

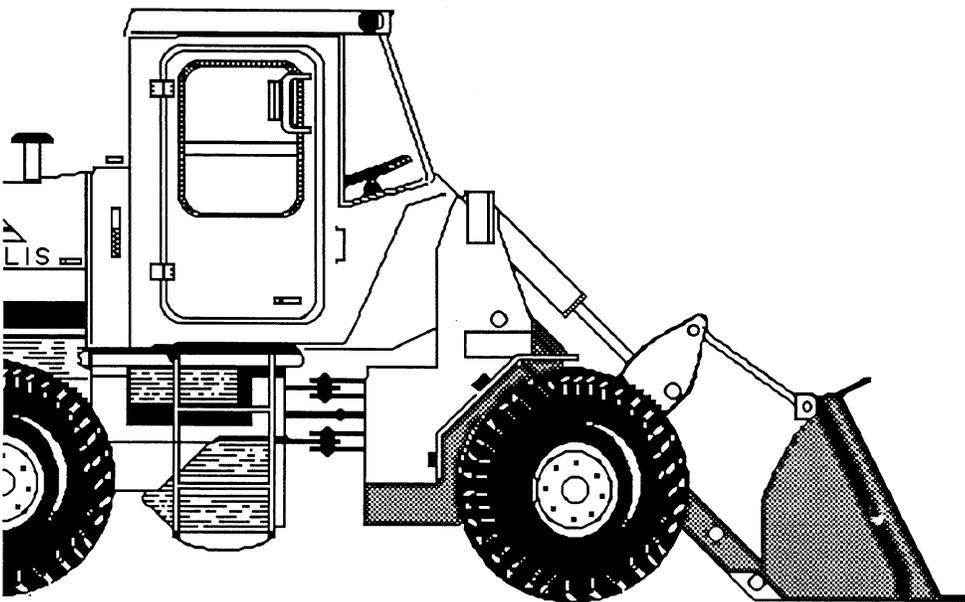
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545
545H
645

wheel loaders

service manual

**BRAKES and
AIR SYSTEM**



Form 73047530 English
8-89

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545,545H,645

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BRAKES and AIR SYSTEM service manual

545,545H S/N 1001 - 3000

21U 03001 - UP

34M 03001 - UP

48U 03001 - UP

78A 03001 - UP

645

S/N 1001 - 2031

Form 73047530 English



WARNING

STUDY THE OPERATION AND MAINTENANCE INSTRUCTION MANUAL THROUGH BEFORE STARTING, OPERATING, MAINTAINING, FUELING OR SERVICING THIS MACHINE.



The Operation and Maintenance Instruction Manual provides the instructions and procedures for starting, operating, maintaining, fueling, shutdown and servicing that are necessary for properly conducting the procedures for overhaul of the related components outlined in this Service Manual.



This symbol is your safety alert sign. It MEANS ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED.



Read and heed all safety instructions carrying the signal words WARNING and DANGER.



Machine mounted safety signs have been color coded yellow with black borders and lettering for warning and red with white borders and lettering for danger points.



SUPPLEMENT NO. 2
SERVICE MANUAL FORM 73047530 (Same as 3047530-5)
BRAKES AND AIR SYSTEM
545, 545H, 645 WHEEL LOADERS

(7-74)

ATTENTION: Insert this sheet in the front of publication as record of receipt.
Replace or add pages in the publication according to instructions below.

Additional copies of this supplement are available. Please direct your request to
*Fiat-Allis Construction Machinery, Inc., Technical Publications Dept., 3000 South
6th Street, Springfield, Illinois, 62710 U.S.A.*

Replace the following like pages:

1 (No Change)	25 (No Change)	45 (Revised)	61 (Revised)
2 (Revised)	26 (Revised)	46 (Revised)	62 (Revised)
5 (Revised)	27 (Revised)	47 (Revised)	63 (No Change)
6 (No Change)	28 (No Change)	48 (No Change)	64 (Revised)
19 (Revised)			
20 (Revised)			

Remove pages 73 and 74.

Write in the following changes: (Changes are underlined)

Page 52 Figure 53 Item 6 Cup

Page 70 Paragraph d, 3, a; should read:
"If the gauge registers less than 20 inches....."

NOTICE
THESE CHANGES ARE
INCLUDED IN THIS COPY

NOTICE: Allis-Chalmers Corporation and FIAT S.p.A. entered into a joint venture agreement to combine their manufacture, sale and service of construction machinery products throughout the world after January 1, 1974.

In view of the new enterprise, wherever in this publication reference is made to Allis-Chalmers or your Allis-Chalmers dealer, such reference is intended to identify FIAT-ALLIS Construction Machinery Inc. or your FIAT-ALLIS dealer

NOTICE OF CHANGE

TO

SERVICE MANUAL 3047530-5 (7-66)

BRAKES

545 and 645 (Prior to S/N 2032) Wheel Loaders

Write in the following changes (changes are underlined)

- Page 4, Topic VIII ----- Add: F. AIR COMPRESSOR GOVERNOR setting..... 48
- Page 7, Fig. 2 ----- Add: Item 5A. Check valve assy.
- Page 11, 1st column, 2nd para. --- that SAE J1703 or its
- Page 12, SPECIAL NOTE ----- Delete entire SPECIAL NOTE
- Page 38, paragraph c ----- loading at a minimum of 90 to 105 pounds
- Page 45, Fig. 43, Item 5 ----- under head
- Page 51, paragraph 6 ----- (4) (Later type is dish shaped), spring...
- Page 51, paragraph 16 ----- remove cup (6) from

NOTICE
These changes are included in this copy

Replace the following like pages:

19 (Revised)	43 (Revised)	49 (Revised)	69 (Revised)
20 (Revised)	44 (Revised)	50 (Revised)	70 (No change)
20a (Added)	47 (No change)	67 (No change)	
	48 (Revised)	68 (Revised)	

Reason: This mailing updates Manual

INSERT THIS SHEET INTO THE FRONT OF MANUAL NO. 3047530-5 (7-66) TO INDICATE RECEIPT OF THIS MAILING.

Additional copies of this mailing are available. Please direct your order to the Technical Publications Department, Springfield Plant.

SAFETY RULES

GENERAL

Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling, or servicing machine.

Read and heed all machine-mounted safety signs before starting, operating, maintaining, fueling or servicing machine.

Machine-mounted safety signs have been color coded yellow with black border and lettering for **WARNING** and red with white border and lettering for **DANGER** points.

Never attempt to operate the machine or its tools from any position other than seated in the operator's seat. Keep head, body, limbs, hands and feet inside operator's compartment at all times to reduce exposure to hazards outside the operator's compartment.

Do not allow unauthorized personnel to operate service or maintain this machine.

Always check work area for dangerous features. The following are examples of dangerous work areas: slopes, over hangs, timber, demolitions, fire, high walls, drop off, back fills, rough terrain, ditches, ridges, excavations, heavy traffic, crowded parking, crowded maintenance and closed areas. Use extreme care when in areas such as these.

An operator must know the machine's capabilities. When working on slopes or near drop offs be alert to avoid loose or soft conditions that could cause sudden tipping or loss of control.

Do not jump on or off machine. Keep two hands and one foot, or two feet and one hand, in contact with steps grab rails and handles at all times.

Do not use controls or hoses as hand holds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Controls also may be inadvertently moved causing accidental machine or equipment movement.

Keep operator's compartment, stepping points, grab-rails and handles clear of foreign objects, oil, grease, mud or snow accumulation to minimize the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.

Be careful of slippery conditions on stepping points, hand rails, and on the ground. Wear safety boots or shoes that have a high slip resistant sole material.

For your personal protection. Do not attempt to climb on or off machine while machine is in motion.

Never leave the machine unattended with the engine running.

Always lock up machine when leaving it unattended. Return keys to authorized security. Heed all shut down procedures of the Operation and Maintenance Instruction Manual. Always set the parking brake when leaving the machine for any reason.

Do not wear rings, wrist watches, jewelry, loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as authorized for the job. Examples: hard hats, safety shoes, heavy gloves, ear protectors, safety glasses or goggles, reflector vests, or respirators. Consult your employer for specific safety equipment requirements.

Do not carry loose objects in pockets that might fall unnoticed into open compartments. Do not use machine to carry loose objects by means other than attachments for carrying such objects.

DO NOT CARRY RIDERS unless the machine is equipped for carrying people to reduce personal exposure to being thrown off.

Do not operate machinery in a condition of extreme fatigue or illness. Be especially careful towards the end of the shift.

Roll Over Protective Structures are required on wheel loaders, dozer tractors, track type loaders, graders and scrapers by local or national requirements. **DO NOT** operate this machine without a Roll Over Protective Structure.

Do not operate a machine without a falling object protective structure (FOPS).

Do not operate this machine without a rear canopy screen when machine is equipped with rear mounted towing winch.

Seat belts are required to be provided with roll over protective structures or roll protection cabs by local or national regulations. Keep the safety belt fastened around you during operation.

Where noise exposure exceeds 90 dBA for 8 hours, wear authorized ear protective equipment per local or national requirements that apply.

Keep clutches and brakes on machine and attachments such as power control units, winches and master clutches adjusted according to Operation and Maintenance Instruction Manuals of the manufacturers at all times. **DO NOT** adjust machine with engine running except as specified.

Do not operate a machine with brakes out of adjustment. See the Operation and Maintenance Instruction Manual.

Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hat, safety glasses, safety shoes, ear protectors.

To move a disabled machine, use a trailer or low boy truck if available. If towing is necessary, provide warning signals as required by local rules and regulations and follow Operation and Maintenance Instruction Manual recommendations. Load and unload on a level area that gives full support to the trailer wheels. Use ramps of adequate strength, low angle and proper height. Keep trailer bed clean of clay, oil and all materials that become slippery. Tie machine down securely to truck or trailer bed and block tracks (or wheels) as required by the carrier.

SAFETY RULES

To prevent entrapment in cabs or mounted enclosures, observe and know the mechanics of alternate exit routes.

On machines equipped with suction radiator fans, be sure to periodically check all engine exhaust parts for leaks as exhaust gases are dangerous to the operator. Keep a vent open to outside air at all times when operating within a closed cab.

