

M-302-13R

For Units Manufactured after 3/1/01
Supersedes M-302-13 and M-302-02



Bituminous Transport



Operation



Maintenance



Safety



E. D. ETNYRE & CO. 1333 S. Daysville Road, Oregon, IL 61061
Phone: 815/995-2116 • Fax: 800-521-1107 • www.etnyre.com

M-302-13R
Bituminous Transport
Operation, Safety and Maintenance Manual
For Units Manufactured After 3/1/13

September 2015

HOW TO ORDER PARTS

To assure prompt delivery when ordering parts, please furnish the following information: **1)** Complete name and address of consignee. **2)** Method of shipment preferred. **3)** Is shipment to be prepaid or collect? **4)** Serial numbers of units to which parts apply. **5)** Complete part numbers and descriptions. **6)** Any special instructions. Part numbers beginning with 9250000 are category numbers and must include descriptive term to complete the order (such as, length, color, etc.). These items when listed in the parts manual will indicate what information must be included.

Specify unit serial number when ordering parts!

WARRANTY

E.D. Etnyre & Co. warrants to the original Purchaser, it's new product to be free from defects in material and workmanship for a period of twelve (12) months after date of delivery to original Purchaser. The obligation of the Company is limited to repairing or replacing any defective part returned to the Company and will not be responsible for consequential damages or any further loss by reason of such defect.

The company excludes all implied warranties of merchantability and fitness for a particular purpose. There are no warranties, express or implied, which extend beyond the description of the goods contained in this contract.

This warranty does not obligate the Company to bear the cost of machine transportation in connection with the replacement or repair of defective parts, nor does it guarantee repair or replacement of any parts on which unauthorized repairs or alterations have been made or for components not manufactured by the Company except to the extent of the warranty given by the original Manufacturer.

This warranty does not apply to:

- (1) Normal start-up services, normal maintenance services or adjustments usually performed by the selling dealer, factory service representative or customer personnel.
- (2) Any product manufactured by E.D. Etnyre & Co. purchased or subjected to rental use.
- (3) Any product or part thereof which shows improper operation, improper maintenance, abuse, neglect, damage or modification after shipment from factory.
- (4) Any product or part thereof damaged or lost in shipment. Inspection for damage should be made before acceptance or signing any delivery documents releasing responsibility of the delivering carrier.

This warranty and foregoing obligations are in lieu of all other obligations and liabilities including negligence and all warranties of merchantability or otherwise, express or implied in fact or by law.



E. D. ETNYRE & CO., Oregon, Illinois 61061-9778
1333 South Daysville Road Phone: 815/732-2116 Fax: 815-732-7400



WARNING

Fluoroelastomer handling

Some “O” rings and seals used in this vehicle are made from fluoroelastomers. When used under design conditions, fluoroelastomers do not require special handling. However, when fluoroelastomers are heated to temperatures beyond their design temperature (around 600 degrees Fahrenheit), decomposition may occur with the formation of hydrofluoric acid. Hydrofluoric acid can be extremely corrosive to human tissue if not handled properly.

A degraded seal may appear as a charred or black sticky mass. Do not touch either the seal or the surrounding equipment without wearing neoprene or PVC gloves if degradation is suspected. Wash parts and equipment with 10% lime water (calcium hydroxide solution) to neutralize any hydrofluoric acid.

If contact with the skin occurs, wash the affected areas immediately with water. Then rub a 2.5 calcium gluconate gel into the skin until there is no further irritation, while seeking prompt medical attention.

Note to physicians: For advice or treatment of HF Burns, call the DuPont Medical Emergency Number 1-800-441-3637.

Reporting Safety Defects

If you believe that your vehicle has a defect which could cause a crash, injury, or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying E.D. Etnyre & Co.

If NHTSA receives similar complaints, it may open an investigation. If it finds a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or E.D. Etnyre & Co.

To contact NHTSA, you may call the Auto Safety Hotline too-free at 1-800-424-9393 (or 366-0123 in the Washington, D.C. area). Or, you may write to: U.S. Department of Transportation, Washington, D.C. 20696. You may also obtain other information about motor vehicle safety from the Auto Safety Hotline.

E.D. Etnyre & Co., Oregon, Illinois 61061, Phone Area Code 815/732-2116.

PROPOSITION 65 WARNING

Diesel Engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Please note this warning and remember -

Always start and operate the engine in a well ventilated area;

If in an enclosed area, vent the exhaust to the outside;

Do not modify or tamper with the exhaust system.



WARNING

Unsafe operation of equipment may cause injury

Read, understand and follow the manuals when operating or performing maintenance

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SAFETY and IMPORTANT INFORMATION

This manual covers standard features and options. If your unit incorporates custom features, some of the information contained in this manual may not apply. If you have any questions regarding this manual or your unit, contact your dealer or the E. D. ETNYRE Service Department at 1-800-995-2116

The operation of a Bituminous Transport normally requires handling of liquid products at elevated temperature. Also, these liquids may be of a volatile nature. A heating system may be supplied to raise or maintain the product temperature, and these systems use highly combustible fuels. As with any type of construction equipment, there are certain hazards associated with careless or improper operation.

WARNING

Unsafe operation of equipment may cause injury

Read, understand and follow the manuals when operating or performing maintenance

Safety warnings have been provided to call attention to any potentially hazardous situation that may cause property damage, personal injury or death to the operator or bystanders. These safety warnings will be shown at various times throughout this manual, as they are applicable to the subject being presented. These safety warnings are identified by the following warning symbols:

Safety Precautions, Hazard Seriousness Level

You will find safety information boxes throughout this manual. These boxes contain information alerting you to situations or actions to avoid.

Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Their selection is based on the likely consequence of human interaction with a hazard. Definitions of hazard levels are as follows.

 **DANGER** - Immediate hazards which will result in severe personal injury or death.

 **WARNING** - Hazards or unsafe practices which could result in severe personal injury or death.

 **CAUTION** - Hazards or unsafe practices which could result in minor personal injury or product or property damage.

These warnings are listed below and they also appear throughout the manual. In addition to these, you will find notes throughout the manual.

NOTE - A note provides general information that the operator should be aware of when performing an operation.

WARNING

- A fully charged dry chemical type fire extinguisher must be within easy reach whenever the burners are operating or there is an open flame near the transport. The minimum capacity of the fire extinguisher should be 10 pounds.
- To prevent an explosion or fire hazard: Do not heat the material beyond the manufacturer's recommended temperature.
- Do not heat material over 200°F if moisture or emulsified material is present in tank.
- To prevent possible burns from foaming or violent eruption, do not load tank with material temperature over 200°F if water or condensation is present in tank, or if emulsion was used in the previous load. Clean and thoroughly drain tank first.
- To prevent possible burns from material overflow: Allow sufficient space in the tank for expansion of the material when heating
- To prevent possible personal injury: Do not load the vehicle beyond the GAWR or GVWR. The maximum load volume must be calculated based on material density
- To prevent an explosion or fire hazard: Keep area free of all sources of combustion. Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.
- To prevent an explosion or fire hazard: Eliminate sparks from engine exhaust.
- To prevent an explosion or fire hazard: Check the tank vent to insure that it is free from obstruction.

**WARNING**

- To prevent possible burns to operators or bystanders, or possible equipment damage, do not start any operation if any control settings are unknown.
- To prevent possible burns from leaking material: Be sure all pipe, cap and hose connections are secure before opening valves, or beginning any operation.
- To prevent possible burns from hot asphalt spray: Do not stand, or allow anyone to stand, where accidental opening of a valve may cause contact with hot asphalt.
- To prevent burns: Always wear eye protection, long sleeve shirt, insulated gloves, boots, and long pants outside the boots when working around the Transport.
- To prevent burns: Always wear insulated gloves when handling spray bar sections or hoses.
- To prevent severe injury from becoming entangled in machinery: Stand clear of rotating drives.
- To prevent possible injury: Always open the manhole cover slowly. Pressure build up in the tank may cause the cover to burst open.
- To prevent possible fire hazards, burns or falls: Keep the unit clean for safe operation.
- To prevent possible burns: Use extreme caution when using a torch to heat the pump. Asphalt accumulated around the pump may ignite when heating the pump with a torch

Use the **measuring stick** as shown in figure 1 to determine the amount of product in the tank before lighting burners, if so equipped. The minimum amounts shown on the warning placard only apply if the tank is level. **Remember that the measuring stick is accurate only when the tank is level.** If the tank is not level, reposition the transport to place the tank in a level position, before taking the final measurement. You must have at least the amounts shown, with the tank level, in order to safely light the lower and upper burner respectively. **Failure to have the appropriate amount, accurately measured, can result in an explosion causing death or serious injury.**

Using the Measuring Stick

The measuring stick is only accurate when the tank is level.

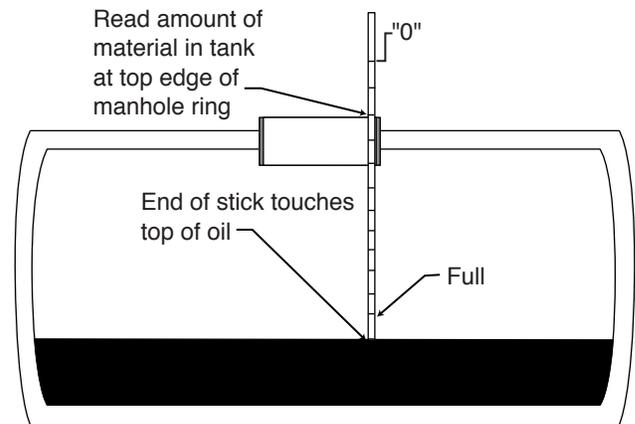


Figure 1. Measuring Stick

Asphalt Institute

To further increase awareness of the hazards associated with the operation of a bituminous distributor, and before beginning initial operation, the operator should also receive instruction by an authorized Etnyre dealer, or Etnyre representative.

The Centennial Distributor is designed to handle a number of different products, such as AC's, cutbacks & emulsions.

Knowledge of these liquid asphalts is required for safe operation of the distributor. It is critical to know which product can be loaded after the previous product, and which products react with each other.

The Asphalt Institute is a source of asphalt handling safety information.

Asphalt Institute
 Research Park Drive
 PO Box 140052
 Lexington, KY 40512-4052
 606-288-4960

Foaming

If the transport is to be filled with hot bitumen, proceed very cautiously. If there is any moisture in the tank, or if an emulsion product was the last load, foaming or eruption may occur.

Dow-Corning DC-200 may be used to prevent foaming in Distributors, Transports, and Maintenance Units.

Mix the contents of one can (16 oz.) with one (1) gallon of diesel fuel or kerosene. Add one (1) oz. of this diluted mixture to each 1000 gallons of asphalt. The correct amount may be poured through the manhole. This will assist in reducing foaming, particularly if moisture is present or if an emulsified asphalt was used in a previous load.

Tank Capacity

The Etnyre Transport is designed to haul a variety of asphalt products in an efficient and user friendly manner.

The Etnyre Transport tank has a built-in air space, or expansion space, above the “Tank Full” level. This air space is designed to minimize the chance that the tank will overflow if the material in the tank expands due to heating or foaming. This air space should not be used to carry product. The “Tank Full” level is based on the vehicle’s axle ratings, and, GVWR at a material density of 7.7 lbs/gallon. A lower “tank full” must be calculated if a product with a density greater than 7.7 lbs/gallon is to be loaded. The lower “tank full” is calculated by multiplying the original “tank full” by 7.7 and dividing the result by the new heavier product density.



WARNING

To prevent possible personal injury: Do not load the vehicle beyond the GAWR or GVWR. The maximum load volume must be calculated based on material density



CAUTION

GENERAL - TIRE CARRIER

Loss of tire in transit can cause bodily injury or property damage. Carry only one spare tire at a time. Do not carry the tire loose in the carrier. Tightly wrap the chain around the tire to eliminate slack and always fasten the chain in the locking retainer plate.

Inspect carrier annually. Check for bent members and fatigue in welds. Closely examine chain, chain retainer and fastener for signs of wear, corrosion or fatigue. Replace or repair damaged or worn parts promptly.

IMPORTANT NOTICE

Inspect the jacket shell and heads

The aluminum jacket on your Etnyre Steel Asphalt Transport is designed to maintain a dry environment for the asphalt tank and the surrounding insulation. Etnyre’s unique horizontal jacket sheet orientation minimizes the number of jacket seams which can leak water or other corrosive liquids into the insulation cavity.

Despite the inherent design advantages of Etnyre Transports, you must maintain the integrity of the jacket envelope. The following inspections should be completed every three (3) months of use and the appropriate service completed.

1. Inspect the jacket shell and heads for dents, tears or improper fit. Repair or replace damaged sections.
2. Inspect for missing or damaged finishing (trim) pieces. thermometer well cover, etc. Repair or replace as necessary.
3. Inspect for missing or loose fasteners (rivets or screws). Tighten or replace as necessary.
4. Inspect all caulked joints. if the caulk is not firmly attached to both mating services, remove the old caulj, clean the affected area and repair with a quality silicone caulking material.

If you have any questions regarding this notice or the recommended procedures, contact the E. D. Etnyre Service Department at 1-800-995-2116 (Fax 1-815-732-7400)

WARNINGS - RIGHT SIDE

⚠️ WARNING

Eruption or explosion could cause serious injury or death.

1. Open manhole slowly to relieve pressure that may exist in tank.
2. Lit cigarettes or other sources of combustion should remain clear of open manholes or overflow vents.
3. Periodically check and clean 3" overflow tube.

3390679

⚠️ CAUTION



**Hot surface.
Remain clear until cool.**

3390684

⚠️ WARNING

Do not attempt any operation which is not described in the manuals.

Other operations could cause serious injury or death.

Read, understand and follow the manuals when operating or performing maintenance.

Please notify Etnyre Service if you bought this machine used.

For service, instructions, or to get manuals, call Etnyre Service at 800-995-2116.

3390678

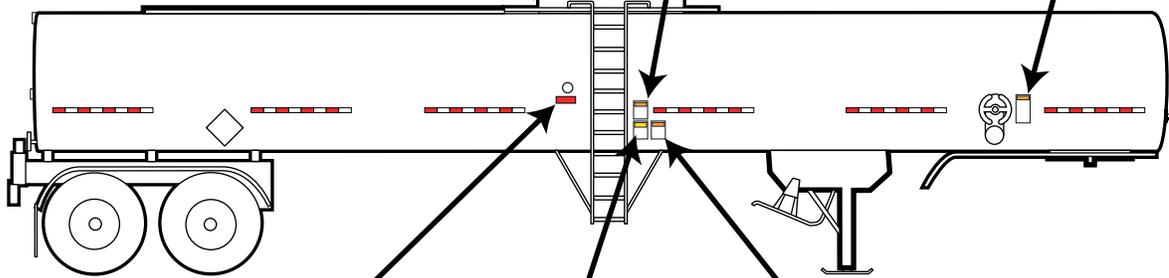
⚠️ WARNING



Do not use wrenches or bars to close valve. Tightening more than hand tight can damage valve, causing product release.

Product release can cause burns and personal injury.

2790080



MAXIMUM ALLOWABLE CARGO TEMPERATURE IS °F.

E.D. ETNYRE & CO. OREGON, ILL. U.S.A.

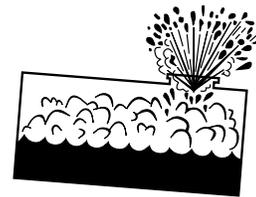
3390192

CAUTION

1. ALWAYS USE STEPS, PLATFORMS AND HANDRAILS PROVIDED.
2. ALWAYS HAVE DRY CHEMICAL FIRE EXTINGUISHER AVAILABLE AND IN GOOD CONDITION.
3. PERIODICALLY CHECK ALL BODY MOUNTING TIE DOWNS AND FASTENERS. CHECK KING PIN PLATE FASTENERS AND ALL SUSPENSION AND RUNNING GEAR COMPONENTS.
4. LIT CIGARETTES OR OTHER SOURCES OF COMBUSTION MUST REMAIN CLEAR OF OPEN MANHOLES OR OVERFLOW VENTS.
5. USE GLOVES WHEN HANDLING HOSES.
6. PERIODICALLY CHECK AND CLEAN OVERFLOW TUBES.
7. OPEN MANHOLE SLOWLY TO RELIEVE PRESSURE THAT MAY EXIST IN TANK. IF VACUUM RELIEF VALVE IS PRESENT, DEPRESS TO RELIEVE PRESSURE.
8. ALL PIPE AND HOSE CONNECTIONS MUST BE SECURE BEFORE OPERATING VALVES.
9. KEEP UNIT CLEAN FOR SAFETY AND OPERATING.
10. IF MOISTURE IS PRESENT IN TANK, DO NOT LOAD WITH MATERIAL HAVING A TEMPERATURE OVER 200 DEGREES F.

2790006

⚠️ WARNING



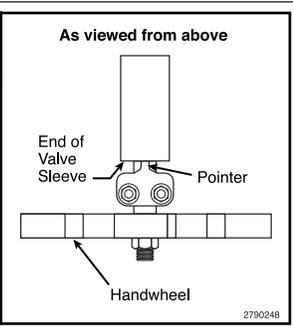
Do not change asphalt grades without reading operators manual. Explosion can occur causing death or serious injury.

3390637

WARNINGS - REAR

WARNING

Close Valve tightly. Pointer should be flush with end of valve sleeve. If not- Valve may not be fully closed. Failure to close the valve could result in serious injury or death.



WARNING

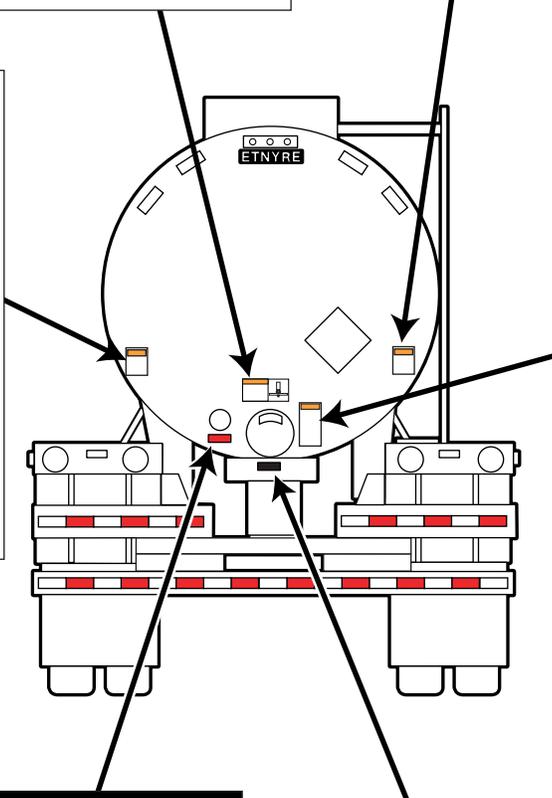
Do not attempt any operation which is not described in the manuals. Other operations could cause serious injury or death. Read, understand and follow the manuals when operating or performing maintenance. Please notify Etnyre Service if you bought this machine used. For service, instructions, or to get manuals, call Etnyre Service at 800-995-2116.

3390678

WARNING

Do not attempt any operation which is not described in the manuals. Other operations could cause serious injury or death. Read, understand and follow the manuals when operating or performing maintenance. Please notify Etnyre Service if you bought this machine used. For service, instructions, or to get manuals, call Etnyre Service at 800-995-2116.

3390678



WARNING

Do not use wrenches or bars to close valve. Tightening more than hand tight can damage valve, causing product release. Product release can cause burns and personal injury.

