

MIDLAND HY-POWER—OPERATION

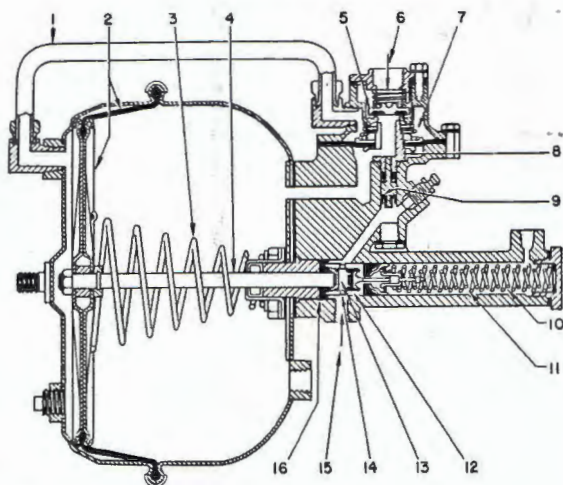


plate assembly (2) forward, causing pushrod (4) to move into slave cylinder piston and in contact with slave cylinder piston check valve (13) which seats rubber surface of check valve over piston orifice, sealing brake fluid in slave cylinder and brake system. As atmospheric pressure forces diaphragm and pressure plate assembly to move, the pushrod moves the slave cylinder piston and cup forward, building up hydraulic pressure in lines and applying brakes.

If power chamber fails to function, brake fluid will by-pass through slave cylinder piston openings (14) and piston and cup orifices, permitting operation as a straight hydraulic system.

When brake pedal is released, control valve diaphragm spring (7) returns control valve plunger (8) to released position allowing control valve disc (5) to seat and close atmospheric openings. Then vacuum through hollow section of control valve plunger (8) displaces atmosphere in rear section of chamber. Return spring (3) forces diaphragm and pressure plate assembly (2) to released position while slave cylinder piston and cup are forced back against pushrod seal (16) by return springs (10 & 11). As pushrod moves out of contact with slave cylinder piston check valve (13) return spring (12) forces check valve open.

HY-POWER TROUBLE SHOOTING

The following complaints and remedies include those caused by difficulties other than an improperly operating Hypower unit. If, after making the following tests, the trouble cannot be corrected, the Hypower unit should be removed and serviced by an authorized service station. Complete details on how the brakes perform will prove helpful to the service station. See *Trouble Shooting Chart, Below*

OPERATION

With engine running, brake pedal is depressed and fluid passes from master cylinder into slave cylinder inlet passage (15), to slave cylinder piston openings (14), to control valve plunger and piston seals (9), around slave cylinder piston check valve (13) and through piston and cup orifices into brake system. When fluid pressure reaches approximately 40 lbs. per square inch, control valve plunger and piston (8) starts to move and contacts rubber surface of control valve disc (5) which seals engine vacuum in front section of Hypower Chamber. As plunger continues to move, the control valve disc (5) is forced from its seat admitting atmosphere through connection (6) which passes through by-pass tube (1) and displaces vacuum in rear section of chamber. Atmospheric pressure then forces diaphragm and pressure

MIDLAND HY-POWER (Trouble Shooting)

COMPLAINT	PROBABLE CAUSE	REMEDY
NOTE: If following tests are made on a tractor, shut-off valves at trailer must be closed.		
Loss of fluid in brake master cylinder.	Brake wheel cylinder leaking. Loose hydraulic tube connection. Hypower leaking.	Replace necessary parts. Tighten or repair. Remove and repair.
Brake fluid in Hypower vacuum chamber.	Seals leaking.	Overhaul unit.
Brake pedal kicks back against foot when applied.	Defective parts in Hypower.	Service unit.
Engine runs uneven on idle with brakes released.	Vacuum leaks. Dirt or damaged parts in unit.	Check all connections between manifold and Hypower unit. Check unit.
NOTE: Before applying following tests, vehicles should be jacked up to determine whether all wheels are dragging. If all wheels do not drag, trouble is not in Hypower, but in the dragging wheels.		
Brakes release slowly.	Incorrect pedal linkage adjustment. Brake shoes sticking. Weak or broken brake shoe return spring. Residual pressure in master cylinder too high.	Adjust brake pedal free play. Remove rust and corrosion. Replace. Make certain control valve plunger moves in and out freely. Start engine; apply brakes and release. If brakes do not release, open bleeder screw at Hypower unit. If brakes release, master cylinder is at fault. If they do not release, repair Hypower.
Engine runs unevenly with brakes applied combined with hard pedal.	Defective diaphragm, valve seats, or dirt under valves.	Service Hypower.
Hard pedal at different intervals.	Defective manifold check valve. Obstructed air cleaner. Slave cylinder piston sticking due to dirt or inferior brake fluid.	Replace. Service Hypower air cleaner. Clean out slave cylinder. Flush system with alcohol. Install recommended fluid and bleed. Replace damaged parts.