STARTING FLUID IS FLAMMABLE. Follow the recommendations as outlined in the Operation and Maintenance Instruction Manual and as marked on the containers. Store containers in cool, well-ventilated place secure from unauthorized personnel. **DO NOT PUNCTURE OR BURN CONTAINERS.**

Follow the recommendations of the manufacturer for storage and disposal.

Wire rope develops steel slivers. Use authorized protective equipment such as heavy gloves, safety glasses when handling.

OPERATION

Before starting machine, check, adjust and lock the operator's seat for maximum comfort and control of the machine.

DO NOT START OR OPERATE AN UNSAFE MACHINE. Before working the machine, be sure that any unsafe condition has been satisfactorily remedied. Check brakes, steering and attachment controls before moving. Advise the proper maintenance authority of any malfunctioning part or system. Be sure all protective guards or panels are in place, and all safety devices provided are in place and in good operating condition.

Check instruments at start-up and frequently during operation.

Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.

Be sure exposed personnel in the area of operation are clear of the machine before moving the machine or its attachments. **WALK COMPLETELY AROUND** the machine before mounting. Sound horn. Obey flag man, safety signals and signs.

Know the principles of cross steering of crawler tractors. Read section in Operation and Maintenance Instruction Manual on cross steering.

Keep engine exhaust system and exhaust manifolds clear of combustible material. Equip machine with screens and guards when working under conditions of flying combustible material.

If engine has a tendency to stall for any reason under load or idle, report this for adjustment to a proper maintenance authority immediately. Do not continue to operate machine until condition has been corrected.

Never use bucket as a man-lift.

Use recommended bucket for machine and material load ability and heaping characteristics of material, terrain, and other pertinent job conditions.

Avoid abrupt starts and stops when transporting a loaded bucket.

Inspect your seat belt webbing and hardware at least twice a year for signs of fraying, wear or other weakness that could lead to failure.

Use only designated towing or pulling attachment points. Use care in making attachment. Be sure pins and locks as provided are secure before pulling. Stay clear of draw bars, cables or chains under load.

When pulling or towing through a cable or chain, do not start suddenly at full throttle. Take up slack carefully. Guard against kinking chains or cables. Inspect carefully for flaws before using. Do not pull through a kinked chain or cable due to the high stresses and possibility of failure of the kinked area. Always wear heavy gloves when handling chain or cable.

Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cable or chain. **DO NOT PULL OR TOW UNLESS OPERATOR'S COMPARTMENT OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.**

During operation always carry ripper in full raised position when not in use and lowered to ground when parked.

When counterweights have been provided, do not work machine if they have been removed unless their equivalent weight has been replaced. See the Operation and Maintenance Instruction Manual.

When operating a machine know what clearances will be encountered, overhead doors, wires, pipes, aisles, roadways; also the weight limitations of ground, floor, and ramps.

Know bridge and culvert load limits and do not exceed them. Know machine's height, width, and weight. Use a signal person when clearance is close.

Be sure that the exact location of gas lines, utility lines, sewers, overhead and buried power lines, and other obstructions or hazards are known. Such locations should be precisely marked by the proper authorities to reduce the risk of accidents. Obtain shut-down or relocation of any such facilities before starting work, if necessary.

Be certain to comply with all local, state, and federal regulations regarding working in the vicinity of power lines.

When roading find out what conditions are likely to be met - clearances, congestion, type of surface, etc. Be aware of fog, smoke or dust element that obscure visibility.

When backing, always look to where the machine is to be moved. Be alert to the position of exposed personnel. **DO NOT OPERATE** if exposed personnel enter the immediate work area.

SAFETY RULES

Never travel a machine on a job site, in a congested area, or around people without a signal person to guide the operator.

In darkness, check area of operation carefully before moving in with machine. Use all lights provided. Do not move into area of restricted visibility.

Maintain clear vision of all areas of travel or work. Keep cab windows clean and repaired. Carry blade low for maximum visibility while traveling. Obtain and use fan blast deflectors where tractors are used a pusher tractors in tandem.

Transport a loaded bucket with the bucket as far tipped back and in as low a position as possible for maximum visibility, stability, and safest transport of the machine. Carry it at a proper speed for the load and ground conditions.

Carry the bucket low when traveling with a load.

Maintain a safe distance from other machines. Provide sufficient clearance for ground and visibility conditions. Yield right-of-way to loaded machines.

Avoid going over obstacles such as rough terrain, rocks, logs, curbs, ditches ridges, and railroad tracks whenever possible. When obstructions must be crossed, do so with extreme care at an angle if possible. Reduce speed - down-shift. Ease up to the break over point - pass the balance point slowly on the obstruction and ease down on the other side.

Cross gullies or ditches at an angle with reduced speed after insuring ground conditions will permit a safe traverse.

Be alert to soft ground conditions close to newly constructed walls. The fill material and weight of machine may cause the wall to collapse under the machine.

Operate at speeds slow enough to insure complete control at all times. Travel slowly over rough ground, on slopes or near drop offs, in congested areas or on ice or slippery surfaces.

Be alert to avoid changes in traction conditions that could cause loss of control. *DO NOT* drive on ice or frozen ground conditions when working the machine on steep slopes or near drop offs.

Keep the machine well back from the edge of an excavation.

Be especially careful when traveling up or down slopes. Position the bucket in such a way as to provide a possible anchorage on the ground in case of a slide.

When proceeding across a hill side proceed slowly. Never turn sharply up hill or down hill.

Avoid side hill travel whenever possible. Drive up and down the slope. Should the machine start slipping sideways on a grade, turn it immediately downhill.

In steep down hill operation, do not allow engine to over speed. Select proper gear before starting down grade.

There is no substitute for good judgement when working on slopes.

The grade of slope you should attempt will be limited by such factors as condition of the ground, load being handled, the type of machine, speed of machine and visibility.

NEVER COAST the machine down grades and slopes with the transmission in neutral on power shift machines, or clutch disengaged on manually shifted machines.

To reduce the danger of uncontrolled machine, choose a gear speed before proceeding down grade that will hold machine to proper speeds for conditions.

Operating in virgin rough terrain that includes previously mentioned hazards is called pioneering. Be sure you know how this is done. Danger from falling branches and upturning roots is acute in these areas.

When pushing over trees, the machine must be equipped with proper over head guarding. Never allow a machine to climb up on the root structure particularly while the tree is being felled. Use extreme care when pushing over any tree with dead branches.

Avoid brush piles, logs or rocks. *DO NOT DRIVE THE MACHINE ONTO BRUSH PILES, LOGS, LARGE ROCKS* or other surface irregularities that break traction with the ground especially when on slopes or near drop offs.

Avoid operating equipment too close to an over hang or high wall either above or below the machine. Be on the look out for caving edges, falling objects and slides. Beware of concealment by brush and under growth of these dangers.

Park in a non-operating and non-traffic area or as instructed. Park on firm level ground if possible. Where not possible, position machine at a right angle to the slope, making sure there is no danger of uncontrolled sliding movement. Set the parking brake.

Never park on an incline without carefully blocking the machine to prevent movement.

If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and warning signals as required. Also provide advance warning signals in the traffic lane of approaching traffic.

Move the machine away from pits, trenches, overhangs and over head power lines before shutting down for the day.

When stopping operation of the machine for any reason, always return the transmission or hydrostatic drive control to neutral and engage the control lock to secure the machine for a safe start up. Set parking brake, if so equipped.

Never lower attachments or tools from any position other than seated in operator's seat. Sound the horn. Make sure the area near the attachment is clear. Lower the attachment slowly. *DO NOT USE* float position to lower hydraulic equipment.

SAFETY RULES

Always before leaving the operator's seat and after making certain all people are clear of the machine, slowly lower the attachments or tools flat to the ground in a positive ground support position. Move any multi purpose tool to positive closed position. Return the controls to hold. Place transmission control in neutral and move engine controls to off position. Engage all control locks, set parking brake, and open and lock the master (key, if so equipped) switch. Consult Operation and Maintenance Instruction Manual.

Always follow the shut down instructions as outlined in the Operation and Maintenance Instruction Manual.

MAINTENANCE

Do not perform any work on equipment that is not authorized. Follow the Maintenance or Service Manual procedures.

Machine should not be serviced with anyone in the operator's seat unless they are qualified to operate the machine and are assisting in the servicing.

Shut off engine and disengage the Power Take Off lever if so equipped before attempting adjustments or service.

Always turn the master switch (key switch if so equipped) to the *OFF* position before cleaning, repairing, or servicing and when parking machine to forestall unintended or unauthorized starting.

Disconnect batteries and *TAG* all controls according to local or national requirements to warn that work is in progress. Block the machine and all attachments that must be raised per local or national requirements.

Never lubricate, service or adjust a machine with the engine running, except as called for in the Operation and Maintenance Instruction Manual. Do not wear loose clothing or jewelry near moving parts.

Do not run engine when refueling and use care if engine is hot due to the increased possibility of a fire if fuel is spilled.

Do not smoke or permit any open flame or spark near when refueling, or handling highly flammable materials.

Always place the fuel nozzle against the side of the filler opening before starting and during fuel flow. To reduce the chance of a static electricity spark, keep contact until after fuel flow is shut off.

Do not adjust engine fuel pump when the machine is in motion.

Never attempt to check or adjust fan belts when engine is running.

When making equipment checks that require running of the engine, have an operator in the operator's seat at all times with the mechanic in sight. Place the transmission in neutral and set the brakes and lock. **KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS.**

Avoid running engine with open unprotected air inlets. If such running is unavoidable for service reasons, place protective screens over all inlet openings before servicing engine.

Do not place head, body, limbs, feet, fingers, or hands near rotating fan or belts. Be especially alert around a pusher fan.

Keep head, body, limbs, feet, fingers, or hands away from bucket, blade or ripper when in raised position.

If movement of an attachment by means of machine's hydraulic system or winches is required for service or maintenance, do not raise or lower attachments from any position other than when seated in the operator's seat. Before starting machine or moving attachments or tools, set brakes, sound horn and call for an all clear. Raise attachments slowly.

Never place head, body, limbs, feet, fingers, or hands into an exposed portion between uncontrolled or unguarded scissor points of machine without first providing secure blocking.

Never align holes with fingers or hands - Use the proper aligning tool.