2790080

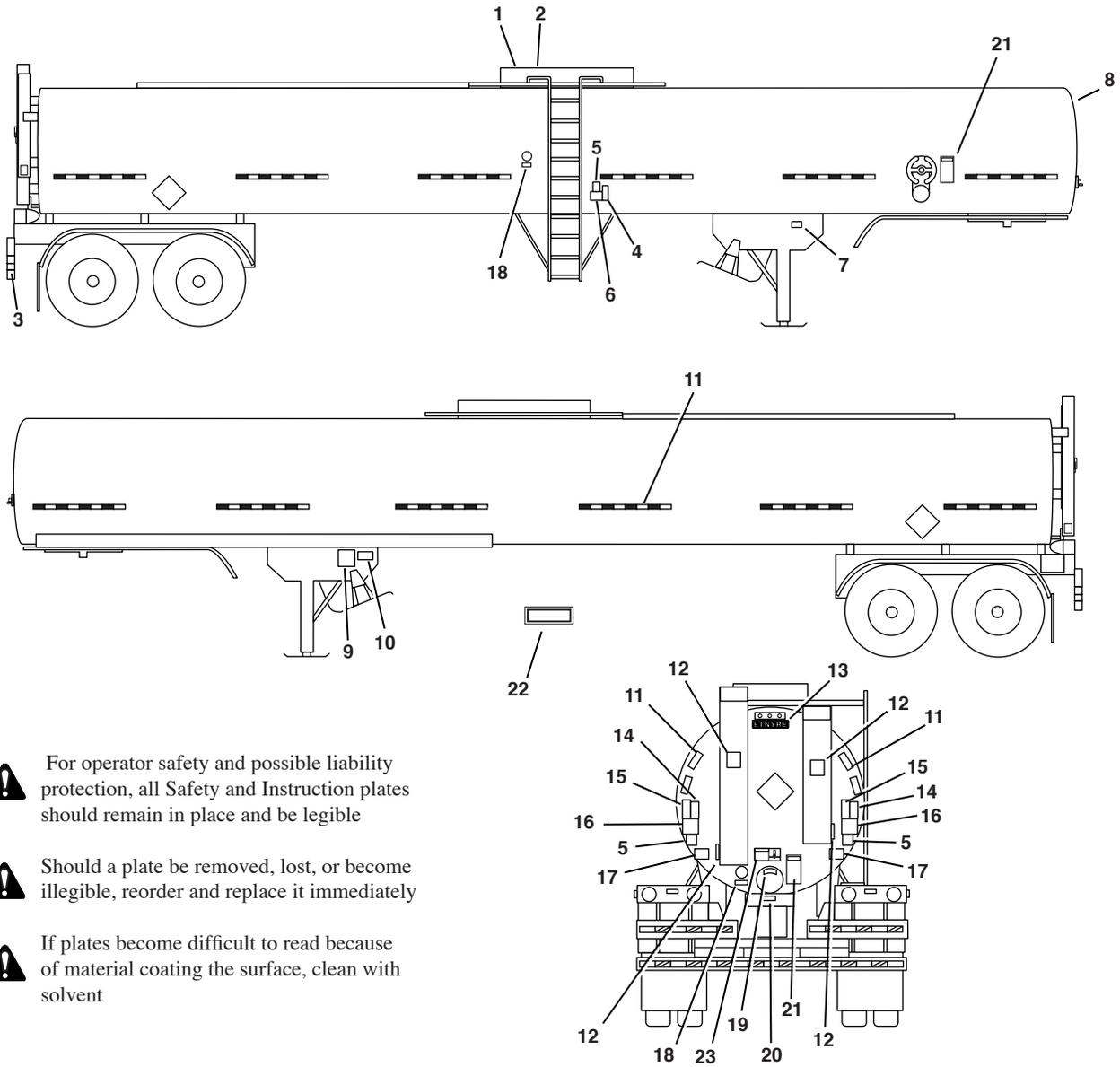
MAXIMUM ALLOWABLE CARGO TEMPERATURE IS °F.
E.D. ETNYRE & CO. OREGON, ILL. U.S.A.

3390192

CAUTION
ALWAYS OPEN MANHOLE COVER BEFORE OPENING THIS VALVE. "PREVENT VACUUM-SAVE TANK"

3390406

WARNING AND INSTRUCTION PLATES



- For operator safety and possible liability protection, all Safety and Instruction plates should remain in place and be legible
- Should a plate be removed, lost, or become illegible, reorder and replace it immediately
- If plates become difficult to read because of material coating the surface, clean with solvent

REF	PART NO.	QTY	DESCRIPTION	REF	PART NO.	QTY	DESCRIPTION
1	3390679	2	Decal: Warning, Manhole	14	3390639	2	Plate-Warning, Manhole/Burner
2	3390684	2	Decal: Caution, Hot Surface	15	3390636	2	Plate-Warning, Burner
3	6320504	1	Decal: Rear Impact Guard	16	2790007	2	Plate-Caution, HT, W/Flue, Gen.
4	3390637	2	Tag-Warning, Don't Mix Asphalts	17	3390670	2	Label: High Press. Burn/Elec. Mtrs.
5	3390678	4	Decal: Warning, "Read Manuals"	18	3390192	2	Plate-Temp, Hauling Tank
6	2790006	2	Plate-Caution, HT W/O Flue, Gen.	19	2790023	2	Decal-Valve, Open/Close
7	2790001	1	Nameplate-Hauler, Tank Brass	20	3390406	2	Plate-Warning
8	3390191	1	Decal-Oval, Etnyre	21	2790080	2	Decal-Warning, Valve Closing
9	2790530	1	Plate-Name, Spec, 178.345, Var Sh	22	2742475	1	Decal-Auto Air Lift
10	2790017	1	Label-Cent., FMVSS, Trailer, 1/81	23	2790248	1	Decal-Warning, Valve Closed
11	2790527	AR	Tape-Conspicuity, 2 In., Red/White				AR - AS REQUIRED
12	3390592	4	Tag Brkt Asm-Caution, Hot Surface				
13	3390149	1	Plate-Name, Straight, Etnyre				

GENERAL IDENTIFICATION

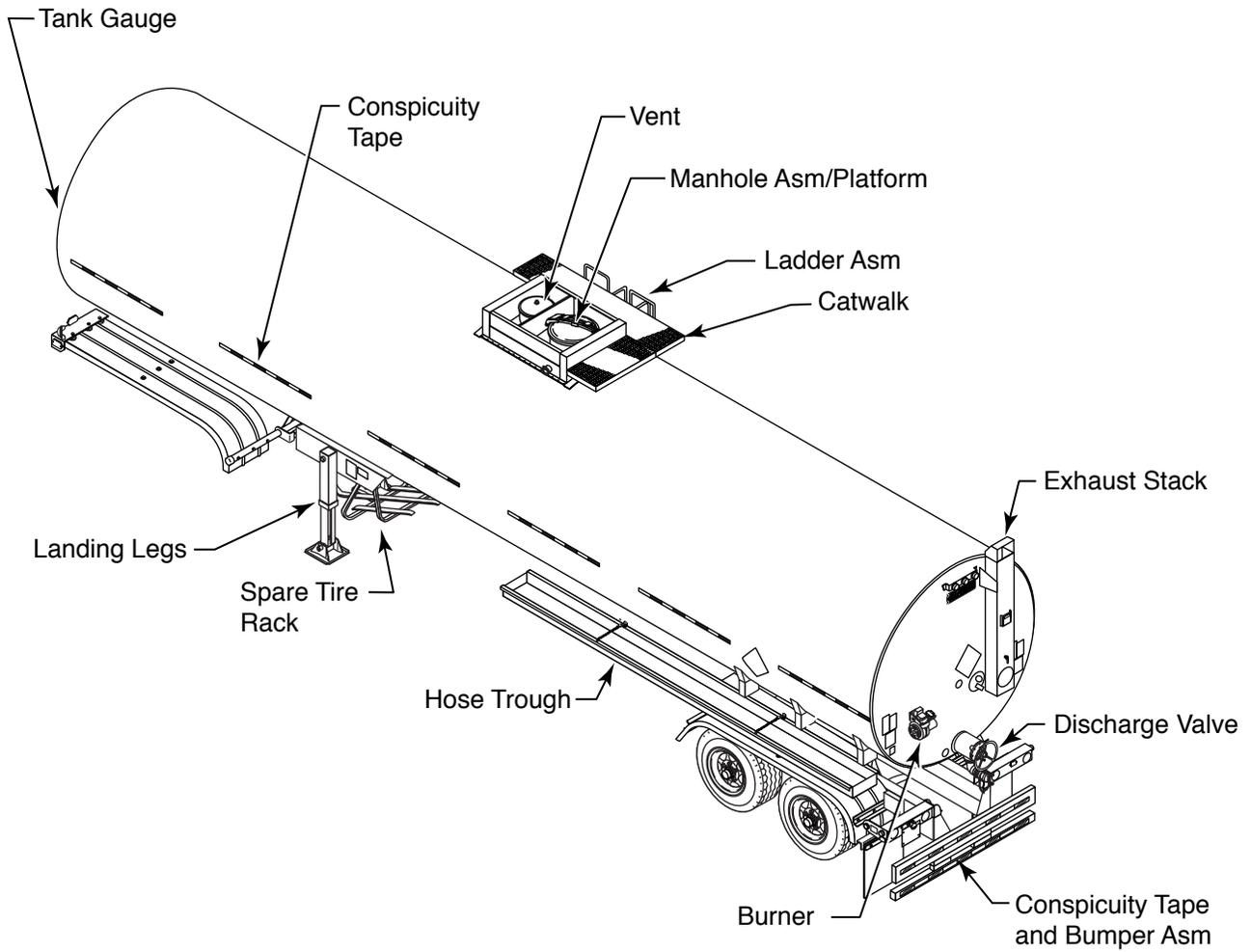
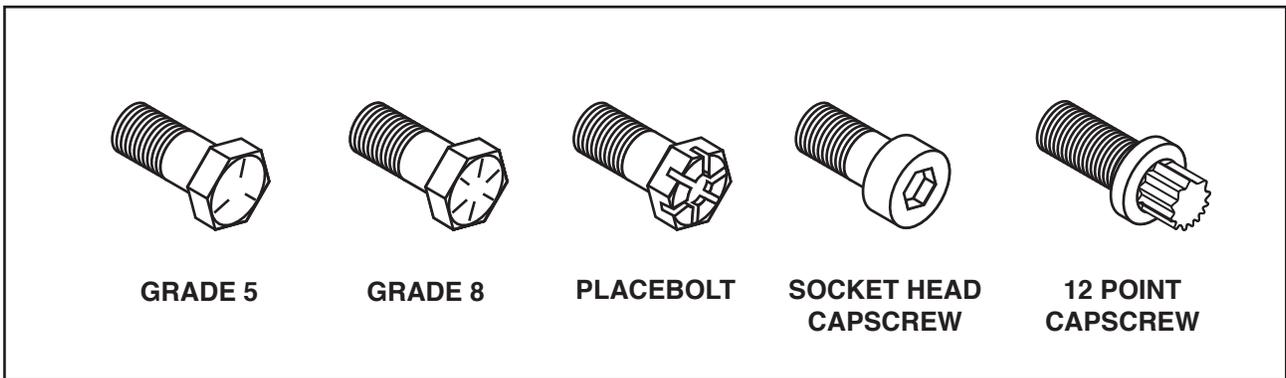


Table 1 Torque Specifications for Standard Hardware

Nominal Size	Thread Series	SAE Grade 5 Capscrews				SAE Grade 8 Capscrews			
		Torque (ft. lbs.)		Torque (Nm)		Torque (ft. lbs.)		Torque (Nm)	
		DRY	LUBED	DRY	LUBED	DRY	LUBED	DRY	LUBED
1/4	20 UNC	8	6	11	9	12	9	16	12
	28 UNF	10	7	13	10	14	10	19	14
5/16	18 UNC	17	13	24	18	25	18	33	25
	24 UNF	19	14	26	20	27	20	37	28
3/8	16 UNC	31	23	42	31	44	33	59	44
	24 UNF	35	26	47	36	49	37	67	50
7/16	14 UNC	49	37	67	50	70	52	95	71
	20 UNF	55	41	75	56	78	58	105	79
1/2	13 UNC	75	57	100	77	105	80	145	110
	20 UNF	85	64	115	86	120	90	165	120
9/16	12 UNC	110	82	145	110	155	115	210	155
	18 UNF	120	91	165	125	170	130	230	175
5/8	11 UNC	150	115	205	155	210	160	285	215
	18 UNF	170	130	230	175	240	180	325	245
3/4	10 UNC	265	200	360	270	375	280	510	380
	16 UNF	395	225	405	300	420	315	570	425
7/8	9 UNC	430	320	580	435	605	455	820	615
	14 UNF	475	355	640	480	670	500	905	680
1	8 UNC	645	485	875	655	910	680	1230	925
	14 UNF	720	540	980	735	1020	765	1380	1040
1 - 1/8	7 UNC	795	595	1080	805	1290	965	1750	1310
	12 UNF	890	670	1210	905	1440	1080	1960	1470
1 - 1/4	7 UNC	1120	840	1520	1140	1820	1360	2460	1850
	12 UNF	1240	930	1680	1260	2010	1500	2730	2050
1 - 3/8	6 UNC	1470	1100	1990	1490	2380	1780	3230	2420
	12 UNF	1670	1250	2270	1700	2710	2040	3680	2760
1 - 1/2	6 UNC	1950	1460	2640	1980	3160	2370	4290	3210
	12 UNF	2190	1650	2970	2230	3560	2670	4820	3620

NOTE: This table lists torque values for standard hardware and is intended as a guide for average applications involving typical stresses and machined surfaces. Values are based on the physical limitations of clean, plated and lubricated hardware. In all cases, when an individual torque value is specified, it should take priority over values given in this table. Replace original hardware with hardware of equal grade.



Standard Hardware

LOADING AND UNLOADING OPERATIONS

WARNING

- Check to insure that the kingpin is locked into the tractor fifth wheel.
- To prevent burns: Always wear eye protection, long sleeve shirt, insulated gloves, boots, and long pants outside the boots when handling hoses, operating valves or working around the transport.
- To prevent possible burns: Use extreme caution when using torch to heat a valve. Asphalt accumulated around the valve may ignite when heating the valve with a torch
- To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.
- To prevent possible burns from leaking material: Be sure all pipe, cap and hose connections are secure before opening valves, or beginning any operation.
- To prevent possible burns from foaming or violent eruption, do not load tank with material temperature over 200°F if water or condensation is present in tank, or if emulsion was used in the previous load. Do not heat material over 200°F if moisture or emulsion is present in tank.
- To prevent possible personal injury: Do not load the transport beyond the GAWR or GVWR. The maximum load volume must be calculated based on material density.
- To prevent possible burns from material overflow: Allow sufficient space in the tank for expansion of the material when heating
- To prevent possible injury: always open the manhole cover slowly. Pressure buildup in the tank may cause the cover to burst open.
- These suggested directions are not exhaustive since transports are of varying design to meet the requirements of the first purchaser. Therefore, the user must satisfy himself that his safety, the safety of the public, and the integrity of the transport and loading are not jeopardized.

Trailer to Tractor Connecting Procedures

1. Inspect the fifth wheel area and the trailer frame for wear, structural cracks, damaged or broken steel.

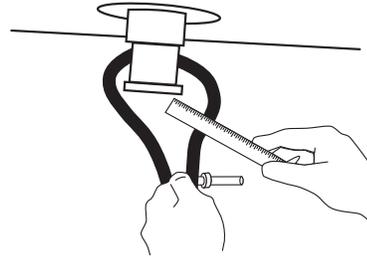


Figure 2. Measuring Kingpin

2. Check the kingpin for wear or damage. Replace it if the diameter measures less than 1 7/8" at any point (see figure 2).

3. Check the bolts for tightness. Tighten if required. Refer to the torque table for correct torque values.

4. Connect the trailer to the fifth wheel.

5. Connect the glad hands and build up reservoir air pressure.

6. Connect the plug into the electrical socket.

7. Check the lights, turn signals and reflectors for operation.

8. Before operating the trailer, test the airbrake system using the following procedure:

a. Check the air system pressure. The system must hold 100 psi (7 Bar) minimum.

b. Apply the brakes. Inspect the brake action on all the wheels for proper application.

c. Release the brakes. The brakes must release promptly. The air pressure must discharge quickly from the relay emergency valve.

d. Disconnect the emergency line to the trailer. The trailer brakes must automatically apply.

e. Connect the emergency line to the trailer. The trailer brakes must release.

9. Check the tires for proper inflation pressure. Inspect the tires for cuts or other damage.

Before loading and/or unloading the transport, familiarize yourself with its operational characteristics, including manholes, vents, gravity discharge valves, pump off valves, heating procedures and material characteristics. **Know what commodity you are loading and know what commodity was last carried in the transport.**

Pre-Loading, Ground Level

1. Insure that all product discharge valves are closed.

The rear discharge valve consists of a disc type seat which is positioned by a screw mechanism and a manually operated handle. There is a position indicator on the valve to give the operator visual assurance in addition to the mechanical feedback that the valve is in the closed position.

There are various scenarios that could give the operator a false indication that the rear discharge valve is closed when in fact it may not be, these include but are not limited to cold “slug” of asphalt, foreign objects or a possible valve mechanical failure. The pointer on the position indicator should be flush with the end of the valve sleeve when the valve is closed. See illustrations below.



Figure 3. Position Indicator - Closed

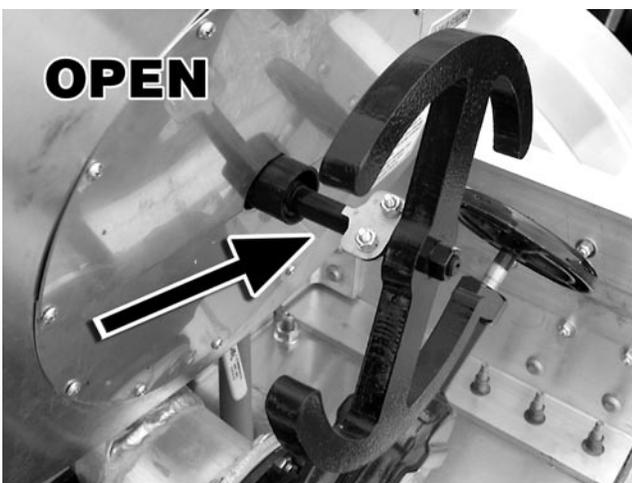


Figure 4. Position Indicator - Open

2. Valves may be “slugged” with solid asphalt and will require external heating to soften the material enough to permit closing. Open the manhole cover during this type of heating.

3. **DO NOT HEAT** if the last load was a naphtha type cut-back, known as a Rapid Curing Asphalt (RC).

4. Lit cigarettes or other sources of combustion must remain clear of open manholes or vents.

5. Check to see that the overflow tube is not plugged with solidified product.

6. Pre-heat a cold tank before loading hot product by warming in a building, using steam heat or by another means not detrimental to the cargo tank to avoid buckling of the tank shell due to thermal expansion.

7. When loading a cold tank with hot product, set the tractor brakes only, leave the trailer brakes un-set to avoid buckling of the tank shell due to thermal expansion.

⚠ CAUTION ⚠

Hot Product Tanks Experience Thermal Expansion During Loading

- ⚠ Rapid thermal expansion can damage tank shell.
- ⚠ Restricting thermal expansion can damage tank shell.

- Never load material at a higher temperature than the tank rating.
- When loading a cold tank with hot product begin loading "slowly" to warm tank.
- If possible, pre-heat a cold tank before loading.
- When loading hot product, set tractor brakes only, leave trailer brakes un-set.

Rapid expansion of the bottom of the tank shell can put the top of tank shell into compression creating stress and possibly buckling the shell.

Pre-Loading, Top Side

1. See that the manhole cover gasket is intact and that the closing mechanism functions properly to secure the lid tightly.
2. Check the overflow tube to insure that it has not become clogged before each loading.
3. Check the vent tube to insure that it has not become clogged before each loading.
4. When the tank is cold from non-use, be sure the inside is free of moisture from condensation or rain before loading the tank with hot material.
5. Anti-foam agent (Dow Corning DC-200) is recommended if there is any doubt about the presence of moisture. Follow the directions on the Dow Corning can for mixing and usage.
6. Know the rated gallon size of tank to avoid overfilling. Bitumens are sold by volume at 60° F or by weight, hence the hot bitumen (say 375° F) will require approximately 8% greater volume, or gallons, than if the bitumen is at 60° F.

Loading

1. Do not load the tank with hot product which exceeds the tank manufacturer's maximum temperature rating. Doing so endangers the structural capability of the tank to continue trouble-free performance. Aluminum tanks require especially close adherence to this caution.
2. If moisture is present in the tank, do not load with material having a temperature above 200° F.
3. The loading pipe should be adequately secured, braced, or restrained to prevent accidental spills during loading.
4. To avoid being splashed and burned and exposure to the product fumes, do not stand in the vicinity of the manhole during loading.
5. When loading a cold tank with hot product, load the tank slowly at first to avoid buckling of the tank shell due to thermal expansion.
6. Load the transport.
7. Be sure the manhole cover is closed, seated, and securely tightened, before moving the transport.

Unloading

1. Be sure that the discharge lines, valves and transfer hose are empty and clean, before opening valve on transport.
2. Open the manhole cover slowly, before starting to discharge the load either by gravity or pump.

3. Handle the discharge hose with gloved hands and connect it to the discharge connection. After both ends are secured, open the valve(s) slowly to check for leakage before opening the valves fully.

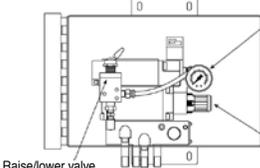
4. When pumping off, run the pump for several minutes after the pump starts to suck air. Then close the discharge valve and open the small air bleeder valve if equipped with one, to purge the discharge hose. If a pressure type washout system is provided, open the supply valve for about 45 seconds, to flush the hose and leave some solvent in the pump. Do not allow the pressure in the washout system to exceed the pressure indicated on the plate located in the vicinity of the solvent tank.

5. If a gravity outlet has been used, close the tank valve to prevent accumulation from hardening in the pipeline in between loads.

Lift Axle Operation

If your unit is equipped with an air lift axle, it is necessary to determine the proper air pressure required in the ride spring bags in order to have the axle support its correct share of the load. The procedure is described on the Hendrickson decal, L402, which is on the inside of the air lift control box door. It is also shown here, along with a schematic of the entire system. It is important to follow this procedure in order to have the axle support its correct share of the load and also to avoid having the tires on the lift axle lock up while braking.

AK-162/AK-163 LIFT AXLE CONTROL



Ride spring air gauge

Ride spring regulator

Raise/lower valve

Air Port Identification

1 - Air reservoir input
2 - Ride air springs
3 - Lift air springs
4 - Exhaust

AXLE LIFT CONTROL FOR AIR RIDE/AIR LIFT SUSPENSIONS

CAUTION

- Regulate the ride air spring pressure to the correct operating pressure to ensure that the suspension is properly loaded. Contact Hendrickson for information on the suspension operating pressures.
- Raise and lower the vehicle axle(s) according to the suspension installer's specification.
- Avoid overloading the other trailer axle(s) when lifting the lift axle(s).

