TROUBLE SHOOTING GUIDE

HARD BRAKE PEDAL

- **C**heck for engine vacuum, make sure manifold is open and clear of carbon build up.
- **U**se a vacuum gauge to check the vacuum at the booster, do not guess.
- **C**heck vacuum hoses for soft spots, deterioration or collapse (replace hose if in doubt.)
- **C**heck brake pedal for binding.
- **C**heck the condition of the foundation brakes, drums, linings, and brake shoes for binding.
- **C**heck for air in Hydraulic System.
- **C**heck for any line restrictions.

PEDAL KICKBACK

- **C**heck for dirt or foreign matter in Hydraulic System.
- **B**efore replacing the booster, remove the master cylinder to clean any dirt out. Also; Clean out the rest of the Hydraulic System.

BRAKE WILL NOT RELEASE

- **B**e sure a brake booster with residual check valve is not used with master cylinder with check valve.
- **O**n remote mountd boosters, disconnect the line between the master cylinder and the brake booster.
- **I**f the brakes release, the trouble is in the master cylinder (possibly the brake pedal is binding.)
- **I**f brakes do not release, disconnect the line from the booster to the wheel cylinders.
- **I**f the brakes release, the problem will be in the booster.
- **I**f brakes still do not release, the problem is in foundation brakes.
- **I**f brakes will not release on firewall mounted brake booster, disconnect the hydraulic line to the wheels.
- **I**f brakes release, the problem is in the booster or master cylinder (be sure the brake pedal is not binding.)

LOW BRAKE PEDAL

- **M**ake sure master cylinder reservoir is full.
- **C**heck for air in the hydraulic system.
- **M**ake sure there are no leaks in the wheel cylinders, lines or fittings.
- **C**heck the foundation brakes for proper adjustment, cracked or over-sized drums.

SPECIAL NOTES: Common Causes of Booster Failure

GAS ENGINES: Gas is the cause of a large number of booster failures. If the vacuum hose does not have a vacuum check valve in the line, raw gas fumes are drawn into the Hydrovac causing the diaphragm to rupture and fail. It could possibly cause an explosion. The vacuum hose should run from the manifold to the vacuum check valve mounted on the firewall above carburetor, then down to the booster. If no firewall is available, such as on cab-over models, the vacuum hose should be routed so that it goes above the maniford an then down to the booster.

PROPANE AND BUTANE EQUIPPED ENGINES: A vacuum check valve should be used as close to the manifold as possible and as high on the firewall as possible. This would prevent raw gas or fumes from getting to the Hydrovac orBooster and prevent a possible explosion if the engine should backfire. A vacuum tank should be used between the engine and Hydrovac or Booster when Butane or Propane gas is used to fuel the engine.

DIESEL ENGINES: Diesel engines with vacuum pumps need a check valve in the vacuum line to prevent oil from being drawn into the booster when the engine is shut down. Oil will ruin the diaphragm causing the booster to fail.

TROUBLE SHOOTING POWER BRAKES

BASIC TEST

ENGINE OFF. Depress and release brake pedal several times to remove vacuum from power section.

Depress pedal and hold with light pressure, 15 to 25 lbs., and **START ENGINE.**

If power section is operating, pedal will fall slightly and then hold. Less pressure will be needed to hold pedal down.

IF POWER IS NOT OPERATING - disconnect vacuum hose from power section vacuum valve. Then, with ENGINE RUNNING, check vacuum supply with a vacuum gauge. There should be at least 14 inches of vacuum.

IF VACUUM SUPPLY IS BELOW 14 INCHES - replace or repair vacuum hose and vacuum fittings.

When adequate vacuum supply is obtained, repeat **BASIC TEST.**

IF VACUUM SUPPLY IS 14 INCHES OR MORE - power section is defective and should be replaced.

IF APPLICATIONS ARE NOT POWER ASSISTED - disconnect vacuum hose from intake manifold or power section check valve, whichever is easier. If disconnected at check valve, attach a short length of hose to valve.

Blow into hose attached to check valve. If air passes through, valve is defective.