Disconnect batteries before working on electrical system or repair work of any kind.

Check for fuel or battery electrolyte leaks before starting service or maintenance work. Eliminate leaks before proceeding.

BATTERY GAS IS HIGHLY FLAMMABLE. Leave battery box open to improve ventilation when charging batteries. Never check charge by placing metal objects across the posts. Keep sparks or open flame away from batteries. Do not smoke near battery to guard against the possibility of an accidental explosion.

Do not charge batteries in a closed area. Provide proper ventilation to guard against an accidental explosion from an accumulation of explosive gases given off in the charging process.

Be sure to connect the booster cables to the proper terminals (+ to +) and (- to -) at both ends. Avoid shorting clamps. Follow the Operation and Maintenance Instruction Manual procedure.

Due to the presence of flammable fluid, never check or fill fuel tanks, storage batteries or use starter fluid near lighted smoking materials or open flame or sparks.

Rust inhibitors are volatile and flammable. Prepare parts in well ventilated place. Keep open flame away - **DO NOT SMOKE.** Store containers in a cool well ventilated place secured against unauthorized personnel.

Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.

DO NOT pile oily or greasy rags - they are a fire hazard. Store in a closed metal container.

SAFETY RULES

Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flammable, non-toxic solvents.

Never place gasoline or diesel fuel in an open pan.

Shut off engine and be sure all pressure in system has been relieved before removing panels, housings, covers, and caps. See Operation and Maintenance Instruction Manual.

Do not remove hoses or check valves in the hydraulic system without first removing load and relieving pressure on the supporting cylinders. Turn radiator cap slowly to relieve pressure before removing. Add coolant only with engine stopped or idling if hot. See Operation and Maintenance Instruction Manual.

Fluid escaping under pressure from a very small hole can almost be invisible and can have sufficient force to penetrate the skin. Use a piece of card board or wood to search for suspected pressure leaks. **DO NOT USE HANDS.** If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

Never use any gas other than dry nitrogen to charge accumulators. See Operation and Maintenance Instruction Manual.

When making pressure checks use the correct gauge for expected pressure. See the Operation and Maintenance Instruction Manual or Service Manual for guidance.

For field service, move machine to level ground if possible and block machine. If work is absolutely necessary on an incline, block machine and its attachments securely. Move the machine to level ground as soon as possible.

Brakes are inoperative when manually released for servicing. Provision must be made to maintain control of the machine by blocking or other means.

Block all wheels before bleeding or disconnecting any brake system lines and cylinders.

Never use make shift jacks when adjusting track tension. Follow the Undercarriage Service Manual.

Know your jacking equipment and its capacity. Be sure the jacking point used on the machine is appropriate for the load to be applied. Be sure the support of the jack at the machine and under the jack is appropriate and stable. Any equipment up on a jack is dangerous. Transfer load to appropriate blocking as a safety measure before proceeding with service or maintenance work according to local or national requirements.

Always block with external support any linkage or part on machine that requires work under the raised linkage, parts, or machine per local or national requirements. Never allow anyone to walk under or be near unblocked raised equipment. Avoid working or walking under raised blocked equipment unless you are assured of your safety.

When servicing or maintenance requires access to areas that cannot be reached from the ground, use a ladder or step platform that meets local or national requirements to reach the service point. If such ladders or platforms are not available, use the machine hand holds and steps as provided. Perform all service or maintenance carefully.

Shop or field service platforms and ladders used to maintain or service machinery should be constructed and maintained according to local or national requirements.

Lift and handle all heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

In lifting and handling heavy parts, slings must be of adequate strength for the purpose intended and must be in good condition.

Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

When using compressed air for cleaning parts use safety glasses with side shields or goggles. Limit the pressure to 207 kPa (30 psi) according to local or national requirements.

Wear welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding or burning. Wear dark safety glasses near welding. **DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.**

Replace seat belts every two years on open canopy units and every three years on machines with cabs or at change of ownership.

Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.

Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.

Keep maintenance area **CLEAN** and **DRY**. Remove water or oil slicks immediately.

Remove sharp edges and burrs from reworked parts.

Be sure all mechanics tools are in good condition. **DO NOT** use tools with mushroomed heads. Always wear safety glasses with side shields.

Do not strike hardened steel parts with anything other than a soft iron or non-ferrous hammer.

Do not rush. Walk, do not run.

Know and use the hand signals used on particular jobs and know who has the responsibility for signaling.

SAFETY RULES

Face the access system when climbing up and down.

Apply the parking device and place the transmission in neutral before starting the machine.

Do not bypass the starter safety switch. Repair the starter safety controls if they malfunction.

Fasten seat belt before operating.

Steering should be checked to both right and left. Brakes should be tested against engine power. Clutch and transmission controls should be moved through or to neutral positions to assure disengagement. Operate all controls to insure proper operation. If any malfunctions are found, park machine, shut off engine, report and repair before using machine.

If the power steering or the engine ceases operating, stop the machine motion as quickly as possible. Lower equipment, set parking device and keep machine securely parked until the malfunction is corrected or the machine can be safely towed. Never lift loads in excess of capacity.

Should the machine become stuck or frozen to the ground, back out to avoid roll over.

Know and understand the job site traffic flow patterns.

Keep the machine in the same gear going down hill as used for going up hill.

When roading a machine, know and use the signaling devices required on the machine. Provide an escort for roading where required.

Always use the recommended transport devices when roading the machine.

Do not attempt repairs unless proper training has been provided.

Use extreme caution when removing radiator caps, drain plugs, grease fittings or pressure taps. Park the machine and let it cool down before opening a pressurized compartment.

Release all pressure before working on systems which have an accumulator.

When necessary to tow the machine, do not exceed the recommended towing speed, be sure the towing machine has sufficient braking capacity to stop the towed load. If the towed machine cannot be braked, a tow bar must be used or two towing machines must be used - one in front pulling and one in the rear to retard. Avoid towing over long distances.

Observe proper maintenance and repair of all pivot pins, hydraulic cylinders, hoses, snap rings and main attaching bolts.

Always keep the brakes and steering systems in good operating condition.

Replace all missing, illegible or damaged safety signs. Keep all safety signs clean.

Do not fill the fuel tank to capacity. Allow room for expansion.

Wipe up spilled fuel immediately.

Always tighten the fuel tank cap securely. Should the fuel cap be lost, replace it only with the original manufacturer's approved cap. Use of a non-approved cap may result in over-pressurization of the tank.

Never drive the machine near open fires.

Use the correct fuel grade for the operating season.

FOREWORD

Always furnish serial number if making an inquiry to dealer or factory about this machine.

Many equipment owners employ the Dealer Service Department for all work other than routine lubrication and minor service. This practice is encouraged, as our Dealers are well informed and equipped to render efficient service by factory trained mechanics.

This manual may not be reprinted or reproduced, either in whole or in part, without written permission of Fiatallis ®.

Illustrations show standard and optional items.

IMPORTANT

The information in this manual was current at the time of publication. It is our policy to constantly improve our product and to make available additional items. These changes may affect procedures outlined in this manual. If variances are observed, verify the information through your Dealer.

Fiatallis is not responsible for any liability arising from any damage resulting from defects caused by parts and/or components not approved by Fiatallis for use in maintaining and/or repairing products manufactured or merchandized by Fiatallis.

In any case, no warranty of any kind is made or shall be imposed with respect to products manufactured or merchandized by Fiatallis when failures are caused by the use of parts and/or components not approved by Fiatallis.

Study SAFETY RULES in the front of this manual thoroughly for the protection of machine and safety of personnel.

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TOPIC I - BRAKES

A. GENERAL DESCRIPTION

1. AIR/HYDRAULIC BRAKES

The TL645 tractor loader utilizes an air-hydraulic power brake system consisting of an air compressor, air storage tank, and air-pak unit to supply the power boost needed for brake application, and conventional hydraulic wheel cylinders to actuate the brake shoes. The governor controlled air compressor has a capacity of 7-1/4 cubic feet per minute. The storage tank is provided to maintain an adequate supply of compressed air for brake applications. The air-pak unit uses the energy of the compressed air, acting through a mechanical linkage against a piston in the hydraulic circuit, to apply the units wheel brakes. The energy exerted by the compressed air in applying the brakes is many times that required by the operator in de-

pressing the brake pedal. If, for any reason, the air system should fail the brakes will continue to operate as a conventional hydraulic brake system.

2. VACUUM/HYDRAULIC BRAKES

The models TL545 (D & G) tractor loaders are equipped with similar vacuum hydraulic brakes. To further explain each units power system is as follows:

- a. The TL545 (gasoline) is not equipped with a vacuum pump driven by a belt from the fan pulley.
- b. The 545 (diesel) is equipped with a vacuum pump which is driven by a belt from the fan pulley.

Vacuum for the TL545 (diesel) loader is provided by an engine belt driven vacuum pump from the fan pulley.