1. Raise the air lift suspension(s) by using the axle raise/lower valve in the control box or a remote electrical switch, if available.
2. Adjust the ride air springs with the ride spring regulator to match the axle loading.
 - a. Use a certified scale to properly adjust air pressure in the air ride springs.
 - b. Record the indicated air pressure(s).
 - c. Use the recorded air pressure setting(s) when using the air lift suspension.
 - d. Push in knob on ride spring regulator to lock pressure setting.

IMPORTANT: Adjustment of the ride air springs should occur prior to first use of the trailer and periodically to check the accuracy of the gauge.

IMPORTANT: On the AK-163 only, the lift axle service brakes are disconnected when lifting the axle(s).

Total Suspension Systems
30712 Rowland Plaza St.
Canton, OH 44707-2900 USA
800-425-2643
330-425-2643
Fax 330-598-4110



HENDRICKSON

Total Suspension Systems
210 Cheater Drive, Unit #3
Bridgeton, OH 45804-0000
800-768-1000
Fax 800-758-1000

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Figure 5. Hendrickson Air Lift Control Decal L402

Auto Lift Axle Operation

If your unit is equipped with an auto air lift axle, the axle will raise as the tanker is unloaded. The axle will lower as the tanker is loaded.

Ball Valve ON = Lift axle will drop when trailer is unloaded.

Ball Valve OFF = Lift axle will retract when trailer is unloaded.

NOTE: The valve will resume fully automatic operation when the ball valve is in the OFF position.

NOTE: When the manual override is used, the system may take several minutes to lift or lower the axles.

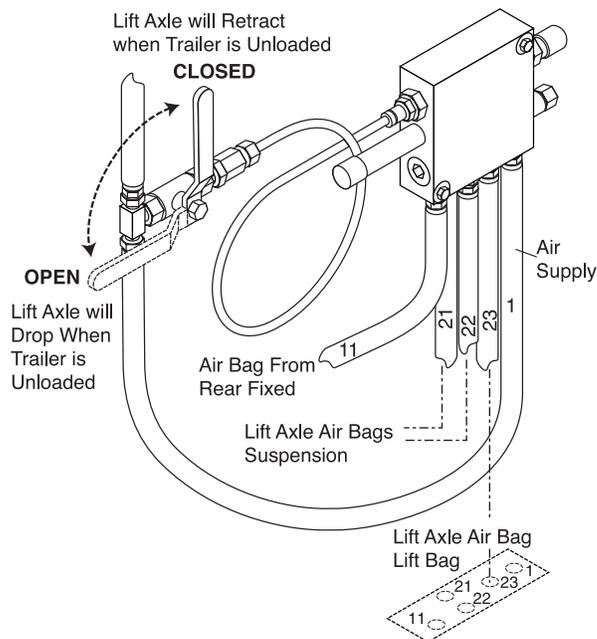


Figure 6. Auto Lift Axle Operation

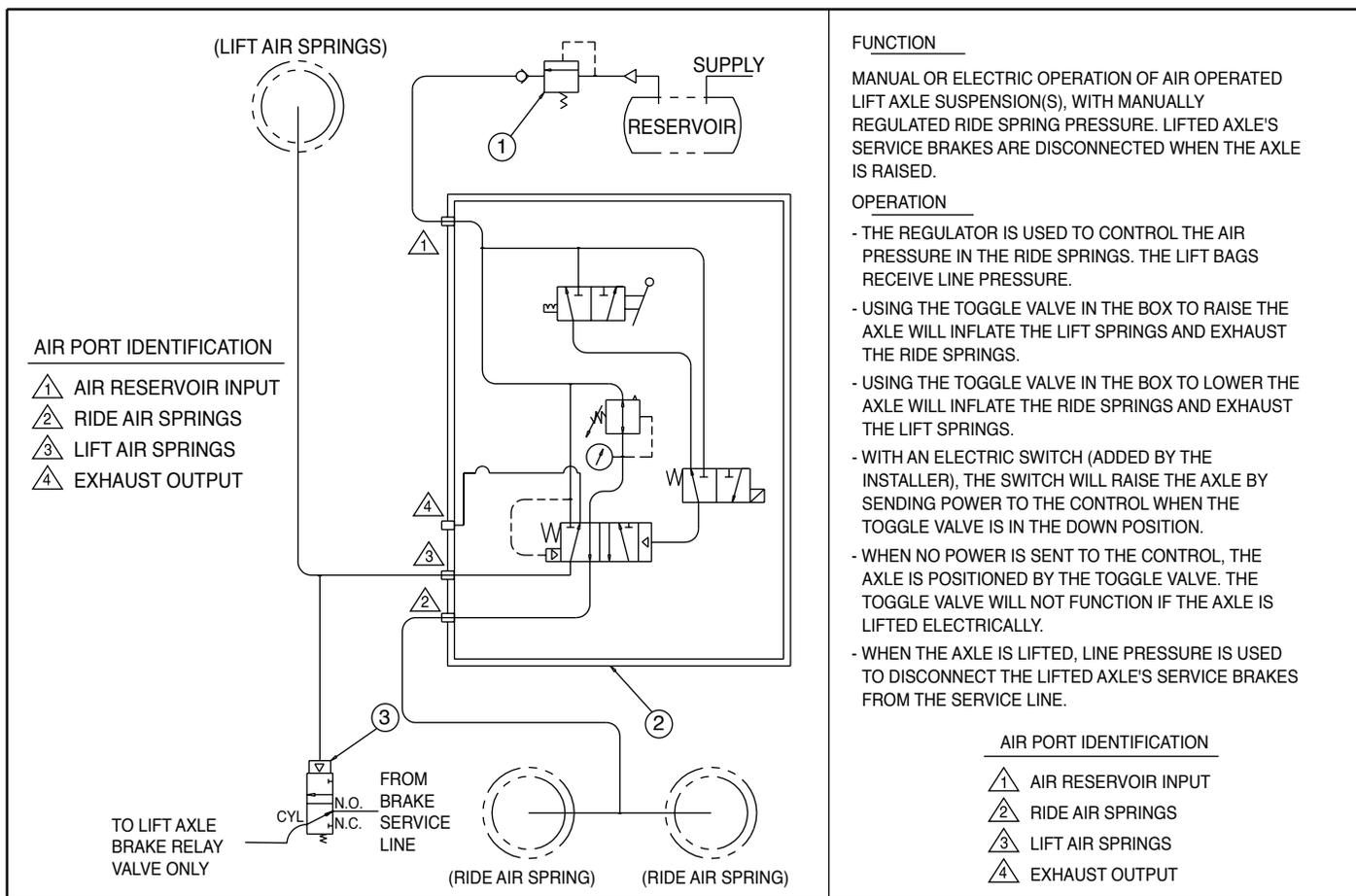
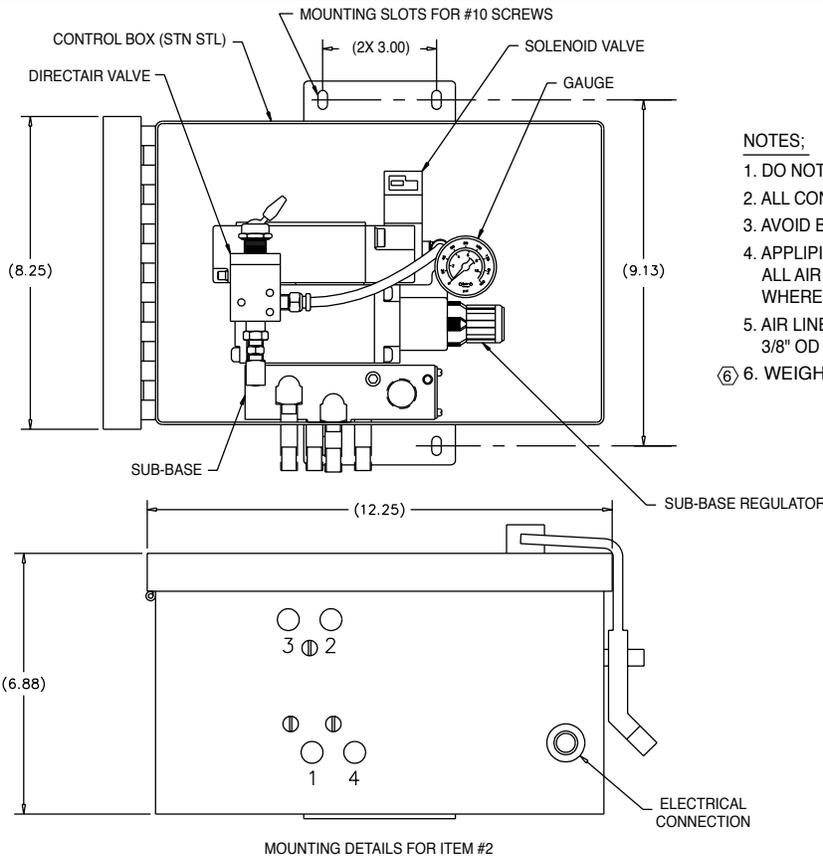
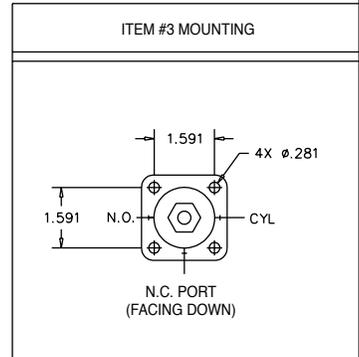
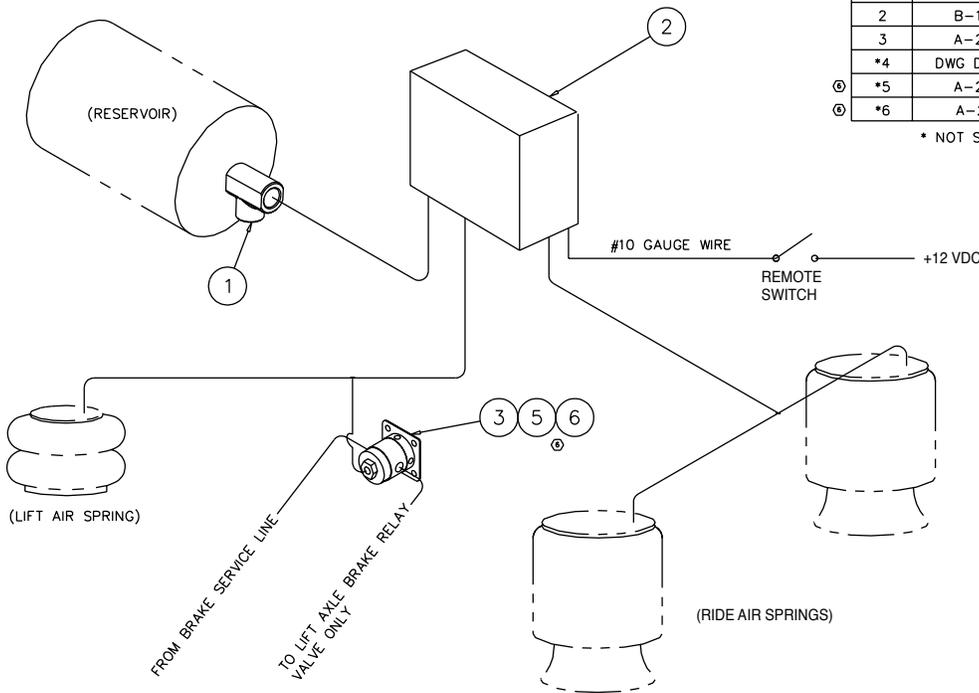


Figure 7.

Hendrickson Air Lift Control Kit AK-163 Schematic

ITEM	PART NO.	DESCRIPTION	QTY.	
1	A-14149	PRESSURE PROTECTION VALVE	1	
2	B-14355	AIR KIT ENCLOSURE	1	
3	A-23588	AIR PILOTED VALVE (3 WAY)	1	
*4	DWG D-14340	AK-163 AIR KIT DRAWING	1	
ⓐ	*5	A-27360	BARBED TUBE FITTING	1
ⓑ	*6	A-27361	3/8" ID TUBE	1

* NOT SHOWN



NOTES:

- DO NOT ADD LUBRICATION TO AIR SYSTEM.
- ALL CONNECTIONS MUST BE LEAK PROOF.
- AVOID BENDS IN AIR LINES
- APPLICATION:
ALL AIR RIDE / AIR LIFT SUSPENSIONS USING AIR TO LIFT AXLE WHERE REMOTE CONTROL LIFT SWITCH IS REQUIRED.
- AIR LINE FITTINGS AND LINES TO BE FURNISHED BY INSTALLER. 3/8" OD D.O.T. APPROVED TUBING RECOMMENDED.
- WEIGHT: 16.46 LB.

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	.XX: ± .06 .XXI: ± .030 ANGULAR: ± 0.5° DIMENSIONS ADHERE TO ANSI Y14.5M-1982 (REV.)	5 8255 LOW 5-27-99 4 7420 EEM 6-10-98	CWD BY: J. SUKOSD 2-25-93 APP'D BY: R. FRANKS	AIR CONTROL KIT AK-163	

Figure 7.

Hendrickson Air Lift Control Kit AK-163 Schematic

MAINTENANCE INSTRUCTIONS

General

This section contains instructions for the care and maintenance of the Etnyre Transport. This section is divided into two subsections: a **Maintenance Schedule** and **Maintenance Procedures**. The maintenance schedule lists the recommended distance/time intervals between maintenance checks. The procedures subsection provides detailed instructions for performing the maintenance checks. The instructions listed in the procedures subsection are given by systems and are not necessarily in the order listed in the table.

Keep unit clean for operating safety and appearance.

Flue liners which reduce scaling and eventual burn-thru in the flame impingement zone are recommended on tanks which routinely carry commodities requiring heating while in the tank. Inspect the liners often and replace as necessary.

Every three months during continual usage inspect inside of transport for carbon accumulation on outside of flue surface. Heaviest deposits occur at the flame area and should be removed periodically for efficiency of heating and longer flue life.

Roofing bitumens (pitch, steep, flat) will build up from bottom under flues and will sometimes push the flue upward and probably fracture it. Periodic removal by chipping or mining is recommended.

Inspection and Maintenance, Tank Proper

The inner tank barrel itself is an important piece of equipment. The barrel serves the purpose of transporting the product and must carry the weight of the product in addition to the weight of the barrel. The barrel is strongest when in its originally manufactured condition. A substantial amount of the load bearing capability is lost if bucking or distortion occurs in the tank shell due to an accident, overloading or any of the following:

1. Fast filling of hot product in a “cold” tank that has not been prewarmed can cause the tank shell to buckle and/or fail. Slow initial filling is highly recommended. Setting the tractor brakes only and leaving the trailer brakes un-set is recommended. These practices should be followed to avoid buckling of the tank shell due to thermal expansion.

2. Loading with a product that is hotter than the maximum temperature rating of the trailer.

3. Vacuum created by the unloading process (or by tank cooling after unloading) with manhole closed and vents plugged with solidified material or otherwise inoperative.

4. Repeated travel over rough roadways at speeds that are not reasonable for longevity of any type of vehicle.

5. Dropping loaded trailer on the landing gear which creates unusual shock, instead of setting it down gently.

6. Operating the trailer at a continuous speed at which the frequency (vibration) is at its peak. Every trailer has such a frequency and a change in speed of two or three miles per hour either faster or slower reduces the vibration out of the peak range.

The caulking around the manhole should be inspected monthly to insure that it is intact, and recaulked as necessary. If not kept sealed, moisture leaking in will cause premature failure of the inner shell due to corrosion.

Annually inspect the special anti-corrosion paint on the lower third, and entire circumference of the inner shell in the area of the manhole, for corrosion. This requires removal of the jacketing in these areas and should only be done by an authorized tank repair facility.

It is recommended that the barrel and all internal members be checked regularly at intervals of every three (3) months or 15,000 miles, whichever occurs first. Corrective repairs should be made as soon as possible.

Maintenance Schedule

The Maintenance Schedule lists the recommended maintenance checks. It is outlined in two schedules: the mileage schedule and the periodic schedule. Perform maintenance on the basis of whichever occurs first. See next page for Maintenance Schedule chart.

MAINTENANCE SCHEDULE

ITEM NO.	ITEM	SCHEDULE					QUAN-TITY	TYPE or REMARKS
		Day	Wk	Mo.	25,000 mi.	50,000 mi.		
1	Fifth Wheel Plate and Kingpin	X	L					Multipurpose Grease Inspect
2	Frame	X						Check
3	Undercarriage	See Operator's Guide for the undercarriage specific to your trailer						
4	Wheel Bearings (Oil Lubricated)	X				C	3 pints per axle	Check Multipurpose Gear Oil Grade 90
5	Rims and Brake Drums			X				Inspect
6	Wheels	X	X					Visual Check. Tighten Cap Nuts or Rim Clamps.
7	Tires	X						Check Inflation Remove Debris Between Duals.
8	Air Lines	X		X				Test. See Page 33 Inspection
9	Air Reservoir	X						Drain Condensation
10	Relay Emergency Valve					X		Clean
11	Brake Chambers			X			2 Dia-phragms per axle. X	Check Condensation Holes Clean. Inspect and replace Diaphragm.
12	Slack Adjuster and Yoke Pin				X		2 Zerks per Axle	Inspect. Lubricate with Multipurpose Grease.
13	Brakes	X	X		X		4 Fittings per Axle	Multipurpose Grease. Note: Do not over-grease Brake Spider (or Anchor Pins when applicable). Check for Overheating. Inspect and Adjust.
14	Manhole Caulking		X					Inspect and Recaulk As Necessary
15	Lights and Reflectors	X						Check Operation.

MAINTENANCE

L = Lubricate X = Check C = Change

Maintenance Procedures

Fifth Wheel Plate and Kingpin Inspection and Lubrication

Inspect the kingpin throat for signs of wear. Replace the kingpin if worn 1/8 inch (3.18 mm) undersize (see figure 2).

If the grease remaining on the fifth wheel plate contains sand and dirt, clean it before lubricating. The kingpin and the fifth wheel plate should be greased thoroughly with multipurpose grease before connecting the tractor and trailer.

Wheel Bearings

The oil level must be maintained between the “add” and “full” lines on the hub cap windows (see figure 8). Check for cracked windows, missing vent plugs and for oil leaks around the hub cap. Oil can be added through either the vent plug or the filler plug. Clean and inspect the bearings and change the oil at 50,000 miles or at brake relinings.

Undercarriage

The undercarriage must be visually examined for broken and missing parts. Check brackets, adjusting screws and walking beam ends. Replace faulty parts. Check the rim clamps or cap nuts for tightness daily. See Figure 8 for torque specifications and tightening sequence. Brake drums should be carefully examined for cracks.

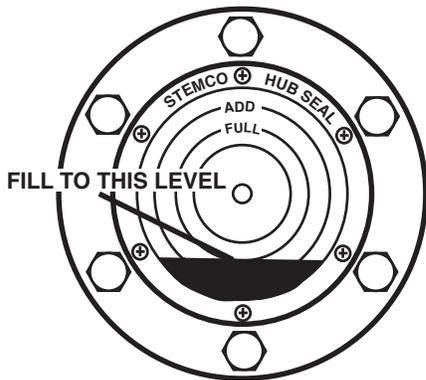


Figure 8. Oil Level of Oil Lubricated Bearings

⚠ CAUTION

Do not allow brake drums to become excessively worn or expensive repairs will be required.

Suspension Alignment & Fastener Torque

The major source of costly repair bills on suspensions is insufficient torque. After an initial shakedown run of 1,000 miles and every 25,000 miles thereafter, nuts on the suspension should be restored to original torque specifications.

Torque Specifications

Item	Transpro	Reyco 21B
U-bolt nuts	300 lb-ft	300 lb-ft
Torque arm nuts	400 lb-ft	160 lb-ft
Torque arm clamps	140 lb-ft	140 lb-ft
Equalizer Bolts	500 lb-ft	450 lb-ft

Figure 9. Torque Specifications

Alignment Adjustment

To assure proper alignment of the suspension, the following steps should be followed exactly:

Step 1. Locate the trailer on a flat, smooth surface and disconnect trailer brakes.

Step 2. With the brakes disconnected, roll the trailer forward and rearward a distance of approximately 10 feet to relieve any binding which might be caused by turning or braking.

Step 3. Remove the tractor from the trailer and level the trailer body until it is parallel to the ground, using the landing gear adjustment. Trailer should be leveled by measuring from the frame to the ground at the front and rear hanger.

Step 4. Check to make sure that there is no interference between the springs and the hanger brackets.

Step 5. Tighten all torque arm bolt nuts and Ubolt nuts to the torque specified above.

Step 6. Remove hub caps from all four trailer wheels and install axle extensions on each end of each axle.

Step 8. Measure from the kingpin extension to either end of the front axle and make necessary adjustments.

Step 9. With the front axle properly aligned, measure between the axle extensions on either end of each axle and make necessary adjustments.

Step 10. Remove the axle extension, kingpin extension and install hub caps.

Step 11. Check the nuts on the adjustable torque arm tube clamps to insure they are tightened to torque shown above.

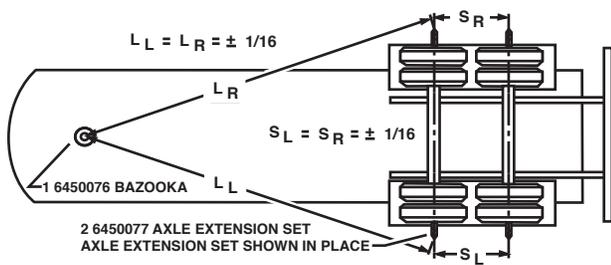


Figure 10. Checking Alignment

Note A. Steps one and two are very important in the proper alignment of your suspension and should be done before any attempt is made to align the suspension.

