Brakes

ELECTRIC/DRUM (Standard)

HYDRAULIC/DISC (Optional)

Brake Operation

The Kelsey-Hayes brakes are operated by 12 volt current from the tow vehicle and are integrally connected with the tow vehicle's brake system (Item No. 4). The controller mounted in the car (Item No. 3), synchronizes the application of trailer brakes (Item No. 6) with the tow vehicle brakes. The selective resistor (Item No. 2) allows the trailer brakes to be adjusted based on the total trailer weight.

When the brake pedal is applied, current flows from the tow vehicle's battery (Item No. 1) through the controller (Item No. 3), selective resistor (Item No. 2), 7 way connector (Item No. 5), and energizes the trailer brakes. (item No. 6).

REPLACEMENT PARTS LIST

CONTROLLER PARTS

PART NO.	DESCRIPTION
39666	Wire & Terminal Assembly (25' lg.) (not shown)
56946	Tube & Fitting Assembly (not shown)
83775	Controller Assembly
83817	Cylinder & Pin Assembly
83820	Resistor, Contact & Lead Assembly

ADAPTOR FITTINGS

PART NO.	IDENTIFICATION
42323	1/4" "K/H Ⓑ " Tee
42324	3/16" "K/H Ⓐ " Tee
47772	(Chrysler cars) "K/H Ⓒ " Tee
78496	"K/H Ⓔ " Tee
78497	"K/H Ⓓ " Tee
78498	"K/H Ⓕ " Tee
78499	"K/H Ⓖ " Tee
78994	AMC Adaptor

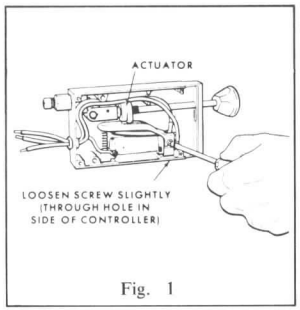


Fig. 1

Electrical Connections of Controller

Before wiring the controller it should be determined whether a Kelsey-Hayes selective resistor is required. The resistor is necessary when the electric brake capacity exceeds the trailer's braking needs. This condition can be determined by first determining the approximate weight of the trailer (when loaded) then consulting the selective resistor settings chart, page2-7. If no resistor is required the chart will so indicate.

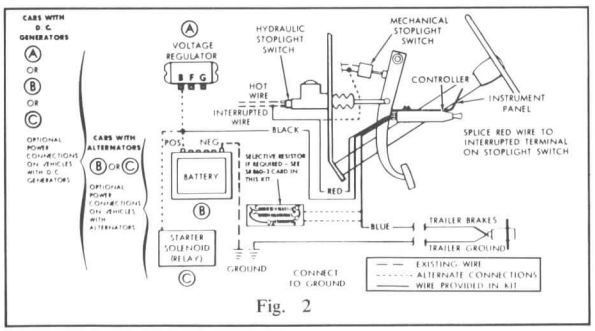


Fig. 2

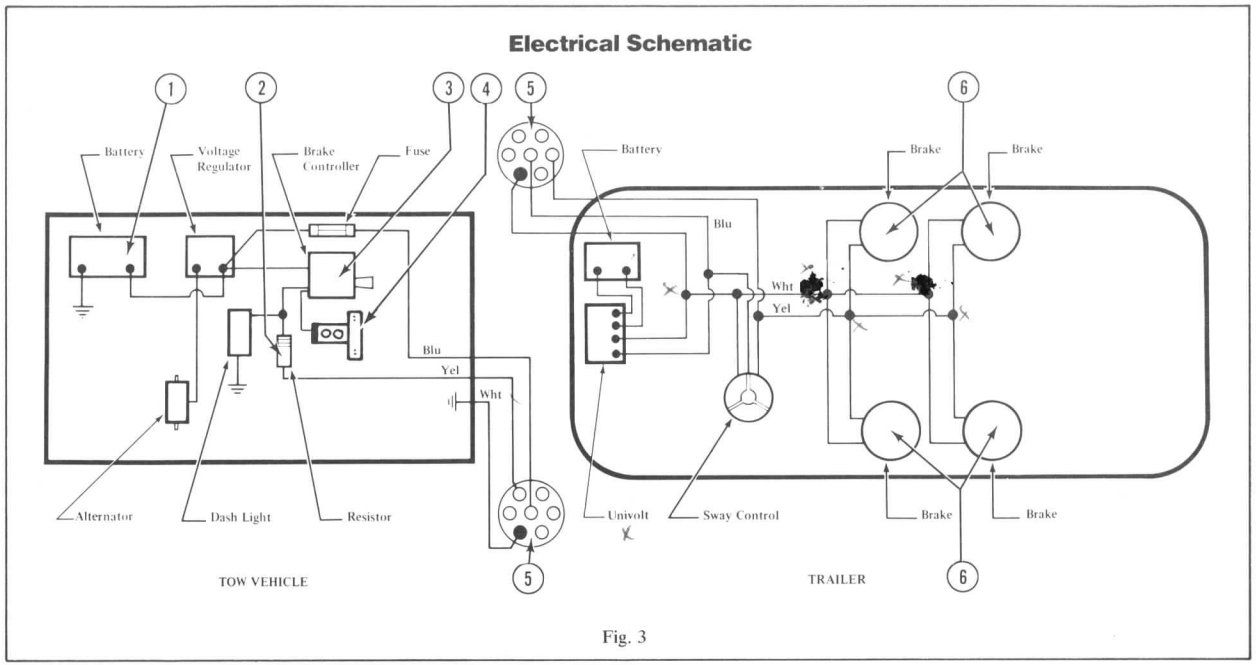


Fig. 3

Brake Assembly

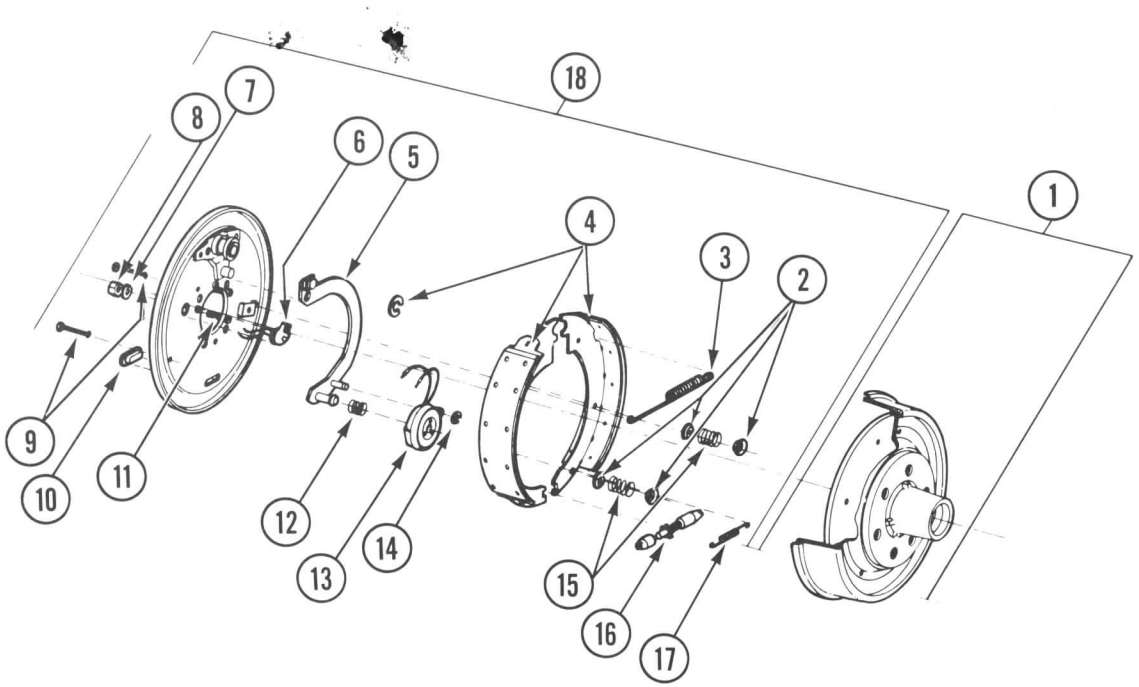


Fig. 4

No.	Part No.	Description
1	400086	Hub, drum and plate assembly
2	30690	Hold down cups
3	85073	Retractor spring
4	400089	Shoe and lining kit (1 primary, 1 secondary)
5	55829-30	Lever
6	48770	Connector (magnet leads)
7	22548	Brake mounting washer
8	44448	Brake mounting nut
9	30687	Hold down pins
10	47564	Brake adj. hole cover
11	30810	Brake mounting stud
12	71830	Magnet spring
13	56222-7	Magnet assembly (12 Volt)
	94731	Magnet assembly – will fit either roadside or curbside
14	71829	Magnet retaining ring
15	30688	Hold down springs
16	58929	Adjusting screw assembly
17	85068	Adjusting screw spring
18	76717-8	Brake assembly
	56266	Kit (includes No. 2, No. 9 and No.15)

Brake Adjustment

1. This should be done at least every year or 10,000 miles, whichever comes first.

2. Jack trailer at marked jack location pad behind axle on main frame.

3. Remove the small rubber plug at the base of the backing plate.

4. While turning the wheel and tire, tighten the brakes (Fig. 5) using a brake adjusting tool or a screw driver bent to a 90 degree angle until the wheel has a heavy drag. Then back off until the wheel turns freely.

5. Replace rubber plug.

6. Repeat this operation with all trailer wheels.

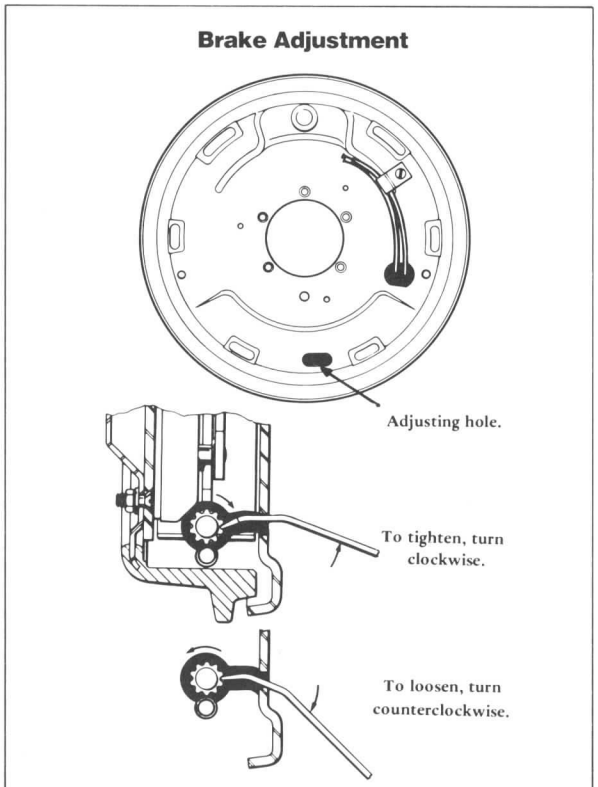


Fig. 5

Brake Assembly Removal and Installation

1. Jack trailer at marked jack location and behind axle on main frame.

2. Index marks should be added to wheel and drum. Realign these marks when replacing wheel thus eliminating the need for wheel/drum rebalance.

3. Remove hub cap or spindle cover, wheel and tire.

4. Remove dust cap.

5. Remove cotter pin.

6. Remove spindle nut and washer.

7. Remove hub/drum and outer bearing.

8. Remove brake by taking off five bolts attaching brake to brake flange and spindle.

9. To install, reverse procedure. Be sure bearings are clean before installing. See page 1-16 for wheel bearing installation procedure.

Checking, Repairing & Replacing Electrical Components (after brake assembly removal)

1. Test Instrument

   In order to properly check the electrical circuit and components, a d.c. ammeter having a range of approximately 0-15 amps, should be used.

2. Testing the Circuit

   First check the continuity of the system. To do this connect the trailer to the towing vehicle, then place the ammeter in the circuit as shown in Figure 6.

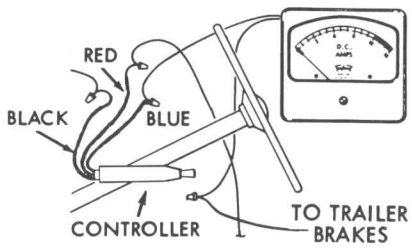


Fig. 6

NOTE: You can avoid possible damage to the ammeter by connecting one lead; then just touch the other lead quickly. If the needle goes the wrong way you have reversed the polarity. To correct, simply reverse the leads, then complete the connection. Now operate the controller slowly. The cut-in or lowest current should read from 1 to 2¼ amps for single axle models and 2 to 3 amps for tandem axle models. Move lever completely to right. AMP reading should be 6.0 to 6.5 AMPS on single axle models and 12.0 to 13.0 AMPS on tandem axle models. These values are without the selective resistor in the circuit. It should be by-passed by putting both wires on a common terminal.

If the ammeter registers the correct high and low readings and shows smooth current modulation, you may assume that the controller is functioning properly. If you do not show the correct high and low, or the modulation is poor, check the following electrical circuit problems.

a. Circuit Check

   Check 7-way connector for proper engagement and cleanliness.

   Check ALL terminal points and splices in both tow vehicle and trailer.

   (NOTE: Sometimes a fuse has been installed in tow-vehicle portion of brake circuit. This is not recommended.)

b. Controller Check

   Remove controller from tow vehicle and connect the ammeter as shown in Fig. 7. The ammeter should vary smoothly from "off" to "on". If it does not vary smoothly or shows no current when the controller is at full "on", remove the controller cover and inspect the resistor coil. If the coil is burned out, it must be replaced. A burned out coil can be detected by visual inspection.

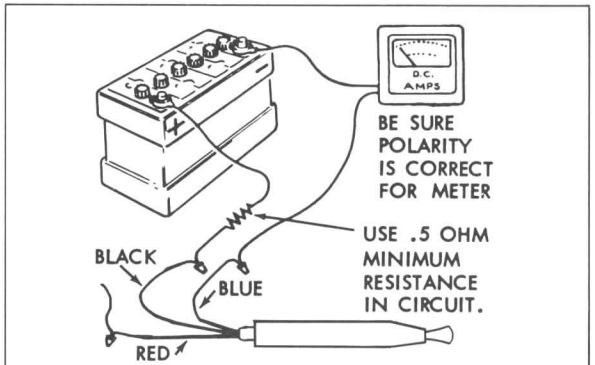


Fig. 7

CAUTION: The resistor coil should last indefinitely under normal operating conditions. If the coil is burned out, carefully check the entire electrical system for a short-circuited condition. A short circuit can damage any electric brake controller.

After replaceing the coil, be sure there is at least .020" clearance between the contactor strip and the coil when the controller handle is unapplied.

c. Stop Light Switch

First check the continuity of the system. To do this, connect the trailer to the towing vehicle, then place the ammeter in the circuit as shown in Fig. 8.

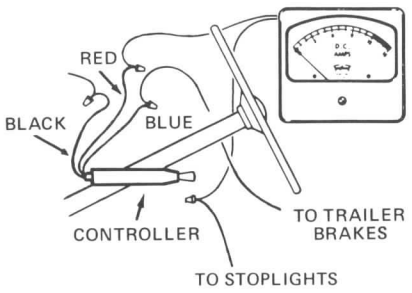


Fig. 8

NOTE: Whenever connecting the ammeter, you can avoid possible damage to the ammeter by connecting one lead then just touching the other lead quickly. If the needle goes the wrong way you have reversed the polarity. To correct, simply reverse the leads, then complete the connection.

All K-H controllers are equipped with a separate stop light switch which allows full current to flow to the trailer stop lights throughout brake application. It should be at .020" gap when the controller handle is unapplied. This gap can be adjusted by loosening one screw through an access hole in the bottom on the controller case.

d. Hydraulic Cylinder Leakage

When checking the electrical circuit of the controller, it is advisable to check its hydraulic cylinder at the same time, to be sure it is tight and free of leakage.

If leakage does occur, it is recommended that the complete hydraulic cylinder assembly be replaced. When reconnecting the controller into the hydraulic system of the tow car, bleed and check connections.

e. Bleeding the Hydraulic Brake Line

Removing air from the brake system is easy to do and very important. Follow the procedure given in Figure 9 carefully. Then wipe away all excess of brake fluid to avoid damage to painted surfaces. Refill the master cylinder reservoir.

NOTE: If pedal is spongy after bleeding at controller, it may be necessary to bleed the system at the wheel cylinders. All automotive hydraulic brakes have a bleeder screw on the backing plates or disc brake for this purpose.

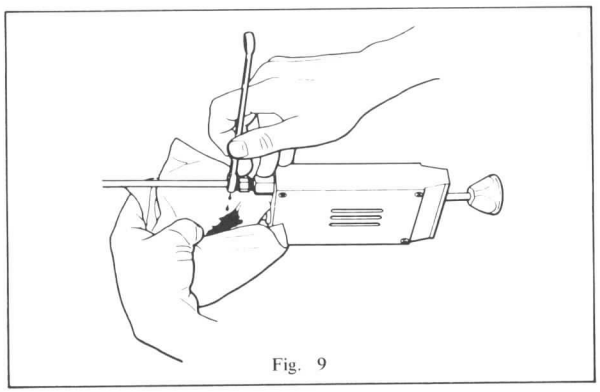


Fig. 9

1. Apply continuous pressure on brake pedal.
2. Loosen fitting at the controller to allow fluid (and air) to bleed out.
3. Bleed until fluid flows continuously (all air removed).
4. If pedal goes to floor board, tighten fitting before raising pedal and repeat steps 1 through 3.
5. With all fittings tight, press pedal hard for 10 seconds. Check for leaks at adaptor tee and controller.
6. Refill master cylinder reservoir.

f. Special Note on Failure Switch Reset

All 1967 and later vehicles have a brake failure warning lamp on the instrument panel. This lamp should remain unlit during brake applications after the installation of the controller. It may inadvertantly be switched "on" if excess pressure is applied during the controller hydraulic line bleeding, and must be reset.

g. Procedure for Resetting Switch

Ford Motor Company vehicles must be reverse bled in order to reset this switch. To do this, loosen a front connection on the safety switch and re-bleed the system. If any difficulty occurs in resetting the switch refer to the vehicle manufacturer's shop manual.

Chrysler and General Motors vehicles have failure lamp switches which are self-resetting and therefore should require no adjustments after controller installation.

American Motors, Kaiser Jeep and International Harvester failure lamp switches do not require bleeding. However, they do require loosening the connector where the failure lamp wire contacts the switch. This allows the switch to center and be reset. Consult the vehicle manufacturer's shop manual if detailed procedure is required.

h. Break-Away Switch

The break-away switch can be checked simply by placing an ammeter in the circuit between the break-away switch and the brakes, then pulling out the break-away pin. If no current flows to the brakes, check to be sure the break-away switch contacts are clean. If the contacts are clean, check the trailer battery for adequate charge. Recharge or replace battery if necessary.

NOTE: Break-away switch is an emergency device only, and is not to be used as a parking brake. Pull pin and lubricate with light household oil and replace every 90 days.

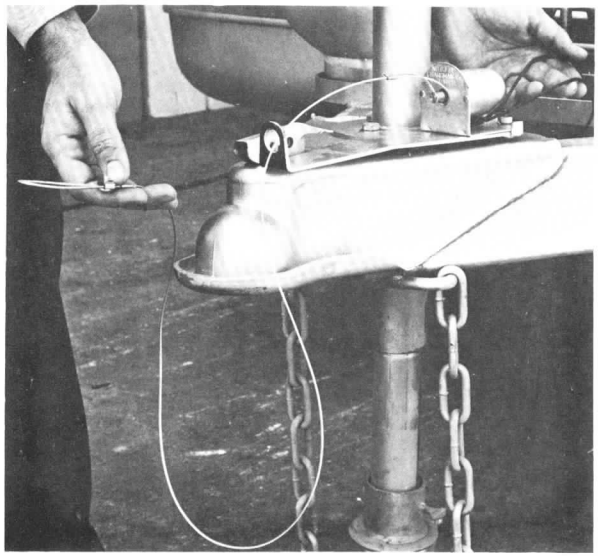


Fig. 10

i. Magnet Assembly

Without removing the magnet assembly from the brake, inspect the magnet for wear and flatness.

If the magnet rubbing surface is flat it need not be replaced until the friction element shows signs of wearing through. A magnet that is not wearing flat must be replaced, since it cannot function efficiently. To check the wearing surface for flatness, lay a scale or straight-edge on the magnet as shown in Figure 11

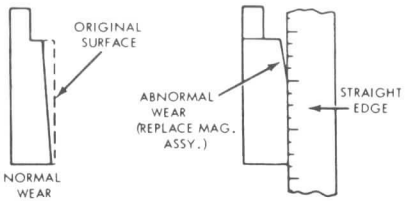


Fig. 11

Before replacing with a new magnet, determine the cause of the improper wear. First check the magnet lever pivot. A worn pivot bushing can cause the magnet lever to cock, thus allowing the magnet to tip against the armature plate. If this condition exists, the lever assembly should be replaced. When reinstalling magnets, be sure to install the loom (lead wires) properly, avoiding kinks and allowing ample clearance for the lever to move through its full travel. Operate the lever in both directions to be sure the loom moves properly without binding, kinking, or interfering with lever movement.

j. Magnet Bench Check

To check electrically, remove the magnet for bench test. To check for a possible coil-to-case short, connect the magnet with the ammeter as shown in Figure 12. Since the short may be intermittent, move the leads and rap the magnet while checking. If the ammeter shows current, a short is present. Replace with a new magnet assembly.

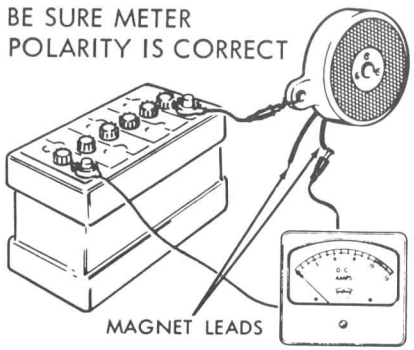


Fig. 12

To check for possible shorts within the magnet coil, connect as shown in Figure 13. Check current. It should be 3.0 to 3.5 AMPS. If not, replace magnet.