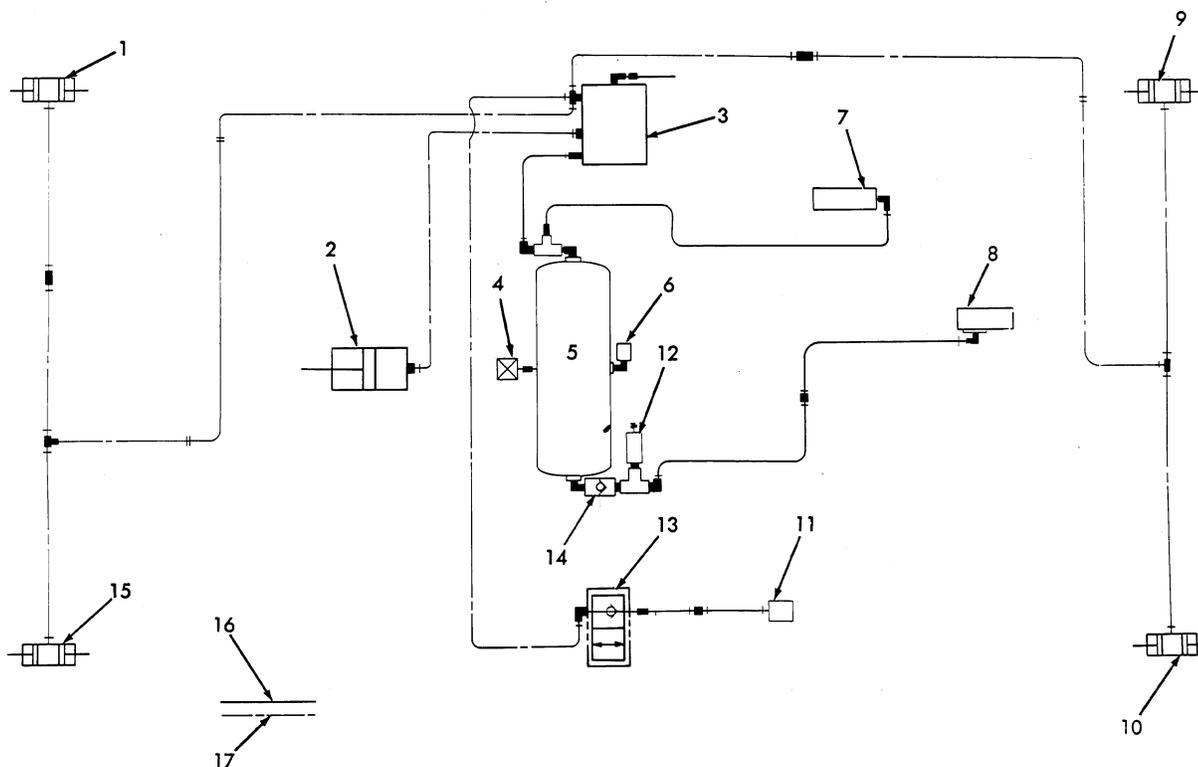


Fig. 1 TL645 Power Brake System - Schematic
(T-72569)

- | | | |
|---------------------------------|--------------------------------|---------------------------------|
| 1. Wheel cylinder - right front | 7. Governor | 13. Clutch disconnect valve |
| 2. Master cylinder | 8. Air compressor | 14. Check valve |
| 3. Air-pak | 9. Wheel cylinder - right rear | 15. Wheel cylinder - left front |
| 4. Drain cock | 10. Wheel cylinder - left rear | 16. Indicates air line |
| 5. Air tank | 11. Clutch cut-off | 17. Indicates hydraulic line |
| 6. Air pressure sender | 12. Safety valve | |

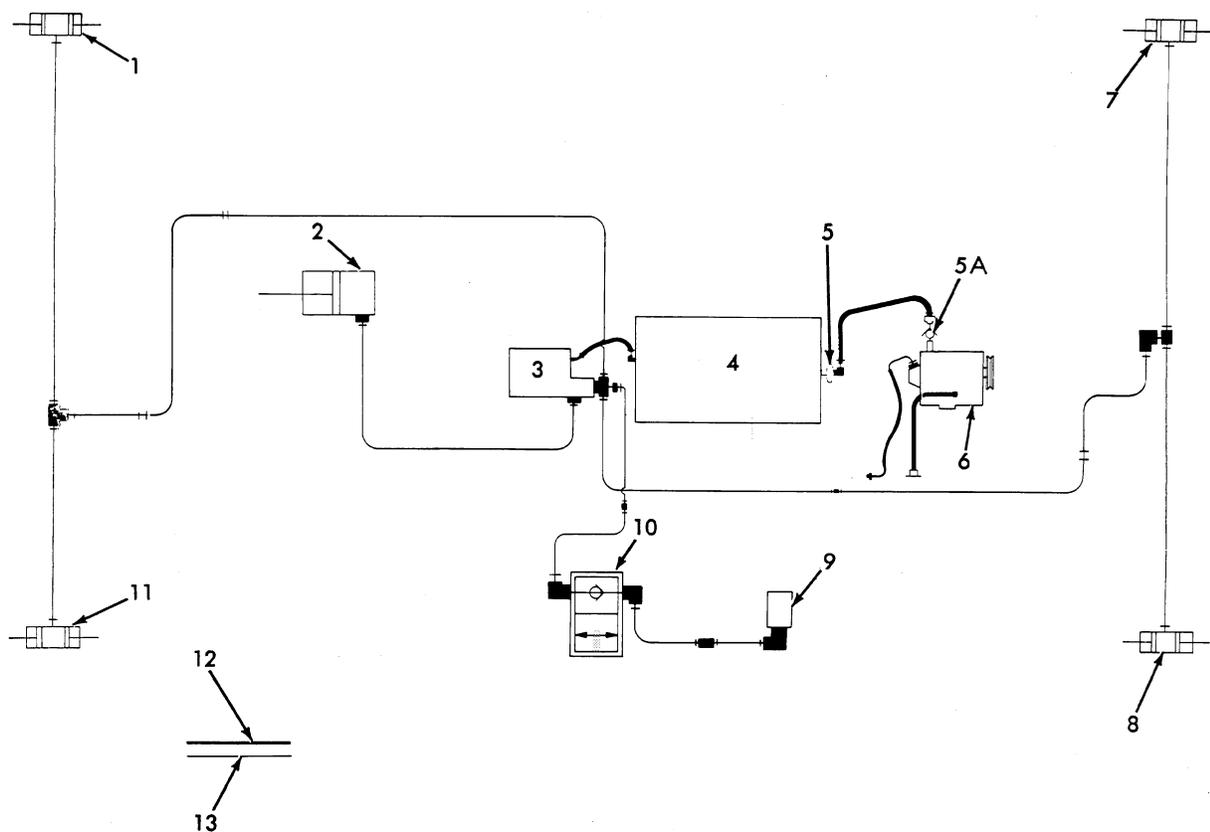


Fig. 2 TL545(D) Power Brake System - Schematic
(T-72570)

- | | |
|---------------------------------|---------------------------------|
| 1. Wheel cylinder - right front | 7. Wheel cylinder - right rear |
| 2. Master cylinder | 8. Wheel cylinder - left rear |
| 3. Hydrovac | 9. Clutch cut-off |
| 4. Vacuum tank | 10. Check valve |
| 5. Air cleaner | 11. Wheel cylinder - left front |
| 5a Check valve assy. | 12. Heavy line indicates hose |
| 6. Vacuum pump | 13. Thin line indicates tubing |

At any time the loader is operating, maximum vacuum is built up in the vacuum reserve tank. A one way check valve is located in the vacuum line between the vacuum tank and pump. When the brake pedal is depressed, the master brake cylinder signals the hydrovac, through hydraulic pressure, to supply the necessary power to actuate the brakes. The amount of power being in direct proportion to the amount of pressure applied to the brake pedal. If, for any reason, the vacuum system should fail, the brakes will continue to operate through the

hydraulic system.

The vacuum for the TL545 (gasoline) loader is supplied from the engine intake manifold to the vacuum tank. Thus, maximum vacuum is provided any time the loader is in operation. Also, a one way check valve is located in the vacuum line between the vacuum tank and the engine manifold. Again, should the vacuum system fail, the brakes will continue to operate through the hydraulic system.

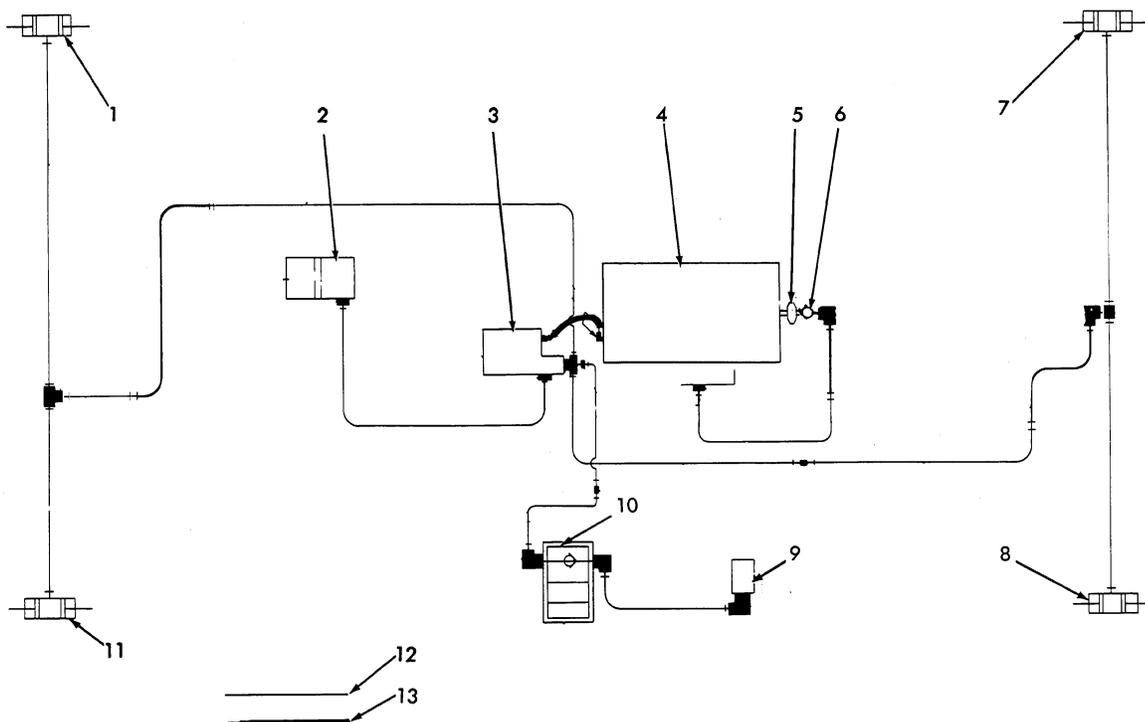


Fig. 3 TL545(G) Power Brake System - Schematic
(T-71837)

- | | |
|---------------------------------|---------------------------------|
| 1. Wheel cylinder - right front | 8. Wheel cylinder - left rear |
| 2. Master cylinder | 9. Clutch cut-off |
| 3. Hydrovac | 10. Check valve |
| 4. Vacuum tank | 11. Wheel cylinder - left front |
| 5. Air cleaner | 12. Thin line indicates hose |
| 6. Check valve | 13. Heavy line indicates tubing |
| 7. Wheel cylinder - right rear | |

TOPIC II - WHEEL BRAKES

A. BRAKING PRINCIPLES

When brake shoes contact the drum the friction drag tends to rotate each shoe about the hinge point (anchor). When this shoe friction presses the shoe lining into tighter contact with the drum, it acts as a "self-energizing" force which is added to the actuating force to assist the braking operation. Conversely, if the drag tends to force the shoe away from the drum, it resists the actuating force and is described as a "de-energizing" force. Referring to Figure 4, self-energized shoes are frequently referred to as "forward," "leading" or "primary" shoes, and the de-energized shoes as "reverse," or "trailing" shoes. All drum type brakes make use of these energizing principles in varying degrees.

