

WALINGA[®] INC.



Trailer



Truck

BULK FEED UNIT AUGER UNLOAD OPERATOR'S MANUAL



WALINGA[®]
INC.

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Auger Unload
Operators Manual
OM PART# 34-17696-6

Dear Customer

Thank you for choosing **WALINGA TRANSPORTATION EQUIPMENT**. For your convenience, should you require any information related to Parts, Service or Technical Engineering, please contact one of the following Walinga Personnel:

TECHNICAL - ENGINEERING:

Janus Droog (ext: 259) email:jad@walinga.com
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Parts Department Fax: (519) 824-0367

SERIAL NUMBER LOCATION

The serial number plate is located on the Drivers Side of the unit, at the front of the body on the truck, and on the landing gear on trailers. Please mark the serial number and the date of manufacture of the body in the space provided for easy reference.

DATE OF MANUFACTURE: _____

SERIAL NUMBER: _____

V.I.N. PLATE LOCATION

Always give your dealer the V.I.N. (Vehicle Identification Number) of your Walinga Bulk Feed unit when ordering parts or requesting service or other information.

Please mark the number in the space provided for easy reference. Also obtain and mark down the Model Number, Production Year and other pertinent information of your Trailer/Truck unit in the spaces provided.

The plate is located where indicated.



Trailer (VIN Plate)



Truck (Serial Number Plate)

V.I.N. Number _____

Wheels _____

Model Number _____

Tires _____

Length _____

Date Purchased _____

Suspension _____

Dealer Purchased From _____

Axles _____

Address _____

**AIR / AUGER UNLOAD and
AUGER UNLOAD**

**BULK FEED UNIT
Warranty Registration Form
Inspection Report**

WARRANTY REGISTRATION

This form must be filled out by the dealer and signed by both the dealer and the customer at the time of delivery.

Customer's Name _____ Dealer Name _____

Address _____ Address _____

City, Prov./State, Code _____ City, Prov./State, Code _____

Phone Number (____) _____

Model _____

VIN Number _____

Delivery Date _____

DEALER INSPECTION REPORT

SAFETY

- ___ Airlock and Blower Turn Freely (applies to air/auger unit only)
- ___ Boom Swings Freely
- ___ Bottom, Vertical and Boom Augers Turn Freely
- ___ Landing Gear Moves Freely and Crank Stowed
- ___ Air and Hydraulic Lines Properly Stowed (No Leaks)
- ___ Electrical Connections Stowed
- ___ Instructions
- ___ Tires at Specified Pressure
- ___ Rims and Tires Torqued
- ___ Brakes Adjusted Properly

- ___ Safety Signs Installed
- ___ Manual Supplied
- ___ All Reflectors Installed and Clean
- ___ All Lights Functioning
- ___ Brakes Release at Proper Pressure
- ___ Review Operating and Safety

I have thoroughly instructed the buyer on the above described equipment which review included the Operator's Manual content, equipment care, adjustments, safe operation and applicable warranty policy.

Date _____

Dealer's Rep. Signature _____

The above equipment and Operator's Manual have been received by me and I have been thoroughly instructed as to care, adjustments, safe operation and applicable warranty policy.

Date _____

Owner's Signature _____

WALINGA® INC. WARRANTY

The Seller warrants to the Buyer that the Equipment manufactured by the Seller will be free from defect in material, workmanship and title for a period of one (1) year from the date of delivery to the Buyer. This warranty is subject to the following:

- a) The Seller's obligation under said warranty shall be limited to repairing or replacing (at the Seller's option) EXW (ExWorks) Guelph, Ontario, Canada, any part of the Equipment which, if properly installed, used and maintained, proves defective in material or workmanship, provided that notice of any such defect and satisfactory proof thereof is promptly given by the Buyer to the Seller;
- b) All costs of the installation or transportation pursuant to this warranty are for the account of the Buyer;
- c) The obligations set forth in this clause are conditional upon:
 - i. Proper storage, installation (except where installation is supervised by or performed by the Seller), use, maintenance and compliance with any applicable recommendations of the Seller; and,
 - ii. The Buyer promptly notifying the Seller of any defect and obtaining authorization prior to proceeding with repairs, and if required, promptly making the goods available for correction;
- d) In respect of any Equipment or part thereof supplied hereunder which are manufactured by others, the Seller gives no warranty whatsoever, and the warranty given by the manufacturer, if any, shall apply;
- e) The Seller shall not be liable for any cargo loss, loss of equipment, use or any other incidental or consequential damages resulting from any defective part or parts, the Seller's liability and the Buyer's exclusive remedy being expressly limited to the replacement of defective parts as provided herein;
- f) The warranty set out within this paragraph does not apply to:
 - i. tires, accessories, and other items including the items, if any listed on the face hereof as "Buyers Specified Items", manufactured by others and the Buyer shall rely solely on the warranty, if any, of the manufacturer of such tires, accessories and other items; nor
 - ii. to any equipment, otherwise subject to this warranty, which shall have been repaired, modified or altered in any way by anyone other than the Seller or one of its duly authorized service representatives.
- g) With respect to used equipment sold hereunder, regardless of manufacture, the Seller makes no warranty whatever, and all warranties, express or implied are hereby excluded. With respect to such used equipment, the Buyer agrees to accept such used equipment on an "as is" basis.

WARRANTY VOID IF NOT REGISTERED

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1 INTRODUCTION

Walinga appreciates your patronage and trust this unit will give you many years of trouble-free use. We are pleased to have you join a growing number of people operating Walinga Bulk Feed units.

We take pride in building products to meet the demands of discriminating buyers in the feed transporting industry. We have sought to anticipate your needs with respect to safety, convenience, design and engineering for your unit. Walinga provides information and service support to its customers through its distributor and dealer network. Contact them at once should you need assistance.

Safe, efficient and trouble free operation of your Bulk Feed unit requires that you and anyone else who will be operating or maintaining the unit, read this manual carefully and understand the Safety, Operation, Maintenance and Trouble Shooting information contained within the Operator's Manual. Failure to read and follow the manual could lead to serious injuries or costly repairs.



Trailer



Truck

Although some of the diagrams and pictures may not apply to all units, we have tried to show details of common adjustments and features that are on standard production units.

Use the Table of Contents or Index as a guide in locating the specific information applicable to your unit.

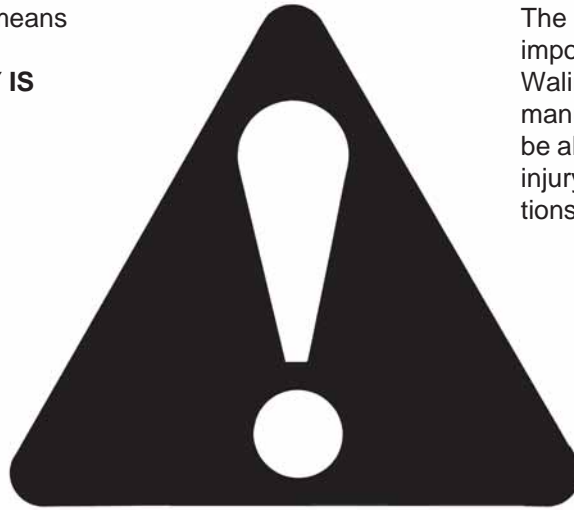
Keep this manual handy for frequent reference and to pass on to new operators or owners.

OPERATOR ORIENTATION - The directions left and right as mentioned throughout this manual, are taken as if the operator was in the driver's seat and facing in the direction of travel.

2 SAFETY

SAFETY ALERT SYMBOL

This Safety Alert symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



The Safety Alert symbol identifies important safety messages on the Walinga Bulk Feed unit and in the manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

Why is SAFETY important to you?

3 Big Reasons

**Accidents Disable and Kill
Accidents Cost
Accidents Can Be Avoided**

SIGNAL WORDS:

Note the use of the signal words **DANGER**, **WARNING** and **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guide-lines:

DANGER - Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations, typically for machine components that, for functional purposes, cannot be guarded.

WARNING - Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

CAUTION - Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

SAFETY

YOU are responsible for the **SAFE** operation and maintenance of your Walinga Bulk Feed unit. **YOU** must ensure that you and anyone else who is going to operate, maintain or work around the Truck or Trailer be familiar with the operating and maintenance procedures and related **SAFETY** information contained in this manual.

Remember, **YOU** are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that **EVERYONE** operating this equipment is familiar with the recommended procedures and follows all the safety precautions. Remember, most accidents can be prevented. Do not risk injury or death.

- Remember the difference between being just a driver and an efficient operator. Drivers may only drive but an operator is a very safe, cost efficient and professional person.
- Bulk Feed unit owners must give operating instructions to operators or employees before allowing them to operate the equipment, and at least annually thereafter.
- The most important safety feature on this equipment is a **SAFE** operator. It is the operator's responsibility to read and understand **ALL** Safety and Operating instructions in the manual and to follow these. All accidents can be avoided.
- Walinga feels that a person who has not read, understood and been trained to follow all operating and safety instructions is not qualified to operate the equipment. An untrained operator exposes himself and bystanders to possible serious injury or death.
- Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety of the equipment and affect Truck or Trailer life.
- Think **SAFETY!** Work **SAFELY!**

2.1 GENERAL SAFETY

1. Read and understand the Operators Manual and all safety signs before operating, maintaining or adjusting the unit.



2. Only trained competent persons shall operate the unit. An untrained operator is not qualified to operate the unit.

3. Have a first-aid kit available for use should the need arise and know how to use it.



4. Do not allow riders outside the cab.

5. Have a fire extinguisher available for use should the need arise and know how to use it.



6. Wear appropriate protective gear. This list includes but is not limited to:

- A hard hat
- Protective shoes with slip resistant soles
- Heavy gloves



7. Place all controls in neutral, disengage PTO clutch, stop engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, adjusting or repairing.
8. Do not drink and drive.

2.2 OPERATING SAFETY

1. Read and understand all the Operator's Manual and all safety signs before operating or adjusting the Walinga Bulk Feed unit.
2. Perform circle check before driving.
3. Do not allow riders outside the cab during road or highway travel.
4. Drive very carefully when negotiating hilly or uneven terrain.
5. Keep hands, feet, clothing and hair away from all moving parts.
6. Place all controls in neutral, disengage PTO clutch, stop the engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.
7. Stay away from power lines when moving boom or climbing on top of the trailer. Electro-cution can occur without direct contact.
8. Do not open access doors to airlocks, trough chain or augers while the air system or auger are running.
9. Use care when climbing on ladder(s) and/or platform(s) to prevent falling.
10. Maintain running gear in good condition at all times. In addition, on trailers, maintain king pin and fifth wheel assembly in good condition.
11. Clear the area of all bystanders, especially children, before starting up and operating the unit.
12. Make sure that all lights and reflectors that are required by the local highways and transport authorities are in place, clean and can be seen clearly by all overtaking and oncoming traffic.
13. Do not operate unit with spring brakes caged or brakes disabled. Block wheels if unhooked.
14. Before disconnecting the tractor from the trailer unit(s) make sure that the tractor and trailer are on level ground and that the trailer wheels are securely blocked. Lower landing gear and provide extra support if the ground is soft. Deflate air ride if so equipped prior to uncoupling.
15. Do not unload unless vehicle is on a firm level surface.
16. Review safety items with all personnel annually.

2.3 UNLOADING SAFETY

1. Position vehicle on a firm level surface before swinging boom or unloading unit. Soft or uneven terrain can result in tipping of frame when swinging boom or unloading.
2. On semi units, position tractor and trailer in a straight line to provide maximum stability when swinging boom or unloading.
3. Stay away from power lines when swinging or raising the boom. Electro-cution can occur without direct contact.
4. Use care when on ladder or on top of unit to prevent falling. Stay away from power lines to prevent electrocution.
5. Stay out of tank compartments when unloading and when engine is running.
6. Do not operate when any guards are removed or any access doors are opened.

2.4 MAINTENANCE SAFETY

1. Read and understand all the information in the Operator's Manual regarding maintenance, adjusting and servicing the Bulk Feed unit.
2. Place all controls in neutral, disengage PTO clutch, stop the engine, remove ignition key and set the park brake before adjusting, servicing or maintaining any part of the Bulk Feed unit.
3. Follow good shop practices:

- Keep service area clean and dry.
- Be sure electrical outlets and tools are properly grounded.
- Use adequate light for the job at hand.

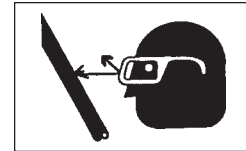


4. Block wheels before de-activating brakes.
5. Maintain air system and brake components in top condition at all times.
6. Maintain fasteners in running gear systems at their specified torque at all times.
7. Establish and maintain a Trailer Preventative Maintenance (TPM) program on your equipment. Some jurisdictions require this program and the maintenance of records on every commercial vehicle on the road for future reference.

2.5 HYDRAULIC SAFETY

1. Always place hydraulic controls in neutral before disconnecting from tractor or working on hydraulic system.
2. Make sure that all components in the hydraulic system are kept in good condition and are clean.
3. Replace any worn, cut, abraded, flattened or crimped hoses or lines.
4. Do not attempt any makeshift repairs to the hydraulic fittings or hoses by using tape, clamps or cements. The hydraulic system operates under extremely high-pressure. Such repairs will fail suddenly and create a hazardous and unsafe condition.

5. Wear proper hand and eye protection when searching for a high-pressure hydraulic leak. Use a piece of wood or cardboard as a backstop instead of hands to isolate and identify a leak.



6. If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing the skin surface.

2.6 TRAVEL SAFETY

1. Read and understand all the information in the operator's manual regarding procedures and safety when operating the Bulk Feed unit on the road.
2. Make sure all the lights and reflectors that are required by the local highway and transport authorities are in place, are clean and can be seen clearly by all overtaking and oncoming traffic.
3. Drive carefully and defensively at all times and especially when negotiating uneven or hilly terrain.
4. Do not allow riders outside the cab during road and highway travel.
5. Make sure you are in compliance with all local regulations regarding transporting on public roads and highways. Consult your local law enforcement agency for further details.

2.7 TIRE SAFETY

1. Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion which may result in serious injury or death.
2. Do not attempt to mount a tire unless you have the proper equipment and experience to do the job.
3. Have a qualified tire dealer or repair service perform required tire maintenance.

2.8 SAFETY SIGNS

1. Keep safety signs clean and legible at all times.
2. Replace safety signs that are missing or have become illegible.
3. Replaced parts that displayed a safety sign should also display the current sign.
4. Safety signs are available from your Distributor or the factory.

How to Install Safety Signs:

- Be sure that the installation area is clean and dry.
- Be sure temperature is above 50°F (10°C).
- Decide on the exact position before you remove the backing paper.
- Remove the smallest portion of the split backing paper.
- Align the sign over the specified area and carefully press the small portion with the exposed sticky backing in place.
- Slowly peel back the remaining paper and carefully smooth the remaining portion of the sign in place.
- Small air pockets can be pierced with a pin and smoothed out using the piece of sign backing paper.

2.9 SIGN-OFF FORM

Walinga follows the general Safety Standards specified by the Society of Automotive Engineers (SAE) and the Occupational Safety and Health Administration (OSHA). Anyone who will be operating and/or maintaining the Bulk Feed unit must read and clearly understand ALL Safety, Operating and Maintenance information presented in this manual.

Do not operate or allow anyone else to operate this equipment until such information has been reviewed. Annually review this information with all personnel.

Make these periodic reviews of SAFETY and OPERATION a standard practice for all of your equipment.

A sign-off sheet is provided for your record keeping to show that all personnel who will be working with the equipment have read and understand the information in the Operator's Manual and have been instructed in the operation of the equipment.

SIGN-OFF FORM

DATE	EMPLOYEE'S SIGNATURE	EMPLOYER'S SIGNATURE


3 SAFETY SIGN LOCATIONS

The types of safety signs and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various safety signs, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

- Think SAFETY! Work SAFELY!



A

 **CAUTION**

1. Read Operator's Manual and safety signs before operating.
2. Do not load trailer in excess of the gross vehicle weight rating shown on the certification plate.
3. Do not allow riders on the trailer.
4. Keep hands, feet, clothing and hair away from all moving parts.
5. Place all controls in neutral, stop the engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.
6. Maintain king pin, fifth wheel assembly and all running gear components in good condition at all times.
7. Make sure that all lights and reflectors are clean and working when transporting on public roads.
8. Keep all hydraulic lines, fittings and hoses tight, free of leaks and in good condition at all times.
9. Do not operate unit with spring brakes caged or brakes disabled. Block wheels if unhooked.
10. Stay away from overhead power lines when moving boom to prevent electrocution.
11. Raise boom only when trailer is on firm, level ground and evenly loaded.
12. Do not unhook trailer if it is loaded.
13. Do not load trailer unless it is attached to a towing unit.
14. Review safety items with all personnel annually.

53-17706-6

B

 **DANGER**




**ROTATING AUGER HAZARD
KEEP AWAY**

To prevent serious injury or death from rotating auger:

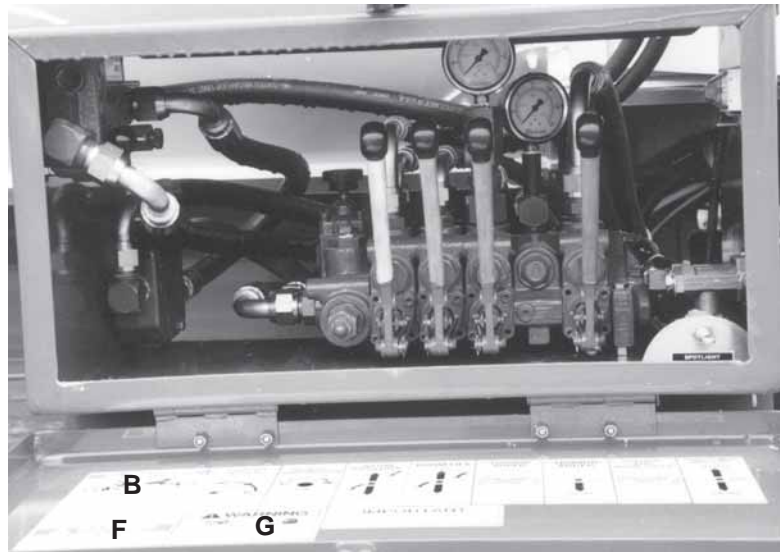
1. Place all controls in neutral, stop engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, repairing, adjusting or unplugging.
2. Do not operate with the auger guards removed.
3. Do not stand near augers when operating. Keep others away.

53-17705-6

REMEMBER - If safety signs have been damaged, removed, become illegible or parts replaced without signs, new signs must be applied. New signs are available from your authorized dealer or factory direct.

The types of safety signs and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various safety signs, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

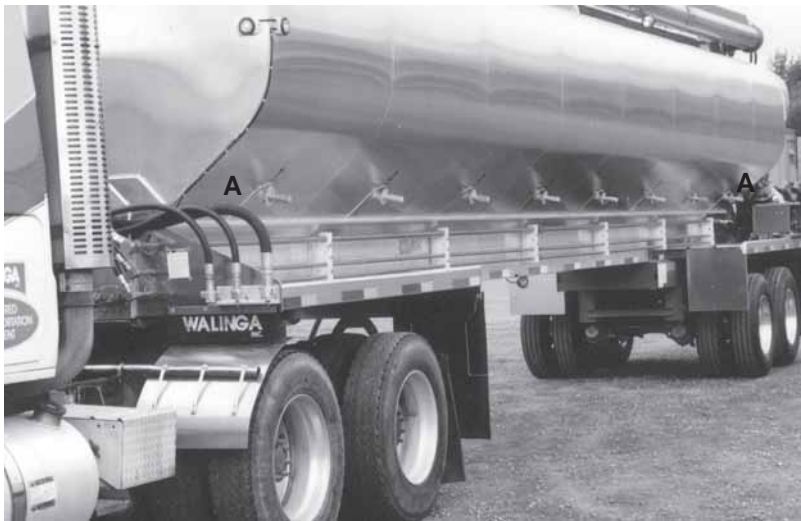
- Think SAFETY! Work SAFELY!



REMEMBER - If safety signs have been damaged, removed, become illegible or parts replaced without signs, new signs must be applied. New signs are available from your authorized dealer or factory direct.

The types of safety signs and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various safety signs, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

- Think SAFETY! Work SAFELY!



D

WARNING

**ROTATING PART HAZARD
KEEP AWAY**

To prevent serious injury or death from rotating parts:

1. Place all controls in neutral, stop engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, repairing, adjusting or unplugging.
2. Close and secure guards before operating.
3. Keep hands, feet, hair, and clothing away from moving parts.

53-17703-6

E

WARNING

FALLING HAZARD

To prevent serious injury or death from falling:

1. Use care when climbing ladder or working on platform.
2. Keep unauthorized people off machine.
3. Do not allow riders.

53-17702-6

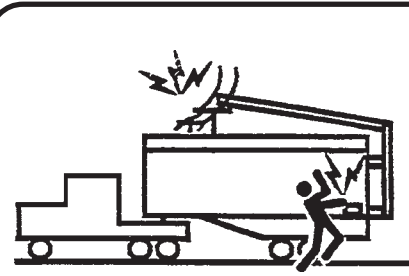
REMEMBER - If safety signs have been damaged, removed, become illegible or parts replaced without signs, new signs must be applied. New signs are available from your authorized dealer or factory direct.

The types of safety signs and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various safety signs, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

- Think SAFETY! Work SAFELY!



F



! DANGER

ELECTROCUTION HAZARD

To prevent serious injury or death from electrocution:

- Stay away from power lines when transporting and raising or lowering boom.
- Electrocution can occur without contacting power lines.

53-17701-6

REMEMBER - If safety signs have been damaged, removed, become illegible or parts replaced without signs, new signs must be applied. New signs are available from your authorized dealer or factory direct.

The types of safety signs and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various safety signs, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

- Think SAFETY! Work SAFELY!



G

	 <h2>WARNING</h2> <h3>HIGH-PRESSURE FLUID HAZARD</h3> <p>To prevent serious injury or death:</p> <ul style="list-style-type: none">• Relieve pressure on hydraulic system before servicing or disconnecting hoses.• Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.• Keep all components in good repair. <p>53-15638-6</p>
	

REMEMBER - If safety signs have been damaged, removed, become illegible or parts replaced without signs, new signs must be applied. New signs are available from your authorized dealer or factory direct.

4 OPERATION GUIDELINES



OPERATING SAFETY

1. Read and understand all the Operator's Manual and all safety signs before operating or adjusting the Walinga Bulk Feed unit.
2. Perform circle check before driving.
3. Do not allow riders outside the cab during road or highway travel.
4. Drive very carefully when negotiating hilly or uneven terrain.
5. Keep hands, feet, clothing and hair away from all moving parts.
6. Place all controls in neutral, disengage PTO clutch, stop the engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.
7. Stay away from power lines when moving boom or climbing on top of the trailer. Electrocutation can occur without direct contact.
8. Do not open access doors to airlocks, trough chain or augers while the air system or auger are running.
9. Use care when climbing on ladder(s) and/or platform(s) to prevent falling.
10. Maintain running gear in good condition at all times. In addition, on trailers, maintain king pin and fifth wheel assembly in good condition.
11. Clear the area of all bystanders, especially children, before starting up and operating the unit.
12. Make sure that all lights and reflectors that are required by the local highways and transport authorities are in place, clean and can be seen clearly by all overtaking and oncoming traffic.
13. Do not operate unit with spring brakes caged or brakes disabled. Block wheels if unhooked.
14. Before disconnecting the tractor from the trailer unit(s) make sure that the tractor and trailer are on level ground and that the trailer wheels are securely blocked. Lower landing gear and provide extra support if the ground is soft. Deflate air ride if so equipped prior to uncoupling.
15. Do not unload unless vehicle is on a firm level surface.
16. Review safety items with all personnel annually.

4.1 TO THE NEW OPERATOR OR OWNER

The Walinga Bulk Feed units combine light weight construction methods combined with high strength materials to become a safe, reliable and efficient feed or grain hauling unit. Be sure to familiarize yourself with the unit by reading this Operator's Manual, the Safety Alerts and any other material provided with the unit before attempting to operate it. With careful use and a good maintenance schedule, the unit will give many years of trouble-free use.

It is the responsibility of the owner and operator to be familiar with the weight and loading of your trailer. Trailer weight and loading requirements vary from jurisdiction to jurisdiction. Be familiar with yours and any that you will be travelling through.

4.2 TERMINOLOGY

The Walinga Bulk Feed unit is available as a semi-trailer or a straight frame truck. High strength aluminium is used for the tank and structural components to minimize weight and maximize payload.

Augers are used at the bottom of the tank, in the vertical tube and boom to unload. All augers and paddle chain are powered by a hydraulic motor to provide maximum unloading efficiency. The boom rotates and raises to allow unloading into a variety of customer feed storage facilities.

Sliding gates control the flow of material to the tank unloading auger. The controls for all systems are located in the box on the left rear corner. Each truck or tractor section must be equipped with a hydraulic power pack to provide oil flow to the hydraulic motors and cylinders.



Fig. 4-1 PRINCIPAL SYSTEMS

4.3 BREAK-IN

Break-in is the most important time in a Truck or a Trailer's life. It is critical that the unit be checked frequently during the first 5000 miles to be sure that all components and systems are properly adjusted and performing as required.

The following inspection schedule is provided as a guide for normal operating conditions. More frequent inspections are recommended in severe or extreme conditions.

Inspect at:

50-100 miles, 1-2 hours

500 miles, 8-10 hours

1500 miles, 25-30 hours

5000 miles, 100 hours:

1. Brakes

It takes a few weeks of operation for the brake shoes to mate with the drum contour and burnish the surface. During this period of time, the operator should check the brakes every day. After the first month, inspection of the brakes every 2 weeks or every 10,000 miles is required. Check the function and adjustment of the brakes on each axle. All brakes should apply evenly. No shoes should drag on the drum when the brakes are not applied.

2. Tires

Tires are designed to provide maximum life and performance when maintained at their specified inflation pressure. Although the tires are inflated to their specified pressure at the factory, the pressure can change before going into service. Always use an accurate gauge to check the pressure when the tire is cold.

3. Wheels/Rims

Although lug bolts and rim fasteners are always tightened to their specified torque at the factory, it is normal for them to lose some of their torque during the first few miles of operation. Always retorque lug bolts and rim fasteners to be sure that they stay tight. Then go to the retorque interval defined in the Maintenance section of every 25,000 miles. Keep all fasteners tightened to their specified torque to prevent damaging any components.

Whenever a wheel is removed from an axle, the above retorque procedure must be followed to be sure that the wheel is secured to the axle. If any component is damaged due to loose fasteners, it will have to be replaced.

4. Axles

Each wheel bearing is assembled at the factory with the required end play (refer to Section 8.5). This end play should be checked to insure proper axle and bearing function. Check the temperature of the hub by hand after 10 to 15 miles (15 to 25 km) during the first trip. A hot hub must have the bearing end play reset before continuing.

Jack the axle up and support it on a stand. Turn the wheel by hand. The wheel should turn freely. If it does not, check if the brakes are dragging or if the bearing has too much end play. If either of these conditions exist, correct before proceeding.

Move the wheel laterally on the axle shaft. If the wheel wobbles, the bearing has lost its end play. Tighten bearing and set end play before continuing.

5. Hub Lubricant Levels

a. Oil Bath:

Oil bath hubs are used on some trailers and are filled at the factory. Check hubs frequently (at least daily) during the first few weeks of operation. Always check when the oil is cold and the trailer is on the level. Use the level mark on the hub face when checking oil level. Replace seals and gaskets if hub has an oil leak. Do not operate without oil in the hub.

b. Grease Packed:

Grease packed hubs are used on some trailers and do not require servicing unless the wheel end is being serviced or removed.

4.3 BREAK-IN (cont'd)

6. Suspension

A suspension system connects the axles to the frame. All fasteners must be maintained at their specified torque to ensure that all clamping and anchoring forces remain intact. If these forces are not maintained, components can shift or move and affect the performance and component life. Refer to Maintenance Section for the list of required torque values for all fasteners in suspension system. Any loosening can lead to component shifting, misalignment and/or twisting. Any of these items can cause erratic handling, broken components or rapid tire wear. Always tighten the nut end of fastener. Specified torque values apply only to nut end torquing.

7. Axle Alignment

Axle alignment is properly set at the factory when the unit is new and will remain aligned unless fasteners loosen or components wear. Use a steel measuring tape to check the alignment. Refer to Maintenance Section for alignment checking procedure. Axles that are out of alignment can cause erratic handling characteristics, broken components and accelerated tire wear.

8. Fifth Wheel Assembly Components

The king pin, anchor frame and upper and lower fifth wheel assemblies must be inspected to check for mechanical integrity of all components. All components and systems must be kept in good condition to safely and reliably transmit the accelerating, braking and side loads between the trailer, fifth wheel and towing vehicle.

a. King Pin:

Check the king pin for cracks, chips, or whether it is bent. Check that there are no cracks or distortions between the king pin and its anchor frame. If any defects are found, replace the king pin and its anchor frame before resuming work.

b. Fifth Wheel Assembly:

The fifth wheel assembly consists of the king pin locking mechanism, surface plate, frame, pivot and anchor system. Check that the king pin locking mechanism locks and unlocks easily and that all moving surfaces are coated with grease. Check that the surface plate is free of grit and coated with grease.

Check the surface plate and anchor frame for cracks, bends or distortions. Replace any damaged components. Retorque fasteners to maintain the proper clamping forces on all components. Loose fasteners can cause components to move or bend and create mechanical or safety problems during operation.

9. Electrical, Hydraulic and Air Lines

Electrical, hydraulic and air lines extend from the front of the unit to each electrical, hydraulic and air operated component. Although they are all anchored along their routing pathways from the factory, they occasionally do come loose and will sag. Inspect all lines. Use plastic ties to secure line to frame if any are loose and sag. Replace if any are pinched, kinked, cut or abraded. Extra care should be taken in cold or extreme operating conditions. Ice, mud or brush can pull lines loose from their anchors and cause damage. Clean components, repair damage, re-anchor and install protectors if appropriate. Do not operate with damaged components.

4.4 PRE-OPERATION VEHICLE INSPECTION PROCEDURE - FOR TRAILERS

The safe and trouble-free use of a Walinga Bulk Feed Unit requires the operator to maintain the unit in good operating condition. To assist the operator, a pre-operation checklist is provided that should be followed each time before the unit is used.

NOTE

The tractor items, part of the Department of Transport (D.O.T.) walk around sequence, have been omitted.

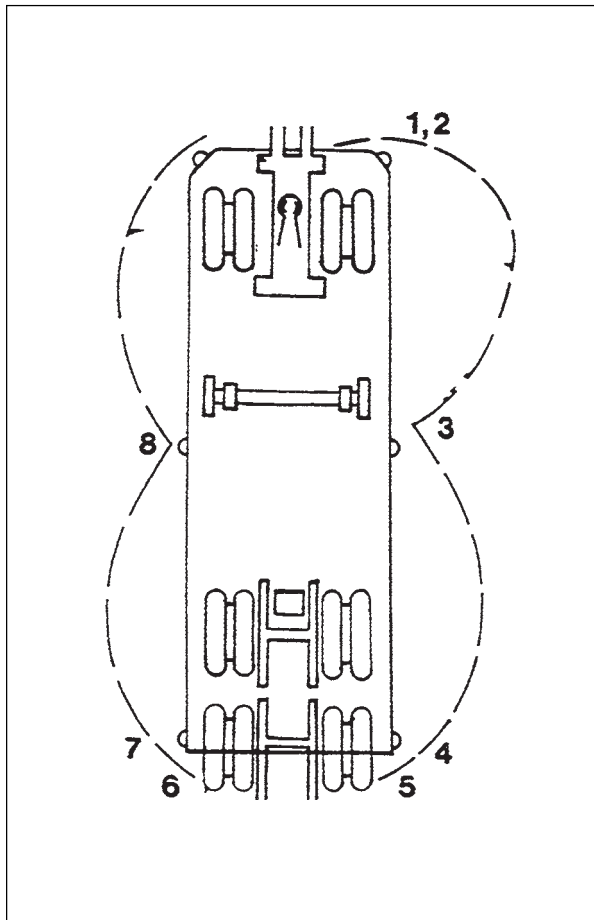


Fig. 4-2 WALKAROUND SEQUENCE

WALK AROUND SEQUENCE

Step 1 - Trailer Frontal Area

1. **Air, Hydraulic and Electrical Connections**
 - a. Glad hands properly mounted, free of damage, not leaking and not worn.
 - b. Electrical line receptacle properly mounted, free of damage, plug adequately seated and safety catch engaged to prevent accidental disconnection.
 - c. Hydraulic couplers properly seated and tightened, no leaks and properly secured against tangling, snagging and chafing, with sufficient slack for turning.
 - d. Air, electrical and hydraulic lines properly secured against tangling, snagging and chafing with sufficient slack for turns.
2. **Lights and Reflectors**
 - a. Front trailer clearance and identification lights - should be clean, operating and proper color.
 - b. Reflectors and conspicuity tape clean and proper color.

Step 2 - Coupling System Area

1. **Fifth Wheel (Lower)**
 - a. Securely mounted to frame.
 - b. No missing or damaged parts.
 - c. No visible space between upper and lower fifth wheel.
 - d. Locking jaws around the shank and not the head of kingpin.
 - e. Release lever properly seated and safety latch lock engaged.
2. **Fifth Wheel (Upper)**
 - a. Kingpin not worn, bent or damaged.
 - b. Anchor frame not cracked, bent, worn or damaged.
3. **Air, Hydraulic and Electric Lines Visible From This Point**
 - a. Should be secure from dangling, snagging and chafing.
 - b. Should be free from damage and clean.

4.4 PRE-OPERATION VEHICLE INSPECTION PROCEDURE - FOR TRAILERS (cont'd)

Step 3 - Right Side of Trailer Area

1. **Front Trailer Support (Landing Gear)**
 - a. Fully raised, no missing parts, not bent or otherwise damaged.
 - b. Crank handle secured.
2. **Spare Tires**
 - a. Carrier or rack not damaged.
 - b. Tire and/or wheel securely mounted in the rack.
 - c. Tire and wheel condition adequate. Proper spare tire size, correctly inflated.
3. **Lights and Reflectors**
 - a. Trailer side clearance lights clean, operating and proper color.
 - b. Reflectors and conspicuity tape clean and proper color.
4. **Frame and Body**
 - a. Frame and cross members not bent, cracked, damaged or missing.
 - b. Body parts not damaged or missing.
5. **Air Tank**
 - a. Drain moisture from air tank(s). Pull on cable attached to drain valve. Hold cable until the tank moisture is drained.

NOTE

In cold weather, it is best to drain the moisture from the tanks at the end of the day to prevent ice build-up in the tanks.

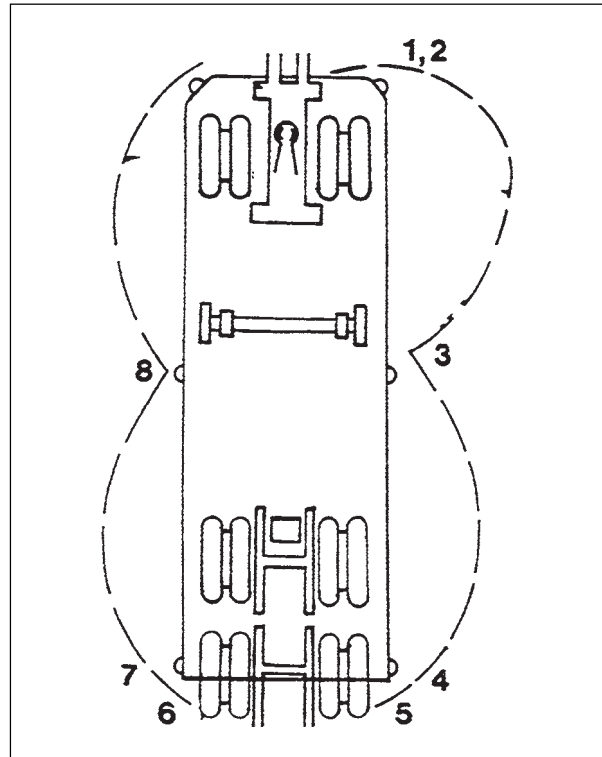


Fig. 4-3 WALKAROUND SEQUENCE

Step 4 - Right Rear Trailer Wheel Area

1. **Dual Wheels**
 - a. Condition of wheels and rims, no cracked or bent rims, broken spacers, studs, clamps or lugs.
 - b. Condition of tires - properly inflated, valve stems not touching wheel rims or brake drums, valve caps in place, no serious cuts, bulges, tread wear or any signs of misalignment and no debris stuck between the tires.
 - c. Tires all same type e.g. do not mix radial and bias types on the same axles.
 - d. Wheel bearings and hub - no obvious leaking.
 - e. Mud flaps in place and in good condition.
2. **Tandem or Triaxles**
 - a. Repeat wheel and tire inspection as above.
 - b. Flexible air lines not cracked, cut, crimped or otherwise damaged, secured against tangling, dragging or chafing.
 - c. Sliding axle anchor pins locked in place.
3. **Suspension**
 - a. **Mechanical:**
Condition of spring(s), spring hangers, equalizers and U-bolts.
 - b. **Air:**
Condition of air bag(s), axle clamping bolts, pivot arm and height control valve.
 - c. Check that air suspension is inflated and at proper ride height.

Step 5 - Brakes

1. **Brakes**
 - a. Condition of brake drum(s).
 - b. Condition of hoses, lines and valves.
 - c. Check slack adjusters.
 - d. Check air chamber mounting.
 - e. Check spring brakes (if so equipped).
 - f. Drain moisture from air tank with cable.

Step 6 - Rear of Trailer

1. **Lights and Reflectors**
 - a. Rear clearance and identification lights, clean and operating and proper color.
 - b. Reflectors and conspicuity tape clean and proper color.
 - c. Tail-lights clean, operating and proper color.

2. Check Unloading Systems

Check that access doors are closed and secured, compartment gate crank is stowed and secured, the boom is in its transport cradle, tank covers are closed, control box door closed and secured, and all guards in place and secured.

Step 7 - Left Rear Trailer Wheel Area

Check all items as done on right side (Step 4 "Right Rear Trailer Wheel Area").

Step 8 - Left Side of Trailer Area

1. Check all items as done on right side (Step 3 "Right Side of Trailer Area").
2. **Tank Gate System**
 - a. Check that tank slide gates are down and secured with retainer.
 - b. Check that tank gate crank is stowed and secured.

Step 9 - Trailer Functional Check (Tractor Attached)

1. Check for proper connection of the air brake glad-hands, hydraulic system couplers and secure contact of electrical connection.
2. Start engine.
3. Build up air pressure in the tractor-trailer systems.
4. Turn on lights and inspect for proper function of:
 - a. Clearance lights.
 - b. Identification lights.
 - c. Turn signals and 4-way flasher.
 - d. Sidemarket lights.
 - e. Tail lights.
 - f. Stop lights.
5. Check the function of brakes.
 - a. Apply service brakes.
 - b. Apply parking/emergency brakes.
 - c. Stop engine.
 - i. Release trailer emergency brakes.
 - ii. Apply service brakes
Air loss should not exceed
3 psi per minute on single vehicles.
4 psi per minute on combination.

4.5 HOOKING UP/UNHOOKING TRAILER

Special care should be taken when hooking up or unhooking trailer to be sure the equipment is in good condition and all systems are functioning as required.

4.5.1 HOOKING UP

Follow this procedure when hooking up the trailer to tractor:

1. Back the tractor up in a straight line to the trailer and align the fifth wheel coupling opening with the trailer king pin.
2. Stop before the fifth wheel makes contact with the trailer and apply the towing vehicle parking brake.
3. Inspect all the coupling components before hooking up:
 - a. Inspect trailer coupling components. Check that king pin is not broken, bent or chipped. Check that the anchor frame is not distorted or cracked. If problems found, correct before proceeding.
 - b. Inspect fifth wheel coupling components. Check that the fifth wheel assembly is securely anchored to the tractor frame. Check that the structure of the frame, pivot and fifth wheel is not bent, broken or cracked. Check that the jaws of the lock are open. If problems found, correct before proceeding.
 - c. Be sure that the fifth wheel plate is cleaned and greased.
4. Check that the trailer is at the required height to slide onto the fifth wheel.
 - a. Use the crank on the landing gear to raise or lower the trailer as required.

The trailer frame should contact the fifth wheel just behind the pivot point as the tractor backs under the trailer.

5. Connect brake and electrical lines. Route the lines so they do not get pinched.

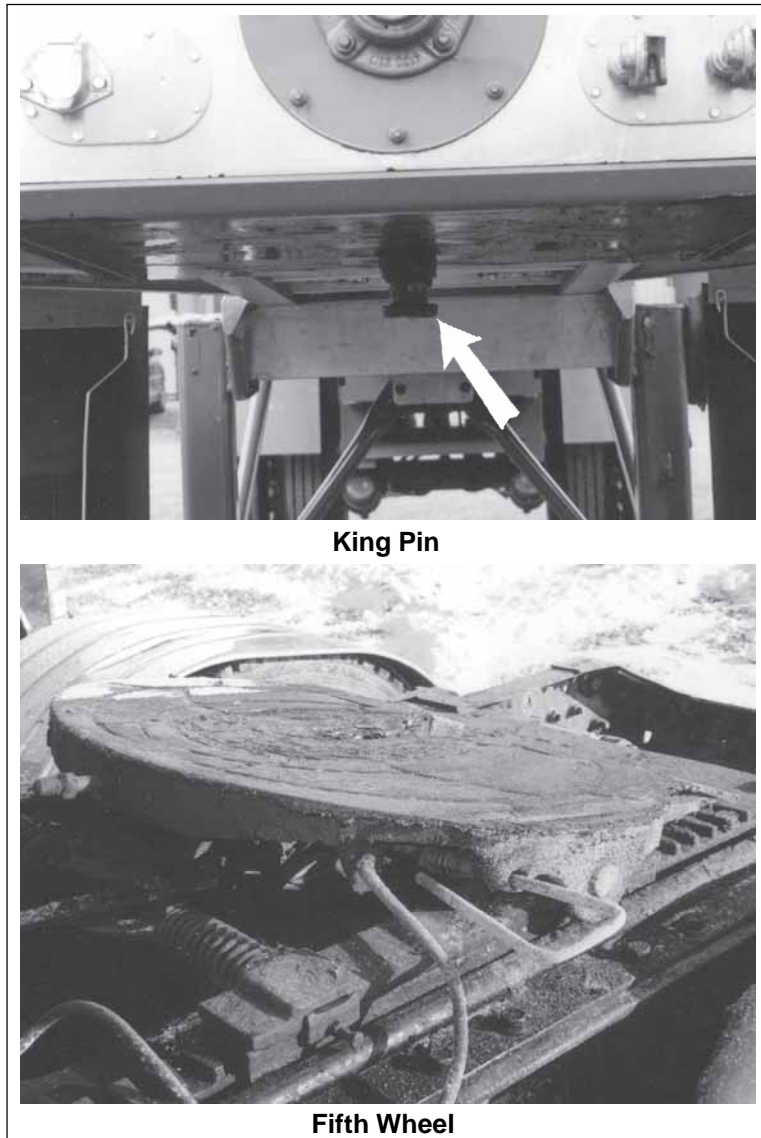


Fig. 4-4 COUPLING COMPONENTS

6. Back slowly under trailer keeping the king pin centered in the fifth wheel jaws.
7. Back up until the fifth wheel coupler locks on the trailer king pin.
8. Move the towing vehicle forward sharply while the trailer brakes are engaged to check that the jaws have locked around the king pin.
9. Set tractor parking brake, stop engine and dismount.
10. Visually check that the coupler jaws are securely locked around the king pin and the coupler release lever is in the locked position. Release and hook up again if the jaws are not securely locked around the king pin.
11. Check that the trailer frame is resting on the fifth wheel.
12. Check brake application by applying and releasing brakes. If brakes do not release, air lines may be crossed. Do not continue unless brakes are functioning properly.
13. Connect and secure the pressure and return hydraulic lines. Start hydraulic pump and check that there are no leaks.
14. Check that all electrical circuits are completed and that all lights are working.
15. Route the electrical, hydraulic and air lines to prevent snagging, dragging and pinching.
16. Raise the landing gear. Use the crank to raise the legs. Place drive gear in low ratio and stow crank.
17. Check that the air ride bags are inflated to proper height.
18. Remove blocks or chocks from the wheels.
19. Perform Pre-Operation Inspection before starting.