I**F CHECK VALVE IS DEFECTIVE -** install new check valve and repeat the VACUUM LEAK TEST.

I**F CHECK VALVE IS OKAY -** power section is leaking and should be replaced.

IF POWER SECTION IS OPERATING - do the following VACUUM LEAK TEST.

VACUUM LEAK TEST

Run engine to medium speed. Release accelerator and turn ENGINE OFF. This builds up vacuum.

Wait 90 seconds and apply brakes. Two or more applications should be power assisted.

IF APPLICATIONS ARE POWER ASSISTED - there is no vacuum leak. Do the following HYDRAULIC LEAK TEST.

HYDRAULIC LEAK TEST

Depress and release brake pedal several times. Then hold pedal depressed with medium pressure, 25 to 30 lbs.

IF PEDAL DOES NOT FALL AWAY - hydraulic system is not leaking.

IF PEDAL FALLS AWAY - hydraulic system is leaking. Check for external leakage at wheel cylinders, hydraulic line and hoses. If there is no external leak, there may be an internal leak (master cylinder cups.) Repair or replace parts needed to correct leak.

TROUBLE SHOOTING THE HYDRO-BOOST - Part 1

HYDRO-BOOST BRAKE BOOSTERS

PROCEDURE FOR NOISE - SLOW OR INCOMPLETE BRAKE PEDAL RETURN - OVERSENSITIVE BRAKING - SELF-APPLYING BRAKES

NOISY BRAKE BOOSTER

VERIFY COMPLAINT
1. TYPE OF NOISE.
2. WHEN IT OCCURS.

IF THE NOISE OCCURS DURING:
- HIGH BRAKE PEDAL EFFORTS.
- QUICK PEDAL RELEASE.

SEE NORMAL OPERATION NOISES AND COMPARE WITH A KNOWN ACCEPTABLE SYSTEM.

HYDRO-BOOST BRAKE NOISE CHARACTERISTICS: NORMAL OPERATING NOISES

NORMAL HYDRO-BOOST BRAKE UNITS WILL PODUCE CERTAIN CHARACTERISTIC BOOSTER NOISES. THESE NOISES OCCUR, FOR THE MOST PART, WHEN THE BRAKE PEDAL IS MANIPULATED IN A MANNER NOT ASSOCIATED WITH EVERYDAY BRAKING OR DRIVING HABITS. THE GENERAL CATEGORIES OF NORMAL OPERATING NOISES ARE: (1) HISSING NOISES AND (2) CLUNK CLICK/CHATTER NOISES.

IF THE NOISE OCCURS DURING:
- LOW BRAKE PEDAL EFFORT.
- ENGINE IDLE - NO PEDAL EFFORT.
- NORMAL DRIVING CONDITIONS.

OPERATE THE VEHICLE UNTIL THE ENGINE IS AT NORMAL OPERATING TEMPERATURE.

DUPLICATE THE OPERATING CONDITION ABOVE AND LISTEN FOR NOISE.

COMPARE RESULTS WITH A KNOWN ACCEPTABLE SYSTEM.

ERRATIC OPERATION, STICKS, BINDS OR GRABS.

RUN PUMP AT FAST IDLE.

PULL THE BRAKE PEDAL REARWARD WITH APPROXIMATELY 10 POUNDS FORCE. RELEASE THE PEDAL AND MEASURE THE DISTANCE TO THE FLOOR BOARD.

MAKE A 100 POUND BRAKE APPLICATION. RELEASE THE BRAKE PEDAL AND AGAIN MEASURE THE PEDAL TO FLOOR BOARD DISTANCE. THE PEDAL SHOULD RETURN TO ITS ORIGINAL POSITION.

IF THE PEDAL DOES NOT RETURN PROPERLY, CHECK THE PEDAL TO BE SURE IT IS OPERATING FREELY. CORRECT ANY STICKING, BINDING AS NECESSARY.

IF PEDAL IS FREE - CHECK FOR OBSTRUCTION IN THE RETURN LINE AND CONNECTIONS BETWEEN HYDRO-BOOST AND PUMP RESERVOIR.