NOTE: Most of the above tests can be applied to any make of vacuum booster.

VACUUM-HYDRAULIC POWER BRAKE SYSTEM (Trouble Shooting)

In this section only those troubles that can be attributed to the vacuum power unit will be covered. The Foundation brakes and hydraulic system must be checked to see if the difficulty exists in a component other than the power unit.

A. HARD PEDAL

1. Low engine vacuum — engine needs service.
2. Low vacuum caused by restriction in vacuum lines.
3. Loss of vacuum due to leaks in vacuum lines — loose fittings.
4. Collapsed vacuum hose or tubing.
5. Defective check valve.

B. BRAKES FAIL TO RELEASE

1. Control valve hydraulic piston binding in fitting.
2. Clogged hydraulic passage to control valve piston.

3. Binding of power piston.
4. Control valves malfunctioning.
5. Vacuum power cylinder damaged or cracked.
6. Check valve in hydraulic cylinder piston fails to open.
7. Rust or dirt in vacuum power cylinder.

C. EXCESSIVE BRAKE PEDAL TRAVEL

1. Air trapped in hydraulic cylinder.
2. Fluid leakage at external connections.
3. Internal fluid leak or bypass.
4. Scored hydraulic cylinder bore or excessive wear of hydraulic cylinder cups.

D. GRABBY BRAKES

1. Control valve hydraulic piston binding in fitting.
2. Power piston binding.
3. Faulty operation of control valves.

TROUBLE SHOOTING BRAKES — ALL TYPES

Brake Systems consist of three primary components . . .

CONTROL — Hydraulic

The hydraulic system from the foot pedal to and including the wheel cylinders. Also the mechanical emergency brake linkage when used on rear wheels.

Mechanical

The linkage from the foot pedal to the backing plate, including frame brackets, cross shaft levers, rods, cables and conduits.

Booster

The vacuum system from the intake manifold (or pump) to the power cylinders including all valves and reserve tanks.

Air

The compressor and its governor to the wheel chambers or pistons including all valves and reservoir tanks. The slack adjusters are considered a part of the control and must be thoroughly inspected.

BRAKE ASSEMBLY

The brake itself. The backing plate with the anchors. The

shoes and linings with pull back springs and drums, links and wheel bearings.

CHASSIS

Every part of the vehicle through which the torque set up by braking is absorbed. This includes tires, steering mechanism, suspension and connections, rear axle housing with its connections.

THE FIRST STEP in trouble shooting is to localize the fault to one of these three components, then correct that part as a whole, since all items in that part are closely related and all are usually impaired by the failure of one.

Most troubles follow the same pattern. The chart below will help to locate the parts at fault. The method of correction is noted. These methods are given in detail on reference pages indicated in the index.

NOTE: CHECK INDEX FOR BRAKE TYPE AND ADDITIONAL INFORMATION. SEE SPECIAL SECTIONS ON TROUBLE SHOOTING, AIR AND VACUUM BRAKES.

TROUBLE	CAUSE	METHOD OF CORRECTION
NOISE	Insufficient pressure to shoes due to sluggish fluid or sticking wheel cylinders.	Examine entire hydraulic system.
	Shoes vibrate due to weak pull back or anti-rattler springs; guide springs rusty or missing.	Examine all springs, renew where necessary.
	Eccentric or distorted drum.	True drum, replace if necessary.
	Shoes vibrate due to weak pull back or hold down springs; poor lining to drum contact; or loose rivets.	Examine shoes, fit to drums.
	Secondary shoe contacts drum at toe or heel due to wrong anchor position or worn pin hole.	Adjust brakes, renew worn shoes.
	Secondary shoe has weaker pull back spring and leaves anchor first when brakes are applied.	Check springs.
	Shoes vibrate due to rusty or frozen anchor pins; poor lining to drum contact, loose rivets.	Examine shoes and fit to drum.
	Shoes contact at toe or heel due to incorrect anchor setting or worn anchor pin holes.	Adjust brakes. Renew worn shoes.
	Reverse shoes bend in center due to short length of lining at one end.	Install lining at toe of shoe.
	Too much clearance between lining and drum.	Adjust correctly.
	Shoe guides loose, allowing shoes too much side play.	Tighten so shoes are held snugly.
	Shoe ramps dry or worn.	Lubricate.
	Backing plates and shoe support brackets loose.	Tighten support bolts.
	Wheel bearing adjustment too loose allowing vibration when brakes are applied.	Adjust to specifications.
	Drum vibration; due to loose hub bolts, out of round or thin drums.	Examine drums. Install springs.
	Dampening springs missing.	Clean out dust thoroughly.
	Dust in brake assembly.	Reline.
Lining glazed or lining loose on shoe.	Tighten all chassis parts.	
Weak axle supports, broken springs, loose "U" clips.	Examine, adjust and refill shock absorbers.	
Weak shock absorbers allow axles to bounce when brakes are applied.		