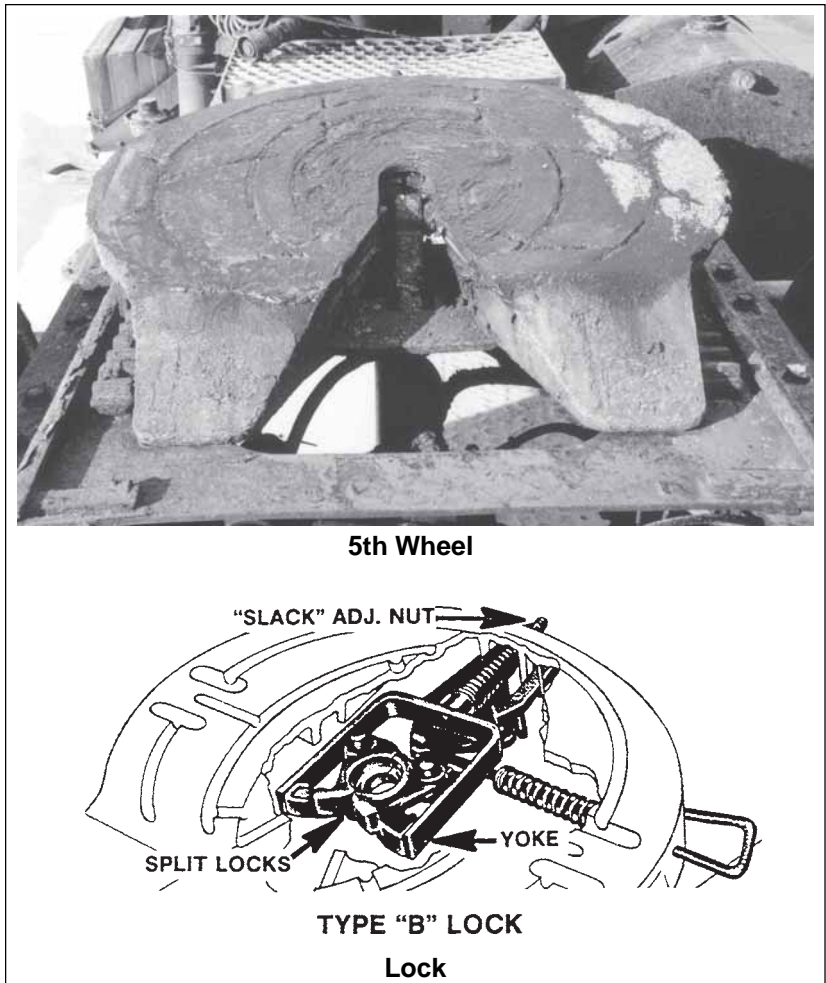


Fig. 4-5 COUPLER LOCKS

4.5.2 UNHOOKING TRAILER

1. Position tractor and trailer in a straight line on a clear, level and firm surface.
2. Apply the trailer brakes and the parking brakes on the tractor before dismounting.
3. Place blocks or chocks in front of and behind trailer wheels if not on a level surface.
4. Check that the surface under the landing pads can support the trailer. Support with blocks or planks if required. This is particularly important if the trailer is loaded or will be loaded while unhooked.



Fig. 4-6 LANDING GEAR

5. Deflate air suspension system.
6. Lower landing gear. Use crank to lower leg on landing gear. Lower leg until pads solidly contact the ground but do not lift trailer off fifth wheel. Stow crank.
7. Unhook fifth wheel coupler.
8. Disconnect air and hydraulic lines and electrical connector.
9. Release tractor parking brake and pull slowly forward until the trailer frame just slides down the fifth wheel ramp. Stop.
10. Set the parking brake on the tractor before dismounting.



Fig. 4-7 UNHOOKED

11. Disconnect air and hydraulic lines and electrical connector.
12. Install glad hands on dead end connectors if so equipped.
13. Drive tractor away from trailer.
14. Drain air tanks if operating in cold temperatures to eliminate ice build-up.
15. Inspect the equipment. Document problems found so they can be corrected before the unit will be used the next time. Record problems and repairs for your files.

4.6 CONTROLS

Before starting to work, all operators should familiarize themselves with the location and function of all controls. Each unit is controlled by the controls in the box on the left rear corner of the machine.

1. Control Box (Inside):

a. Flow Divider:

An automatic or manual flow divider sets the amount of oil flowing to the trough auger. The automatic system maintains the pressure in the vertical and boom drive system between 1500 and 2000 psi (10245 and 13660 kPa). Use the manual flow divider to obtain the same pressure range.

b. Air Dump Valve:

This 2 position valve is located in the dump line for the air suspension air system. Move the handle toward the back of the unit to close the dump line. The valve must be in this position to re-inflate the air suspension. Move the handle at right angles to the truck to dump the air from the suspension.

c. Boom Movement Speed:

This flow control valve controls the amount of oil flowing to the boom lift and boom rotate circuits. Turn the knob clockwise (in) to close the valve and slow the speed and counter-clockwise (out) to increase the speed.

d. Trough Conveyor Pressure Gauge:

This pressure gauge monitors and shows the pressure in the trough conveyor drive system. Normally this system should operate between 1000 to 1800 psi (6830 to 12294 kPa) when the machine is equipped with the boom/trough optional compensating valve. When equipped with the standard manual flow adjuster, set the adjuster to operate the trough auger in this range.

e. Boom Lift:

This spring-loaded-to-neutral-centre lever controls the position of the boom height. Pull and hold the lever to raise the boom. Release the lever and it will return to its centred neutral position to stop the boom lift. Push on the lever and hold to lower the boom. Release the lever to stop its motion.

f. Boom Rotation:

This spring-loaded-to-neutral-centre lever controls the direction of the boom rotation. Push on the lever and hold to swing the boom to the right (clockwise). Release the lever and it will return to its centred neutral position to stop the boom rotation. Pull on lever and hold to swing the boom to the left (counter-clockwise).

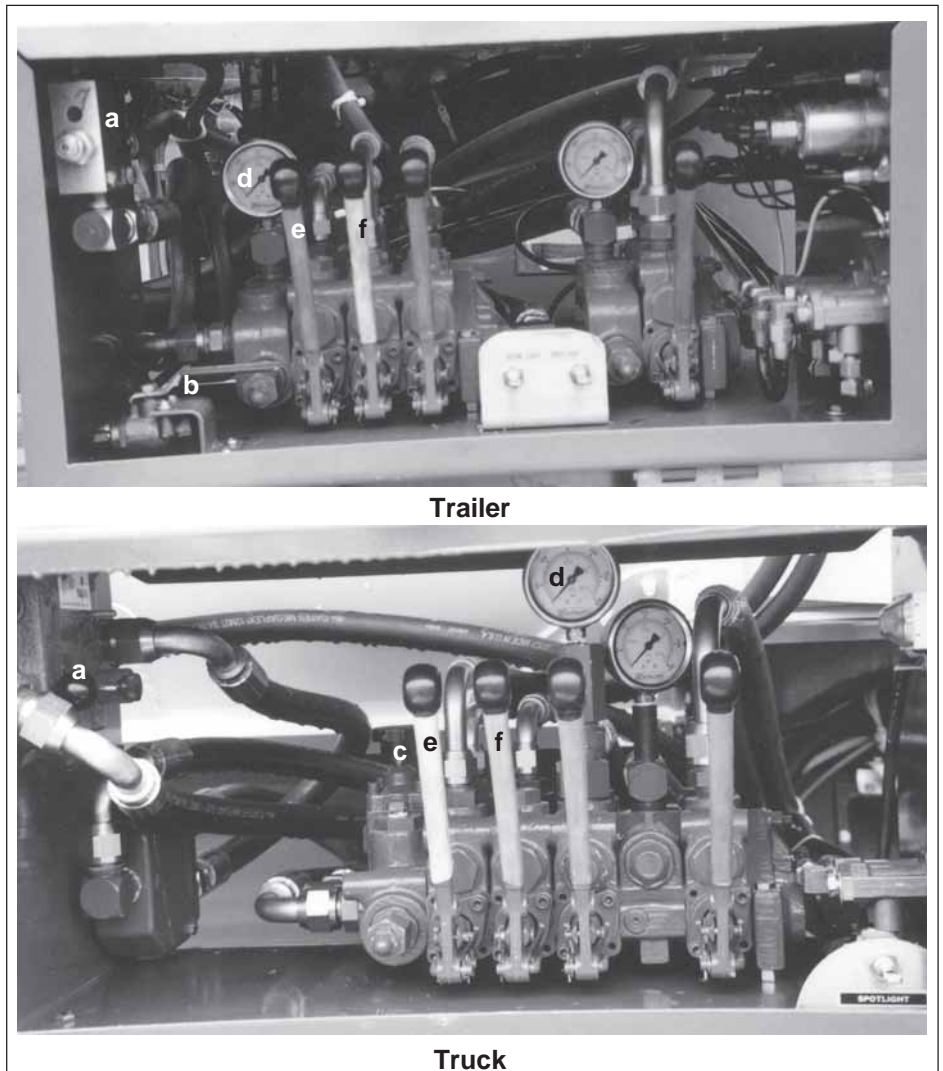


Fig. 4-8 CONTROL BOX (INSIDE)

4.6 CONTROLS (cont'd)

1. Control Box (cont'd):

g. Trough Auger:

This 2 position hydraulic valve controls the flow of oil to the trough auger drive motor. Pull the lever forward to direct the flow of oil to the motor and run the trough auger. Push the lever back to stop the flow of oil and stop the trough auger.

An optional 3 position valve is available where pushing the lever will reverse the auger and is useful to assist in unplugging.

h. Rear Light:

This toggle switch controls the power to the working lights on the back of the machine. Move the switch up to turn the lights ON and down for OFF.

i. Spotlight:

This toggle switch controls the power to the light illuminating the end of the boom. Move the switch up to turn the lights ON and down for OFF.

k. Pressure Gauge:

This pressure gauge monitors and shows the pressure in the vertical and boom auger drive systems. Normally this system can operate between 1500 to 2000 psi (10245 to 13660 kPa) when fully loaded during unloading and the unit is equipped with the boom/trough optional compensating valve. When equipped with the standard manual flow adjuster and on the floor auger, set the adjuster to operate the boom auger drive system in this range. The amount of material fed by the floor auger controls the pressure in the boom and vertical auger drive system.

m. Vertical and Boom Auger:

Trailer

Truck

Fig. 4-9 CONTROL BOX (INSIDE)

This 3 position hydraulic valve controls the flow and direction of flow to the vertical and boom auger drive systems. Pull the lever forward to run the augers for unloading. Place the lever in its centred position to stop the augers. Push the lever into its rearmost position to run the augers in their reverse direction. It is recommended that the boom and vertical augers be run only momentarily in the reverse direction as this position is provided to assist in unplugging either auger as required.

n. Manual Flow Control:

This manual flow control valve controls the

amount of oil flowing to the trough conveyor drive system to set the discharge speed. Set the pointer between 0 and 10 on the scale to adjust the speed ratio between 0 and 100% of the available speed. Use the divider to set the vertical and boom auger drive circuit pressure at 1500 to 2000 psi (10245 to 13660 kPa) during operation.

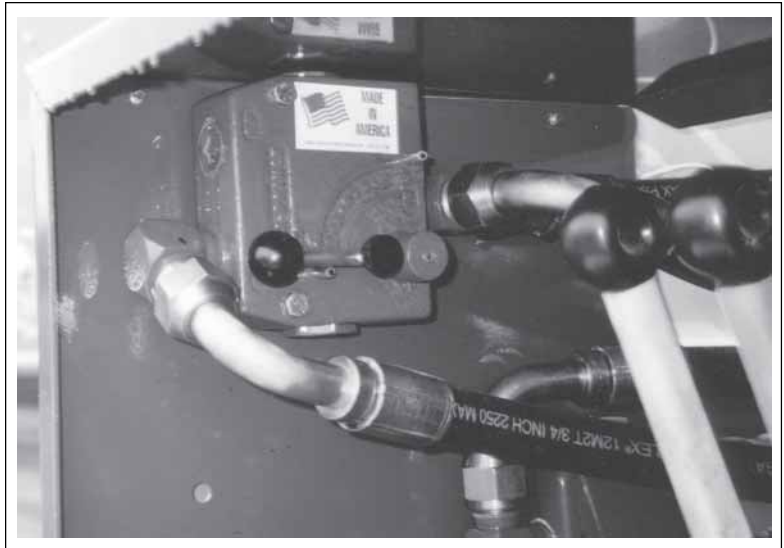


Fig. 4-10 MANUAL FLOW CONTROL

2. **Control Box (Outside):**

- a. **Roof Cover Position (Front):**
This 2 position toggle switch controls the flow of air and direction of air to the cylinders that set the position of the cover over the front tank. Move switch to its fully up position to close the front tank cover. Move the switch completely down to open the cover over the front tanks.
- b. **Roof Cover Position (Rear):**
This 2 position toggle switch controls the flow of air and direction of air to the cylinders that set the position of the cover over the rear tank. Move switch to its fully up position to close the rear tank cover. Move the switch completely down to open the cover over the rear tanks.



Fig. 4-11 CONTROL BOX (OUTSIDE)

4.6 CONTROLS (cont'd)

3. Tank Gate Position:

A. Manual

This square shaft controls the position of the gates over the trough conveyor in the bottom of each tank section. Use the crank provided with each unit to turn the shaft clockwise to open the gates and counter-clockwise to close. Always close the gate(s) before loading the tank(s).

- a. Open
- b. Close



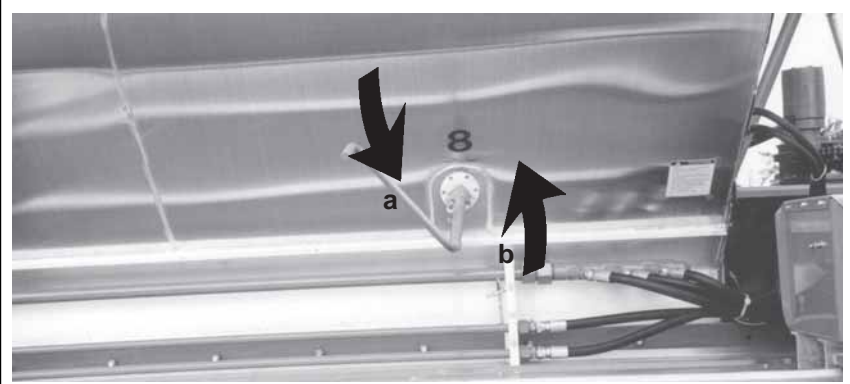
WARNING

Machine is shown with guard removed or access door opened for illustrative purposes only. Do not operate machine with guard removed or access door opened.

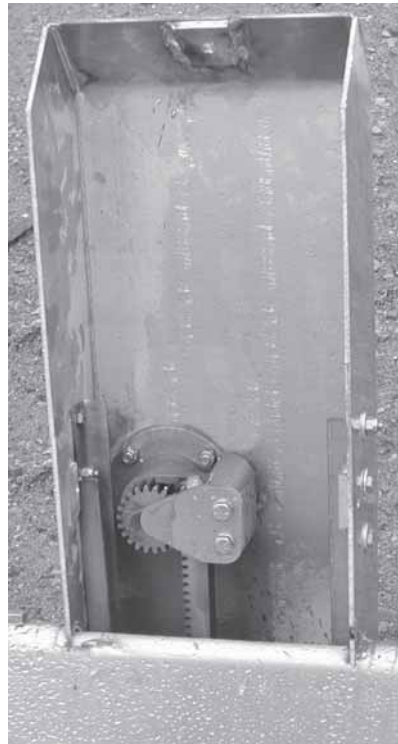
B. Air

This two position toggle switch controls the power to the valve that directs the air to the cylinder inside the gate tower. Move the switch up to open the gate and down to close.

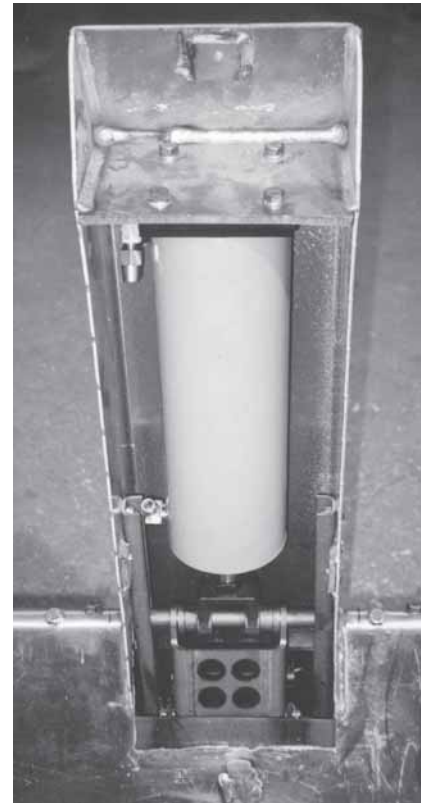
- a. Open
- b. Close



Crank - Manual

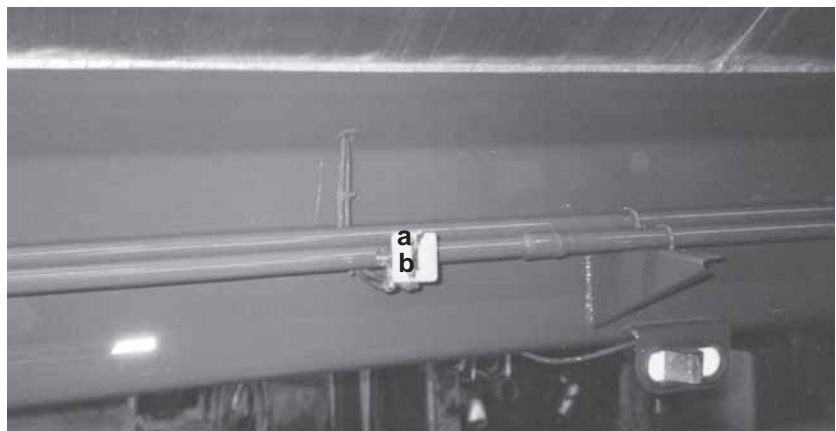


Manual



Air

Tower Opened



Switch - Air

Fig. 4-12 TANK GATE

4. **Cab Controls:**

Each tractor section or power unit must be equipped with an auxiliary hydraulic system to provide pressurized oil to operate the machine. The hydraulic pump is powered through the PTO drive with the control box located in the doorway to the left of the driver. The control for the pump PTO will be labelled.

Pull the yellow collar up and move the red knob forward to engage the PTO and drive the hydraulic pump. Push down to disconnect the drive and stop the pump. Most systems are not "live" and cannot be engaged and disengaged without depressing the clutch.

NOTE

Put truck in gear first to stop transmission clash when engaging PTO. Then shift transmission to neutral again when PTO engaged.



Fig. 4-13 PTO CONTROLS

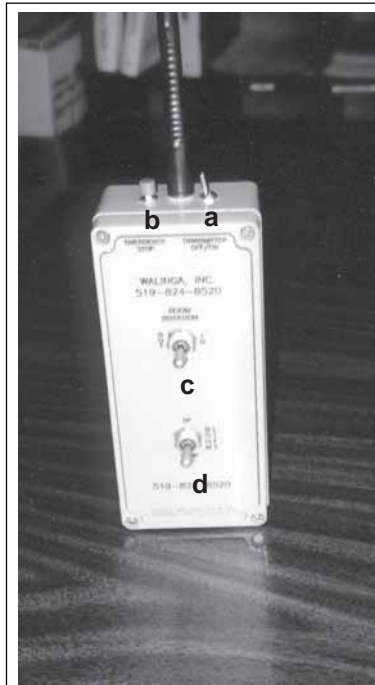
5. **Remote Control (Optional):**

a. **ON/OFF Switch:**

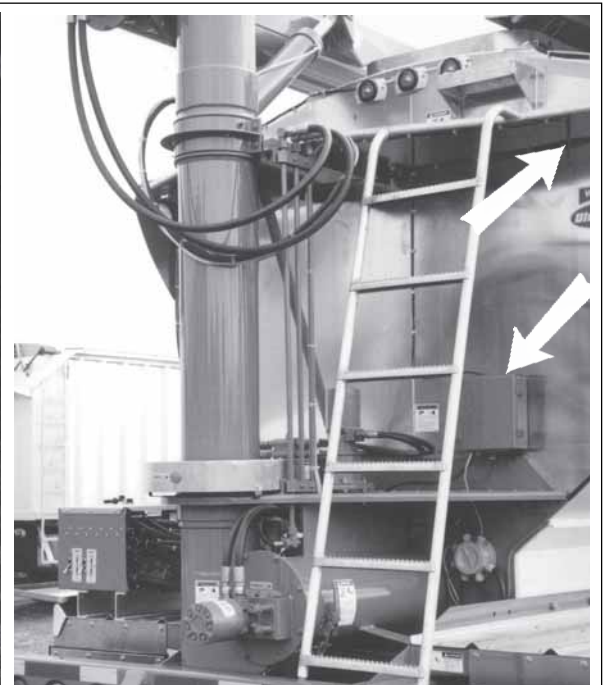
This 2 position toggle switch turns the power on to the hand held radio transmitter. Move the switch to the left (toward the aerial) to turn OFF and to the right to turn ON.

b. **Emergency Stop:**

This red button switch is the emergency STOP control for the controller functions. Depress the button switch to stop all boom motion (lift and rotation). Turn the power switch OFF and then ON to re-activate the control box prior to using the controller again.



Transmitter



Receiver

Fig. 4-14 REMOTE CONTROL (OPTIONAL)

c. **Boom Rotation:**

This 3 position spring-loaded-to-centre neutral switch controls the boom rotation function. Move the switch to the left and hold to move the boom out (counter-clockwise). Release the switch and it will return to its centred neutral (OFF) position to stop the boom rotation. Move the switch to the right and hold to swing the boom in (clockwise). Release the switch to stop the motion.

d. **Boom Lift:**

This 3 position spring-loaded-to-centre neutral switch controls the boom lift function. Move the switch up and hold to raise the boom. Release the switch and it will return to its centred neutral position to stop the motion of the boom. Move the switch down and hold to lower the boom. Release the switch to stop the boom motion.

4.7 MACHINE PLACEMENT

Each Bulk Feed unit must be properly placed prior to unloading to obtain the optimum performance. When positioning the machine, follow this procedure:

1. Clear the area of bystanders, especially small children, before moving the machine into position.
2. Inspect the parking or unloading position to be sure the surface is firm and level.
3. Drive the unit into its approximate unloading position with the tractor and trailer in a straight line and stop.
4. Do not position the unit on a surface that is not level or is so soft that one set of wheels can sink while the boom is rotating or the tanks are being unloaded. Boom rotation will shift the load on the axles when it is at 90° to the frame and can cause tipping if the suspension system flexes and one axle sinks into the ground.

IMPORTANT

Be sure the unit is on level ground during positioning or unloading to prevent tipping.

5. Do not position the unit where the boom will be closer than 30 feet (10 m) to overhead power lines when swinging the boom into position or unloading.
6. Set the parking brakes.
7. Deflate air suspension if so equipped.
8. Depress clutch and engage PTO driving the auxiliary hydraulic system.
9. Run the engine at 1000 RPM to provide oil to position the boom.
10. Dismount and open control box door.
11. Raise the boom out of its transport cradle.
12. Stay away from overhead power lines.

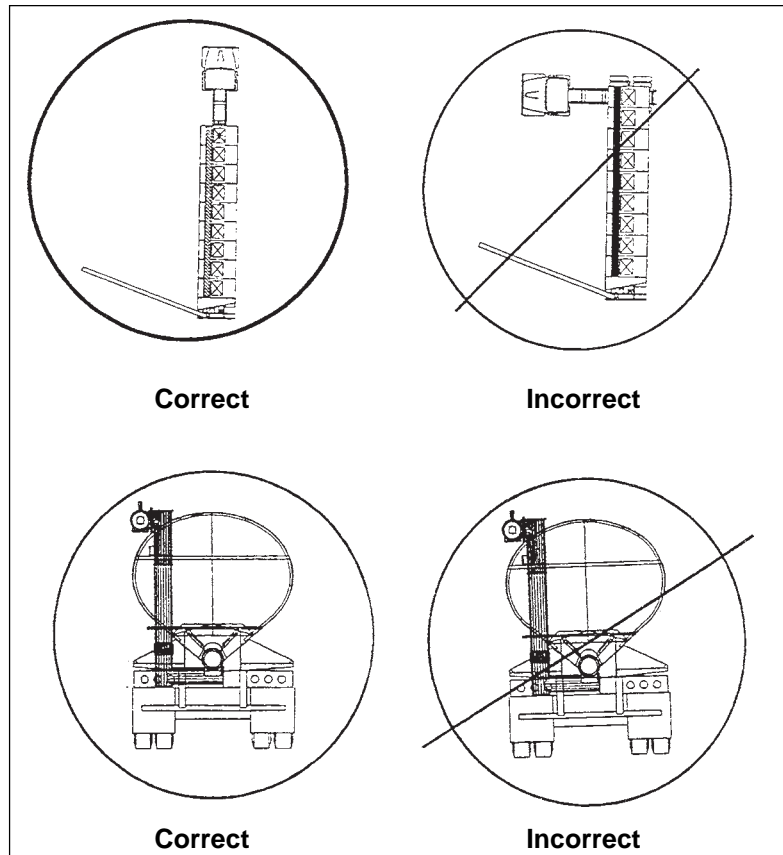


Fig. 4-15 PLACEMENT

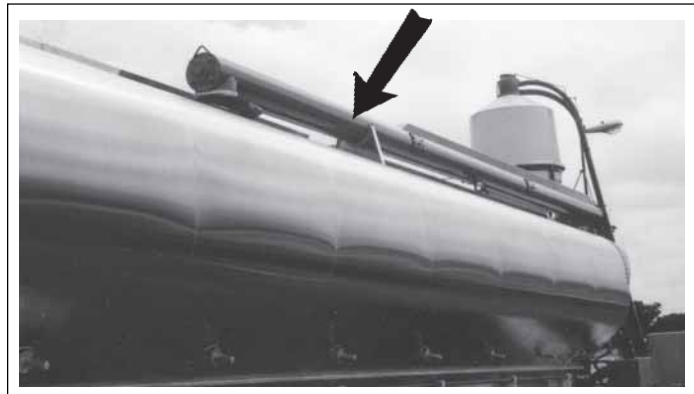
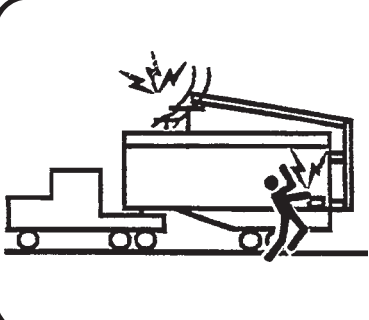


Fig. 4-16 TRANSPORT CRADLE



⚠ DANGER

ELECTROCUTION HAZARD

To prevent serious injury or death from electrocution:

- Stay away from power lines when transporting and raising or lowering boom.
- Electrocution can occur without contacting power lines.

13. Slowly swing the boom around to the required position.

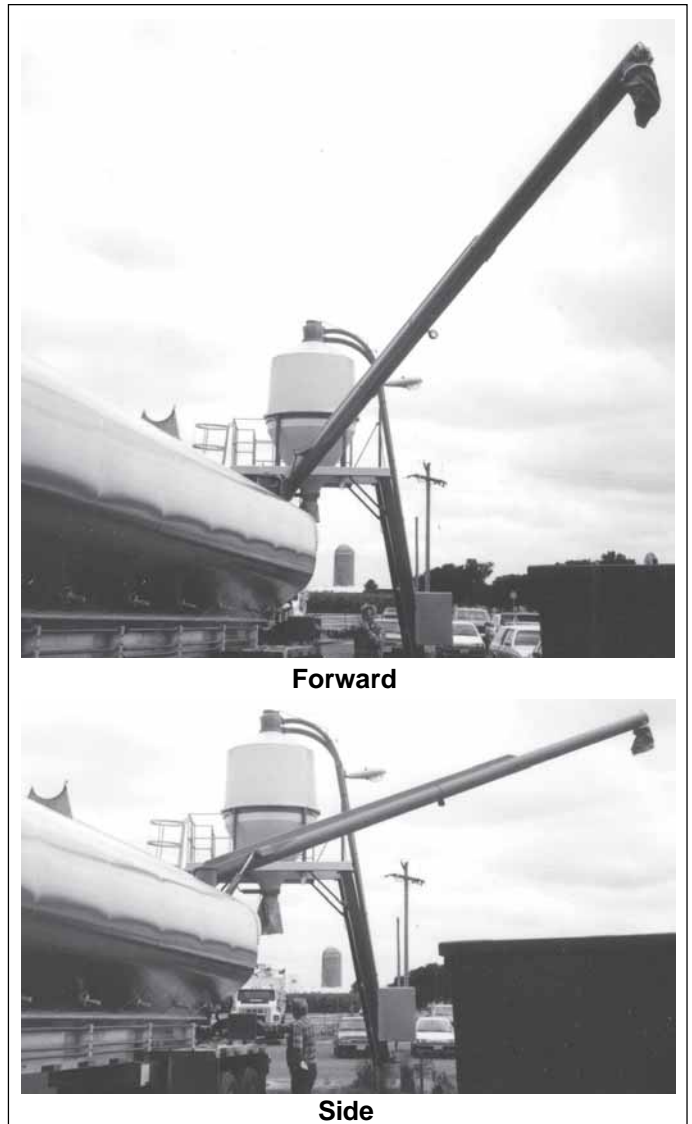


Fig. 4-17 BOOM ROTATION

14. Swing the boom to the left or the right as required for unloading, but watch the location of the boom drive hydraulic hoses. Do not pull the supply hoses tight when positioning the boom. If this occurs, swing the boom around the other direction or reverse the direction of the unit to keep the hoses slack.

IMPORTANT

It is recommended that the boom be positioned to the left side of the unit or behind it for unloading to eliminate tight hydraulic hoses. Drive in from the opposite direction if required.



Fig. 4-18 SUPPLY HOSES

15. Swing the boom around and position the boom discharge over the feed storage facility.

NOTE

It may be necessary to move the unit to centre the discharge in the opening.



Fig. 4-19 BOOM

16. Leave the boom a small distance above the storage structure. Do not rest the boom on the storage structure. Boom sag while unloading could damage the structure.

17. Then proceed to section 4.8 Operation for unloading procedure.

18. Reverse the above procedure when unloading is finished and stowing the boom prior to transport.



Fig. 4-20 POSITIONED

4.8 OPERATION



OPERATING SAFETY

1. Read and understand all the Operator's Manual and all safety signs before operating or adjusting the Walinga Bulk Feed unit.
2. Perform circle check before driving.
3. Do not allow riders outside the cab during road or highway travel.
4. Drive very carefully when negotiating hilly or uneven terrain.
5. Keep hands, feet, clothing and hair away from all moving parts.
6. Place all controls in neutral, disengage PTO clutch, stop the engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or maintaining.
7. Stay away from power lines when moving boom or climbing on top of the trailer. Electrocutation can occur without direct contact.
8. Do not open access doors to airlocks, trough chain or augers while the air system or auger are running.
9. Use care when climbing on ladder(s) and/or platform(s) to prevent falling.
10. Maintain running gear in good condition at all times. In addition, on trailers, maintain king pin and fifth wheel assembly in good condition.
11. Clear the area of all bystanders, especially children, before starting up and operating the unit.
12. Make sure that all lights and reflectors that are required by the local highways and transport authorities are in place, clean and can be seen clearly by all overtaking and oncoming traffic.
13. Do not operate unit with spring brakes caged or brakes disabled. Block wheels if unhooked.
14. Before disconnecting the tractor from the trailer unit(s) make sure that the tractor and trailer are on level ground and that the trailer wheels are securely blocked. Lower landing gear and provide extra support if the ground is soft. Deflate air ride if so equipped prior to uncoupling.
15. Do not unload unless vehicle is on a firm level surface.
16. Review safety items with all personnel annually.

Follow these operating procedures to obtain maximum performance and long life:

1. Review and follow pre-operation inspection and checklist before operating.
2. Review the location and function of all controls.

4.8 OPERATION (cont'd)

3. Loading Unit:

- a. Drive the unit under conveyor or loading system.
- b. Check that all compartment gates are closed and locked.



Control

- c. Raise optional collapsible railing if so equipped.



Closed

Fig. 4-21 SLIDING GATES

- d. Open top covers over tanks.



Fig. 4-22 TOP COVER (TYPICAL)

- e. Fill the tank compartment(s) with desired material.



Fig. 4-23 FILLED COMPARTMENTS

- f. Close and secure the top cover(s).
- g. Lower collapsible railing if so equipped.



Fig. 4-24 COVERS CLOSED

- 4. Transport to the unloading area.
- 5. Position the unit per Section 4.7. Stay away from power lines and be sure the unit is on firm level ground.

4.8 OPERATION (cont'd)

6. Starting:

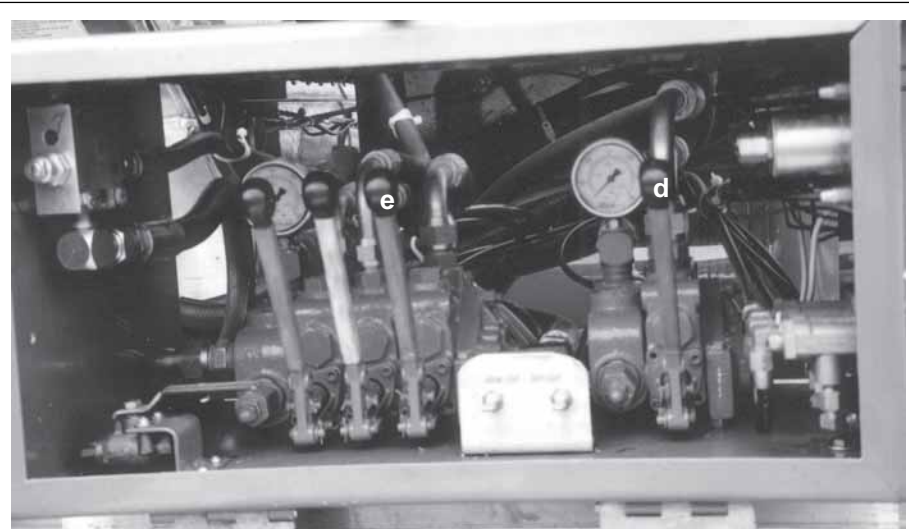
- a. Open control box door and place all controls in neutral or OFF/STOP position.
- b. Start engine, set engine at low idle (1000 RPM or less), disengage clutch, engage transmission, engage PTO(s), disengage transmission (place in neutral), engage clutch. The PTO driving the hydraulic system and the PTO driving the blower have now been set.
- c. Set engine speed at 1050-1100 RPM to provide sufficient oil flow to the auger drive motors.
- d. Use hydraulic control lever to start the vertical and boom auger drive motors.
- e. Start the trough conveyor drive motor.
- f. Set flow to start trough conveyor movement if equipped with manually operated flow divider.

NOTE

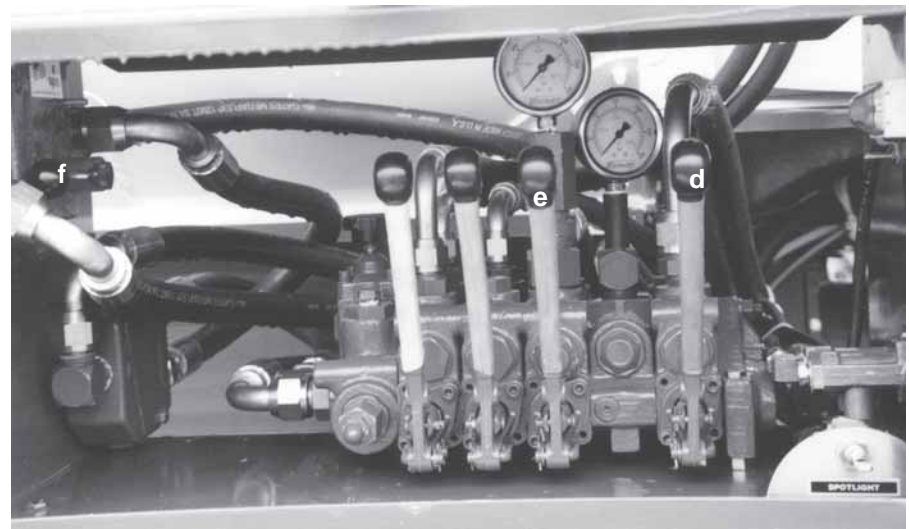
On systems equipped with the flow compensator, the compensator will automatically set the speed (drive system pressure) of the trough auger to produce a boom and vertical drive system pressure of 1500 to 2000 psi (10245 to 13660 to kPa) which provides maximum capacity.



Fig. 4-25 PTO CLUTCH



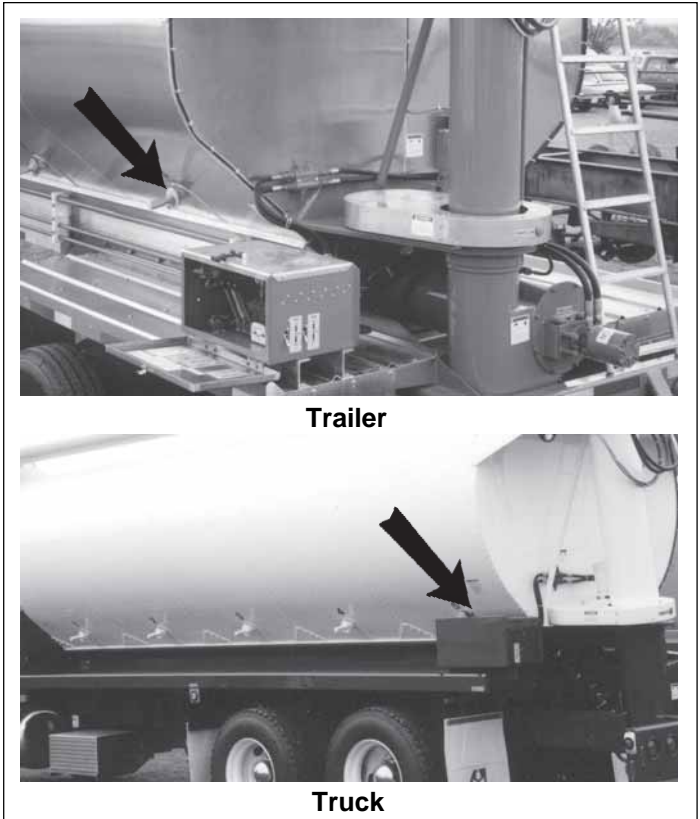
Trailer



Truck

Fig. 4-26 CONTROLS

- g. Open required tank compartment sliding gate starting with rear compartment.



- h. Use the manual flow control on the trough conveyor drive system to set the vertical and boom auger drive pressure at 1500 to 2000 psi (10245 to 13660 kPa) to maximize unloading capacity.

Fig. 4-27 SLIDING GATE

NOTE

Watch pressure on boom and vertical drive system gauge.

- i. Increase the speed of the trough conveyor until the material starts to back up in the sight glasses. Reduce conveyor speed slightly until material flows smoothly.

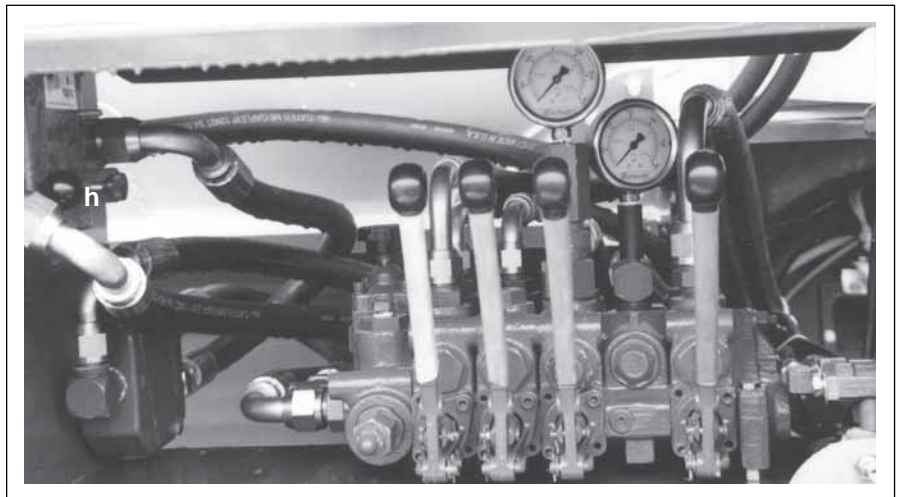


Fig. 4-28 CONTROLS

- j. When the compartment is empty, open the sliding gate over the next compartment. Repeat with the next compartment until all are empty.

IMPORTANT

Do not try to empty more than one compartment at a time while unloading. When more than one tank is open during unloading, the material can over-load the trough conveyor and cause stalling or plugging.

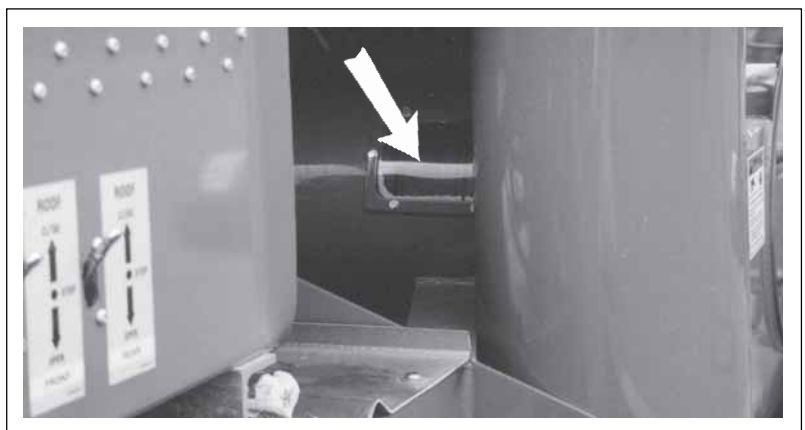


Fig. 4-29 SIGHT GLASS

4.8 OPERATION (cont'd)

7. Stopping:

- a. Turn trough conveyor OFF and set manual flow control to 10.

IMPORTANT

When the flow control is set at 10, the circuit bypasses all the oil and the trough conveyor is OFF.

- b. Turn vertical and boom augers OFF.
- c. Close all compartment gates and secure with safety pins.