REMOVE OBSTRUCTION OR REPLACE LINE AS REQUIRED. IF CONDITION REMAINS, CHECK FOR A DAMAGED REACTION END. IF DAMAGED, HYDRO-BOOST SHOULD BE REPLACED OR REPAIRED.

IF THE PEDAL IS FREE OF ANY BINDING CONDITION, AND THERE ARE NO OBSTRUCTIONS IN THE RETURN LINE, REMOVE THE MASTER CYLINDER RESERVOIR COVER.

OBSERVE THE BRAKE FLUID IN THE RESERVOIR WHILE RAPIDLY DEPRESSING THE BRAKE PEDAL ONE INCH.

FLUID SURFACE SHOULD HAVE SOME MOVEMENT OR SPOUT IN THE FORWARD RESERVOIR SECTION. MINOR SPOUTING MAY OCCUR IN THE REAR RESERVOIR SECTION ALSO. IF NO MOVEMENT OR SPOUTING OR FLUID OCCURS IN FORWARD RESERVOIR SECTION, THE HYDRO-BOOST UNIT IS DEFECTIVE AND MUST BE REPLACED OR REPAIRED.

IF HYDRO-BOOST WILL EMIT NORMAL HISSING NOISES WHEN ABOVE NORMAL BRAKE PEDAL EFFORTS ARE APPLIED (40 LBS. PEDAL EFFORT AND UP). THE HISS SOUNDS ARE PARTICULARLY NOTICEABLE WITH THE VEHICLE MOTIONLESS AND WILL INCREASE IN INTENSITY AS PEDAL PRESSURE INCREASES ABOVE 40 LBS. AND SYSTEM OPERATING TEMPERATURE INCREASES. LOUD HISSING SOUNDS AT OR BELOW NORMAL (20-25 LBS.) PEDAL EFFORT WARRANTS INVESTIGATION.

CLUNK, CHATTER OR CLICKING NOISES WILL BE HEARD WHEN THE BRAKE PEDAL IS QUICKLY RELEASED FROM HARD (50-100 LBS.) PEDAL EFFORTS.

TROUBLE SHOOTING THE HYDRO-BOOST - Part 2

HYDRO-BOOST BRAKE BOOSTERS PROCEDURE FOR EXCESSIVE BRAKE PEDAL EFFORT, BRAKE PEDAL CHATTER AND PULSATION AND/OR LEAKS.

BASIC TEST

ENGINE (PUMP) OFF, DEPRESS AND RELEASE BRAKE PEDAL FOUR TIMES TO DEPLETE ALL HYDRAULIC PRESSURE FROM HYDRO-BOOST.

DEPRESS THE PEDAL AND HOLD WITH LIGHT PRESSURE, THEN START THE ENGINE.

IF POWER SECTION IS OPERATING, THE PEDAL WILL FALL SLIGHTLY AND THEN HOLD. LESS PRESSURE WILL BE NEEDED TO HOLD PEDAL DOWN TO THIS POSITION,

IF POWER SECTION IS NOT OPERATING - CHECK PUMP RESERVOIR FLUID LEVEL.

IF FLUID LEVEL IS OK, CHECK TENSION AND CONDITION OF DRIVE BELT.

IF BELT IS LOOSE OR DAMAGED, TIGHTEN OR REPLACE AS REQUIRED AND REPEAT BASIC TEST.

IF PUMP SPEED IS SLOW, ADJUST AND REPEAT BASIC TEST.

IF PUMP SPEED IS OK, PERFORM PUMP FLOW AND RELIEF PRESSURE TEST.

IF PUMP OUTPUT IS BELOW MINIMUM SPECIFICATION, REPLACE AND REPEAT BASIS TEST.

IF ALL TESTS AND CHECKS ARE OK, THE BOOSTER IS DEFECTIVE AND SHOULD BE REPLACED OR REPAIRED.

IF FLUID LEVEL IS LOW, ADD FLUID AND REPEAT BASIC TEST PLUS HYDRAULIC LEAK TEST.

STEERING HYDRAULIC LEAK TEST

THOUROUGHLY CLEAN THE HYDRO-BOOST UNIT AND ALL HOSE CONNECTIONS.