Note B. The slot in the adjustable torque arm should be located in the down position and in alignment with the open part of the clamp to insure proper clamping.

Note C. The adjustable torque arm tube retaining nuts should be tightened to the torque shown above

Tires, Rims and Disc Wheels

Tire Inflation

Proper and improper inflation will produce the tire section and ground contact characteristics shown in Figure 11. Tire inflation must be checked daily while tires are cold.

Either overinflation or underinflation will cause premature tire wear.

CAUTION

Do not attempt to adjust the inflation pressure while the tires are hot.

Do not exceed the cold inflation pressures. In some cases the rim or disc wheel will have a lower inflation pressure than the tire, in which case the lower pressure must be used. The maximum inflation pressure to be used is shown on the certification label. Tire inflation must be checked during road stops to locate air losses. Also, remove any foreign objects jammed between the dual wheels.



Figure 11. Proper Tire Inflation

WARNING

Repair any leaks immediately. All tires must be equipped with valve caps.

Do not overinflate tires.

Before removing the tire and rim or the tire and disc wheel assemblies, remove the valve core and exhaust all air from both tires in the dual assembly. Check the valve stem by running a piece of wire through the stem to make sure it is not plugged.

Tire Overinflation

Overinflation weakens the cord body of the tire by reducing its ability to absorb road shocks.

Overinflation can cause failure due to fatigue cracks.

Overinflation can also cause rim and wheel damage.

1. Inflate to correct pressure when tires are cool.

2. Never “bleed” tires to relieve excessive pressure buildup when the tires are warm. Excessive buildup of air pressure can be due to load, underinflation, speed, or a combination of the three.

Tire Underinflation

Underinflation causes rapid wear and premature failure. Underinflation or overloading of the tires on any vehicle driven at sustained speeds will result in weakening of the tire cords. This can make the tire susceptible to further damage or failure even under normal load and inflation conditions.

Matching Dual Tires

Matching of the duals by size will result in longer tire life. Improper matching will cause the larger diameter tire to carry an overload. This will cause typical overloaded tire difficulties. The smaller diameter tire will also wear more rapidly due to scuffing. Differences of not more than 1/4 inch (6.35 mm) in diameter or 3/4 inch (19.1 mm) in circumference are allowed.

NOTE: The smaller of the two tires should be mounted in the inside position.

Removing Tire and Rim Assemblies

⚠ WARNING

Before removing the tire and rim or the tire and disc wheel assemblies, remove the valve core and exhaust all air from both tires in the dual assembly. Check the valve stem by running a piece of wire through the stem to make sure it is not plugged.

⚠ WARNING

Mounting and demounting of tires must be done by trained personnel only!

Always use industry approved procedures.

Use properly constructed cages, guards or baskets when inflating tires.

Mounting faces which have been damaged must be repaired or replaced.

Removing Tire and Disc Wheel Assemblies

With the trailer supported by jacks and blocks, remove all the air from the tires (see warning on this page). Remove the cap nuts (see figure 12). Remove the outside tire and disc wheel. Remove the inside tire and disc wheel if it must be changed.

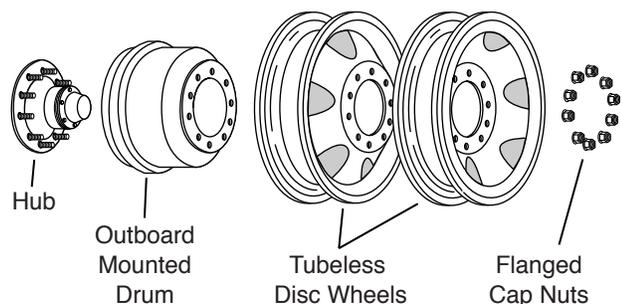


Figure 12.
Removal of Tires and Hub Piloted Wheels

Mounting and Demounting Tires on Rims or Disc Wheels

The following points must be considered when changing or repairing tires on rims or disc wheels.

1. Do not mix rim or wheel components. They may come apart during inflation.
2. Check the rim base for cracks or other damage. Do not attempt to repair rims or disc wheels. Scrap damaged parts.
3. Use proper valve stems and extensions. If valve spacers are used, be sure they are in place before reassembling.
4. Do not overinflate tires.

Mounting Tire and Hub Piloted Type Disc Wheels

Before mounting the disc wheel, clean the mounting face of dirt and excess paint.

Place the inside tire and disc wheel assembly on the hub. Place the outside tire and disc wheel assembly on the hub and start the flange nuts. Valve stems for the two wheels should be mounted in different circumferential positions for easy inflation. Tighten the flange nuts to the torque and in the sequence shown in Figure 12. If the inside tire and disc wheel assembly was not removed, inflate the tire to the proper pressure.

Checking Tightness on Mounted Disc Wheels

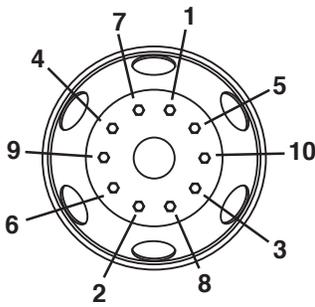
Check the flange nut (cast spoke style) torque after the first 50 - 100 miles of service. Loosen the outer cap nut before tightening the inner cap nut. Tighten the nuts as shown in figure 12.

Wheels and Hubs

General

Two types of wheels are commonly used on Etnyre trailers. Disc wheels mounted on hubs are standard. Bearing cups are pressed into the wheel “spider” on cast wheels and into the hubs for disc wheels.

10 Stud Disc Wheel Tightening Sequence Gunite Disc Wheels



Hub-Piloted (Two piece flange nuts)	
Wheel Stud	Torque
Thread Size	Lbs. Ft. (Oiled*)
M22x1.5 (W/1-1/2" Hex)	450 - 500
Torque Values for Dual Wheels	
Dry Threads - No Lubrication	
Stud Size	Inner & Outer Capnut
3/4 - 16	450 - 500 ft. lbs.
Backnut Torque	
Size	Torque
3/4 - 16	175 - 200 ft. lbs.

Figure 13. Tightening Sequence of Standard Gunite Disc Wheels

For other wheel brands, follow manufacturers recommended sequence.

Cast Wheel or Hub Removal

Disc wheels must be removed before removing cast wheels or hubs. Support the cast wheel or hub assemblies prior to removal. The cast wheel and drum or hub and drum are removed as an assembly using the following procedure.

1. Loosen the brake adjustment by turning the adjusting screw on the slack adjuster.
2. Remove the hub.
3. Bend the flap or tang of the lockwasher from the flat of the outer spindle nut.
4. Remove the outer spindle nut, two (2) lockwashers, and the inner spindle nut.
5. Pull the cast wheel and drum or hub and drum assemblies carefully to avoid damage to the bearing, spindle, and inner seal. Catch the bearing cones as the wheel or hub is removed from the spindle.

Inspection and Cleaning

While the wheel or hub is removed, inspect the condition of the brake drum and linings. Also check the condition of the cups, cones, seal, and axle ring.

Preparing Bearing for Assembly

Coat the bearing cones and cups with oil prior to assembly.

Cast Wheel or Hub Installation

After the parts have been cleaned, inspected and bearings oiled, install as follows:

1. Assemble the inner cone and seal into the wheel or hub.
2. Place the wheel or hub over the spindle, being careful to avoid damage to the spindle, seal and brake.
3. Put the outer cone into position.
4. Tighten the inner spindle nut while rotating the wheel or hub both directions until a slight bind is felt.
5. Loosen the nut 1/4 turn. The wheel or hub must rotate freely.
6. Install the inner nut lock and place the outer lockwasher on the spindle.
7. Tighten the outer nut.
8. The end play must be .001 in. (.0254 mm) to .010 in. (.254 mm).
9. Lock the outer spindle nut in place by bending the tangs or edge of the lockwasher over one flat on the outer nut.
10. Install the hub cap gasket and hub cap. Fill the hub to the "Full" line on the hub cap window (see Figure 8).
11. Adjust the brakes.

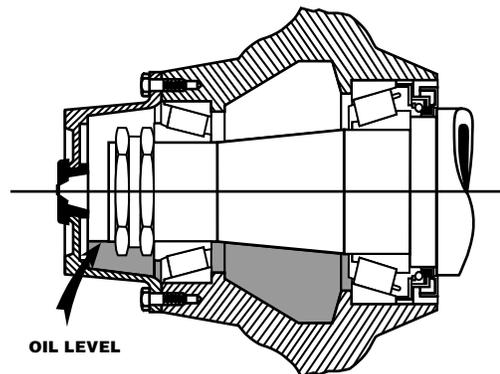


Figure 14. Checking Oil Level in Hub

Air Systems and Brakes

This section contains a description of the operation of the trailer brake air supply system.

Also included in this section are test instructions, disassembly and assembly procedures and a troubleshooting guide.

Air System Tests

A series of tests must be run daily before operating trailers with air brakes.

1. Connect the air lines, turn on the air, and pressurize the system. The system must hold 100 PSI (7 Bar) pressure minimum.
2. Apply the brakes. Inspect the brake action on all the wheels for proper application.
3. Release the brakes. The brakes must release promptly. Air pressure must discharge quickly from the relay emergency valve.
4. Disconnect the emergency line from the trailer. The trailer brakes must automatically apply.
5. Connect the emergency line. The brakes must release.

Air Reservoir

Drain condensation from the reservoir while the reservoir is pressurized. Listen for leaks after closing the drain valve. The drain valve is located on the underside of the reservoir.

Air Hoses and Tubing

Air hoses and tubing must be checked for chafing, bends, and kinking. Replace faulty parts.

Brake Relay Emergency Valve

The air system tests may disclose a malfunction of the relay emergency valve. Repair or replace faulty units. Contact an authorized representative of the original equipment manufacturer for relay valve servicing.

Air Brake Chambers

The air system tests should disclose any malfunctioning brake chambers. Repair or replace faulty units. The diaphragm and any worn parts must be replaced. When replacing the diaphragm or the spring, replace the corresponding parts for the other chamber on the same axle, to aid in even brake application and release. Examine the yoke pin for wear and replace it if necessary.

Brake Air Supply System Description

(see Figure 17)

The trailer relies on the tractor for its air supply. A description of the system operation follows:

1. When the service and emergency lines are connected to the towing vehicle, the reservoir is charged to approximately the same pressure as is present in the tractor reservoir. The relay emergency valve will keep the trailer brakes applied until the emergency line pressure reaches 60 PSI (4.14 Bar). The brakes will then be released.
2. When the towing vehicle and the trailer are traveling over the road, the brakes are released and the emergency line and reservoir are charged to full pressure.
3. When the service brakes are applied in the towing vehicle, the pressure is increased in the service line. This fills the brake chambers with the same pressure as the service line, and applies the trailer brakes.
4. Releasing the service brakes will cause the pressure in the service line to decrease, causing the relay emergency valve to exhaust the pressure from the brake chambers.
5. The trailer brakes can also be applied independently from the tractor brakes by actuating a hand controller. This supplies air pressure to the service line.
6. The brakes will also apply if the pressure in the emergency line is reduced to about 30 PSI (2.07 Bar). A gradual decrease in the emergency line pressure will cause a gradual increase in the pressure to the brake chambers.
7. A sudden release of pressure in the emergency line will cause a full release of reservoir pressure into the brake chambers, resulting in full brake application.

Relay Emergency Valve (see Figure 15)

The relay emergency valve senses the line pressures and relays the response to the brake chambers. Daily operating tests are described elsewhere in this manual. Before conducting further tests, check the tractor air pressure gauge against an accurate test gauge.

WARNING

Block the wheels during these tests

1. Connect the service and emergency lines. When the pressure reaches 60 -65 PSI (4.14 - 4.48 Bar), the brakes must automatically release.

2. Apply and release the service brake several times. Check for prompt brake application and release.

3. Release the brakes and stop the engine with the system pressure between 90 - 100 PSI (6.2 - 6.9 Bar). A two minute check must show a pressure drop of no more than 6 PSI (0.41 Bar) for the combination vehicle system.

4. If step “3” indicates possible leakage, apply soap suds at the relay emergency valve exhaust port. A one inch (25.4 mm) soap bubble in not less than five seconds is permissible.

5. Apply soap suds at the pipe plugs and fittings. Correct all leaks as indicated.

6. With the engine stopped and the pressure at 90 - 100 PSI (6.2 - 6.9 Bar) make and hold a full service brake application. A two minute check must show a pressure drop of no more than 8 PSI (0.55 Bar) for the combination vehicle system.

7. If Step “6” indicates possible leakage, apply soap suds on the relay emergency valve cover and exhaust port. A one inch (25.4 mm) bubble in not less than three seconds is permissible. Correct all leaks as indicated.

8. Place the tractor protection control valve in “emergency” position or close the cutoff valve on the emergency line. Disconnect the emergency line coupling. The trailer brakes must apply promptly. Check for leakage at the emergency coupling. A leak indicates a leaking check valve or O-rings in the relay emergency valve. Also check the service line. A leak here indicates leaking O-rings in the relay emergency valve. Recharge the system. The brakes must release at 65 PSI (4.48 Bar) emergency line pressure.

9. Stop the engine with the system fully charged. Make a series of foot valve applications. Reduce the pressure to 30 PSI (2.07 Bar). The trailer brakes must apply automatically at this pressure or at the emergency setting of the tractor protection equipment.

If the valve does not function properly or leakage is excessive, it must be repaired or replaced.

Brake Chambers (see Figure 16)

Air pressure on the pressure plate side of the brake chamber diaphragm pushes the diaphragm against the push rod assembly. This extension of the push rod pushes against the slack adjuster, which actuates the brakes.

Brake Chamber Servicing

If an air leak is detected around the clamp ring, the bolts can be tightened to stop the leak.

⚠ CAUTION

Overtightening the bolts can cause permanent distortion of the clamp ring. Do Not exceed a torque of 130 inch lbs. (14.7 Nm.)

Brake Chamber Removal

Disconnect the air line and the push rod yoke. Remove the nuts from the mounting studs. Remove the air chamber.

Brake Chamber Disassembly

1. Clean the exterior of the brake chamber.
2. Put a mark on the parts so they can be reassembled in the same relative positions.
3. Pull out the push rod and clamp the push rod in the extended position with vise grip pliers.

NOTE: Tape the grips to prevent damage to the push rod.

4. Remove the bolts from the clamp ring.
5. Spread the clamp ring and remove it.
- Use care not to bend the clamp ring out of shape.**
6. Remove the pressure plate and diaphragm.
7. Remove the locknut and the yoke from the push rod.
8. Release the grip on the push rod.
9. Remove the push rod and the spring.

Cleaning and Inspection of Parts

Clean the metal parts in a solvent. Inspect all the parts for damage, wear or deterioration and replace defective parts.

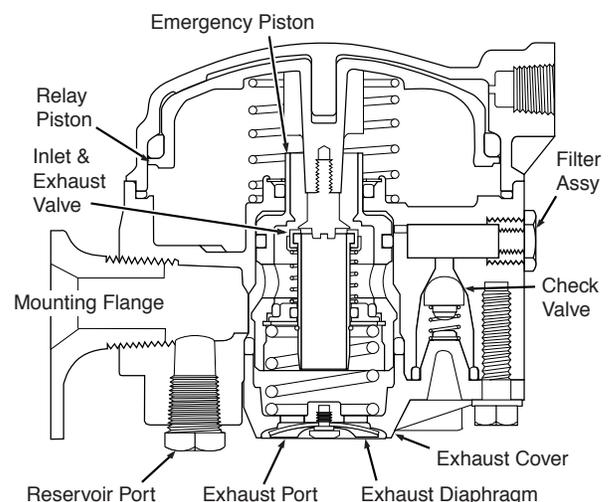


Figure 15. Relay Emergency Valve

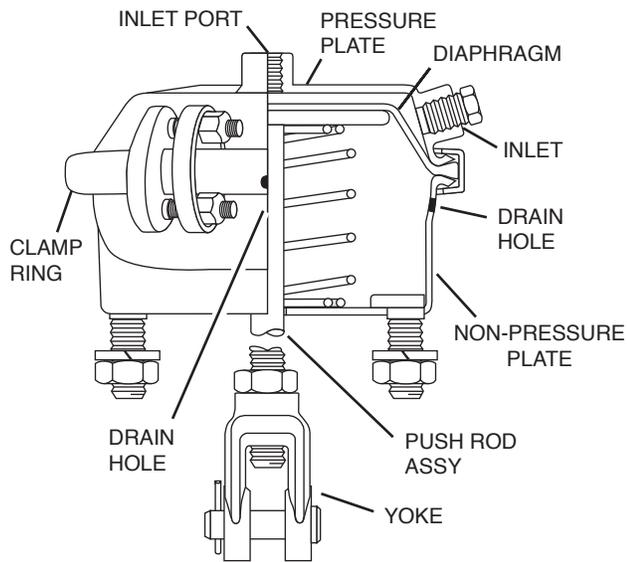


Figure 16. Brake Chamber

Brake Chamber Assembly

1. Stand the push rod assembly on a flat surface.
2. Put the return spring in position.
3. Place the non-pressure plate over the push rod.
4. Push the non-pressure plate down against the flat surface. Hold it in place with vise grip pliers clamped to the push rod.

NOTE: Tape the grips to prevent damage to the push rod.

5. Place the clamp ring over the non-pressure plate clamping surface.

6. Position the diaphragm in the pressure plate. Assemble it with the non-pressure plate by working the clamp ring over the pressure plate. Align all the marks made during disassembly.

7. Draw the clamp lugs together. Start the clamp bolts and nuts. Tighten the nuts to a maximum torque of 130 inch lbs. (14.7 Nm.). **CAUTION:** Overtightening the bolts can cause permanent distortion of the clamp ring.

Installation

Place the brake chamber in the mounting bracket and tighten the nuts on the studs. The drain hole must be placed in the down position. Install the yoke and the locknut on the push rod. Connect the push rod to the slack adjuster with the yoke pin. Adjust the brakes. Check the angle formed by the slack adjuster and the push rod with the brakes applied. This angle must not be less than 90° with the brakes adjusted. Turn the yoke to obtain this angle. The angle must be the same for all slack adjusters to obtain equal braking force at all wheels.

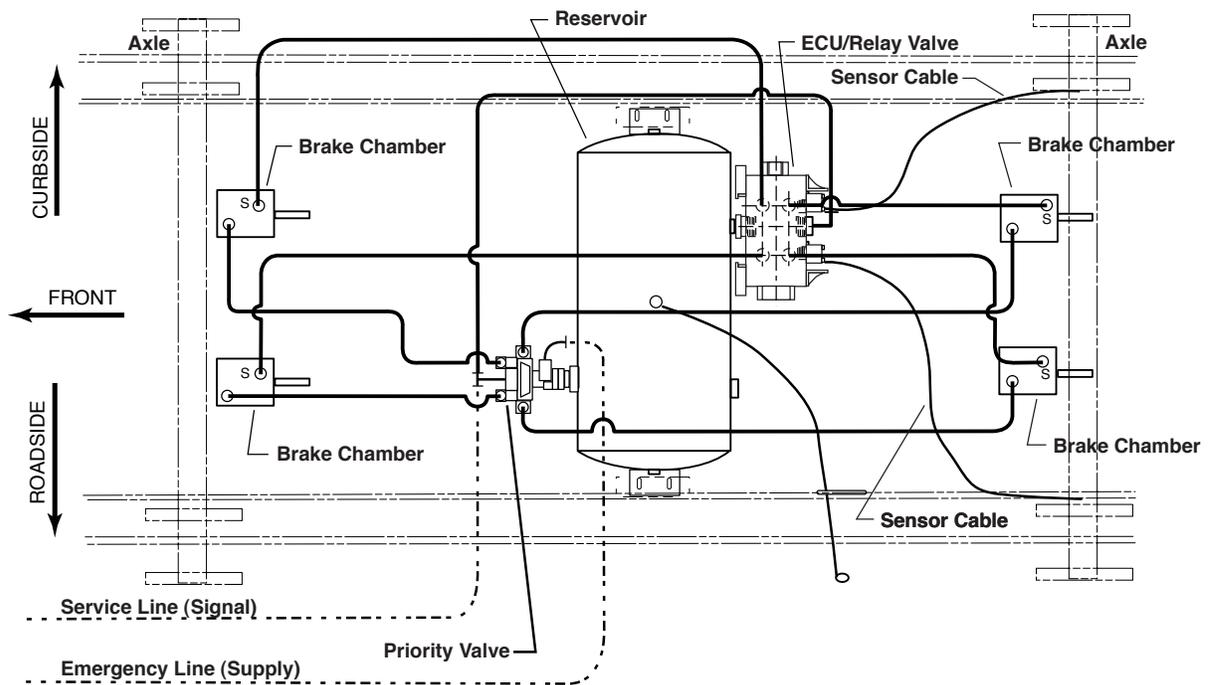


Figure 17. Std ABS Air Schematic

Trailer ABS

Meritor WABCO ABS is an electronic system that monitors and controls wheel speed during braking. The system works with standard air brake systems.

ABS monitors wheel speed at all times and controls braking during wheel lock situations. The system improves vehicle stability and control by reducing wheel lock during braking.

The ECU receives and processes signals from the wheel speed sensors. When the ECU detects a wheel lockup, the unit activates the appropriate modulator valve, and the air pressure is controlled.