Each brake shoe is anchored individually. The forward-acting shoe is self-energized; whereas, the reverse-acting shoe is de-energized since the reverse frictional drag tends to resist the controlling actuating force. On hydraulic brakes the lining will wear more rapidly on the forward-acting shoe; the lining wear being unbalanced as a result of the shoes performing different amounts of work. If the shoe linings are different, the forward shoe usually has the larger lining area and/or the higher friction. Front wheel brakes have in effect the reverse shoe turned upside down and a double acting wheel cylinder to actuate each shoe. With this arrangement, both shoes become forward-acting when the unit is moving forward; both shoes are reverse-acting with the unit moving backward. Therefore, this type is directional in its braking

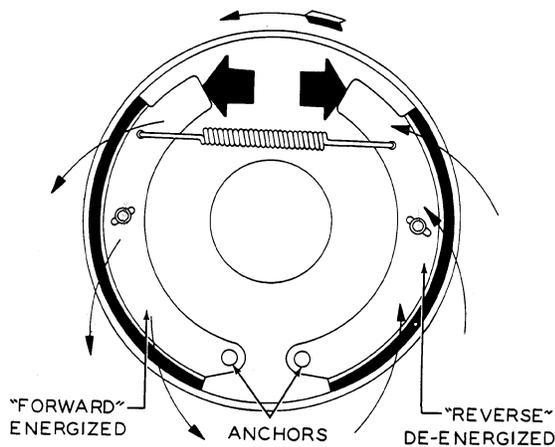


Fig. 4 Typical Brake Internal View
(T-72571)

effectiveness.

Both brake shoes are installed on fixed anchor pins which permits a radial floating, self-centering movement. The center-plane brakes are mounted within a "saddle" formed by two support plates for the main purpose of localizing all stresses on the plane of the shoe webs.

B. BRAKE ADJUSTMENT

If the master cylinder piston is not allowed to return to its stop, the primary piston cup lip will block the compensating port and the compensating feature of the master cylinder cannot function to allow surplus fluid to return from the brake lines. After a few applications, the brakes will drag and soon lock up completely. Excessive pedal free play should be avoided, however, as it would only reduce the effective pedal travel. The free-play adjustment should be made as follows:

1. PEDAL STOP ADJUSTMENT

It may be necessary to adjust the pedal stop set-screw to prevent the pedal from striking the floor plate. If this adjustment is required, it should be made prior to the pedal free-travel adjustment.

2. PEDAL LINK ADJUSTMENT

With the brakes released, just enough clearance should be provided in the master cylinder operating linkage to permit the piston to return to the full "off" position. A slight additional clearance should be allowed for possible expansion of parts when they operate at maximum temperatures.

Referring to Figure 6, the proper adjusted pedal will usually move from 1/8 to 3/8 inch at the

pedal pad to take up free play.

On each master cylinder, the push rod has a locknut adjustment for either lengthening or shortening the rod end connecting to the return spring and brake pedal. Should an insufficient operating clearance exist, it may be necessary to "shim out" the master cylinder mounting capscrew. However, this may not likely be required unless the mounting bracket has been sprung.

With the engine off and no vacuum in the power unit, the push-rod adjustment is made on the connecting link by loosening the locknut and rotating the threaded sleeve.

C. GENERAL INFORMATION

Chafing

Chafing of hoses is usually due to the hose having been installed under stress (twisted), forcing it to rub against the frame, suspension member, or associated part.

Hoses should always be allowed to free themselves prior to tightening their end fittings in order to minimize stresses. After assuming a "free" position, the fitting attached to the tube should be held while the tube nut is tightened.

Tube supporting clips are installed to hold the tube's in their intended positions and they are to be replaced if damaged.

Chafed metal tubes are usually the result of loose clips, or when bent out of proper position may have rubbed against some frame or suspension member. Relocate mis-positioned tube and replace all damaged tubes.

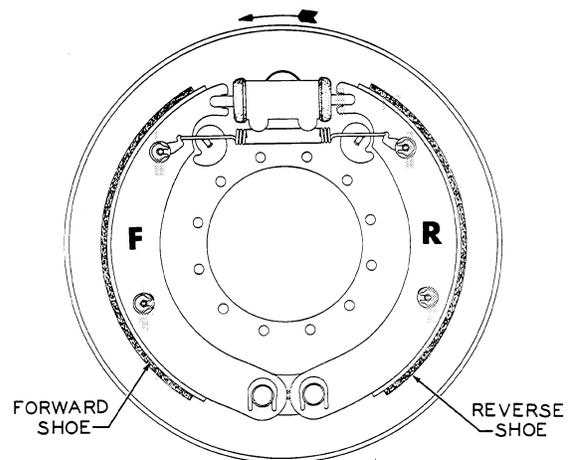


Fig. 5 Typical Double Anchor With Single
Hydraulic Wheel Cylinder
(T-72572)

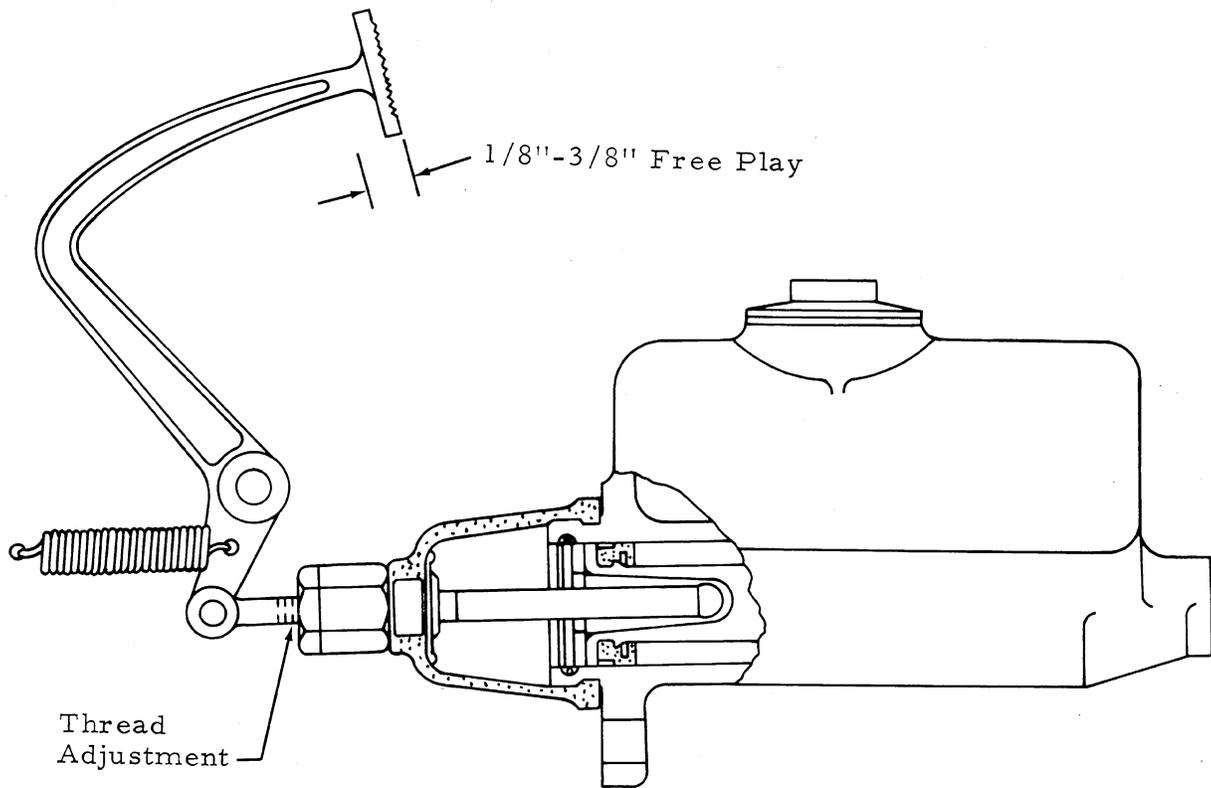


Fig. 6 Typical Pedal Adjustment
(T-72573)

Outer Deterioration of Hoses

This condition is visible. If the outer coverings are damaged by flying stones, roadsplash, or cracks due to long use, they should be replaced.

Fluid Entrapment

Hoses having been operated under a stressed condition will often separate internally. These torn liners may restrict the fluid flow and sometimes the tear may act as a check valve, permitting only a one way flow of fluid. Such a condition may cause a pull to one side when the brakes are applied and/or dragging shoes for a period after the brakes are released.

A check for a blocked hose (or tube) can be made by tapping the drum with a metal object while the brakes are being applied and released. If the drum rings when the brakes are applied, it indicates that fluid pressure is not being exerted in the wheel cylinder to expand the shoes. If the sound is dull after the brakes are released, or there is brake drag, it indicates that

the hose is not permitting fluid to return through the system.

Leakage Stains

Stains or a heavy accumulation of dirt at the hose fittings or other tube locations may indicate a leak. Such leaks may be so small that the fluid loss is not apparent, however, they must be corrected to prevent a sudden failure. If tightening the fitting does not correct the situation the fitting and hose must be replaced.

Brake Fluid Characteristics

It is the nature of the fluid to resist compression and to exert equal pressure upon each square inch of its container. Hydraulic controlling pressures, unlike mechanical brake linkages, are always inherently equalized unless an obstruction blocks the movement of fluid. To function satisfactorily, however, a good fluid also possesses other qualities which provide all-season chemical balance with the following essential special characteristics.

Inferior Fluid

Whether inferior in quality, contaminated, or overage in use and worn out from long and intimate association with heat, pressure, moisture air and dust, poor brake fluids can be responsible for unexpected sudden brake failures and accidents caused by vapor lock, swollen soft and tacky rubber parts, rust and corrosion, and deposits which block lines and start leaks.

