-14) for the next hopper to be unloaded.
16. As this is a single compartment car, some spillage may occur between hoppers during the unloading process. To provide complete clean out, repeat the above procedures for all compartments.
17. After all hoppers are emptied, open both by-pass valves and close all other valves. Allow supply air to thoroughly clean out the car's manifold and plant's product conveying lines.
18. Shut down the blower after the car and conveying lines are blown clean. After the blower stops: depressurize the car body by opening the blow down valve. (An alternate method of depressurizing the car body is to open the product valves, bleeding pressure through the plant dust collection system.) When airflow has stopped, open one product valve and one fluidizing or by-pass valve. Ensure the pressure gauges read "zero," then disconnect the air supply and product hoses. Replace and secure the dust caps on the Product and Air Inlet connections.
19. Close all valves and hatches and apply tamper evident seals, if required.

# General Maintenance

The car must be depressurized before performing any maintenance function. Open the blow down valve then one fluidizing, one bypass valve and one product valve. Confirm the pressure gauges read “zero.”

## Hatch Gasket Replacement

Remove the old gasket by inserting a flat head screwdriver along the outer wall of the gasket groove and prying underneath the gasket. Take care not to gouge the metal surface. Once enough of the gasket is exposed pull the remainder out by hand.

Do not pry against the inner wall of the gasket groove as this could result in damage to the dovetail.

1. Clean the gasket groove with a commercial adhesive remover to remove any residue then wipe down both sides of the new gasket and allow to dry.
2. Apply a thin layer of Scotch-grip EC1357 Contact Adhesive to the bottom of the gasket groove and gasket. Allow the adhesive to set until the surfaces become tacky.
3. Install the gasket by slipping one edge into the dovetail. Repeat this every 90 degrees. Continue pressing the gasket into the dovetail with thumb pressure or the heel of your hand. A small roller can also be used. Make sure the gasket is properly seated.
4. Wipe away any excess adhesive.
5. Close the cover, center on the hatch ring and latch all cam levers. Check lever closing force. See pages 22 and 23.

## Pressure Gauges

The pressure gauges must be calibrated on an annual basis. Two tee connections are located on the back side of the pressure gauge housing. These fittings connect the gauge inlet lines, the pressure gauges and the petcocks.

1. Remove the petcocks and connect calibrated test gauges to the tees. If necessary, the gauge inlet lines can be cleared with compressed air.
2. Close all product and air valves except for one fluidizing valve.
3. Connect an air supply line and pressurize the car to 10.0 psig.
4. The pressure reading between the car gauge and the test gauge must be within 1.0 psig. If the car gauge falls outside this range, remove the gauge and replace.
5. If there is no pressure reading, stop the blower and open the blow down valve to allow the car to depressurize.
6. Disconnect the fitting at the back of the gauge panel, close the petcock and using compressed air, blow back through the gauge line to clear away any product that may be causing a blockage.
7. Reassemble the gauges and retest.

## Rupture Disc Assembly

The rupture disc assembly must be inspected annually, or if the security seal is broken.

1. Break the security wire and remove the four nuts securing the weather cover.
2. Visually inspect the disc looking for signs of rupture, tears or holes. An air leak test can be performed by pressurizing the car body to 10 psig and using a soap solution.
3. If the disc requires replacement, depressurize the car and ensure the pressure gauges read “zero.”
4. Remove the four bolts, separate the flanges and discard the old rupture disc.
5. Inspect and clean the disc seating surfaces on each flange removing any nicks or burrs then lightly polish with an emery cloth.
6. Remove the new rupture disc from the packaging and visually examine to ensure it is in good condition. Confirm the pressure rating is 20 psig. The disc must be specifically manufactured for use in the rupture disc holder assembly.
7. Place the rupture disc on the inlet flange. The convex side of the disc must be in the up position so pressure inside the car will be against the concave side of the disc.
8. Replace the upper flange. Install the four bolts finger tight to ensure all components are properly aligned and seated. Torque the nuts to 34 – 38 ft-lbs. *Do not over tighten as damage to the rupture disc may occur.*
9. Reinstall the cover, tighten nuts 20 – 25 ft-lbs and install a new security wire with lead seal.

# General Maintenance

## Pressure Relief Valves

The pressure relief valves must be visually inspected as part of the preload inspection to remove any dirt or debris that may have collected in the discharge opening. The discharge pressure must be tested annually. The pressure test can be performed either on the car, or on a test bench.

### Pressure Settings

Car body valve - 14.5 psig. +/- 0.5 psig

Air manifold valve - 16.0 psig. +/- 0.5 psig.

1. Pressure relief valve maintenance cannot be performed in the field. If the “start to discharge” pressure falls outside the +/- 0.5 psig tolerance, the valve can be replaced in kind or returned to The Greenbrier Companies for rebuilding. This includes adjustment of the start to discharge pressure. *Oil and grease must be kept away from the inside of the valve as it is designed to operate without lubrication.*
2. To remove the pressure relief valves, use a standard open-end wrench to engage the flats on the bottom of the valve. Do not apply force to the valve body or the discharge connection.
3. Reinstall the valve by applying a moderate coating of pipe compound or plumber’s tape to the male threads of the pipe connection. Keep the compound away from the first few threads to prevent contamination of the valve, car or piping.