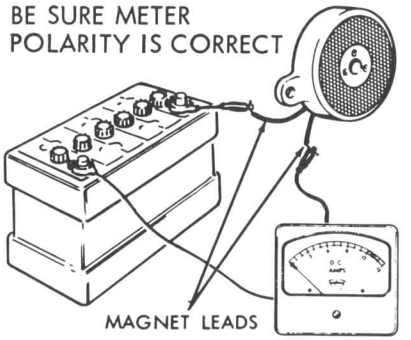


Fig. 13

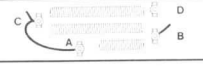
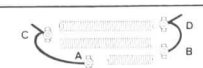
Selective Resistor	All settings shown are for 12 volt tow car with 12 volt brakes, and trailers with 2 axle – 4 brake arrangement except where noted.		
Model	Trailer Wt. (lbs.)		Setting
21 Ft. Single Axle – 2 brake 23 Ft. Single Axle – 2 brake	3500 – 4000 1500 – 4000		
21 Ft. Single Axle – 2 brake 23 Ft. Single Axle – 2 brake	4000 – 4500 4000 – 4800	No resistor required. Attach both leads to terminal B.	
23 Ft. 25 Ft. 27 Ft.	4500 – 5200 4500 – 5200 4500 – 5200		
23 Ft. 25 Ft. 27 Ft. 29 Ft. 31 Ft.	5200 – 5800 5200 – 5800 5200 – 6000 5200 – 6000 5200 – 6000		
27 Ft. 29 Ft. 31 Ft.	6000 – 6200 6000 – 7100 6000 – 7100		
31 Ft. Excella	6500 – 8000		
31 Ft. Excella	8000 – 8500	No resistor required. Attach both leads to terminal B.	

Fig. 14

k. Proper Selective Resistor Setting and Controller

1. SELECTIVE RESISTOR ADJUSTMENT – The Selective Resistor adjustment affects the maximum braking capacity of the trailer brakes. Because of the wide variety of axle loadings, the rated load capacity of the brakes may exceed the load on the trailer axle.

   When a Resistor is installed on the towing vehicle and a setting is made according to instructions in Figure 14 check the initial trailer brake application with the controller fully applied. If the setting is correct, the controller full "on" position should provide firm braking action just short of skidding on dry pavement. Follow the chart and change the setting to achieve greater or less braking, as required.

2. CONTROLLER HANDLE ADJUSTMENT (Selective resistor must be adjusted first) – The controller handle adjustment affects the rate of application of the trailer brakes. This adjustment has no bearing on the maximum braking capacity of the trailer brakes. Because of the wide variety of towing vehicles and trailers, it is necessary to balance the trailer brakes with the towing vehicle brakes to provide for a safe, comfortable stop. This adjustment should be made to provide for a slight lead of the trailer brakes over the tow vehicle brakes. Turning the handle clockwise will decrease the rate of application of the trailer brakes, while counter-clockwise will increase the rate of application. When the desired setting is reached, the controller will hold the adjustment, but may be varied at any time by rotating the handle as described above. After this adjustment, there should be no sensation of the trailer pushing the car during a stop, nor should there be an excessive sensation of the trailer pulling the car during a stop.

   Due to normal brake lining wear, the brakes and the controller setting should be checked and readjusted, if necessary, during the trailer manufacturer's recommended inspection intervals. Normally, it is not necessary to reset the Selective Resistor unless there are major changes in the trailer loading.

   Properly set, these adjustments will provide for safe comfortable stops. They will also help assure optimum brake and tire life for both the tow vehicle and the trailer.

Checking, Repairing & Replacing Mechanical Components

(after brake assembly removal)

1. Armature Plate

Inspect the armature plates. Under normal conditions, the Kelsey-Hayes Tufftrided armature plate should last indefinitely. However, if an armature plate shows excessive galling due to severe contamination (mud, small stones, etc.) it can easily be replaced. Replacement armature plates are supplied with the necessary screws, nuts and lockwashers (three required). If the original plate is riveted the rivets may be drilled out easily. If only one plate is damaged, only the damaged plate needs to be replaced.

NOTE: Always inspect the magnet assembly when replacing an armature plate since the same condition which caused damage to it may also have caused magnet damage. If the magnet is wearing flat it need not be replaced with the armature plate unless it is badly worn. However, if it shows uneven or angular wear, it should be replaced. (See Fig. 11)

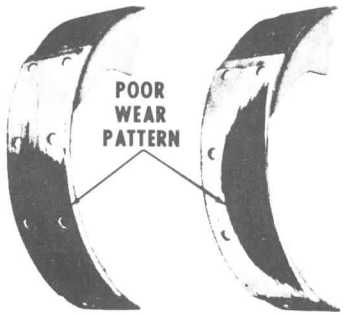


Fig. 15

2. Brake Drum

Inspect the brake drum rubbing surface. This surface should have a dull grey appearance free from heavy scoring and/or excessive wear. One or two light score marks are not cause for reboring the drum. If the drum has heavy scoring, is worn more than .020", oversized, or has more than .015" runout; the drum should be rebored. A standard drum lathe may be used, taking care not to remove more than .060" from the original drum diameter (.030" per side). The drum should be discarded if it must be bored more than .060" over its original diameter to clean up the surface.

NOTE: Since K-H brakes are adjustable, they do not require spacers between the shoe and lining when the drum is rebored. However, if a drum is bored out as much as .060" on the diameter, be sure the brake shoes and linings are ground to match the new drum inside diameter.

3. Brake Lining

First inspect the brake linings for wear. If a lining is worn to the rivets, it should be replaced. Inspect for uneven lining wear patterns such as shown in Figure 15, and replace if this condition exists. Wear patterns such as this may indicate improperly located flanges or a bent backing plate. Also, if lining is badly contaminated with grease, oil, etc., it must be replaced, since contamination of this type cannot be sanded or dissolved out.

IMPORTANT: Always replace brake linings in sets – both brakes on the same axle.

If the lining is worn to the rivets without evidence of uneven wear, simply replace with new Kelsey-Hayes factory ground shoe and lining assemblies.

To remove brake shoes, first remove the brake shoe return spring. Then remove the shoes, adjustor assembly and adjustor spring as an assembly (Figure 16). Remove adjustor assembly and spring from the brake shoes. Before replacing shoes carefully inspect all springs. If springs appear stretched or otherwise deformed, new springs should be installed to avoid dragging brakes. Apply a light coating of lubriplate to the adjustor assembly and to the six points on the backing plate where the shoes rest. Reinstall the brake shoes, reversing the removal sequence. (After installing new brake lining, adjust brake.)

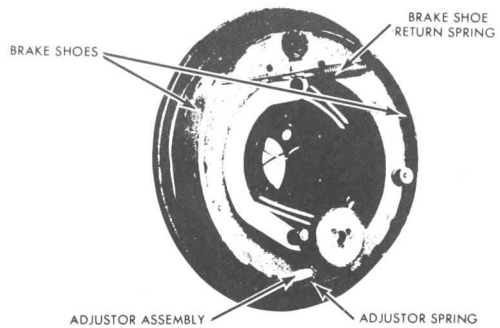


Fig. 16

Trouble Shooting

1. PROBLEM: GRABBY OR LOCKING BRAKES

PROBABLE CAUSE	REMEDY
Controller not Modulating	1. Disconnect red wire on controller. Road test for braking modulation. If modulation is okay, check red wire, (stop lights). 2. Bench check controller – replace if necessary. (See p. 2-4)
Improper Lining	Check lining. Replace, if necessary. (See p. 2-8)
Grease on Lining	Check for contamination. Replace seals and lining. (See p. 2-8)
Loose Parts in Brakes	Check for loose rivets, broken springs, etc. jammed in brakes.
Rust in Armature Plate and/or Brake Drums	Caused by non-use. Usually corrected by normal continued use.

2. PROBLEM: WEAK BRAKES

PROBABLE CAUSE	REMEDY
Poor Connections	Check that all connections are clean and tight.
Poor Ground	Check for proper grounding in tow vehicle, trailer and connector.
Short Circuit	Check electrical circuit. (See p. 2-4)
Selective Resistor Setting Incorrect	Check for proper setting to avoid too much resistance. (See p. 2-7)
Worn or Defective Magnets	Replace magnets. (See p. 2-6)
Poor Brake Adjustment	Adjust brakes. (See p. 2-4)
Backing Plates Bent or Misaligned	Check backing plate and flanges. Correct if necessary.
Greasy Lining	Check for worn or damaged grease seals. Replace if necessary. Make sure bearings are packed with high grade bearing grease, not cup grease or chassis lubricant.
Using Trailer Brakes Only	Use of trailer brakes only, can cause early fade or loss of friction due to excessive heat.

3. PROBLEM: NO BRAKES

PROBABLE CAUSE	REMEDY
Open Circuit	Check for broken wires, loose connections, improper grounding, faulty connector plug between car and trailer, etc.
Improperly Wired or Inoperative Controller	Check controller operation. (See p. 2-4)
Poor Brake Adjustment	Adjust brakes. (See p. 2-4)
Selective Resistor Defective	Check resistor for loose connections.
Worn or Defective Magnets	Replace magnets. (See p. 2-6)
Short Circuit	Check electrical circuit. (See p. 2-4)

4. PROBLEM: INTERMITTENT OR SURGING BRAKES

PROBABLE CAUSE	REMEDY
Out of Round Drums	Rebore drums if more than .015 out of round. (See p. 2-8)
Inadequate Trailer Ground	Check for proper grounding.
Broken Magnet Lead Wires	Bench check magnets. (See p. 2-6) Replace if necessary.
Loose Wheel Bearings	Check and adjust bearings.

5. PROBLEM: DRAGGING BRAKES

PROBABLE CAUSE	REMEDY
Brakes Adjusted Incorrectly	Check brake adjustment. (See p. 2-4)
Electrical Defect in Controller	Insufficient gap between controller contactor strip and coil may cause brakes to be on continuously. Correct condition. (See p. 2-4)
Hydraulic Defect in Controller	Too high a residual pressure in the tow car hydraulic system or a "gummed up" controller cylinder may cause the controller to be held "on" slightly. Check and repair.
Badly Corroded Brake Assemblies	Check brake assemblies for severe corrosion. Check to be sure magnet levers operate freely. Clean and lubricate brake assemblies.
Weak or Broken Shoe Return Spring	Check and replace if necessary.

6. PROBLEM: NOISY BRAKES

PROBABLE CAUSE	REMEDY
Lining Worn to Rivets	Check and reline linings. (See p. 2-8)
Loose Parts – Rivets, Broken Springs, etc.	Check and repair.
Bent Backing Plate	Check and repair if necessary.
Grease on Lining	Check and reline if necessary. (See p. 2-8)
Improper Bearing Adjustment	Check and adjust bearings. Check for worn or damaged bearings. Replace if necessary. (See p. 1-16)
Poor Adjustment	A certain amount of noise is normal when the brake releases. Proper adjustment will minimize this noise. (See p. 2-4)

NOTE: Kelsey-Hayes brakes are noted for quietness of operation. When properly installed, brake noise should not be evident. Consequently, it is wise to have your brakes checked if a noise does develop.

7. PROBLEM: STOP LIGHTS OR TURN-SIGNALS INOPERATIVE

PROBABLE CAUSE	REMEDY
Incorrectly Wired	Check wiring. Rewire if necessary.
Controller Stop Light Switch Improperly Adjusted	Adjust controller stop light switch.

Adaptor Tee Application Chart

Year	Model	Type Brake	Kelsey No.
AMERICAN MOTORS CORPORATION			
1975-71 (1)	All	All types	78499
1971-66	All	All types	78994
1965 & earlier	All with 3/16" line	All types	42324
1965 & earlier	All with 1/4" line	All types	42323
CHRYSLER CORPORATION			
1975-67	All	All types	78498 (2)
1966 & earlier	All	All types	47772
DODGE TRUCK			
1975-67	A-100, D-100; D-200 w/power disc	All types	78498
1975-67	D-200, D-300	All types	42323 (3)
FORD MOTOR COMPANY			
1975	Comet, Granada, Maverick, Mustang, Montego, Pinto	All types	94971 (6)
1975	Cougar, Ford, Mercury, Thunderbird, Torino	All exc. disc F & R	78499
1975	Mercury, Lincoln, Mark IV, Thunderbird	All disc F & R	94971 (7)
1974	All except Mustang, Comet/Maverick & Pinto	All types	78499
1974	Mustang, Comet, Maverick & Pinto	All types	94971
1973	All except Cougar/Mustang (Manual) Comet/Maverick & Pinto	All types	78499
1973	Cougar/Mustang	Drum (manual)	42324
1973	Comet/Maverick & Pinto	All types	78496
1972-69	All except std. Ford, Mercury & Meteor	Disc	78499
1972-69	Std. Ford, Mercury & Metero	Disc	78496
1972-69	All	Drum (manual)	78496
1972-69	All	Drum (power)	78499
1968-67	All	Disc	78499 (4)
1968-67	Fairlane, Falcon & Comet	Drum (manual)	78496
1968-67	Fairlane, Falcon & Comet	Drum (power)	78499
1968-67	Ford, Mercury, Meteor, Mustang & Cougar	Drum (man. & pwr.)	78496
1966 & earlier	All with 3/16" line	All types	42324
1966 & earlier	All with 1/4" line	All types	42323
FORD TRUCK			
1975	E-100, E-150 (Nantucket built)	All types	94971
1975	E-250, E-350 (Nantucket built)	All types	78496
1975-73	E-100, E-200, E-300 (Econoline)	All types	78496
1975-73	F-100 except 4 WD, F-250 up to 6200 GVW	All types	94971
1975-73	Bronco, F-100 4WD, F-250 over 6200 GVW	All types	78496
1975-73	P-350, P-400	All types	78499

Year	Model	Type Brake	Kelsey No.
FORD TRUCK (continued)			
1974-73	F-350	All types	78496
1972-69	F-100, F-250, F-350, P-100, Bronco & Econoline	All types	78496
1968-67	F-100, F-250, P-100, Bronco, Econoline	Drum (man & pwr.)	78499
1968-67	F-350	Drum (man & pwr.)	78496
1966 & earlier	All with 3/16" line	All types	42324
1966 & earlier	All with 1/4" line	All types	42323
GENERAL MOTORS CORPORATION			
1975-67	All	All types	78497
1966 & earlier	All with 3/16" line	All types	42324
1966 & earlier	All with 1/4" line	All types	42323
CHEVROLET & GMC TRUCKS			
1975-67	All	All types	78497
1966 & earlier	All with 3/16" line	All types	42324
1966 & earlier	All with 1/4" line	All types	42323
INTERNATIONAL HARVESTER CORPORATION			
1975-74	100, 200, Scout	3.1 disc	78496
1975-74	200	3.38 disc & drum	78499
1973-72	Travel-All	Disc	78496
1973-69	Travel-All	Drum	78499
1973-69	Scout	All types	78499
1973-67	Scout	Drum	78994 (5)
1968-67	900, 1000, 1100, 1200, 1300	All types	78497
1966 & earlier	All with 3/16" line	All types	42324
1966 & earlier	All with 1/4" line	All types	42323
JEEP CORPORATION			
1975-67	Universal Jeep	Drum	42324
1975-67	Gladiator, Wagoneer, C-101	All types	78499
1966 & earlier	All with 3/16" line	All types	42324
1966 & earlier	All with 1/4" line	All types	42323

(1) Running Change during 1971 Model Year.
(2) 1970-69 Coronet or Belvedere station wagon w/383 or 440 engines has inboard port; clearance between manifold and hydraulic line must be greater than 3/4 inch.
(3) 1974-67 may be inserted at the rear brake side of the failure lamp switch.
(4) Some 1968-67 Ford, Mercury & Meteor sedan models with disc brakes use K-H Tee Fitting #78496.
(5) Must be inserted at the failure lamp switch.
(6) 1975 1/2 Granada, Monarch w/disc F & R and all others w/power brakes use 42324, Montego use 78499
(7) Lincoln w/disc front, drum rear use 94971.

Sway Control

Control Description – The Tru Track Electric Sway Control is a system which momentarily applies the trailer brakes when sway develops as the result of such occurrences as rapid maneuvers to avoid road obstacles, air disturbances caused by passing vehicles and accidental travel on and off the shoulder of the road. Because of its design, it will not react to any normal driving maneuver that is smoothly performed. However, Tru Track will interpret any maneuver that jerks the trailer as an indication of sway and the restraint felt from the short brake application will normally alert the driver to steer with greater care.

Frequent operation of Tru Track indicates that the car-trailer combination is basically unstable and prone to excessive sway. Tru Track is not designed or intended to correct a basic trailer instability problem; such problems should be corrected at their source, e.g. improper load distribution in the trailer, an inadequate hitch, insufficient or excessive tire pressure, etc.

1. Installation Location

   The best location for the installation of the Tru Track Electric Sway Control is below the front lounge.

2. Mounting of Sway Control Unit

   The installation kit contains three 1/4" hexagonal washer head self-tapping screws for mounting the unit. Using the unit as a template, mark the location of holes in the mounting flange. Select the appropriate drill size and drill pilot holes for the screws in the market locations. Insert screws and tighten until unit is flush to the surface but be careful not to strip threads.

3. Mounting of Dash Light

   The dash light should be located so that it is visible to the driver. Suggested locations are on the crash pad or on the dash panel near the trailer brake controller. Installation is accomplished with the double faced adhesive tape included in the kit. Surfaces of both the dash light and the selected location should be clean and dry to obtain good adhesion. Two wires extend from the light. The black wire is to be connected to the brake controller blue wire at the nearest wire-nut connector. The white wire is to be grounded and this may be done by loosening a screw under the dash, wrapping the bare wire around the screw and retightening the screw.

4. Wiring

   A cable containing three wires extends from the sway control. These wires are color coded black, blue and white and should be connected to the trailer brakes and trailer battery, as shown in Figure 17.

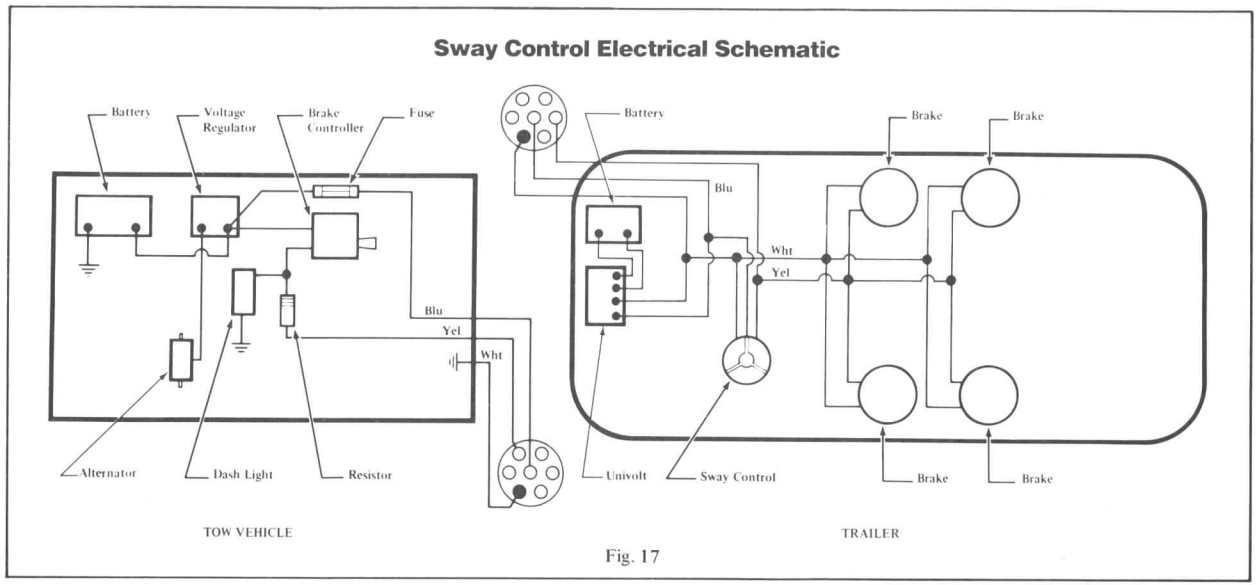


Fig. 17

5. Checkout or Wiring

   Three simple methods may be used to check that the wire connections were made correctly. Read and select the method which is convenient for you.

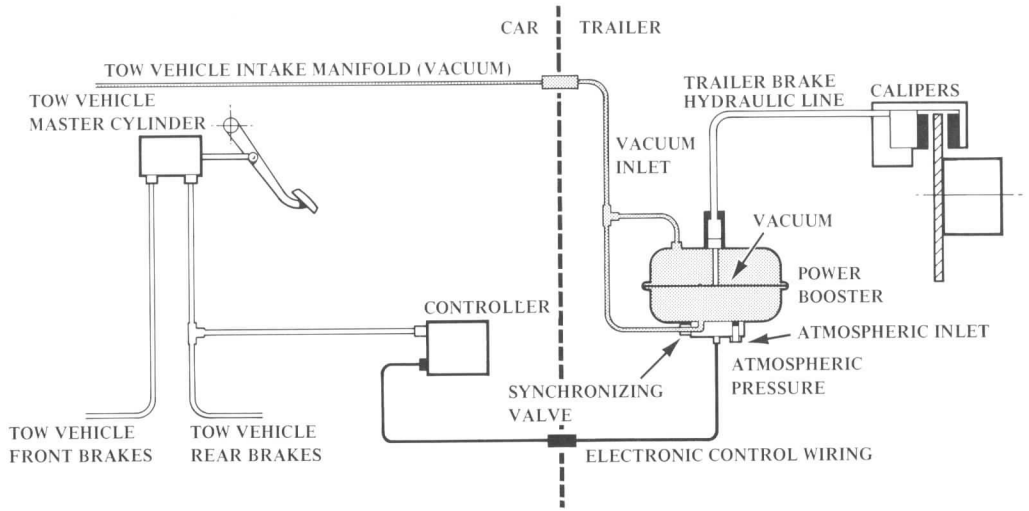
   METHOD A – Observe the dash light and with power "on" detach sway control from the mounting surface and slightly rotate. If wired correctly, the dash light will show momentary lighting.

   METHOD B – Observe the dash light and now disconnect and reconnect power to the unit and watch for a reaction. If correctly wired, the dash light will light up and then turn off. If not correctly wired, the dash light will remain "on" or not show any reaction.

   METHOD C – At the sway control unit, connect a DC voltmeter or a 12 volt three watt pilot lamp to the blue and white wires of unit. Connect the positive terminal to the blue wire and negative terminal to the white wire. Now disconnect and reconnect power to sway control and note meter, or lamp, reaction. If correctly wired, the meter will deflect momentarily and return to zero or the lamp will light up and then turn off. If not correctly wired the meter or lamp will either remain "on" or not show any reaction.

   IMPORTANT
   If at any time dash light remains on or sway control is continually applying trailer brakes, disconnect sway control unit at power source and correct problem.