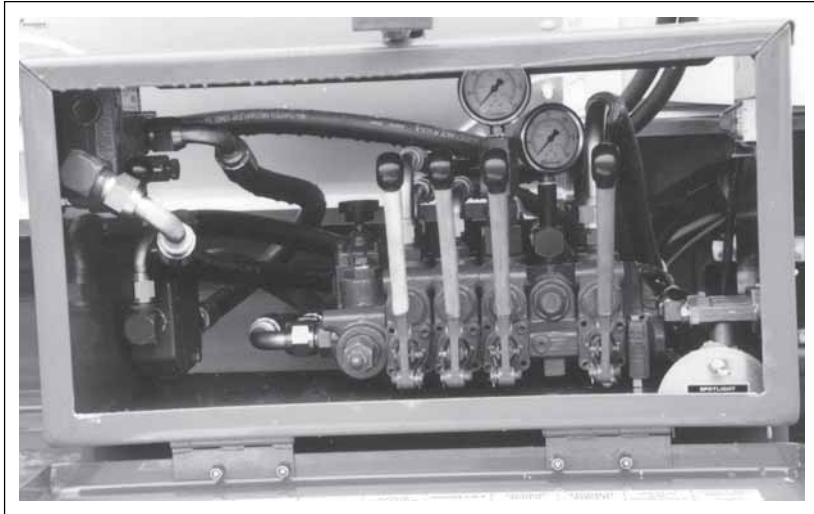


Fig. 4-30 CONTROLS

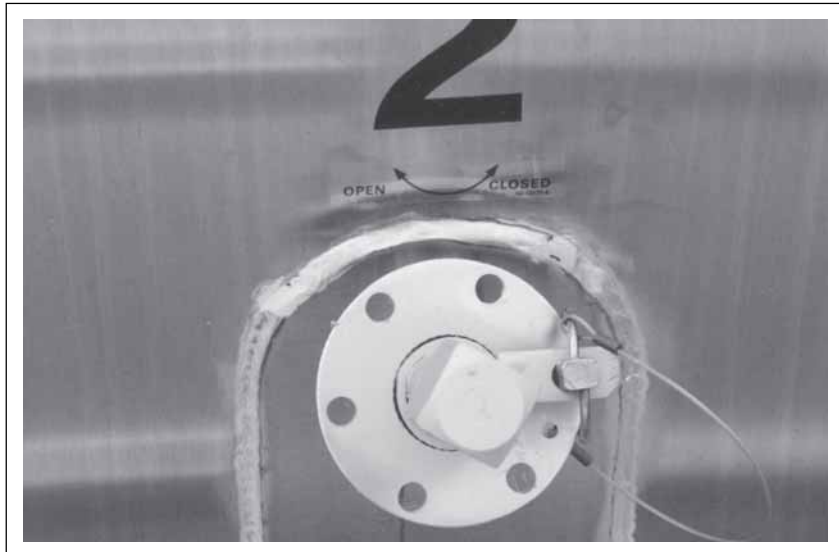


Fig. 4-31 LOCKED GATES

- d. Reduce engine speed to low idle.
- e. Depress master clutch and disengage PTO clutch.

8. Emergency Stopping:

If an emergency occurs that requires immediate machine shut-down, place all controls in the control box in neutral/OFF to stop the machine or disengage PTO clutch. Refer to Step 6 "Starting" and follow the procedure when restarting the machine. Remember, the augers are all full of material and the start-up loads will be higher than normal. Always return all controls to OFF before engaging the PTO drive.

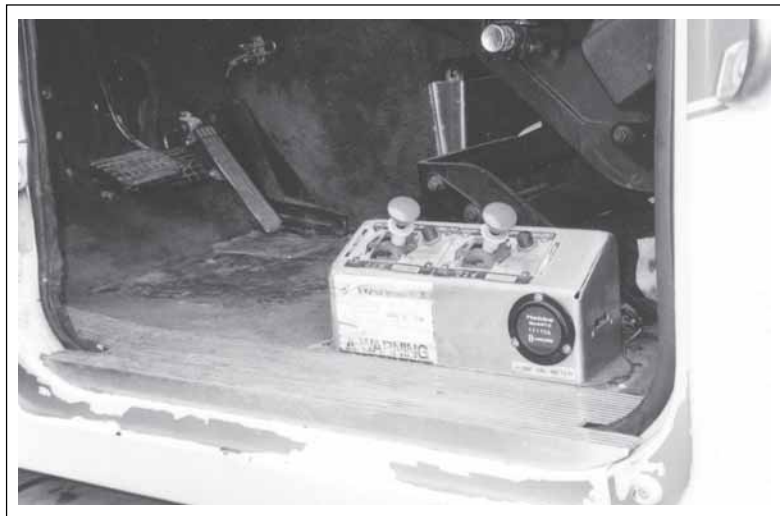
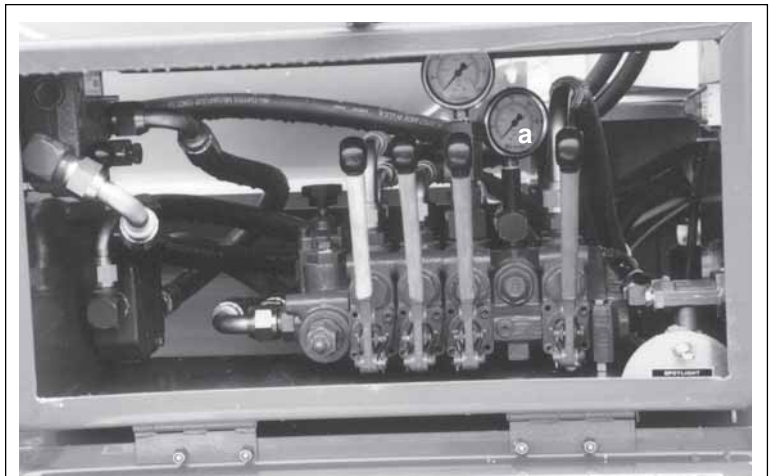


Fig. 4-32 PTO CLUTCH

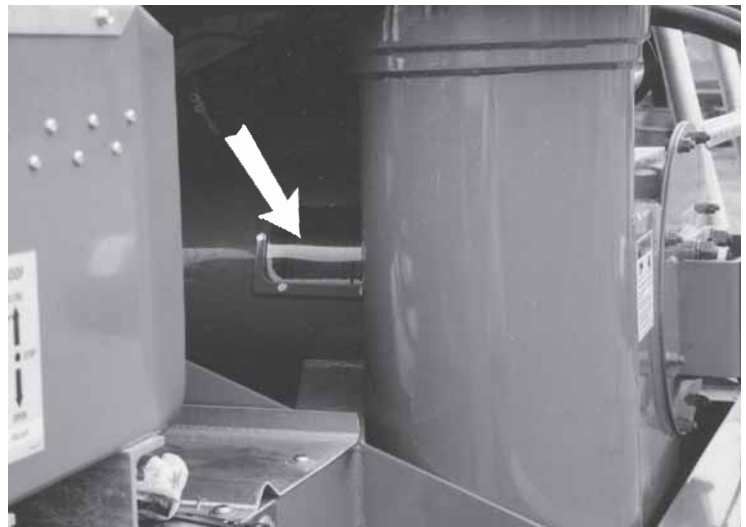
9. **Maximum Capacity:**

The optimum operating conditions occur when the unloading system is providing maximum capacity. The system is designed so the vertical and boom augers are the limiting components. Set the system to obtain maximum capacity in the vertical and boom augers by:

- a. Increase the speed of the trough conveyor with the manual flow control in the control box until the vertical and boom drive system pressure runs between 1500 and 2000 psi (10245 to 13660 kPa) and
- b. The material is flowing smoothly and evenly across the sight glass.



Pressure Gauge



Sight Glass

Fig. 4-33 MAXIMUM CAPACITY

4.8 OPERATION (cont'd)

10. Unplugging:

When the unit plugs, follow this procedure to unplug:

- a. Place all controls in neutral/OFF.
- b. Disengage PTO clutch, stop engine, remove ignition key and wait for all moving parts to stop.
- c. Remove ignition keys.
- d. Close all the compartment gates.
- e. Open access cover on the back of the conveyor tube.
- f. Clean out the material from the back of the conveyor tube and the transition cross-over cavity.
- g. Close and secure access door.
- h. Start engine, engage PTO driving hydraulic pump and start the vertical and boom augers.
- i. If the augers will not move, run them in the reverse direction momentarily to dislodge the plug or jam. Then run again the forward direction.

NOTE

If the trough conveyor will not run in the forward direction after reversing momentarily, it will be necessary to shut down and clean the material out of the transition area again before resuming operation.

- j. Start the trough conveyor to bring material to the vertical and boom augers but run at a slower speed to reduce the pressure in the boom/vertical drive system.

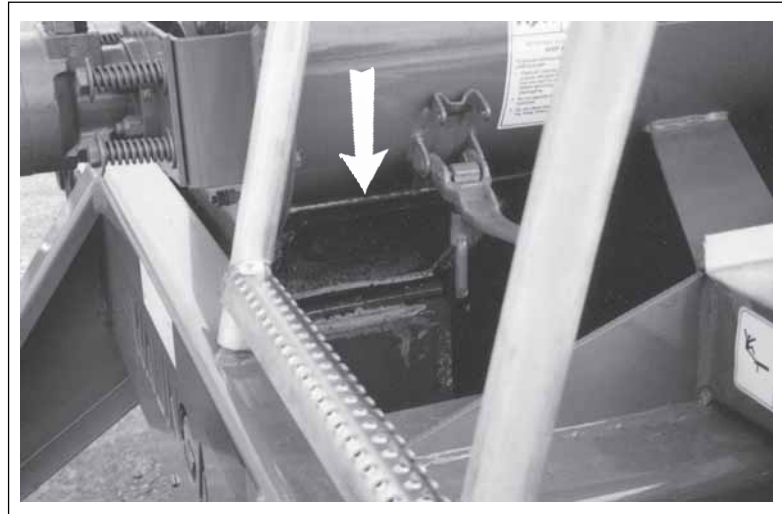


Fig. 4-34 ACCESS DOOR

! **DANGER**



**ROTATING AUGER HAZARD
KEEP AWAY**

To prevent serious injury or death from rotating auger:

1. Place all controls in neutral, stop engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, repairing, adjusting or unplugging.
2. Do not operate with the auger guards removed.
3. Do not stand near augers when operating. Keep others away.

- k. If the trough conveyor plugs:
 - Disengage PTO, stop engine and wait for all moving parts to stop.
 - Open access door and clean out tube and transition.
 - Close and secure access door.
 - Close and secure gates at the bottom of each compartment.
 - Start engine, engage PTO, run vertical and boom augers and start trough conveyor.
 - Open the desired compartment gate only enough to provide material to the trough conveyor for unloading but not enough to plug it.

! **WARNING**

Machine is shown with guard removed or access door opened for illustrative purposes only. Do not operate machine with guard removed or access door opened.

11. Operating Suggestions:

- a. Use only fully trained operators at all times. Review safety and operating instructions annually.
- b. Position the unit on a firm level surface to unload. Be sure the tractor and trailer are in a straight line for unloading to provide maximum stability.



Fig. 4-35 POSITION

- c. Empty the rear tank first when unloading. The empty tank will allow excess material to fill in if required as other compartments empty.
- d. Stay away from power lines when raising or swinging the boom, raising the collapsible railing or climbing on the top platform. Electrocutation can occur without direct contact.

	<p>! DANGER</p> <p>ELECTROCUTION HAZARD</p> <p>To prevent serious injury or death from electrocution:</p> <ul style="list-style-type: none">• Stay away from power lines when transporting and raising or lowering boom.• Electrocutation can occur without contacting power lines.
--	--

- e. Extend boom on the left side of the vehicle for unloading to keep boom drive motor hoses slack.



Fig. 4-36 LEFT SIDE

4.8 OPERATION (cont'd)

11. Operating Suggestions (cont'd):

f. Relief Valve:

The hydraulic circuit driving the boom rotation motor is equipped with a cross circuit relief valve to plumb oil to the opposite side of the circuit when the pressure exceeds a preset value. Should the boom strike an obstruction while rotating, the relief will open and stop the movement. In addition, if the truck is moving, the valve will bypass the oil to allow the boom rotation motor to run backwards and swing the boom out of the way.



Fig. 4-37 RELIEF VALVE

4.9 TRANSPORTING

Although all operating and transporting instructions are common sense, it is wise to review them periodically to refresh your memory. Good operational procedures result in a safe workplace for the operator and others.

4.9.1 OPERATING INSTRUCTIONS

Since this equipment can be used in a variety of conditions, it is difficult to give instructions appropriate for all applications. However, these general guidelines apply to all situations:

1. Be sure that the trailer is securely attached to the towing vehicle and locked into position.
2. Be sure that the air, hydraulic and electrical lines are securely connected and that they have sufficient slack for turns.
3. Be sure that the brakes are properly adjusted and in good working condition.
4. Be sure that the electrical harness is securely attached and all lights and reflectors are clean and operating.
5. Maintain the mud flaps in good condition to minimize road splash in wet conditions.
6. Always maintain the truck and trailer in good mechanical condition.

4.9 TRANSPORTING (cont'd)

4.9.2 BRAKING GUIDELINES

Safe, reliable and trouble-free operation of your unit requires that the brakes be maintained in good operating condition at all times and the driver follows good application techniques when driving. The irresponsible use of brakes by the driver when traveling can contribute to low brake life or result in system malfunctions, short life and poor tire wear patterns. The following list summarizes some basic operational guidelines for the driver.

1. Check the function of the brake system at the start of each day.
2. Maintain a safe vehicle speed at all times. Slow down for rough road or slippery surface conditions, winding roads or congested areas.
3. Always provide sufficient vehicle spacing on the road to allow for a safe stopping distance.
4. Apply brakes gradually to produce an even deceleration until the vehicle is stopped.
5. Watch traffic patterns ahead. Anticipate pattern changes that could result in an emergency. Apply the brakes gradually in sufficient time to produce a controlled stop.
6. Shift to a lower gear to use engine compression as the retarding force when going down steep grades.
7. Do not apply brakes for a long period of time such as when traveling on a long downgrade. The brakes will overheat. Instead, apply both the tractor and trailer brakes for short periods of time and the brakes have a chance to cool between applications.
8. Dry the brakes by applying them several times after going through water.
9. Release the brakes just before going over railroad tracks or other rough conditions. By allowing the wheels to turn over rough road surfaces, there will be no shock loads to the brake system components or produce flat spots on the tires.
10. Wet, icy or snow-packed surfaces require special care. Make cautious, intermittent applications by fanning or pumping the brakes to reduce speed without skidding or locking the wheels.
11. Use wheel chocks, apply trailer and tractor parking brakes and place tractor in low gear when parking the unit.
12. Maximum brake retarding occurs just before the wheels lock up and the tires skid. Release the brakes should you feel them lock-up and reapply them.
13. When trailer parking brakes are applied with hot drums, it may result in a cracked drum. Allow them to cool before reapplying the brakes.
14. Fanning or repeated on-and-off applications will use up the system air reserves. This procedure is not recommended unless adverse road conditions are encountered. The wasting of air reserves in this way could result in insufficient application pressure should an emergency arise.
15. Hard or panic stops can overheat the linings and drums. Overheating will cause brake fade. Severe overheating and fade can result in the complete loss of braking capability. This will substantially reduce the expected life of brakes.

4.9.3 TIRES

When operating the unit, it is the responsibility of the driver to check the tires frequently. Inflation pressures, wear patterns and matching are critical parameters that must be monitored. The following factors affect tire care:

1. **Inspection frequency:** Tires should always be checked at the start of a day and twice during the day or every 4 operating hours, whichever comes first. It is also a good practice to check the tires at each rest period during the day. When a driver hears unusual noise or experiences unusual handling characteristics, the first item to check is the tires. Problems found early, during frequent tire checks, can save more serious problems later on. A sampling of typical abnormal wear patterns are shown in the Maintenance section along with their causes. Always correct the cause of the tire wear problem before proceeding.
2. **Inflation pressure:** Tires should always be operated at their specified pressures. At their specified pressures, the tire is designed to run with the full width of the tread flat on the contact surface. Operating at other than specified pressures will change the tread contact patterns and can dramatically shorten tire life. In addition, the tires will run hotter and can lead to blow-outs.

Check tire pressure when the tire is cold. A hot tire can read as much as 20 psi higher than a cold tire. If tires are over-inflated, check for poor load distribution, uneven surface contact, over-loading or poor operating conditions.

3. **Tire matching:** Do not mix ply types on the same axle. Their operating characteristics are different and will lead to uneven tire loading, rapid tire wear and adverse handling characteristics. Matching also includes combining tires that have the same amount of tread remaining. A tire with more tread has a larger rolling radius and will have to carry a higher load. The best performance will be obtained when the rolling radius is within 1/8" for all tires on an axle.

4.10 OPTIONAL EQUIPMENT

The trailers can be equipped with several options or attachments to adapt it to special customer requirements.

1. Several types of compartment covers are available. Select the style that best fits your application.



Air Opened



Individual



Canvas

Fig. 4-38 COVERS

2. **Collapsible Railing:**

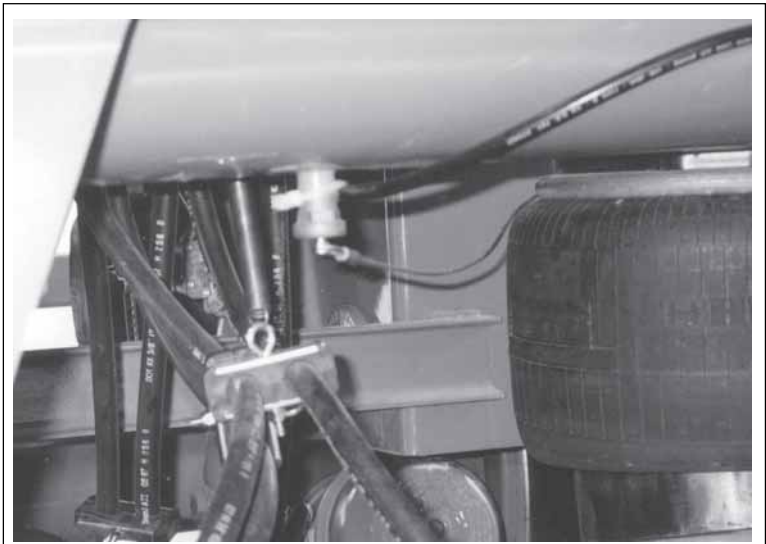
A collapsible railing is available for the top platform and is raised and lowered with an air cylinder. Always lower it when transporting to bring the vehicle height within legal limits.



Fig. 4-39 COLLAPSIBLE RAILING

3. **Suspension Systems:**

A variety of types and styles of running gear is available for use on the trailer including air or mechanical suspensions. Select the type that best suits your application.



Air



Mechanical

Fig. 4-40 SUSPENSION TYPES

5 SERVICE AND MAINTENANCE

Review the manual provided with the truck for service and maintenance information.

This section provides information on daily and periodical service and maintenance of the Trailer unit. Follow these recommendations for safe and dependable operation of the Trailer unit. Refer to the safety section at the front of the operator's manual for all applicable safe maintenance and operating procedures.

Be sure that all operators are familiar with the operation and maintenance procedures and related safety information contained in the operator's manual.



MAINTENANCE SAFETY

1. Read and understand all the information in the Operator's Manual regarding maintenance, adjusting and servicing the Bulk Feed unit.
2. Place all controls in neutral, disengage PTO clutch, stop the engine, remove ignition key and set the park brake before adjusting, servicing or maintaining any part of the Bulk Feed unit.
3. Follow good shop practices:
 - Keep service area clean and dry.
 - Be sure electrical outlets and tools are properly grounded.
 - Use adequate light for the job at hand.
4. Block wheels before de-activating brakes.
5. Maintain air system and brake components in top condition at all times.
6. Maintain fasteners in running gear systems at their specified torque at all times.
7. Establish and maintain a Trailer Preventative Maintenance (TPM) program on your equipment. Some jurisdictions require this program and the maintenance of records on every commercial vehicle on the road for future reference.

5.1 SERVICE

5.1.1 FLUIDS AND LUBRICANTS

1. **Grease:**
Use an SAE multi-purpose lithium based grease with extreme pressure (EP) characteristics.
2. **Wheel Hub Oil:**
 - a. Use an SAE 80W90 for normal temperature conditions (-10°F to 100°F ambients).
 - b. Use an SAE 85W140 for hot temperature conditions (100°F and hotter ambients).
 - c. Use an SAE 30W motor oil for ambients below -10°F.

Capacity: 1 pint (500 ml) approximately

3. **Hydraulic Oil:**
Refer to 5.1.3 for Hydraulic Oil Specifications.
4. **Storing Lubricants:**
Your unit can operate at top efficiency only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture and other contaminants.

5.1.2 GREASING

Refer to Section 5.1.1 for recommended grease. Use the Service Record checklist provided to keep a record of all scheduled servicing.

1. It is recommended that a hand-held grease gun be used for greasing. An air-powered greasing system can damage the seals on bearings and lead to early failure.
2. Wipe grease fitting with a clean cloth before greasing, to avoid injecting dirt and grit.
3. Replace and repair broken fittings immediately.
4. If fittings will not take grease, remove and clean thoroughly. Also clean lubricant passageway. Replace fitting if necessary.

5.1 SERVICE (cont'd)

5.1.3 HYDRAULIC SYSTEM

1. Oil Specifications:

PUMP MODEL	Min. Start-up (No Load)	Minimum Operating Temperature (Loaded)	Maximum Operating Temperature
P197 (PERMCO)	-16°C / 3°F	-2°C / 28°F	82°C / 180°F
P3100 / P5000 / DMD25-064 (PERMCO)	-16°C / 3°F	-10°C / 14°F	82°C / 180°F

- a. All hydraulic systems will be filled with Hydrex XV.
- b. Check with dealer or factory for oil requirements when using other oils or in other temperature ranges.

2. System Operation:

- a. Be sure your oil specifications meet or exceed the pump manufacturer requirements.
- b. Do not exceed starting and operating temperatures as specified above.
- c. When operating a unit and the oil temperature is over 180°F (82°C), the pump system must be shut down, or run slower until the system cools down.
- d. If overheating persists, check the system for possible causes (see Section 10.7).
- e. Hydraulic oil filter must be changed before the gauge needle is in red on 10 MICRON return filters.
- f. Hydraulic oil should be checked regularly. (Testing of oil is recommended once a year).
- g. Always maintain a proper level in the hydraulic tank and keep oil clean.
- h. Do not over speed the hydraulic pump, it causes overheating of the hydraulic oil. (Run the engine as shown on RPM tag on dash).
- i. Check vent filler cap and keep it clean.

6 TRAILER SERVICING INTERVALS

A standard servicing schedule on your trailer unit is provided as a guide for your convenience. In unusual or extreme operating conditions, increase the frequency or perform additional service items to customize this schedule to your application.

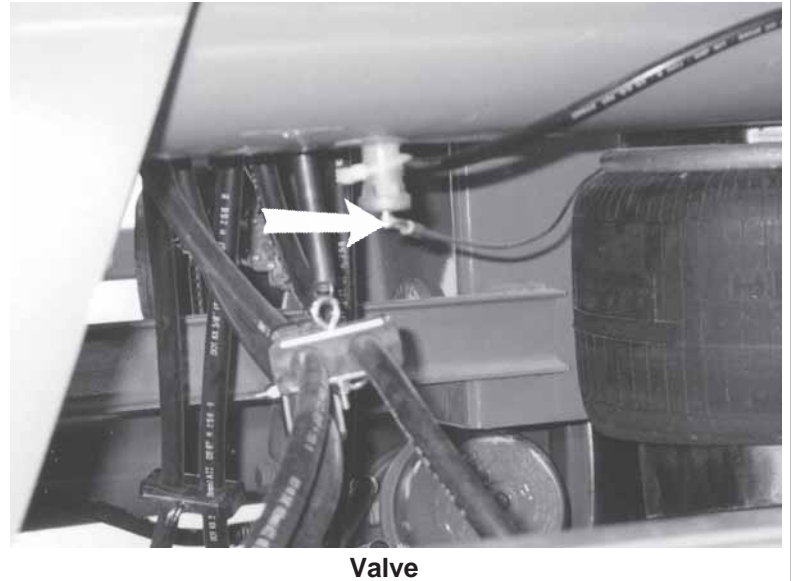
Refer to the Service Section of the truck manual for truck servicing information.

A. Servicing: 8 Hours, Daily or 500 Miles

1. Drain moisture from air tanks (use cables to open drain valves).



Tank Drain



Valve

Fig. 6-1 DRAIN CABLE(S) (TYPICAL)

2. Check tire air pressure. Add as required.



Fig. 6-2 TIRES (TYPICAL)

Weekly, 10 Days or 5000 Miles

1. Grease slack adjusters
(1 location each adjuster).

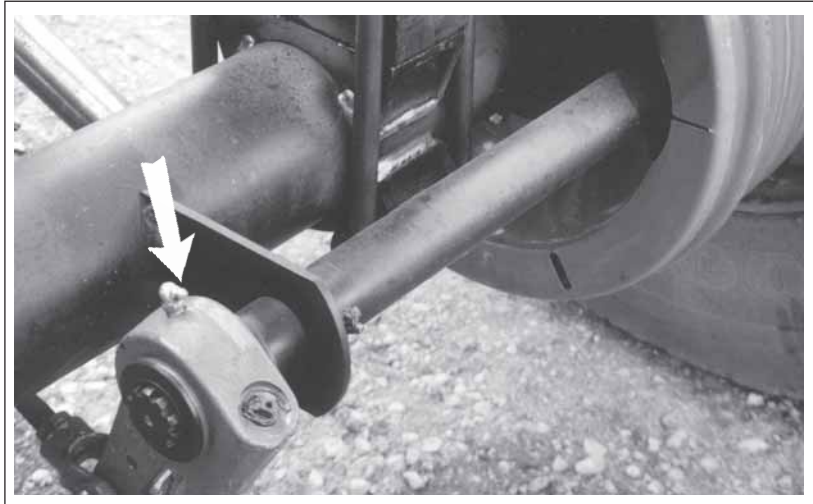


Fig. 6-3 SLACK ADJUSTER (TYPICAL)

2. Grease camshaft bearings
(1 location each camshaft).

IMPORTANT

Do not overgrease.



Fig. 6-4 CAMSHAFT BEARING

Weekly, 10 Days or 5000 Miles (cont'd)

3. Check wheel hub oil levels.

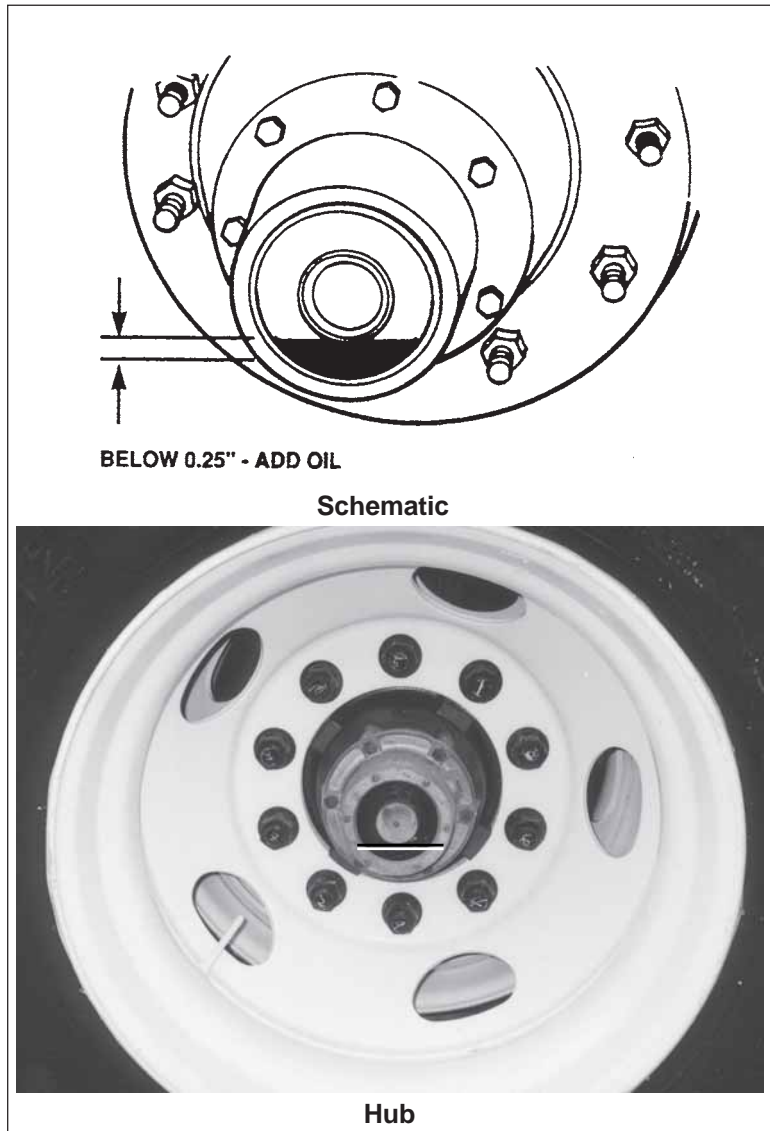


Fig. 6-5 HUB OIL LEVEL

4. Retorque the following fasteners:

- a. Brake/wheel end system fasteners. Refer to Section 8.8.

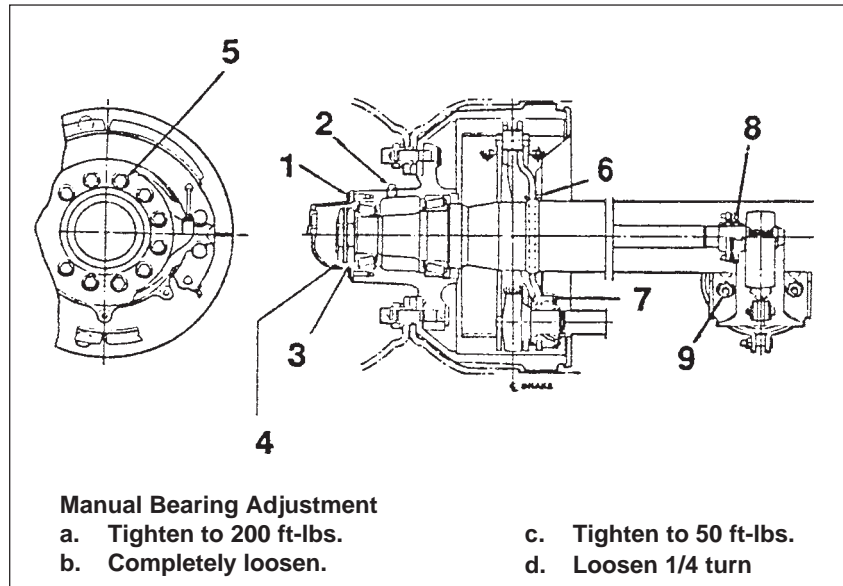


Fig. 6-6 BRAKE/WHEEL END

- b. Landing gear bolts.

1/2 in. 115 ft. lbs
5/8 in. 220 ft. lbs



Fig. 6-7 LANDING GEAR MOUNTING BOLTS

Weekly, 10 Days or 5000 Miles (cont'd)

- c. Retorque cast spoke wheel rim nuts if so equipped.

Table 1 Recommended Wheel Bolt Torque (Spoke Wheels)

Bolt Size	Ft-lbs Torque (Dry)
5/8" - 11	150 - 175
3/4" - 10	210 - 260

IMPORTANT

Do not over-torque fasteners. Over-torquing can strip threads, collapse spacers or lead to other problems that cause loose fasteners. Use an accurate torque wrench when tightening fasteners.

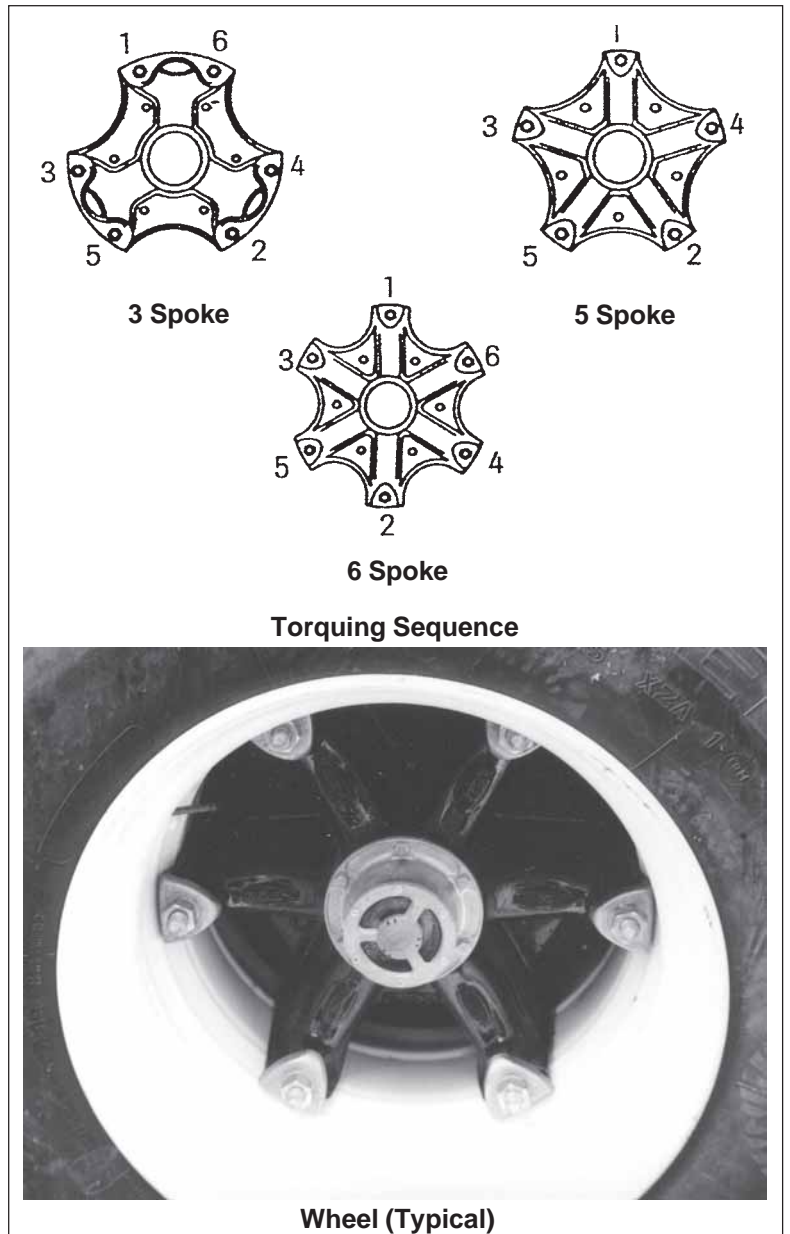


Fig. 6-8 CAST WHEEL RIM NUTS

Weekly, 10 Days or 5000 Miles
(cont'd)

- d. Retorque for stud pilot inner and outer wheel nuts if so equipped.

Table 2 Recommended Wheel Stud Torque (Disc Wheels)

Stud Size	Wheel Type	Ft-lbs Torque (Dry)
3/4" - 16	Disc	450 - 500
1-1/8" - 16	Disc	450 - 500
15/16 - 12	Disc	750 - 900
1-5/16 - 12	Disc	750 - 900
	Bud Unimount 10	390 - 440
	WHD-8	400 - 600

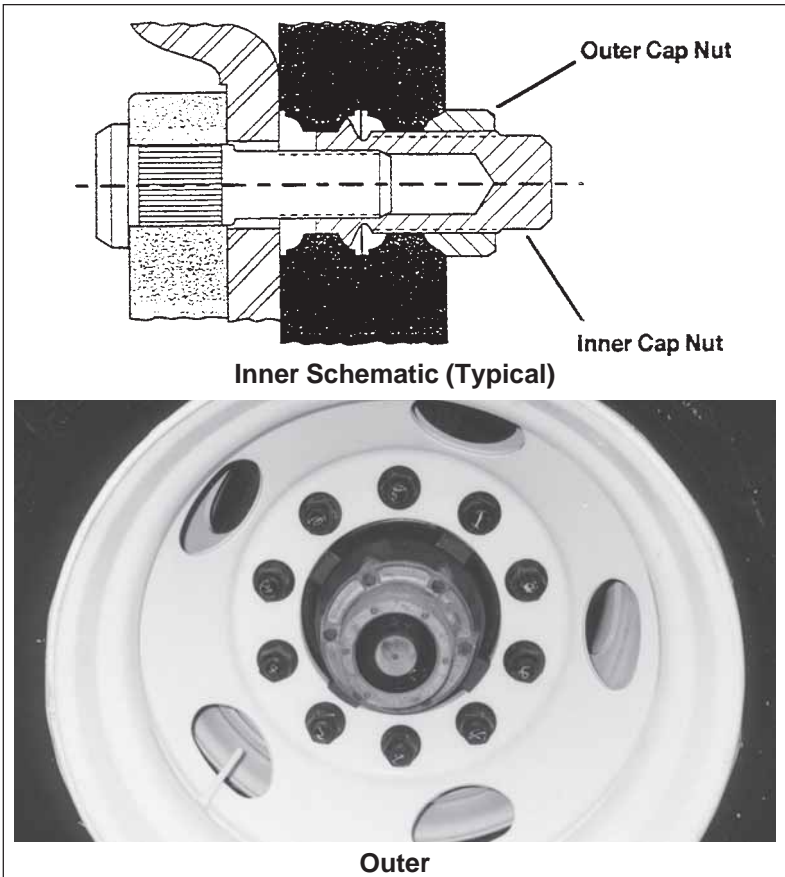


Fig. 6-9 10 STUD WHEEL NUTS

- e. Retorque hub piloted wheel single nuts if so equipped.

Table 3 Recommended Wheel Stud Torque

Stud Size	Ft-lbs Torque (Oiled)
M22 x 1.5 (33 mm or 1-1/2 Hex)	450 - 500
M20 x 1.5 (30 mm Hex)	280 - 330

IMPORTANT

Do not over-torque fasteners. Over-torquing can strip threads, collapse spacers or lead to other problems that cause loose fasteners. Use an accurate torque wrench when tightening fasteners.

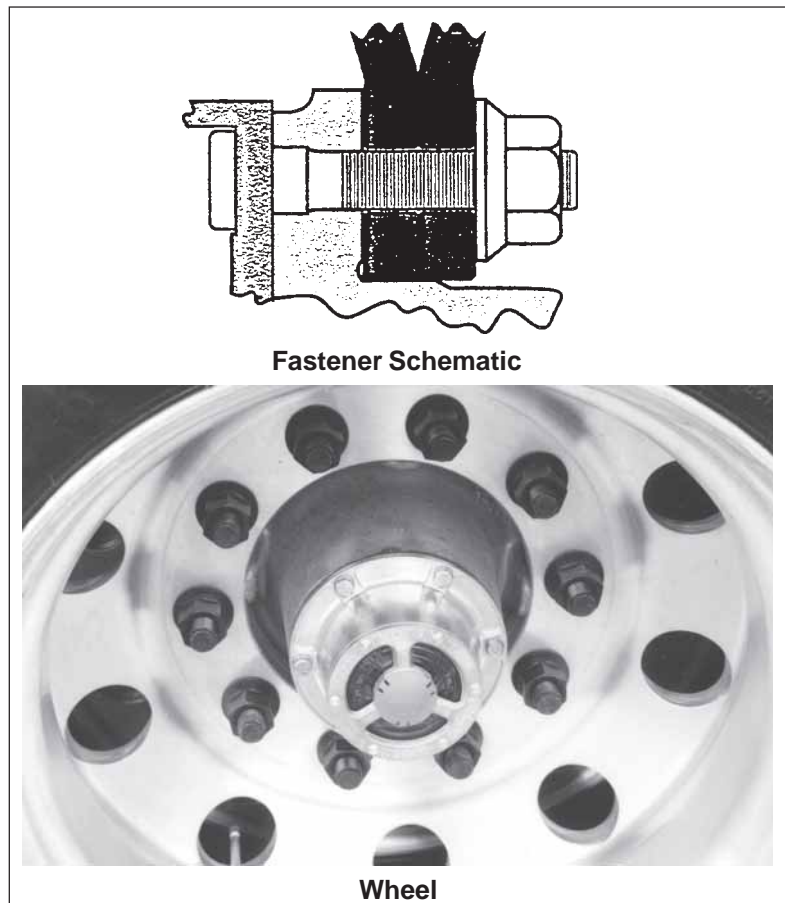


Fig. 6-10 SINGLE NUTS

Weekly, 10 Days or 5000 Miles (cont'd)

- f. Retorque suspension system fasteners. (Refer to charts for torque levels in Maintenance Section 8.1.)

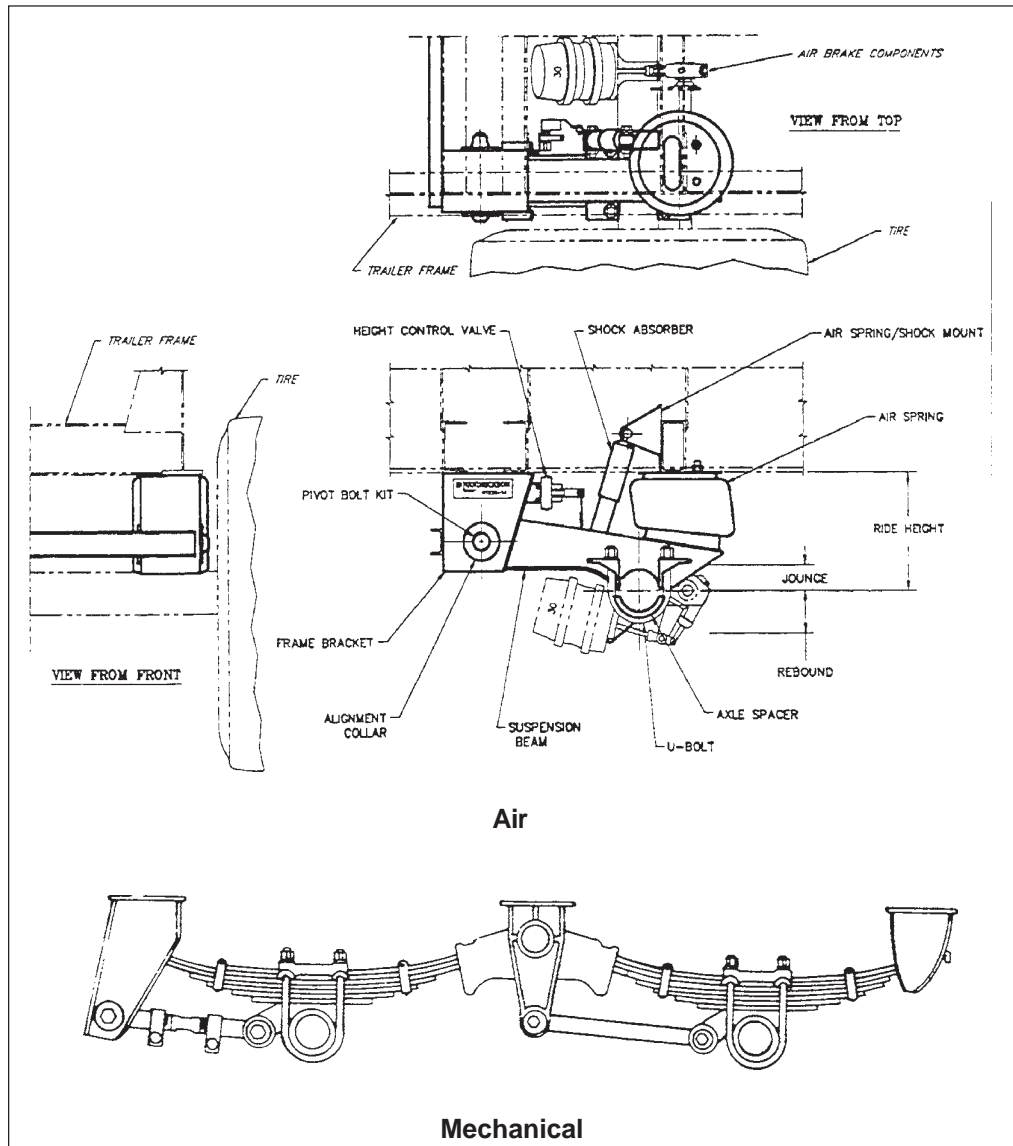


Fig. 6-11 SUSPENSION SYSTEM U-BOLTS

10,000 Miles (15,000 km) or Monthly

1. Grease landing gear bearings.



Fig. 6-12 LANDING GEAR

2. Retorque landing gear and suspension.
 - a. Landing gear.
 - b. Torque mechanical system suspension (refer to Section 8.1).