NOTE

Repair shop tests of brake fluids are inconclusive and should not be attempted.

Only fluid of known quality should be permitted into the system. Replacement of brake fluid should mix compatibly with the original fluid. It is recommended that SAE J1703, or its equivalent, be used whenever the need to refill or to add to the system.

Heat and Cold Range

The fluid must have a high boiling point so that usual braking heats will not boil off gas and cause an unexpected type of failure due to vapor lock compression. Prolonged exposure to heat must not break-down the fluid to a lower boiling point. Heated fluid must remain sufficiently viscous to avoid leakage, yet in coldest climates in a standing unit, it must not separate or become so thick that braking is hindered.

Lubricating

Lubrication protection for all parts of the hydraulic system depends upon fluid with adequate film strength.

Moisture Absorption

Fluid must absorb small amounts of water, principally from condensation in the fluid reservoir, into solution to prevent freezing and the blocking of passages in cold weather.

Rubber Protection

Fluid should cause new rubber cups to swell a small amount to assure satisfactory sealing action. Precise fluid chemistry is essential as too much or too little swell could result in brake failure.

Corrosion Resistance

Fluid, in contact with various metals, plastics and rubber must maintain the system in an acid-alkaline balance which inhibits the formation of corrosion and rust.

Gum and Grit Resistance

The fluid should not include chemicals that would cause gummy or gritty deposits to form. Fluid evaporation, taking place in small amounts, should leave the remaining fluid oily and free of gummy or gritty residue.

Fluid Contamination

Brake fluid should always be changed when any form of contamination is observed, and if contamination is active, as evidenced by deposits, rust and corrosion, swollen or soft rubber parts, it will be necessary to flush and clean the system and replace all affected parts.

Aged in Service of Fluid

It is normal, in long periods of service, that the fluid gradually picks up moisture and dust, most entering the system through the master cylinder filler cap vent and the reservoir will have been topped off with various refills. Contaminated fluid, compared with fresh, will usually appear darker, comparatively odorless and watery, lacking the normal feel of a thin lubricating film when rubbed between the fingers.

Dirt

Usually from failure to clean the master cylinder filler cap before removing it to check the fluid level or from careless handling of fluid storage.

Oils, Greases and Solvents

Even minute amounts of mineral base oils and solvents cause quick failure of rubber parts due to excessive swelling and softening. Never fail to thoroughly rinse all parts in alcohol or brake fluid to remove all traces of solvents after degreasing or washing. Be certain stored fluid is recapped after use.

Compressed Air in Pressure Bleeding

Residue from air lines, misted oil from the air compressor, and water is picked up and carried by compressed air. If the equipment for pressure bleeding does not provide positive separation of compressed air from the brake fluid, it is essential to have a source of cleaned compressed air for use in the pressure bleeder in order to avoid fluid contamination.

Fluid Level

The proper level of fluid in the master cylinder reservoir is approximately $3/8$ - $3/4$ inch below the top edge of the reservoir. This space is needed to prevent surge losses through the air vent.

IMPORTANT

When checking fluid level, every one hundred hours, clean around the filler cap before removal and be certain the cap vent is open.

Should the fluid level be low, a check should be made for evidence of leaks within the hydraulic system. Also the loss of fluid may indicate it is being pumped into the transmission through selector valve because of an imperative or distorted clutch cut-off cup or oring.

Draining the System

The brake system should be completely drained when any form of contamination is observed and if contamination is active, as evidenced by deposits, rust and corrosion, swollen or soft rubber parts. The system may be drained in a simple procedure by opening the bleeder screw at each wheel and pumping the brake pedal slowly until all the fluid is expelled. Also drain line from hydrovac to transmission.

Flushing the System

After draining the system, it is always advisable to flush the system with clean denatured alcohol before refilling with new fluid.

NOTE

Do not use flushing fluids containing mineral oil, kerosene, gasoline, carbon tetrachloride, etc.

Remove the master cylinder filler cap and fill the reservoir with alcohol. As in draining, open each wheel cylinder bleeder screw in turn and pump the brake pedal slowly until the passage of clean alcohol indicates that all the contaminating material has been removed. After using the alcohol flush, repeat the process with clean brake fluid in order to force out all of the flushing agent.

When to Bleed the System

The hydraulic brake system requires a solid column of brake fluid free of air bubbles, otherwise compression of these bubbles, as pressure is raised in the system, may nullify the effective stroke of the brake pedal. It is recommended that the brake system should be bled when any one or more of the following conditions are present.

- a. When the system is drained, flushed and refilled with new fluid.
- b. When some part of the system has been disconnected or replaced.
- c. When neglect in maintaining the proper fluid level in the master cylinder has resulted in air being taken into the system.
- d. When faulty sealing has permitted air leakage past the master cylinder secondary cup or wheel cylinder cups. The master cylinder cup may take in air when the cup is worn or damaged, or when a vacuum is maintained in the cylinder, due to a blocked filler cap vent.
- e. When the brake pedal feels "spongy" after a brake adjustment, indicating the presence of air in the system.
- f. When overloading of brakes, or use of brake

fluid having a low boiling point, causes "gassing" of the fluid.

D. REMOVAL - BRAKES

1. Using a suitable hoist, lift up the front module so that the tires are off the floor and ground.
2. Place jacks or blocks under the axle that is to have work done.

NOTE

Due to the extreme weight of the unit, the axle should, for safety, be blocked to support the weight and to hold the axle level.

3. Rotate the hub assembly so that the drain plug is at the bottom.
4. Place a container underneath the hub assembly and remove the drain plug, allowing sufficient time for the oil to drain from the assembly.
5. After the oil has had sufficient time to drain, replace the drain plug finger tight.
6. Remove the planetary wheel cover capscrews and lockwashers.
7. Carefully remove the cover plate and gasket from the planetary.
8. Remove the planetary spider stud nuts and lockwashers.
9. Separate and remove the planetary spider assembly and sealing o-ring from the wheel hub assembly by use of puller screws in the threaded holes provided in the spider flange.
10. Leave the snap ring intact and remove the axle shaft sun gear (20 teeth) as an assembly.
11. Remove the locking nut retainer from the axle shaft.
12. Remove the hub retaining nut.
13. Remove the ring gear (52 teeth) and the ring gear hub sleeve.
14. Using a suitable hoist, place straps around the tire and carefully remove this entire assembly from the hub, allowing access to the wheel cylinder and brake shoes.

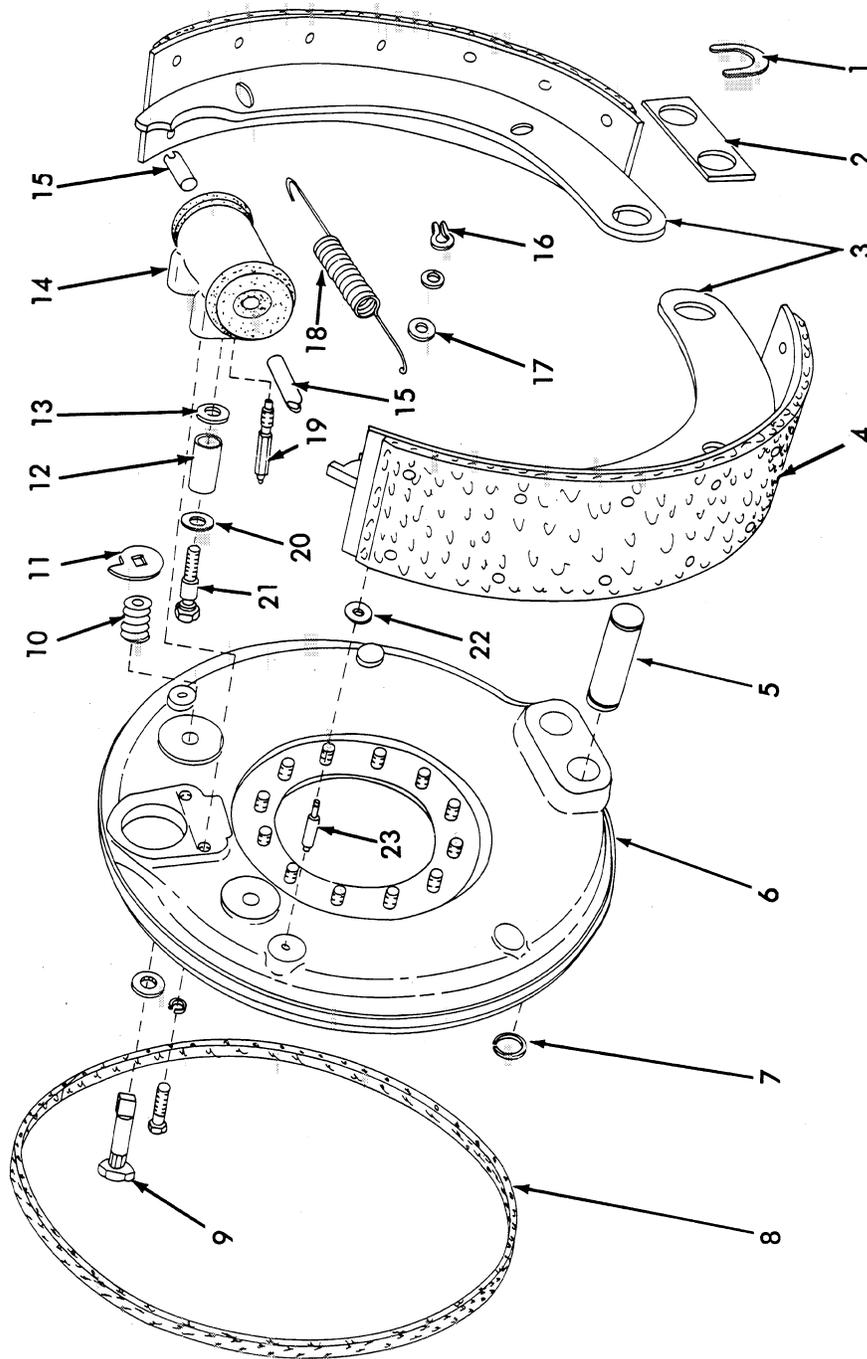


Fig. 7 Typical Front Brake Assembly - Exploded View
(T-72574)