START THE PUMP AND RUN AT IDLE SPEED.

IF THE HOSE FITTINGS DO NOT LEAK, CHECK THE HYDRO-BOOST FOR LEAKS, APPLY THE BRAKE PEDAL WITH APPROXIMATELY 100 POUNDS EFFORT AND HOLD WHILE CHECKING HYDRO-BOOST HOSE FITTINGS FOR LEAKS. DO NOT HOLD BRAKE PEDAL AT 100 POUND EFFORT OR ABOVE FOR MORE THAN FIVE SECONDS AT A TIME.

IF THE HYDRO-BOOST LEAKS, IT IS DEFECTIVE AND SHOULD BE REPLACED OR REPAIRED.

IF NO LEAKS ARE FOUND IN THE HYDRO-BOOST OR HOSES, DO NOT REPAIR OR REPLACE HOSES OR HYDRO-BOOST,

IF POWER SECTION IS OPERATING, PERFORM IN ORDER:

IF POWER SECTION IS OPERATING, PERFORM IN ORDER:

HYDRO-BOOST ACCUMULATOR PRESSURE RETENTION TEST

RUN PUMP TO MEDIUM SPEED, APPLY BRAKE PEDAL FORCE TO 100 LBS. FOR NOT MORE THAN FIVE SECONDS. STOP ENGINE (PUMP).

WAIT 90 SECONDS AND APPLY BRAKES, TWO OR MORE APPLICATIONS SHOULD BE POWER ASSISTED.

IF APPLICATIONS ARE NOT POWER ASSISTED, THE HYDRO-BOOST IS DEFECTIVE AND SHOULD BE REPAIRED OR REPLACED.

IF APPLICATIONS ARE POWER ASSISTED, THE ACCUMULATOR IS FUNCTIONING PROPERLY; **DO THE HYDRAULIC LEAK TEST**

THOUROUGHLY CLEAN THE HYDRO-BOOST UNIT AND ALL HOSE CONNECTIONS.

START THE PUMP AND RUN AT IDLE SPEED.

APPLY BRAKE PEDAL FORCE TO 100 LBS. AND HOLD WHILE CHECKING HYDRO-BOOST AND HOSE CONNECTIONS FOR LEAKS. DO NOT HOLD BRAKE PEDAL TO 10 LBS. FORCE FOR MORE THAN FIVE SECONDS AT A TIME.

IF THE HOSE FITTINGS DO NOT LEAK, CHECK THE HYDRO-BOOST FOR LEAKS, APPLY THE BRAKE PEDAL WITH APPROXIMATELY 100 LBS. EFFORT AND HOLD WHILE CHECKING HYDRO-BOOST HOSE FITTINGS FOR LEAKS. DO NOT HOLD BRAKE PEDAL AT 100 LBS. OR ABOVE FOR MORE THAN FIVE SECONDS AT A TIME.

IF NO LEAKS ARE FOUND IN THE HYDRO-BOOST OR HOSES, DO NOT REPAIR OR REPLACE HOSES OR HYDRO-BOOST. DO THE HYDRAULIC LEAK TEST.

BRAKE HYDRAULIC LEAK TEST

DEPRESS AND RELEASE BRAKE PEDAL SEVERAL TIMES, THEN HOLD PEDAL DEPRESSED WITH MEDIUM PRESSURE, 25-35 LBS.

IF THE HYDRO-BOOST LEAKS, IT IS DEFECTIVE AND SHOULD BE REPLACED OR REPAIRED.

IF PEDAL DOES NOT FALL AWAY, HYDRAULIC SYSTEM IS NOT LEAKING.

IF PEDAL FALLS AWAY, HYDRAULIC BRAKE SYSTEM IS LEAKING. CHECK FOR EXTERNAL LEAKAGE AT WHEEL CYLINDERS, CALIPERS, BRAKE HYDRAULIC LINES AND HOSES. IF THERE IS NO EXTERNAL LEAK, THERE MAY BE AN INTERNAL LEAK (MASTER CYLINDER CUPS) REPAIR OR REPLACE PARTS NEEDED TO CORRECT LEAK.