In the event of a malfunction in the system,, the ABS in the affected wheel(s) is disabled; that wheel still has normal brakes. The other wheels keep the ABS function. See Figure 17.

An ABS warning light lets drivers know the status of the system.

For a complete description of diagnostic and maintenance procedures refer to Meritor WABCO Maintenance Manual no. 0180.

11	Internal modulator failure, outlet valve	Verify proper installation. If code continues, contact Meritor WABCO for assistance.
14	Power Supply	Verify proper electrical installation. Check power supply. Make necessary corrections.
15	ECU Failure	Verify proper installation. If code continues, contact Meritor WABCO assistance.
16	SAE J1708 Failure	Internal failure, contact Meritor WABCO.
17	SAE J2497 (PLC) Failure	Internal failure, contact Meritor WABCO.
18	Generic I/O Failure	Verify proper electrical installation. Check power supply. Make necessary corrections.

TRAILER ABS BLINK CODES

Blink Code	Problem Area	Action
3	Sensor BU1	Determine sensor location. Check sensor installation. Make necessary repairs.
4	Sensor YE1	Determine sensor location. Check sensor installation. Make necessary repairs.
5	Sensor BU2	Determine sensor location. Check sensor installation. Make necessary repairs.
6	Sensor YE2	Determine sensor location. Check sensor installation. Make necessary repairs.
7	External ABS modulator valve	Verify proper electrical installation. Check power supply. Make necessary corrections.
9	Internal modulator failure, inlet valve #2	Verify proper installation. If code continues, contact Meritor WABCO for assistance.
10	Internal modulator failure, inlet valve #1	Verify proper installation. If code continues, contact Meritor WABCO for assistance.

Trailer ABS with Roll Stability

Meritor WABCO ABS is an electronic system that monitors and controls wheel speed during braking. The system works with standard air brake systems.

ABS monitors wheel speed at all times and controls braking during wheel lock situations. The system improves vehicle stability and control by reducing wheel lock during braking.

The ECU receives and processes signals from the wheel speed sensors. When the ECU detects a wheel lockup, the unit activates the appropriate modulator valve, and the air pressure is controlled.

The ECU provides additional assistance in maintaining trailer directional stability with Roll Stability Support. Combining the data received from the wheel sensors and an internal lateral accelerometer, the RSS-*plus*TM will proactively engage the Roll stability Support to increase trailer stability and reduce the possibility of a rollover condition.

In the event of a malfunction in the system,, the ABS in the affected wheel(s) is disabled; that wheel still has normal brakes. The other wheels keep the ABS function. See Figure 18.

An ABS warning light lets drivers know the status of the system.

For a complete description of diagnostic and maintenance procedures refer to Meritor WABCO Maintenance Manual no. 0888.

TRAILER ABS with Roll Stability BLINK CODES

Blink Code Counts	Component Name
0	No failure
3	Sensor failure c
4	Sensor failure d
5	Sensor failure e
6	Sensor failure f
7	External modulator failure
9	Internal modulator failure H2
10	Internal modulator failure H1
11	No speed failure
12	Control pressure failure
13	Supply pressure failure
14	Power supply failure
15	ECU internal failure*
16	SAE J 1708 failure
17	PLC failure
18	Generic I/O failure
19	Load sensing failure
20	Roll stability system failure

*This error code will also appear on newly installed ECUs that have not been put into service with T00LBOX™ Software End-of-Line test.

Air Brakes - General

Etnyre trailers are equipped with cam actuated brakes. Braking force is supplied by air pressure in the brake chamber, which pushes a pushrod against the end of the slack adjuster. The slack adjuster rotates the camshaft, which forces the brake shoes against the brake drum.

Operating Checks

During road stops, check the brake drums for heating.

⚠ WARNING

Proceed cautiously. Malfunctioning or misaligned brakes can cause the drum to become extremely hot. Do not operate the vehicle until the problem causing the overheating is corrected.

A cool brake drum may indicate an inoperative brake.

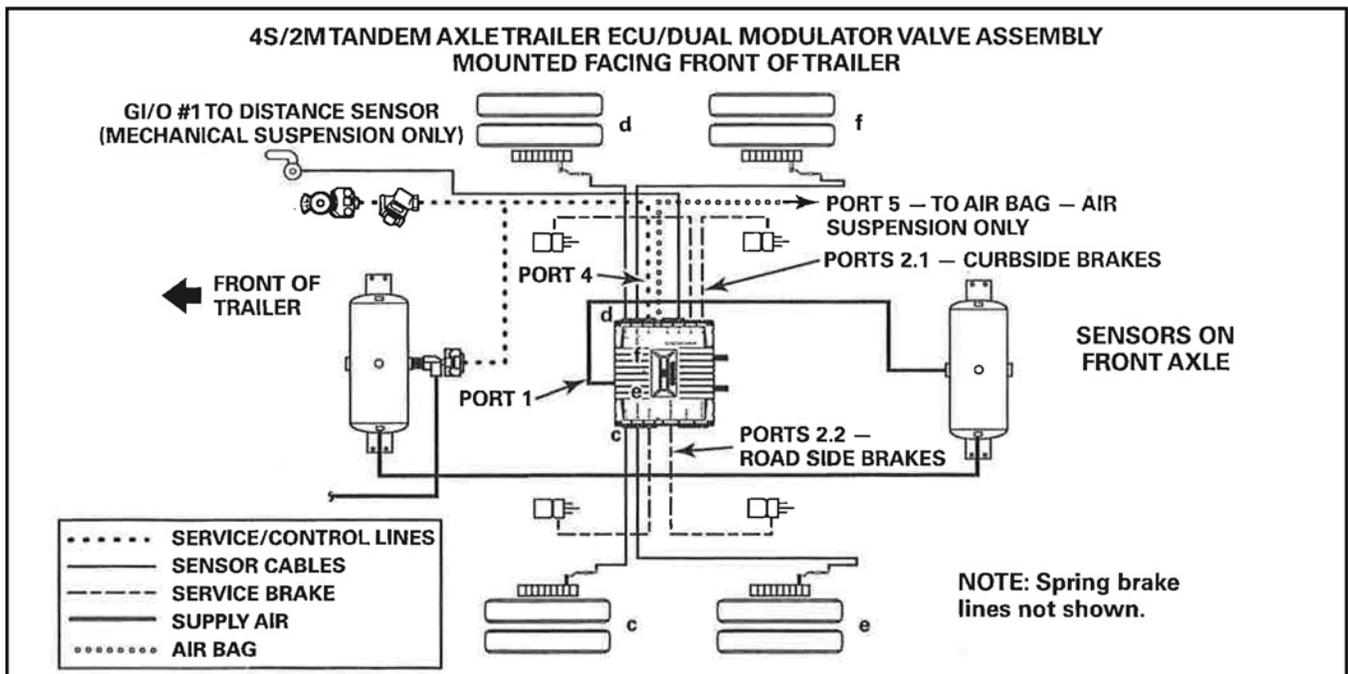


Figure 18. ABS with Roll Stability Support Air Schematic

Brake Assembly

Examine the brake linings visually to locate the lining showing the greatest amount of wear.

⚠ CAUTION

Do Not allow the linings to wear thin enough so the lining bolts or rivets contact the drum.

Grease the anchor pins, camshaft bracket bearing and the spider bushing at four (4) grease fittings. Do Not use an excessive amount of grease on the anchor pins and spider bushing. Avoid getting grease on the brake lining surfaces.

ABS STANDARD ELECTRICAL DIAGRAM

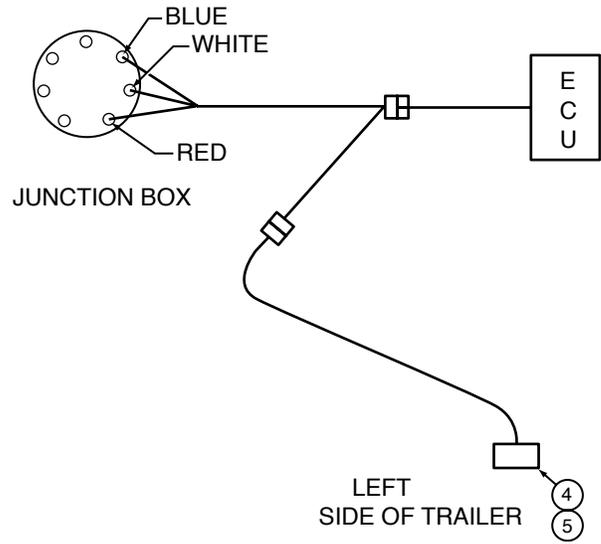


Figure 19. Std ABS Electrical Schematic

MAINTENANCE

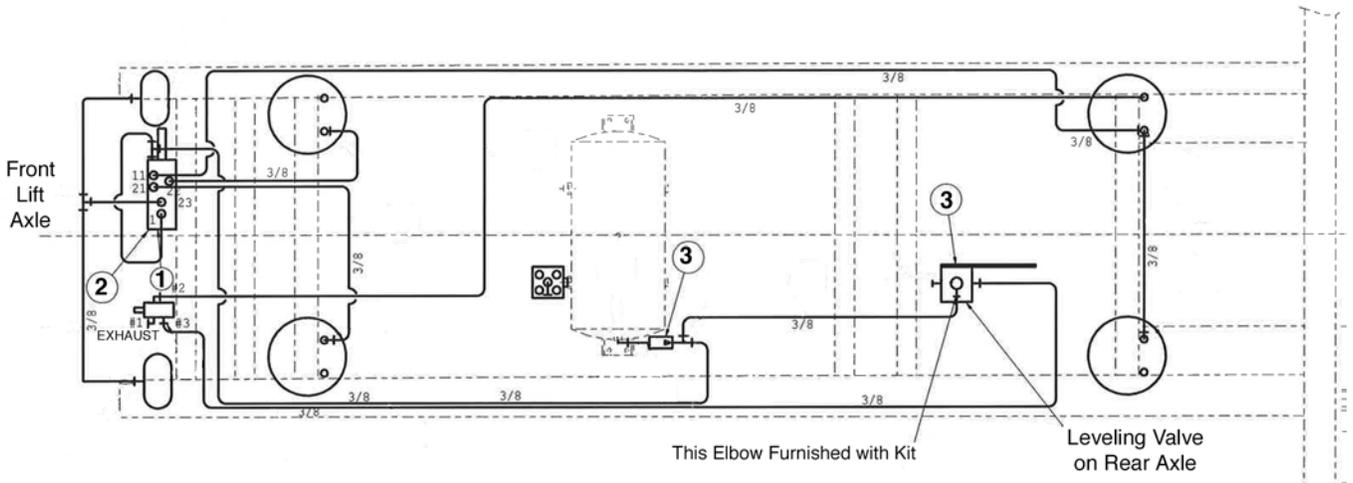


Figure 20. Air System with Front Axle Lift, 2 Axle

Slack Adjuster

Automatic Slack Adjuster

Recommended Preventive Maintenance

Every Three Months or 25,000 Miles

1. Check the condition of the brakes, including drums, shoes and linings, cams, rollers, bearings, etc.
2. Check for structural damage of the automatic slack adjuster housing and condition of the boot for cuts, tears, etc. Replace if necessary.
3. After allowing brake drum to cool to room temperature, check for correct chamber stroke. See chart below for correct stroke measurements.

Chamber Type	Maximum Stroke
12.....	less than 1-3/8"
16.....	less than 1-3/4"
20.....	less than 1-3/4"
24.....	less than 1-3/4"
30.....	less than 2"

Every Six Months or 50,000 Miles

The automatic slack adjusters are factory lubricated and extensively sealed to protect against dirt, water, salt and other corrosive elements. Nevertheless, periodic lubrication is recommended.

1. Grease the automatic slack adjuster.
 - (a) The styles of grease plugs or reliefs may vary according to models.
 - (b) See service data for the approved types of lubricant.
2. Test adjuster function.

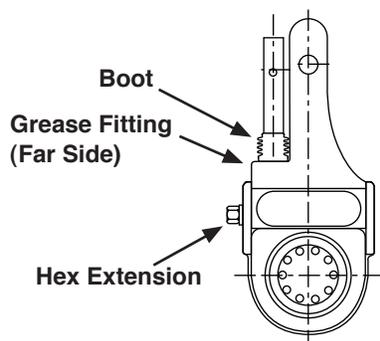


Figure 21. Slack Adjuster Lubrication Points

Testing Adjuster Function

Check the operation of the slack adjuster by observing the auto-check indicator during several applications of the brakes. The pointer should return to the "Home" position and not go into the red zone when the brakes are applied. Another way to check the operation is to measure the maximum stroke during brake application. If maximum stroke at 90 psi of the automatic slack adjuster is less than the distance in the **Maximum Stroke Chart** below, the adjuster is functioning properly.

Chamber Type	Maximum Stroke
12.....	less than 1-3/8"
16.....	less than 1-3/4"
20.....	less than 1-3/4"
24.....	less than 1-3/4"
30.....	less than 2"

1. The Automatic Slack Adjuster should not require manual readjustment. If the maximum chamber stroke is within the range for the size chamber used, the slack should not be manually readjusted. If the chamber stroke exceeds the limit, and does not adjust to within the specifications, either the brake linings or the slack adjuster should be replaced. Apply the brakes several times and watch for the hex to rotate. A box wrench on the hex makes an excellent indicator to magnify the movement. The hex extension must rotate. The adjustment is intentionally made in small increments so it will take several cycles to bring the adjuster within the stroke limit shown in the chart.

2. If the hex extension did not rotate, the automatic slack must be replaced.

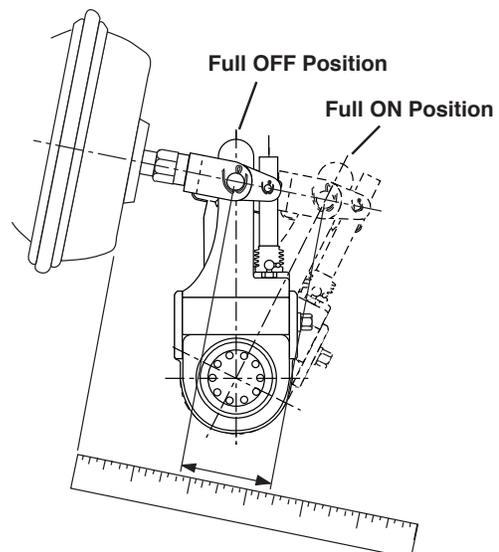


Figure 22. Measuring Maximum Stroke

Slack Adjuster Replacement

1. Chock the wheels.
2. Fully cage the spring chamber with 100 psi air pressure or a threaded T-bolt only.
3. Remove the existing slack adjuster and clevis. Do not move the existing jam nut.
4. Clean and apply anti-seize compound to the pushrod threads.
5. Thread the clevis onto the pushrod and install the 1/2" clevis pin. Do not tighten the jam nut.
6. Slide the installation template over the "S" cam spline. Swing the template into the clevis until the appropriate slot totally engages the 1/2" clevis pin.
7. Once the template has been swung into place, install the 1/4" clevis pin. If the 1/4" pin does not slide freely into the clevis and template, remove the template from the clevis. Rotate the clevis clockwise or counterclockwise several turns and reinstall the template in the clevis.
8. Position the clevis on the pushrod so both pins fit freely in the clevis and the template.
9. If the pushrod threads extend through the clevis more than 1/16", remove the clevis and cut the rod to length. A minimum of 1/2" thread engagement in the clevis body is required. If this is not the case, install a new pushrod and cut to length.
10. Tighten jam nut to a minimum of 50 ft-lbs.
11. Remove both clevis pins and template.
12. Before installing auto slack adjuster, coat the "S" cam spline, both clevis pins, and the pushrod threads with anti-seize compound.
13. Install the slack adjuster on the "S" cam spline. Using a 7/16" wrench, manually rotate the adjuster shaft clockwise until the slack adjuster arm holes line up with the clevis holes.
14. If your slack adjuster is equipped with an auto-check indicator, insert the 1/4" and 1/2" pins in to the auto-check holes. The clevis pin heads should be toward the front of the auto-check. The auto-check should face the center of the vehicle.
15. Insert the clevis pins through the auto-check and clevis and secure with cotter pins. If you do not have an auto-check insert the pins through the clevis and secure with cotter pins.
16. Using a 7/16" wrench, manually rotate the adjuster clockwise until the brake shoes contact the brake drum.
17. Install any washers and the snap ring on the "S" cam shaft.
18. Manually back off the adjuster counterclockwise 1/2 turn.

19. Uncage the spring brake.
20. Build up the vehicle air pressure to 90 psi.
21. Fully apply and release the brakes several times to check for adequate clearance to all of the adjacent components.
22. Measure the distance from the air chamber to the center of the 1/2" pin.
23. Apply the brakes with 80 to 90 psi air pressure, and measure the distance to the 1/2" pin. The difference between these 2 measurements is the stroke. The stroke, or difference between these two measurements must be less than as shown on the following charts.

The auto-check pointer will point to the home position to verify proper installation.

Chamber Type	Maximum Stroke
12.....	less than 1-3/8"
16.....	less than 1-3/4"
20.....	less than 1-3/4"
24.....	less than 1-3/4"
30.....	less than 2"

Long Stroke Chamber	Maximum Stroke
16.....	less than 2"
20.....	less than 2"
24 (below 3" max stroke).....	less than 2"
24 (3" max stroke version)....	less than 2 1/2"
30.....	less than 2 1/2"

WARNING

An auto slack adjuster should never have to manually adjusted while in service. The only time it should be manually adjusted is during installation or at brake relining. By constantly manually adjusting the hex shaft the internal clutch life can be shortened. The proper way of checking an auto slack to see if it is working within specifications is to measure the working stroke.

CAUTION

Check the brake adjustment frequently during the first 500 miles after relining. Overloading or using only the trailer brakes to stop the complete tractor-trailer unit will cause the heat absorption capacity of the brake to be exceeded. Hotter brake linings and drums, longer stopping distances, and shorter brake lining life will result.

Trouble Analysis for Air Brakes (continued)

Trouble	Probable Cause	Corrective Action
Brakes release too slowly.	Brakes need adjustment or lubrication.	Adjust and lubricate brakes.
	Brake components binding.	Align brackets or replace bent components.
	Exhaust port or relay emergency valve restricted or plugged.	Clean valve.
All brakes do not release.	Brake air system improperly connected.	Reconnect correctly.
	Brake valve on towing vehicle applied.	Release brake.
	Relay emergency valve in emergency position.	Check line pressure and valve.
	Restriction in brake hoses.	Locate and remove restriction.
Insufficient brakes.	Tractor protection valve malfunction.	Troubleshoot tractor air system.
	Brakes need adjustment.	Adjust brakes.
	Brakes need lubrication.	Lubricate brakes.
	Lining worn away.	Reline brakes.
	Defective relay emergency valve.	Repair or replace valve.
	Brakes overheated.	Stop and allow to cool. Locate the cause of overheating.
	Low air pressure.	Troubleshoot tractor air system.
Brakes grabbing.	Lubricant on brake lining.	Reline brake.
	Brake components binding.	Locate cause and repair, adjust or replace components.
	Defective brake valve on towing vehicle.	Repair or replace valve.
	Defective relay emergency valve.	Repair or replace valve.
Excessive leakage with brakes released.	Relay emergency valve leaking.	Repair or replace valve.
	Leaking tubing or hose line.	Tighten or replace leaking lines.
Excessive leakage with brakes applied.	Relay emergency valve leaking.	Repair or replace valve.
	Leaking brake chamber or diaphragm.	Tighten clamp ring or replace diaphragm.
	Leaking tubing or hose line.	Tighten or replace leaking lines.
Excessive leakage with emergency system only applied - no leakage with normal brake application.	Defective relay emergency valve.	Clean and repair, or replace valve.

(continued)

Trouble Analysis for Air Brakes (continued)

Trouble	Probable Cause	Corrective Action
Excessive water present in brake system. Excessive oil present in brake system. Brake will not apply.	Reservoir not drained often enough. Compressor on towing vehicle passing excessive oil. Flat spot on cam roller or camshaft.	Drain reservoir daily. Repair compressor. Replace defective parts.