TROUBLE SHOOTING BRAKES — ALL TYPES (continued)

TROUBLE	CAUSE	METHOD OF CORRECTION
PEDAL LOW	<p>Leaking primary cup in master cylinder. Closed or dirty parts. Air or gas in lines. Expanding hoses. Check valve leaks failing to keep system preloaded.</p> <p>Air or gas bubbles in line. Fluid low in master cylinder.</p> <p>Lining to drum clearance excessive.</p>	<p>Examine all parts of hydraulic system, particularly master cylinder, and adjust pedal.</p> <p>Bleed lines. Add fluid.</p> <p>Adjust. Reline if necessary.</p>
PEDAL FADING OR SPONGY	<p>Air or gas in line. Dirty master cylinder ports. Weak hoses expand. Leak in system.</p> <p>Primary cup leaks allowing fluid to escape into reserve chamber.</p> <p>Fluid wrong type. Gases when hot.</p> <p>Air or gas in line; bubble may be trapped in brake tee or high part of line.</p> <p>Lined shoes do not fit drum.</p> <p>Shoes incorrectly adjusted.</p> <p>Anchors incorrectly adjusted.</p> <p>Drums turned or worn too thin and expand when hot.</p> <p>Shoes incorrectly adjusted; contact at heel and then bend causing vibration.</p>	<p>Check entire hydraulic system.</p> <p>Overhaul master cylinder.</p> <p>Drain and flush system. Refill with super heavy duty brake fluid.</p> <p>Bleed all four wheels at same time.</p> <p>Re-arc shoes.</p> <p>Make major adjustment.</p> <p>Adjust anchors.</p> <p>Renew drums.</p> <p>Readjust or re-arc shoes.</p>
BRAKES DRAG	<p>Master cylinder ports dirty or kept closed by primary cup.</p> <p>Pedal rod incorrectly set so there is no play before master cylinder piston is engaged.</p> <p>Sticking wheel cylinders, scored pistons, expanded cups, dirty fluid.</p> <p>Linkage on rear wheel emergency brakes adjusted too tightly.</p> <p>Brake valve not returning to fully released position.</p> <p>Adjusters over-operative.</p> <p>Restricted tubing or hose line.</p> <p>Exhaust port of brake valve or quick release valve restricted or plugged.</p> <p>Defective brake valve or quick release valve.</p> <p>Rusty or frozen anchor pins. Weak pull back springs.</p> <p>Bent backing plates or shoe supports. Shoe ledges worn or rusty.</p> <p>Frozen anchor pins or bushings.</p> <p>Shoes don't fit drums — pull back springs weak or missing.</p> <p>Incorrect shoe adjustment. Shoes not centered in drum.</p> <p>Axle shift due to broken spring center bolts or loose "U" clips or saddles.</p>	<p>Check ports.</p> <p>Adjust pedal rod.</p> <p>Examine wheel cylinders and fluid.</p> <p>Adjust rear wheel emergency brake.</p> <p>Check linkage for free movement. Check clearance under treadle valve.</p> <p>Free-up, examine and replace defective parts.</p> <p>Check for spring cage binding in brake valve.</p> <p>Disconnect lines and check for obstruction or collapse of hose.</p> <p>Clean exhaust ports.</p> <p>Replace with new or rebuilt valve.</p> <p>Examine springs and lubricate anchors.</p> <p>Tighten backing plates and lubricate.</p> <p>Check shoes and fit to drums.</p> <p>Make major adjustment.</p> <p>Check all springs and saddles.</p>
BRAKES WON'T HOLD	<p>Check line pressure to localize trouble to either control or brake assembly as first step.</p> <p>Sticking wheel cylinders, sluggish fluid.</p> <p>Cups in master cylinder swollen. Sticking wheel cylinders due to swollen cups.</p> <p>Check engine manifold vacuum and all valves as first step to localize trouble to either vacuum system or brake assembly.</p> <p>Incorrect lining contact due to warped shoes or tapered drums.</p> <p>Refinished drums not completed across full lining track so that lining to drum contact is made on ridge left in drum.</p> <p>Drum tapered so lining contacts only on inner edge.</p> <p>Shoes don't fit drums.</p> <p>Backing plate or shoe supports out of line.</p> <p>Incorrect lining contact due to warped shoes.</p> <p>Anchors incorrectly set.</p> <p>Grease on lining. Lining worn so that cam rise is too great.</p> <p>Lining glazed.</p> <p>Hard spots in drum surface.</p>	<p>Use pressure gauge.</p> <p>Examine wheel cylinder and fluid.</p> <p>Examine and renew cups if necessary.</p> <p>Use vacuum gauges.</p> <p>Fit shoes and turn drums.</p> <p>Refinish drum correctly.</p> <p>Recondition drum.</p> <p>Fit shoes to drums.</p> <p>Check shoe supports.</p> <p>Replace shoes.</p> <p>Make major adjustment.</p> <p>Reline.</p> <p>Reline.</p> <p>Remove hard spots in lathe or install new drum.</p>