- | | | |
|------------------------------|------------------------------------|------------------------------------|
| 1. Shoe retaining "C" washer | 9. Adjusting cam bolt assembly | 17. Guide pin washer |
| 2. Shoe supporting link | 10. Adjusting cam spring | 18. Shoe return spring |
| 3. Brake shoe assembly | 11. Shoe adjusting cam | 19. Wheel cylinder bleeder screw |
| 4. Brake lining | 12. Inlet connector | 20. Bolt sealing washer |
| 5. Anchor pin | 13. Inlet connector sealing washer | 21. Inlet connector bolt |
| 6. Brake spider assembly | 14. Wheel cylinder assembly | 22. Guide pin washer (spring type) |
| 7. Anchor pin snap ring | 15. Wheel cylinder push rod | 23. Shoe guide pin |
| 8. Brake drum seal (felt) | | |

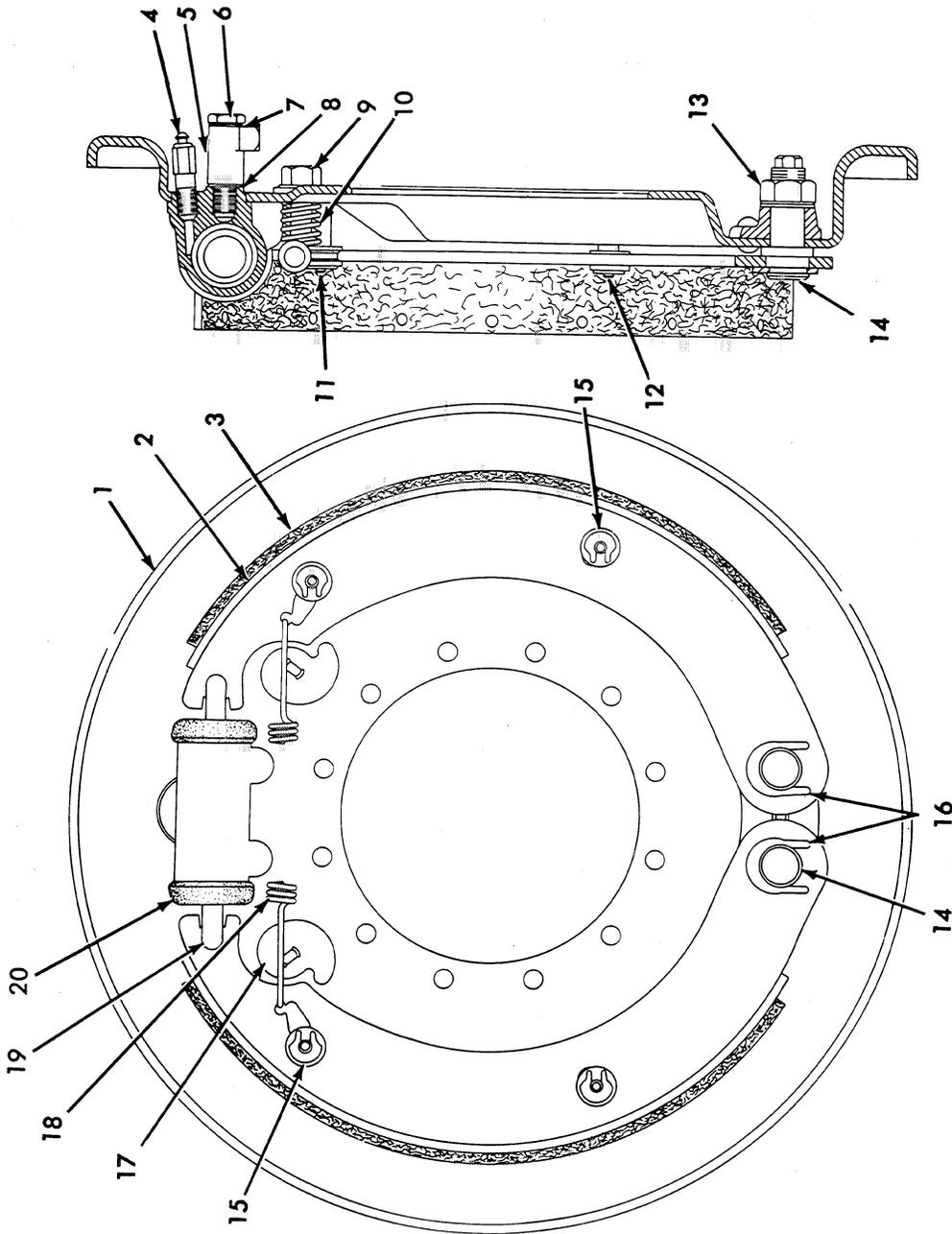


Fig. 8 Typical Rear Brake Assembly - Cross Section View
(T-72575)

- | | | |
|----------------------------|--|-----------------------------|
| 1. Backing plate assembly | 8. Inlet connector washer | 14. Anchor pin with washer |
| 2. Brake shoe assembly | 9. Adjusting cam bolt assembly with washer (not shown) | 15. Guide pin washer |
| 3. Brake lining | 10. Adjusting cam bolt spring | 16. "C" washer |
| 4. Bleeder screw | 11. Guide pin (long) | 17. Adjusting cam |
| 5. Inlet connector fitting | 12. Pin (short) | 18. Shoe return spring |
| 6. Bolt | 13. Anchor pin nut | 19. Wheel cylinder push rod |
| 7. Bolt washer | | 20. Wheel cylinder assembly |

E. BRAKE AND DRUM INSPECTION

1. Perform a visual inspection to determine the general condition of the brake and drum for any faults which might affect the brake performance.
2. Inspect the outside of the backing plate, drum and inner wall of tire for stains and dampness which would indicate leakage of the hydraulic brake fluid. In some cases the nature of a leak can be determined by the order of residue.
3. Inspect lines and hose connections for stains around fittings or wet spots around hoses which indicate fluid leakage. Tighten the connections and replace all damaged hoses.
4. On hydraulic brake lines, follow the lines back to the master cylinder while checking for indications of leaks, dents, kinks, damaged fittings and/or holding clamps.
5. On brakes having a self-centering, sliding type anchor, the lining wear pattern is more affected by operating conditions.
6. Linings should indicate good contact with the drum, but there can be more wear at either end than near the center. For this reason it is better to compare wear on left and right brake shoes and on front and rear axles. Then the odd wear pattern on one brake bears further checking to determine the cause.
7. "Charring," grease soaking, faulty riveting, and imbedded foreign particles necessitate a reline job. A "glassy" type of glaze or random cracking of the lining surface suggest overheating, however, a glaze can also form from light service.
8. Obvious faults, heat-check cracks, score marks, out-of-round, bell-mouths, or barrel shapes, and any excessive wear pattern requires that the drums be resurfaced or replaced. When drums are resurfaced, new lining is required. If lining surface wear does not appear to be square, suspect a drum condition. Drums should always be "miked" in connection with a reline job.
9. Stains suggest fluid leaks from the hydraulic wheel cylinder. The rubber boots should not be brittle or cracked and should be pulled back to determine if (and how much) brake fluid has collected between the boot and piston. The actual presence of fluid, other than mere dampness, indicates a fluid leak. It is recommended: never fail to disassemble, clean, recondition (or replace) wheel cylinder at reline periods.
10. Damaged retraction springs and other visible abnormalities should be noted.
11. The backing plates and anchor condition must not be loose, bent or distorted. Check the condition of shoe pads and galled anchors. Rusty or dirt coated shoe pads suggest an alignment fault.
12. Examine wheel bearing races and general condition of the bearings. Grease, other than in the wheel hub, suggests a leaking seal.
13. If inspection of one brake reveals no fault, replace drum and wheel and perform the brake adjustment. During the adjustment run shoes out until there is a drag, and slowly rotate the wheel. A variation in drag suggests an out-of-round drum. If an out-of-round condition seems extreme, remove that wheel and drum for inspection.

F. BRAKE RELINE

Work done at reline actually should be a reconditioning which prepares the entire system for operation throughout the life of the new lining. All too often an additional non-profitable service phase in the form of increased "come-backs" or "call-backs" requiring the correction of "grab," "pull," "squeal," "leaks," would develop less frequently with systematic reconditioning.

1. Check drums and lining visually for "bell-mouthed" or "barrel shaped" conditions. The lining surface will be tapered toward one side if the drum is "bell-mouthed." If the lining is worn more on the sides than at the center, it is an indication that the drum is "barrel-shaped."
2. Check the drum visually for scoring and heat cracking. A drum should be resurfaced if scoring can be felt with tips of fingers. A heat cracked drum contains cracks with cutting edges which shave off lining surfaces rapidly and the drum must either be resurfaced or replaced.
3. Regardless of the results from a running inspection, it is recommended to gauge every drum. Measure drum diameter at points 45 degrees apart around the entire circumference and at inside and outside as well as the center of the surface. Use a brake drum micrometer gauge, diameter-bar and thickness gauge, or check the drum in a lathe and measure its radius. Drums should be resurfaced if maximum measurement differences exceed 0.010 inch on the diameter.
4. Inspect old shoe alignment for possible corrections needed during reline.
 - a. Excessive lining wear at one end of the forward shoe may indicate a need for an anchor adjustment.
 - b. Check lining wear for possible "out-of-square" condition which would indicate a distorted shoe and/or bent backing or support plate. A loose or bent backing plate may cause unbalanced braking and/or noise.

- c. Before removing shoes, drain the system.
 - d. Take the time to note details of the spring hook-up and any color coding, the adjuster position and rotation, positions of linings and smaller parts for correct assembly. Keep left, right, front and rear parts separated.
 - e. Now, remove the old shoes, checking for possible bind or distortion at support pads, cylinder links, adjuster links, hold-down, etc. Watch for bind between shoe webs and support plates. Check the support plate distortion by placing a straight edge across its flat. On all brakes check for galled or loose anchor pins.
 - f. Examine the wheel cylinders and small parts. Discard worn parts, especially springs with twisted or nicked shanks or spread coils.
5. Inspect shoes (after removal) for any damage which would render them unfit for re-use or relined.