## Dust Caps

Inspect the chains, gaskets and cam lever hardware on each dust cap. Replace damaged or missing parts.



# Troubleshooting

## Car Body Will Not Pressurize

POSSIBLE CONDITIONS	SUGGESTED ACTION
Pressure gauges inoperative.	<ol style="list-style-type: none"> <li>1. Ensure petcocks on gauge lines are closed.</li> <li>2. The air line to the gauge is plugged. Disconnect and clean as required.</li> <li>3. Pressure gauge readings are incorrect. Recalibrate, if required.</li> </ol>
Dust cap missing or not properly secured.	Check dust caps on the air inlet, clean out ports and product discharge connections. Check condition of gaskets. Confirm caps are properly secured.
Inadequate air supply.	See page 25 for air flow requirements. Check for obstructions or leaks in air supply line.
Pressure relief valve leaking or open. Rupture disc blown.	Tap valves with rubber mallet to attempt to reseat. If reseating fails, replace the valve. Replace rupture disc. See pages 29 and 30.
Vacuum relief valve leaking.	Press down on top of valve to dislodge debris from seating area. Repeat 2–3 times, if necessary. Replace valve, if required.
Hatch cover leaking.	<ol style="list-style-type: none"> <li>1. Check to ensure all covers are closed and cam lever is engaged and secure.</li> <li>2. Adjust cam levers per page 23.</li> <li>3. Clean gaskets and seating surface.</li> <li>4. Replace gaskets and levers, as required.</li> </ol>
Leak from car body.	Contact The Greenbrier Companies for assistance.

# Troubleshooting

## Inadequate Product Flow

POSSIBLE CONDITIONS	SUGGESTED ACTION
Check valve failure.	Remove and inspect check valve. The flapper must operate freely and the shaft oriented in the vertical position. Replace, if required.
Four-way valve jammed.	Cycle the valve open and closed. Ensure valve is properly installed. Replace, if required.
Excessive backpressure on discharge side.	Check receiving vessel for proper air venting. Check for plugged or leaking conveying lines. Clean air filters, if installed.
Material forms a rat hole.	<p><i>For the PD3300, PD5001, PD5300, PD5750, PD3720N and PD5650N:</i> Check to determine if the lading is hung-up on one side of the car. If so, redirect the flow of fluidizing air with the four-way valve.</p> <p>If product flow does not resume, allow the car to depressurize. Direct all of the air with the 4 way valve to the side with the hang-up. Fluidize the product and repressurize the car to normal operating pressures and unload. Repeat as necessary to finish unloading.</p> <p><i>For the PD3720N &amp; PD5650N:</i> Allow the car to depressurize, then fluidize the product and repressurize the car to normal operating pressures and unload. Repeat as necessary to finish unloading.</p> <p>In extreme cases, it may become necessary to depressurize the car body, open the compartment hatch and scrape down the sides before the next attempt to unload.</p>
Insufficient airflow or limited blower capacity.	<ol style="list-style-type: none"> <li>1. Reference page 25 for general conveying air requirements.</li> <li>2. Check blower for proper operation.</li> </ol>

# Troubleshooting

## Plugged Product Discharge Line

POSSIBLE CONDITIONS	SUGGESTED ACTION
Plugged discharge line.	<ol style="list-style-type: none"> <li>1. Shut off the blower.</li> <li>2. Close all product valves and fluidizing air valves.</li> <li>3. Open both by-pass air valves to the full open position.</li> <li>4. Restart blower. If the line cannot be cleared, shut off the blower and close all valves.</li> </ol> <p><b>REVERSE FLOW PROCEDURE</b></p> <ol style="list-style-type: none"> <li>1. Open the product valve on the compartment with the least amount of product then open the blown down valve to depressurize the car.</li> <li>2. Ensure the car is depressurized.</li> <li>3. Ensure all fluidizing air valves are closed.</li> <li>4. Open the by-pass air valves to the full open position.</li> <li>5. Ensure the product valve on the emptiest hopper is in full open position. Confirm all other product valves are closed.</li> <li>6. Restart the blower.</li> <li>7. If the product line doesn't clear, close the product valve to pressurize the air inlet manifold to 14.5 psig.</li> <li>8. Cycle the product valve open and closed until a reverse flow is established.</li> <li>9. The system is clear when the inlet manifold pressure drops to about 2 psig and the product valve is closed.</li> <li>10. After the system is cleared, close the product valve, and open both by-pass valves to clear the manifold.</li> <li>11. Close the blow down valve, then open the fluidizing valve to pressurize the car body.</li> <li>12. Close the bypass air valves.</li> <li>13. Proceed with normal unloading operations.</li> </ol>
If the blockage cannot be cleared by reverse flow it will be necessary to disassemble the discharge piping.	<ol style="list-style-type: none"> <li>1. Open one fluidizing valve and the blow down valve to depressurize the car body.</li> <li>2. Open the product valve on the emptiest compartment.</li> <li>3. Close both by-pass valves.</li> <li>4. Shut down the blower.</li> <li>5. Manually disassemble and clean out product discharge line between the car and storage bin.</li> </ol>