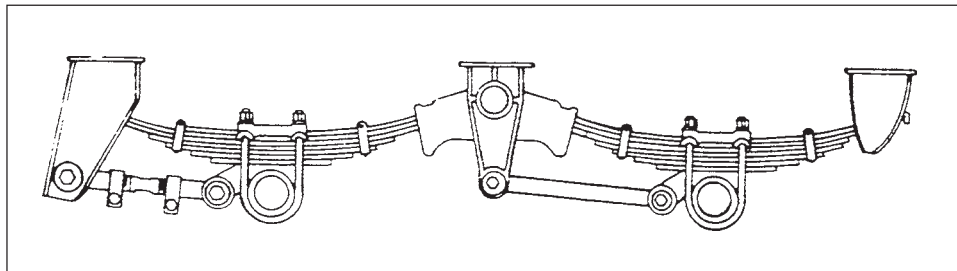


Fig. 6-13 MECHANICAL SUSPENSION SYSTEM

25,000 Miles (40,000 km), Quarterly or Every 3 Months

1. Check condition of wheel ends.
Release brakes, jack up the axle and spin the wheel. Check:
 - a. Wheel bearings.
 - b. Wobble.
 - c. Rims and tires.
 - d. Brake drag.



Fig. 6-14 WHEEL END

2. Inspect frame and structure for bends, distortions or cracks.
 - a. Kingpin.
 - b. Fifth wheel and mounts.
 - c. Longitudinal and transverse frames.
 - d. Compartment structure.
 - e. Unloading system structure.
 - f. Suspension system anchorage.
 - g. Axles.
 - h. Optional Accessories
 - i. Side Covers
 - ii. Top Covers



Fig. 6-15 TRAILER (TYPICAL)

3. Inspect electrical system components for:
 - a. Binding.
 - b. Rubbing/abrasion.
 - c. Looseness/dangling.
 - d. Cracks/tears in harness.
 - e. Burned out lights.

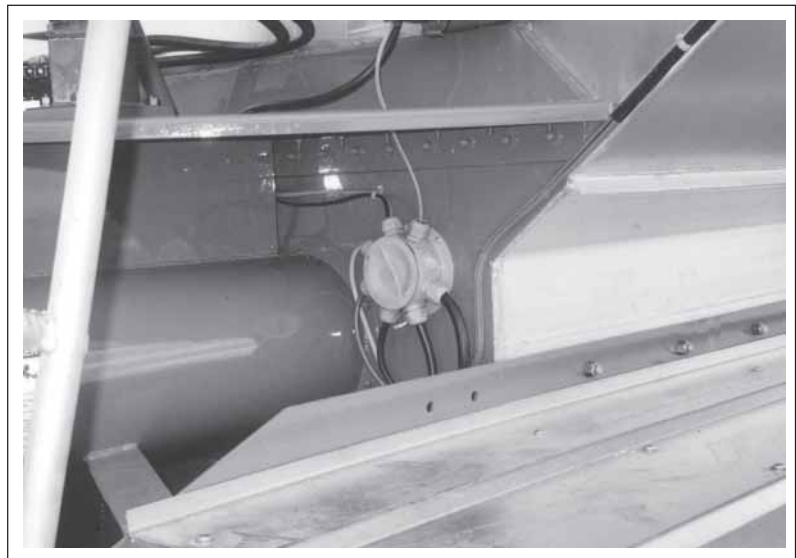


Fig. 6-16 ELECTRICAL (TYPICAL)

4. Inspect air system and components for:
 - a. Leakage by performing leak-down test.
 - b. Rubbing/abrading.
 - c. Cracked hoses.



Fig. 6-17 AIR SYSTEM (TYPICAL)

5. Clean gladhand screens if so equipped.

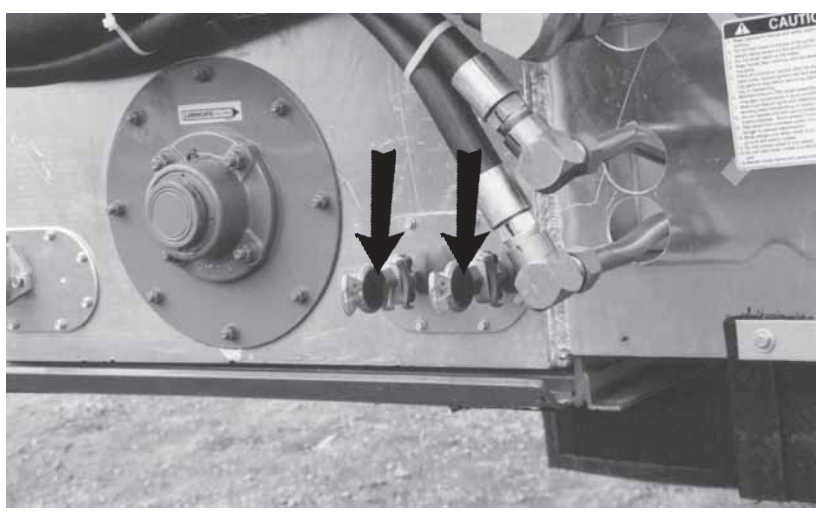


Fig. 6-18 SCREENS

6. Check brake lining thickness. Replace as required.

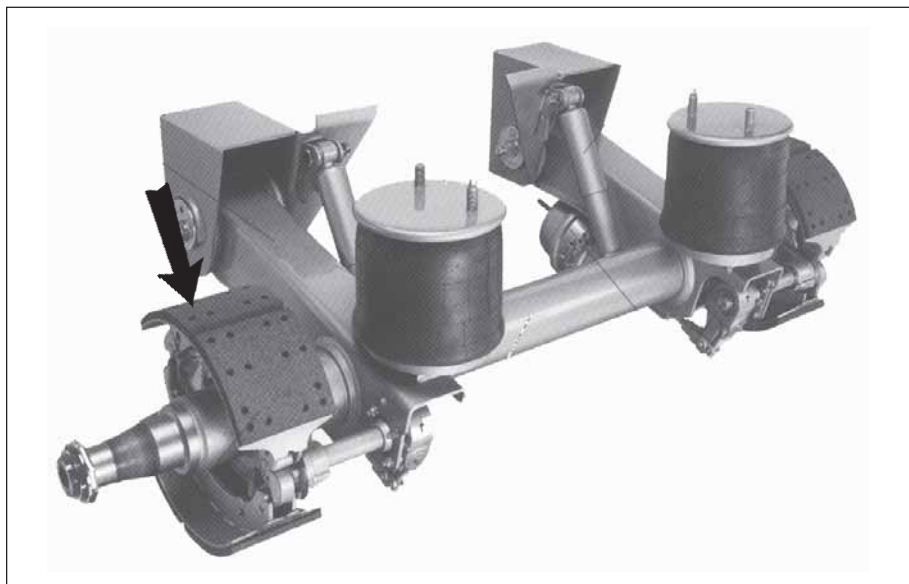


Fig. 6-19 BRAKE LINING

100,000 Miles (150,000 km) or Annually

1. Reline brakes as required.

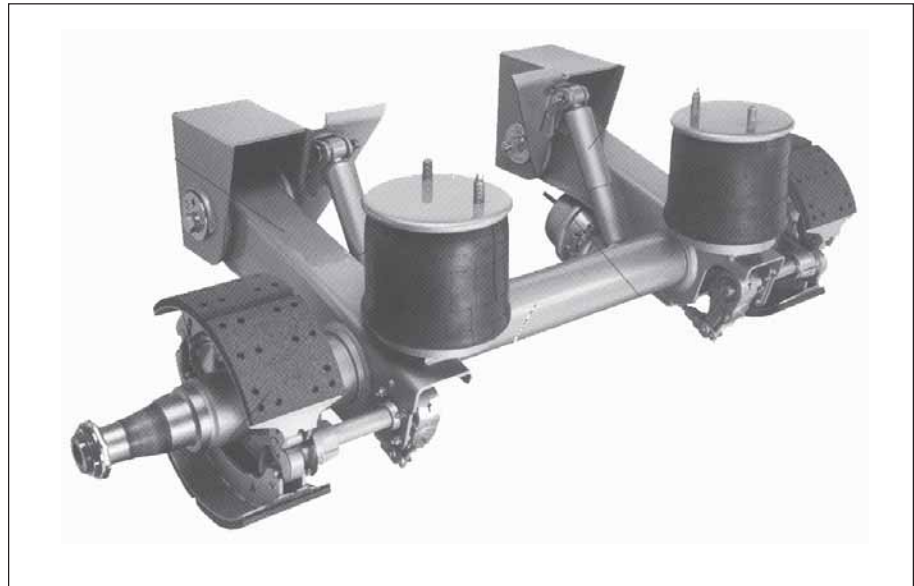


Fig. 6-20 BRAKES

2. Change oil in hubs.



Fig. 6-21 HUB OIL (TYPICAL)

6.1 SERVICE RECORD SUMMARY (LUBRICATION)

LOCATION	DESCRIPTION	FREQUENCY	LUBRICANT
Fifth wheel. Coat pivot pins and lock	Coat bearing surface.	Daily or as needed.	Chassis grease.*
Landing gear	Gearbox and screws.	Periodic basis (weekly).	Chassis grease.*
Wheels	Check oil level.	Weekly, 10 Days or 5000 m (8000 km)	
	Bearings.	25,000 miles (40,000 km).	SAE 80W90 gear oil.
	Change oil.	100,000 miles (150,000 km).	SAE 80W90 gear oil.
Brakes			
Camshaft bearing	Lubricate	5,000 miles (8,000 km) or monthly.	Chassis grease.*
Slack adjuster	Lubricate	5,000 miles (8,000 km) or monthly.	Chassis grease.*
Brake shoe anchor pin bushing	Lubricate	30,000 miles (50,000 km) or yearly.	Chassis grease.*
Also at brake reline.		As appropriate.	
* Use a good quality lithium based extreme pressure grease throughout. MIL-G-25013C in below -40°F.			
NOTE: Do not use excessive lubricant.			

7 UNLOADING SYSTEM SERVICING

7.1 SERVICING INTERVALS

8 Hours, Daily or 500 Miles

1. Check condition of hydraulic system filter.

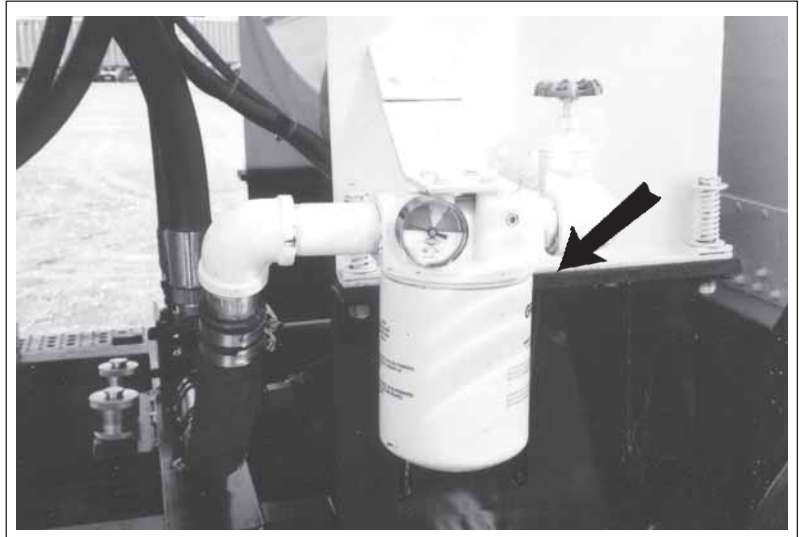


Fig. 7-1 HYDRAULIC SYSTEM FILTER

Weekly, 10 Days or 5000 Miles

1. Grease trough auger bearings front.

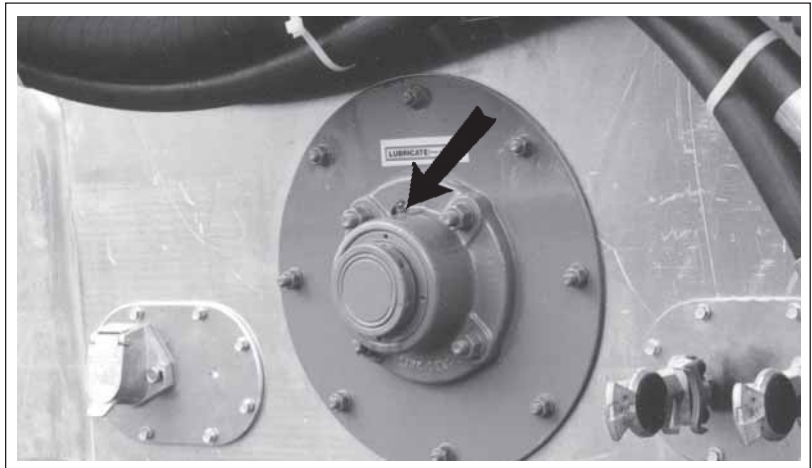


Fig. 7-2 TROUGH AUGER BEARINGS FRONT

Monthly or 10,000 Miles (15,000 Km)

1. Grease trough auger bearings rear.

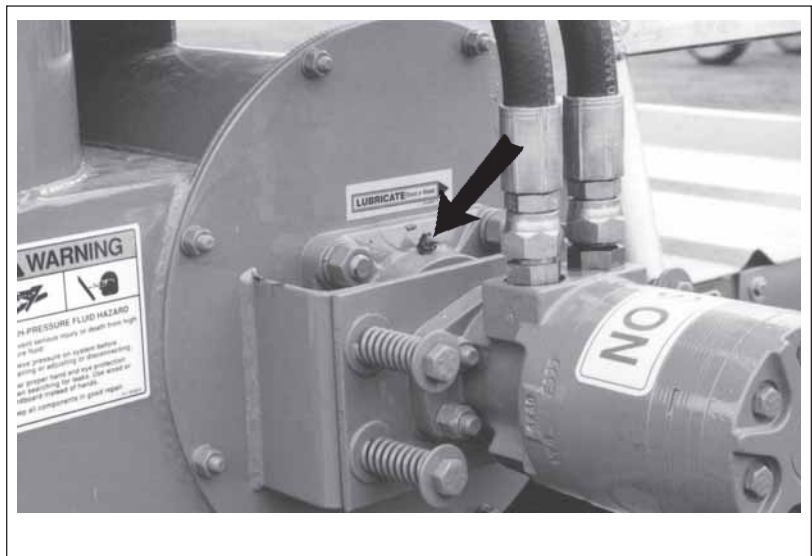


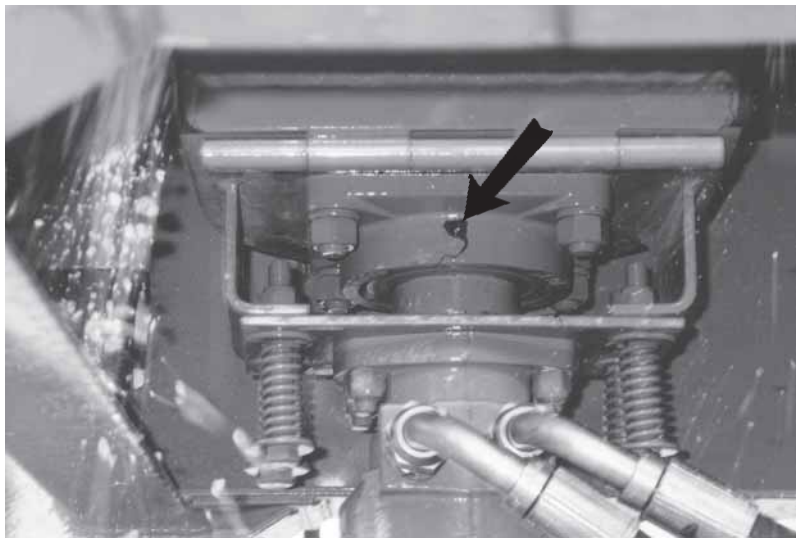
Fig. 7-3 TROUGH AUGER BEARINGS REAR

Monthly or 10,000 Miles (15,000 Km) (cont'd)

2. Grease the vertical auger: top and bottom.



Top



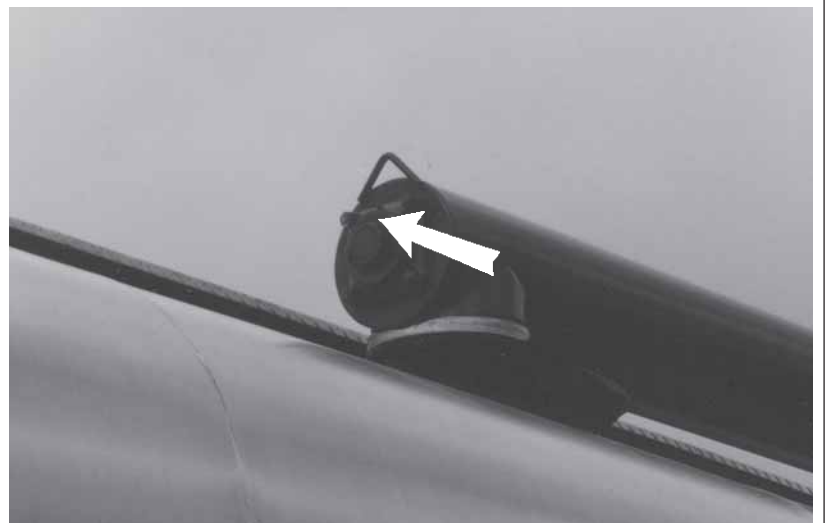
Bottom

Fig. 7-4 VERTICAL AUGER

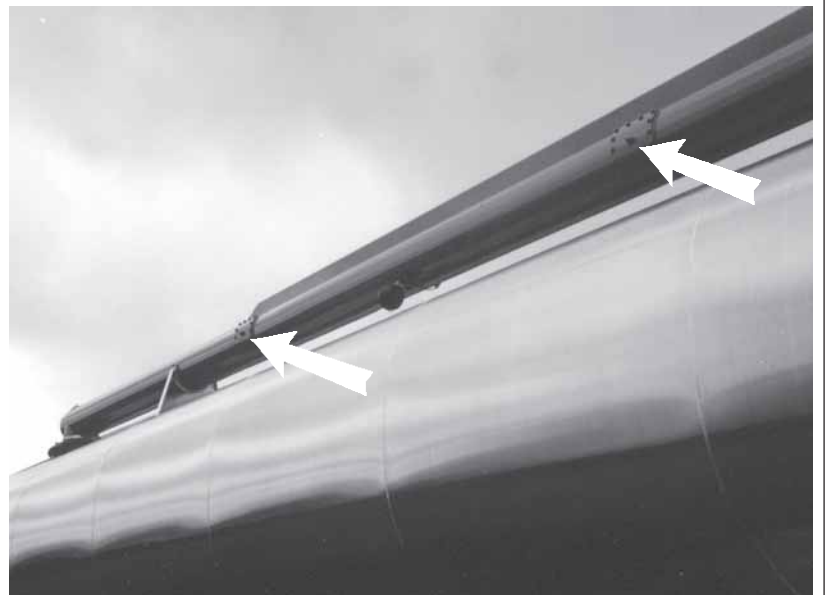
- Grease boom auger bearings: drive, driven and support bearings, if so equipped.



Drive



Driven



Support

Fig. 7-5 BOOM AUGER BEARINGS

Monthly of 10,000 Miles (15,000 Km) (cont'd)

4. Grease boom rotation collar.



Fig. 7-6 BOOM ROTATION COLLAR

5. Grease boom lift collar.



Fig. 7-7 BOOM LIFT COLLAR

6. Grease or oil boom rotation drive roller chain.

IMPORTANT

Lift boom out of saddle and rotate to left 270° while lubricating chain then rotate back to right 360°. When lubricating chain ensure that complete chain gets lubricated. Rotate 360°.



Fig. 7-8 ROTATION DRIVE ROLLER CHAIN

7. Grease the boom lift cylinder bushings (each end).



Fig. 7-9 LIFT CYLINDER BUSHINGS

8. Grease the boom rotation drive sprocket shaft.

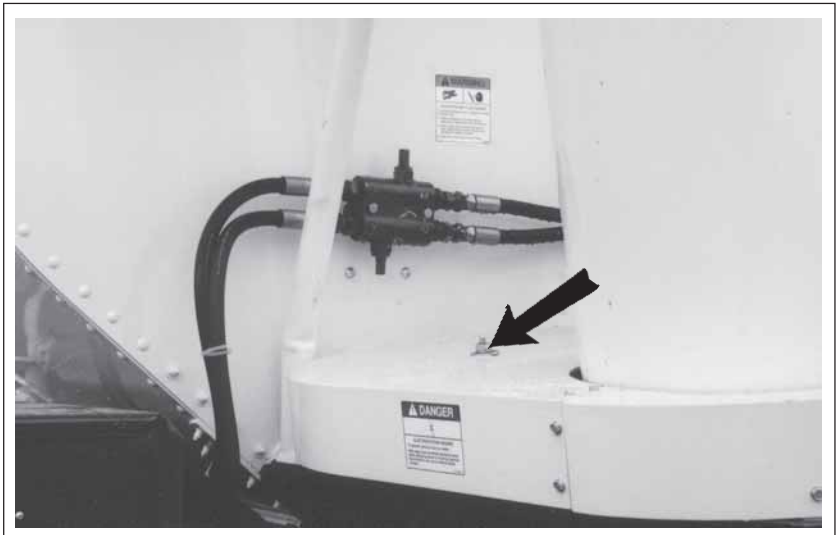


Fig. 7-10 BOOM ROTATION DRIVE SPROCKET

9. Grease the tank sliding gate shafts.



Fig. 7-11 SLIDING GATE SHAFTS

100,000 Miles (150,000 km) or Annually

1. Change hydraulic system oil.



Fig. 7-12 DRAIN PLUG

2. Change hydraulic system filter(s).



Fig. 7-13 FILTER

7.2 SERVICE RECORD

See Lubrication and Maintenance sections for details of service. Copy this page to continue record.

ACTION CODE: L LUBRICATE C CHANGE
 š CHECK

<div style="text-align: center;"> HOURS SERVICED BY MAINTENANCE </div>																				
	8 Hours, Daily or 500 Miles																			
š Hydraulic System Filter																				
Weekly, 10 Days or 5000 Miles																				
L Trough Auger Bearings front																				
10,000 Miles or Monthly																				
L Trough Auger Bearings rear																				
L Vertical Auger - Top & Bottom																				
L Boom Auger Bearings																				
L Boom Rotation Collar																				
L Boom Lift Collar																				
L Boom Rotation Dr. Roll Chain																				
L Boom Lift Cylinder Bushings																				
L Boom Rotation Dr Sprckt Shaft																				
L Tank Sliding Gate Shafts																				
100,000 Miles or Annually																				
C Hydraulic System Oil																				
C Hydraulic System Filter(s)																				

8 PERIODIC MAINTENANCE AND ADJUSTMENTS



MAINTENANCE SAFETY

1. Read and understand all the information in the Operator's Manual regarding maintenance, adjusting and servicing the Bulk Feed unit.
2. Place all controls in neutral, disengage PTO clutch, stop the engine, remove ignition key and set the park brake before adjusting, servicing or maintaining any part of the Bulk Feed unit.
3. Follow good shop practices:
 - Keep service area clean and dry.
 - Be sure electrical outlets and tools are properly grounded.
 - Use adequate light for the job at hand.
4. Block wheels before de-activating brakes.
5. Maintain air system and brake components in top condition at all times.
6. Maintain fasteners in running gear systems at their specified torque at all times.
7. Establish and maintain a Trailer Preventative Maintenance (TPM) program on your equipment. Some jurisdictions require this program and the maintenance of records on every commercial vehicle on the road for future reference.

Your trailer can only operate at top efficiency when it is maintained in good operating condition. The maintenance procedures are summarized from the component manufacturers instructions included with this manual. Only standard industry and component procedures are required to keep your trailer in top condition. All maintenance intervals are established for normal operating conditions. In light or intermittent conditions, the servicing and maintenance intervals can be extended. In heavy, extended or severe off-highway application, reduce the intervals for servicing and maintenance to keep the equipment in good condition. When a problem is found, correct the condition before continuing.

A good maintenance program will find conditions early when they are easily and quickly corrected before they become major problems. Operating your trailer in a defective condition, can lead to serious mechanical problems or can create safety hazards for the driver, bystanders or other operators.

8.1 TORQUE SPECIFICATION SUMMARY

Table 1 Recommended Torque Specifications

1. Air Ride Suspension		
Description	Size	Torque
Quik-Align™ Pivot Bolt	7/8"-9	475-525 Ft. Lbs
Shock Bolt	3/4"-10	150-175 Ft. Lbs.
Air Spring Bolt (Lower)	1/2"-13	25-35 Ft. Lbs.
Air Spring Nut (Upper)	3/4"-16	45-55 Ft. Lbs.
Brake Dust Shield Bolt	5/16"-18	160-180 In. Lbs.
ABS Bracket Bolt	1/4"-20	75-100 In. Lbs.

Table 1 Recommended Torque Specifications (cont'd)

2. Mechanical Suspension

Description	Size	Torque	
		Ft. Lbs.	N.m
Equalizer Shaft (All Spread) 49" Spread 54"-65-1/2" Spread 72"-109" Spread	1-1/4" Nut	575-625	780-850
	3/4" Capscrew	200-225	270-305
	2-1/2" Nut	300-325	410-445
	1-1/2" Nut	200-225	270-305
U-Bolt Nuts		300-325	410-445
Torque Arm Bolt Nuts	1"	160-200	216-270
Torque Arm Clamping Nuts	1/2"	80	110
	3/4"	175-200	236-270
Spring Retainer Nuts	1/2"	80	110

3. Wheel End Components

Description	Torque Range		Fastener Size
	(lb-ft)	N.m	
1. Hub-cap bolts	10-15	13-20	5/16"
2. Hub fill plug	15-20	20-27	3/8"
3. Adjustment nut - manual bearing adjustment (double nut)	Tighten to 200, loosen, tighten to 50, loosen 1/4 turn and check end play	136	Size depends on axle model and adjustment method.
		68	
4. Jam nut - manual bearing adjustment	250-300	340-408	5/8"
5. Brake mounting bolt	130-165	177-224	
6. Two-piece dust shield bolts (shown)			
• Forged spider	15-20	20-27	3/8"
7. Bolt-on bushing bolts	25-35	34-48	3/8"
8. Cam bushing bolts	25-35	34-48	3/8"
9. Air chamber nuts	80-125	109-170	5/8"

4. Wheel Nut

Stud Size	Wheel Type	Ft-lbs Torque (Dry)	Bolt Size	Ft-lbs Torque (Dry)
3/4" - 16	Disc	450 - 500	5/8" - 11	150 - 175
1-1/8" - 16	Disc	450 - 500	3/4" - 10	210 - 260
	Bud Unimount 10	390 - 440		
	WHD-8	400 - 600		

8.2 KINGPIN AND FIFTH WHEEL PLATE

The kingpin at the front of the trailer is the structural component used to transmit accelerating and decelerating loads into the trailer frame. It must be in good condition to perform as required.

Visually inspect the kingpin as part of the pre-trip inspection, at 5,000 miles (8,000 km) or weekly and annually as part of your normal preventative maintenance program. Be sure the kingpin does not have excessive wear, looseness, chipped out areas, cracks or bent mounting frame. If any kingpin shows such defects, it should be replaced immediately.

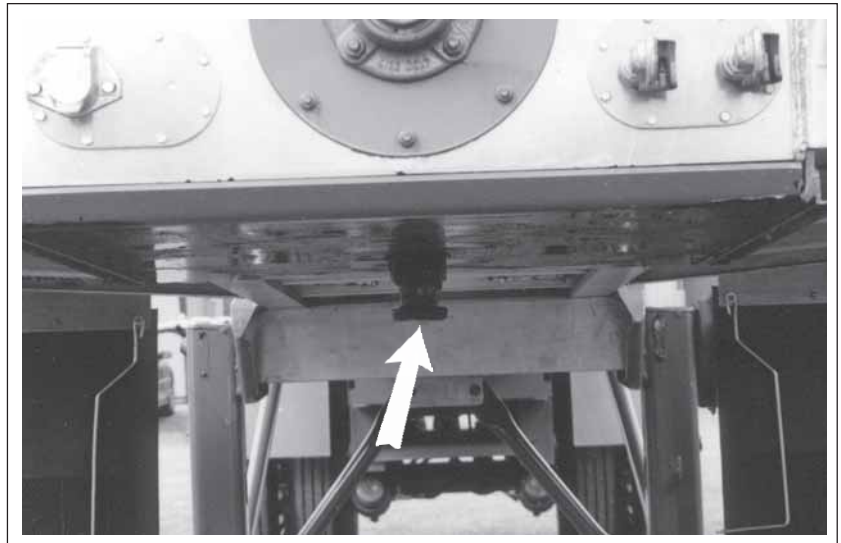


Fig. 8-1 KINGPIN

Visually inspect the frame and structure for bends, cracks or distortions as part of the pre-trip inspection procedure. Thoroughly inspect the structural integrity of the assembly every 25,000 miles (40,000 km) or every three months as part of your preventative maintenance program. Replace the entire assembly if any structural defects are found.

8.3 FIFTH WHEEL

A fifth wheel system is used on the towing tractor to secure the kingpin and carry the weight of the attached trailer. It must be maintained in good condition to perform as intended.

Visually inspect the fifth wheel as part of the pre-trip inspection to check for cracks, bends, chips or distortions of the frame and upper plate.



Fig. 8-2 FIFTH WHEEL

NOTE

Use a high-pressure washer or steam cleaner to remove all the dirt and grease from the fifth wheel assembly prior to each weekly inspection. Apply a fresh coat of grease to the fifth wheel assembly prior to hooking-up the trailer.

Clean the assembly every 5,000 miles (8,000 km) or bi-monthly and annually to perform a thorough inspection. Check the frame and upper plate for cracks, bends, chips or distortions.

When the components are clean, check that the lock closes completely around the kingpin.

To adjust the lock:

1. Obtain a Holland kingpin lock tester and place in the throat of the lock. Close the lock.
2. The jaws should be snug around the tester but not binding.
3. Use the adjusting nut on the front edge of the fifth wheel to set the clearance of the jaws.
4. Use a light oil to lubricate all moving parts prior to returning to service.

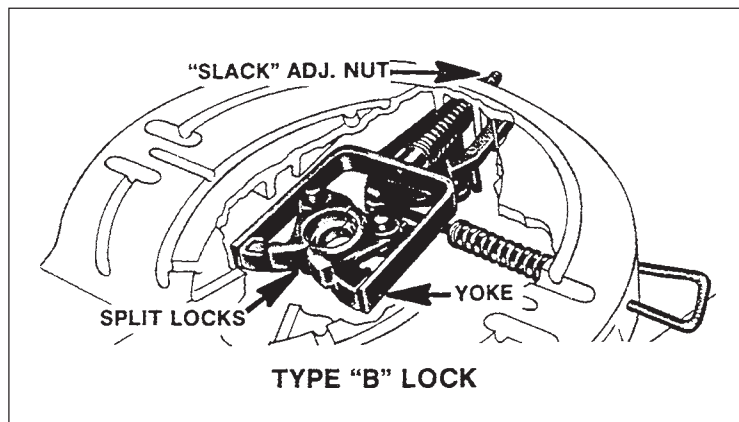


Fig. 8-3 KINGPIN LOCK

8.4 AXLE ALIGNMENT

A standard axle is used as the main transverse structural member to transmit loads between the trailer frame and the surface contacting components. All running gear components are attached to or form part of the axle assembly.

Although there is very little that can go wrong with the axle itself, loose, bent or damaged attaching components can cause the axle to go out of alignment. This misalignment will be found during the regularly scheduled 25,000 mile inspection. However, axle misalignment shows itself most commonly by accelerated tire wear and dogtracking by the trailer. Visually check the tire wear when checking air pressure. The driver should identify these handling characteristics to service personnel for correction.

To check axle alignment, follow this procedure:

1. Select a working area that is level, with a compacted surface and is large enough to provide access from all sides.
2. Move the trailer forward and backward several times to remove any binding from the components.
3. Stop the trailer when moving in the forward direction without using trailer brakes. This will give the components a forward bias with no binding.
4. Unhook the trailer and support on the landing gear at the normal height or parallel to the ground.
5. Install a commercially available axle extender on each axle or remove the wheels to prevent any components from interfering with the measurements.

8.4 AXLE ALIGNMENT (cont'd)

6. Attach an S hook to a steel tape and measure the distance between the kingpin and the end of each axle. Dimensions A and B should be equal within $\pm 1/8$ inch (0.125 in) (3.1 mm).
7. Adjust the suspension mounting system as required to set dimension A and B within $1/8$ inch (0.125 in) (3.1 mm). Refer to suspension system instruction brochure for detailed adjustment procedure.

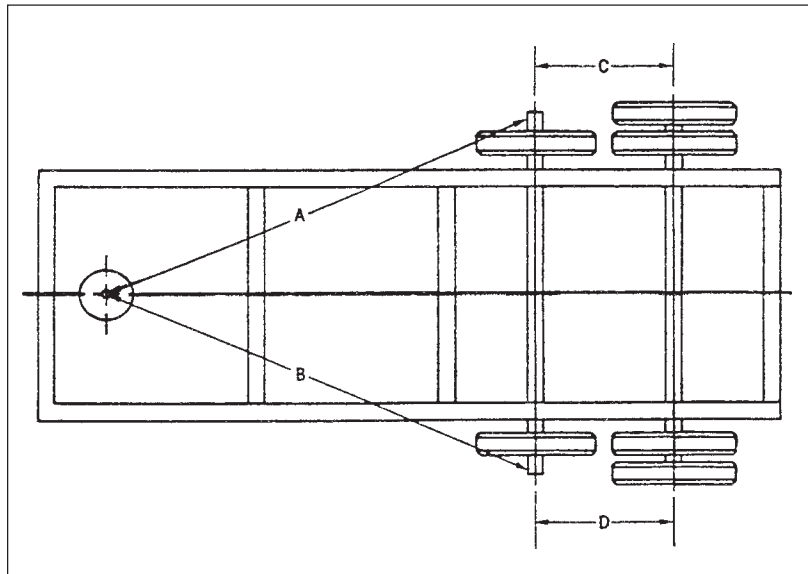


Fig. 8-4 AXLE DIMENSIONS

8. Use a trammel bar to measure the road and curbside dimensions between the first and second axles. Dimensions C and D should be within $1/16$ inch (0.0625 in) (1.6 mm).

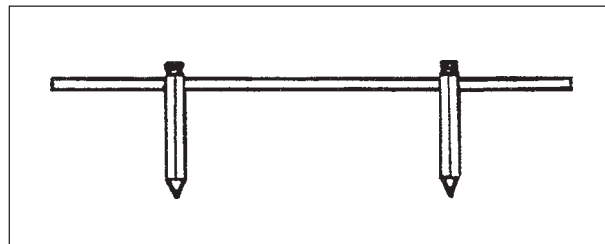


Fig. 8-5 TRAMMEL BAR

9. Adjust the suspension system as required to set this dimension to its recommended tolerance.
10. Repeat measuring and adjustment procedure on the third axle if so equipped.
11. Tighten all fasteners to their specified torque. Do not allow any suspension system or running gear fasteners to loosen.

IMPORTANT

Always use a torque wrench when tightening fasteners. The correct torque on a fastener provides the proper clamping force on the adjacent components and they will perform as expected.

12. The front axle must be aligned to the kingpin with second and third axles adjusted to the front axle.
13. Always check axle alignment after repairing the suspension system.

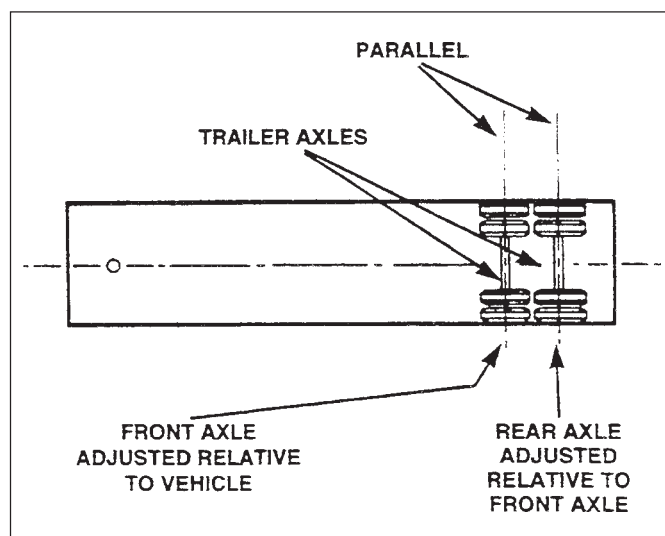


Fig. 8-6 ALIGNED

8.5 WHEEL HUBS/BEARINGS

Some axles use an oil bath design for lubricating wheel bearings. It is a virtual zero maintenance system providing that the oil remains in the hub.

Visually check the hub every day for leaks when checking tire pressure during pre-trip, daily, refueling, or rest stop inspections. If oil leaks are detected on any hub, repair the leak and refill the hub before proceeding.

A. Oil Leaks:

Visually inspect the hub for leaks every time the tire pressures are checked. Leaks will normally be visible as dust collects on the escaping oil. Stop and correct the leak immediately to prevent running the hub low on oil. Running low or without oil will quickly overheat the hub and cause the bearings to seize. Change the oil in the hub when installing new seals to correct a leak.

B. Oil Level:

1. Check the oil level in each wheel hub every 5,000 miles (8,000 km) or weekly and whenever an oil leak is found. Clean the end plate of the hub to remove the dust, dirt or mud build-up.

The oil should be visible to the top of the outer concentric circle of the end cap. Add oil as required through the fill plug in the hub. Always use clean oil and prevent contaminants from entering the hub when adding or changing oil.

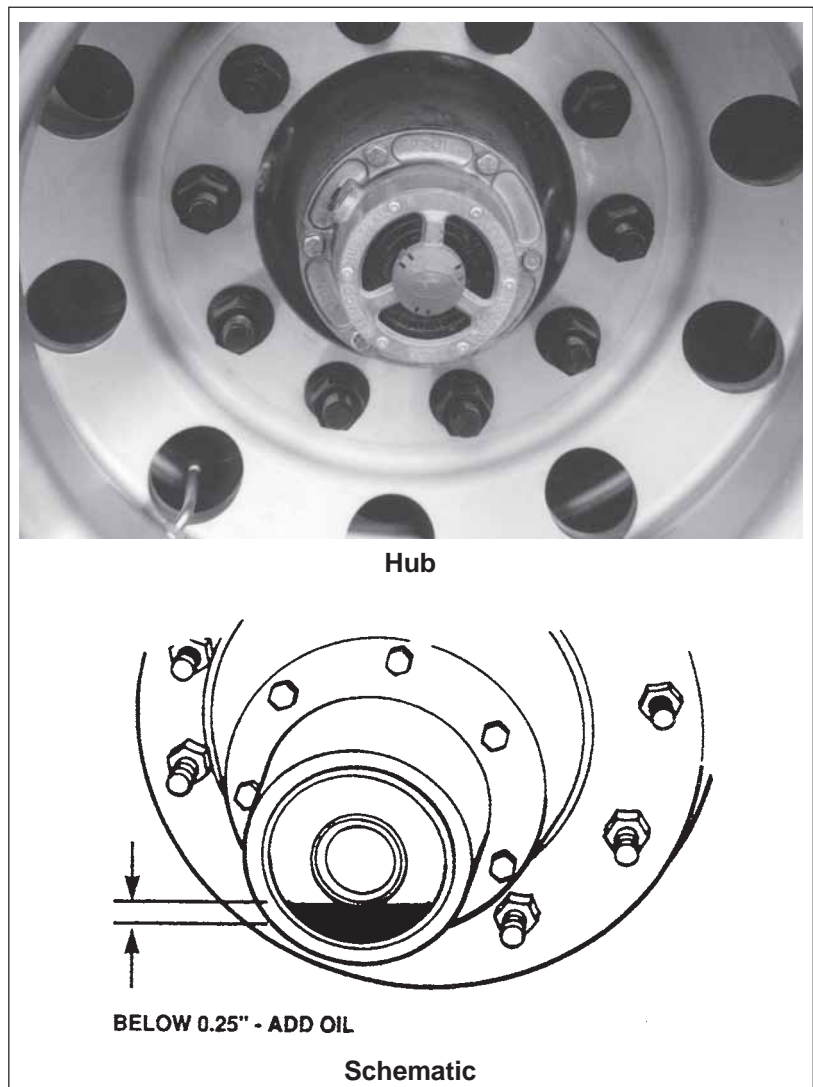


Fig. 8-7 OIL LEVEL

2. Change the oil every 100,000 miles (160,000 km), annually or whenever the axle nuts are retorqued or the brakes are relined. The hub cavities must be opened when retorquing axle nuts and changing oil should be done as part of the procedure.

8.5 WHEEL HUBS/BEARINGS (cont'd)

C. Wheel Bearings:

Wheel bearings carry and transmit the load between the wheels and the axles. In addition to proper lubrication, the bearings must have the recommended end play to perform as expected. Bearing end play is set and controlled by the torque of the axle nuts on the end of each spindle. Each hub must seat securely on its bearings to prevent wobble or slop in the system. Turning the wheel or wobbling it indicates the condition and tightness of the hub/bearing assembly.

1. Turning/Wobble:

- a. Park the trailer on a level, hard surface and release the brakes.

- b. Place chocks in front of and behind each wheel.

- c. Jack each axle up until the tire clears the ground.

- d. Support the axle on a safety stand to prevent slipping or tipping.

- e. Turning the wheel slowly to check the condition of the bearings and to determine if the brakes are dragging.

- f. **Dragging Brakes:** Can



Fig. 8-8 WHEELS

be felt as a steady drag on the turning of the wheel or at the same position or arc of the rotation. Adjust the brakes to eliminate the drag before resuming work.

- g. **Bearing Condition:** Can be felt as the wheel turns. Bearings in good condition turn easily and smoothly. Bearings in poor or bad condition can be felt through the wheels as scraping, grinding, dragging or bumps. Replace bearings before resuming work.

- h. **Wobble:** Grasp each side of the

wheel or tire and wiggle the wheel and assembly. If the wheel or hub wobble on the spindle, the bearings have lost their end play and the axle nuts require tightening.

NOTE

If the bearings are not in good condition, replace them before setting the end play.

8.5 WHEEL HUBS/BEARINGS (cont'd)

C. Wheel Bearings (cont'd):

2. Bearing End Play:

- a. Place a pan under the hub drain plug.
- b. Remove the drain plug from the hub and drain the oil.
- c. Remove the hub end plate and lay to the side.
- d. Remove the set screw from the jam nut.
- e. Remove the jam nut and perforated lock washer from the spindle.
- f. Use a torque wrench to tighten the adjusting nut 200 ft-lbs. (136 N.m) while rotating the wheel assembly in both directions.
- g. Back the adjusting nut off to zero torque.
- h. Retorque the adjusting nut again to 50 ft-lbs (68 N.m) of torque while rotating the wheel assembly in both directions.
- i. Loosen the nut 1/4 turn.
- j. Install the perforated lock washer. Be sure the adjusting nut pin aligns with the hole in the lock washer. Turn washer over and/or adjusting parts as required.
- k. Install jam nut and tighten to 250-300 ft-lbs. (340-408 N.m).