G. HYDRAULIC ACTUATION (WHEEL CYLINDERS APPLY BRAKE SHOES)

In hydraulic actuation, each wheel cylinder responds to hydraulic pressure in the system and converts this

pressure into mechanical force to expand the brake shoes into contact with the drum.

The straight-bore, double-end wheel cylinder consists of a cylinder casting, two pistons, two sealing cups, a spring (between the cups), two boots, and provide an opening for the bleeder screw as shown.

Fluid entering the wheel cylinders force the pistons to move outward (individually) and brings the lined shoes into contact with the drum. As hydraulic pressure increases the piston cup lips are forced more tightly against the cylinder wall, producing a positive fluid seal. Except for minor friction losses and spring pressure, the control actuating force is proportional to, and varies with, the hydraulic pressure exerted against each square inch of piston face.

During brake application, the pistons follow the shoes and maintain their force regardless of drum and/or shoe deflection or drum expansion. This feature permits foundation brake designs which can fully utilize the principle of self-energy to provide additional braking force, although lining wear may then be unbalanced.

Pistons are returned to the off position (brake released) by the force of brake shoe retracting springs when the hydraulic pressure is reduced, thus returning dis-

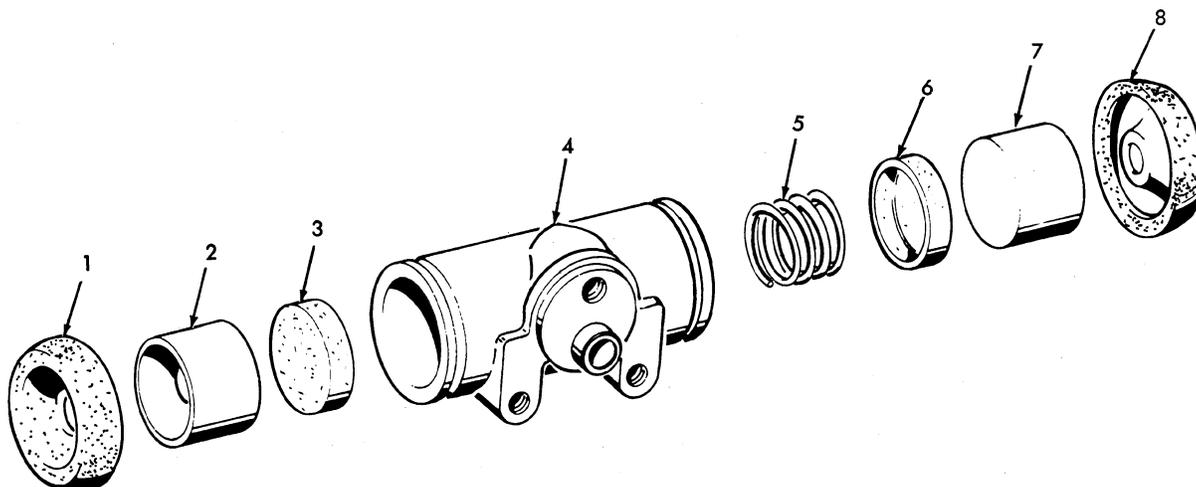


Fig. 9 Front and Rear Wheel Cylinders - Exploded View (T-72576)

- | | | |
|--------------------|---------------------------|--------------------|
| 1. Protecting boot | 4. Wheel cylinder housing | 7. Piston |
| 2. Piston | 5. Piston return spring | 8. Protecting boot |
| 3. Piston cup | 6. Piston cup | |

placed brake fluid to the master cylinder. Piston cup lips retain their seal against the cylinder walls because of the resiliency of the cups, plus residual pressure (maintained by the residual check valve) in order to seal the cylinder against possible air leakage into the system as well as fluid loss.

H. REMOVAL (WHEEL CYLINDERS)

NOTE

After removing the shoes, some brake service-men prefer to disassemble the wheel cylinders while still attached to the backing plate. It is recommended not to follow this procedure for it is not practical. Removal of the cylinder is as follows:

1. Remove the brake shoe retracting springs and spread the shoes outward from the wheel cylinder, or remove the shoes altogether.
2. Disconnect the hydraulic brake line on the rear brakes and front brakes.
3. In order to prevent kinking the hose or copper tubing, it is suggested to disconnect the lines at the chassis fitting or loosen at the wheel cylinder. Then the wheel cylinder is "screwed" off of the hose fitting after it has been disconnected or dismounted. The hose may be damaged if twisted during removal or replacement.
4. Remove the mounting capscrews to free the cylinder from the backing plate and remove.

NOTE

On center plane brakes it is necessary to loosen and remove the support plate assembly in order to permit the removal of the wheel cylinders.

I. DISASSEMBLY (WHEEL CYLINDERS)

NOTE

Refer to Figure 9.

1. Remove the rubber boots from each end by pulling them off the cylinder.
2. Push the internal parts out of the cylinder.

NOTE

Should any parts be frozen in the cylinder, they may be loosened by driving them with a wood dowel.

J. CLEANING AND INSPECTION

1. CLEANING

- a. Wheel cylinders and master cylinders are cleaned

alike.

- b. Degrease the cylinder castings and metal parts.
- c. Clean the rubber parts and thoroughly rinse the castings and metal parts in denatured alcohol or brake fluid.

NOTE

Even a trace of mineral base solvents such as gasoline, kerosene, distillant, carbon-tet, acetone, paint thinner, etc. will spoil rubber parts and contaminate the brake fluid.

2. INSPECTION

- a. After cleaning, visually inspect the cylinder bore.
- b. Should there be evidence of pitting, scratches and visible wear patterns, replacement is required.
- c. Accumulation of dirt, gummy substances and/or slight surface corrosion, remaining after the cleaning process, may be removed with crocus cloth or jeweler's rouge.
- d. The cylinder diameter should be measured to be certain it has not been honed to an oversize dimension.
- e. Use a "No-Go" gauge or micrometer to check a possible oversize cylinder as follows:

(1) Cylinders under 1 inch diameter must not exceed the standard diameter by more than 0.005 inch. For example: a 15/16 (0.9375) inch cylinder (nominal) must not exceed $0.9375 + 0.005$ or 0.9425 inch.

(2) Cylinders 1 inch diameter and over must not exceed the standard diameter by more than 0.007 inch. For example: a 1.0 (1.000) inch cylinder (nominal) must not exceed $1.000 + 0.007$ or 1.007 inch.

(3) An alternate method of checking bore size is to insert a piston and measure its clearance. Maximum clearance, probed with a wire feeler gauge, is 0.005 inch on diameters less than one inch; 0.007 inch on diameters one inch and larger.

K. ASSEMBLY

1. To assemble the wheel cylinder is the reverse of the disassembly.
2. Assemble the cups from each end. Do not slide them through the cylinder.
3. Extreme care must be exercised when installing the cups to avoid damaging the lips.

4. ~~Parts and service repair manual~~ Brake fluid prior to installation in the cylinder.

L. INSTALLATION

1. To install the wheel cylinders, reverse the procedure used for the removal.

NOTE

Extreme care must be taken to avoid twisting the hoses.

M. INSTALLING LININGS ON SHOES

1. Use a knock-out anvil and rivet punch in a conventional re-lining fixture to remove the old rivets from shoes.
2. Clean the shoes in a degreaser and afterward wire-brush them to remove dust and foreign material.
3. The lining must fit the shoe smoothly and evenly, contacting the shoe throughout the arc. A good method is to lineup rivet holes and clamp the lining (including shim stock, if used) evenly to the shoe with a lining clamp.
4. Rivet the lining at both ends before removing the clamp.
5. If a clamp is not used, start by first riveting the lining at the center and move outward at consecutive holes, alternating toward each end of the lining.
6. Before inserting each pair of rivets, draw the lining down tightly against the shoe. Do not set the riveting anvil too close as an exceptionally tight rivet may crack the lining or cause it to buckle away from the shoe between rivet holes.
7. Check tightness of rivets by running a feeler gauge around the lining-to-shoe joint. A 0.008 to 0.010 inch gauge should not penetrate beyond the rivets on wire-back linings; a 0.005 to 0.006 inch gauge on other lining types. Inspect all rivets to be certain that they have been evenly and firmly set against the shoe and that the rivet heads have not been cocked to one side.

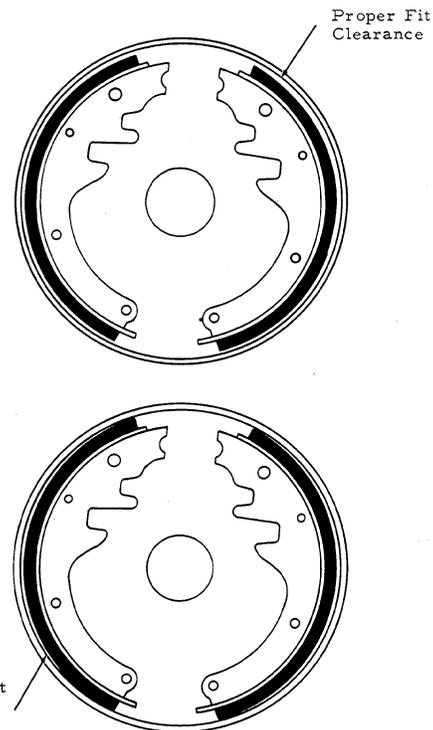


Fig. 10 Proper and Improper Brake Lining Fit (T-72577)

Do not install the lined shoe if a lining clearance appears near the center instead of the ends. This indicates an improper eccentric over-size grind which could cause pinching pressures at the lining ends and result in squeal, grab or pull.

O. LUBRICATION

Lightly coat backing plate shoe support pads, link ends, anchor pin shoe bushings and metal to metal contacts with brake lubricant. Also lubricate total contact brake shoe webs where they enter between support plates, but never lubricate the brake shoes.

N. CHECKING LINING FIT IN DRUM

When eccentric (contour) ground relined shoes are placed in the drum opposite each other, with the arc centers touching the drum, some lining clearance will exist at both heel and toe of each shoe. This clearance, 45° above and below the point of center contact, will be approximately 1/4 the amount of eccentric grind (on the diameter). On brakes ground 0.020" to 0.030" undersize, this clearance should be 0.005 to 0.0075 inch. There is a reasonable tolerance for "turned" drum diameters since enlarging a drum 0.010 inch changes these clearances only 0.0025 inch.