TECHNICAL PROCEDURE

HENDRICKSON TIRE INFLATION SYSTEM

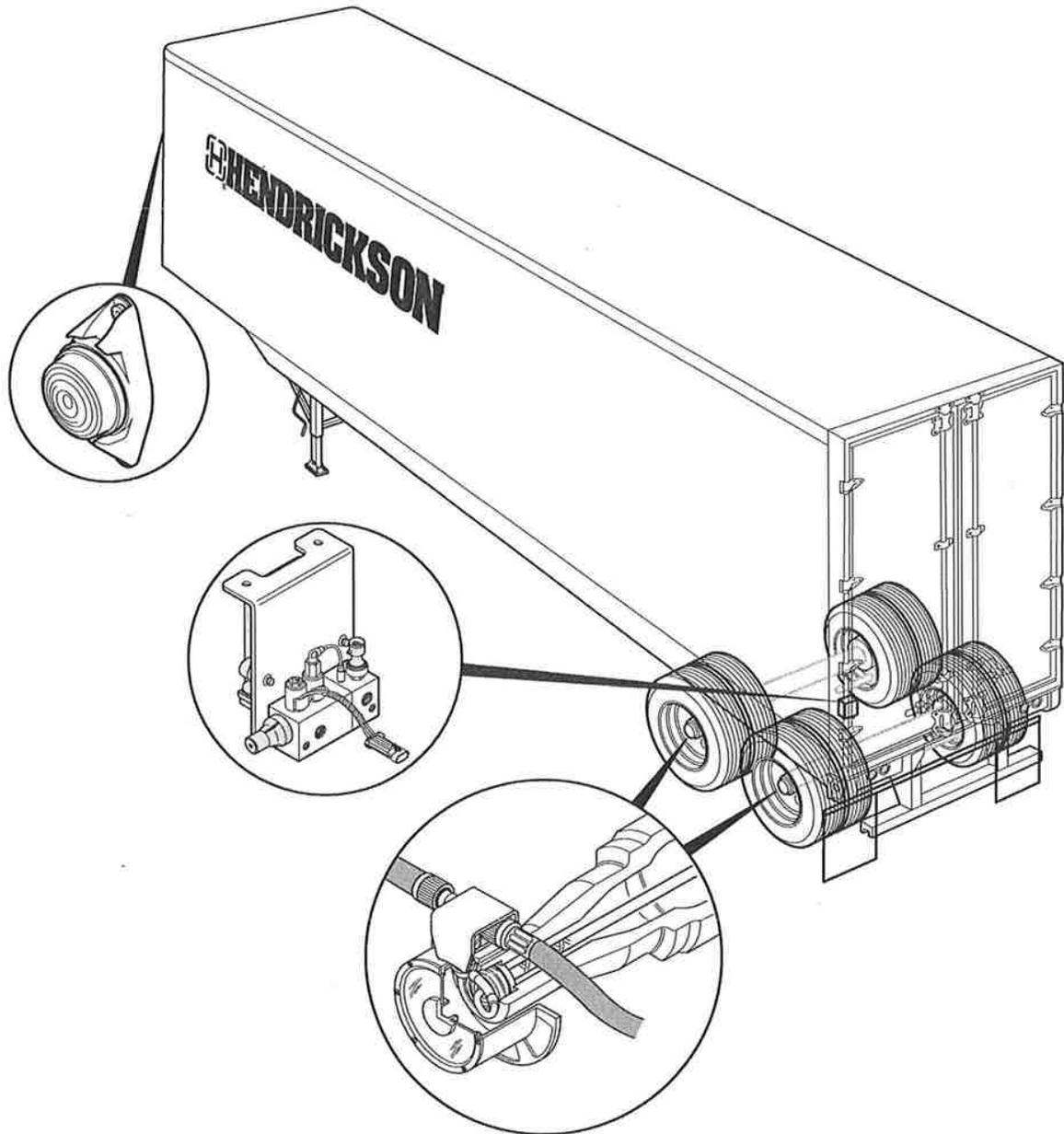
NOTE: These pages are included here
for basic Trouble Shooting information.

For complete manual please go to
www.hendrickson-intl.com/ProductInfo/Trailer-Product-Info-New

SUBJECT: Installation, Service and
Troubleshooting Procedures

LIT NO: L786

DATE: December 2003 **REVISION:** A



MAINTENANCE

For The Road Ahead™

 **HENDRICKSON**



OPERATION

SYSTEM OPERATION

To ensure that the system is functioning, the operator should verify that a two-second warning lamp bulb check occurs when the unit is powered. The system is powered from the "blue circuit" on the seven-pin trailer connector.

Once powered, the brake supply tank must be charged before the system will operate. The system will then pressurize the lines and measure the tire pressure. If one or more tires are low, the system automatically inflates the low tire(s) to the cold tire pressure setting. The remaining tires are protected from pressure loss by check-valves located in each tire hose. If one or more tires are low by 10% or more, the warning lamp will turn on and remain on until the tire(s) are reinflated.

Once the tires are at the proper pressure, the seals and hoses will be depressurized, preventing unnecessary wear on the seals. The system rechecks tire pressure every 10 minutes by momentarily pressurizing the lines and measuring tire pressure as described above.

If the warning lamp flashes multiple times on power-up, the system has stored a service code and may be unable to properly check or maintain tire pressure. The operator should manually check tire pressures to ensure that it is safe to operate the vehicle and should seek service at the next opportunity.

If the warning lamp remains on, the system is attempting to inflate the tires but may not be able to adequately maintain proper tire pressure. The operator should stop and check the tires to determine if it is safe to continue to operate the vehicle and should seek service at the next opportunity.

⚠ CAUTION: All hoses must be connected for the system to operate properly. If any of the hoses are removed or damaged, the system cannot inflate any low tire(s).

MANUALLY CHECKING TIRE PRESSURE

⚠ WARNING: TO PREVENT INJURY, ALWAYS WEAR EYE PROTECTION WHEN MAINTAINING OR SERVICING THE VEHICLE.

NOTE: Check valves in the tire hoses help prevent tire pressure loss when a tire hose is removed. You may, however, experience air flow at the open line and a low tire indication on the warning lamp if the tire hose is disconnected and the system is powered and attempts to check tire pressures.

To manually check tire pressure (figure 1):

- Disconnect tire hose from tee at hubcap or from valve stem.
- Use a conventional gage to measure tire pressure at hose end or at valve stem.
- Reattach and firmly hand-tighten tire hose.

⚠ CAUTION: Do not overtighten tire hose or the seal may be damaged. Ensure tire hoses are not stretched or rubbing on the wheel.

WARNING LAMP DESCRIPTION

TWO SECONDS ON AT POWER-UP

This is a system verification and warning lamp bulb check (figure 2). If there is no bulb check at power-up, the system may not be functioning. Verify proper power is applied to the system.

NOTE: The HTIS system utilizes the trailer's blue circuit for power. Some early model tractors do not power this circuit, resulting in no power to the system.

MULTIPLE FLASHES AT POWER-UP

If the warning lamp flashes multiple times on power-up, the system has stored a service code (refer to the table on page 31 for complete service code details). A service code indicates the need for tire or system maintenance. If this occurs, the system may be unable to properly check or maintain tire pressure. Verify that all tires are inflated properly, and have the system serviced at the next opportunity.

NOTE: Only active service codes cause the warning lamp to blink multiple times at power up.

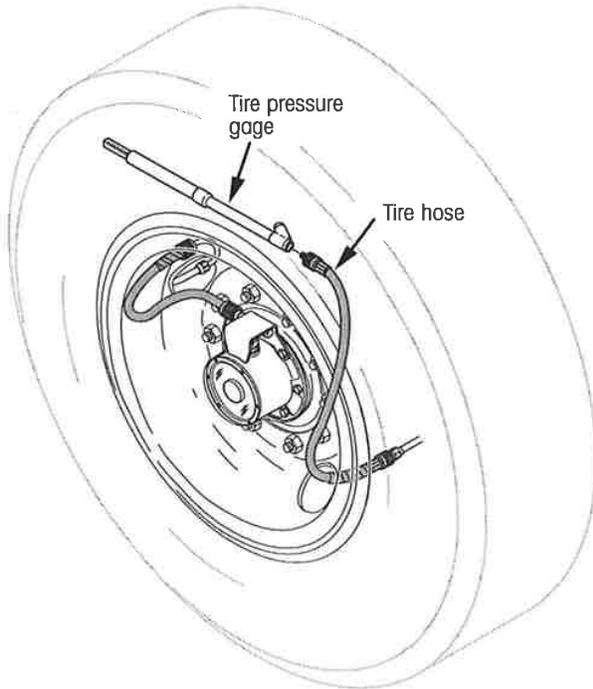


Figure 1. Manually checking tire pressure

LAMP ON CONTINUOUSLY

The lamp will illuminate if the measured pressure of one or more tires is 10% or more below the cold pressure setting. The lamp will remain on until the tires are reinflated to the proper tire pressure. If the lamp remains on for an extended period of time, the operator should stop the vehicle and check the tires for damage.

Under some normal operating conditions, you may find that the warning lamp illuminates when no visible damage is apparent. This may be due to changes in ambient temperature while the trailer is idle. When the system is first powered on a trailer at a temperature significantly lower than when previously operated, cooling of the tires may result in a drop of pressure below 10% of the target pressure, thus illuminating the lamp. Refer to the Appendix (figure 42) for examples of temperature effects on tire pressure.

In addition, the lamp may turn on solid as the result of a significant air line leak, the system failing to depressurize, or because a new ECU has not had a target programmed yet (on ECU's shipped before September 2003).

CAUTION: Extended periods of use with the lamp illuminated may decrease the life of the rotary air seals.

HOW THE SYSTEM OPERATES

The system checks the tire pressures at 10-minute intervals. To measure the tire pressure, the system charges the air lines with a series of pulses. If the line pressure has not increased to the target tire pressure after a specified period of time, the system will begin to inflate the low tire(s). If the measured tire pressure is 10% or more below the target tire pressure, the warning lamp will illuminate while the system is inflating the tire(s) to inform the driver of a potential tire leak. Once the target tire pressure is achieved, the system performs an additional check to verify that the control lines have depressurized and turns off the lamp.

To prevent air from leaking while the control lines are not pressurized, there is a check valve (no spring valve core) in each of the tire hoses.

If the warning lamp remains lit for an extended period of time, the driver should check all the tires for damage and take corrective actions if applicable.

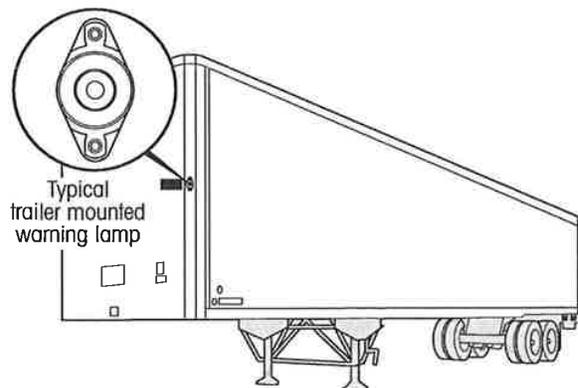


Figure 2. Trailer mounted warning lamp



SYSTEM SETUP

NOTE: Beginning in September of 2003, the controller assembly began shipping with the target inflation pressure already programmed to 95 PSI. These "preprogrammed" controllers are identified with a letter "P" marked on the end of the valve body. With these preprogrammed controllers, no programming is required to enable the HTIS system to function unless a target inflation pressure other than 95 PSI is desired. In that case, refer to the following information for complete controller programming details.

INTRODUCTION

After the installation is complete, the system must be programmed before it is put into service. On power-up, the lamp will remain on as an indication that the target pressure has not yet been programmed.

There are two methods for setting the system's target tire pressure:

System Learn Method: All tire pressures are manually adjusted to the recommended cold tire pressure and the system "reads" this tire pressure.

Service Tool Method: A service tool (PC-based or hand-held) is used to "download" the target pressure over a data link.

SYSTEM LEARN METHOD

To accurately set the target tire pressure using this method, all tires must be at the desired target pressure before beginning this procedure. Refer to the section titled *Manually Checking Tire Pressure* on page six to measure current pressure, then add or remove air (if necessary) until the desired target pressure is reached. Repeat for all tires.

1. Apply 12 volt power to the trailer at the SAE J560 connector.
2. Provide adequate pressure to the brake supply tank (115 psi minimum).
3. Remove the weather cap from the diagnostic connector on the HTIS harness (figure 26). Using a screwdriver, short pins "A" and "E" together three consecutive times for the following

durations: maintain the short for approximately one second, then release the short for approximately one second. The pins to be shorted are easily identified by the slot in the diagnostic connector shell. This slot allows convenient use of a coin or screwdriver tip to short the pins together.

4. Upon entering learn mode, the warning lamp will illuminate for two seconds twice and then will flash once every 10 seconds to acknowledge that the learn mode is active.
5. The system will pressurize the air lines for several seconds, and then will wait for the pressure to stabilize.
6. The current tire pressure will now be stored as the target pressure. Once the target pressure is established, the warning lamp will illuminate for five seconds and then blink the target pressure. For example if the tire pressure is 102 psi; the warning lamp will illuminate for five seconds and then blink one time, pause, blink 10 more times (0 is represented by 10 blinks), pause, and then blink two more times. If the value communicated by the blink codes is lower than the desired target pressure, verify that all the tires are set to the proper pressure and that no line leaks are present.
7. After the system has determined the target pressure, it will remain pressurized for up to two minutes (or until power is cycled). During this time, manually check for air leaks. If an air leak

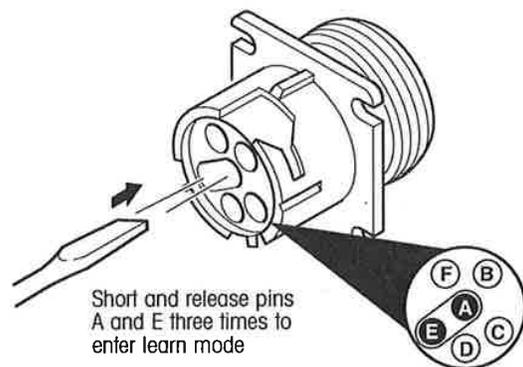


Figure 26. Entering learn mode



Condition	Possible Cause
Lamp does not illuminate during power-up	Poor electrical connection, power below nine volts or burned out lamp
System remains in learn mode	Ensure supply pressure is above 115 psi
The lamp remains illuminated after the learn mode	A fault has occurred. Refer to the blink code diagnostics or use a diagnostic tool
The system reads the tire pressure slightly low	Verify there are no air leaks within the system

is detected, the system will not program a target pressure and the warning lamp will illuminate continuously. If this occurs, correct the leak(s) and then set all tires to the desired target pressure and conduct the learn sequence again.

NOTE: The system is only pressurized during the actual pressure check. A leak will only be audible during the few seconds the system is attempting to determine the target tire pressure.

TROUBLESHOOTING LEARN MODE

Several conditions may prevent the system from "learning" the target pressure. The above table outlines the most common causes of failure.

SERVICE TOOL METHOD

When using a PC or other supported service tool connected to the diagnostic port, follow the instructions included with the service tool.

1. Apply 12 volt power to the trailer at the SAE J560 connector.
2. Using the PC or service tool, enter the desired cold temperature target tire pressure into the ECU. Then remove power from the trailer.
3. Reapply power and verify proper operation by selecting the manual operation mode with the diagnostic tool. Select pressure check and hold to check for air leaks in the system.
4. Watch for a drop in manifold pressure and listen for any audible leaks. If a leak is detected, take corrective actions.
5. If any faults have occurred during programming, clear all historical faults.

TROUBLESHOOTING

TROUBLESHOOTING INTRODUCTION

The system identifies certain conditions and reports them via the trailer mounted warning lamp. In normal mode, the operator is informed whenever a tire is low enough to require service (typically 10%) or there is a fault in the system. For troubleshooting, additional information can be obtained either through blink-codes, or through the use of a service tool connected to the diagnostic connector.

BLINK-CODE DIAGNOSTICS

Blink codes provide a means to determine, without any special tools, what service codes were stored by the system. To activate the blink codes, you must enter the diagnostic mode:

1. Apply power to the system.
2. Remove the weather cap from the diagnostic connector on the HTIS harness (figure 27). Using a screwdriver, short pins "A" and "E" together for approximately five seconds until the warning lamp changes state. The pins to be shorted can be easily identified by the interconnecting slot in

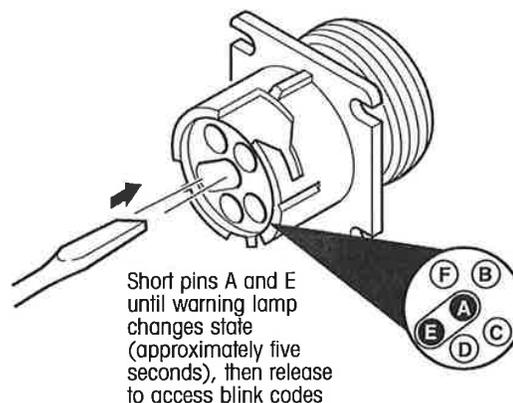


Figure 27. Entering diagnostic mode



the diagnostic connector shell, allowing convenient use of a coin or screwdriver tip to short the pins together. The warning lamp will illuminate for five seconds upon entering the diagnostic mode, and will then flash a two-digit service code. Refer to the table on page 31 for service code descriptions. If more than one service code was stored, there will be a two second pause between each flash sequence. If no service codes are stored or if all the service codes have been flashed, the system will flash a five-five code.

It is not necessary to short pins "A" and "E" on the diagnostic connector when a service tool is used for troubleshooting. Follow the instructions included with the service tool.

BLINK-CODE DESCRIPTION

Low Tire — Low tire pressure is indicated by an illuminated warning lamp (no blinking or flashing). This service code will be stored when one or more tire pressures drops a predetermined amount (typically 10% below the target pressure). Inspect the tires to rule out tire damage. This service code can also be stored as a result of a large line leak.

ECU in Normal Operating Mode	
Warning Lamp Status	System Condition
Two seconds on at power up*	Normal operation (lamp check)
Multiple flashes at power up	Active service code stored in ECU
Continuously on	Low pressure in one or more tires Substantial air line leak Failure to depressurize the system No target tire pressure programmed (new ECU)
<p>NOTE: If the vehicle is powered and the supply air tank pressure is not at a minimum of 90 psi and is not two psi above the target tire pressure, the system will not check or inflate the tires.</p> <p>*The HTIS system utilizes the trailer blue circuit for power. Some early model tractors do not power this circuit, resulting in no power to the system.</p>	

ECU in Learn Mode	
Warning Lamp Status	System Condition
Two seconds on twice when learn mode is selected	Learn mode has been activated
One-half second on every 10 seconds	Inadequate supply pressure to determine target tire pressure
Five seconds on, then multiple one-half second on, two seconds off flashes	A target tire pressure has been determined by the ECU (each series of flashes represents one digit of new target tire pressure. For example; nine flashes, two second pause, five flashes represents a target tire pressure of 95 psig). Zeroes are indicated by 10 flashes.



HTIS INSTALLATION, SERVICE AND TROUBLESHOOTING PROCEDURES

ECU in Diagnostic Mode (Service Codes)*			
1st Digit	2nd Digit	Description	Possible Cause
1	1	Leaking tire**	Repeated attempts to inflate a slow leak in tire or wheel assembly
1	2	Tire pressure low**	Tire pressure more than 10% (typical) below target pressure, significant air line leak
1	4	Line leak	Air line leaking between manifold and wheel-end; very low tire
1	5	Supply pressure low	Supply pressure inadequate to check tire pressures for greater than 24 hours
1	6	Maximum inflate time	System has been inflating for over two hours but has not reached target pressure
1	7	System vent failure	System unable to depressurize air lines. Check valve or manifold contamination
2	1	Target pressure out of range	Programmed target tire pressure is outside allowable range (80 - 125 psig)
4	1	ECU memory failure	Faulty ECU (possible lost data)
4	2	Atmospheric sensor failure	Faulty ECU (system defaults to 14.5 psig reference pressure)
4	3	No target pressure programmed	New installation. Target pressure not yet programmed (applies only to ECU's shipped before September 2003)
5	5	End of service code listing	
6	1	Lamp - open circuit	Faulty lamp or wiring
6	2	Lamp - short circuit	Faulty lamp or wiring
6	3	Solenoid 1 - open circuit	Faulty solenoid 1 or wiring
6	4	Solenoid 1 - short circuit	Faulty solenoid 1 or wiring
6	5	Solenoid 2 - open circuit	Faulty solenoid 2 or wiring
6	6	Solenoid 2 - open circuit	Faulty solenoid 2 or wiring
<p>* The warning lamp will turn on continuously for five seconds when entering the diagnostic mode. The lamp will then flash any active two digit blink codes.</p> <p>**Following repair of the leaking tire, check all other tires manually for correct tire pressure. If the system has been maintaining pressure in a leaking tire for an extended period of time, the other tires may now be slightly above target pressure.</p>			



System Fault — A system fault service code is stored when a problem has been detected with the system. System fault service codes include memory reset, internal atmospheric sensor fault, or other pneumatic faults.

Code Five-Five — This indicates the end of the service code list. If this is the only blink code received, then no service codes were stored.

TROUBLESHOOTING TECHNIQUE

The following technique can be used to help find an air leak (if indications point to an air leak somewhere in the system) or to verify the integrity of all air connections after installation.

1. Disconnect the air OUT line from the manifold assembly.
2. Connect a shop air supply to the air OUT line. **This air supply pressure must be below the programmed target pressure. If necessary, use a regulator to reduce the shop air supply pressure.**

The shop air supply provides a constant source of air pressure to the system, eliminating the 10 minute pressure check intervals provided by the controller assembly. This allows an uninterrupted opportunity to thoroughly check for air leaks.
3. Listen for the hissing sound of an air leak and apply soapy water to all connections or suspected areas. Bubbles in the soapy water will provide a visual indication of an air leak.