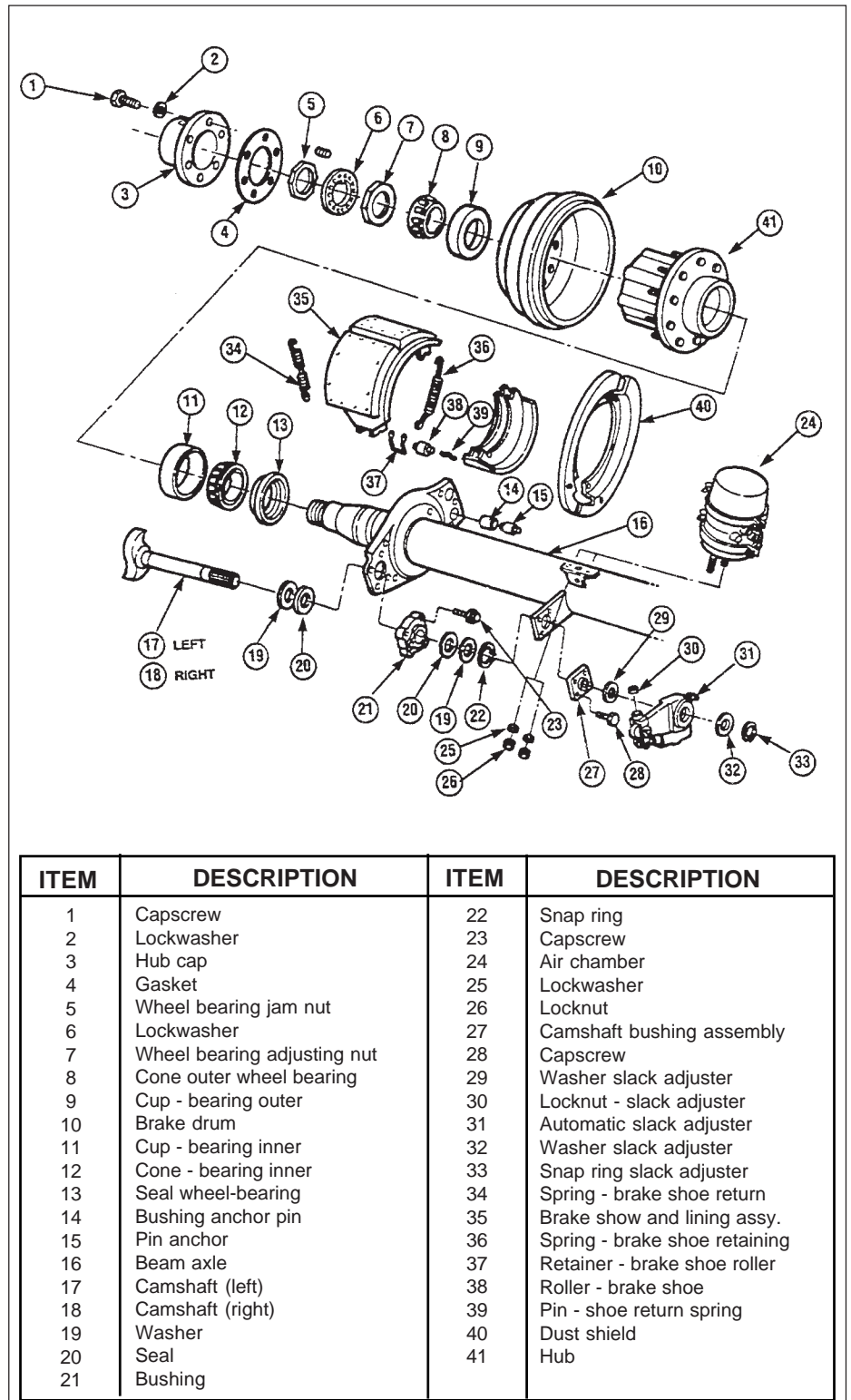


Fig. 8-9 SPINDLE COMPONENTS

8.5 WHEEL HUBS/BEARINGS (cont'd)

- I. Check bearing end play by:
 - i. Attaching a magnetic base dial gauge indicator to the end of the spindle.
 - ii. Push the wheel in while rotating the wheel slightly until the dial gauge reading doesn't change.
 - iii. Zero dial gauge.
 - iv. Pull wheel assembly out while rotating wheel slightly until dial reading doesn't change.
 - v. Dial indicator will read bearing end play.
 - vi. If end play does not register between .001-.005 inches (0.025-.125 mm), readjust end play.
 - vii. Replace components if readjusting does not give end play tolerance within specs.

- m. Install a new gasket on hub face cap.
- n. Install hub face cap and tighten mounting cap screws to their specified torque.
- o. Add the specified amount of oil to the hub and secure fill plug. Check for leaks. Correct leaks before resuming operation.

- p. Remove safety stand from under axle and lower wheel to the ground.

- q. Repeat checks on all other axles.

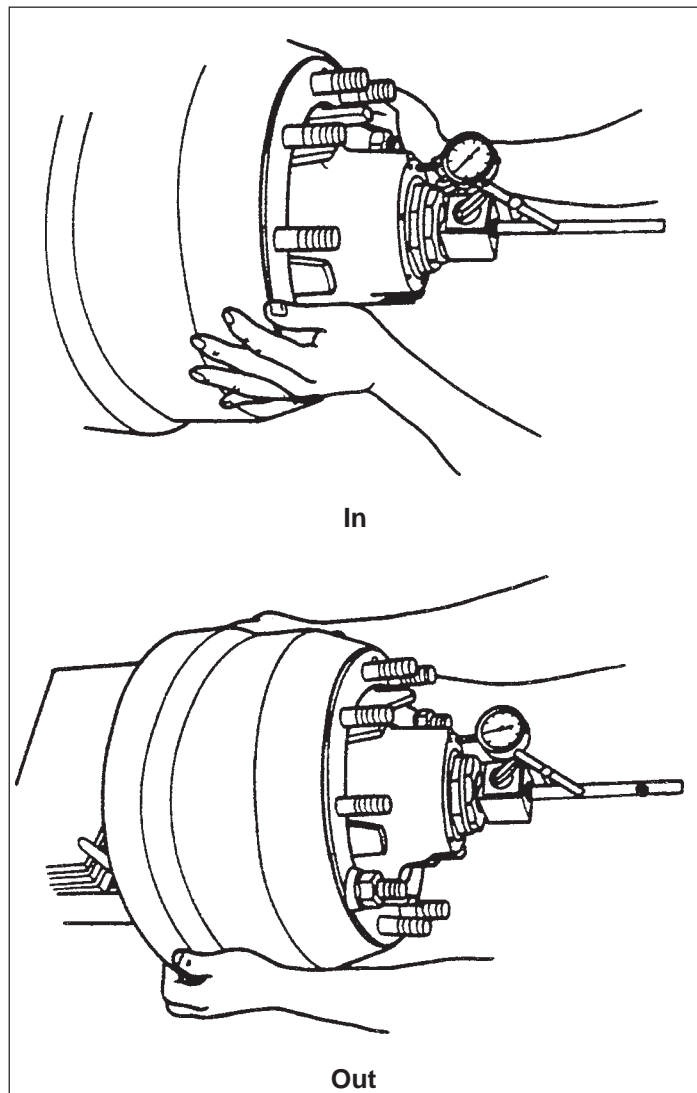


Fig. 8-10 DIAL INDICATOR

8.6 WHEELS

A variety of steel or aluminum wheels can be used on the trailer depending on customer preference or application requirements. Wheels must be maintained in good condition and all fasteners tightened to their specified torque level to obtain the expected life and performance.

Loose fasteners are the most common cause of wheel problems on a trailer. Always retorque the wheel fasteners per the break-in schedule of 100, 500, 1500 and 5,000 miles (160, 800, 2500 and 8000 km) when the unit is new and after a wheel has been removed. Always use an accurate calibrated torque wrench when tightening fasteners. A loose fastener is defined as one that is not tightened to its specified torque. A loose fastener does not provide the required clamping, anchoring or holding forces to stabilize the adjacent components. Insufficient clamping forces can lead to flexing, bending, cracking, hole elongation or other component deterioration that cause failures and/or accidents. Always keep fasteners tightened to their specified torque. Over-torquing can overload certain components, causing compression cracks and strip nuts or studs. Over-torquing fasteners can be as detrimental as under-torquing. Always tighten fasteners to their specified torque.

Use an accurate torque wrench to retorque wheel fasteners every 10,000 miles (15,000 km) or monthly whichever comes first. Always retorque wheels per the break-in schedule whenever a wheel is removed and remounted.

Always follow the recommended mounting procedure when installing wheels to the trailer.

1. Disc Wheels (Stud Pilot Style):

- Mount single or inner dual wheel on hub. Be careful not to damage the threads on any of the studs.
- Snug the nuts up in the alternating sequence shown to center it on the hub and insure an even contact between the wheel and hub.
- Tighten nuts to their specified torque using

IMPORTANT

Left-hand threads are used on the left side of the vehicle. Right-hand threads on right.

the same alternating sequence.

- Mount outer dual. Do not damage the threads when sliding the wheel over the studs.
- Snug up the nuts in the alternating sequence shown to center it on the hub and to provide even contact.
- Tighten the outer wheel nuts to their specified torque.

IMPORTANT

When retorquing inner nuts of double nut design, always back off outer nut several turns, then retorque them.

Table 2 Recommended Wheel Stud Torque (Disc Wheels)

Stud Size	Wheel Type	Ft-lbs Torque (Dry)
3/4"-16	Disc	450 - 500
1-1/8"-16	Disc	450 - 500
15/16-12	Disc	750 - 900
1-5/16-12	Disc	750 - 900
	Bud Unimount 10	390 - 440
	WHD-8	400 - 600

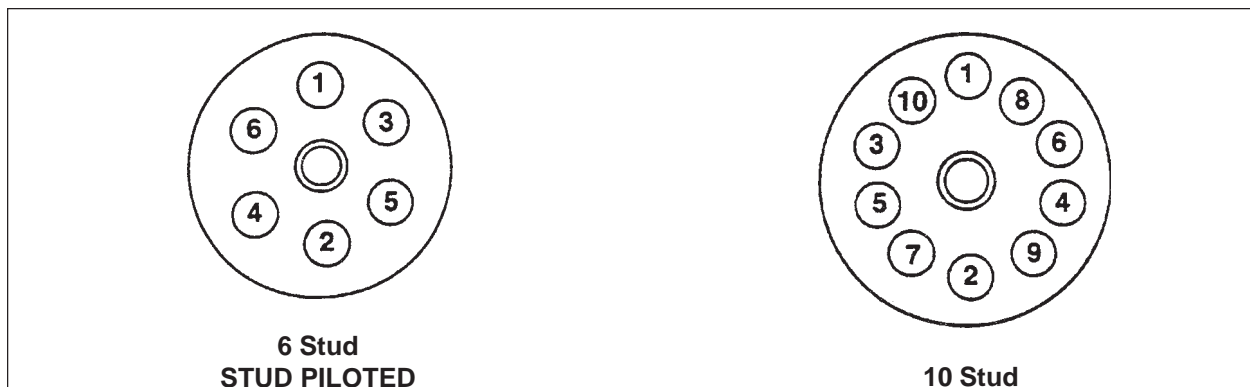


Fig. 8-11 NUT TORQUE SEQUENCE

2. **Hub Piloted Wheels:**

- a. Mount inner wheel on the hub.
- b. Slide on the hub guide until the wheel is snug against the hub. Be careful not to damage the threads on any of the studs.
- c. Mount outer dual wheel on the hub and snug up against the inner wheel.

NOTE

Add a drop or 2 of oil on the end of the bolt, threads and the nuts and flanges.

- d. Install nuts and tighten in alternate sequence shown.

Table 3 Recommended Wheel Bolt Torque

Stud Size	Ft-lbs Torque (Oiled)
M22 x 1.5 (33 mm or 1-1/2 Hex)	450 - 500
M20 x 1.5 (30 mm Hex)	280 - 330

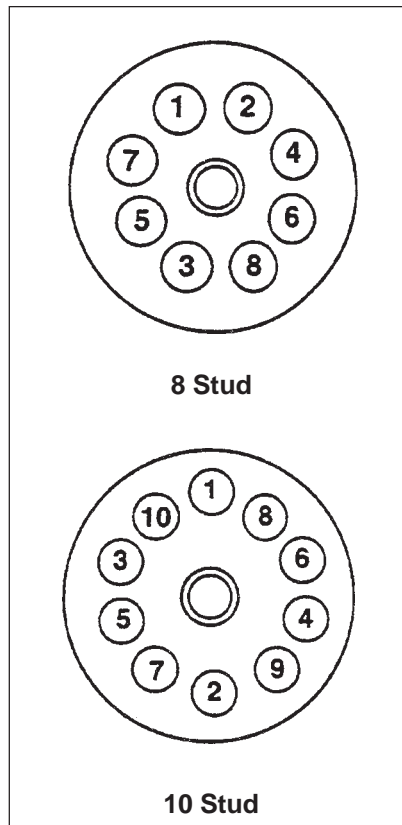


Fig. 8-12 HUB PILOTED

3. **Rim/Wheel (Cast Spoke):**

- a. Inspect and clean all the parts. Replace any damaged components.
- b. Place rims and spacer band on wheel. Be sure to space valve stem between spokes.
- c. Secure clamps evenly in position.
- d. Snug up the nuts in the alternating sequence shown to allow the inside rim to seat itself on the mounting bevel and avoid wheel wobble.
- e. Tighten the nuts evenly in small increments in the shown alternating sequence until all nuts are tightened to their specified torque.
- f. Check for runout and redo if necessary.

Table 4 Recommended Wheel Bolt Torque (Spoke Wheels)

Bolt Size	Ft-lbs Torque (Dry)
5/8" - 11	150 - 175
3/4" - 10	210 - 260

IMPORTANT

Do not over-torque fasteners. Over-torquing can strip threads, collapse spacers or lead to other problems that cause loose fasteners. Use an accurate torque wrench when tightening fasteners.

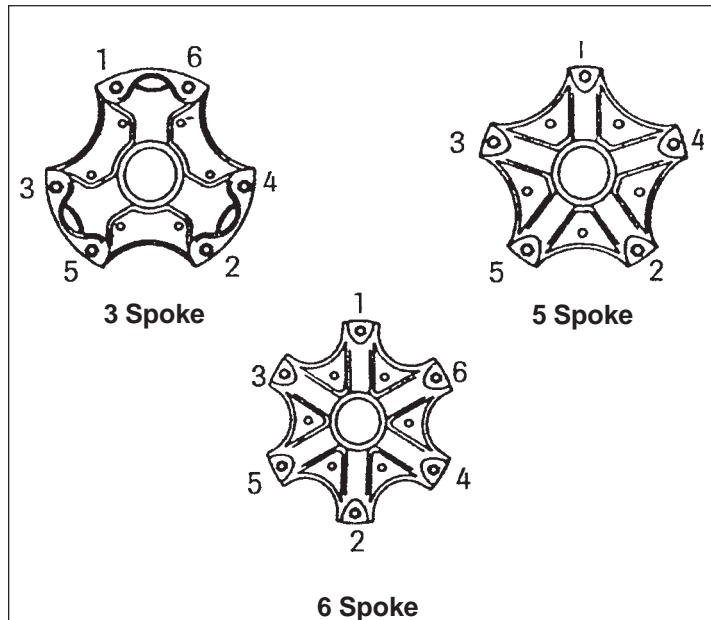


Fig. 8-13 RIM/WHEEL TORQUE SEQUENCE

8.7 TIRES

Tires are one of the most important components on a trailer and must be maintained in top condition to obtain their desired load carrying capacity and durability. Tire wear rate can be used as an indicator of the condition of the axle alignment or suspension system. Poorly maintained tires will wear rapidly or deteriorate and fail quickly and suddenly. A poorly maintained tire can and will affect adjacent components leading to their potential failure as well.

Proper tire maintenance includes but is not limited to:

1. Inflation Pressure:

Operating at an incorrect inflation pressure is the most common maintenance problem with tires. Tires should be checked frequently to be sure they are at their specified pressure.

It is recommended that tire pressure be checked at the start of each working day and at least one other time during the day. Always use an accurate hand gauge when checking the pressure and check each tire. Carry it with your unit so it is always available when needed. Best time to take tire pressure is when tire is cold. Every tire has its specified operating pressure molded into the sidewall. Adjust the pressure as required to obtain the specified inflation pressure when the tire is cold.

Tire pressure will normally increase 10 to 15 psi during operation as the tire heats up. If the pressure exceeds this normal increase, it indicates the tire may be overloaded, underinflated, driven too fast, improperly sized or a combination of these factors. Identify the cause of the problem and correct it before resuming work.

a. Underinflation:

Operating at lower than the specified pressure is a tire's worst enemy. Use an accurate tire pressure gauge to check the pressure at the start of each working day, every few hours during the day and/or whenever the handling characteristics change suddenly. Underinflation will increase tread wear and cause a deterioration of the tire body leading to a separation of the tread from the body. An underinflated tire is soft and deflects more than it should causing fatigue cracks or breaks in the body cord construction leading to sudden air loss.

Operation with a low or flat tire on a dual will generate a lot of heat in the underinflated tire from internal friction that it can and will disintegrate or catch on fire. It also causes overloading of the adjacent tire on the axle or axles and could lead to their failure also.

b. Overinflation:

Inflating a tire over its specified pressure can lead to serious problems also. Overinflation creates a more rigid tire that does not absorb road shocks as well as it should. Shock loading from impacting bumps or pot holes can break the fabric of the tire and/or transmit the higher loads into the rim, wheel and adjacent components causing them to fail as well. Overinflated tires cut, snag or puncture more easily than properly inflated tires. Also overinflating tire will not increase its load carrying capacity.

8.7 TIRES (cont'd)

2. Tire Matching and Spacing on Duals

Tires on a dual assembly must be matched for size (diameter or rolling radius) and type of construction to obtain the desired and expected performance and life.

a. Matching of Size:

Tire sizes can vary between manufacturers and as they wear. Special care must be taken to be sure the tire size (rolling radius, diameter or circumference) is within the following dimensions:

Rolling radius: 1/8 inch (3 mm)
Diameter: 1/4 inch (6 mm)
Circumference: 3/4 inch (19 mm)

Measure the tire when it is mounted, inflated to its specified pressure and not loaded. The easiest method is to use a steel tape to measure the circumference of the tire.

Unequal sized tires will require the larger tire to carry more of the load and potentially overload it. Overloading accelerates the wear and can lead to tire failure. When the one tire fails, the remaining tire or tires will then also be overloaded. The smaller tire will not contact the road surface properly and will wear in an irregular manner giving poor durability.

b. Tire Construction:

Customers can use radial or bias ply tires on their trailer. However, it is recommended that different types of tires not be mixed on an axle. Each type of tire has different deflection, cornering and spring characteristics. These differing characteristics cause the tires to always fight each other during operation and will give erratic handling and poor wear characteristics when mounted on the same axle. Different types can be mounted on different axles but not on the same axle.

c. Tire Spacing:

A wide variety of rims can be used on the trailer and each will provide a different offset. Select the rims to provide sufficient space and clearance between the sidewalls of the tires. Normally there should be at least 2 inches (50 mm) and 3 inches (75 mm) between the sidewall of a bias ply and radial dual tire assembly respectively. This spacing will provide sufficient clearance for each type of tire to deflect as they rotate and when they impact a pothole or bump in the road. If they touch during operation, they will wear or abrade at the contact point. In addition, tires that are too close do not shed dirt, trash or stones that can get between them during operation as well as properly spaced tires.

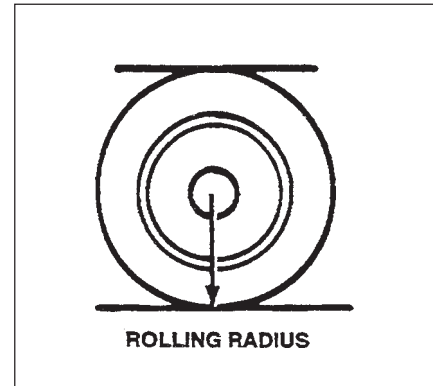


Fig. 8-14 TIRE DIMENSIONS

8.8 BRAKES

All components in the brake system must be maintained in good condition for the system to perform at top efficiency. It is recommended that brakes and associated components be checked, serviced and maintained per the Trailer Preventative Maintenance Schedule (TPM) for the trailer. In this section, the basic brake disassembly and assembly procedure will be covered. Refer to the axle manufacturers service manual for a more detailed repair and rebuilding procedure.

Check brakes frequently to keep them in top condition. Poorly maintained brakes will not stop the trailer as effectively as well-maintained brakes and in the extreme could fail completely leaving no brakes or no ability to stop the unit.

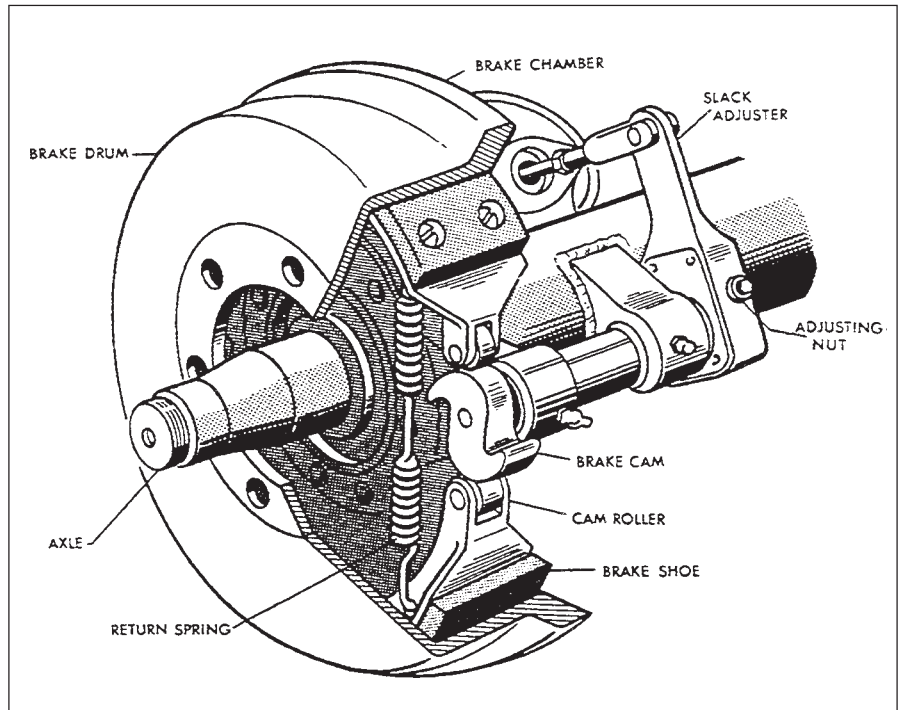


Fig. 8-15 BRAKE SYSTEM

It is recommended that the driver checks the brakes at least once during each working day when checking tire pressure and performing a quick visual of the unit. Use your hand to check the temperature of the drum. All drums should be approximately the same temperature if the system is functioning properly. If any drum is significantly warmer or colder than the rest, it indicates a problem. Determine the cause of the problem and correct it before resuming work. By discovering and correcting it while it is minor, major repair, expense and down time can be prevented.

At 25,000 miles (40,000 km) or every 3 months when the axle is raised off the ground for the complete wheel end inspection, check the brakes at the same time. When the wheels are turned by hand, the wheel end should decrease speed slowly. If it does not, the brakes could be dragging or there could be a problem with the bearings. Dragging brakes will also be detected by hot drums during the daily drum temperature checks. Adjust the brakes to correct the problem.

Remove the brake dust covers (if so equipped) to access the shoes. Check the thickness of the linings. Reline or replace shoes when the lining thickness is less than 1/8 inch (3 mm). Uneven wear among the brake shoes on a trailer indicate that the braking system has not been set or maintained properly causing uneven application and wear. If uneven lining wear appears, reset the system to provide even application of all the shoes. Do not operate when the linings are less than 1/8 mile (3 mm) to prevent the lining anchor rivet or bolts from contacting the drum. Head contact with the drum will cut grooves in the surface and require extra machining to remove them when rebuilding the brakes.

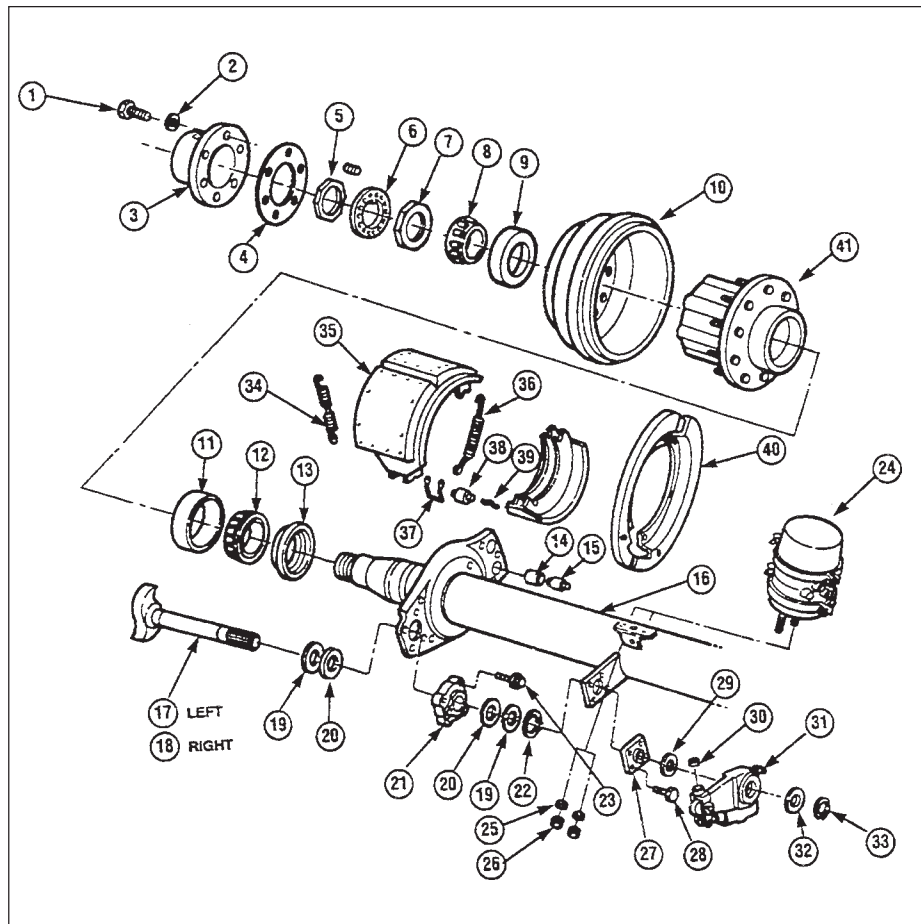


Fig. 8-16 EXPLODED VIEW

Several types of friction material are available for use on the brake shoes. Each has its own friction coefficient and braking characteristics. Select the one that best fits your application but do not mix materials on the same trailer. Differing materials require different application forces to obtain the same braking force and a braking system can only apply one force when it is properly set.

Recent changes in environmental laws have banned the use of asbestos including brake linings. Always use the appropriate safety gear when removing brake shoes containing asbestos from your trailer. Replace the shoes that are equipped with approved material.

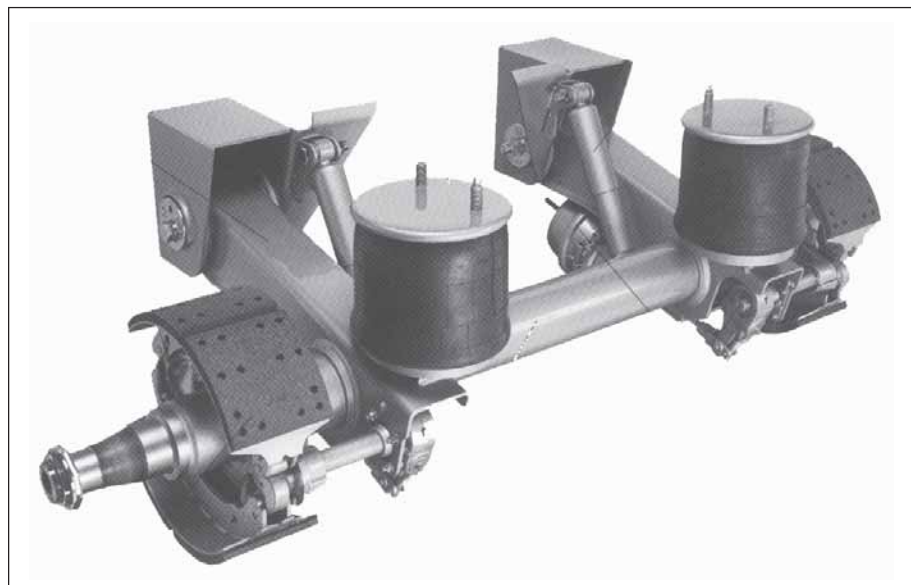


Fig. 8-17 AXLE

A. Removing Brakes:

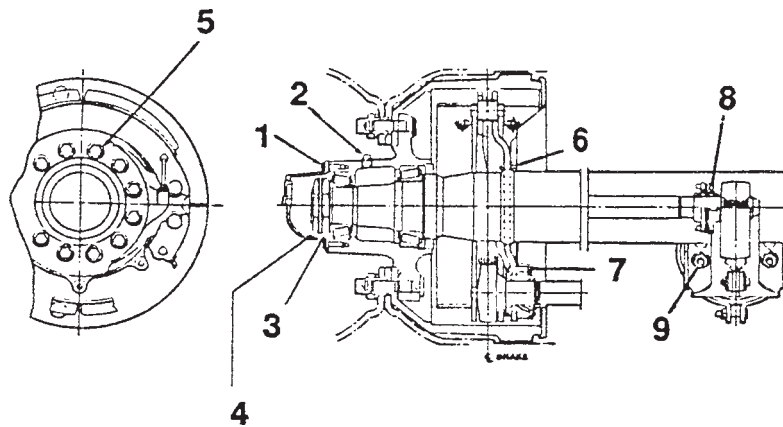
1. Position the trailer on a level hard surface.
2. Exhaust all the air from the air system.
3. Jack the axle up and place on safety stands.
4. Remove the wheel assembly from the axle.
5. Release the slack adjuster (Refer to Section 8.6).
6. Disable or cage spring brakes if so equipped.
7. Drain oil from hub and remove spindle end components.
8. Remove the hub and drum assembly. Support with a hoist as the assembly slides off the spindle. Use a puller if required.
9. Remove roller retaining clip from the bottom and top brake shoe cam rollers.
10. Disconnect and remove bottom shoe return spring.
11. Rotate bottom shoe to remove retaining springs.
12. Lift top shoe to remove.
13. Disconnect push rod from slack adjuster.
14. Back off and remove slack adjuster.
15. Remove cam shaft.

B. Installing Brakes:

1. Inspect all the components. Replace any that are cracked, bent or worn.
2. Lubricate the camshaft spline, slack adjuster gear and slack adjuster pins with anti-seize compound.
3. Install cam shaft and slack adjuster. Secure with snap rings.
4. Adjust slack adjuster to its required angle and attach to the push rod. Release slack adjuster pawl if so equipped.
5. Use a good quality brake grease to lubricate the anchor pins and rollers where they contact the brake shoes.
6. Place the upper shoe in position.
7. Place the lower shoe in position and attach 2 new retaining springs.
8. Rotate lower shoe forward and attach new brake shoe return spring.
9. Install both cam rollers and secure with retainers.
10. Install and secure the remaining wheel and components.
11. Repeat with other wheel ends as required.
12. Tighten all fasteners to their specified torque.

Manual Bearing Adjustment

- a. Tighten to 200 ft-lbs.
- b. Completely loosen.
- c. Tighten to 50 ft-lbs.
- d. Loosen 1/4 turn



Description	Torque Range		Fastener Size
	(lb-ft)	N.m	
1. Hub-cap bolts	10-15	13-20	5/16"
2. Hub fill plug	15-20	20-27	3/8"
3. Adjustment nut - manual bearing adjustment (double nut)	Tighten to 200, loosen, tighten to 50, loosen 1/4 turn	136 68	Size depends on axle model and adjustment method.
4. Jam nut - manual bearing adjustment	250-300	340-408	
5. Brake mounting bolt	130-165	177-224	5/8"
6. Two-piece dust shield bolts (shown) • Forged spider	15-20	20-27	3/8"
7. Bolt-on bushing bolts	25-35	34-48	3/8"
8. Cam bushing bolts	25-35	34-48	3/8"
9. Air chamber nuts	80-125	109-170	5/8"

Fig. 8-18 BRAKE/WHEEL END COMPONENTS

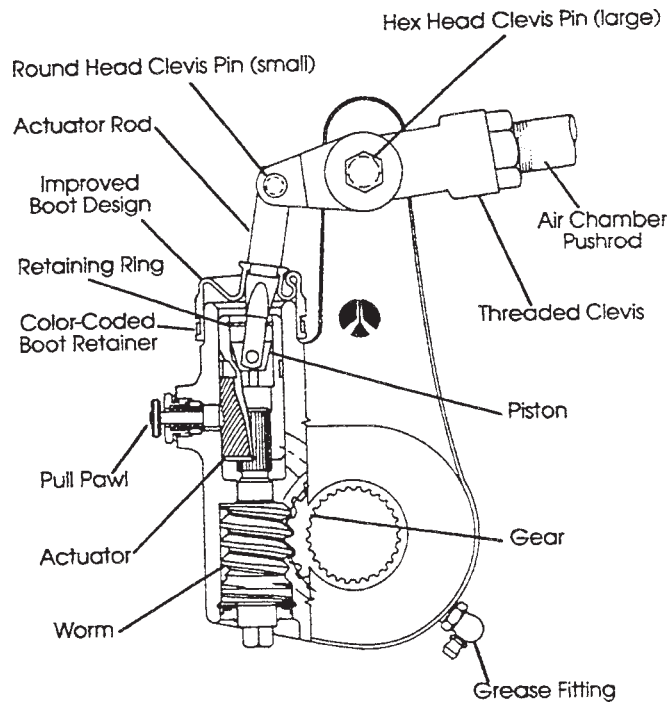
8.9 SLACK ADJUSTERS

8.9.1 ROCKWELL AUTOMATIC SLACK ADJUSTER

1. The air chamber push rod extends beyond its pre-determined optimum stroke length, the change in geometry between the chamber pushrod and slack lever arm raises the slack adjuster actuator rod.
2. The piston contacts the retaining ring and lifts the actuator.
3. If adjustment is required, the spiral serrations on the actuator are lifted over the serrations on the pawl.
4. When the push rod retracts, it forces the actuator downward into the pawl serrations and the actuator rotates.
5. As the actuator rotates downward, it turns the worn gear that turns the gear/spline/camshaft to maintain the brake adjustment.
6. Pull the pawl out and block in the out position when disassembling the brake system.
7. Use the bottom nut to turn and adjust the gear position.



Installed



Schematic

Fig. 8-19 ROCKWELL SLACK ADJUSTER (TYPICAL)

8.9 SLACK ADJUSTERS (cont'd)

8.9.2 MANUAL AND AUTOMATIC SLACK ADJUSTER MAINTENANCE

In an S-cam type foundation brake, the final link between the pneumatic system and the foundation brake is the slack adjuster. The arm of the slack adjuster is fastened to the push rod of the chamber with a clevis and the spline end is installed on the brake camshaft.

Primarily, the slack adjuster is a lever that converts the linear force of the air chamber push rod into a torque which turns the brake camshaft and applies the brakes.

Two types of slack adjusters are in use: manual type slack adjusters, which periodically require a manual adjustment and automatic slack adjusters which will automatically adjust during normal service braking applications. All slack adjusters utilize the worm and gear principle and fundamentally differ only in their torque limit specification.

MANUAL SLACK ADJUSTERS

Manual slack adjusters contain four basic components: the body, worm gear, worm shaft, and locking screw or collar. See Fig. 8-20.

The worm shaft of a slack adjuster incorporates an external adjusting hex. Turning the adjusting hex rotates the worm shaft which turns the worm gear and brake cam shaft, thus spreading the brake shoes and reducing drum-to-lining clearance.

Higher torque-rated slack adjusters use the lock ball or plunger and worm shaft indent principle adjustment lock. The lock ball or plunger must engage the worm shaft indent after the adjustment is completed. An audible metallic click can be heard when engagement is made.

IMPORTANT

Manual and automatic slack adjusters are for brake adjustment and will not compensate for faulty foundation brakes.

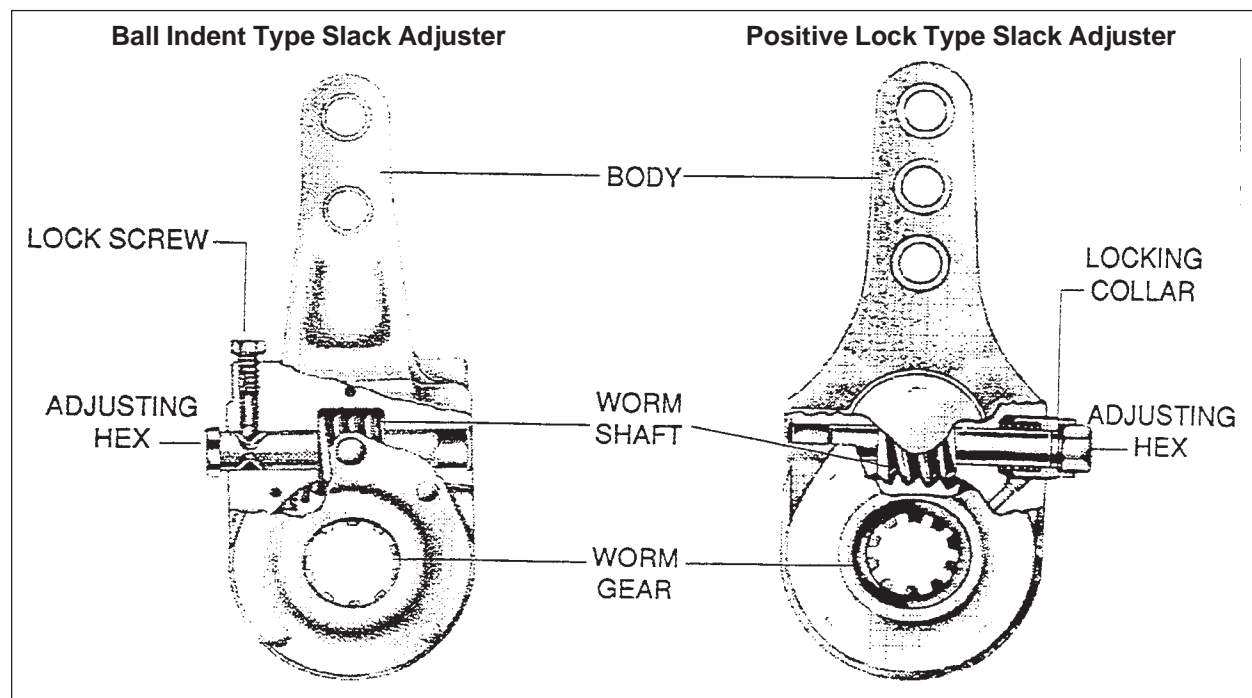


Fig. 8-20 MANUAL SLACK ADJUSTERS

8.9 SLACK ADJUSTERS (cont'd)

8.9.2 MANUAL AND AUTOMATIC SLACK ADJUSTER MAINTENANCE (cont'd)

AUTOMATIC SLACK ADJUSTERS

While automatic slack adjuster designs vary in the manner in which they are installed and operate, all are designed to automatically maintain a predetermined shoe-to-drum clearance or brake chamber stroke. Some automatic slack adjusters adjust upon the brake application stroke, others adjust upon release. Automatic slack adjusters can greatly reduce manual adjustments. **Automatic slack adjusters do not reduce the need for periodic maintenance.**

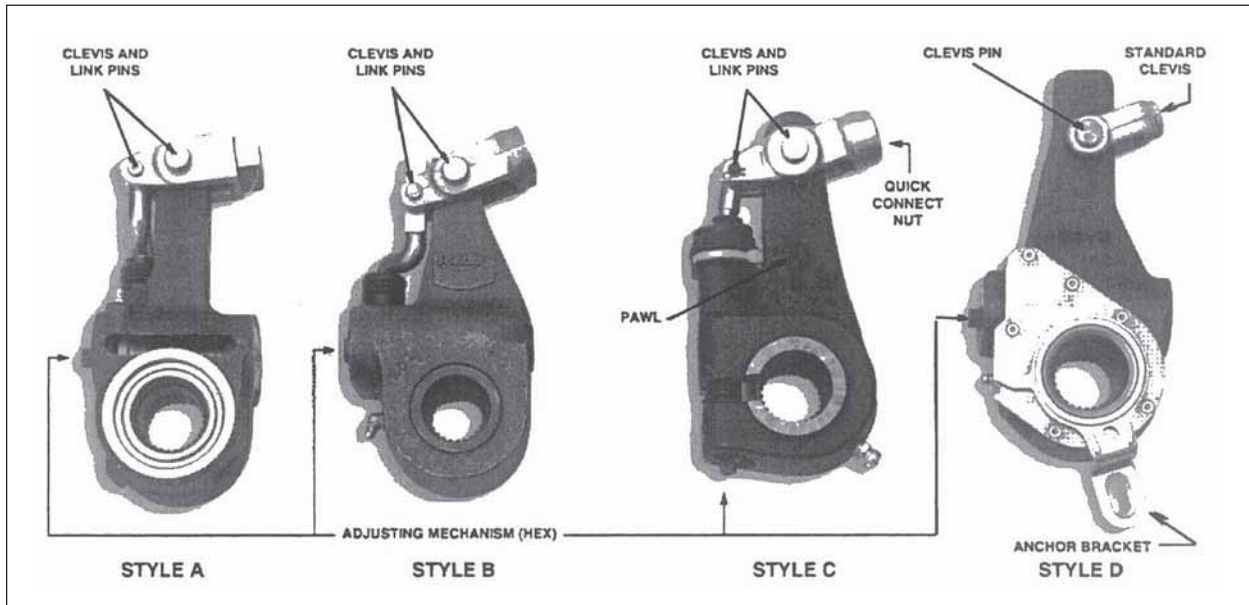


Fig. 8-21 AUTOMATIC SLACK ADJUSTERS

8.9 SLACK ADJUSTERS (cont'd)

8.9.2 MANUAL AND AUTOMATIC SLACK ADJUSTER MAINTENANCE (cont'd)

BRAKE ADJUSTMENT PROCEDURE

NOTE

All adjustments should be made with cold brake drums and the brakes fully released.

A. Manual Slack Adjuster Brake Adjustment Procedure

1. Slack adjusters with locking collar (positive lock type):

Jack up the vehicle. Thoroughly clean the adjusting hex and locking sleeve area. Position a wrench or socket over the adjusting hex and disengage the locking sleeve by depressing it. With the locking sleeve fully depressed, adjust the brakes while rotating the tire and wheel. Use the wrench or socket to turn the adjusting hex until the shoes contact the drum. Then back off the adjusting hex until the tire and wheel turn freely. The actuator stroke should be as short as possible without the brakes dragging.

If the vehicle cannot be jacked up, thoroughly clean the adjusting hex and locking sleeve area. Position a wrench or socket over the adjusting hex and disengage the locking sleeve by depressing it. With the locking sleeve fully depressed, use the wrench or socket to turn the adjusting hex until it will go no further indicating that either the shoes have contacted the drum or the adjusting hex has been turned in the wrong direction. Pull on the slack adjuster to make sure it will not move. If there is movement, adjustment was made in the wrong direction and the adjusting hex must be turned in the opposite direction until it will go no further. After establishing solid shoe-to-drum



WARNING

To avoid possible injury, proper precautions must be taken to prevent automatic actuation of the brake chambers while adjusting slack adjusters. Always block the wheels or mechanically secure the vehicle. Spring brakes must be mechanically caged or released with air. All brakes should be released.

contact, back off the adjusting hex 1/4 turn for worn linings and 1/2 turn when relining brakes. The actuator stroke should be as short as possible without the brakes dragging. Measure the chamber power stroke at 80-90 psi as described in subsection "B", "Automatic Slack Adjuster Brake Adjustment Procedure," below. Take a free stroke measurement as outlined in the section entitled FAILURE ANALYSIS. Make sure you have at least 3/8" of free stroke. Free strokes less than 3/8" can cause brake drag. If you cannot maintain the maximum legal stroke and the free stroke is less than 3/8", contact the brake manufacturer for foundation or brake geometry problems.



CAUTION

When the manual slack adjuster brake adjustment is completed, the adjusting hex should be positioned so the locking sleeve engages it, thus locking it in place. If the locking sleeve does not engage the adjusting hex, the slack adjuster can back itself off.