Disc Brake System—Theory of Operation



BRAKES UNAPPLIED Fig. 1

Brakes Unapplied

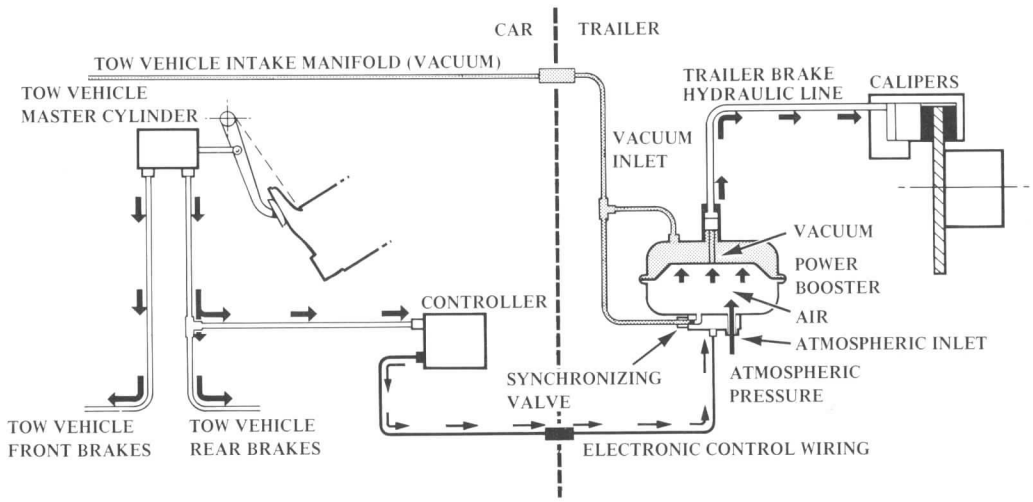
1. Tow Vehicle Brakes
   No pressure in tow vehicles brake lines

2. Brake Controller unenergized
   No electrical output to synchronizing valve

3. Synchronizing Valve
   Atmospheric inlet port closed
   Vacuum inlet port open

4. Power Brake Booster unapplied
   Vacuum on both sides of diaphragm
   No hydraulic pressure

5. Calipers unapplied



BRAKES APPLIED Fig. 2

Brakes Applied

1. Tow Vehicle Brakes applied
   Pressure in tow vehicles brake lines including line to brake controller.

2. Brake Controller energized
   Electrical current transmitted to synchronizing valve

3. Synchronizing Valve
   Atmospheric inlet port open
   Vacuum inlet port closed

4. Power Brake Booster applied
   Atmospheric pressure pushes on diaphragm
   Hydraulic pressure in trailer brake lines

5. Calipers applied

Disc Brake System

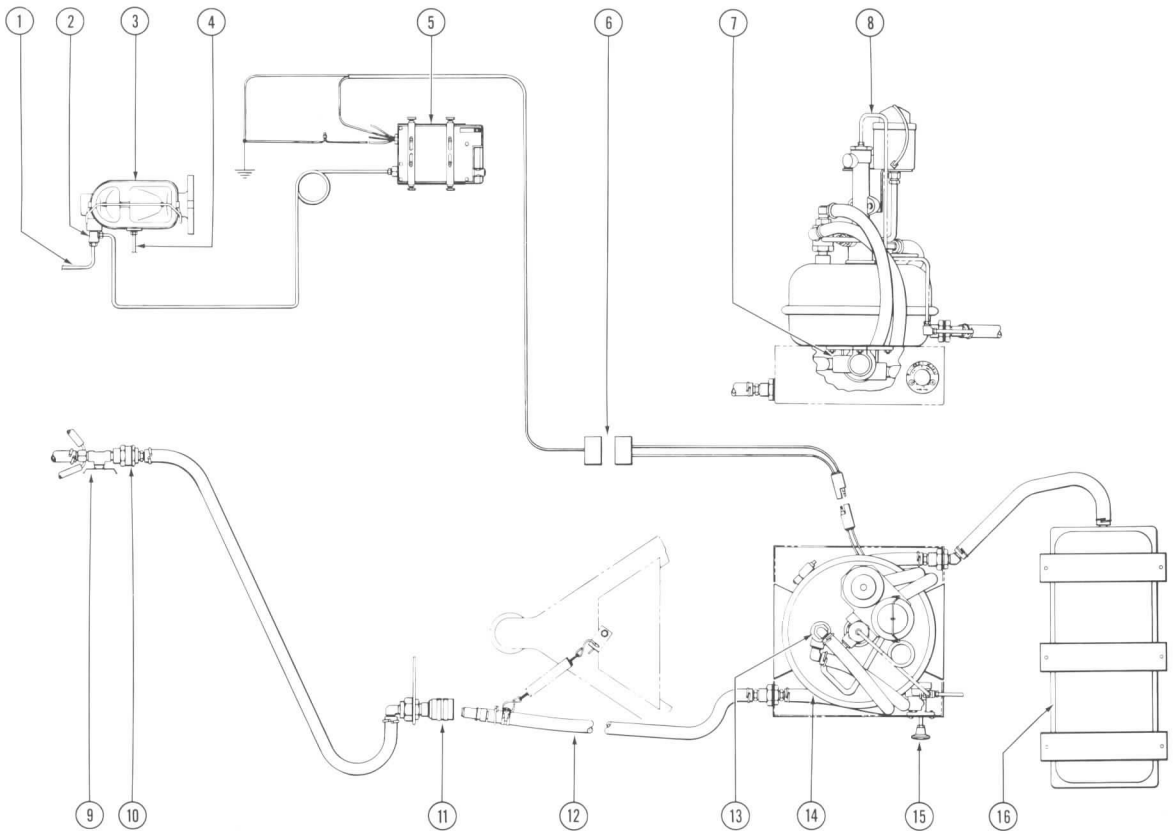


Fig. 3

No.	Description
1	Hydraulic brake line - rear wheel
2	Adapter tee
3	Tow vehicle master cylinder
4	Hydraulic brake line - front wheel
5	Tow vehicle brake controller
6	7-way electrical connector
7	Synchronizing valve
8	Hydraulic brake line
9	Tow vehicle engine intake manifold
10	Vacuum supply check valve
11	Vacuum supply hose coupling
12	Trailer vacuum supply hose
13	Breakway check valve
14	Power brake actuator
15	Brake release valve
16	Vacuum reservoir

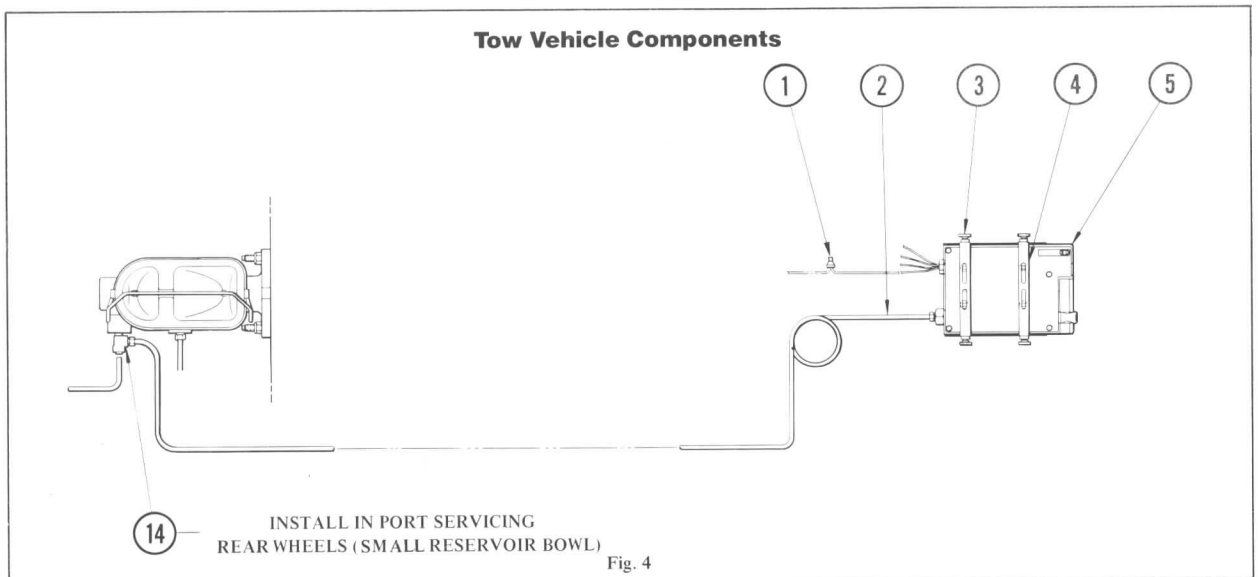


Fig. 4

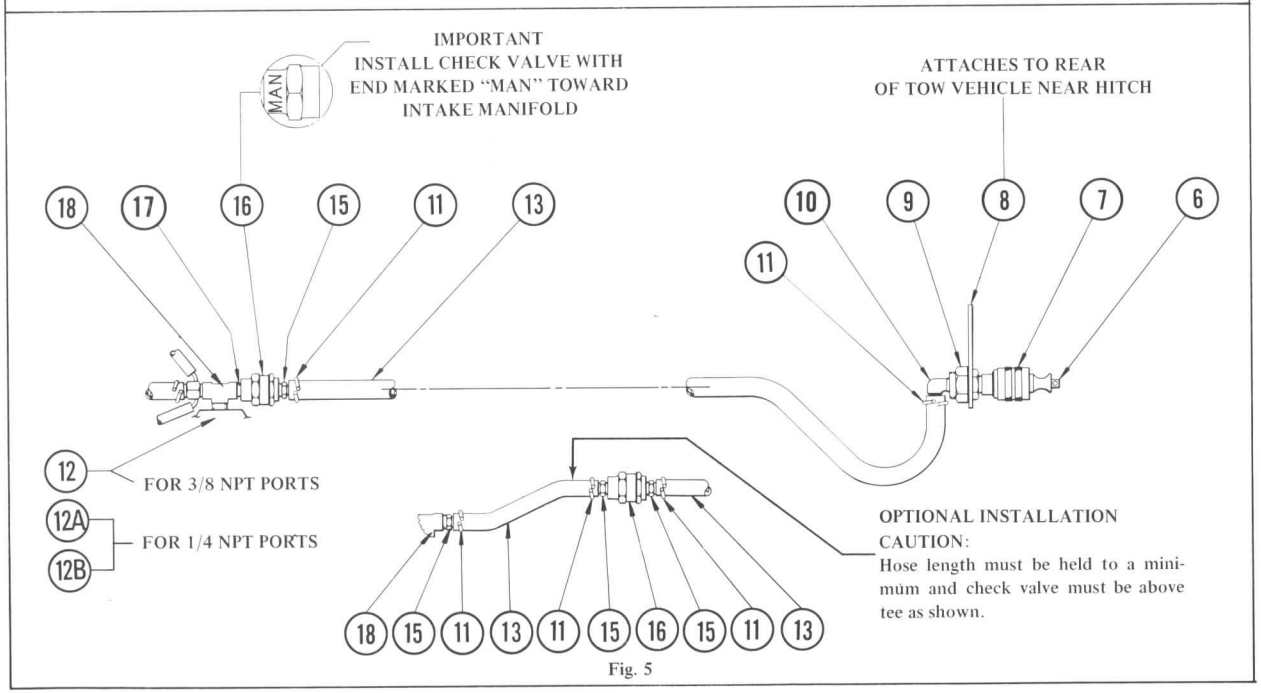


Fig. 5

No.	Part No.	Description
1	100317-E	Close end connector
2	101012-AG	Tube & nut assembly
3	101929-K	Thumb screw
4	102020-AG	Bracket assembly
5	C-3700-A	Controller assembly
6	C-10202	Coupling plug
7	C-11453	Coupling (female)
8	C-13148-A	Bracket
9	N-11246	Terminal bolt assembly
10	C-1583-A	90° fitting
10A	600039-C	Straight fitting
11	22-X-150	Clamp (3/8 hose)
12	19-X-25	Nipple (3/8 NPT)
12A	19-X-20	Nipple (1/4 NPT)
12B	19-X-11	Reducer (3/8-1/4)
13	18-X-2500	Vacuum hose - 11/32" x 22 ft.
14	(Dealer Supplied)	Adaptor tee
15	600039-C	Straight fitting
16	C-11545	Supply vacuum check valve assembly
17	19-X-25	Nipple (3/8 NPT)
18	101012-C	Tee

Trailer Components

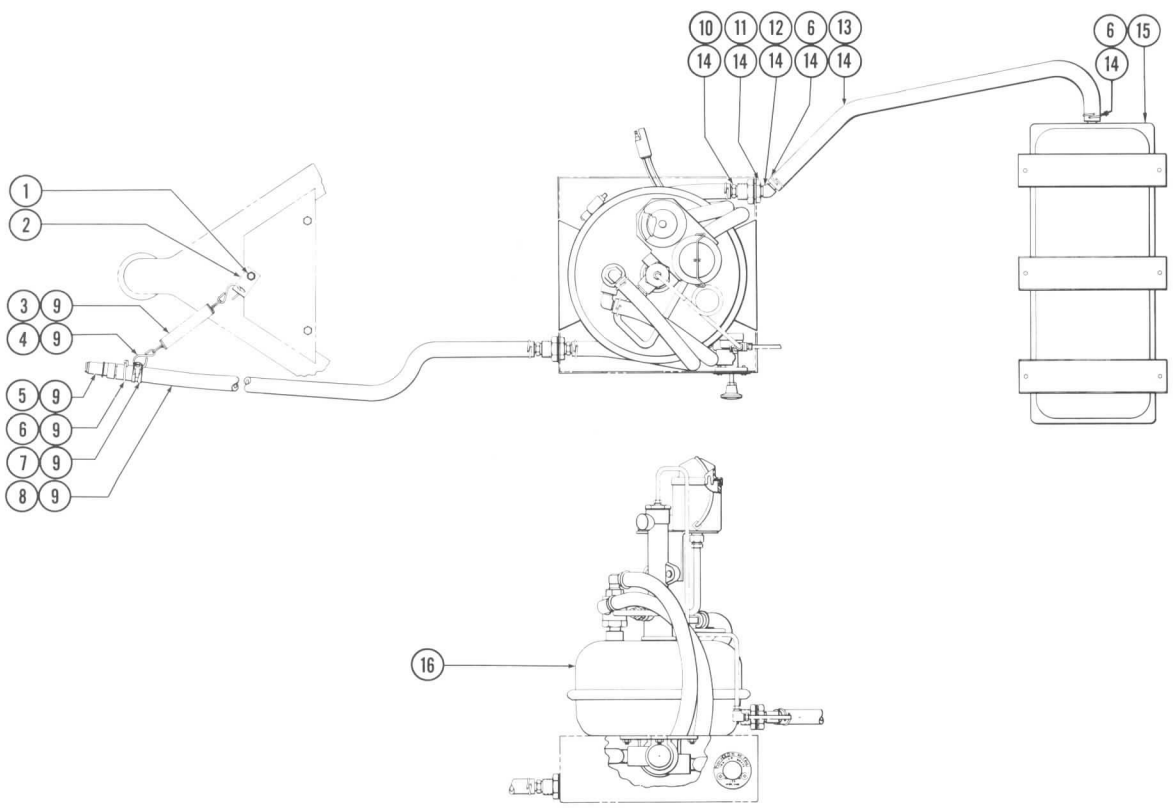
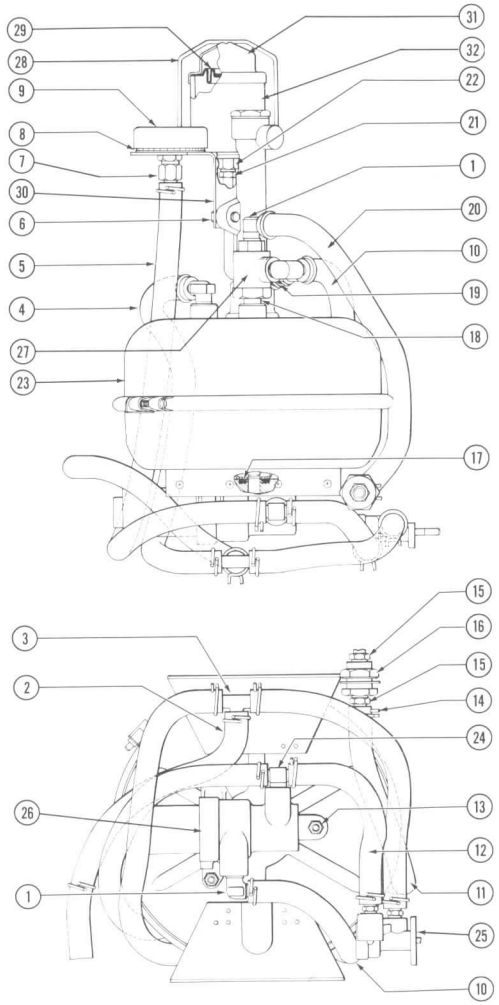


Fig. 6

No.	Part No.	Description
1	102500	Stowage pin
2	102008-SC	Bracket
3	N-12929	Spring
4	102498	S-hook
5	C-10187	Coupling - male
6	22-X-151	Hose clamp
7	22-X-10	Hose clamp
8	18-X-213	Vacuum supply hose - 1/2" x 50"
9	C-10804-E	Vacuum supply hose assembly
10	C-144	Hose nipple
11	N-11161-A	Terminal bolt assembly
12	C-12273	Hose fitting - 45°
13	18-X-213	Vacuum reservoir hose - 1/2" x 64"
14	C-10804-F	Vacuum reservoir hose assembly
15	C-3098-K	Vacuum reservoir
16	C-4800-B	Actuator assembly

Brake Actuator Components (C-4800B)



SEPARATE MOUNTING BRACKET ASSEMBLY (See Separate Parts List)

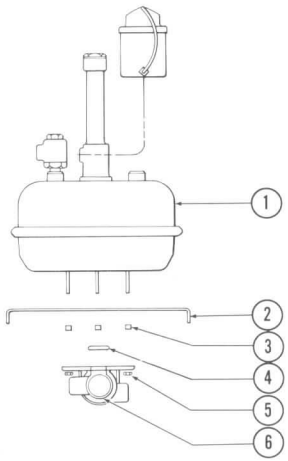


Fig. 7

No.	Part No.	Description
1	C-10223	Hose fitting - 90°
2	18-X-213	Hose - 1/2" x 12 1/2"
3	C-11398	Hose tee
4	18-X-213	Booster hose - 1/2" x 24"
5	18-X-213	Breather hose - 1/2" x 24"
6	08W22814	Bolt
7	C-144-A	Hose fitting
8	100696-A	Breather filter element
9	101996-A	Breather cover
10	18-X-213	Synchronizing valve hose - 1/2" x 19-1/2"
11	18-X-213	Release valve hose - 1/2" x 10"
12	18-X-213	Release valve hose - 1/2" x 8"
13	03W62018	Nut
14	22-X-151	Hose clamp
15	C-144	Hose nipple
16	N-11161-A	Terminal bolt assembly
17	N-11728-NJ	"O" ring
18	19-X-25	Pipe nipple
19	26-X-32	Tube connector
20	18-X-213	Check valve hose - 1/2" x 24"
21	101012-AH	Tube and nut assembly
22	26-X-39	Tube connector
23	C-479-G	Vacuum booster assembly (late production model)
24	C-1739	Fitting (tee)
25	N-20928-BB	Release valve assy.
26	C-20420-B	Synchronizing valve assy.
27	C-20421	Break-away check valve
28	102172-B	Retainer
29	102098-D	Diaphragm gasket
30	200569-J	Hydraulic reservoir bracket assy.
31	101380-K	Cap
32	N-2769-J	Reservoir assy.

Parts List for Models with separate mounting bracket. (See Inset)

1	SC-144M	Replacement booster kit - includes booster assy., mounting bracket and three spacers
2	200817-K	Mounting bracket
3	C-13652-K	Tube spacer (3 req'd)
4	N-11728-NJ	"O" ring
5	03W62018	Nut (3 req'd)
6	C-20420 or C-20420-C	Synchronizing valve

Brake Actuator Hose Schematic

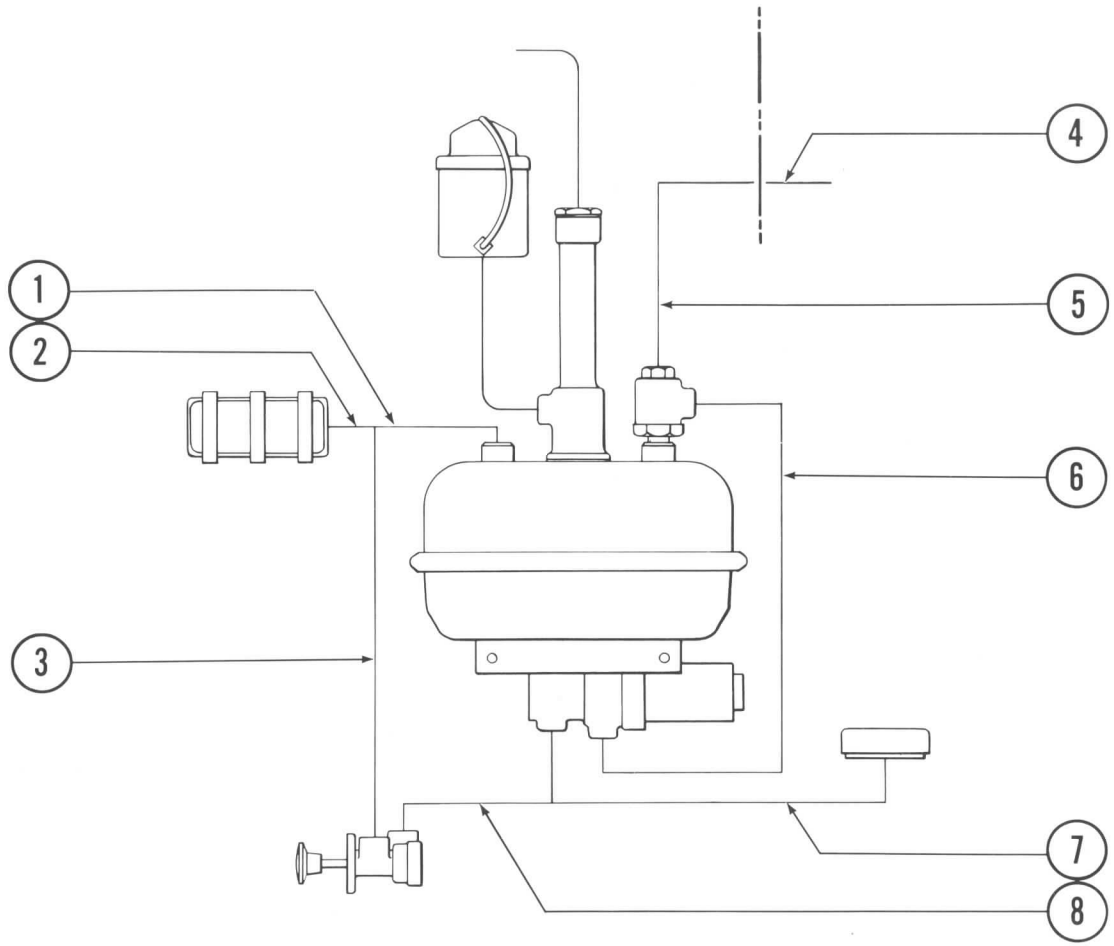


Fig. 8

No.	Part No.	Description
1	18-X-213	Booster hose 1/2" x 24"
2	18-X-213	Vacuum reservoir hose 1/2" x 64"
3	18-X-213	Release valve hose 1/2" x 10"
4	C-10804-E	Vacuum supply hose assy.
5	18-X-213	Check valve hose 1/2" x 24"
6	18-X-213	Synchronizing valve hose 1/2" x 19 1/2"
7	18-X-213	Breather hose 1/2" x 24"
8	18-X-213	Release valve hose 1/2" x 8"

Routine Maintenance and Inspection

Brake System Integrity

The brake system can be quickly checked to assure basic operation.