NOTE: These pages are included here for basic Trouble Shooting information. For complete manual please go to <http://www.psi-atis.com/literature/mm14p.pdf>

MERITOR®

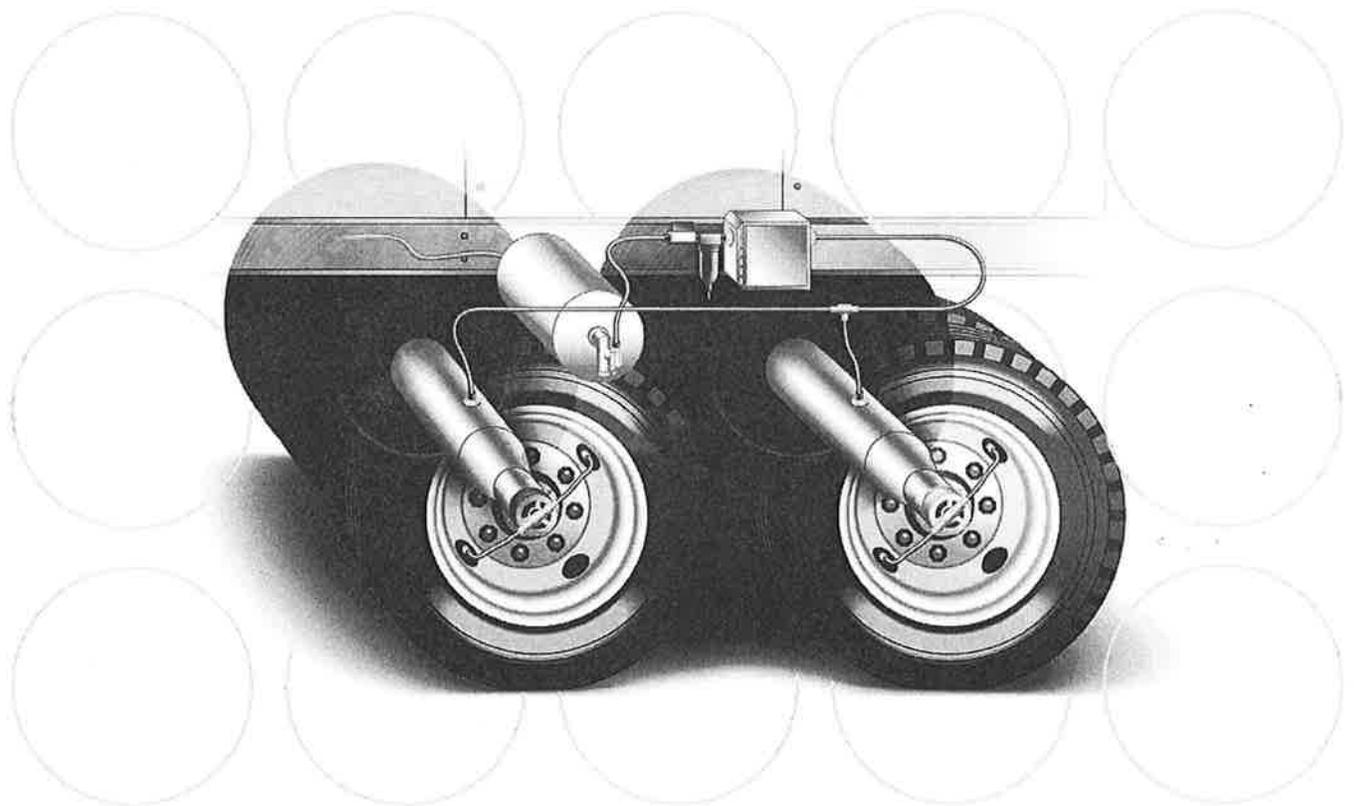
Installation and Maintenance Manual 14P

Meritor Tire Inflation Systems (MTIS) by P.S.I.™

Standard MTIS

MTIS with the ThermALERT™ System

Revised 06-06



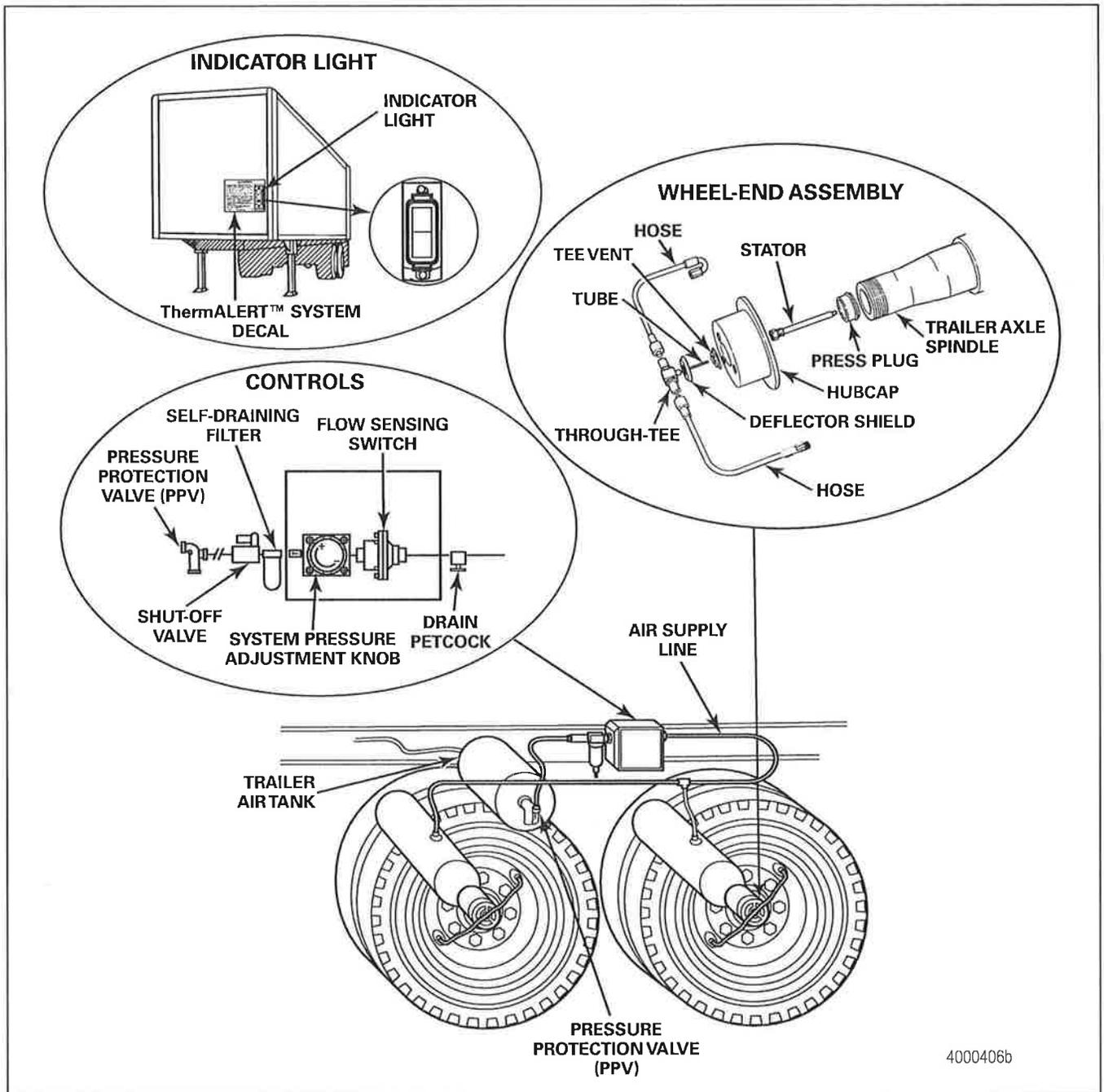


Figure 1.1

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Check System Operation

Use the following procedure to check the tire inflation system for correct operation. This inspection ensures that the system is activated, the indicator light works, the hoses are installed correctly and that the system delivers the correct pressure to the tires.

1. Wear safe eye protection.
2. Check that the shut-off valve is ON. When the valve is ON, the knob aligns with the shut-off valve body. Also, check that the petcock is closed. Figure 3.1.

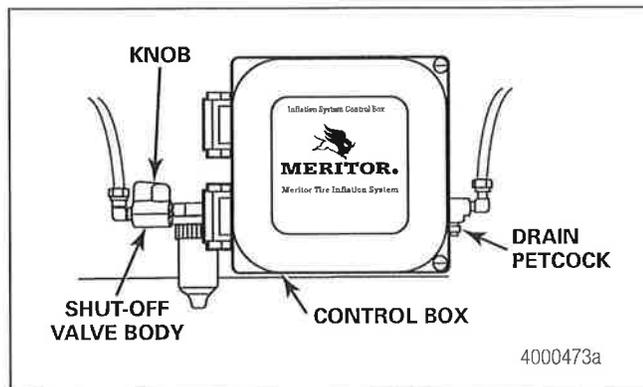


Figure 3.1

3. The tire inflation system must be fully pressurized before proceeding. This may take up to 10 minutes, since the axles, tires and possibly the brake system will have to be pressurized. A shop air source will charge the system more quickly than a tractor compressor.

Fully pressurize the tire inflation system by connecting the trailer to a pressure source that can deliver 120-130 psi (827-896 kPa) to the trailer gladhands. Allow the air pressure source sufficient time to pressurize the system, which may take up to 10 minutes.

Check all fittings and the hubcap tee vent with soapy water for air leaks.

4. Connect a 12-volt power source to the trailer seven-way box. Figure 3.2.

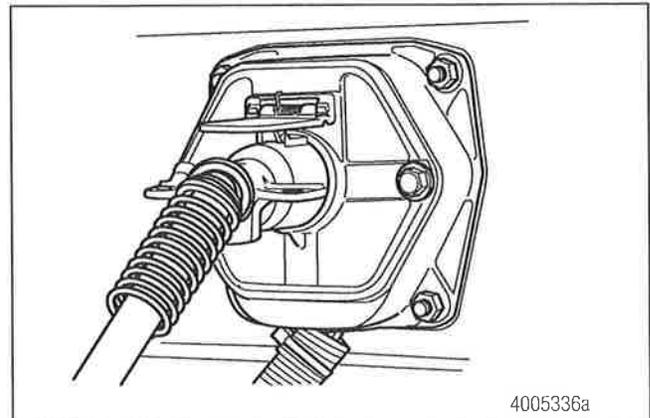


Figure 3.2

5. Check all of the through-tees by pushing a short piece of tire inflation system air line into the through-tee. Air should flow from the through-tees. Figure 3.3.

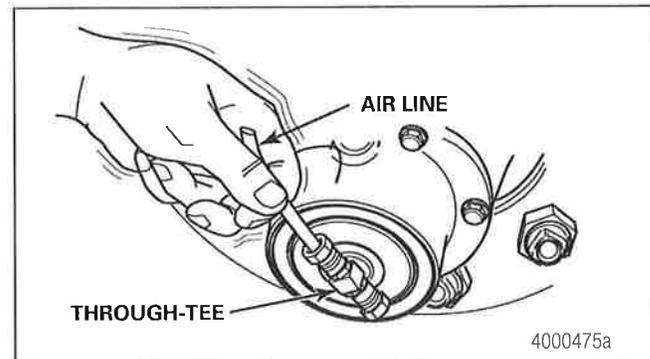


Figure 3.3

6. Check that the indicator light comes ON as air flows from the through-tee and turns off when the air flow stops. Figure 3.4.

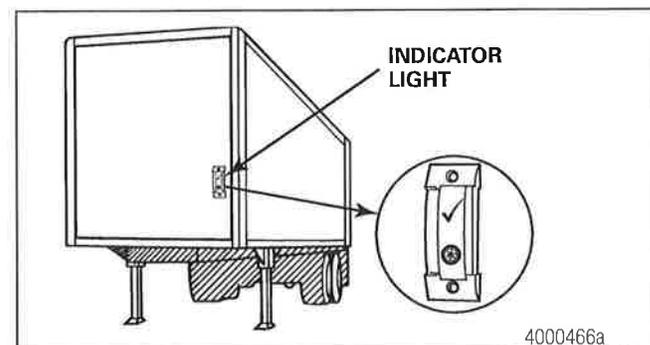


Figure 3.4

3 Check System Operation

7. Push on the valve cores at the ends of the hoses attached to the tires. Air should flow from the tires. Figure 3.5.

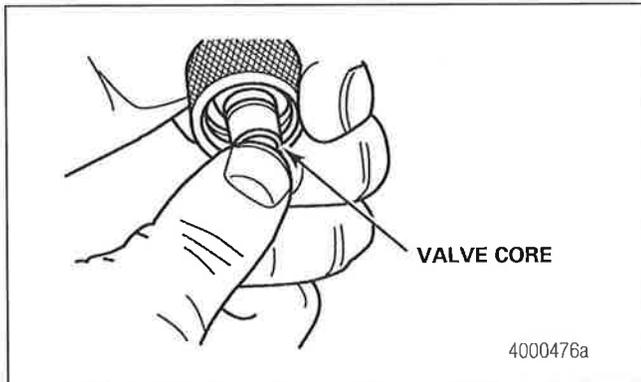


Figure 3.5

8. Use the valve cores in the hoses to reduce pressure in all the tires 5 to 10 psi below the desired tire pressure. A sticker located inside the control box door indicates the tire pressure that the inflation system will deliver. Figure 3.6. For example, if the fleet runs 100 psi (689 kPa), reduce the tire pressure to 90 to 95 psi. Figure 3.5.

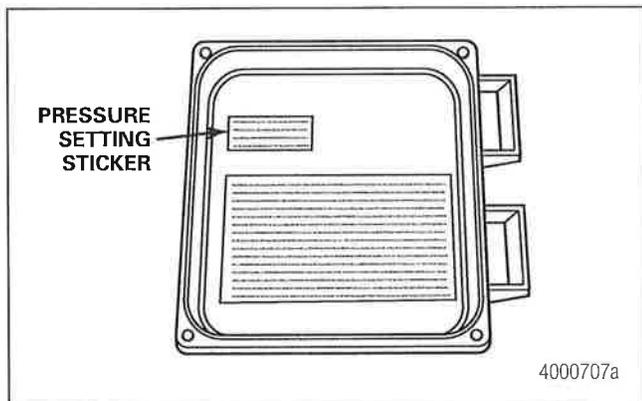


Figure 3.6

9. Choose a tire to test. Hand-tighten the hose to the through-tee. Figure 3.7.

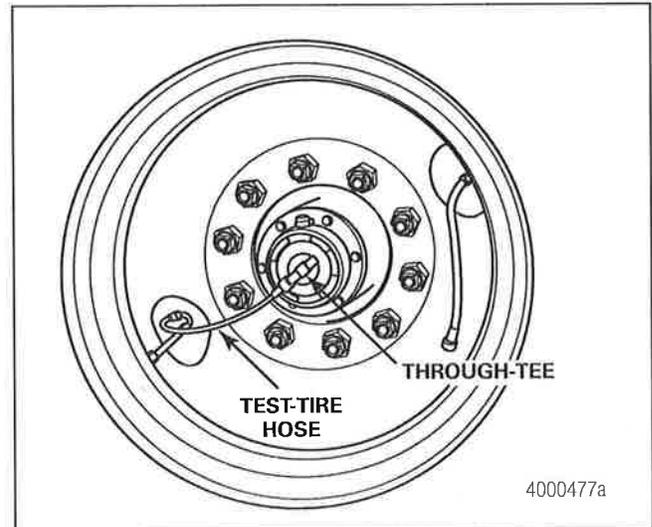


Figure 3.7

10. Allow sufficient time for the pressure to build up in the test-tire. This may take up to 20 minutes, depending on system pressure and other vehicle air requirements.
11. Disconnect the test-tire hose from the through-tee. Check the test-tire pressure using an accurate air pressure gauge. Tire pressure should equal the system pressure setting on the decal in the control box. Figure 3.8.
 - **To increase the tire pressure:** Pull the system adjustment knob out, then turn the knob **CLOCKWISE** approximately 1/8 turn (45 degrees). Hand-tighten the hose to the through-tee. Do not use pliers. Repeat Step 10 and Step 11. When complete, lock the knob by pushing it inward. Figure 3.9.
 - **To decrease the tire pressure:** Reduce the pressure on the test-tire 5 to 10 psi below the desired air pressure. Pull the system adjustment knob out, then turn the knob **COUNTERCLOCKWISE** approximately 1/8 turn (45 degrees). Hand-tighten the hose to the through-tee. Do not use pliers. Repeat Step 10 and Step 11. When complete, lock the knob by pushing it inward. Figure 3.9.

3 Check System Operation

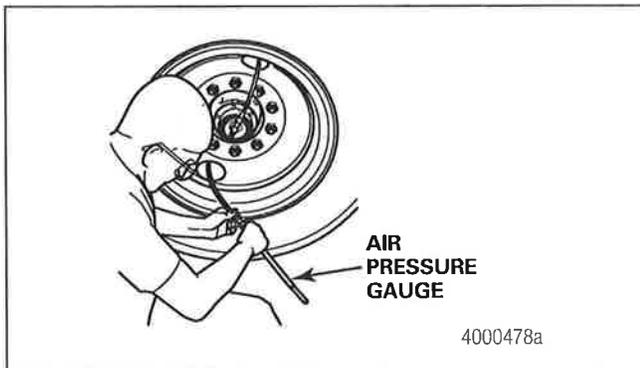


Figure 3.8

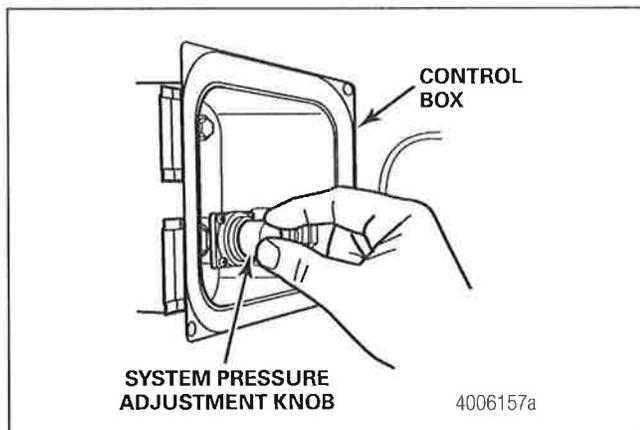


Figure 3.9

12. When the test-tire pressure is correct, hand-tighten the remaining tire hoses to the through-tees. Do not use pliers. The tire inflation system will inflate all of the tires to the specified pressure. At this point, the system is fully assembled. Figure 3.10.

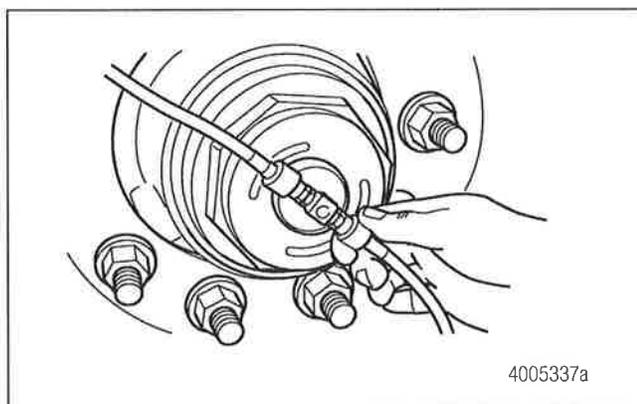


Figure 3.10

13. Check the wheel ends to verify that the tire inflation system hoses do not contact the wheels. Figure 3.11.

- **If a hose contacts a wheel:** Use a wrench to slightly rotate the through-tee to reposition the hose away from the wheel. Ensure the through-tee is still tightened to the hubcap at 45-55 lb-in (5.1-6.2 N•m). 

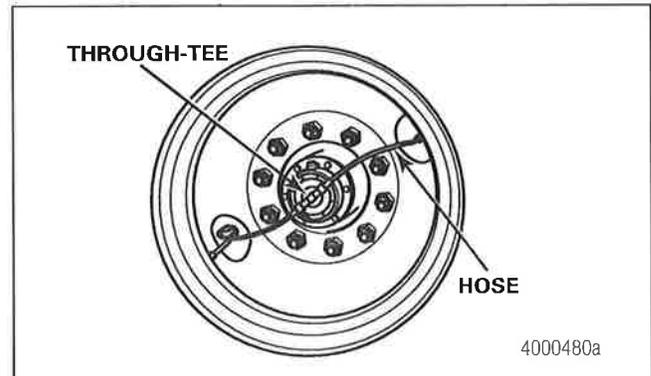


Figure 3.11

Check the Control Box Pressure

Use the following procedure to check the tire inflation system control box delivery pressure, if the pressure in the tires is different than the pressure value specified on the control box door label. This procedure will help determine whether the tire pressure difference is from incorrect control box settings or other issues, such as a system leak downstream from the control box.

1. Turn the tire inflation system off using the shut-off valve at the control box.
2. Drain all the air from the system using the drain petcock at the control box.
3. Remove the outlet air line from the control box. Figure 3.12.

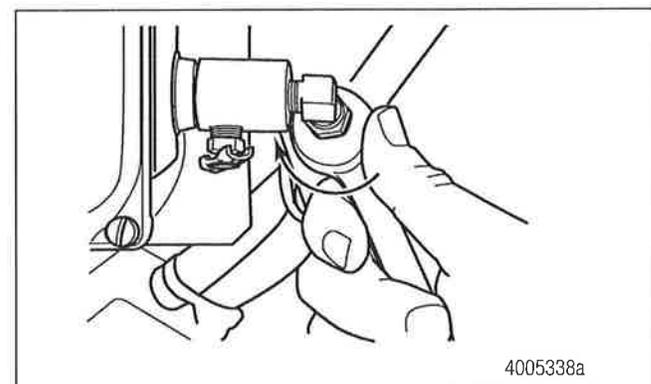


Figure 3.12

3 Check System Operation

- Attach an air pressure test gauge fixture to the outlet port of the control box. Figure 3.13. Refer to Section 8 for information on building an air pressure test gauge fixture. Figure 3.14.