8.9 SLACK ADJUSTERS (cont'd)

8.9.2 MANUAL AND AUTOMATIC SLACK ADJUSTER MAINTENANCE (cont'd)

2. **Slack adjuster with lock screw ball indent type lock mechanism:**
Back off (turn counter-clockwise) the worm shaft lock screw (if applicable). Make the necessary adjustment by turning the adjusting hex as described in item number 1, directly above. Following brake adjustment, make certain that the lock ball or plunger engages the worm shaft indent. Without such engagement, the slack adjuster can back itself off.

Table 5 Chamber Type vs. Maximum Legal Stroke at 80 PSI Brake Application Pressure

Chamber Type	Maximum Legal 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"
24 Long Stroke	Less than 2.0"
30	Less than 2.0"
36	Less than 2-1/4"

B. Automatic Slack Adjuster Brake Adjustment Procedure

An automatic slack adjuster should not have to be manually adjusted except for initial installation and at brake reline. Instead of manually adjusting the slack, the following procedure should be followed during inspection:

Chamber Power Stroke:

A power stroke at 80-90 psi brake application pressure will check both adjustment and foundation brake condition. Perform the following:

1. Measure the brake chamber face to the center of the clevis pin at all wheel locations (see Fig. 8-22).
2. Make brake applications until the air reservoir gauge reads 90-100 psi. Then have an assistant make a full brake application and hold it.
3. Measure the brake chamber face to the center of the clevis pin (see Fig. 8-23).
4. The difference between the brakes released and applied measurements is the power stroke measurement. If the stroke is less than the maximum stroke for the chamber size (see Table 5), the inspection is complete. If the power stroke is more than the maximum stroke for the chamber size (see Table 5), refer to the section entitled FAILURE ANALYSIS.

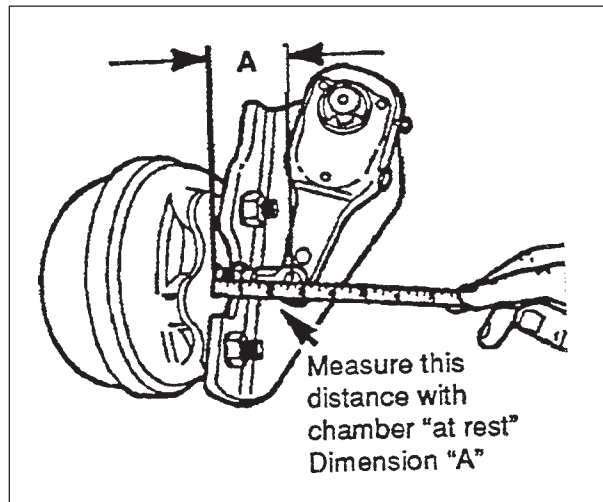


Fig. 8-22 PUSH ROD "AT REST"

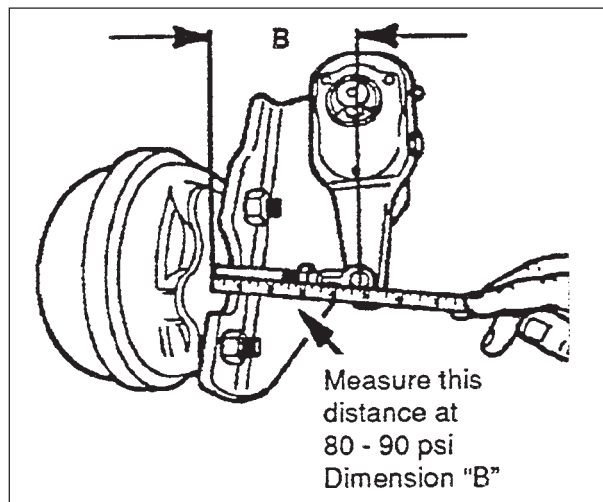


Fig. 8-23 PUSH ROD "EXTENDED"

AUTOMATIC SLACK ADJUSTER ADJUSTMENT PROCEDURE AT RELINE AND INSTALLATION

An automatic slack adjuster should be manually adjusted after a brake reline and/or installation using the following procedure:

1. Position a wrench or socket over the adjusting mechanism.

NOTE

If the automatic slack adjuster is equipped with a pawl, remove the pawl for the brake adjustment and then properly reinstall the pawl (see Fig. 8-24 Style C). Tighten the pawl to 15-20 ft-lbs.

2. Rotate the adjusting mechanism until the brake shoes contact the drum. Pull on the slack adjuster by hand to make sure it will not move. If there is movement, adjustment was made in the wrong direction and the adjusting hex must be turned in the opposite direction until it will go no further.
3. Reverse the rotation, backing the slack adjuster off one-half (1/2 turn).
4. Measure the chamber power stroke at 80-90 psi brake application pressure as described in the previous section.
5. Take a free stroke measurement as outlined in the section entitled FAILURE ANALYSIS. Make sure you have at least 3/8" free stroke. Free strokes of less than 3/8" can cause brake drag. If you cannot maintain the maximum legal stroke and the free stroke is less than 3/8", contact the brake manufacturer for foundation or brake geometry problems.

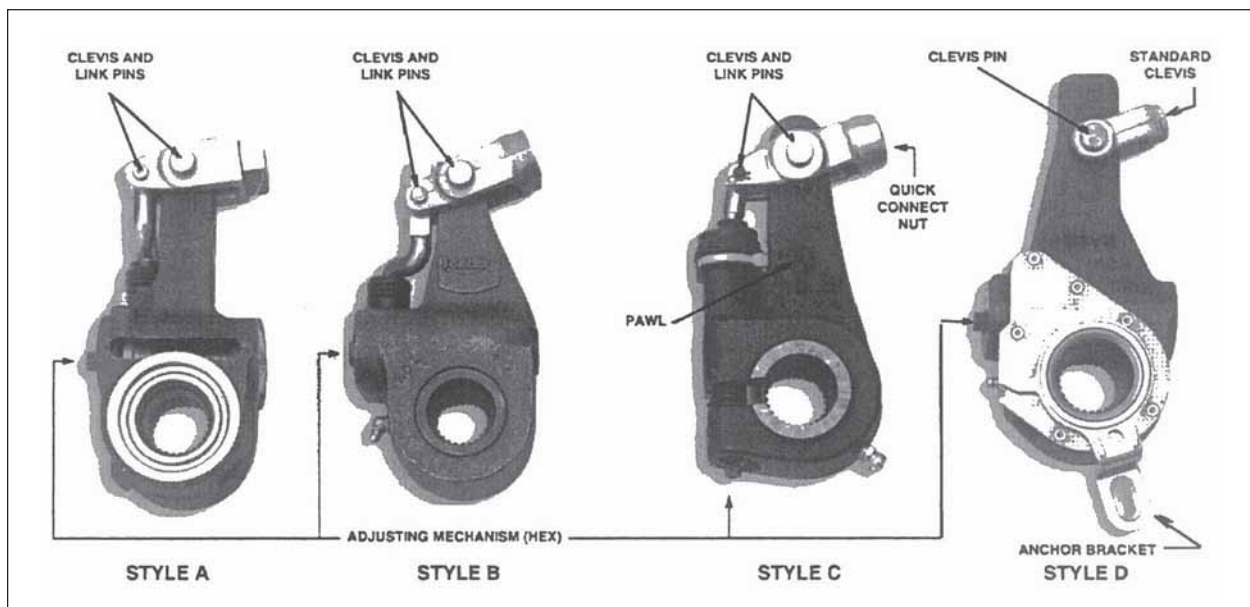


Fig. 8-24 SLACK ADJUSTER TYPES

8.9 SLACK ADJUSTERS (cont'd)

8.9.2 MANUAL AND AUTOMATIC SLACK ADJUSTER MAINTENANCE (cont'd)

ROADSIDE BRAKE ADJUSTMENT

If the driver has to adjust brakes on the road, the following procedure is recommended:

If the vehicle is equipped with an automatic slack adjuster, use a pry bar to pull on the slack adjuster. If movement is more than 5/8", a manual adjustment should be made following the same procedure as described below for a manual slack adjuster. If the automatic slack adjuster is equipped with a pawl, remove the pawl for the brake adjustment and then properly reinstall the pawl. If the automatic slack adjuster needs adjustment, inform maintenance personnel.

1. Block the wheels or mechanically secure the vehicle. On the brakes to be adjusted, spring brakes must be mechanically caged or released with air.
2. Rotate the adjusting mechanism until the brake shoes contact the drum. Using a pry bar, pull on the slack adjuster by hand to make sure it will not move. If there is movement, adjustment was made in the wrong direction and the adjusting mechanism must be turned in the opposite direction. Tap the brake drum with a wrench; you should hear a dull clunk indicating the brake linings are tight against the drum.

3. Back off the slack adjuster a small amount at a time, while tapping on the brake drum with a wrench in between adjustments. Stop backing off the adjuster when you hear a clear ringing sound from the brake drum when tapped with a wrench.
4. Using a pry bar, pull on the slack adjuster by hand. If movement is more than 5/8", adjustment was not done properly or there is a problem with the foundation brake.

NOTE

Some brake chamber push rods are marked to warn of an over-stroke condition. While the marking themselves may vary, the marking system has two basic features. They are: There is a mark on the brake chamber push rod near its clevis attachment to signal that it incorporates a stroke alert indicator (see Fig. 8-25 B). There also is a mark on the brake chamber push rod opposite its clevis attachment end which is exposed from the brake chamber wherever over-stroke occurs (see Fig. 8-25 C).

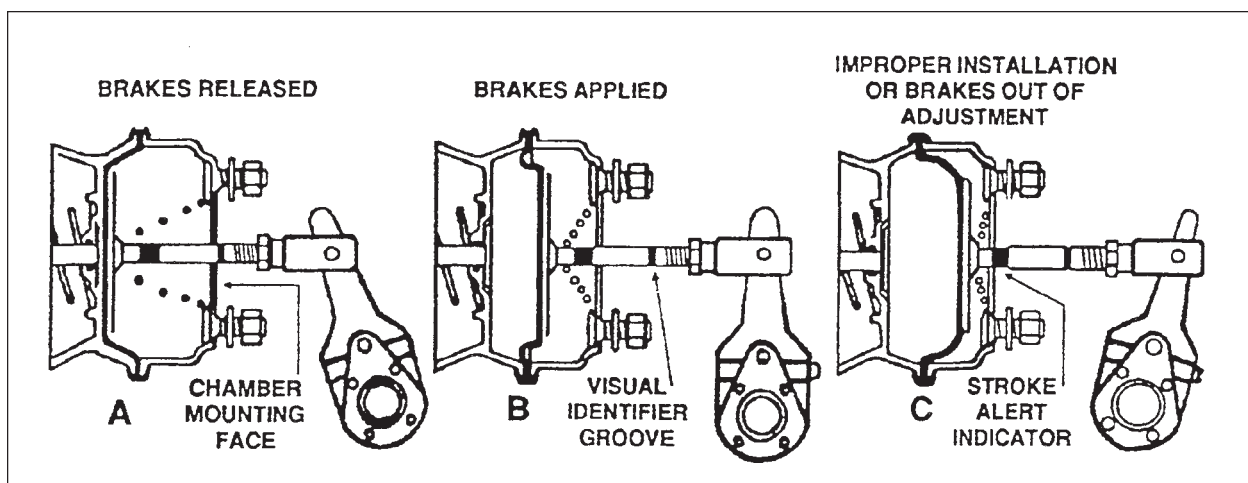


Fig. 8-25 PUSH ROD POSITION

FAILURE ANALYSIS

Manual Slack Adjuster Failure Analysis

Manual slack adjusters should be inspected for gear set wear. To do this, back off the adjusting hex until all spring pressure is relieved from the clevis. Work the adjusting nut 1/4 turn back and forth while watching for cam rotation. If you have 1/8 to 1/4 turn of play without the cam rotating, the manual slack should be replaced. Repeat this procedure every 1/4 turn of the adjusting nut to check the whole gear set.

Automatic Slack Adjuster Failure Analysis

If the power stroke is at or more than the maximum stroke, measure free stroke to determine if the slack adjuster is operational.

FREE STROKE MEASUREMENT

Free stroke is the amount of slack arm movement required to move the brake shoes against the drum. To measure free stroke, perform the following:

1. With brakes released, measure from the brake chamber face to the center of the clevis pin.
2. With a lever, pry the slack adjuster arm until the brake shoes contact the drum and measure the slack adjuster movement (see Fig. 8-26).
3. The difference between the brake released and applied measurements is the free stroke. The free stroke should be 3/8" - 5/8". If the free stroke is in the correct range, the out of spec stroke is due to a foundation brake problem. Check for missing or worn components, cracked brake drums, or improper lining-to-drum contact. If the free stroke is greater than recommended, an automatic slack adjuster function test should be performed.

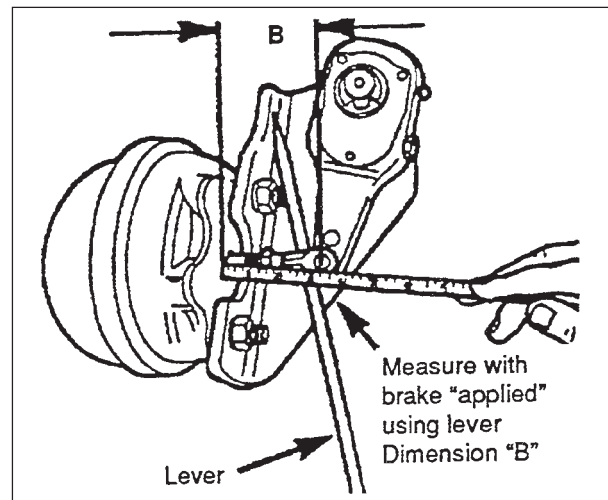


Fig. 8-26 FREE STROKE

8.9 SLACK ADJUSTERS (cont'd)

8.9.2 MANUAL AND AUTOMATIC SLACK ADJUSTER MAINTENANCE (cont'd)

AUTOMATIC SLACK ADJUSTER FUNCTION TEST

1. Remove the pawl, then rotate the adjusting mechanism at least one complete turn as if backing off the brake adjustment (see Fig. 8-27 Style C). The pawl must be installed properly and tightened to 15 - 20 ft-lbs. after backing off the adjuster.
2. Apply the brakes several times and observe whether the adjustment mechanism is rotating in the direction needed to reduce brake chamber pushrod stroke. If the adjusting mechanism does not rotate, the slack adjuster should be replaced.
3. Check back-off torque by rotating the adjusting hex as follows:
 - Style A:** Minimum 15 ft-lbs. counter-clockwise (CCW).
 - Style B:** Minimum 15 ft-lbs CCW.
 - Style C:** Less than 45 in-lbs. CCW (pawl removed)
 - Style D:** Minimum 15 ft-lbs CCW

Consult the manufacturer for more information.

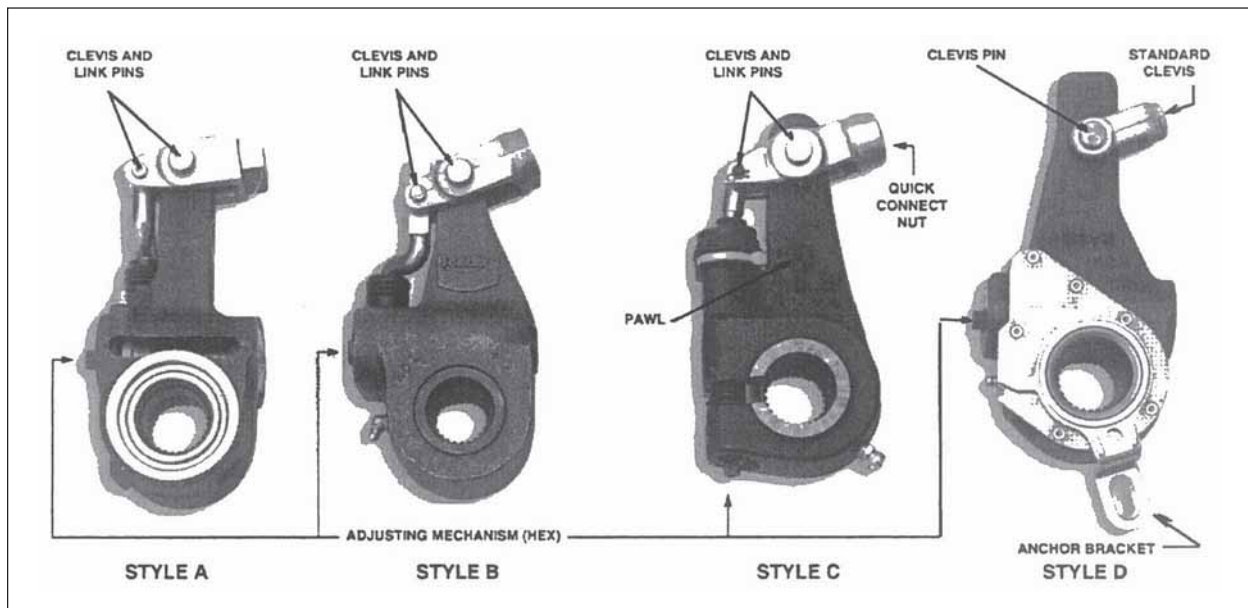


Fig. 8-27 SLACK ADJUSTER TYPES

PREVENTATIVE MAINTENANCE

Every month, 8,000 miles, or 300 operating hours, check brake chamber push rod travel; stroke should be as short as possible without the brakes dragging or the push rod binding. Adjust manual slacks if necessary. Due to different operating conditions, adjustments may be necessary at earlier intervals.

Every 6 months, 50,000 miles, or 1,800 operating hours, lubricate all slack adjusters and clevis pins with manufacturer's recommended lubricant. Check for worn clevises, clevis pins, clevis pin bushings, and control arm/bracket wear. Failure to replace worn components will increase chamber stroke. Lubrication and inspection may be necessary at earlier intervals due to different operating conditions.

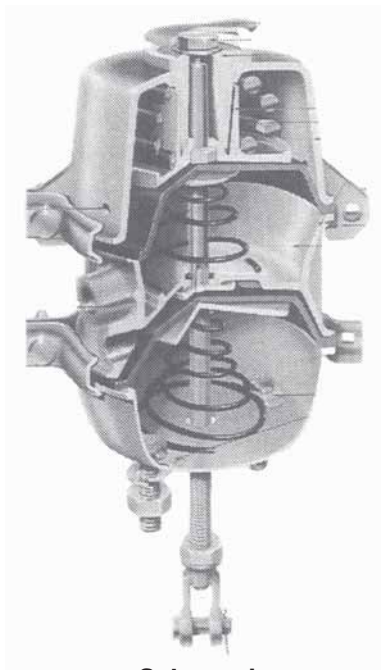
8.10 AIR CHAMBER/SPRING BRAKE

Air chambers mounted on the axle use the air supply/pressure from the tractor to apply the service brakes for stopping the vehicle. In addition this air chamber may be equipped with a spring brake that applies the brake when the service side of the brake loses air. The spring brake side of the system is used as a parking and/or emergency brake if the service side fails.

Spring brakes should not be serviced by anyone in the field unless they have been trained in the proper procedure. Do not work on the brakes unless the springs are caged or locked out. Do not move the trailer if the springs are caged.

When caging or locking out the spring brakes, follow this procedure:

1. Place chocks in front of and behind the trailer wheels.
2. Insert the release bolt, stored on the side of the chamber, into the hole in the head and through the piston.
3. Turn the release bolt clockwise until it stops and locks.
4. Pull release bolt out as far as possible and run the nut down while holding the bolt in place.
5. Use a wrench to turn the release bolt nut clockwise until the bolt extends about 3 inches.
6. Be sure the release bolt is locked in position.
7. The spring is now caged and the trailer can be moved.
8. Always release the spring before placing the trailer back in service.



Schematic



Axle

Fig. 8-28 SPRING BRAKE

8.11 SUSPENSION SYSTEM

The suspension system is the group of components that connect the axle to the main trailer frame and absorb the shock loads from the road. Walinga trailers can be equipped with either a mechanical or air ride suspension system. Either system works well and will provide many years of trouble-free service.

8.11.1 AIR RIDE SUSPENSION

An air ride suspension consists of air springs that are inflated and pressurized by the trailer air system and controlled by a height control valve. It is a simple system that requires minimal servicing and maintenance to perform well.

Visually inspect the trailer at the start of the day or trip to check the condition of the suspension. When the suspension is in good condition, the frame will be level and at the proper ride height. Also, check for loose fasteners or damaged components. Correct any problems before placing the trailer into service. Problems caught early and corrected minimize cost and downtime.

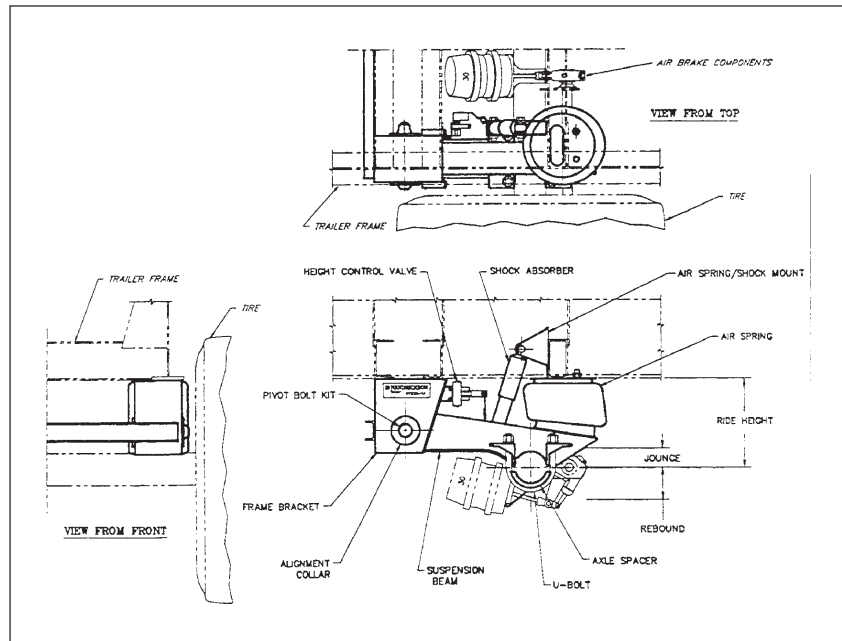


Fig. 8-29 SUSPENSION

Table 6 Bolt Torque Values For Hendrickson Turner Suspensions

Description	Size	Torque
Quik-Align™ Pivot Bolt	7/8"-9	475-525 Ft. Lbs
Shock Bolt	3/4"-10	150-175 Ft. Lbs.
Air Spring Bolt (Lower)	1/2"-13	25-35 Ft. Lbs.
Air Spring Nut (Upper)	3/4"-16	45-55 Ft. Lbs.
Brake Dust Shield Bolt	5/16"-18	160-180 In. Lbs.
ABS Bracket Bolt	1/4"-20	75-100 In. Lbs.

Every 5,000 miles (8,000 km) or monthly, check the clearance around all the suspension system components. Correct any interference problem. Retorque all the fasteners to their specified torque.

Every 25,000 miles (40,000 km) or 3 months, visually inspect all components and welds for cracks, distortions or other damage. Repair or replace all defective components before placing unit into service.

Typical repairs include but are not limited to:

1. **Air Spring Replacement:**

Air springs are designed to be virtually trouble-free throughout their life. Problems seldom occur unless they are cut, punctured, abraded, pinched or torn and then they must be replaced.

- a. Block the wheels to prevent trailer movement.
- b. Exhaust air from the suspension system.
- c. Raise and support the frame on safety stands.

NOTE

Do not raise frame too high unless shock absorbers are installed to prevent over-extending the air spring.

- d. Disconnect the air lines to the air spring(s).
- e. Loosen mounting bolts and remove air spring(s).
- f. Install new air spring(s).
- g. Tighten mounting bolts to their specified torque of 50 ft. lbs. (68 N.m).
- h. Install air lines and tighten to their specified torque.
- i. Repeat on other air springs.
- j. Remove stands from under frame.

2. **Shock Absorber Replacement:**

Shock absorbers remove energy from the suspension system as the trailer encounters holes and bumps on the road surface. They also act as a stop for the air springs to prevent the axle from moving too far away from the frame and tearing or damaging the air spring.

- a. Remove the upper and lower mounting bolts.
- b. Remove old shock and install new one.

IMPORTANT

Use only correct Hendrickson Turner replacement parts. Substitute parts do not work with the suspension system.

- c. Secure shock by tightening mounting bolts to their specified torque of 250 ft. lbs. (338 N.m).

3. **Pivot Bushing:**

Pivot bushings are a very durable, long lasting component. Bushing failures are rare and should be attempted only when all other problem causes have been eliminated. A bushing removal/installation tool is available from Hendrickson Turner when replacing the bushing and can be borrowed from your dealer or distributor. A 10 ton portable hydraulic press must be supplied by the customer. Purchase the bushing replacement kit that includes a new bushing, pivot bolt kit and lubricant.

When replacing the bushing, follow this procedure:

- a. Use a torch to "cut off" the Huck fasteners from the clamping bolt.
- b. Press out the old bushing and press in the new one.
- c. Install the clamping bolt and tighten the fastener to 800 ft. lbs. (1080 N.m).
- d. Tack weld the nut to the bolt to prevent loosening.

8.11 SUSPENSION SYSTEM (cont'd)

8.11.1 AIR RIDE SUSPENSION (cont'd)

4. **Air Control (Ride Height Control):**
An air ride suspension system uses the air from the tractor to pressurize the air springs. A single height control valve is used to monitor the height of the frame above the axle and add/exhaust air from the system as required to maintain this dimension. Normally this dimension is set for your trailer and never changes.

The height control valve is located on the rear axle of the axle assembly area on the trailer and controls the adding/exhausting of air to the air springs. As the dimension between the frame and axle increases, the control lever moves down and air is exhausted from the system. As the dimension decreases, air is added to raise the frame. All valves incorporate a 5 to 15 second time delay to minimize jerking or cycling. Replace valve if not functioning properly.

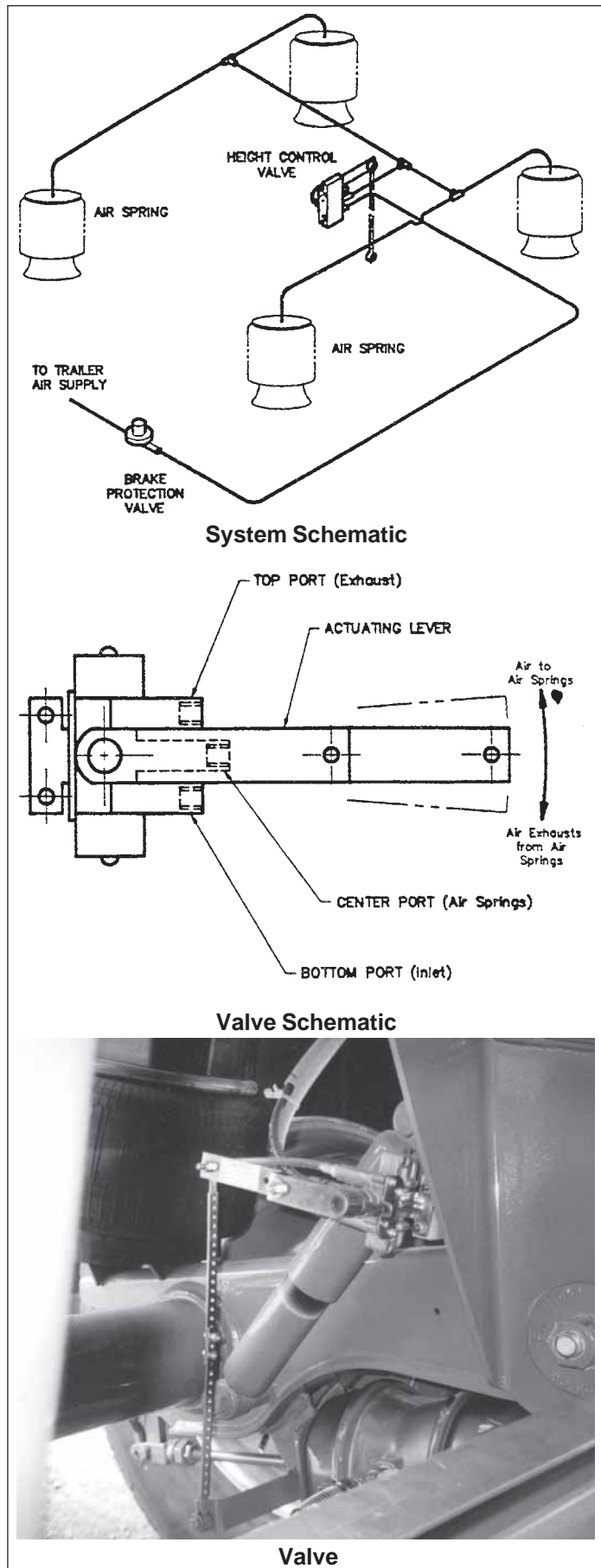


Fig. 8-30 RIDE HEIGHT CONTROL

5. **Dump Valve:**

All air control systems are equipped with a dump valve that allows the operator to exhaust the air from the system as required.

a. **Always dump the air when parking the trailer and before unhooking.**

b. Dumping the air is optional when:

i. **Loading:** The rapid or sudden addition of load to the trailer can cause the control valve to search for neutral. Exhausting the air rests the frame on the interval bumper and prevents the valve from searching. When the loading is completed, close the valve to repressurize the system.

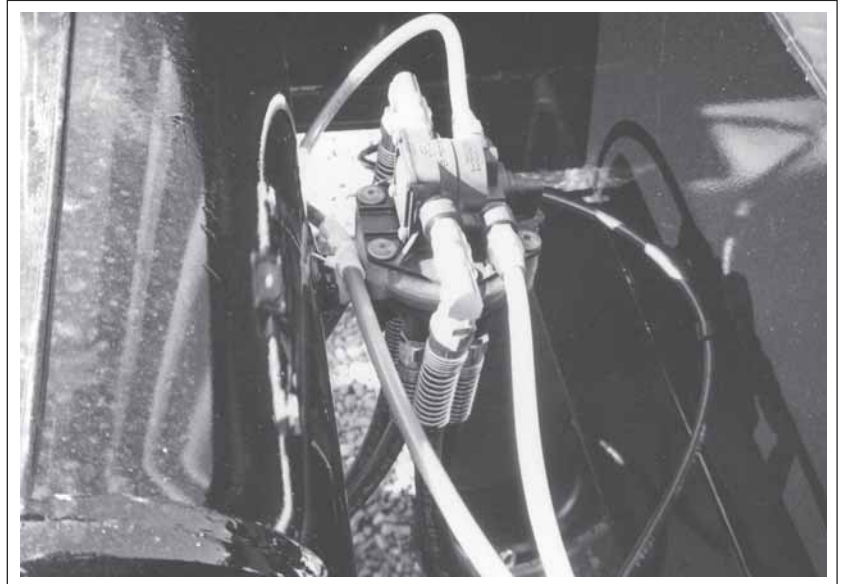


Fig. 8-31 DUMP VALVE

ii. **Unloading:** Dumping rapidly can also require the valve to search for neutral. Close the valve when the unloading is completed to repressurize the system.

8.11 SUSPENSION SYSTEM (cont'd)

8.11.2 MECHANICAL SUSPENSION

Two types of mechanical suspensions are available on the trailer and must be specified and ordered from the factory. Both work well and provide the customer with a choice.

The standard suspension for the tandem and triaxle models are the Reyco 21B 8 leaf and the Hutch 9700 3 leaf. Both are designed to require minimal service and maintenance on a trailer. However, these service intervals and maintenance procedures must be followed:

Service Intervals:

1. Follow the break-in procedure specified in Section 4.3.
2. Visually inspect the suspension at the start of the day or trip for bent, broken or loose components. Always correct these conditions and perform a complete check-out of the suspension before placing the trailer back in service.
3. After each additional 25,000 miles (40,000 km), or every 3 months, retorque all the fasteners to their specified torque per the following table. Always use an accurate torque wrench when retorquing fasteners and attach to the nut.
4. 25,000 miles (40,000 km) or every 3 months, inspect the following:
 - a. Check position of clamp if moveable clamps used. Clamping legs must be centered over slot in end tube.
 - b. Check fit and function of all bushings.
5. In addition to checking the alignment at the recommended intervals, axle alignment should be checked when any of the following conditions occur:
 - a. Discovery of loose fasteners or components.
 - b. Discovery of elongated holes in a suspension system component.
 - c. Whenever bushings are replaced.
 - d. Whenever excessive or abnormal tire wear is observed.

- c. Check all hanger and hanger bracing welds for cracks.
- d. Check all other welds for signs of cracks or distortion.
- e. Check fit of springs in hangers and equalizers.
- f. Check equalizers for excessive wear at spring ends.
- g. Check suspension system alignment.

IMPORTANT

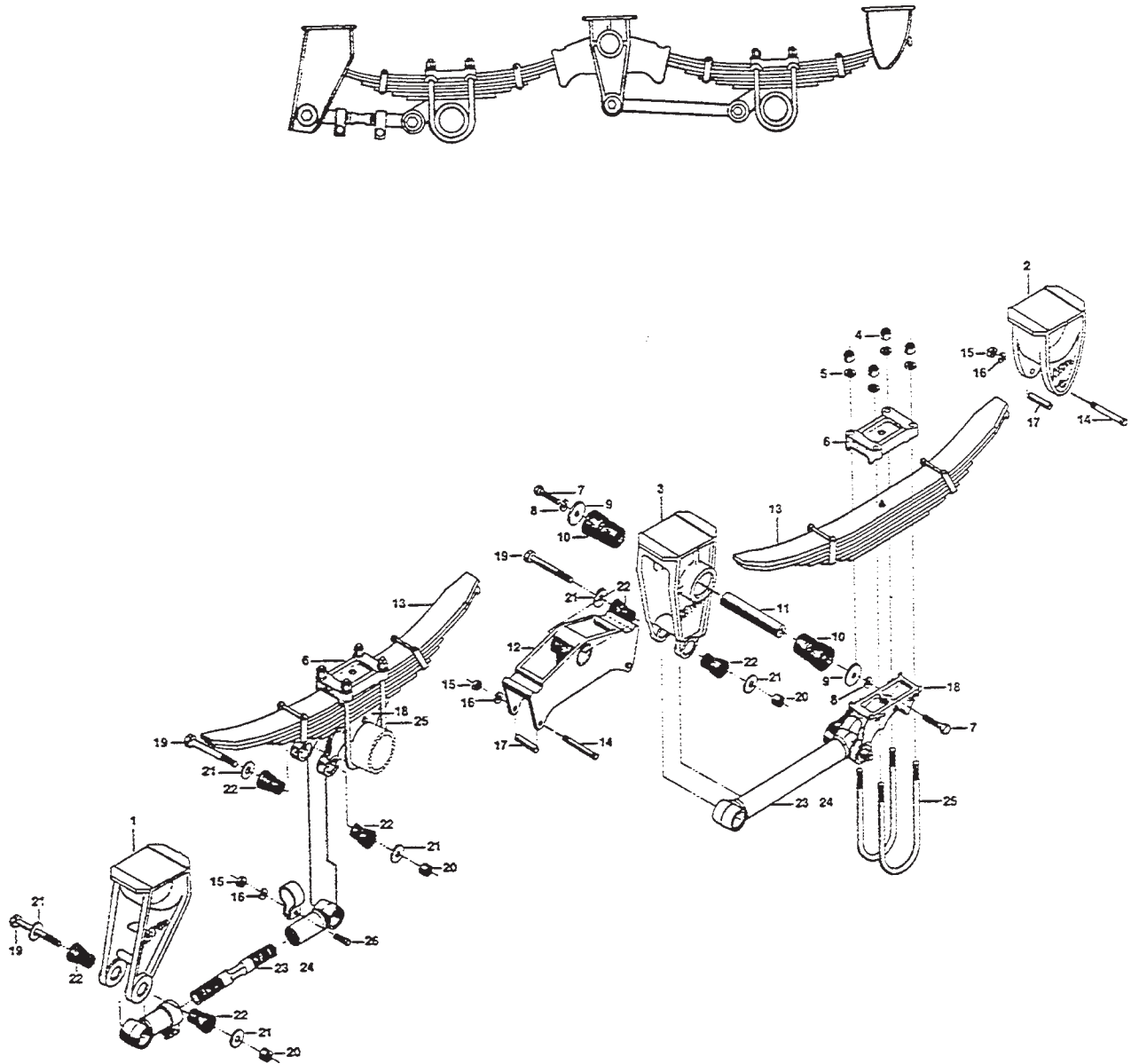
A loose fastener is defined as one whose torque has dropped below its specified level.

Table 7 Suspension Fastener Torque Requirements

Description	Size	Torque		
		Ft. Lbs.	N.m	
Equalizer Shaft (All Spread)	49" Spread	1-1/4" Nut	575-625	780-850
	54"-65-1/2" Spread	3/4" Capscrew	200-225	270-305
	72"-109" Spread	2-1/2" Nut	300-325	410-445
		1-1/2" Nut	200-225	270-305
U-Bolt Nuts		300-325	410-445	
Torque Arm Bolt Nuts	1"	160-200	216-270	
Torque Arm Clamping Nuts	1/2"	80	110	
	3/4"	175-200	236-270	
Spring Retainer Nuts	1/2"	80	110	

8.11 SUSPENSION SYSTEM (cont'd)

8.11.3 SUSPENSION SYSTEM SCHEMATICS



8.12 TIRE WEAR PATTERNS

The way your tires wear is a good indicator of other parts of the suspension. Abnormal wear patterns are often caused by the need for simple maintenance or axle alignment.

a. **Over-Inflation:**

Excessive wear at the center of the tire indicates the air pressure in the tire is consistently too high. The tire is riding on the center of the tread and wearing it prematurely. Occasionally, this wear pattern can result from outrageously wide tires on narrow rims. The cure for this is to replace either the tires or the wheels.

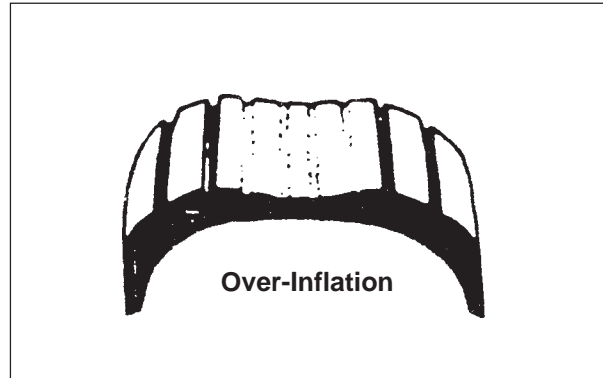


Fig. 8-32 OVER-INFLATED

b. **Under-Inflation:**

This type of wear usually results from consistent under-inflation. When a tire is under-inflated, there is too much contact with the road by the outer treads, which wear prematurely. When this type of wear occurs, and the tire pressure is known to be consistently correct or the need for axle alignment could be indicated.

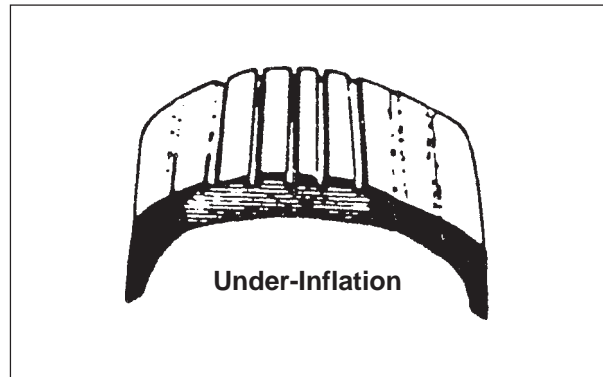


Fig. 8-33 UNDER-INFLATED

c. **Feathering:**

Feathering is a condition when the edge of each tread rib develops a slightly rounded edge on one side and a sharp edge on the other. By running your hand over the tire, you can usually feel the sharper edges before you will be able to see them. The most common causes of feathering are incorrect toe-in setting, deteriorated bushing in the suspension or misalignment.

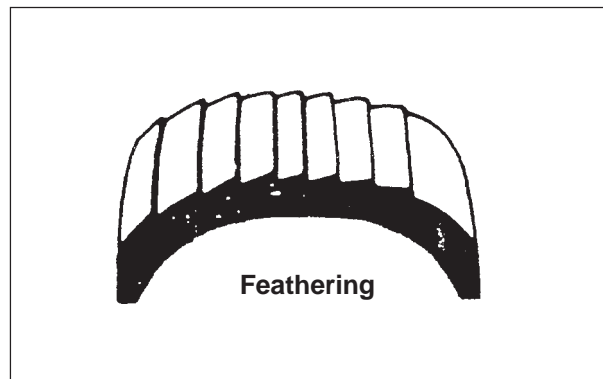


Fig. 8-34 FEATHERING

d. **One-Side Wear:**

When an inner or outer rib wears faster than the rest of the tire, the need for axle alignment is indicated. There is excessive camber in the axle causing the wheel to lean too much excessive load on the one side of the tire. Misalignment could also be due to sagging springs, or worn suspension system components.

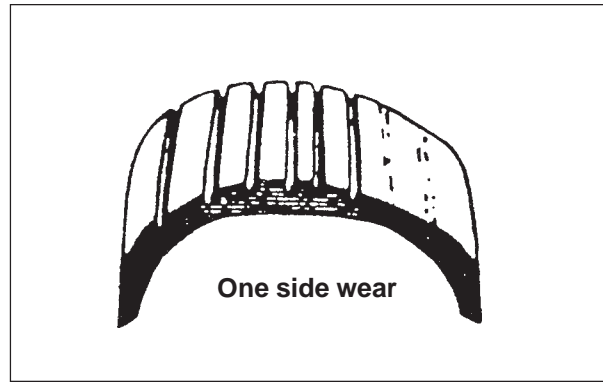


Fig. 8-35 ONE-SIDE WEAR

e. **Cupping:**

Cups or scalloped dips appearing around the edge of the tread almost always indicate worn (sometimes bent) suspension parts. Adjustment of axle alignment alone will seldom cure the problem. Any worn component that connects the wheel to the suspension can cause this type of wear. Occasionally, wheels that are out of balance will wear like this, but wheel imbalance usually shows up as bald spots between the outside edges and center of the tread.

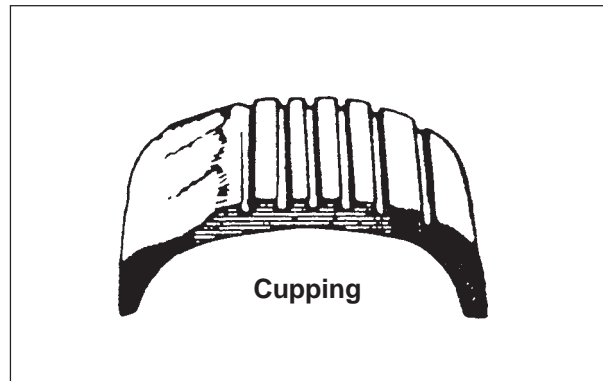


Fig. 8-36 CUPPING

f. **Second Rib Wear:**

Second rib wear is usually found only in radial tires, and appears where the steel belts end in relation to the tread. It can be kept to a minimum by paying careful attention to tire pressure and frequently rotating the tires. This is often considered normal wear but excessive amounts indicate that the tires are too wide for the wheels.

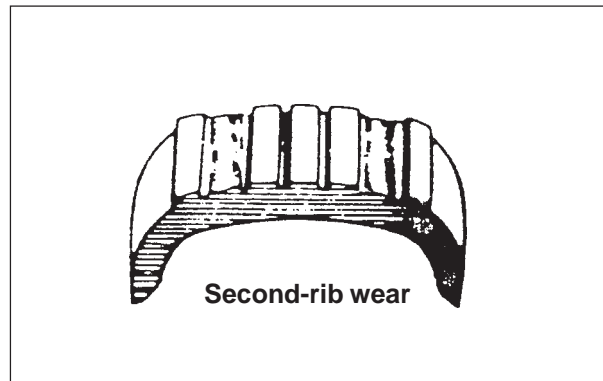


Fig. 8-37 SECOND RIB WEAR

8.13 AIR SYSTEM

Trailers are equipped with an air system, that is pressurized by a compressor on the tractor, for operating the discharge gates, brakes and air suspension (if so equipped). All components must be in good condition for the system to function and perform as intended. The air system must be inspected to be kept in good condition and functional checks performed to be sure it is operating as required.