1. Connect trailer to tow vehicle.
2. Start engine to charge trailer brake vacuum system. Let cold engines warm up until normal (low) idle speed is achieved.
3. Apply (and hold) trailer brakes fully using manual control lever on brake controller.
4. Attempt to pull trailer with tow vehicle. Proper trailer brake operation will prevent towing.
5. Release trailer brakes. Trailer should roll freely. Let engine run 30 seconds, then shut engine off.
6. Wait 5 minutes (engine off) then disconnect trailer vacuum supply coupling.
7. Sound of inrushing atmosphere assures system does not have major vacuum leak and that tow vehicle check valve is operating.
8. Place coupling plug in tow vehicle vacuum supply coupling.
9. Start engine and attempt to move trailer. Locked trailer brakes signifies that breakaway system is functioning.
10. Wait 5 minutes and again attempt to move trailer. Locked trailer brakes signify that the trailer breakaway system does not have a detrimental vacuum leak.
11. Depress the trailer brake release valve handle. Hold depressed for 20-30 seconds.
12. Move trailer with tow vehicle leaving trailer vacuum supply hose disconnected. Trailer should move freely indicating that breakaway system has been released.
13. Reconnect trailer vacuum supply hose to tow vehicle before towing trailer.

Hydraulic Fluid Level

The hydraulic brake fluid level in the trailer power brake booster should be periodically checked by removing the reservoir cover (See fig.7) while the brakes are not applied.

The fluid level should be maintained about ¼ inch from the top of the reservoir. Gradual lowering of this level accompanies the normal wear of the disc brake caliper pads. Significant wear of brake pads is evidenced by considerable drop in reservoir fluid level. The need for frequent refilling indicates that a leak is present in the hydraulic system. FILL RESERVOIR ONLY WITH HYDRAULIC BRAKE FLUID LABELED "DOT 3".

Disc Brake Integrity

The disc brake should be checked periodically for signs of wear, heating, fluid leaking, binding, etc. See Disc Brakes section for complete information.

Brake Controller Operation and Diagnosis

The BRAKE CONTROLLER is wired into the tow vehicle's electrical circuitry and is hydraulically connected to the tow vehicle brake system. The controller monitors the tow vehicle's brake pressure and supplies a proportional electrical current to the synchronizing valve in the trailer.

In addition, the controller provides:
(See fig. 9)

1. Manual trailer brake control to allow independent trailer brake application.

2. Adjustment of trailer brake sensitivity to balance tow vehicle to trailer braking effectiveness.

3. Indicator lamps to display electrical system operational modes and fault diagnosis.

The sensitivity control lever allows the vehicle driver to adjust the intensity of the trailer brake action relative to the tow vehicle brake action; i.e. to balance the tow vehicle to trailer brakes. Balanced brakes provide smooth effective braking action without premature skidding of tires on either trailer or tow vehicle during heavy braking.

The brake controller should be wired per Figure 11 and hydraulically connected to the tow vehicle brake system as shown in Figure 4. The adapter tees required for various tow vehicles are available at most trailer dealers or automotive parts suppliers.

The brake controller monitors the tow vehicle brake pressure using a solid state, electronic pressure transducer. The transducer requires no hydraulic displacement and has no moving parts.

The controller circuitry is energized by either depressing the tow vehicle pedal sufficiently to actuate the vehicle brake light switch or by applying the manual lever on the controller. Either action will cause the green indicator lamp to glow. Increasing vehicle pedal force or manual lever actuation will cause this green lamp to brighten. The presence of a glowing lamp when neither the vehicle pedal or manual lever are activated, signifies an electrical problem. Refer to controller wiring check-out procedure for diagnosis and corrective measure.

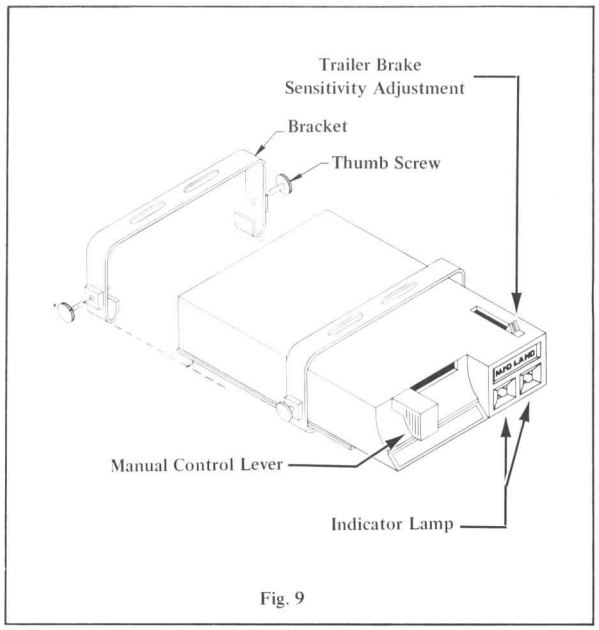


Fig. 9

The brake controller output can most easily be checked by connecting a D.C. voltmeter or 12 volt bulb to the brake wire and ground wire on the trailer connector (See fig.11). When the tow vehicle brakes are operated the measured voltage or bulb brightness should vary in proportion to the force applied to the vehicle brake pedal.

Removal and Replacement

The controller is serviced only on a unit replacement basis. Tampering with the controller will void the warranty.

Remove controller from tow vehicle as follows:

1. Disconnect four wires.

2. Disconnect hydraulic brake line at the controller. Use two wrenches. Do not heavily twist fitting in rear of controller.

3. Immediately cap hydraulic line in tow vehicle. Use standard SAE 3/16 inverted flare tubing cap (available at most automotive parts suppliers).

4. Loosen four thumbscrews in controller brackets.

5. Remove controller by withdrawing from brackets.

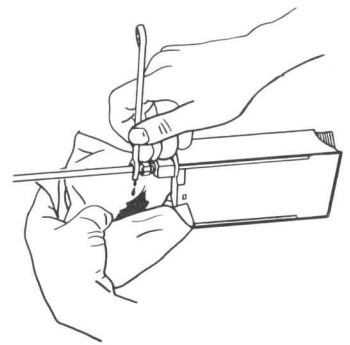


Fig. 10

Reinstall controller as follows:

1. Place controller in brackets. Tighten thumbscrews.

2. Connect wires per Figure 11.

3. Attach hydraulic line to controller.

4. Bleed line as follows: (See fig.10)

   a. Wrap fitting with absorbent towel to catch spillage.

   b. Loosen fitting about 1/4 turn.

   c. Apply light brake pedal force to expel air and small quantity of fluid from loosened fitting.

   d. Retighten fitting while pedal force is being applied.

   e. Thoroughly wipe away all traces of expelled fluid with clean towel.

   f. Start engine. Depress brake pedal firmly and check for brake fluid leakage.

   g. Check master cylinder reservoir fluid level. Refill with "DOT 3" brake fluid if necessary.

Electrical Wiring

The brake controller should be wired as shown in the electrical schematic (fig.11). Solid connection and adequate wire size are essential to proper brake system performance.

The positive electrical supply wire should be protected by a 20 or 25 ampere thermal circuit breaker which is wired directly to the vehicle battery. This wire should not be connected to any fuse, circuit breaker, relay, etc., that serves other circuits.

The controller provides, by means of its indicator lamps, a convenient self-checking feature. Following the tests below, in sequence, will identify most problems encountered in the vehicle wiring (See fig 11).

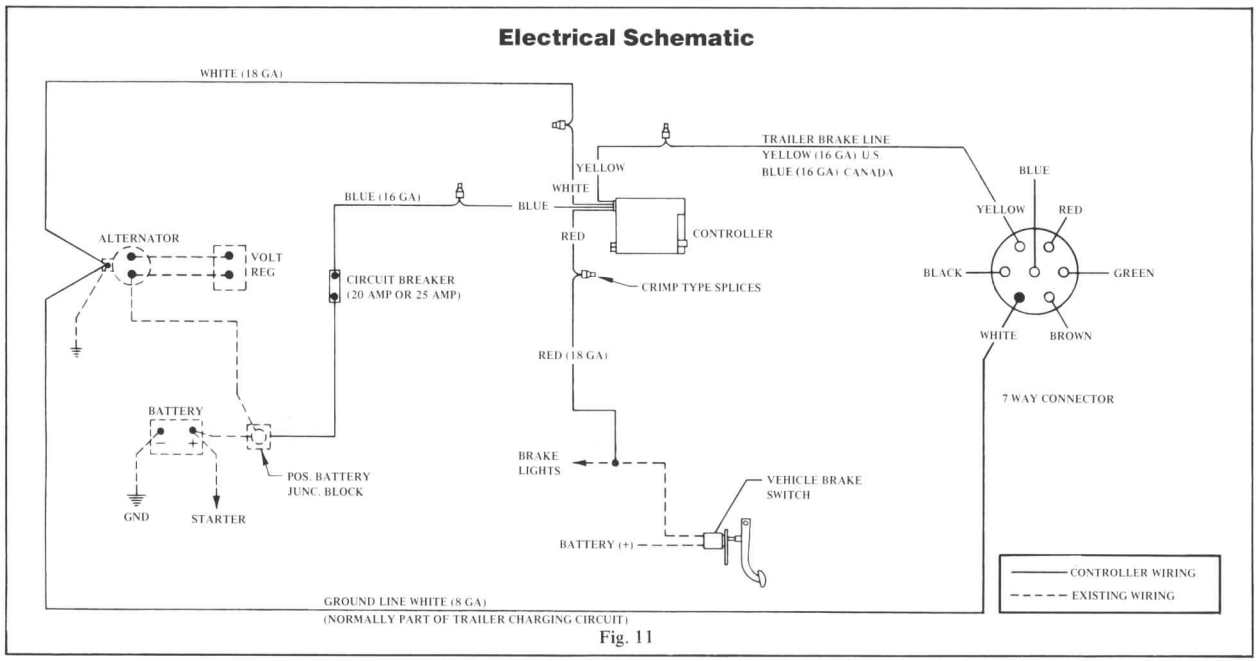


Fig. 11

Troubleshooting the Brake Controller Wiring

1. Disconnect the trailer electrical connector (7-way) from the tow vehicle.

2. Observe controller indicator lamps while the vehicle brake pedal and controller manual operation lever are NOT ACTUATED.

OBSERVATION	DEDUCTION	REQUIRED ACTION
No indicator lamps glowing	OK	None
Vehicle brake lights ON.	Vehicle brake light switch misadjusted.	Adjust vehicle brake light switch per vehicle service manual.
Green lamp ON but vehicle brake lights OFF.	Red controller wire connected to wrong side of vehicle brake light switch.	Connect red wire to normally OFF side of brake light switch.

3. Apply manual control lever on controller.

OBSERVATION	DEDUCTION	REQUIRED ACTION
Green lamp ON. Red lamp OFF. Brake lights ON.	OK	None
No lamps on.	Positive battery voltage not reaching controller through blue wire.	Properly connect blue wire to positive battery terminal (use recommended thermal circuit breaker)
Red lamp ON. Green lamp OFF.	White wire not grounded. or Yellow wire shorted to ground (chassis).	Properly ground white wire. Repair short in yellow wire.
Brake lights do not come on.	Faulty connection of Red Controller wire to vehicle brake switch wire.	Correct faulty connection.

4. Depress vehicle brake pedal.

OBSERVATION	DEDUCTION	REQUIRED ACTION
Green lamp ON (brightens with increasing pedal force).	OK	None
Red lamp ON.	Problem should have been corrected in (3) above.	Repeat step (3) thoroughly.

5. Depress brake pedal with a jumper wire connected between the brake light pin (marked YEL) on the 7-way connector and a good chassis ground point.

OBSERVATION	DEDUCTION	REQUIRED ACTION
Red lamp ON.	Brake wire OK.	None
Green lamp ON.	Brake wire not properly connected to right pin on 7-way connector.	Check yellow brake wire for solid connections. Connect wire to YEL pin on 7-way connector.

6. Depress brake pedal with a jumper wire connected between brake wire pin (marked YEL) and the ground pin (marked WHT) on the 7-way connector.

OBSERVATION	DEDUCTION	REQUIRED ACTION
Red lamp ON.	Ground wire OK.	None
Green lamp ON.	Ground wire not solidly connected to battery negative terminal.	Install proper ground wire (8 ga.). Make solid connections.

7. Reconnect trailer electrical connector to tow vehicle.

8. Depress brake pedal.

OBSERVATION	DEDUCTION	REQUIRED ACTION
Red lamp ON.	Trailer wiring circuit to synchronizing valve solenoid is shorted.	Check trailer wiring circuit. Check solenoid. Check sway control (if used).
Green lamp ON.	OK	None
Trailer brake lights do not work.	Problem not related to brake controller wiring.	Check separate wiring of trailer brake lights to tow vehicle brake light circuit.

9. An overall verification of trailer brake operation is recommended by starting vehicle engine, applying the trailer brake manually and attempting to move the trailer. Vacuum supply line must be connected and engine should be at normal operating temperature.

Vacuum Supply System (Tow Vehicle)

Operation and Diagnosis (Ref. Figures 4 & 5)

The vacuum supply system on the tow vehicle provides vacuum to operate the trailer power brake booster. The vacuum is obtained from the tow vehicle engine intake manifold and is transmitted to the trailer by means of a hose (Item 13) and coupling assembly (Item 7). A normally closed check valve (Item 16) retains high trailer system vacuum level when engine intake vacuum levels diminish during loaded engine operation or engine shut down. A coupling plug (Item 6) must be installed into the coupling (Item 7) when the trailer vacuum line is disconnected. The plug prevents atmospheric air from entering the engine intake through the coupling and keeps the coupling's internal parts and seal free of contamination. Engine operation without this plug may result in erratic engine operation or inoperative vacuum powered accessories (brakes, emissions, etc.). Extended operation may cause engine damage.

The tow vehicle's vacuum supply line should be periodically checked for leakage and to be sure the check valve (Item 16) is operating. Check as follows:

1. Install coupling plug (Item 6) in coupling.

2. Start engine and idle to achieve high engine vacuum. Engine must be warm.

3. Shut off engine.

4. Remove coupling plug and listen for inrushing air (vacuum). If no air inrush is heard, check for large leak in line, improper orientation of check valve (Item 16), contamination in check valve, damaged or missing seal in coupling (Item 7), or restricted vacuum line (Item 13). An acceptably tight system should retain vacuum for at least 5 minutes after engine has stopped.

Vacuum Supply Check Valve

The check valve (Item 16) can become contaminated and may require disassembly and cleaning. The check valve (See fig. 12) can be disassembled by unscrewing and separating the housing. Internal parts should be cleaned and inspected for wear or damage. The rubber valve face (Item 3) and metal seat (Item 5) should be smooth and free of indentations, cracks, etc. Replace components or entire valve as necessary.

Reinstall check valve properly. Use thread sealant on male fitting threads. Orient check valve as shown in Figure 5.

Vacuum Supply Check Valve

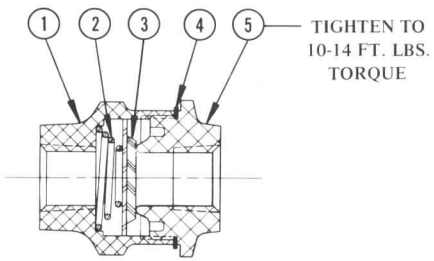


Fig. 12

No.	Part No.	Description
1	C-11544	Body
*2	C-1716	Spring
*3	C-11472-A	Seal assembly
*4	4-X-509	Washer
5	C-11546	End cap

*Indicates parts furnished in repair kit
(Midland Ross Part No. RC-10-E)

Vacuum Supply Coupling

The vacuum coupling may become contaminated making it difficult to operate. Smooth operation can generally be regained by removing washing, drying and lubricating the coupling. Compressed air is helpful in cleaning and drying the coupling. Light petroleum based lubricant, dry film or silicones can be used. Heavy oils and greases should be avoided because they retain contaminants that contact the lubricated surfaces.

Trailer Brake Actuator Operation and Diagnosis (Ref. Fig 8)

The brake actuator uses tow vehicle electrical power and engine vacuum to operate the trailer hydraulic DISC BRAKES. Electrical current is carried by the trailer 7-way electrical connector. The vacuum is transmitted through a vacuum line coupling between the tow vehicle and trailer.

The trailer brake actuator basically consists of a vacuum supply line (Item 4) and vacuum reservoir (Fig. 6), synchronizing valve (Fig. 7), power brake booster (Fig. 7), break-away check valve (Fig. 7) and brake release valve (Fig. 7). These components are located on the trailer A-frame.

Vacuum is supplied from the tow vehicle to the actuator through the supply line. The vacuum reservoir provides vacuum, stored at high levels, for braking power when the tow vehicle engine vacuum is low. When the vehicle is being operated with the brakes not applied, supply vacuum passes through the normally open check valve and open synchronizing valve to provide equal pressure (vacuum) to both sides of the power diaphragm in the power brake booster. The booster, experiencing no differential pressure (vacuum) across its power diaphragm, exerts no internal forces and generates no hydraulic output to the disc brakes.

Upon receipt of an electrical signal from the brake controller on the tow vehicle, the synchronizing valve shuts off the vacuum supply line and admits atmospheric air directly to one side of the booster power diaphragm. The atmospheric air causes the power diaphragm to exert force on the booster hydraulic cylinder, generating hydraulic pressure to activate the disc brakes. The synchronizing valve controls the pressure acting on the booster diaphragm in proportion to the strength of the electrical signal received from the brake controller on the tow vehicle. The synchronizing valve appropriately admits atmospheric air or supply vacuum to the booster power diaphragm as required. When no electrical current signal is being received, the synchronizing valve isolates the atmospheric port, admits supply vacuum to the booster power diaphragm, equalizing the pressures on the power diaphragm. This results in reduction of the hydraulic output and release of the disc brakes.

Disconnecting or severing the trailer supply line, under normal operating conditions, will cause automatic and sustained trailer brake application. Opening the supply line admits inrushing atmospheric air to the actuator system. This inrushing air causes the flow sensitive break-away check valve to close, trapping supply vacuum on one side of the booster power diaphragm and vacuum reservoir. The inrushing air passes through the synchronizing valve; pressurizes the other side of the booster power diaphragm, generating hydraulic output pressure which applies the disc brakes. Once this occurs, the trailer brakes can be manually released by depressing (for 10 seconds) the trailer brake release valve to deplete the trapped vacuum in the booster and allow the check valve to re-open.

The trailer brakes normally reset automatically when the trailer vacuum supply line is reconnected to the tow vehicle and engine vacuum reaches the level of the vacuum trapped by the break-away check valve.

The break-away safety feature should be periodically checked. This is easily accomplished any time the trailer is attached to the tow vehicle and the engine has achieved normal operating temperature. Stopping the engine has achieved normal operating temperature. Stopping the engine and disconnecting the trailer supply vacuum coupling will activate the break-away system. Installing the coupling plug (leaving trailer supply line disconnected), starting the engine, and attempting to move the vehicle will confirm trailer brake activation. Depressing the brake release valve (hold for 10 seconds) should release the trailer brakes (confirm by moving vehicle). Re-connecting the trailer supply line to the tow vehicle will resume normal operation.

Vacuum Hoses and Reservoir (Ref. Fig. 6)

The vacuum hoses and vacuum reservoir require service only if damage or contamination is incurred. The trailer vacuum supply line (Item 8) should be replaced if cracking, buckling, or abrasion is evident.

When the trailer vacuum supply hose is disconnected from the tow vehicle, the hose end should be inserted over the stowage pin (Item 1) at the base of the trailer tongue hoist. This prevents contamination (insects, water, dirt, etc.) of the vacuum system.

The hose restraining spring assembly (Item 3) must prevent a disconnected vacuum supply line from nearing the ground where it may ingest contamination (sand, water, snow, etc.) Replace spring assembly if it is stretched, broken, missing, etc.

If diagnosis reveals that the brake actuator vacuum system has been contaminated (sand, water, etc.), the system should be disassembled and cleaned. All vacuum hoses should be removed and blown clean with compressed air. The vacuum reservoir should be removed, rinsed with clean water, thoroughly drained, and reinstalled. Only after extreme contamination of the system would it be necessary to clean the other brake actuator devices. The breakaway check valve (Item 27 Fig. 7) is an exception and is discussed in a following section.

Synchronizing Valve (Ref. Fig. 7)

The SYNCHRONIZING VALVE responds to the controller current by proportionally energizing the POWER BRAKE BOOSTER to which it is attached. The synchronizing valve controls the differential pressure (vacuum) acting within the power booster, generating a hydraulic output pressure which actuates the self-adjusting caliper disc brakes. The resulting trailer braking action is essentially proportional to the braking action of the towing vehicle.

The synchronizing valve (Item 26) does not require routine maintenance and should not be disassembled. If careful diagnosis identifies a defective valve, it must be replaced as a unit.

Normal synchronizing valve operation can generally be determined by listening for the ingestion of air into the valve filter as the brakes are activated. Connect trailer electrical connector and vacuum line to the tow vehicle: start vehicle engine. When brakes are not applied, no air flow should exist at the breather. When the brakes are applied, air should momentarily flow but should cease to flow if the brakes are held steadily applied. Releasing the brakes will not cause air flow through the breather, but internal system air flow may be momentarily heard.

If continuous air flow exists, the entire synchronizing valve should be replaced.

If no air flow occurs when brakes are applied, listen for valve buzzing or clicking to assure that solenoid is operating. Be sure breather element (Item 8) is not plugged.

If the solenoid is not operating, be sure an electrical signal (12 V) is being received from the brake controller in the tow vehicle. If a signal is being received, but solenoid is not functioning, check the solenoid coil resistance and the continuity of related wires.

The solenoid coil can be electrically checked by disconnecting the trailer electrical connector (7-way) and checking the coil resistance with an ohmmeter. The coil resistance should be 1.5 to 3.0 ohms. The meter can be connected to the "YEL" and "WHT" connector pins. If improper meter reading is attained, disconnect solenoid wire connector and check coil resistance attaching meter directly to solenoid wires (See fig. 13). If coil resistance reading is alright, then the trailer wires, terminals, splices or 7-way connector are defective and should be repaired. If solenoid coil resistance is improper, replace entire synchronizing valve assembly.