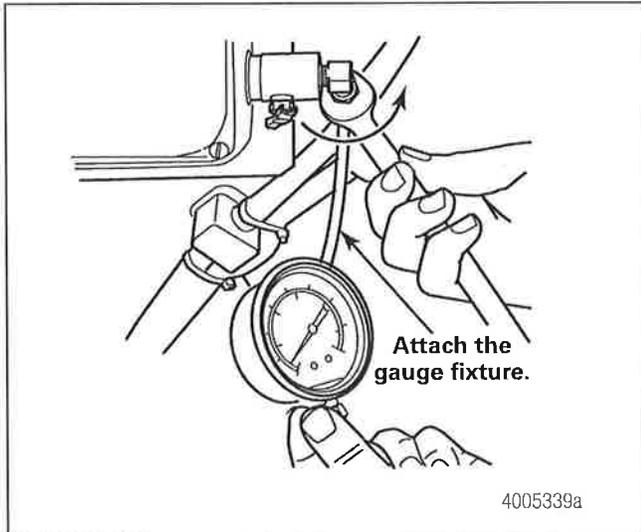


Figure 3.13

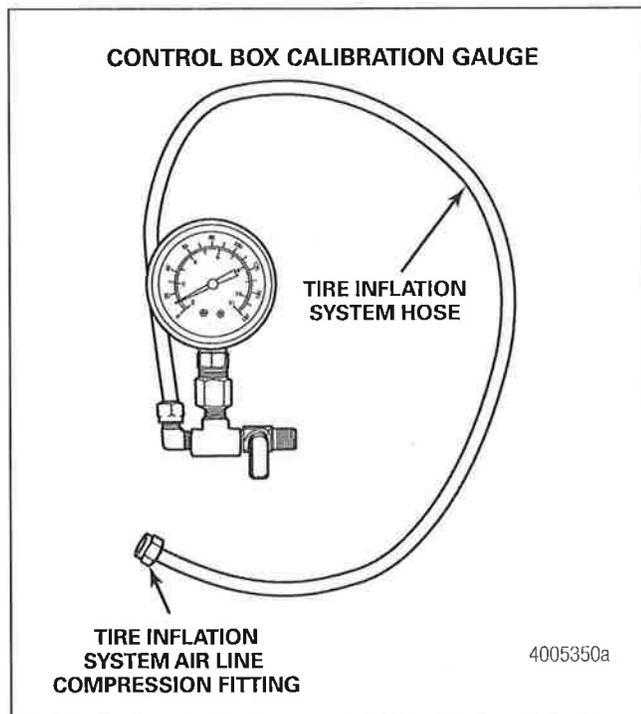


Figure 3.14

- Close the drain petcock at the control box.
- Turn the tire inflation system ON using the shut-off valve at the control box.
- Compare the reading of the air pressure gauge to the pressure value marked on the door of the control box. The air pressure gauge should read three psi (0.21 bar) higher than the pressure value mark on the door of the control box. Figure 3.15.

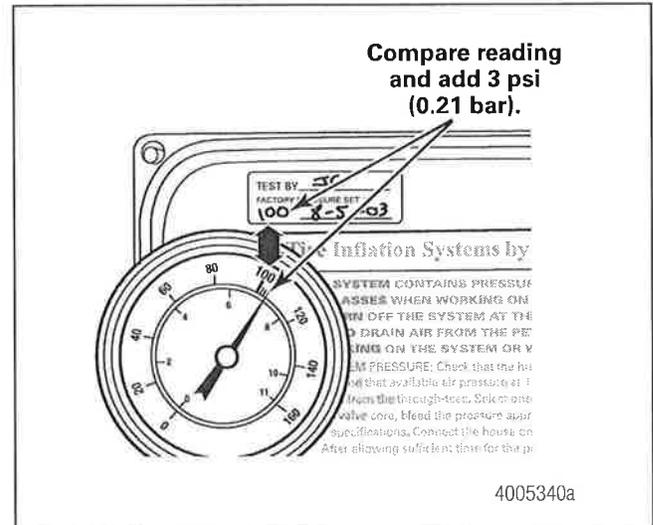


Figure 3.15

- If the air pressure is incorrect, adjust the pressure regulator. First pull out the control knob, then turn the control knob in approximate 1/8-turn (45 degrees) increments. Figure 3.16. Turn the knob CLOCKWISE to increase pressure or COUNTERCLOCKWISE to decrease pressure.

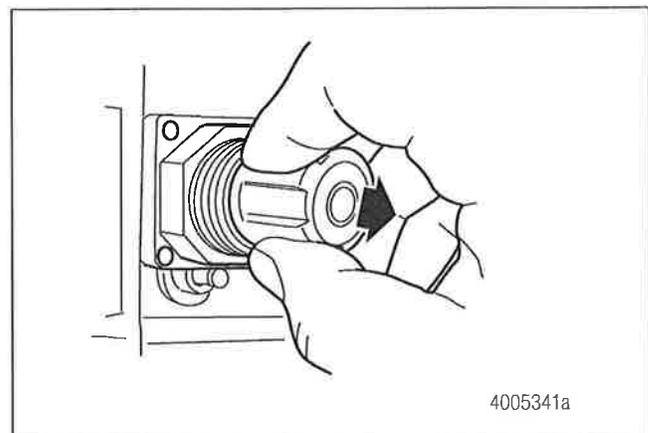


Figure 3.16

9. Check that the air pressure gauge reading is three psi (0.21 bar) higher than the pressure value marked on the door of the control box. Figure 3.17.

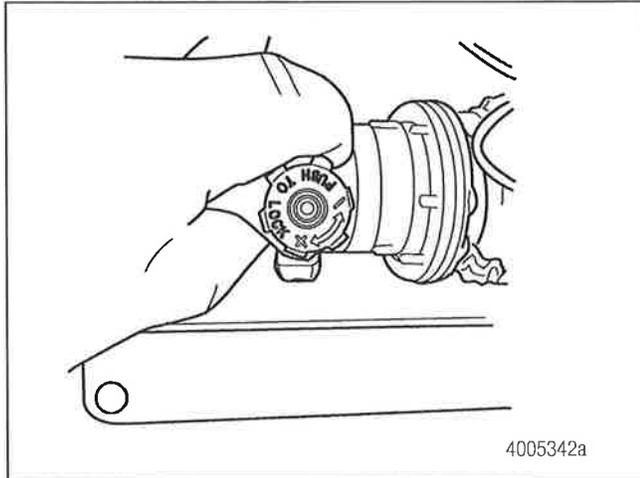


Figure 3.17

10. Once the pressure is set, lock the control knob by pushing it in.
11. Turn the tire inflation system off using the shut-off valve at the control box.
12. Drain all the air from the system using the drain petcock at the control box.
13. Replace the air line to the outlet port.
14. Close the drain petcock, and turn the system on using the shut-off valve.

Check the Hose Connections for Leaks

Use the following procedure to check for and correct system leaks from the tire inflation system fittings and hose connections.

⚠ CAUTION

Test the tire inflation system for air leaks before you place the vehicle into service. Spray a soap-and-water solution on all fittings and connections. Listen for audible leaks and check for bubbles. If you detect a leak, identify the source and replace parts as required. Air leaks in the tire inflation system can cause damage to components during operation.

1. Test the tire inflation system for air leaks. Spray a soap-and-water solution on all fittings and hose connections to check for leaks. Figure 3.18 and Figure 3.19.

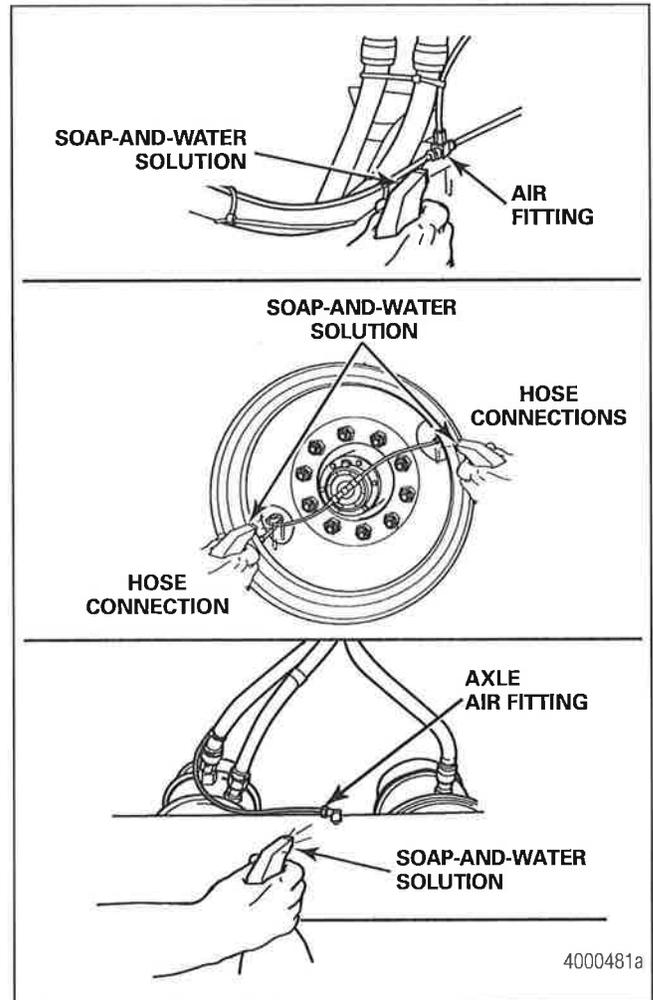


Figure 3.18

3 Check System Operation

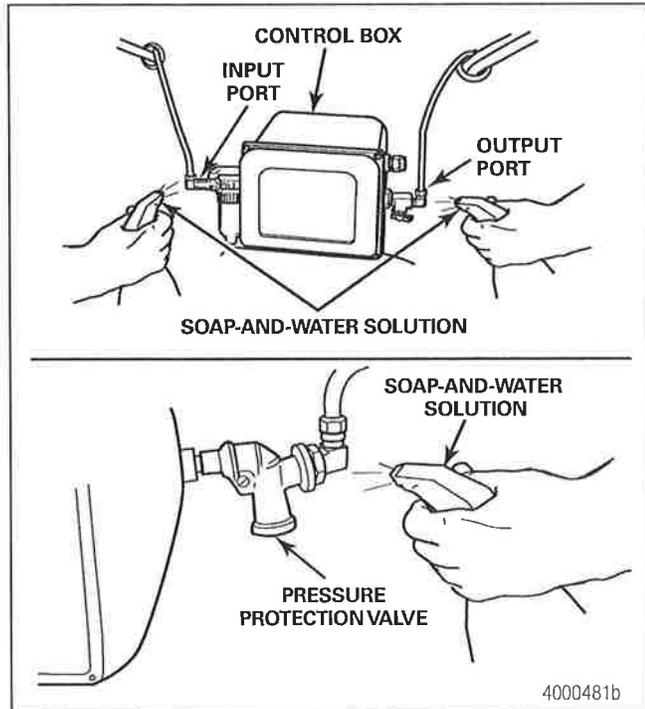


Figure 3.19

2. Look for bubbling and listen for audible leaks.
3. Tighten or replace fittings that leak.

Check the Wheel End for Air Leaks

Use the following procedure to check for, and correct, system air leaks from the tire inflation system components located at the wheel end, including the hoses, through-tee, stator and press plug.

1. Spray a soap-and-water solution to check the hose to the through-tee connection and the hubcap vent for leaks. Figure 3.20.

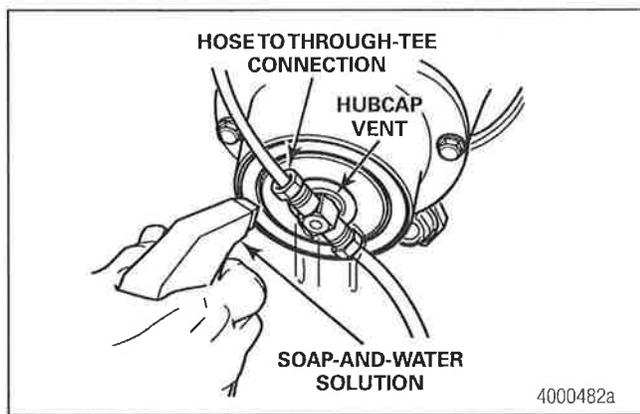


Figure 3.20

2. Look for bubbling and listen for audible leaks.
 - **If the hubcap vent is leaking:** The through-tee, stator or press plug is leaking. Use the following procedure to investigate further. Refer to the instructions in this manual for the following steps.
 - A. Turn the tire inflation system off using the shut-off valve at the control box.
 - B. Drain all the air from the system using the drain petcock at the control box.
 - C. Remove the hoses from the through-tee. Then remove the through-tee and hubcap.
 - D. Cover the wheel end with a clean towel to protect the bearings from contaminants.
 - E. Insert the through-tee into the stator and hold it in place.
 - F. Turn the system ON.
 - G. Ensure to hold the tee straight into the axle. Spray the press plug area with a soap-and-water solution to check for leaks. Figure 3.21.

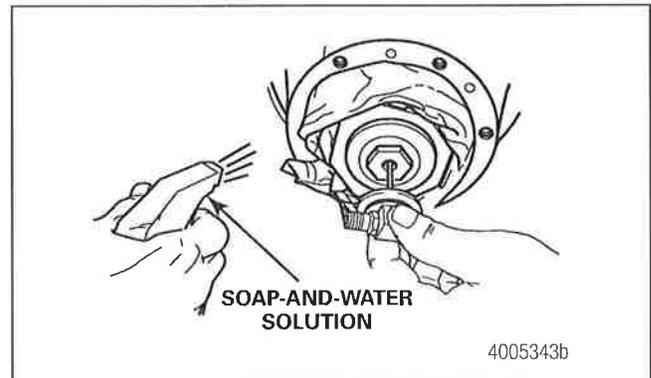


Figure 3.21

- H. Look for bubbling and listen for audible leaks.
 - **If the through-tee is leaking:** Replace it with a new part. Go to Step L.
 - **If the stator is leaking:** Either tighten the stator or replace it with a new part. Go to Step L.
 - **If the press plug is leaking:** Replace the press plug with a new part. Go to Step J.
 - **If your system has the ThermoALERT™ system upgrade and the thermal screw is leaking:** Replace the thermal screw by using the following steps.

3 Check System Operation

- I. Remove the thermal screw with a 5/32-inch (4 mm) Allen-head socket. Figure 3.22.
 - Remove the sealing washer.
 - Inspect the sealing surface in the spindle plug for debris.
 - Install a new sealing washer on a new thermal screw.
 - Install the thermal screw into the spindle plug and tighten to 25-30 lb-in (2.82-3.39 N•m). 

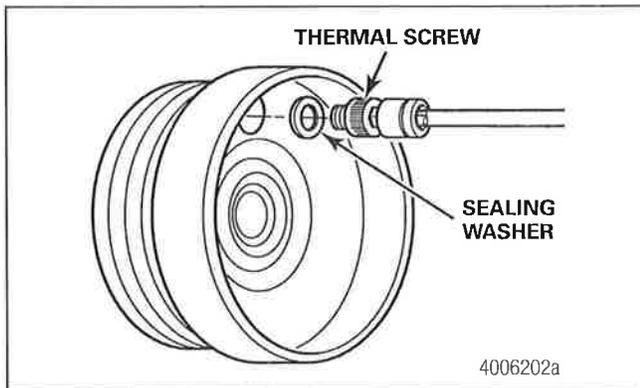


Figure 3.22

- J. Use a slide hammer fitted with the press plug removal tool to remove the leaking press plug. Use care not to score the inside diameter of the spindle bore. Figure 3.23.

A slide hammer and press plug remover is available from Meritor to help remove the press plugs. Refer to Section 8. Figure 3.24.

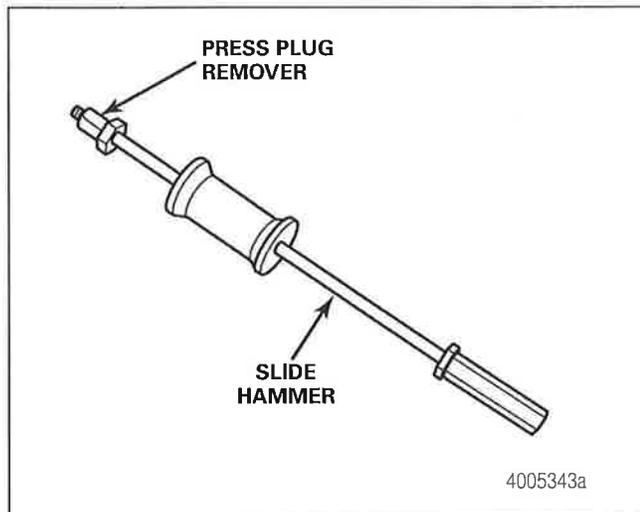


Figure 3.23

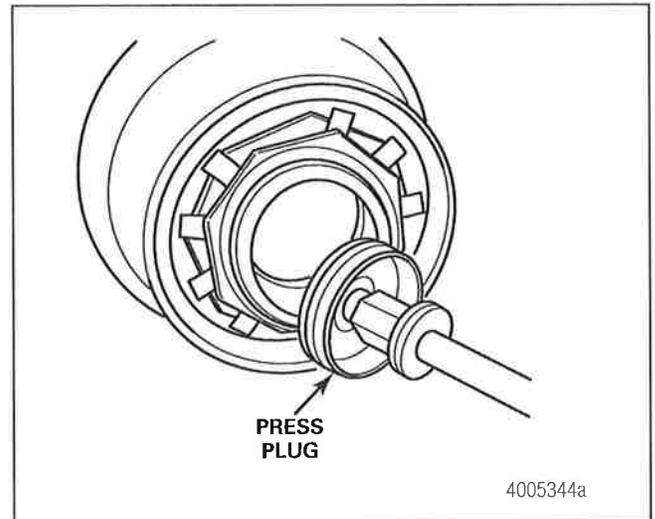


Figure 3.24

- K. Install a new press plug. Refer to the instructions in this manual.
- L. Reassemble the wheel end and tire inflation system components. Refer to the instructions in this manual.

Hazard Alert Messages

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Diagnostics

Table A

Condition	Possible Causes	Actions	
The indicator light is ON.	The system is delivering air during initial system charging.	The system is functioning correctly.	
	The system is delivering air to a leaking tire.	Repair the tire.	
	The system is delivering air to a leaking system component.	Repair the system component.	
	The system is delivering air to a cracked axle.	Repair the axle.	
	The system wiring is incorrect.	Correct the system wiring.	
The indicator light is ON and air is leaking from the wheel-end tee vent.	The trailer is equipped with MTIS ThermALERT™ system and the wheel end is hot.	The system is functioning correctly. Repair and replace wheel-end components.	
	The system is delivering air to a leaking system component.	Repair the system component.	
	The through-tee is leaking.	Replace the through-tee.	
	The stator O-ring is leaking.	Replace the stator.	
	The stator threads are leaking.	Seal the stator threads.	
	The press plug is leaking.	Replace the press plug.	
	The indicator light is OFF during system operation.	The trailer is not supplied with 12-volt power.	Supply 12-volt power to the trailer.
		The indicator light is inoperative.	Replace the indicator light.
		The flow sensing switch is inoperative.	Replace the flow sensing switch.
		The system wiring is damaged.	Repair the system wiring.
The system wiring is incorrect.		Correct the system wiring.	
The indicator light is OFF during system operation and air is leaking from the wheel-end tee vent.	The trailer is equipped with MTIS ThermALERT™ system, the wheel end is hot and the control box has an incorrect flow switch.	Repair and replace the wheel-end components. Replace the flow switch in the control box with a grey color flow switch.	
Air is leaking from the wheel-end tee vent.	The through-tee is leaking.	Replace the through-tee.	
	The stator O-ring is leaking.	Replace the stator.	
	The stator threads are leaking.	Seal the stator threads.	
	The press plug is leaking.	Replace the press plug.	
Tire pressure is low.	The shut-off valve is off.	Turn on the shut-off valve.	
	The system pressure setting is too low.	Increase the system pressure setting.	
	The incorrect valve cores are installed.	Replace the valve cores with Meritor original equipment.	

7 Troubleshooting

Table A

Condition	Possible Causes	Actions
Lubricant is leaking from the wheel-end vent.	The wheel end is overfilled with lubricant. A hubcap without vent extensions is installed onto an oil-lubricated wheel end. The through-tee is leaking. The stator O-ring is leaking. The stator threads are leaking. The press plug is leaking.	Fill the wheel end to the correct level. Install a hubcap with vent extensions. Replace the through-tee. Replace the stator. Seal the stator threads. Replace the press plug.
Tire pressure is high.	The tire is manually over inflated. The system pressure setting is too high.	Reduce the tire pressure. The system will inflate to the correct level. Lower the system pressure setting.
The trailer tire deflates when parked.	The system hose or tire valve stem connection is leaking. The hose valve core is leaking. The tire is leaking.	Correctly tighten the connection or replace the seals. Clean or replace the hose valve core. Repair the tire.

SPECIFICATION CHECK LIST

Serial No. _____

Tank _____ Model _____

Size _____

Suspension _____

Tire Size _____

Rims _____

Axles _____

Brakes _____

Wheels _____

Drums _____

Hubodometer _____

Oil Seals _____

Landing Gear _____

Manhole _____

Manhole _____

Overflow _____

Drain _____

Valve _____

Front Pump Off Valve _____

Rear Pump Off Valve _____

Burner _____

Etnyre Connection _____

Something Wrong with this manual?



If you find inaccurate or confusing information in this manual, or just have a suggestion for improvement, please let us know.

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Address _____

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Date Sent _____

Manual Number (upper right corner of front cover) _____

Manual Title _____

Explain the problem in the space below.

Page Number	Reference Number	Paragraph Number	Figure Number	Problem (please be specific)

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