8.13.1 AIR SYSTEM INSPECTION

The pre-trip or pre-start inspection include several air system related checks, inspections or tasks including but not limited to:

Daily

1. Check that the glad hands are clean and in good condition. Check seals in glad hand. Clean, repair or replace as required.
2. Check that the air hoses between the tractor and the trailer are routed to prevent rubbing, chaffing or pinching. Reroute to correct condition if required.
3. Drain moisture from all air tanks. Pull on the cable attached to drain valve on the bottom of each tank until the water or spray no longer can be seen.

IMPORTANT

Tanks must be drained daily in high humidity and cold temperature conditions to prevent getting water or ice in the system.

4. Check that all the lines and hoses conveying air along the frame are tied up and secured to prevent dragging, scuffing or snagging. Tie up or protect as required to correct the condition. Damaging an air system component can cause a sudden loss of pressure and result in a loss of service brakes.

IMPORTANT

New FMVSS-121 regulations mandate higher pressures in the supply line to insure proper brake operation. Set the compressor pressure for cut-in to 105 psi and cut-out to 120 psi. Do not use additives in the air systems.

8.13.2 AIR SYSTEM FUNCTIONAL

A vehicle air system is a combination of the components on the tractor and the trailer. All must be maintained in good condition for the entire system to function as required. Although a visual check will indicate the outer condition of the components, it does not indicate the leaks or responsiveness of the system. To evaluate the integrity and responsiveness of the system, perform these functional checks:

1. Attach the trailer to a tractor and connect all the air and electrical lines.
2. Block wheels.
3. Stop tractor engine and exhaust air from all tanks.
4. Start engine and run at fast idle (1200-1500 RPM) to charge the air system.

Verify that:

- a. Low pressure alarm goes off when the system pressure exceeds 50 psi.
- b. Increasing the system pressure between 50 psi and 80 psi takes less than 3 minutes.
- c. The compressor cuts out when the system pressure exceeds 120 psi.
- d. Fan brakes to use air. Compressor must engage when system pressure drops below 105 psi.

NOTE

Release spring brakes before fanning service brakes.

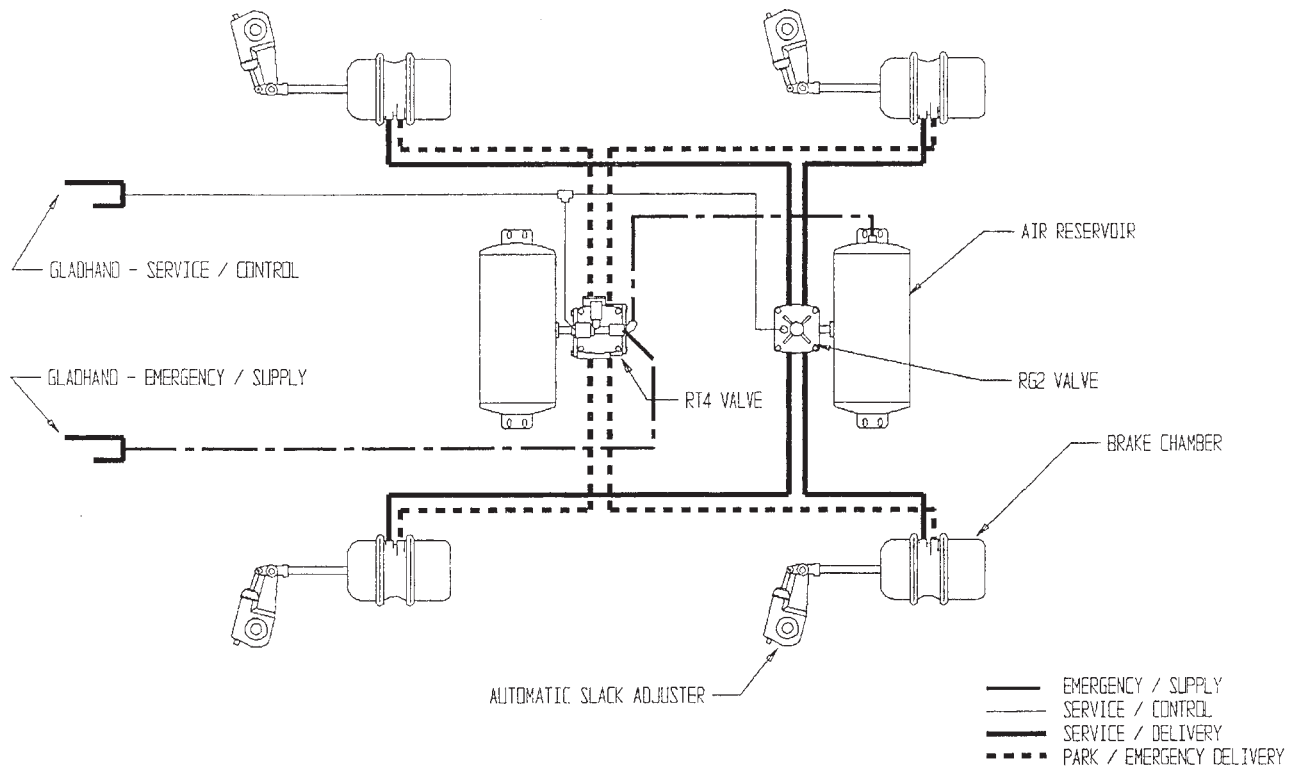
5. Push emergency valve to charge trailer system. Apply and release service brakes.
6. Build system above 120 psi and stop engine.

Verify that:

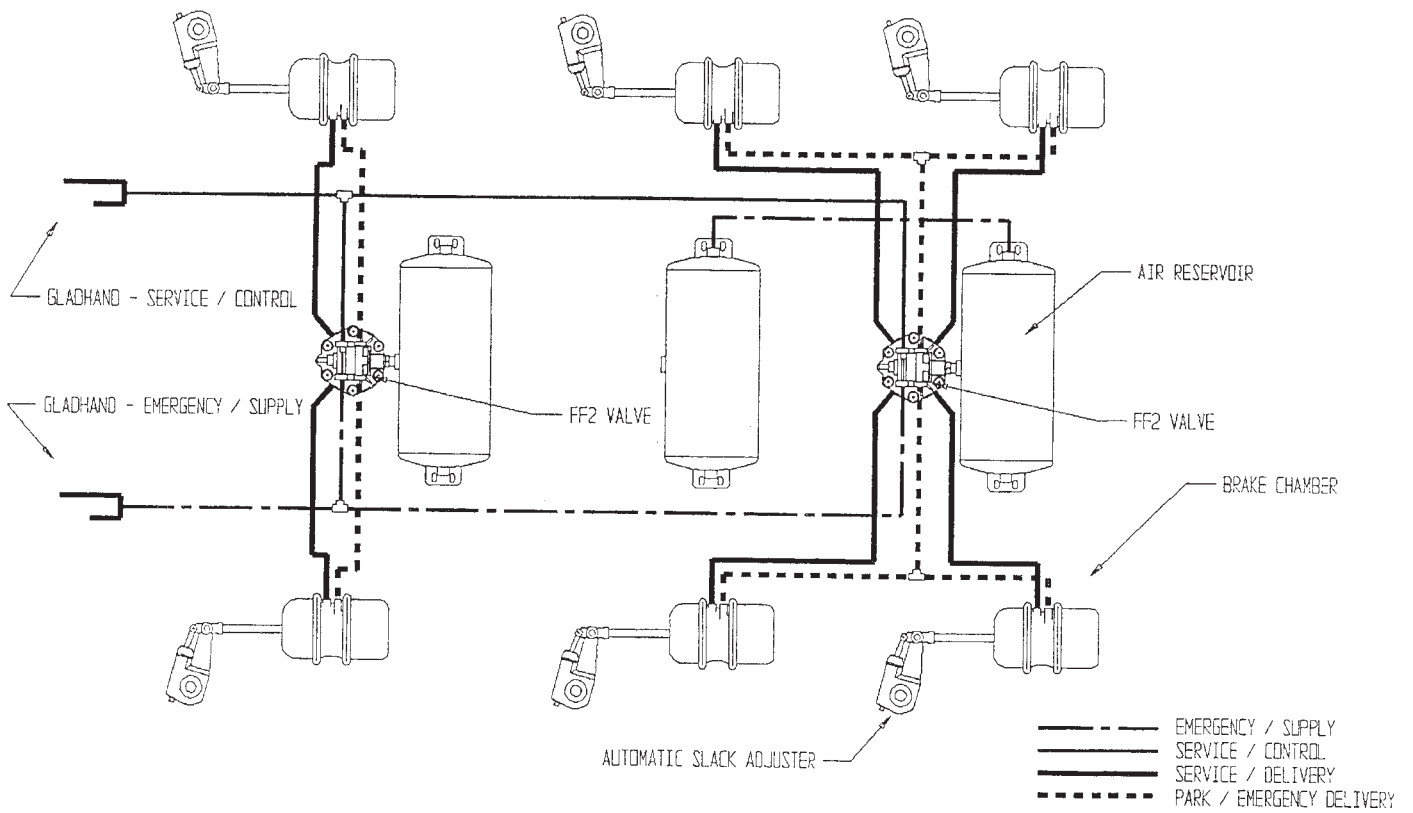
- a. Main tank pressure does not drop more than 18 psi when brakes are fully applied using brake pedal. If pressure drop exceeds 18 psi, adjust brakes and recheck.
- b. System pressure should not drop more than 4 psi per minute. Listen for audible leaks.
- c. Release foot valve, fan treadle to drop main reservoir pressure. Brakes should dynamite automatically when the pressure drops below 60 psi.

Adjust or repair system until these conditions are met.

8.13.3 AIR SYSTEM SCHEMATICS



Tandem Axles - 2 Tank 2 Valve



Triaxle - Tridem W/FF2

8.14 ABS VEHICLE CONTROL SYSTEM

Trailers can be equipped with a system that controls the brakes on a vehicle to prevent wheel lock-up when braking. The system consists of an ECU (Electronic Control Unit), Modulator (ABS modulator valve), tooth wheel, wheel speed sensor and wiring harness. The system configuration is determined by the number of wheel sensors and relay valves in the system. The system is designed with a self-diagnostic feature that monitors the condition of the system and can indicate system faults through a series of cooled flashing lights. Each operator and/or serviceman should have a copy of the Service Booklet from Rockwell that explains the Blink Code Diagnostics System. Use the ECU/Valve serial number and configuration to specify the applicable booklet for your system.

1. Power:

The system can be powered by tapping into the "live" wiring harness or through the brake light circuit. With the former, the system is ON whenever the ignition key is turned on. With the latter, the system is ON when the brakes are applied.

2. Function:

Sensors on each wheel monitor wheel speed and transmit a signal to the ECU. During heavy, severe and emergency braking or hazardous road conditions, the ECU monitors and compares the speed of each wheel to determine if any are slowing too rapidly. If a wheel is slowing too rapidly, the ECU works with the modulator valve to relieve the air pressure to the brake son that wheel to prevent lock-up. By preventing wheel lock-up, each wheel provides maximum braking force and eliminates trailer instability.

3. Warning Lamp:

Each system is equipped with a warning lamp to display the condition of ABS system to the driver/operator. Be familiar with the meaning of the warning lamp codes before using the trailer.

a. On a **stoplight activated** system, the warning lamp comes ON when you apply the brakes and goes OFF when you release the brakes on a stationary vehicle.

b. On a **constant-power** system, the warn- Warning Lamp With Stoplight Power

Brakes	Fault in System	Vehicle Speed	Warning Lamp
Released	N.A.	N.A.	Off
Applied	N.A.*	< 4 mph	On
Applied	No	> 4 mph	Flashes once, then stays off for remainder of stop.
Applied	Yes	N.A.*	On for duration of stop.

* At less than 4 mph, you cannot tell whether the light indicates a fault or an incomplete self-check. To tell if there is a fault, you must apply the brakes while driving faster than 4 mph to see if the light stays on during the application.

ing lamp comes ON when you turn the ignition ON and goes OFF when the vehicle exceeds 4 mph (6 km/h).

Warning Lamp With Constant Power

Ignition	Fault in System	Vehicle Speed	Warning Lamps (on Trailer and Dash)
Off	N.A.	N.A.	Off
On	N.A.**	< 4 mph	On**
On	No	> 4 mph	Off
On	Yes	N.A.**	On

* The light comes on at the initial activation of the ECU, not each time the vehicle slows down below 4 mph. Until the vehicle initially exceeds 4 mph, you cannot tell if the light indicates a fault or an incomplete self-check. To tell if there is a fault, you must drive faster than 4 mph and see if the light stays on. Once vehicle speed exceeds 4 mph, the light remains off unless a fault occurs or the ignition is turned off and then turned on again.

4. **Faults:**
Whenever there is a fault/problem with the system or any of its components, the warning lamp will not come ON per the tables listed on the previous page. The system is designed with an internal self-diagnostic and memory system to tell service personnel the cause and location/site of the fault/problem through their diagnostic blink code system.

5. **Blink Code Diagnostics:**
A system can be accessed using a special diagnostic tool to plug into the ECU to identify the faults/problems and locations. Purchase the appropriate tool and Maintenance Booklet for your system to keep it in good operating condition. Each system is designed with blink code diagnostic code to identify fault cause and location as defined in Maintenance booklet. Always correct any faults as they are identified to maintain the unit in top operating conditions.

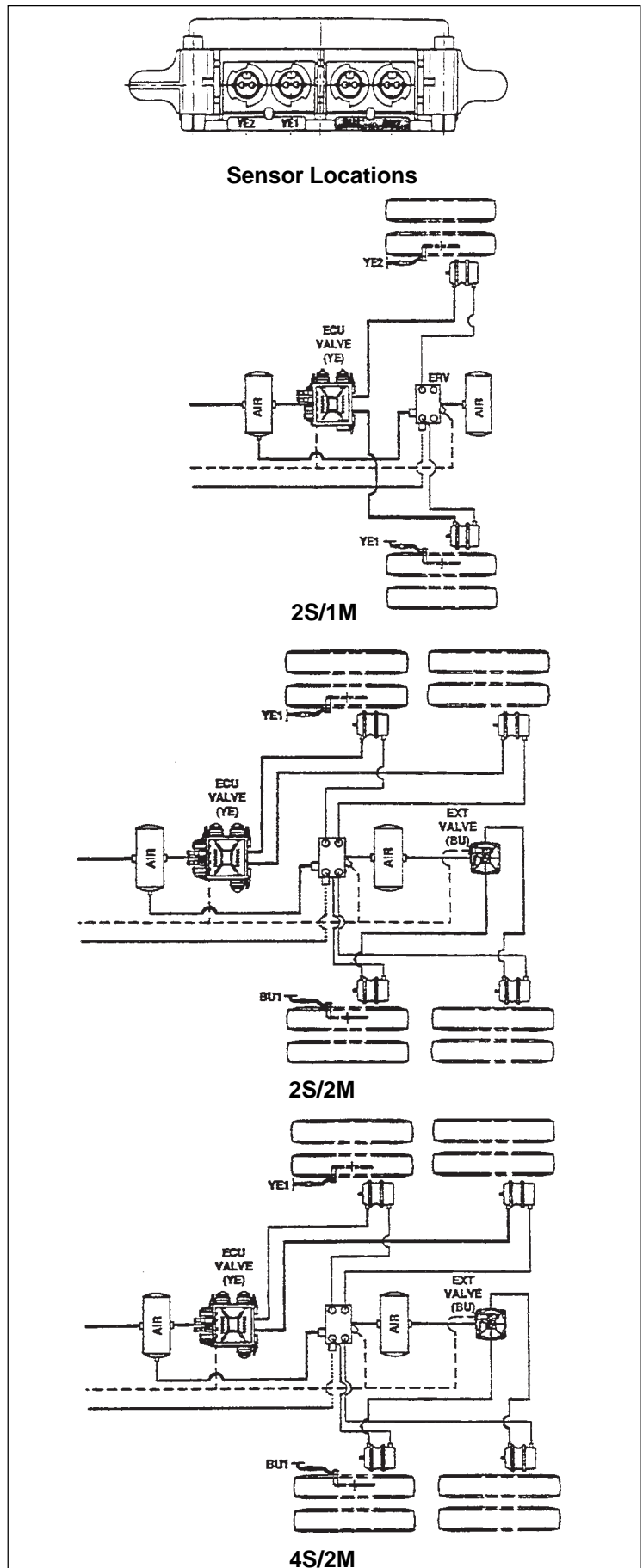
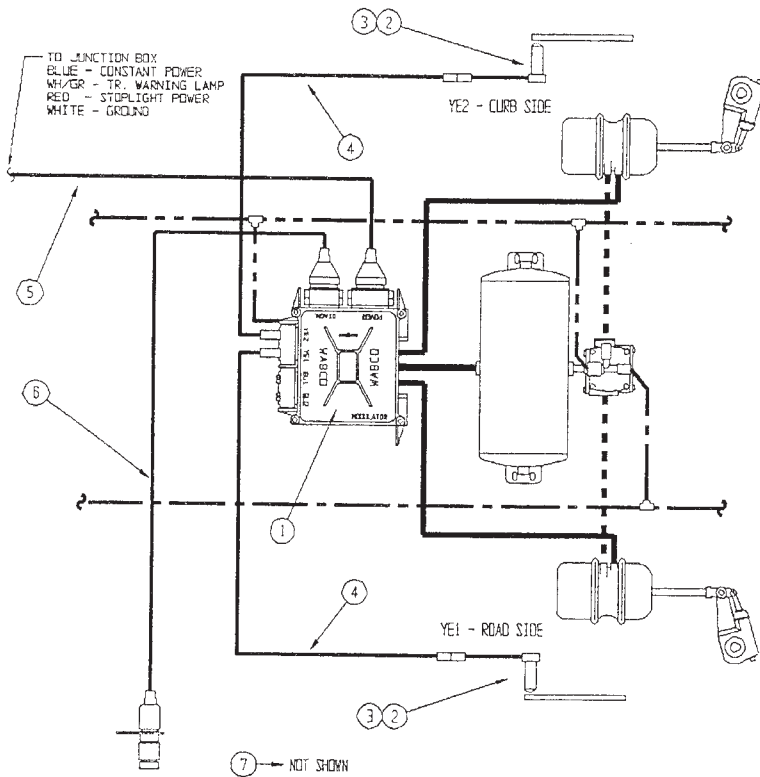


Fig. 8-38 ABS CONFIGURATION

8.15 ABS SCHEMATICS

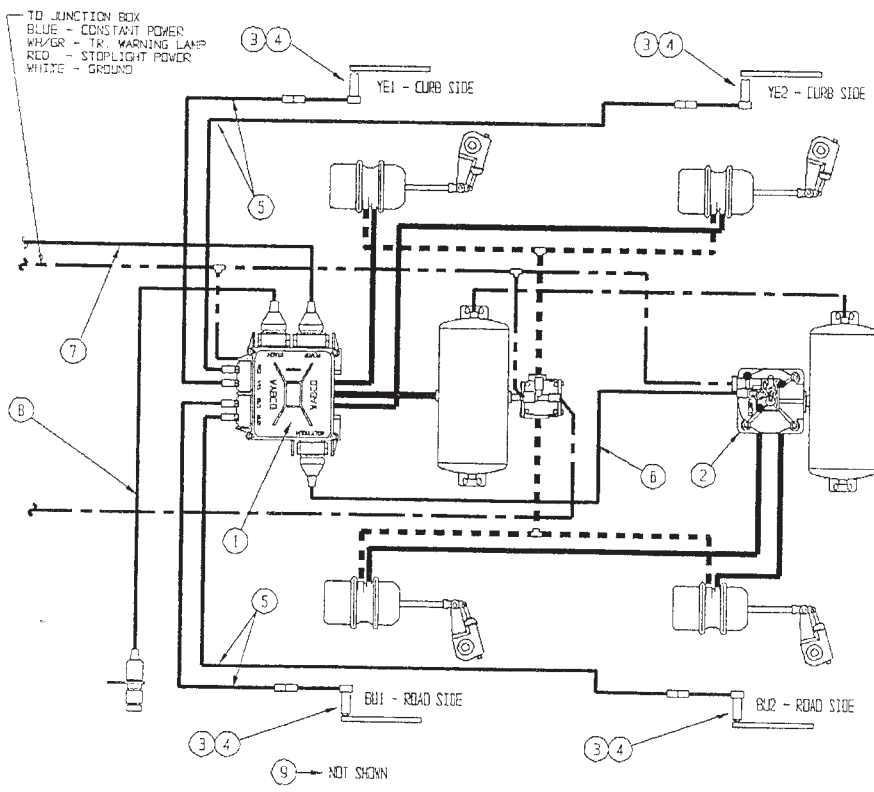


——— EMERGENCY / SUPPLY
 - - - SERVICE / CONTROL
 ——— SERVICE / DELIVERY
 ····· PARK / EMERGENCY DELIVERY

NOTE: FOR LIFT AXLE APPLICATION, INSTALL NORMALLY CLOSED PRESSURE SWITCH INTO SUSPENSION LIFT AIR CIRCUIT IN ORDER TO DISCONNECT ECU GROUND CIRCUIT. (DISABLES ABS FOR LIFT AXLE WHEN AXLE IS IN RAISED POSITION)

7	1	# 3305-T-1242	ECU MOUNTING BRACKET	79-17672-6
6	1	# A1-3237-L-1130	DIAGNOSTIC CABLE W/TOOL	79-17673-6
5	1	# 449 315 150 0	POWER CABLE - 4 COND. - 15 m.	79-17674-6
4	2	# 449 713 018 0	SENSOR EXT. CABLE - 1.8 m.	79-17681-6
3	2	# 899 760 510 4	SENSOR CLIP	79-17677-6
2	2	# 441 032 809 0	SENSOR ASS'Y - 1 m. LEAD	79-17678-6
1	1	# 472 500 011 0	ECU/VALVE - 2S/1M	79-17682-6
ITEM	QTY.	MATERIAL	MATERIAL SPECIFICATION	STOCK NUMBER

2S/1M



——— EMERGENCY / SUPPLY
 - - - SERVICE / CONTROL
 ——— SERVICE / DELIVERY
 ····· PARK / EMERGENCY DELIVERY

NOTE: - SYSTEM SHOWN AS PER TANDEM AXLE SETUP.
 - FOR TRIDEM AXLE SETUP, USE SENSORS ON FIRST AND LAST AXLES ONLY.
 - INSTALL SERVICE/DELIVERY LINES FOR CENTER AXLE SIMILARLY AS SHOWN.

9	1	# 3305-T-1242	ECU MOUNTING BRACKET	79-17672-6
8	1	# A1-3237-L-1130	DIAGNOSTIC CABLE W/TOOL	79-17673-6
7	1	# 449 315 150 0	POWER CABLE - 4 COND. - 15 m.	79-17674-6
6	1	# 449 421 020 0	RELAY VALVE EXT. CABLE - 2 m.	79-17675-6
5	4	# 449 713 030 0	SENSOR EXT. CABLE - 3 m.	79-17676-6
4	4	# 899 760 510 4	SENSOR CLIP	79-17677-6
3	4	# 441 032 809 0	SENSOR ASS'Y - 1 m. LEAD	79-17678-6
2	1	# 472 195 032 0	RELAY VALVE - 4 PORT	79-17679-6
1	1	# 472 500 012 0	ECU/VALVE - 4S/2M (AUTO CON.)	79-17680-6
ITEM	QTY.	MATERIAL	MATERIAL SPECIFICATION	STOCK NUMBER

4S/2M

8.16 ELECTRICAL SYSTEM

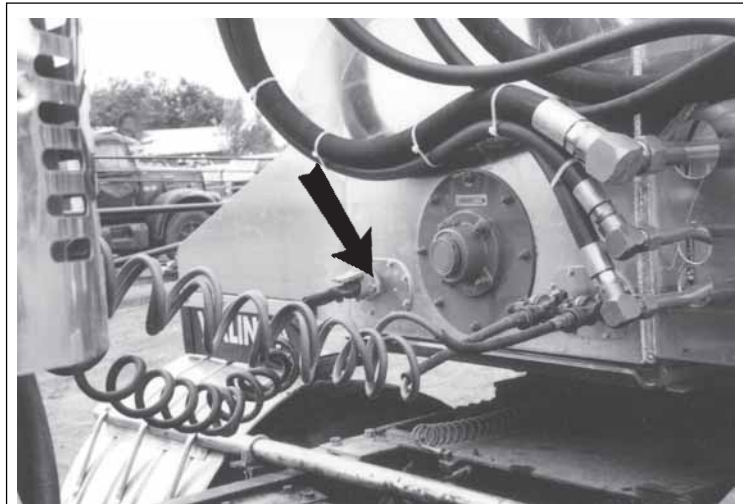
All trailers are equipped with an electrical system for providing power for lights and electrical controls. All components are designed to minimize the effects of foul weather and adverse operating conditions. However, it is the responsibility of the operator to check and verify that all components are in good condition and functioning as intended.

During the daily or pre-trip inspection, always verify that each light functions as required. It may be helpful to work with another individual to verify the function of the brake or turn signal lights. A properly functioning electrical system is the only way an operator can communicate his intentions to other drivers. Checking the electrical system includes but is not limited to:

1. Replace any bulb that is burned out.
2. Clean all reflective lenses. Replace any that are cracked or broken.
3. Clean all connections and terminals to a light that is flickering.
4. Reroute and secure any wires or cables that are dangling or have snagged on something.
5. Check the integrity of the seal around each light. Replace any seal that is cracked or damaged.

Table 8 Trailer Light Requirements

Function	P/N	Size (Watts)
4" Tail Lamp		8
Signal/Brake		27
Side Signal		27
Clearance		8
Marker		5



Electrical Connectors



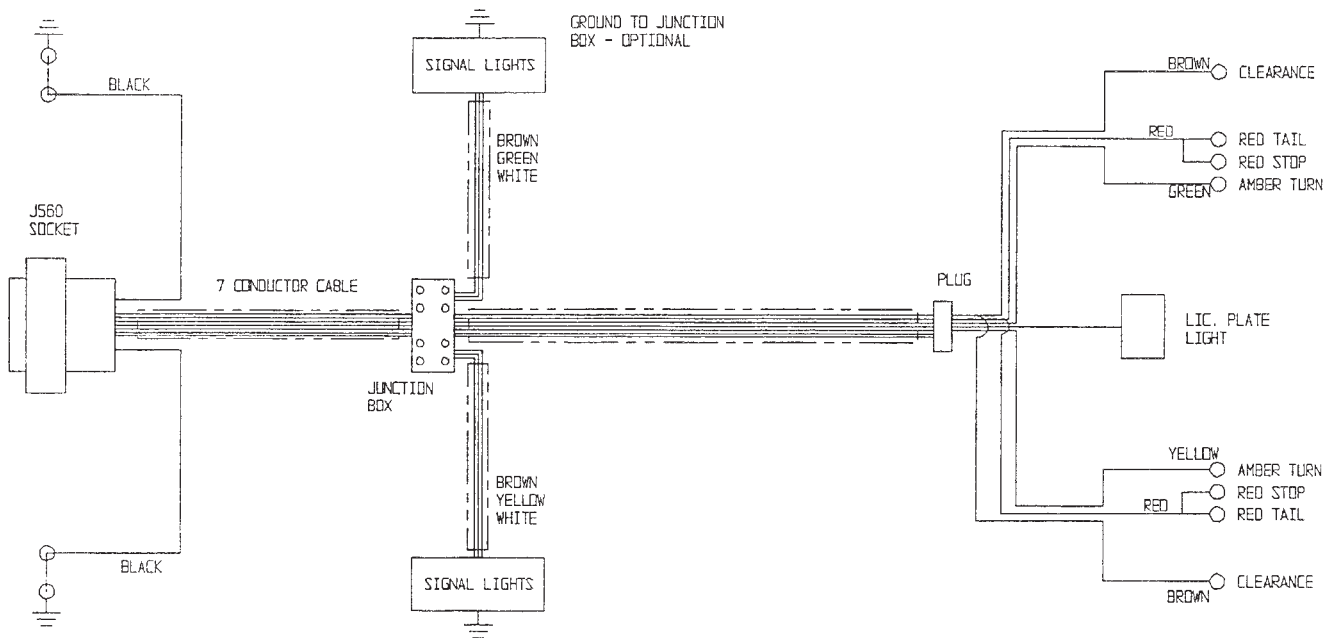
Terminal Box



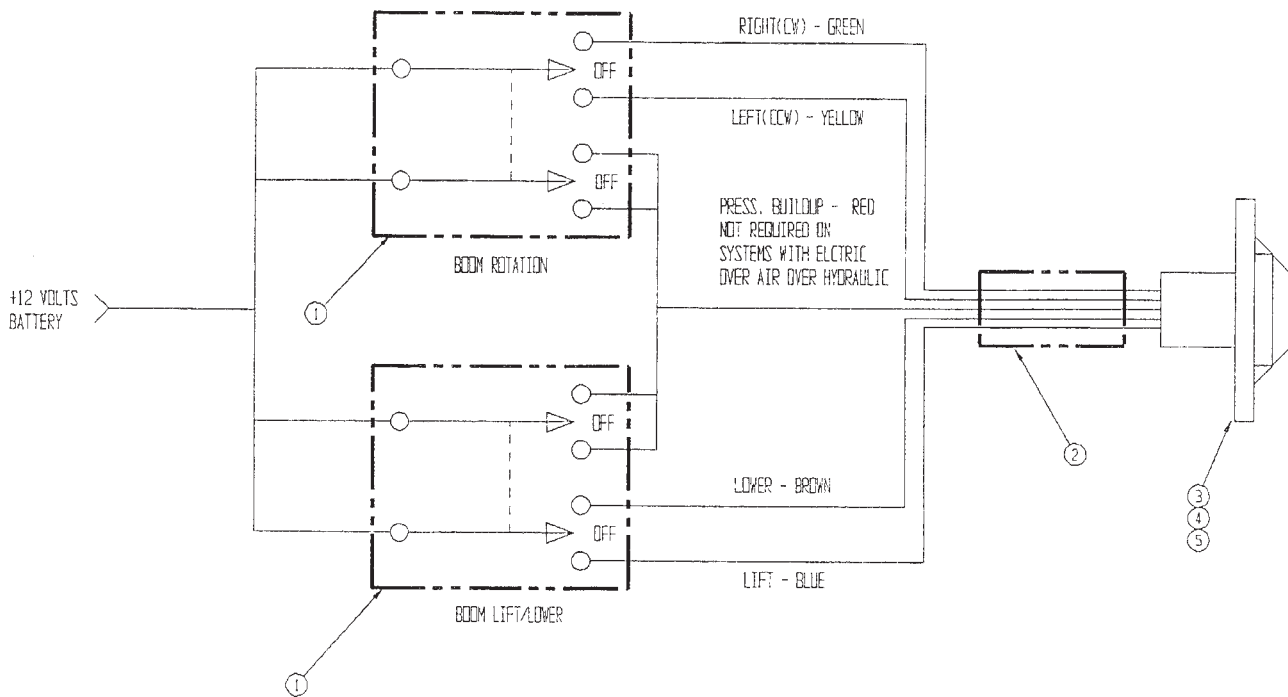
Rear

Fig. 8-39 LIGHTING

8.16.1 ELECTRICAL SCHEMATICS



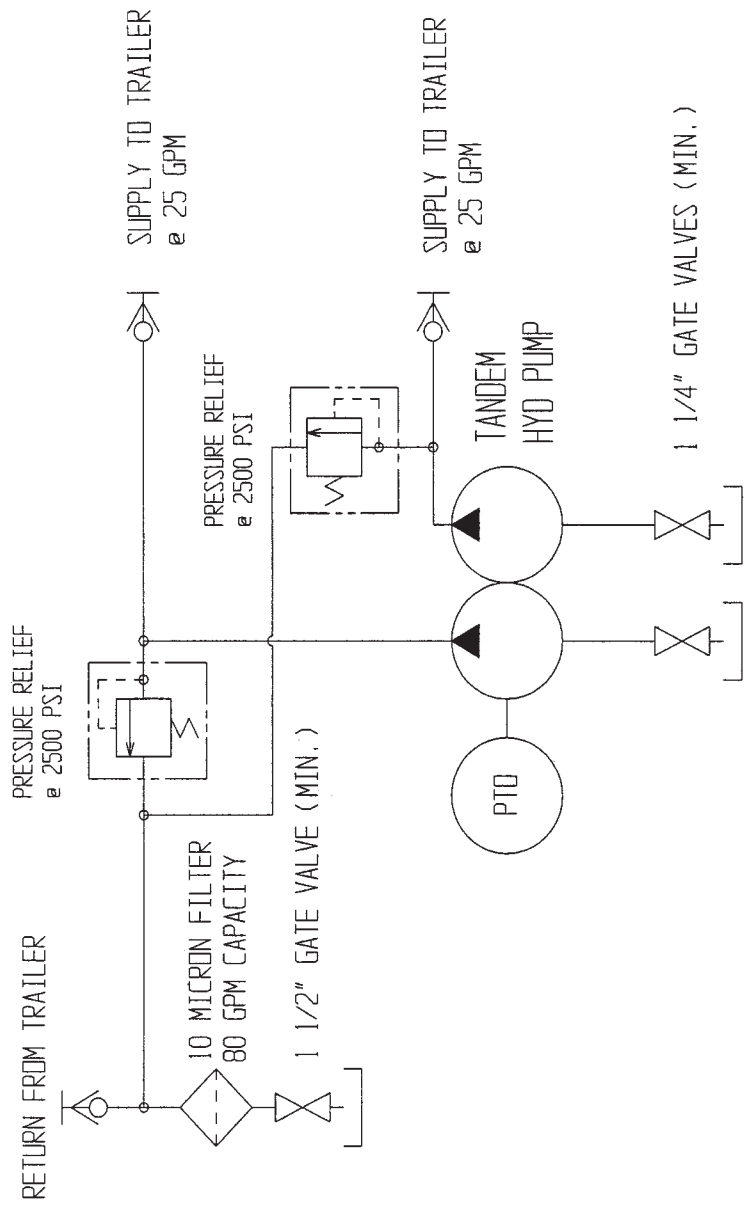
Light Schematic



ITEM	QTY.	MATERIAL	STOCK NUMBER
5	1	BLK. ELEC. COILED CABLE (MALE ENDS) NOT SHOWN	B2-15862-E
4	1	DUST CAP NOT SHOWN	B2-00983-G
3	1	CONNECTOR - 7 POLE SOCKET	B2-01942-E
2	10 FT.	7 WIRE CABLE	B2-00524-G
1	2	TOGGLE SWITCH - OPDT ON - OFF - ON	B2-13708-G

Remote Switch Schematic

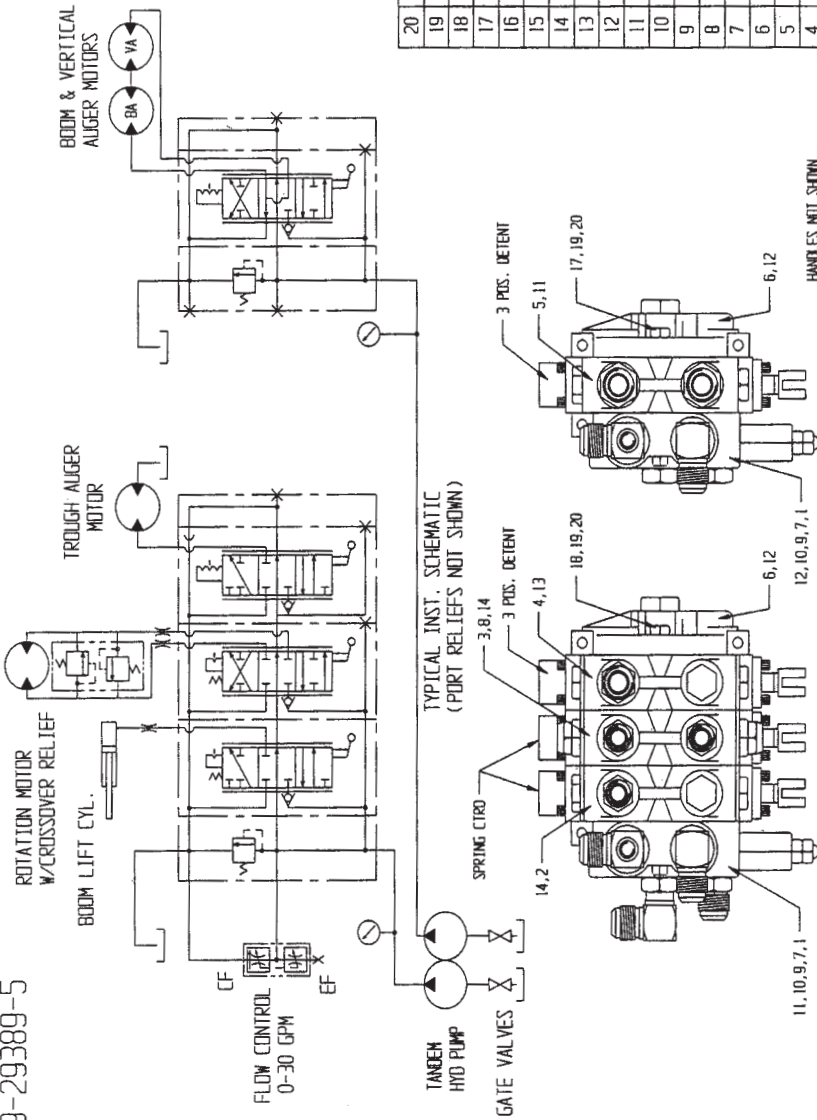
8.17 HYDRAULIC SCHEMATICS



<p>NOTICE: THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND IT SHALL NOT BE REPRODUCED OR ITS CONTENTS DISCLOSED IN WHOLE OR IN PART WITHOUT THE PRIOR WRITTEN CONSENT OF WALINGA INC.</p>		<p>UNLESS SPECIFIED ALL DIMENSIONS ARE IN INCHES - MACHINED SURFACE TOLERANCES : ALL 3 PLACE DECIMALS 1/2- 0.006 - OTHER DIM'S UNMACHINED SURFACES 1/2- 0.015 - HOLE DIA TOLERANCES : HOLES 3 FEET 1/2- 1/10 HOLES 3 FEET 1/2- 1/8 - BREAK ALL SHARP CORNERS 0.01 MAX. - DO NOT SCALE DRAWING</p>		<p>REV</p>	<p>DESCRIPTION</p>	<p>DATE</p>	<p>BY</p>	<p>ECN</p>	<p>FOR USE ON:</p>	<p>ITEM</p>	<p>QTY</p>	<p>MATERIAL</p>	<p>MATERIAL SPECIFICATION</p>	<p>STOCK NUMBER</p>
<p>TANDEM PUMP - TRACTOR WETLINE</p>														
<p>WALINGA INC. GUELPH ONTARIO</p>														
<p>SCALE: NTS DATE: DEC. 10/97</p>														
<p>DOWN BY: PCN CHECKED BY:</p>														

Tandem Pump - Tractor Wetline

DRAWING NUMBER:
59-29389-5



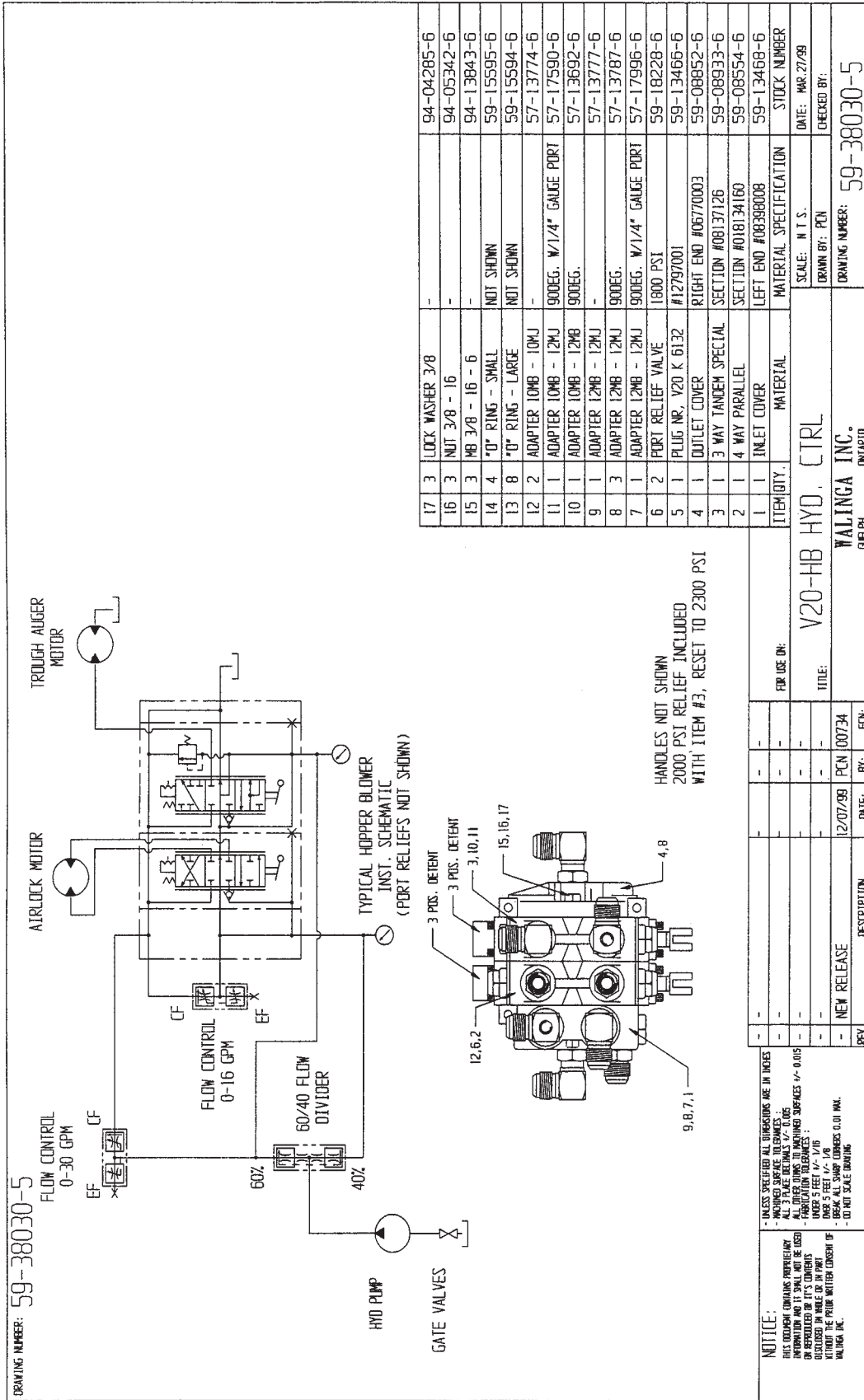
20	6	LOCK WASHER 3/8	-	94-04285-6
19	6	NUT 3/8 - 16	-	94-05342-6
18	3	NB 3/8 - 16 - 8	-	94-13462-6
17	3	NB 3/8 - 16 - 4 1/2	-	94-04299-6
16	8	"O" RING - SMALL	NOT SHOWN	59-15595-6
15	16	"O" RING - LARGE	NOT SHOWN	59-15594-6
14	3	ADAPTER 10MB - 10MJ	-	57-13774-6
13	1	ADAPTER 10MB - 12MJ	-	57-13776-6
12	4	ADAPTER PLUG 12MB	-	57-13805-6
11	3	ADAPTER 12MB - 12MJ	-	57-13777-6
10	3	ADAPTER 12MB - 12MJ	90DEG.	57-13787-6
9	2	ADAPTER 12MB - 12MJ	1800 PSI	59-17996-6
8	2	PORT RELIEF	1800 PSI	59-18228-6
7	2	RELIEF CARTRIDGE	WHA - 2300 PSI	59-18227-6
6	2	OUTLET COVER	RIGHT END #0670003	59-08852-6
5	1	4 WAY FREE FLOW	SECTION #10955194	59-08315-6
4	1	3 WAY TANDEM	SECTION #08137127	59-08556-6
3	1	4 WAY PARALLEL	SECTION #018134160	59-08554-6
2	1	3 WAY PARALLEL	SECTION #08133130	59-08555-6
1	2	INLET COVER	LEFT END #08388008	59-13468-6
ITEM QUANTITY		MATERIAL	MATERIAL SPECIFICATION	STOCK NUMBER
			SCALE: N T S	DATE: MAR. 27/99
			DRAWN BY: PCN	CHECKED BY:
			DRAWING NUMBER: 59-29389-5	

REV	DESCRIPTION	DATE	BY:	ECH:
-	NEW RELEASE	12/07/99	PCN 00734	
-				
-				
-				

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THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND IT'S CONTENTS ARE TO BE KEPT SECRET AND NOT REPRODUCED WITHOUT THE PRIOR WRITTEN CONSENT OF WALINGA INC.
UNLESS SPECIFIED ALL DIMENSIONS ARE IN INCHES
MACHINED SURFACES UNLESS NOTED
ALL OTHER DIMS. TO UNMACHINED SURFACES 1/4 - 0.015
HARDENING: 1/2" & DEEPER 1/2" & DEEPER 5 FEET 1/4" & DEEPER 5 FEET 1/8" & DEEPER 5 FEET 0.015 INK.
- BREAK ALL SHARP CORNERS 0.015 INK.
- DO NOT SCALE DRAWING.