The synchronizing valve can be removed by disconnecting the solenoid lead wires, detaching the vacuum hoses (Items 5, 10 and 12), and removing the three retaining nuts (Item 13). Avoid loss of the valve booster "o" ring seal (Item 17).

When installing the synchronizing valve, assemble "o" ring (Item 17), assemble valve to booster and secure with three nuts (Item 13). Install and secure vacuum hoses. Reconnect solenoid wire connector.

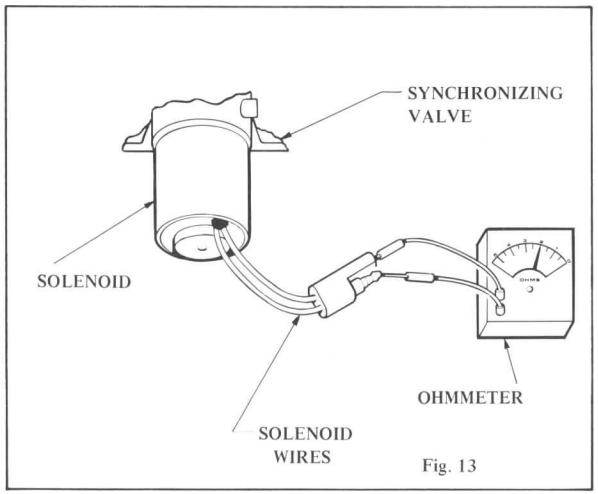


Fig. 13

Power Brake Booster

Operation (See Fig. 2)

The power brake booster generates hydraulic brake pressure when the synchronizing valve admits atmospheric air into the lower booster chamber while vacuum is being applied to the upper chamber. The resulting pressure differential causes a hydraulic pressure to be generated by the booster master cylinder.

Diagnosis (See Fig. 7)

If hydraulic pressure is not generated during normal operation, the following items should be checked before the booster is suspected of malfunction:

1. Vacuum must be supplied to the system.
2. The synchronizing valve must be operating properly.This requires that the trailer electrical cord be connected to the tow vehicle. The brake controller must be operating properly.
3. The brake actuator breather elements (Item 8) must not be obstructed with contamination.
4. The hydraulic system must be free of air. Be sure adequate fluid is in the hydraulic reservoir (Item 30) and that no hydraulic leaks exist. Bleed the trailer hydraulic system if necessary.

If the booster is suspected of malfunction, its basic operation can be checked in the following manner:

1. Connect the trailer to the tow vehicle. Attach the vacuum supply hose and electrical cord. Stop vehicle engine.
2. Depress the trailer brake actuator release valve (Item 25) for 10 seconds to remove all vacuum in the actuator.
3. Remove the brake actuator shroud and lower cover pan to expose the brake actuator.
4. Detach the synchronizing valve (Item 26) from the brake booster (Item 23) by removing the three retaining nuts. Do not lose the "o" ring on the valve mounting face. Leave all vacuum lines attached.
5. Plug the port in the mounting face of the synchronizing valve to prevent vacuum leakage at this point.

CAUTION:

Do not contaminate synchronizing valve. Vacuum may pull foreign objects or contaminants into this port.

6. Start vehicle engine. Let engine idle.
7. Trailer brake booster should generate pressure and lock trailer brakes.
8. Check for vacuum at the exposed hole in the booster lower chamber to which the synchronizing valve is normally attached. No continuous air flow (vacuum) should exist at this hole. Continuous air flow into this booster chamber opening indicates a malfunction of the booster.
9. Hydraulic brake pressure should be generated by the booster when the engine is started and should continue to exist while the engine runs.

   If the brake pressure diminishes, releasing the trailer brakes, after a few minutes of engine operation the booster master cylinder is malfunctioning.
10. Stop the vehicle engine. Disconnect the vacuum hose from the tow vehicle.
11. Release all vacuum in the brake system by depressing the brake release valve 10 seconds. Listen for intake of air through the breather (Item 8).
12. If air intake occurs through the breather when the release valve is depressed for 10 seconds, but the trailer brakes fail to release, hydraulic pressure may be trapped in the booster master cylinder. Confirm this by momentarily loosening (1/2 turn) the hydraulic line at the top of the booster master cylinder. If hydraulic pressure causes fluid to escape the booster is malfunctioning and should be replaced.

    IMPORTANT:

    If fluid does not escape, immediately retighten the hydraulic fitting to prevent the injestion of air through the loosened fitting. Air injestion will require that the hydraulic lines be bled.
13. If no air flow occurs through the booster breather when the release valve is depressed, the breather element (Item 8) or release valve (Item 25) may be malfunctioning.

A malfunctioning brake booster should be removed and replaced as a unit (Item 23) as described in the following section.

If the booster is functioning properly, reinstall the synchronizing valve being sure to remove the temporary plug (see step 5 above) and reinstall the "O" ring between the valve and booster mounting faces.

REMOVAL AND REPLACEMENT

1. Disconnect trailer vacuum supply hose from tow vehicle.
2. Deplete all brake system vacuum by depressing the brake release valve for 20-30 seconds.
3. Remove LPG tanks.
4. Remove brake actuator shroud.
5. Remove knob, lock nut, mounting screws and name plate from brake release valve (Item 25)
6. Detach trailer vacuum supply hose from fitting . (Item 15)
7. Remove nut and lock washer from terminal bolt .(Item 16)
8. Remove lower pan of booster shroud.
9. Disconnect synchronizing valve wiring connector.
10. Disconnect vacuum hose from hose fitting .(Item 10, Fig. 6)
11. Disconnect and remove the steel hydraulic brake line.
12. Remove the four mounting bolts securing the power booster mounting bracket to the trailer chassis.
13. Remove the brake actuator assembly from the chassis.

    IMPORTANT:

    If the actuator assembly is to be disassembled, identify all hose connections as they are disconnected to assure proper reassembly.
14. Detach hoses from breather and chamber fittings. (Items 1 & 7)
15. Detach hoses from breakaway check valve . (Item 27)
16. Remove three nuts (Item 13) holding synchronizing valve to booster.
17. Remove synchronizing valve (Item 26), release valve (Item 25) and attached hoses as an assembly.
18. Remove hydraulic reservoir/breather assembly (Item 32) from master cylinder. Remove hydraulic line.(Item 21)
19. Remove breakaway check valve. (Item 27)
20. To replace brake actuator, reverse above procedure. Apply pipe thread sealant to all male pipe threads of the vacuum line fittings. Do not apply sealant to hydraulic fittings.

Breakaway Check Valve

The trailer brakes are automatically applied any time the trailer VACUUM SUPPLY LINE is severed or disconnected. Atmospheric air entering the supply line causes the CHECK VALVE to close, trapping vacuum in the low pressure side of the booster power chamber. The inrushing atmosphere depletes the vacuum and the vacuum in the high pressure side of the booster power chamber. The atmospheric pressure causes the booster to generate hydraulic pressure which applies the trailer brakes.

The normally open, flow sensitive break-away check valve (Item 27, Fig. 7) can become contaminated and may require disassembly and cleaning. The basic function of this valve can be checked by removing the valve, blocking "SYNC" port, and blowing air into the end marked "VAC SUPPLY". Gentle blowing should result in free flow through the valve. Blowing abruptly, however, should cause the valve to seal tightly blocking air flow.

To clean and inspect the check valve, remove the attached two vacuum hoses, remove and disassemble the check valve. Clean and inspect check valve parts. Properly reassemble check valve and tighten to specified torque (See fig. 14). Use thread sealant on male fitting threads.

CAUTION:

Reinstall check valve as shown in Figure 7 , being sure that the end stamped "Booster" is attached to the power brake booster.

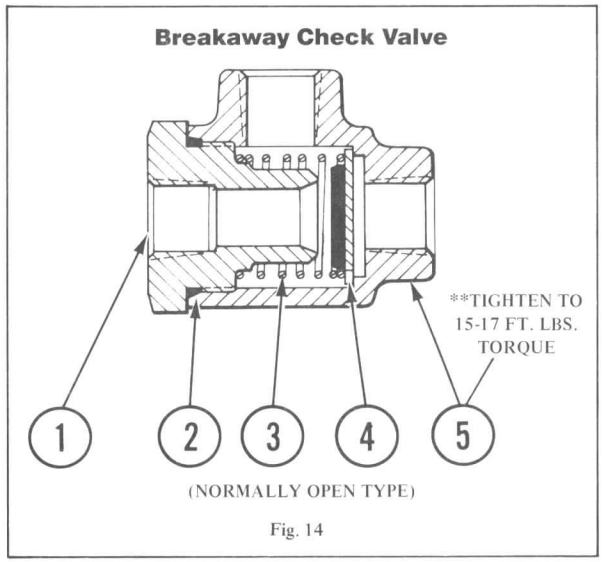


Fig. 14

No.	Part No.	Description
1	200937-H	End cap
2 *	N-11728-DU	"O" ring
3 *	602000-AC	Spring
4 *	C-11472-A	Valve seal
5	200971-C	Body
	RC-10-AB	Repair kit - break-away check valve

*Indicates parts furnished in repair kit (Midland-Ross Part No. RC-10-AB)

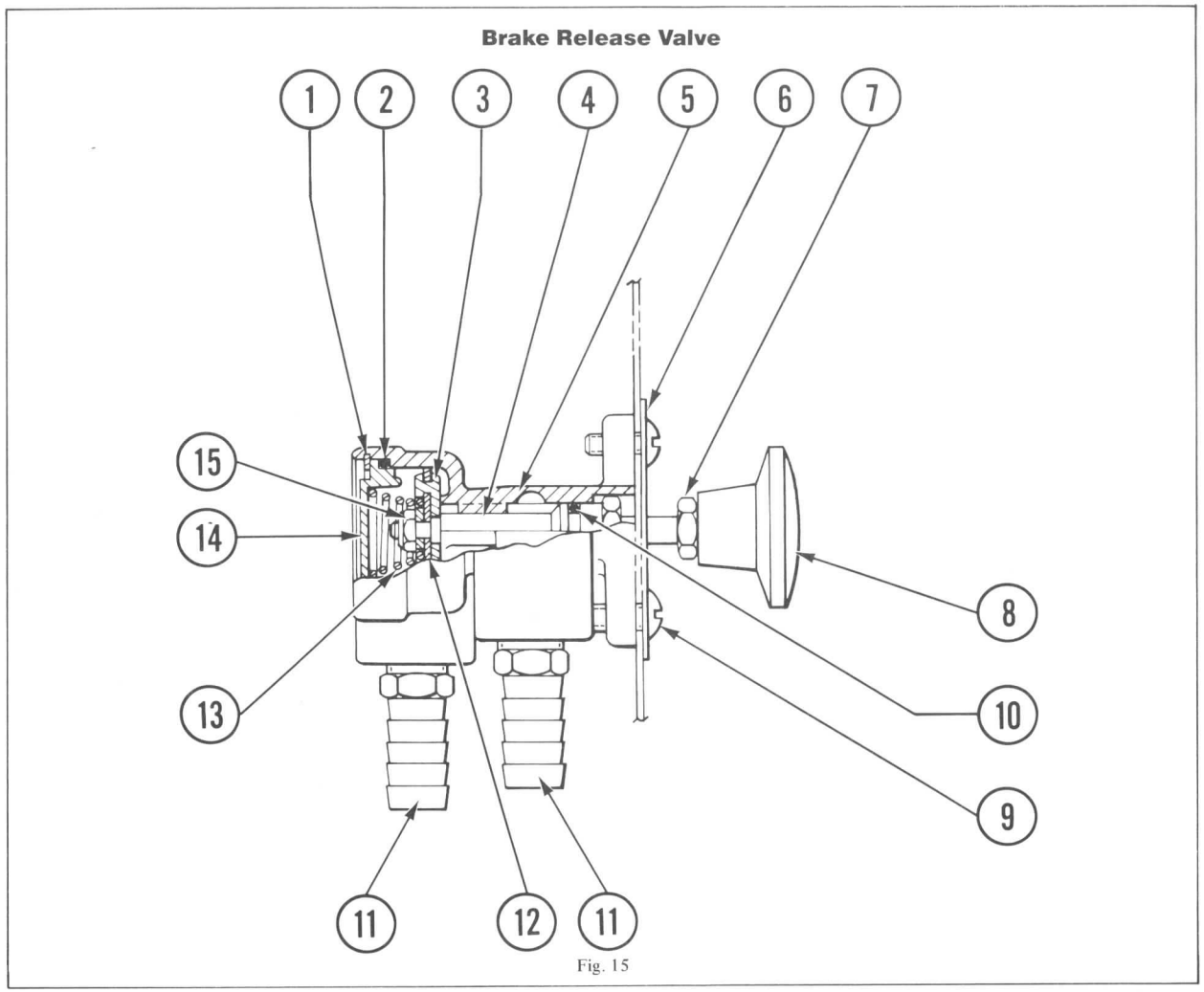


Fig. 15

No.	Part No.	Description
* 1	44W72125	Retaining ring
* 2	N-11728-CT	"O" ring
* 3	600981	Valve assembly
4	101602	Piston
5	200529-A	Body
6	N-14515-BF	Nameplate
7	02W21628	Nut
8	N-14514	Knob
9	3-X-4009	Screw
*10	N-11728-N	"O" ring
11	C-10712	Hose nipple
12	4-X-2662	Washer
*13	600399-CN	Spring
14	101601-C	End cap
15	2-X-5501	Nut

*Indicates parts furnished in repair kit (Midland-Ross Part No. RN-31-N)

Brake Release Valve

The brake release valve operating knob protrudes from the roadside of the actuator housing behind the L.P.G. tanks. The valve is normally closed (spring loaded). Depressing and holding the valve knob opens the valve, admitting atmosphere to the low pressure side of the power brake booster.

Removal

1. Loosen knob lock nut (Item 7). Remove knob (item 8) and nut.
2. Remove two mounting screws (Item 9). Remove name plate (Item6)
3. Remove brake actuator lower cover pan.
4. Remove valve assembly.
5. Remove vacuum hoses from fittings.

Installation

1. Reverse above procedure.

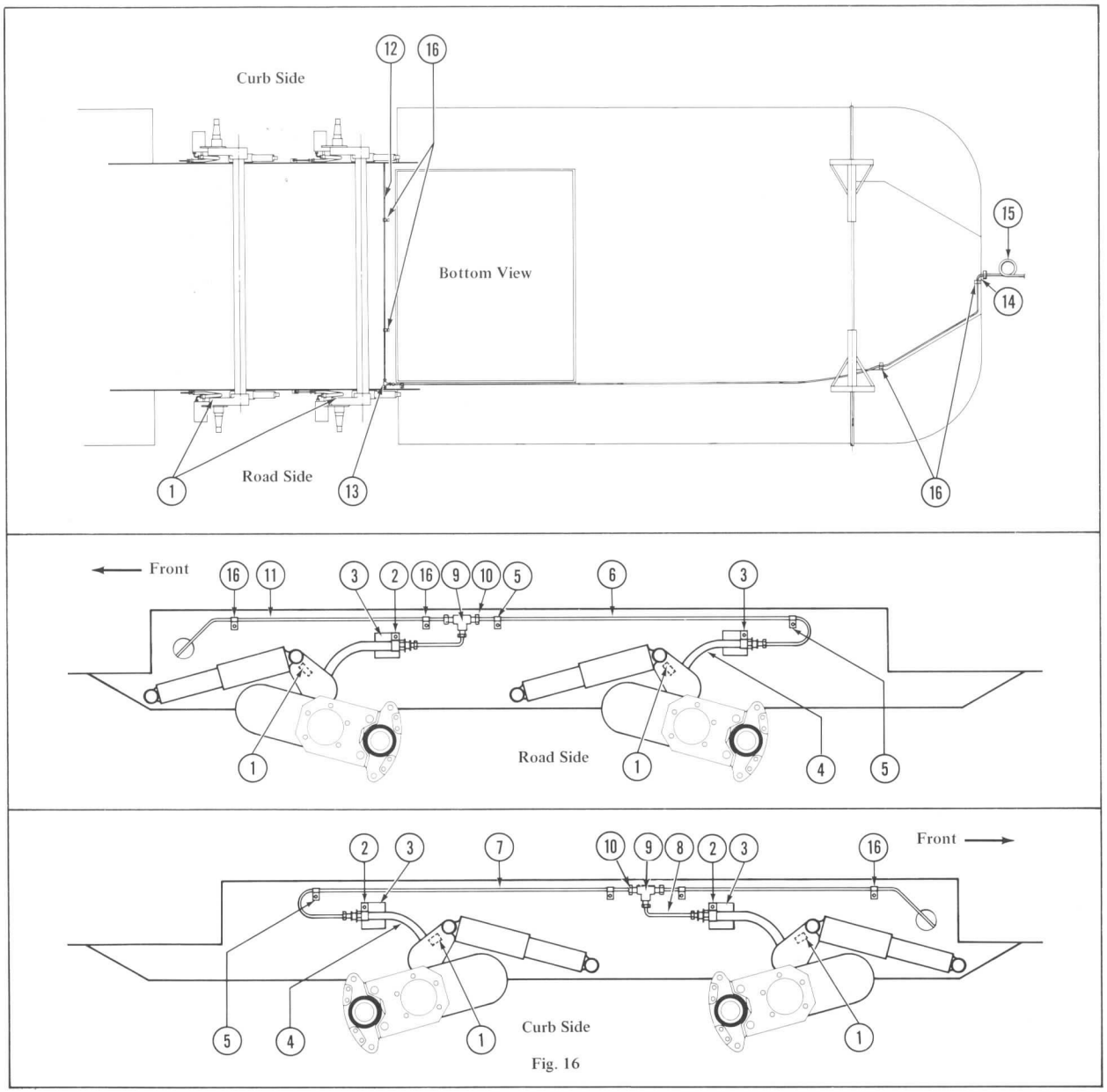


Fig. 16

Hydraulic Brake Lines and Fittings

The hydraulic brake lines are standard Automotive steel tubing, double flared.

NOTE: IF ANY SECTIONS OF TUBING ARE REPLACED BY MAKING UP IN THE FIELD, IT IS MANDATORY THAT STEEL TUBING, WITH ENDS DOUBLE FLARED, BE USED.

The fittings are standard brass Automotive flared type for brake lines.

The brake hose is standard Automotive type for use with brake fluid – do not substitute.

Be sure brake lines are properly attached so that no portion is hanging loose or rubbing or being rubbed against anything. Use tubing clamps (See fig. 17). When replacing lines use original clamps or equivalent.

Tee fitting (Item 13) is accessible thru inspection cover in chassis underbelly.

No.	Part No.	Description
1	S-370-7	Umpco 7/16" hose clamp
2	5188	Hose clip
3	5190	Frame bracket
4	29356	Brake hose
5	–	Tube clamp 3/16"
6	29298	Tube assembly 3/16" roadside
7	29299	Tube assembly 3/16" curbside
8	29300	Tube assembly 3/16" short
9	752 x 3	Running tee 3/16"
10	250 x 4	Female adaptor 1/4"
11	29301	Connector – tube assembly 1/4"
12	29302	Cross line tube assembly 1/4"
13	702 x 4	Union tee 1/4"
14	502 x 4	Union elbow 1/4"
15	29384	Actuator line 1/4"
16	–	Tube clamp 1/4"

Flexible Brake Hose Removal

1. Release pressure on system by pushing brake release valve.

2. Disconnect flexible hose from steel brakeline. Hold fitting on flexible brake line stationary with open end wrench as shown in Fig. 18. Using "tube nut wrench" rotate tube nut off of flexible hose. Remove clip securing brake hose to bracket.

3. Remove clip securing flexible hose to shock absorber bracket.

4. Disconnect flexible brake hose from caliber housing using "tube nut wrench."

Flexible Brake Hose Replacement

1. Reassemble flexible hose securing first to back side of caliper, finger tight only.

2. Install clamp into shock absorber bracket.

3. Install flexible hose into hose bracket with clamp.

4. Hold flexible hose with open end wrench and with "tube nut wrench", tighten tube nut until it bottoms out, then tighten securely 1/6 additional turn.

   CAUTION: Do not twist hose. See Figure 17 and 18 showing correct and incorrect installation.

5. Tighten tube nut at caliper with tube nut wrench until it bottoms out, then tighten securely 1/6 additional turn.

   See Figure 46 for bleeding brakes.