TROUBLE SHOOTING BRAKES — ALL TYPES (continued)

TROUBLE	CAUSE	METHOD OF CORRECTION
ERRATIC BRAKES —DIVE —GRAB	Faulty check valve fails to hold pressure in system.	Rebuild or replace master cylinder.
	Air or gas bubble in lines. Sticking wheel cylinders. Pressure to all wheels unequal due to obstruction in lines.	Examine entire hydraulic system.
	Broken spring in air chamber.	Replace spring.
	Slack adjuster jam nut or ball check loose.	Examine all slack adjusters.
	Faulty check valve or collapsed hoses allowing intermittent flow of atmosphere.	Inspect system.
	Loose lining, lining of wrong type, different types on each wheel. Grease on lining.	Reline.
	Anchors incorrectly set causing too much toe or heel contact, unequal clearance at each wheel.	Make major adjustment.
	Shoes don't fit drums, excessive toe and heel contact.	Fit shoes to drum.
	Backing plates loose and shift under braking torque.	Tighten backing plates.
	Shoe return springs incorrectly installed, or unequal.	Check shoe springs.
	Slack adjuster levers set wrong.	Reset levers.
	Flat spot in drums; or out of round drums. Drums weak and change shape when hot.	Replace drums if too thin.
	Both shoes in same brake not equally adjusted.	Make major adjustment.
Weak car springs allow excessive axle roll — Pitman arm thrown out of line.	Check steering geometry.	
Weak shock absorbers or front springs allow too much dip at brake application.	Check shock absorbers and knee action.	
BRAKES FADE WHEN HOT OR DRIVING AT HIGH SPEED	Fluid gases when hot; or rubber cups expand causing sticking wheel cylinders.	Examine entire hydraulic system.
	Primary cup leaks allowing fluid to escape into reserve chamber.	
	Excessive gassing caused by braking heat being transferred to wheel cylinders or lines too close to exhaust system.	Shield wheel cylinders, relocate hot lines.
	Insufficient brake chamber pushrod movement to compensate for drum expansion.	Adjust brakes. Set linkage.
	Compressor not up to capacity, compressor governor incorrectly set for cut in. Operating range not wide enough.	Examine compressor, adjust governor.
	Reservoir tank not large enough.	Install larger or additional reserve tank.
	Application not balanced nor timed correctly. One wheel or one axle doing more than its share of braking.	Balance action.
	Vacuum reserve tank too small.	Install larger, or additional tank.
	Motor fails to maintain intake manifold vacuum.	Check system.
	Lining to drum clearance too great to take care of natural drum expansion.	Make major adjustment.
Drums expand when hot causing loss of pedal.	Renew drums if worn or turned too thin.	
Grease on lining.	Reline.	
Lining not sufficiently resistant to heat.	Reline.	
WET WEATHER TROUBLES Won't Hold or Grab	When wheel cylinder boots are left off or broken, cylinders may rust causing sticking pistons.	Make certain pistons are free, replace boots.
	Excessive drum dust forms a paste causing friction loss; or absorbs moisture and clings to lining surface causing grab.	Remove drums and clean, dust off all parts or use air hose through ports.
	Too much clearance allows water to form between lining and drum.	Make major adjustment.
	Scored drums trap water in grooves forming a film.	Turn drums.
	Seal on backing plate broken allowing excessive amount of water to enter.	Examine seals and correct.
	Seal may trap water in drum.	Examine seals and correct.
AIR OR GAS IN LINES	FAULTY CHECK VALVE — Allows fluid pressure to drop to atmospheric and air flows into rear wheel cylinders past the cups when hand brake is applied.	Overhaul master cylinder.
	FAULTY FLUID — Or two types that generate gas when mixed.	Drain and flush system.
	Pipe too close to exhaust, causing fluid to gas.	Relocate or insulate hot line.