FOR USE IN:
TITLE: DOUBLE V20-HA HYD. CTRL
WALINGA INC.
GUELPH ONTARIO

8.17 HYDRAULIC SCHEMATICS (cont'd)



Hopper Blower

17	3	LOCK WASHER 3/8	-	94-04285-6
16	3	NUT 3/8 - 16	-	94-05342-6
15	3	NB 3/8 - 16 - 6	-	94-13843-6
14	4	*O* RING - SMALL	NOT SHOWN	59-15595-6
13	8	*O* RING - LARGE	NOT SHOWN	59-15594-6
12	2	ADAPTER 10MB - 10MJ	-	57-13774-6
11	1	ADAPTER 10MB - 12MJ	90DEG. W/1/4" GAUGE PORT	57-17590-6
10	1	ADAPTER 10MB - 12MB	90DEG.	57-13692-6
9	1	ADAPTER 12MB - 12MJ	-	57-13777-6
8	3	ADAPTER 12MB - 12MJ	90DEG.	57-13787-6
7	1	ADAPTER 12MB - 12MJ	90DEG. W/1/4" GAUGE PORT	57-17996-6
6	2	PORT RELIEF VALVE	1800 PSI	59-18228-6
5	1	PLUG NR. V20 K 6132	#12797001	59-13466-6
4	1	OUTLET COVER	RIGHT END #06770003	59-08852-6
3	1	3 WAY TANDEM SPECIAL	SECTION #08137126	59-08933-6
2	1	4 WAY PARALLEL	SECTION #018134160	59-08554-6
1	1	INLET COVER	LEFT END #08388008	59-13468-6
ITEM QTY.		MATERIAL	MATERIAL SPECIFICATION	STOCK NUMBER
			SCALE: N.T.S.	DATE: MAR. 27/99
			DRAWN BY: PCN	CHECKED BY:
			DRAWING NUMBER: 59-38030-5	

REV	DESCRIPTION	DATE	BY	ECN
-	NEW RELEASE	12/07/99	PCN	100734
TITLE: V20-HB HYD. CTRL				
DRAWING NUMBER: 59-38030-5				
DRAWN BY: PCN				
CHECKED BY:				
DATE: MAR. 27/99				
STOCK NUMBER				
MATERIAL SPECIFICATION				
SECTION #018134160				
LEFT END #08388008				
SECTION #08137126				
RIGHT END #06770003				
59-13466-6				
1800 PSI				
90DEG. W/1/4" GAUGE PORT				
57-17996-6				
57-13787-6				
57-13777-6				
57-13692-6				
90DEG.				
57-17590-6				
90DEG. W/1/4" GAUGE PORT				
57-13774-6				
59-15594-6				
59-15595-6				
NOT SHOWN				
NOT SHOWN				
94-13843-6				
94-05342-6				
94-04285-6				

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UNLESS SPECIFIED ALL DIMENSIONS ARE IN INCHES

ALL 3 PLANE SURFACES 1/4" TO .005

ALL OTHER DIMS. TO MACHINED SURFACES 1/4" - .015

FRACTIONAL DIMENSIONS:

1/8" = .125

1/4" = .250

3/8" = .375

1/2" = .500

5/8" = .625

3/4" = .750

1" = 1.000

1 1/8" = 1.125

1 1/4" = 1.250

1 3/8" = 1.375

1 1/2" = 1.500

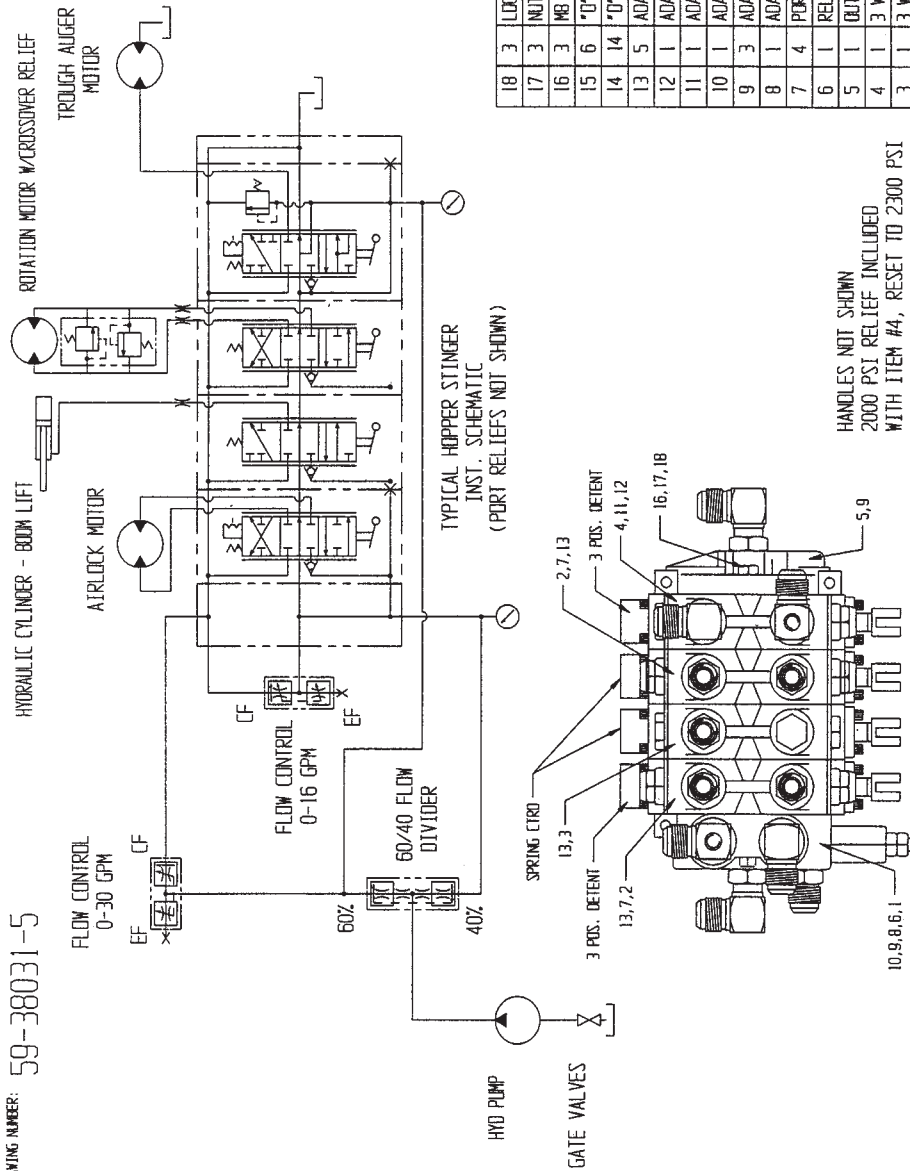
1 5/8" = 1.625

2" = 2.000

BREAK ALL SHARP CORNERS 0.101 MAX.

DO NOT SCALE DRAWING

DRAWING NUMBER: 59-38031-5



HANDLES NOT SHOWN
2000 PSI RELIEF INCLUDED
WITH ITEM #4, RESET TO 2300 PSI

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UNLESS SPECIFIED ALL DIMENSIONS ARE IN INCHES
- ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED
- ALL OTHER DIMS TO UNFINISHED SURFACES 1/2" 0.015
- FABRICATION TOLERANCES:
OVER 5 FEET 1/4" - 1/16"
UNDER 5 FEET 1/8" - 1/32"
- DO NOT SCALE DRAWING

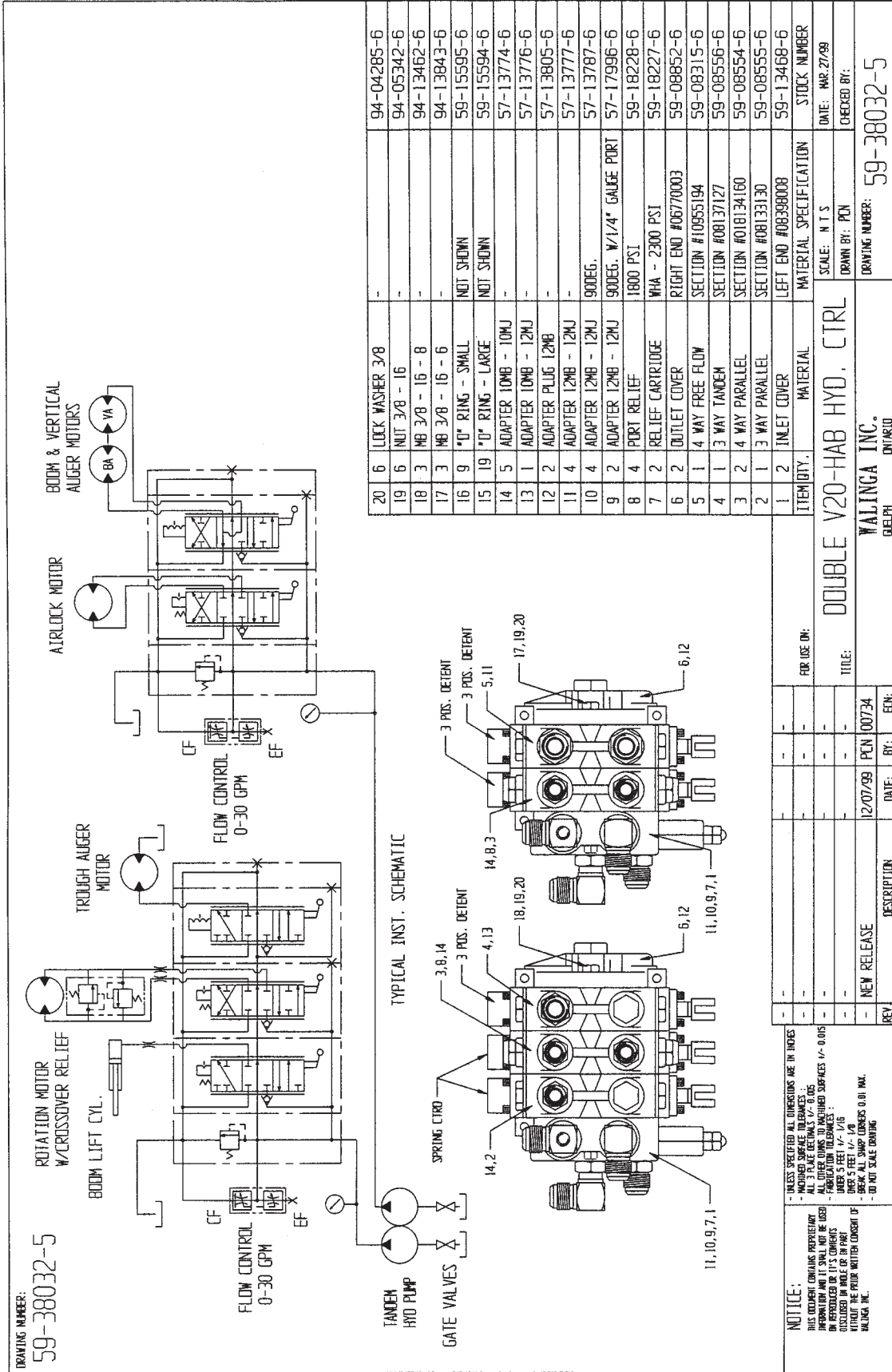
REV	DESCRIPTION	DATE	BY	ECN
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-				
-				
-				
-				

R/R USE OR:
TITLE: V20-HS HYD. CTRL
SCALE: N T S
DRAWN BY: PCN
CHECKED BY:
DATE: MAR 27/99

ITEM #	QTY	MATERIAL	MATERIAL SPECIFICATION	STOCK NUMBER
1	1	INLET COVER		59-13468-6
2	2	4 WAY PARALLEL		59-08554-6
3	1	3 WAY PARALLEL		59-08555-6
4	1	3 WAY TANDEN SPECIAL		59-08933-6
5	1	OUTLET COVER		59-08852-6
6	1	RELIEF VALVE		59-18227-6
7	4	PORT RELIEF VALVE		59-18228-6
8	1	ADAPTER 12MB - 12MJ		57-17996-6
9	3	ADAPTER 12MB - 12MJ		57-13787-6
10	1	ADAPTER 12MB - 12MJ		57-13777-6
11	1	ADAPTER 10MB - 12MJ		57-13692-6
12	1	ADAPTER 10MB - 12MJ		57-17590-6
13	5	ADAPTER 10MB - 10MJ		57-13774-6
14	14	Ø" RING - LARGE	NOT SHOWN	59-15594-6
15	6	Ø" RING - SMALL	NOT SHOWN	59-15595-6
16	3	MB 3/8 - 16 - 10		94-13844-6
17	3	NUT 3/8 - 16		94-05342-6
18	3	LOCK WASHER 3/8		94-04285-6

Hopper Stinger

8.17 HYDRAULIC SCHEMATICS (cont'd)



Hopper Auger Blower

8.18 GATE TOWER - MANUAL

Each compartment is equipped with a gate that controls the flow of material into the trough conveyor. Each gate is opened and closed manually with a crank or with an air cylinder.

For units built prior to 1999, (see figure 8-40) the tracking chain must be positioned snugly against the sprocket to prevent tooth jumping or jamming. To adjust the tracking chain, follow this procedure:

1. Stop engine and remove ignition key.
2. Enter compartment and remove cover over tower.
3. Loosen jam nut on tracking chain position bolt.
4. Use the position nut to properly locate the tracking chain against the sprocket.
5. Tighten jam nut to its specified torque.



WARNING

Machine is shown with guard removed or access door opened for illustrative purposes only. Do not operate machine with guard removed or access door opened.

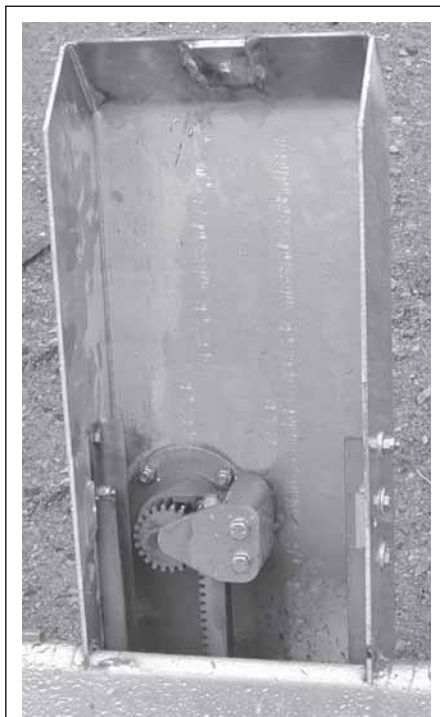
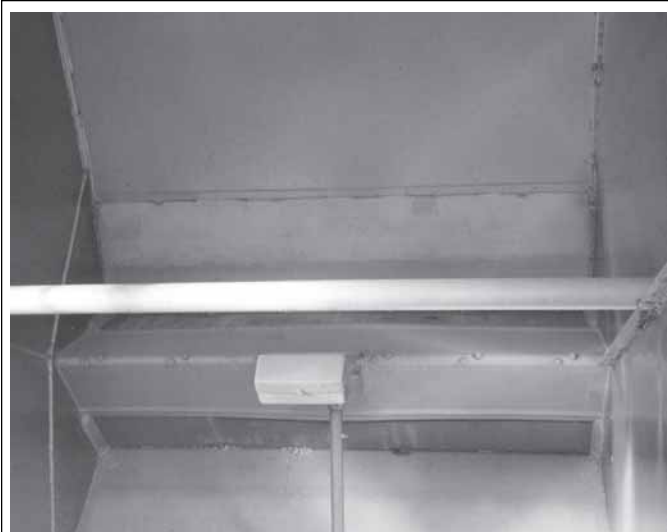
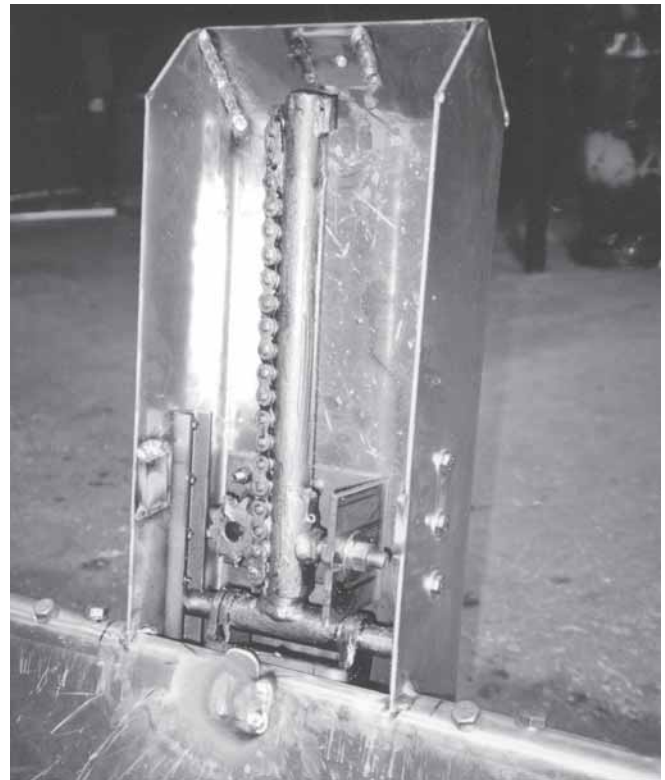


Fig. 8-40A NEW STYLE MANUAL GATE (ON UNITS BUILT AFTER 1999)



Tower



Tracking Chain Position Bolt

Fig. 8-40 MANUAL GATE

9 BOOM ROTATION DRIVE SYSTEM

Each unit is equipped with a boom that can be rotated into position for unloading. A dual stage roller chain drive system provides an infinitely variable system for positioning the boom to any feed storage facility. For the system to function as required, the roller chain must be lubricated monthly and the chain tension maintained at the proper level.

To set chain tension, follow this procedure:

1. Place all controls in neutral, disengage PTO clutch, stop engine, set park brake, remove ignition key and wait for all moving parts to stop.
2. Remove guards over boom rotation drive system.
3. Check tension of each chain. With the proper tension, the chain can deflect 1/8 inch (3 mm) at the centre of the span.
4. **To adjust chain tension:**
 - a. Use the nut on the sprocket position bolt to set the position of the sprocket assembly.

NOTE

Always set the sprocket position first.

- b. Loosen the hydraulic motor assembly mounting bolts.
 - c. Slide or tap the motor assembly into the desired position.
 - d. Tighten motor assembly mounting bolts to their specified torque.
5. Install and secure the drive system guards.

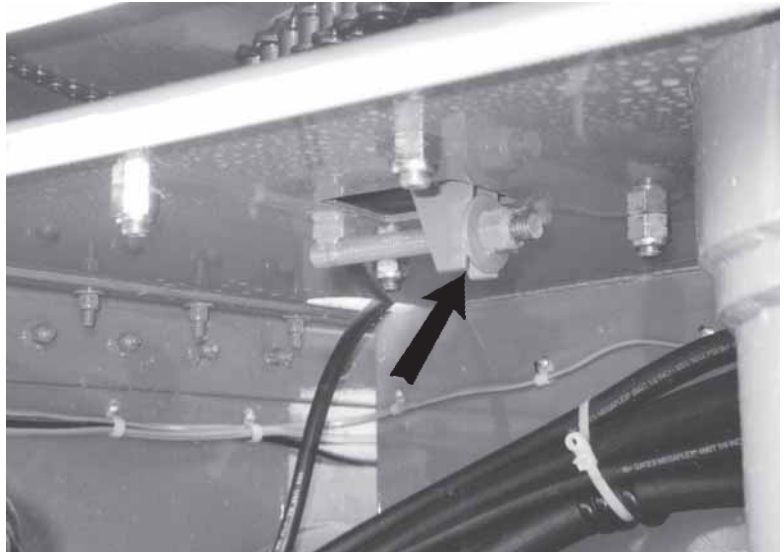


WARNING

Machine is shown with guard removed or access door opened for illustrative purposes only. Do not operate machine with guard removed or access door opened.



Drive System



Sprocket Position Bolt



Hydraulic Motor Assembly

Fig. 9-1 BOOM ROTATION DRIVE SYSTEM

10 TROUBLE SHOOTING

The Walinga Bulk Feed Unit uses an auger, air or a dual system for unloading material as required. It is a simple and reliable system that requires minimal maintenance.

In the following section, we have listed many of the problems, causes and solutions to the problems that you may encounter.

If you encounter a problem that is difficult to solve, even after having read through this trouble shooting section, please call your local Walinga dealer or distributor. Before you call, please have this Operator's Manual and the serial numbers from your trailer ready.

PROBLEM	CAUSE	SOLUTION
1. Air Ride Suspension		
Trailer leans...		
...constantly in one direction	Suspension beams installed out of parallel.	Determine which beam is out of parallel, cut from axle, reposition and re-weld.
...varies from side to side.	Axle welds missing or broken.	Clear away old welds, reposition the beams to be parallel and re-weld to axle.
...varies in one direction.	Failed pivot bushing (rare).	Contact Hendrickson Turner Technical Service Department.
<hr/>		
Trailer "Dog-Tracks"...		
...constantly to one side.	Trailer out of alignment.	Remove weld from the alignment collars on those axles requiring adjustment. Realign per procedure provided by Hendrickson Turner.
...from side to side.	Missing or broken alignment collar welds.	Clear away failed welds and realign per procedure provided by Hendrickson Turner.
...to one side under load.	Suspension not square to axle.	Contact the Hendrickson Turner Technical Service Department.
	Air springs misaligned.	Compare the installation to the suspension drawing and reposition mountings as required.
	Failed pivot bushing (rare).	Contact the Hendrickson Turner Technical Service Department.

PROBLEM

CAUSE

SOLUTION

1. Air Ride Suspension (cont'd)

Bushing Walk

The suspension beams have shifted from the center of the pivot bushings).

Incorrect alignment.

Re-bush the suspension and re-align as per Hendrickson Turner instructions.

Suspension beams out of parallel (vertically or longitudinally).

Determine which beam(s) is out of position, cut from axle, reposition and weld. Re-bush both suspension pivots.

Frame bracket centers do not match the suspension beam centers.

Compare the installation dimensions to the suspension assembly drawing. Reposition the incorrect components and re-bush both suspension pivots.

Use of improper bushing lubricant.

Re-bush using lubricant supplied by Hendrickson Turner.

Pivot can be moved vertically.

Faulty or worn bushing.

Replace bushing.

Bushing protrudes from the bushing tube.

Failed bushing.

Rubber protruding from both ends of the bushing tube is normal. Excess rubber protruding from one end can indicate a bushing walk condition.

PROBLEM

CAUSE

SOLUTION

2. Mechanical Suspension

Improper suspension spring action.

Broken or cracked spring leaves.

Replace complete spring.

Uneven load distribution.

Rearrange load for proper distribution.

Weak spring.

Replace spring.

Springs out of alignment in hangers due to loose U-bolts.

Align springs and tighten U-bolts to proper torque.

PROBLEM

CAUSE

SOLUTION

3. Tires

	Over or under inflation.	Inflate to proper pressure.
	Loose wheel stud nuts or clamps.	Tighten wheel stud nuts or clamps.
	Loose or tight wheel bearing.	Adjust bearings.
	Axle bent or out of alignment.	Straighten, align or replace axle.
	Tires not properly matched.	Match tires.
	Improper acting brakes.	Correct brakes as required.
	Rapid stopping.	Apply brakes slowly when approaching stops.
	High speed.	Reduce speed.
<hr/>		
	Over or under inflation.	Inflate to proper pressure.
	Excessive speed on turns.	Reduce speed.
	Tire wobble due to uneven rim clamping.	Torque tighten all rim clamps.
	Worn or damaged wheel bearings.	Replace bearings.
	Bent wheel or rim.	Replace wheel or rim.
	Bent axle.	Replace or straighten axle.
<hr/>		
	Leaf spring broken.	Replace leaf or complete spring.
	Bent axle.	Replace or straighten axle.
	Frame or suspension (axles) out of alignment.	Straighten frame or align axles.
<hr/>		
Loss of tire air pressure.	Puncture in tire.	Repair or replace tire.
	Faulty valve or valve core.	Replace valve assembly or core.
	Wheel or rim damage.	Replace wheel or rim.

PROBLEM	CAUSE	SOLUTION
4. Electrical		
Lights flicker or do not come on.	Bad connection.	Check electrical system circuits.
	Frayed wires.	Repair as required.
	Battery on tractor not sufficiently charged.	Charge battery.
	Damaged or disconnected wire on ground cable.	Repair or replace cable.
	Poor ground at sockets.	Repair as necessary.
Complete loss of trailer lights.	Broken main harness.	Repair or replace.
	Junction box failure.	Replace junction box.
	Frayed wires.	Repair as required.
	Damaged or disconnected ground cable.	Repair or replace cable as required.
	Loose or corroded connection in ground lead between tractor and trailer.	Repair or replace.
Lights flash improperly or appear to be crossed.	Internal short in junction box.	Repair or replace junction box.

PROBLEM

CAUSE

SOLUTION

5. Air System

Excessive compressor cycling.

Air leak.

Check air line fittings and hose connections on service or supply line.

Check service chamber at clamp housing, push rod for damage.

Check service chamber diaphragm.

Check emergency chamber clamp and vent holes for leakage.

Repair or replace air chamber as required.

Check FFVII brake valve if so equipped. Repair or replace as required.

Trailer brakes slow and sluggish.

System or component failure.

Check slack adjuster and chamber/spring brake push rod alignment for interference.

Assure slack adjuster and chamber/spring brake push rod angle 90° applied with proper adjustment.

Assure open lines - no kinks, bends, closed shut-off cocks, restrictions, excessive elbows.

Assure adequate tractor brake function.

Have authorized service center check for adequate pressure and timing balance relative to tractor/trailer application.

PROBLEM

CAUSE

SOLUTION

5. Air System (cont'd)

Trailer brakes drag.

System or component failure

Assure emergency line exceeds 120 psi pressure; check and maintain governor at max. cut-in.

Check slack adjuster and chamber/spring brake push rod alignment for interference.

Assure slack adjuster and chamber/spring brake push rod angle 90° applied with proper adjustment.

Assure open lines - no kinks, bends, closed shut-off cocks, restrictions, excessive elbows.

Check for trapped service air pressure at trailer service/delivery hoses. If air pressure is noted, check for full release of all application valves (tractor/truck/trailer).

Trailer brakes won't apply (service).

System or component failure.

Check air delivery to emergency system.

Check air delivery to service gladhand.

Check air delivery to air chamber or spring brake.

Check air delivery to all reservoirs at system working pressure.

Check slack adjuster and chamber/spring brake push rod alignment for interference.

Check slack adjuster and chamber/spring brake push rod angle 90° applied with proper adjustment.

Park/emergency brakes won't release.

System or component failure.

Check air jumper hoses are not crossed between tractor and trailer.

Check air delivery to emergency gladhands exceeds 120 psi.

Check air delivery to FFV valve.

Check air delivery to all reservoirs at system working pressure.

PROBLEM

CAUSE

SOLUTION

5. Air System (cont'd)

Park/emergency brakes won't release (cont'd).

System or component failure (cont'd).

Check open lines - no kinks, bends, closed shut-off cocks, restrictions, excessive elbows.

Check that brake shoes are not frozen to drums.

Park/emergency brakes won't hold.

System or component failure.

Check slack adjuster and chamber/spring brake push rod alignment for interference.

Assure slack adjuster and chamber/spring brake push rod angle 90° applied with proper adjustment.

Air reservoir leaks or loose mounting.

System or component failure.

Replace/use rubber grommets with integral brackets.

Semi-trailer "Runs-Up" on tractor.

Check brake linkage.

Assure slack adjuster and chamber/spring brake push rod angle 90° applied with proper adjustment.

Check gladhand connection.

Assure open lines - no kinks, bends, closed shut-off cocks, restrictions, excessive elbows.

Have authorized service center check for adequate pressure and timing balance relative to tractor/trailer application.

Poor braking performance.

Uneven brakes.

Check slack adjuster and chamber/spring brake push rod angle 90° applied with proper adjustment.

Check open lines - no kinks, bends, closed shut-off cocks, restrictions, excessive elbows.

Check for leaks in system by applying service brake and inspecting.

PROBLEM

CAUSE

SOLUTION

5. Air System (cont'd)

Poor braking performance (cont'd).

Trailer brake lining wear excessive.

Have authorized service center check for adequate pressure and timing balance relative to tractor/trailer application.

Proceed per problem "trailer brakes drag."

Trailer brakes slow to apply.

Check slack adjuster and chamber/spring brake push rod angle 90° applied with proper adjustment.

Check air delivery to all reservoirs at system working pressure.

Check open lines - no kinks, bends, closed shut-off cocks, restrictions, excessive elbows.

Have authorized use of "jumper hose analyser" and duplex gauge to pin-point brake imbalance.

Check functional return spring in service chamber or spring brake.

Check open lines - no kinks, bends, closed shut-off cocks, restrictions, excessive elbows.

Trailer service brakes slow to release.

Have authorized use of "jumper hose analyser" and duplex gauge to pin-point brake imbalance.

Slack adjuster not auto-adjusting.

Check for damaged actuator rod. Replace as required.

Slack adjuster internal components seized. Replace.

Cracked housing.

Replace slack adjuster.

Worn clevis pin bushing.

Replace bushing

PROBLEM

CAUSE

SOLUTION

5. Air System (cont'd)

Poor braking performance (cont'd).

Full function valve (FFV) leaks at exhaust port with all brakes released.

Replace FFV valve.

Full function valve (FFV) leaks at exhaust port with service brakes applied.

Replace FFV valve.

Spring parking brake (service only service chamber side of spring brake) drags or won't release.

Check for:

- Improper adjustment, restriction or broken line.
- Diaphragm failure.
- System pressure too low (120 psi min).
- Replace entire unit or piggy-back emergency section.

Spring parking brake leaks when pressurized for park brake release.

Check for:

- Ruptured spring side diaphragm.
- Hose leaks.
- Repair hose leak or replace spring brake chamber.

PROBLEM	CAUSE	SOLUTION
6. Hydraulic System		
No oil pressure.	Hose hook up incorrect.	Reverse hoses on pump.
	Loose coupling in driveline.	Check setscrews in driveline.
	Loose connection.	Check hose fittings.
	Air in oil.	Check hose fittings.
Noisy pump.	Bent drive shaft.	Check driveline.
	Low oil supply.	Increase oil in reservoir.
	Air in oil.	Check hose fittings.
Discharge auger will not raise.	See if boom lock is released.	Check for air leaks.
	Low oil pressure.	PTO in jammed gear.
		Check line pressure at suggested RPM.
Vertical, discharge and floor augers running in reverse.	Wrong motor rotation after being repaired.	Switch oil lines.
Auger does not turn when motor is running.	Key in auger bushing is sheared.	Replace key.
	Motor shaft is broken.	Remove motor and check shaft.
Auger will not swivel when motor is running.	Broken chain.	Replace or repair chain.
	Key in motor shaft is sheared.	Replace key.
	Motor shaft is broken.	Remove motor and check shaft.
Extreme pressure needed to swivel discharge.	Lack of lubrication on pivot rings.	Lubricate pivot rings.
Discharge and floor auger exceedingly noisy.	Nylon lining worn or damaged.	Remove auger, check and repair worn nylon.
	Loose hanger bearing.	Tighten bearing.
Evidence of oil in feed.	Leaking oil seal on boom auger or vertical auger motor.	Remove motor and replace seal.

PROBLEM	CAUSE	SOLUTION
7. Orbit Motor		
Slow operation.	Plugged filter.	Replace filter element or clean filter.
	Relief setting too low.	Set relief valve for proper PSI.
	Worn pump.	Repair or replace pump.
	Worn motor.	Replace worn parts or motor.
	Extremely high fluid temperature causing pump and motor to slip (temp. increase as pump and motor wear).	Increase reservoir size and use a high viscosity index such as 20W40.
	Inadequate size oil lines.	Increase oil lines.
	Pump cavitation.	Increase oil line size to pump, in cold weather, use 5W20 oil.
Motor will not turn.	Shaft seized in housing due to excessive side load or misalignment (Note 500 lb. max. radial loading on shaft).	Replace housing assembly set if damaged.
	Large contaminating particles in fluid such as machining chips or sand - very dirty fluid.	Flush new systems - use better filtration.
	Broken shaft from extreme side loads or misalignment.	Correct and replace.
Motor runs without turning shaft.	Broken shaft.	Replace shaft assembly - check housing for wear and replace if necessary.
Motor turns in wrong direction after being replaced.	Hose connections wrong.	Reverse connections.
Leak at shaft.	Worn or cut quad-ring.	Replace quad-ring, polish shaft at seal area with #600 wet or dry sanding cloth.

PROBLEM	CAUSE	SOLUTION
7. Orbit Motor (cont'd)		
Leak between flange and housing.	Loose flange.	Tighten.
	Damaged seal between housing flange.	Replace seal. Check housing surface at seal for sharp nicks or deep scratches.
	Leak in body plug seal.	Replace faulty o-rings.
<hr/>		
Leak between housing and wear plates or between wear plates and gerotor.	End cap bolts loose. (Note: All motors are tested and rated of a maximum back pressure of 1000 PSI).	Tighten the cap screws at gerotor end of motor - if the threads are accidentally stripped in the housing, the hole may be drilled and tapped deeper and the motor reassembled w/longer bolts.
<hr/>		
Leak between gerotor and end cap.	Dirt between surfaces.	Reassemble - clean and dry parts.
	Scratches or nicks on surfaces.	Polish very carefully on a flat, hard surface - use #600 or finer abrasive cloth and very little pressure - avoid rounding edges.
<hr/>		
Cracked front flange.	Use installation bolts which are too long and bottom against housing.	Replace flange and use proper size bolts.
<hr/>		
Leak at oil ports.	Poor fittings.	Replace fittings carefully.
	Damaged threads.	Replace housing or use nut such as true seal.

PROBLEM

CAUSE

SOLUTION

8. Hydraulic Failures

a. Cavitation.

Insufficient inlet flow.

Wrong pump speed. Slow down engine RPM and pump speed.

System hoses too small. Replace hoses with larger size.

Tank below line inlet. Change inlet to bottom of tank.

Pressure hose used as suction hose. Intake hose too small. Increase size of intake line.

Detergent oil in hydraulic system. Drain and flush hydraulic system. Replace with specified (non-detergent) oil.

Air getting into system (aeration). Tighten all fittings and extend return line outlet below fluid surface in reservoir.

Suction filters restricting flow. Replace all filters and clean all screens.

Clogged or inadequate breather. Clean or replace breather.

Wrong oil for climatic conditions. Change to proper oil.

Poor tank construction. Replace with better tank.

Abused by overspeeding. Replace pump and don't overspeed.

PROBLEM	CAUSE	SOLUTION
8. Hydraulic Failures (cont'd)		
a. Cavitation (cont'd).	Contamination	<p>Condensation in system and tank. Drain and flush system. Fill with specified oil. Increase frequency of changing oil.</p> <p>Inclement weather. Allow system to warm before operating.</p> <p>Poor tank construction. Replace with better tank.</p> <p>Incorrect material for piping (galvanized). Replace all piping. Use steel. Drain and flush system. Replace with clean oil.</p> <p>Dirty environment. Change oil and filters more frequently.</p> <p>Poor handling of oil. Only use clean containers to store and transport oil. Filter oil before adding to system.</p> <p>Clogged or by-passing filter. Replace filter and change filters more frequently.</p> <p>Sabotage. Keep unit in locked and controlled environment.</p> <p>Cavitation contaminants. Replace pump. Drain and flush system. Replace with specified oil.</p> <p>Stuck relief valve. Clean or replace</p>

PROBLEM

CAUSE

SOLUTION

8. Hydraulic Failures (cont'd)

b. System exceeds pressure specifications over-heats.

Worn bearings: Cracks and discoloration.

Warped wear plates or pressure balance plates.

Internal seal destruction: Varnish deposits.

Extreme gear path cutout/ragged and rough edges.

Heat checked or discolored gears.

Components seize.

Housing cracks.

valve.

Running without oil. Do not run without oil or with low oil.

Requirements for cooler disregarded. Install cooler.

Leaving PTO in gear. Always disengage PTO when there is no demand for oil.

System operating at or above relief setting for extended period.

Change operating procedure to reduce pressure requirements.

Replace oil and damaged components.

Hoses have too many fittings and too many angles. Replumb system to reduce fittings and angles.

Poor reservoir design, placement or paint. Install new reservoir in a new place.

Indirect line routing. Replumb system to improve routing.

Poor hose construction. Replace with better hoses.

Improper hose selection. Replace with better hoses.

Lack of proper maintenance. Improve and increase maintenance frequency.

Restrictions in system from poor design and/or improper component selection. Review system design and change components as required.

11 SPECIFICATIONS

Model No.	Cubic Capacity Based on 44 cu. ft./ft.	No. of Compartments Size of Compartments	Base Unit Weight lbs/kg
HA-20-UL	880	Five (48")	10,611/4813
HA-24-UL	1056	Six (48")	11,351/5149
HA-28-UL	1232	Seven (48")	12,091/5485
HA-32-UL	1408	Eight (48")	12,831/5823
HA-34-UL	1496	Eight (51")	13,161/5970
HA-36-UL	1584	Eight (54")	13,485/6117
HA-36-UL	1584	Nine (48")	13,571/6156
HA-38-UL	1672	Eight (57")	13,809/6264
HA-38-UL	1672	Nine (48")	13,895/6303
HA-40-UL	1760	Ten (48")	14,305/6489
HA-40-UL	1760	Eight (60")	14,133/6411

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

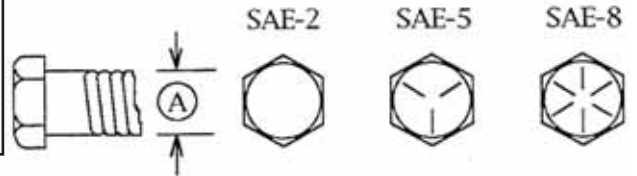
11.2 BOLT TORQUE

CHECKING BOLT TORQUE

The tables shown below give correct torque values for various bolts and capscrews. Tighten all bolts to the torques specified in chart unless otherwise noted. Check tightness of bolts periodically, using bolt torque chart as a guide. Replace hardware with the same strength bolt.

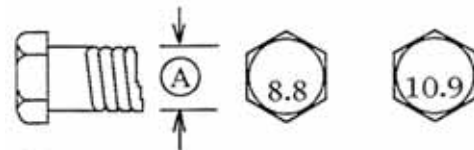
ENGLISH TORQUE SPECIFICATIONS

Bolt Diameter "A"	Bolt Torque*					
	SAE 2 (N.m) (lb-ft)		SAE 5 (N.m) (lb-ft)		SAE 8 (N.m) (lb-ft)	
1/4"	8	6	12	9	17	12
5/16"	13	10	25	19	36	27
3/8"	27	20	45	33	63	45
7/16"	41	30	72	53	100	75
1/2"	61	45	110	80	155	115
9/16"	95	60	155	115	220	165
5/8"	128	95	215	160	305	220
3/4"	225	165	390	290	540	400
7/8"	230	170	570	420	880	650
1"	345	225	850	630	1320	970



METRIC TORQUE SPECIFICATIONS

Bolt Diameter "A"	Bolt Torque*			
	8.8 (N.m) (lb-ft)		10.9 (N.m) (lb-ft)	
M3	.5	.4	1.8	1.3
M4	3	2.2	4.5	3.3
M5	6	4	9	7
M6	10	7	15	11
M8	25	18	35	26
M10	50	37	70	52
M12	90	66	125	92
M14	140	103	200	148
M16	225	166	310	229
M20	435	321	610	450
M24	750	553	1050	774
M30	1495	1103	2100	1550
M36	2600	1917	3675	2710



Torque figures indicated above are valid for non-greased or non-oiled threads and heads unless otherwise specified. Therefore, do not grease or oil bolts or capscrews unless otherwise specified in this manual. When using locking elements, increase torque values by 5%.

* Torque value for bolts and capscrews are identified by their head markings.

11.3 HYDRAULIC FITTING TORQUE

TIGHTENING FLARE TYPE TUBE FITTINGS *

1. Check flare and flare seat for defects that might cause leakage.
 2. Align tube with fitting before tightening.
 3. Lubricate connection and hand tighten swivel nut until snug.
 4. To prevent twisting the tube(s), use two wrenches. Place one wrench on the connector body and with the second tighten the swivel nut to the torque shown.
- * The torque values shown are based on lubricated connections as in reassembly.

	Tube Size OD (in.)	Nut Size Across Flats (in.)	Torque Value*		Recommended Turns To Tighten (After Finger Tightening)	
			(N.m)	(lb-ft)	(Flats)	(Turn)
	3/16	7/16	8	6	1	1/6
	1/4	9/16	12	9	1	1/6
	5/16	5/8	16	12	1	1/6
	3/8	11/16	24	18	1	1/6
	1/2	7/8	46	34	1	1/6
	5/8	1	62	46	1	1/6
	3/4	1-1/4	102	75	3/4	1/8
	7/8	1-3/8	122	90	3/4	1/8

TIGHTENING O-RING FITTINGS *

1. Inspect O-ring and seat for dirt or obvious defects.
2. On angle fittings, back the lock nut off until washer bottoms out at top of groove.
3. Hand tighten fitting until back-up washer or washer face (if straight fitting) bottoms on face and O-ring is seated.
4. Position angle fittings by unscrewing no more than one turn.
5. Tighten straight fittings to torque shown.
6. Tighten while holding body of fitting with a wrench.

	Tube Size OD (in.)	Nut Size Across Flats (in.)	Torque Value*		Recommended Turns To Tighten (After Finger Tightening)	
			(N.m)	(lb-ft)	(Flats)	(Turn)
	3/8	1/2	8	6	2	1/3
	7/16	9/16	12	9	2	1/3
	1/2	5/8	16	12	2	1/3
	9/16	11/16	24	18	2	1/3
	3/4	7/8	46	34	2	1/3
	7/8	1	62	46	1-1/2	1/4
	1-1/16	1-1/4	102	75	1	1/6
	1-3/16	1-3/8	122	90	1	1/6
	1-5/16	1-1/2	142	105	3/4	1/8
	1-5/8	1-7/8	190	140	3/4	1/8
	1-7/8	2-1/8	217	160	1/2	1/12

- * The torque values shown are based on lubricated connections as in reassembly.

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