Flexible Brake Hose – Correct Installation

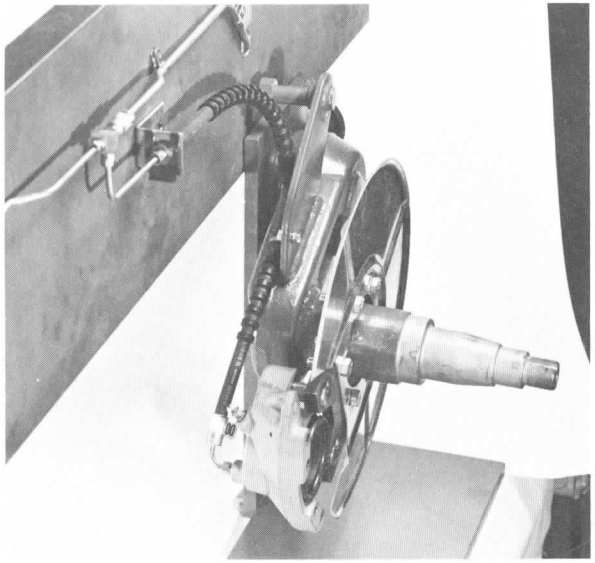


Fig. 17

Flexible Brake Hose – Incorrect Installation

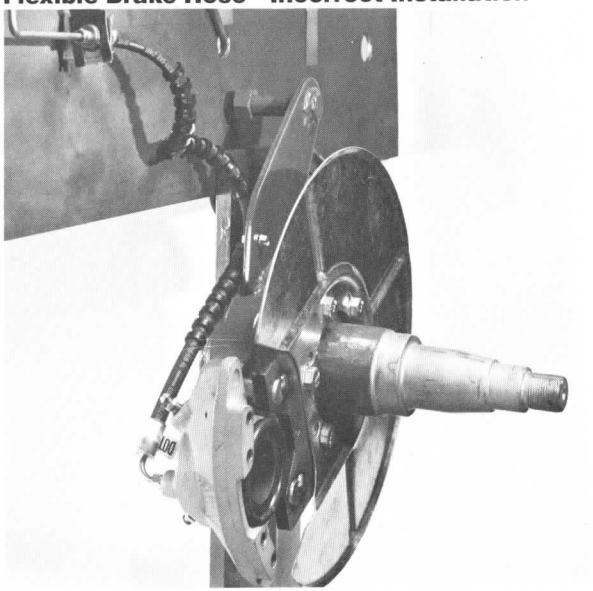


Fig. 18

Flexible Brake Hose – Removal

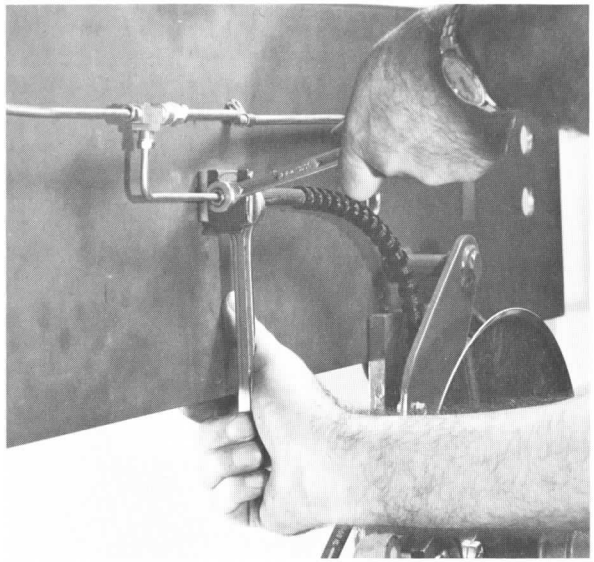


Fig. 19

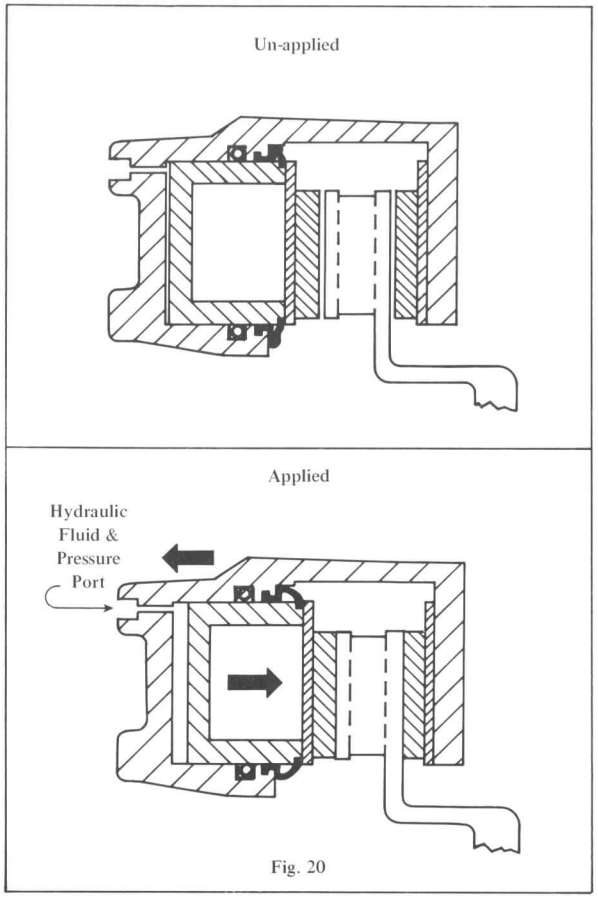


Fig. 20

Caliper Disc Brakes
Operation and Diagnosis

The Caliper Disc Brakes on the trailer are "floating" type, and are self adjusting. The caliper assembly does not need to be removed or disassembled to replace worn linings. (See section on Lining Replacement).

The significant feature of the "floating" caliper operation is that it is free to slide on the two mounting studs on mounting bracket. Figure 20 shows a simplified cross section of the caliper, unapplied and applied, and the forces at work when the brakes are applied.

Upon application of the brakes, the fluid pressure behind the piston increases. Pressure is exerted equally against the bottom of the piston and also against the bottom of the cylinder bore. The pressure applied to the piston is transmitted to the inboard rotor surface. The pressure applied to the bottom of the cylinder bore forces the caliper to slide or move on the mounting studs toward the inboard side, or toward the trailer. Since the caliper is one piece, this movement causes the outboard section of the caliper to apply pressure against the back of the outboard lining assembly, forcing the lining against the outboard rotor surface. As the line pressure builds up the two lining assemblies are pressed against the rotor surfaces with increased force, bringing the trailer to a stop.

In actual practice the application and release of the brake pressure causes a very slight movement of the piston and caliper. Upon release of the braking effort the piston and caliper merely relax into a released position. In the released position the lining assemblies do not retract any appreciable distance from the rotor surfaces.

As the brake lining wears, the piston moves out of the caliper bore and the caliper re-positions itself on the mounting studs an equal distance toward the trailer. In this manner the caliper assembly maintains the inboard and outboard lining assemblies in the same relationship with the rotor surface throughout the full life of the lining.

Inspect the brake lining periodically, and especially when the wheels are removed (tire rotation, etc.). Check both ends of the outboard lining by looking in at each end of the caliper. These are the points at which the highest rate of wear normally occurs. However, at the same time, check the lining thickness on the inboard lining assembly to be sure that it has not worn prematurely. Look down through the inspection hole in the top of the caliper to view the inboard lining assembly.

IMPORTANT

A tapered wear pattern may occur on floating caliper disc brake linings, which is normal.

Lining assemblies are to be replaced when:(Fig. 21)

1. They are worn to a 1/16 inch to 3/32 inch of lining material left or 1/16 min. between steel backing plate and rotor at any one point.

2. There is more than 1/8 inch taper from end to end of the lining material.

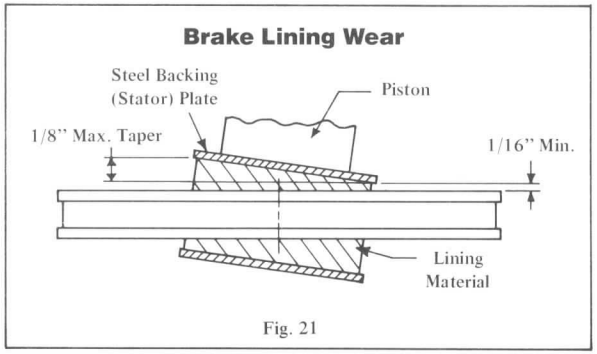


Fig. 21

NOTE: When the trailer brakes are unapplied, there is no residual (back) pressure allowed in the hydraulic brake system. Residual pressure to a disc brake will cause it to drag, resulting in noisy brakes and premature lining wear.

A very light drag of the rotor is present in disc brakes at certain times, especially immediately after a series of brake applications, one immediately after another. This is acceptable as long as the hub and rotor can be rotated by hand.

Caliper Disc Brake Assembly

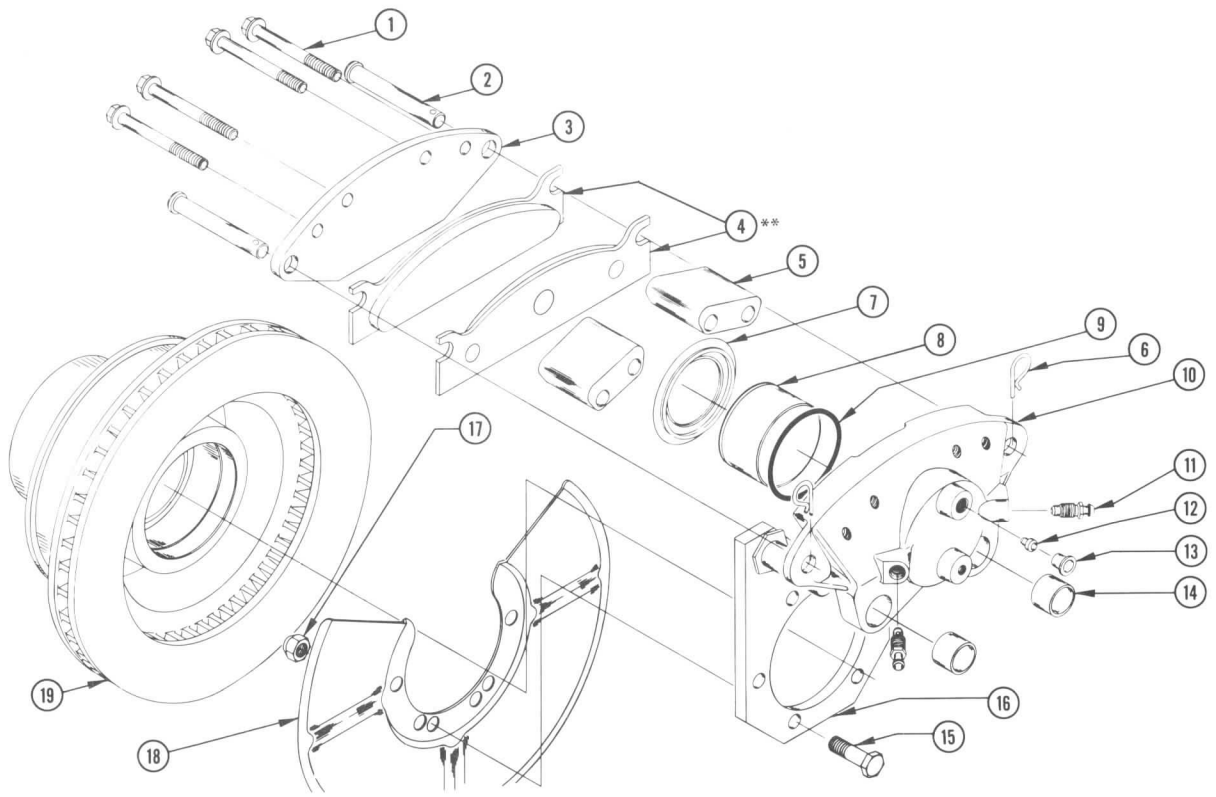


Fig. 22

Item No.	No. Req'd.	Part Name	Part Nos. Caliper & Mtg. Brkt. Assy. Curb Side 30175	Road Side 30174*
1	4	Screw-hex flange	27632	
2	2	Pin-clevis	27633	
3	1	Plate-secondary	27628	
4	2	Stator & Lining Assembly	28323	
5	2	Spacer	27635	
6	2	Clip-pin	28126	
7	1	Boot	26104	Caliper
8	1	Piston	27629	Brake Hyd.
9	1	O-ring	27578	28639
10	1	Housing	28640	
11	2	Screw-bleeder	26127	Hsg.
12	1	Insert-seat	26135	Assy.
13	1	Plug-protective	26930	29222
14	2	Sleeve	28625	
15	5	Bolt-hex head	28429	
16	1	Mounting bracket Assembly	29295	29294
17	5	Lock nut	29236	

*All items are identical to 30175 except as shown

18	1	Dust shield	100986
19	1	Hub & rotor	100989 CH-C

**Note correct position of pads when replacing.

Brake Lining Replacement

(For lining wear allowable see proceeding section on "Operation & Diagnosis")

NOTE: Linings may be replaced on the trailer without removing the brake. Normally all linings should be replaced on the trailer at the same time. It is essential that all linings on an axle must be replaced at the same time.

REMOVING BRAKE LININGS

1. Remove brake fluid from Master Cylinder reservoir, if necessary, so that it has just enough fluid to cover bottom of reservoir. Some fluid must be left to prevent intrapment of air in the master cylinder. This is done so that when pistons are pushed back to make space for new lining assemblies, the reservoir will not over flow. The reservoir is located inside the trailer, at the left (Roadside) front corner.

NOTE: Check fluid level in reservoir after linings are replaced in the first two calipers. Fluid level should not be over 1/2 full. Remove fluid as necessary so that reservoir is less than 1/2 full.

2. Trailer should be raised evenly. Place jackstands under trailer and remove wheels.

NOTE: Work on only one brake at a time.

3. Orient flat on hub of rotor until it is directly below bottom edge of brake lining (Fig. 24 & 25).

4. Remove clip pins from end of clevis pins and pull out clevis pins (Fig. 23).

5. Pull caliper out board to bottom out the piston.

6. Remove linings by sliding out bottom end of caliper (Fig. 24 & 25).

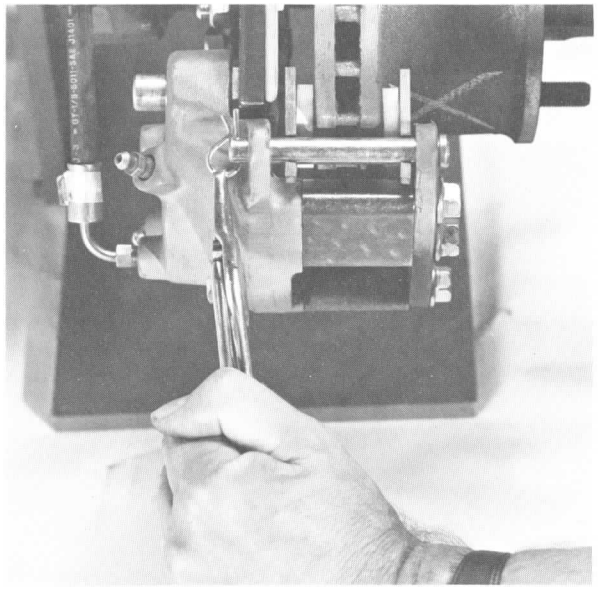


Fig. 23

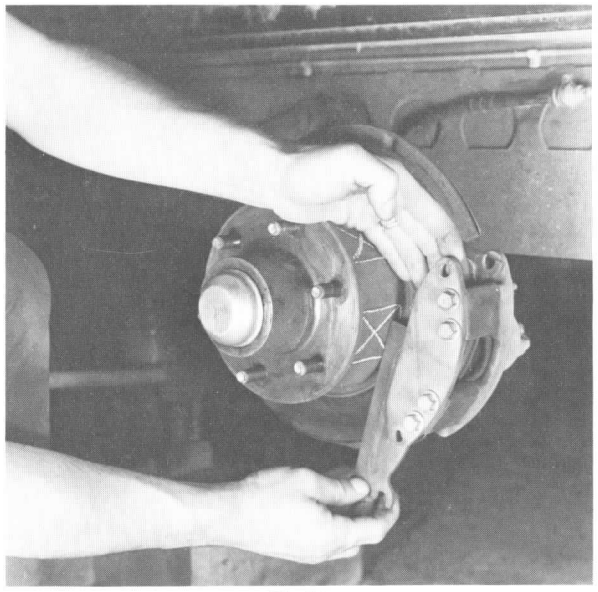


Fig. 24

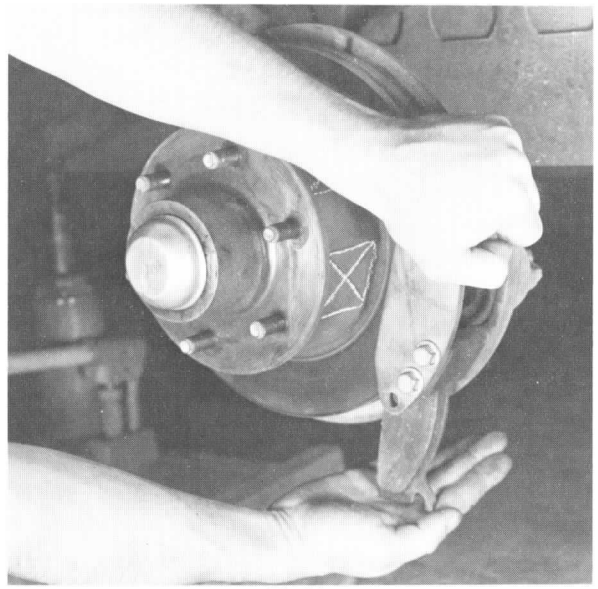


Fig. 25

CHECK CALIPER PARTS

1. Check around the caliper for hydraulic fluid leaks. If evidence of leaks is noted, brake should be overhauled.

NOTE: Some assembly fluid may be present. Do not confuse with leakage.

2. Slide caliper back and forth on mounting studs to see if it is free. Check mounting studs for looseness. Replace bracket if mounting studs are loose.

3. Wipe caliper clean and check dust boot for cracks, cuts or other damage. Overhaul if damage is noted.

4. Apply a small amount of dry film lube, preferably Molydisulfide base, to mounting studs (See Fig. 30).

BRAKE LINING INSTALLATION

NOTE: Be sure that the friction surface of the linings are next to the rotor (disc).

1. With piston pushed in and caliper pushed inboard so outboard plate is against rotor, install lining between piston face and disc, being careful not to pinch boot between lining backing plate and piston. (Fig. 26)

2. Pull forward on caliper and then install the other lining between disc and (outside) secondary plate of caliper housing. (Fig. 27)

NOTE: When installing linings, slide them in from the top end of the brake.

3. While holding linings in place, install the two clevis pins, engaging with slots on end of linings, (pin heads on the outside.) (Fig. 27)

4. Install clip pins in holes on end of clevis pins. (Fig. 23)

5. Check torque on the four (4) caliper assembly bolts. It should be 45-50 lb-ft. (Fig. 28)

6. Check reservoir of Master Cylinder and fill to a 1/4" from the top of reservoir.

7. Hub and Rotor Assembly should rotate by hand, with brakes released.

8. Mount wheels and road test.

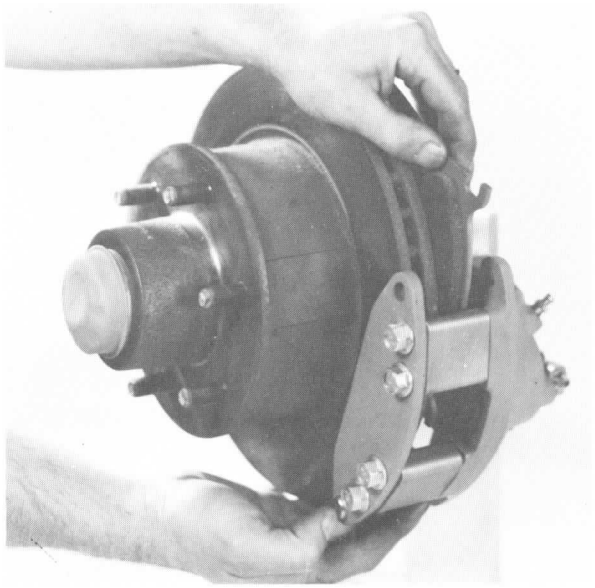


Fig. 26

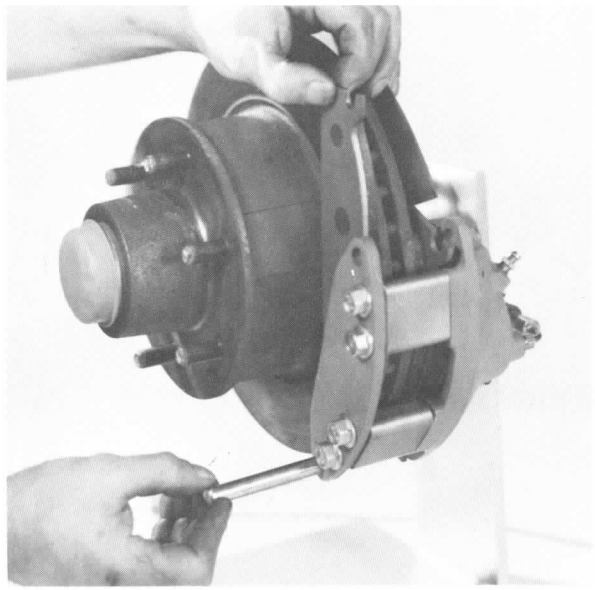


Fig. 27

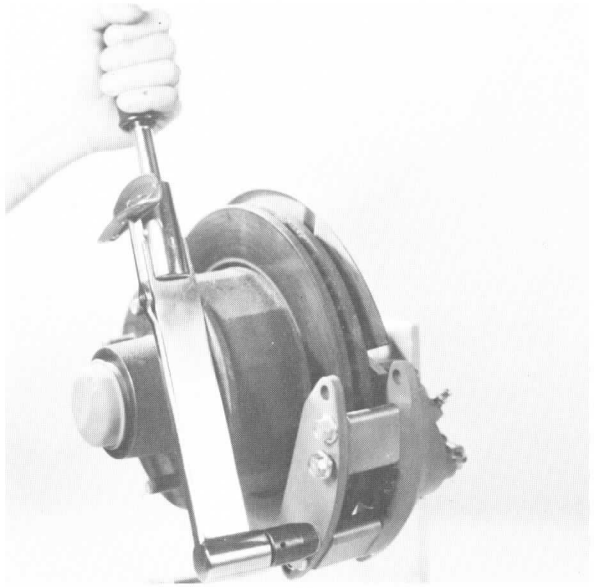


Fig. 28

Servicing the Caliper Assembly

REMOVING THE CALIPER ASSEMBLY FROM VEHICLE

1. Jack trailer at marked jack locations behind axle on main frame. Place garage stands under trailer.

2. Index marks should be added to wheel and disc, then remove wheel. Index marks to preserve balance of wheel.

3. Remove brake fluid from Master Cylinder reservoir as required so that it has enough fluid to just cover bottom of reservoir approximately 1/8 inch deep.

4. Remove brake linings as described in section "Brake Lining Replacement". This requires removal of clevis pins and clip pins.

5. Remove four (4) brake assembly bolts, backing plate and two (2) spacers. (See Fig. 29)

NOTE: Replacement of mounting bracket or dust shield does not require brake hose disconnection. Remove clamp securing flexible hose to shock absorber bracket. Support caliper housing to avoid strain on brake hose.

6. Disconnect flexible hose line at caliper housing.

7. Slide brake housing assembly off of the mounting studs. Lightly tap with plastic or rubber head hammer if necessary. (See Fig. 30)

CHECK BRAKE MOUNTING BRACKET

1. Check for loose bolts and mounting studs.

2. If studs are loose replace bracket.

3. Wipe off and lubricate mounting studs with a dry film lubricant, preferably with a Molydisulfide base.

NOTE: Brake housing should slide by hand on the mounting studs.

4. The five locknuts and bolts holding mounting bracket and dust shield to spindle flange should be torqued 25-30 lb-ft. (See Fig. 37)

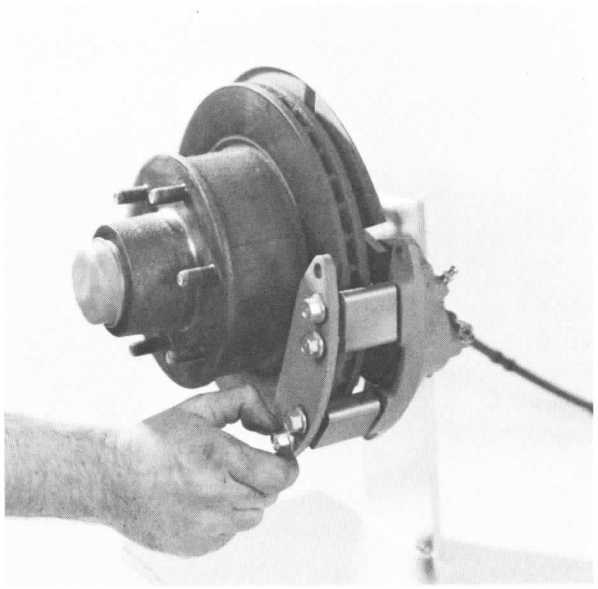


Fig. 29

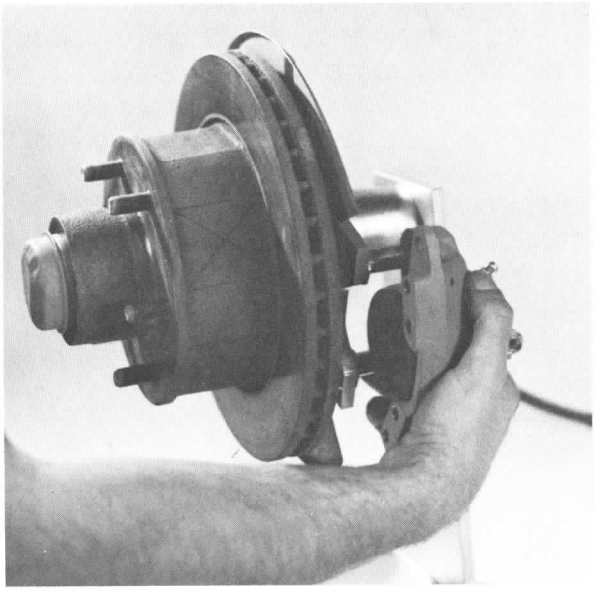


Fig. 30

DISASSEMBLING THE CALIPER

1. Remove piston by following means:

   Blow out with compressed air. Observe caution that the piston does not pop out of control or become damaged. Place caliper housing on top of shop cloth, piston down, and blow air thru inlet port. Wipe clean and replace if scored.

   If piston is not removable by this method, excessive corrosion or binding of piston in cylinder bore is evident. Replace housing assembly. (Fig. 31)

2. Remove boot from caliper housing. (Fig. 32)

3. Use small pointed wood or plastic tool to remove O-ring seal. Do not scratch cylinder bore or damage seal groove. Discard seal. (Fig. 33)

CLEANING AND INSPECTING CALIPER ASSEMBLY

1. Clean all parts with alcohol or brake fluid. Use air hose to blow out passages and cylinder bore.

2. Remove cylinder wall defects with a fine crocus cloth. Do not use abrasives. If they do not clean up replace housing.

3. If piston is pitted or scored, discard and replace piston.

NOTE: Do not use gasoline, solvent, or any other petroleum base product.

Fig. 31

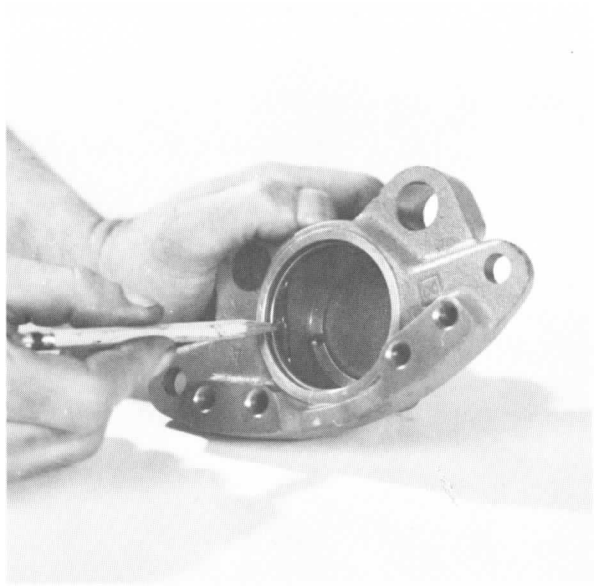


Fig. 33

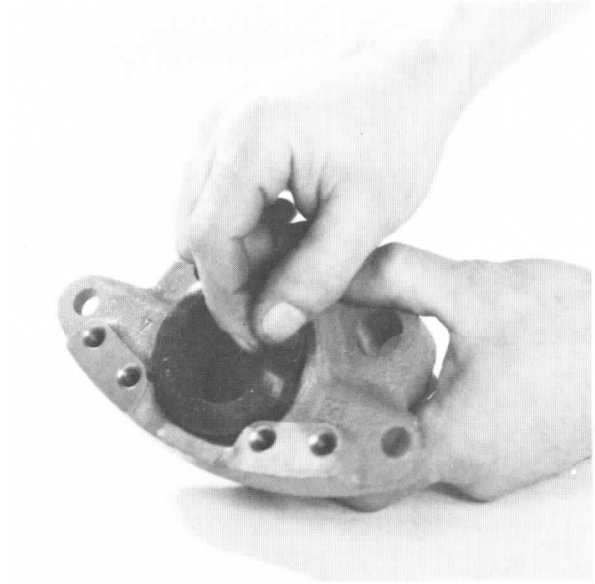


Fig. 32

ASSEMBLING THE CALIPER

1. Place caliper housing on clean bench, open end of cylinder up.

2. Lubricate cylinder wall with brake fluid – wipe clean first.

3. Dip O-ring in brake fluid and install in second groove in cylinder. Check to see it is not twisted in groove.

4. Install boot in first groove in cylinder.

5. Coat O.D. of piston with brake fluid.

6. Use small flat plastic or smooth wooden tool to work boot around the closed end of piston. (Fig. 34)

7. Position piston square and gently work piston straight in until it bottoms out. The boot should slide up the piston. Bead in I.D. of boot should come to rest in small groove at end of piston. (Fig. 35 & Fig. 36)

NOTE: Forcing misaligned piston may result in damaging seal & O.D. of piston.

Fig. 34

Fig. 36

Fig. 35

8. If mounting bracket was not removed from spindle place housing assembly on mounting studs. Be sure studs are clean and apply a dry film lubricant (preferably a Molydisulfide base) to mount in studs. (See Fig. 30)

9. If mounting bracket was removed or a new mounting bracket is being installed, place housing assembly on mounting studs prior to mounting on spindle flange. Mount housing assembly; mounting bracket and dust shield at the same time.

   Caliper housing assembly is to be inboard and towards rear of trailer and should be on the centerline of spindle arm. (See Fig. 37). Insert the five mounting bolts and lock nuts. Torque lock nuts 25-30 lb-ft. (Fig. 37)

10. Connect brake hose.

11. Install disc assembly making sure bearings are lubricated and axle torqued properly. (See section on installing hub and rotor assembly).

12. Assemble two (2) spacers and secondary plate to housing with four (4) bolts. Wide part of spacer to outside. (Fig. 37). Torque bolts evenly to 45-50 lb-ft. dry torque. (Fig. 39)

13. Push caliper assembly inboard on mounting studs and install brake lining between piston and disc. Pull caliper toward rotor (disc) and install lining between secondary plate and disc. (See section on Brake Linings)

NOTE: In each case the friction material of the lining is to be next to the disc. Make sure edge of rubber boot is not pinched between piston and lining.

14. Install clevis pins from outboard side (secondary plate side) aligning the lining slots with the clevis pins. Push pins through and install clip pins on clevis pins. (See section on brake lining installation)

15. Attach brake hose.

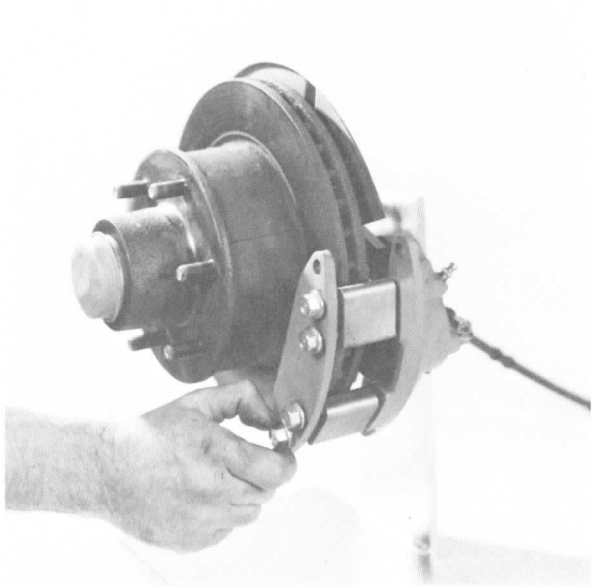


Fig. 37

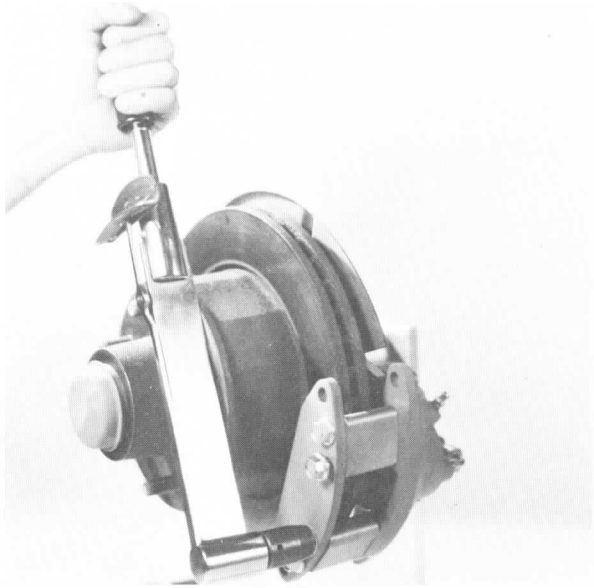


Fig. 39

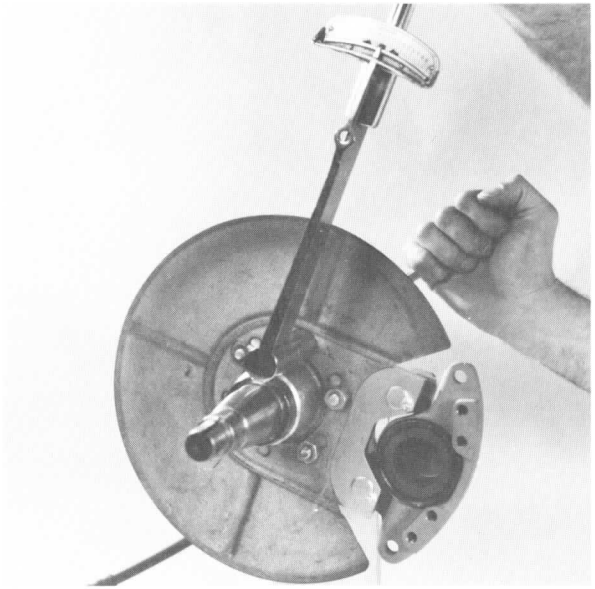


Fig. 38

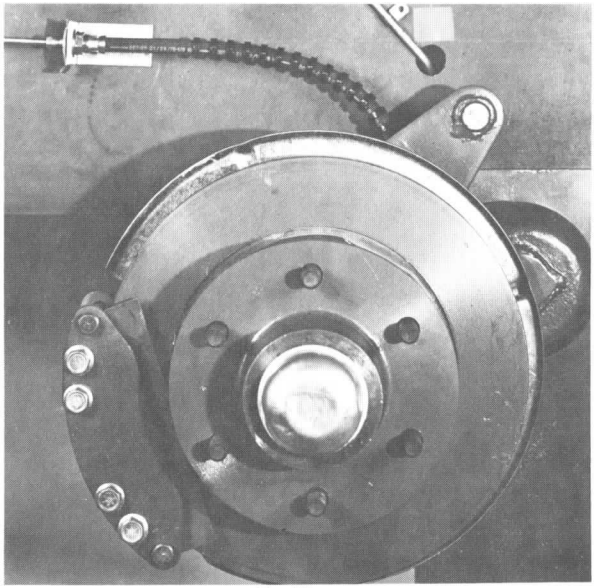


Fig. 40

16. Bleed brakes. Pressure bleeding preferred. Open upper bleeder and allow brake to fill with fluid. Let fluid run until all air bubbles have escaped and fluid runs clear. Close bleeder screw while pressure is being applied. (Fig. 41) Bleed each caliper separately. (See section on bleeding brake system)

17. Remove pressure bleeder reservoir adapter. Fill reservoir with DOT 3 brake fluid to 1/4" from top. Replace reservoir cover.

18. Actuate brakes by connecting trailer to proper tow vehicle.

19. Check for leakage.

20. With brakes released, rotate disc by hand. It must turn freely with possibly a slight drag. If excessive drag exists, see trouble shooting section.

21. Install wheel.

22. Road test – 20-40 mph with relatively hard stops.

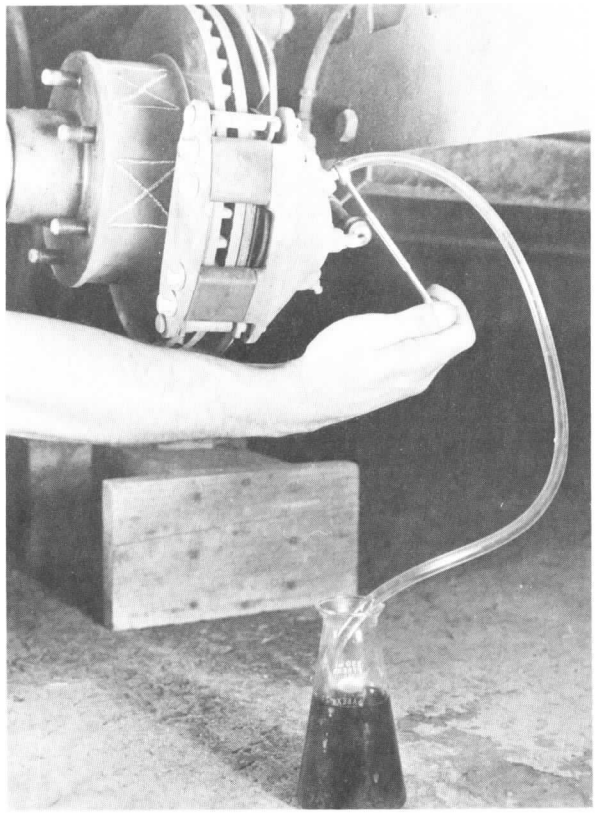


Fig. 41

Hub and Rotor

LATERAL RUN-OUT (Fig. 42)

Lateral run-out is the movement of the rotor from side to side (wobble) as it rotates.

1. Tighten spindle nut until all end play is out of bearings. This lateral checking run out only. (See note)
2. Secure a dial indicator to some portion of the suspension or some fixed point relative to the suspension. (See Photo). Place the point of the system so that it contacts the rotor face approximately 1 inch from the outer edge (O.D.) of rotor.
3. Turn the rotor one complete revolution, and check the indicator as rotor moves.
4. Lateral run-out should not exceed .020 inches.
5. If rotor is within specification, readjust spindle nut to manufacturers specification, while rotating hub and rotor assembly, to establish zero end play.
6. If rotor is out of specification replace bearings and re-check.

NOTE: After checking rotor, it is very important to readjust the spindle nut to the correct bearing end play; failure to do so will quickly cause bearing failure.

PARALLELISM

Parallelism refers to variations in thickness of the rotor. Excessive thickness variation causes excessive lining wear.

1. Thickness variation should not exceed .001 inches.
2. To check parallelism, measure the thickness of the rotor at four or more equally spaced points around the braking surface of the rotor. All measurements must be made at the same distance from the edge of the rotor, preferable at the midpoint between the O.D. and I.D. of the braking surface. (Fig. 43)
3. If rotor is out of specification and cannot be re-machined it is to be replaced. (See Machining section)

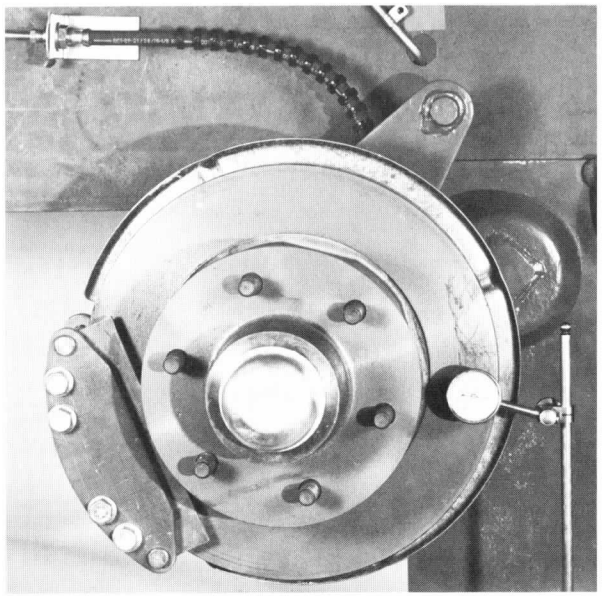


Fig. 42

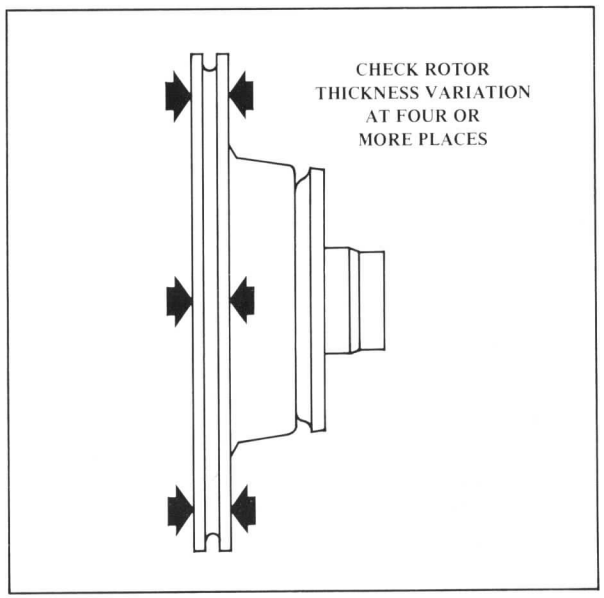


Fig. 43

ROTOR SURFACE CONDITION

The rotor braking surface may have slight grooves around the circumference. However, a badly chattered surface or one with torn metal, or one that is out of parallelism should be re-machined if possible or replaced. (See Machining section). Normally the surface will become somewhat polished with a few shallow grooves (relatively smooth) around the circumference.

MACHINING

Disc brake rotor dimensions, parallelism and runout must be held within close limits. Use only first class equipment in good condition, and follow equipment manufacturer's instructions exactly. Under no circumstances can a rotor be rechucked between the two braking surfaces.

On all disc brakes, always remove an equal amount of metal from each side of rotor. DO NOT EXCEED MINIMUM THICKNESS SPECIFICATIONS, of .940 inch, cast in rotor and parallelism of .001 inch.

REMOVING HUB AND ROTOR ASSEMBLY (Fig. 44)

1. With trailer raised evenly on jackstands, remove wheel.

2. If only rotor is to be removed leave caliper housing assembly on mounting studs. Ref. items 4 and 5, see Page 25

3. Remove the grease cap, cotter pin nut from the hub, and the lock, adjusting nut from the hub, and the lock, adjusting nut, and thrust washer from the spindle.

4. Remove outer wheel bearing cone and roller assembly from hub.

5. Remove hub and rotor assembly from spindle. (Fig. 44)

6. If dust shield or mounting bracket needs to be replaced, see section on replacing rotor splash and mounting bracket.

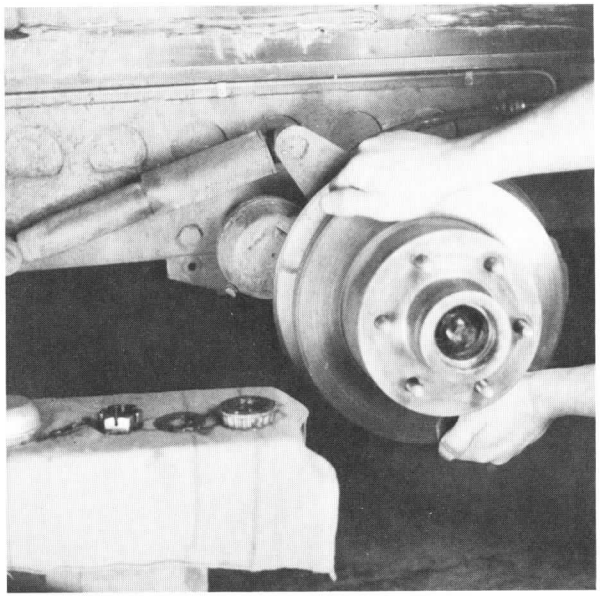


Fig. 44

INSTALLING HUB AND ROTOR ASSEMBLY

NOTE: Before installation make sure that the grease in the hub is clean and adequate, the inner cone and roller assembly and grease retainer are lubricated and in good condition, and the rotor braking surfaces are clean. Use general chassis grease, spec. MIC 75-B, available from Ford parts departments.

1. Slide hub and rotor assembly on spindle, with wheel mounting studs facing out.

2. Install outer bearing, thrust washer, and spindle nut.

3. While rotating the wheel, tighten the spindle nut with a 12-inch wrench until there is a slight tension. Then back off one notch and install cotter pin. There should now be from .001" to .010" end play in hub. If not, back off one more notch.

4. Install a dial indicator and check the runout of the rotor on both sides. The runout must not exceed .020 inches.

5. Important: after checking rotor runout to specification, readjust wheel bearing clearance.

6. If rotor runout exceeds specifications, discard and replace hub and rotor assembly, if new bearings do not correct runout.

7. Clean grease cap, coating the inside with wheel grease (do not fill) and install the cap.

8. Re-install caliper assembly.

9. Install the wheel and torque wheel nuts to specification.

10. Lower vehicle.

11. Road test the vehicle.

REPLACING ROTOR SPLASH SHIELD & MOUNTING BRACKET

1. Removing the Splash Shield & Mounting Bracket:

   Replacement of splash shield is necessary only if it is damaged, or if mounting bracket is to be replaced.

   a. With vehicle raised evenly on hoist or jackstands, remove wheel.

   b. Remove the caliper assembly, but do not disconnect brake line; suspend caliper from a wire hook or loop on front suspension. See section on servicing caliper assembly, if it needs servicing.

   c. Remove hub and rotor assembly and inner bearing.

   d. Remove the bolts which attach Splash Shield & Mounting Bracket to the spindle flange.

2. Installing the Splash Shield & Mounting Bracket (Fig. 45)

   a. Replace Splash Shield by reversing the order of removal steps above.

   b. Align mounting holes and install attaching bolts. Tighten to 25-30 lb-ft.

   c. Reinstall hub and rotor assembly, caliper assembly, and wheel as described under "Installing Hub and Rotor Assembly". Torque wheel nuts to vehicle manufacturer's specifications.

   d. Lower vehicle.

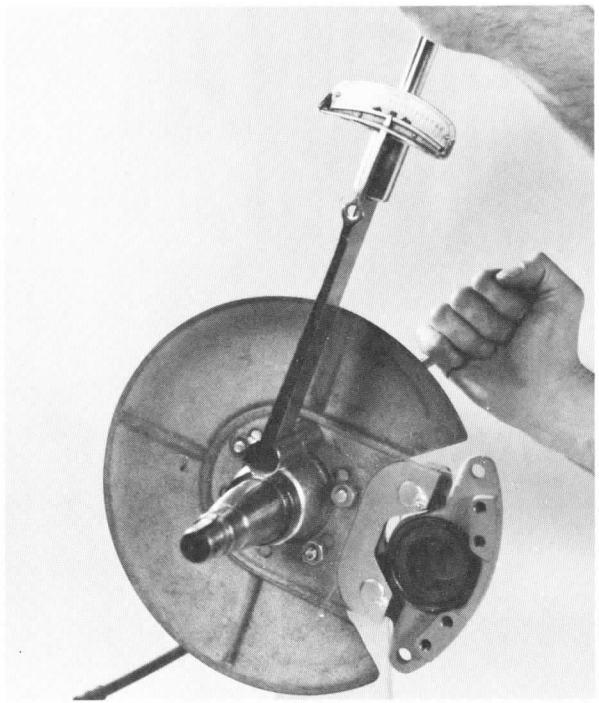


Fig. 45

Bleeding Hydraulic Brake System

The hydraulic brake system can be successfully bled by either pressure bleeding (recommended) or by manual bleeding. Both procedures are described below.

Use only brake fluid labeled "DOT 3".

PRESSURE BLEEDING

A 30 psi pressure bleeding apparatus should be used in bleeding the hydraulic brake system.

1. Tighten all hydraulic fittings and bleed screws.
2. Remove booster reservoir cover.
3. Fill reservoir to within 1/4 inch of top with "DOT 3" brake fluid.
4. Attach pressure bleeder to master cylinder reservoir. Be sure pressure bleeder contains adequate amount of proper fluid.
5. Pressurize the brake system reservoir to 30 psig.
6. Attach bleeder hose to top bleed screw of disc brake caliper and place hose end in container to catch fluid (See Fig. 46).
7. Loosen bleed screw and bleed fluid until air is expelled and clear fluid flows. Tighten bleed screw. Remove hose.
8. Repeat steps (6) and (7) on the top bleed screw at each trailer wheel (See Fig. 46). Always start with wheel closest to master cylinder on each side of trailer.
9. Connect trailer vacuum line and electrical connector to tow vehicle.
10. Start engine. Rapidly apply and release the trailer brakes several times using the manual control lever. Stop engine.
11. Repeat steps (6), (7) and (8) above.
12. Release pressure in pressure bleeder apparatus and remove from reservoir.
13. Refill reservoir with fluid to 1/4 inch from top.
14. Replace reservoir cover and diaphragm.

MANUAL BLEEDING

Manual bleeding requires the brakes be actuated by the tow vehicle brake controller as hydraulic fluid is bled at the trailer wheels.

1. Connect trailer vacuum supply hose and electrical connector to tow vehicle.
2. BLOCK TRAILER WHEELS.
3. Tighten all trailer hydraulic fittings and bleed screws.
4. Remove booster reservoir cover.
5. Fill hydraulic reservoir to within 1/4 inch of top with "DOT 3" brake fluid.
6. Start tow vehicle engine.
7. Attach bleeder hose to top bleed screw of disc brake caliper and place hose end in container to catch fluid (See Fig. 46). Always start with wheel closest to master cylinder on each side of trailer.
8. Apply and hold manual control lever on brake controller.
9. Loosen bleed screw to allow fluid flow.
10. Tighten bleeder while fluid is flowing, then release brake controller lever.
11. Repeat steps (7), (8), (9) and (10) until all air is expelled and clear fluid flows at all wheels. Tighten bleeders. Stop engine.

IMPORTANT: Replenish fluid in master cylinder reservoir as necessary. Do not allow reservoir to become empty while bleeding system. Doing so requires rebleeding entire hydraulic system.

12. Refill reservoir to 1/4 inch from top.
13. Replace reservoir cover and diaphragm.

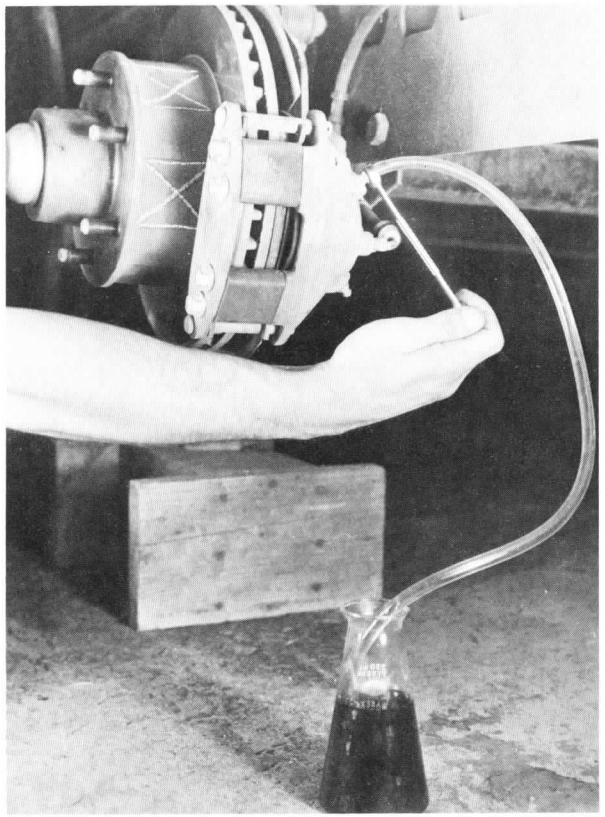


Fig. 46

Sway Control

Control Description: The Tru Track Electric Sway Control is a system which momentarily applies the trailer brakes when sway develops as the result of such occurrencessas rapid maneuvers to avoid road obstacles. Disturbances caused by passing vehicles and accidental travel on and off the shoulder of the road. Because of its design, it will not react to any normal driving maneuver that is smoothly performed. However, Tru Track will interpret any maneuver that jerks the trailer as an indication of sway and the restraint felt from the short brake application will normally alert the driver to steer with greater care.

Frequent operation of Tru Track indicates that the car-trailer combination is basically unstable and prone to excessive sway. Tru Track is not designed or intended to correct a basic trailer instability problem; such problems should be corrected at their source, e.g. improper load distribution in the trailer, an inadequate hitch, insufficient or excessive tire pressure, etc.

Installation Location

The best location for the installation of the Tru Track Electric Sway Control is below the front lounge.

Mounting of Sway Control Unit

The installation kit contains three 1/4" hexagonal washer head self-tapping screws for mounting the unit. Using the unit as a template, mark the location of holes in the mounting flange. Select the appropriate drill size and drill pilot holes for the screws in the market locations. Insert screws and tighten until unit is flush to the surface but be careful not to strip threads.

Indicator Light

Actuation of the sway control unit is automatically displayed by the indicator lamp of the brake controller. It is therefore unnecessary to install the dash light provided with the Tru Track Sway Control on vehicles equipped with Midland Ultravac II brake controllers.

Wiring

A cable containing three wires extends from the sway control. These wires are color coded black, blue and white and should be connected to the trailer brakes and trailer battery as shown in Figure (47).

Checkout of Wiring

Before attaching sway control to mounting surface, connect trailer electrical connector to towing vehicle. Observe brake controller indicator lamp while slightly rotating sway control. Momentary lighting of green controller indicator lamp signifies proper wiring of sway control.

IMPORTANT: IF AT ANY TIME THE INDICATOR LAMP REMAINS ON OR SWAY CONTROL IS CONTINUALLY APPLYING TRAILER BRAKES, DISCONNECT SWAY CONTROL UNIT AT POWER SOURCE AND CORRECT PROBLEM.

Sway Control Electrical Schematic

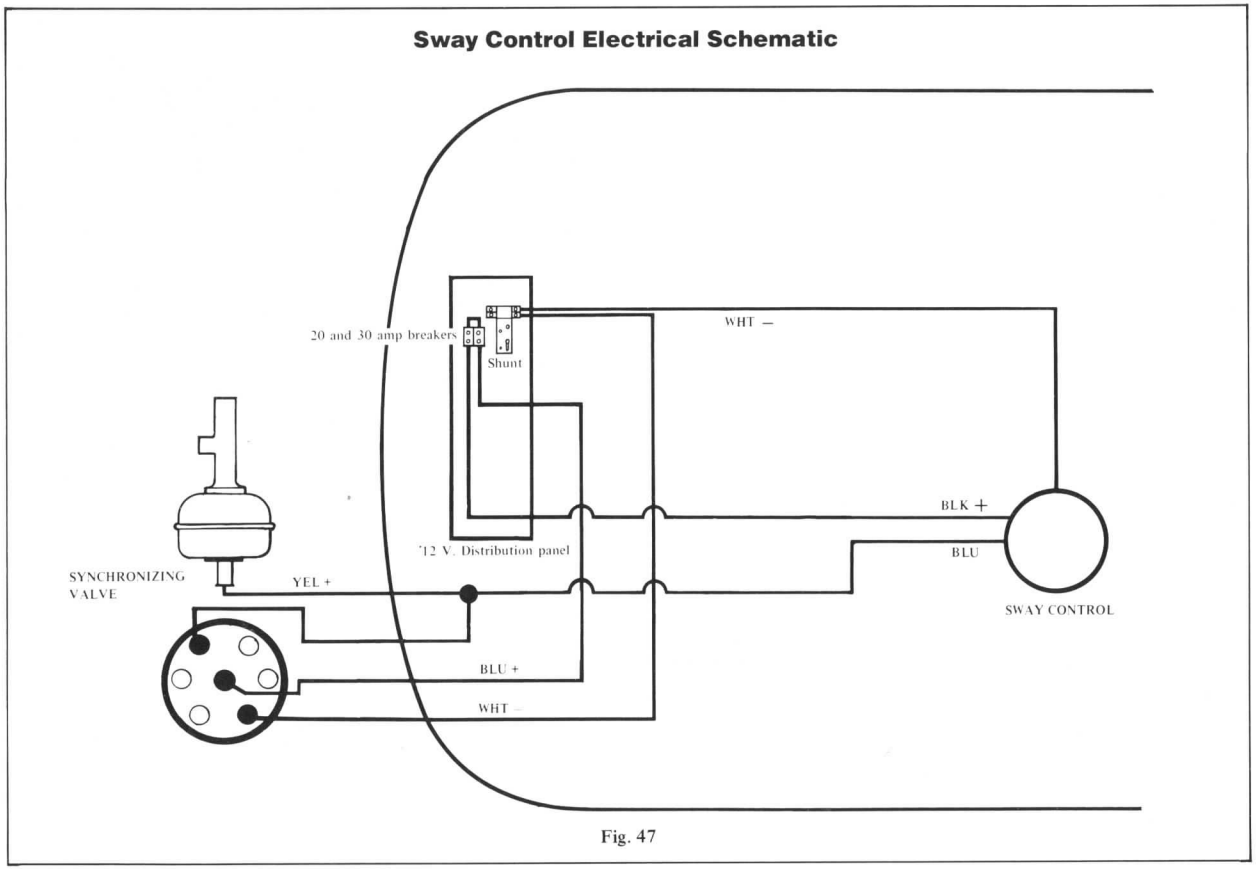


Fig. 47

Troubleshooting the Brake System

1. NOISY TRAILER BRAKES

PROBABLE CAUSE	REMEDY
Considerable use of trailer brakes, particularly using trailer brakes only (glazed linings).	Decelerate from 40 mph to 30 mph ten to fifteen times, using trailer brake only (reburnishes linings)
Lining work to backing plate.	Replace lining assemblies. Check and repair rotor if required.
Dragging brakes	(See "Dragging Brakes" below)
Loose caliper(s).	Check fit on mounting stud and mounting brackets. Check mounting brackets. Tighten all loose bolts.
Excessive lateral run-out of rotor.	Check and repair per "Hub and Rotor" section.
Parallelism of rotor faces not within specification.	Check and repair per "Hub and Rotor" section.
Wheel bearing not adjusted properly.	Adjust wheel bearings.

2. DRAGGING TRAILER BRAKES

PROBABLE CAUSE	REMEDY
Break-away system activated.	Operate brake release valve.
Brake controller not releasing (accompanied by continuously glowing green indicator lamp).	Check controller wiring. Adjust vehicle brake light switch.
Caliper binding on mounting stud.	Remove caliper and clean stud. (See "Caliper Removal" section).
Binding caliper piston.	Repair caliper per instructions.
Restricted brake line(s).	Repair, clean or replace line(s).
Synchronizing valve not releasing.	Check and replace synchronizing valve if necessary.
Power brake booster not releasing.	Check or replace if necessary.
Restricted vacuum line on brake actuator.	Check and repair.
Vacuum supply check valve on tow vehicle malfunctioning.	Check, repair or install properly.

3. GRABBY OR LOCKING TRAILER BRAKES

PROBABLE CAUSE	REMEDY
Trailer brakes too effective.	Reduce sensitivity adjustment on brake controller.
Rusty rotors or moist linings after trailer stowage.	Make several stops to burnish brakes.
Malfunctioning brake controller.	Check controller output. Replace controller if necessary.
Malfunctioning synchronizing valve	Check and replace valve if necessary.
Loose wheel bearings.	Adjust wheel bearings.
Worn rotors.	Check and repair rotors.

4. WEAK TRAILER BRAKES

PROBABLE CAUSE	REMEDY
Brake controller sensitivity set to low.	Increase trailer brake sensitivity adjustment on controller.
Low vacuum.	Repair leakage in brake system vacuum lines. Clean vacuum supply check valve. Improve engine performance to achieve proper manifold vacuum level.
Faulty wiring.	Install proper ground wire. Use proper size wires. Make clean, firm connections.
Low fluid level in trailer brake actuator	Repair leaks in system. Refill reservoir and bleed trailer brake system. Check power booster stroke.
Air in trailer brake hydraulic system.	Bleed hydraulic brake system.
Grease or oil on brake lining.	Check and repair wheel grease seals. Replace linings if necessary.
Hydraulic fluid on lining.	Correct fluid leak. Replace linings if necessary.
Glazed linings.	Decelerate from 40 mph to 30 mph ten to fifteen times, using trailer brakes only (reburnishes linings).
Worn linings.	Replace linings.
Caliper binding on mounting stud.	Remove caliper assembly and clean mounting stud per instructions.
Improper linings.	Replace linings per instructions.
Restricted brake line(s).	Repair or replace line(s).

5. SLOW ACTING TRAILER BRAKES

PROBABLE CAUSE	REMEDY
Dirty synchronizing valve filter.	Clean filter.
Excessive trailer brake power booster stroke.	Check stroke. Repair hydraulic leak, replenish hydraulic fluid, bleed brakes if necessary.
Restricted brake line(s).	Repair or replace line(s).
Restricted vacuum line on brake actuator.	Check and repair.

6. INOPERATIVE BREAK-AWAY SYSTEM

PROBABLE CAUSE	REMEDY
Partially blocked or buckled trailer vacuum inlet line.	Clean, repair, or replace hose and fittings.
Inoperative break-away check valve.	Clean and repair check valve. Install properly.
Vacuum leakage in trailer brake actuator system.	Check and repair vacuum leakage.
Inoperative vacuum supply check valve (tow vehicle).	Check, clean, repair. Install properly.

7. INOPERATIVE TRAILER BRAKES

PROBABLE CAUSE	REMEDY
Hydraulic fluid leakage or low fluid level in trailer brake actuator.	Repair leaks in system, refill reservoir and bleed trailer brake system. Check power booster stroke.
No vacuum in trailer brake actuator.	Connect supply hose. Inspect supply vacuum check valve on tow vehicle for proper orientation. Clean plugged vacuum supply line.
Inoperative brake controller.	Check and correct wiring. Check and correct vehicle stop light switch operation. Check and replace controller if necessary.
Inoperative synchronizing valve.	Check wiring. Clean filter. Check and replace valve if necessary.
Inoperative trailer power brake booster.	Check booster. Replace booster if necessary.
Brake-away check valve installed backwards.	Install break-away check valve properly.

8. TRAILER PULLS TO ONE SIDE WHEN BRAKES ARE APPLIED

PROBABLE CAUSE	REMEDY
Incorrect or uneven tire pressure.	Adjust tire pressure.
Unmatched tires on same axle.	Match tires on same axle.
Restricted brake line(s).	Repair or replace line(s).
Lining glazed.	Decelerate from 40 mph to 30 mph ten to fifteen times using trailer brakes only.
Uneven lining wear.	Replace lining in complete axle sets.
Caliper binding on mounting stud	Remove caliper assembly and clean mounting stud per instructions.
Binding capiper piston.	Repair caliper per instructions
Defective or damaged lining assemblies (grease or brake fluid on linings).	Replace linings in complete axle sets.
Loose calipers.	Check and repair.

9. ENGINE RUNS ROUGH WITH PLUG IN VACUUM SUPPLY LINE

PROBABLE CAUSE	REMEDY
Coupling seal damaged.	Replace coupling.
Vacuum hoses or fittings leaking.	Tighten fittings or replace damaged hose.
Coupling plug not fully engaged.	Properly engage. Clean and lubricate coupling if necessary.

10. ENGINE RUNS ROUGH WHEN TRAILER SUPPLY HOSE IS CONNECTED

PROBABLE CAUSE	REMEDY
Couplings not fully engaged.	Properly engage. Clean and lubricate per instructions.
Coupling seal damaged.	Replace coupling.
Vacuum hoses or fittings leaking.	Tighten fittings or replace hose if necessary.
Malfunctioning synchronizing valve.	Check and replace valve if necessary.

11. ENGINE RUNS ROUGH ONLY WHEN TRAILER SUPPLY HOSE IS CONNECTED AND TRAILER BRAKES ARE ACTUATED

PROBABLE CAUSE	REMEDY
Malfunctioning trailer power brake booster.	Check and repair or replace booster if necessary.
Malfunctioning synchronizing valve.	Check and replace valve if necessary.

12. GREEN INDICATOR LAMP ON BRAKE CONTROLLER GLOWS WHEN BRAKES ARE NOT BEING APPLIED.

PROBABLE CAUSE	REMEDY
7-way connector or wiring terminals contaminated with moisture and salt or dirt.	Clean, dry and lubricate contacts and terminals.
Red controller wire improperly connected (new installations).	Connect red wire to "Off" side of vehicle brake light switch.
Activation of sway control on trailer is being indicated by green lamp.	Correct sway control unit if necessary.
If vehicle brake lights are simultaneously on, vehicle brake switch may be improperly adjusted or defective.	Adjust vehicle brake light switch per manufacturer's instructions.
Brake wire (yellow) shorted to positive electrical wire at some point.	Correct wiring problem.
If green lamp glows, with the red and yellow wires disconnected, the brake controller is defective.	Replace brake controller.

Adaptor Tee Application Chart

Year	Model	Type Brake	Kelsey No.	Weatherhead No.
AMERICAN MOTORS CORPORATION				
1976-71	All	All types	78499 (1)	7906
1971-66	All	All types	78994	7829
1965 & earlier	All with 3/16" line	All types	42324	
1965 & earlier	All with 1/4" line	All types	42323	
CHRYSLER CORPORATION				
1976-67	All	All types	78498 (2)	7905
1966 & earlier	All	All types	47772	
DODGE TRUCK				
1976-67	A-100, D-100; D-200 w/power disc	All types	78498	7905
1976-67	D-200, D-300	All types	42323 (3)	7900
FORD MOTOR COMPANY				
1976-74	Comet, Granada, Maverick, Mustang, Montego, Pinto	All types	94971 (6)	7914
1976-74	Cougar, Ford, Mercury, Thunderbird, Torino	All exc. disc F & R	78499	7906
1976-75	Mercury, Lincoln, Mark IV, Thunderbird	All disc F & R	94971 (7)	7914
1974	All except Mustang, Comet/Maverick & Pinto	All types	78499	7906
1974	Mustang, Comet, Maverick & Pinto	All types	94971	7914
1973	All except Cougar/Mustang (Manual) Comet/Maverick & Pinto	All types	78499	7906
1973	Cougar/Mustang	Drum (manual)	42324	7900
1973	Comet/Maverick & Pinto	All types	78496	7903
1972-69	All except std. Ford, Mercury & Meteor	Disc	78499	7906
1972-69	Std. Ford, Mercury & Metero	Disc	78496	7903
1972-69	All	Drum (manual)	78496	7903
1972-69	All	Drum (power)	78499	7906
1968-67	All	Disc	78499 (4)	7906
1968-67	Fairlane, Falcon & Comet	Drum (manual)	78496	7903
1968-67	Fairlane, Falcon & Comet	Drum (power)	78499	7906
1968-67	Ford, Mercury, Meteor, Mustang & Cougar	Drum (man. & pwr.)	78496	7903
1966 & earlier	All with 3/16" line	All types	42324	7900
1966 & earlier	All with 1/4" line	All types	42323	7900
FORD TRUCK				
1976	E-100, E-150 (Nantucket built)	All types	94971	7914
1976	E-250, E-350 (Nantucket built)	All types	78496	7903
1976-73	E-100, E-200, E-300 (Econoline)	All types	78496	7903
1976-73	F-100 except 4 WD, F-250 up to 6200 GVW	All types	94971	7914
1976-73	Bronco, F-100 4WD, F-250 over 6200 GVW	All types	78496	7903
1976-73	P-350, P-400	All types	78499	7906
FORD TRUCK (continued)				
1976-67	F-350	All types	78496	7903
1972-69	F-100, F-250, F-350, P-100, Bronco & Econoline	All types	78496	7903
1968-67	F-100, F-250, P-100, Bronco, Econoline	Drum (man & pwr.)	78499	7906
1968-67	F-350	Drum (man & pwr.)	78496	7903
1966 & earlier	All with 3/16" line	All types	42324	7900
1966 & earlier	All with 1/4" line	All types	42323	7900
GENERAL MOTORS CORPORATION				
1976-67	All	All types	78497	7904
1966 & earlier	All with 3/16" line	All types	42324	7900
1966 & earlier	All with 1/4" line	All types	42323	7900
CHEVROLET & GMC TRUCKS				
1975-67	All	All types	78497	7904
1966 & earlier	All with 3/16" line	All types	42324	7900
1966 & earlier	All with 1/4" line	All types	42323	7900
INTERNATIONAL HARVESTER CORPORATION				
1976-74	100, 200, Scout	3.1 disc	78496	7903
1976-74	200	3.38 disc & drum	78499	7906
1973-72	Travel-All & International 1010	Disc	78496	7903
1973-69	Travel-All	Drum	78499	7906
1973-69	Scout	All types	78499	7906
1973-67	Scout	Drum	78994 (5)	7829
1968-67	900, 1000, 1100, 1200, 1300	All types	78497	7904
1966 & earlier	All with 3/16" line	All types	42324	7900
1966 & earlier	All with 1/4" line	All types	42323	7900
JEEP CORPORATION				
1976-67	Universal Jeep	Drum	42324 (8)	7900
1976-67	Gladiator, Wagoneer, C-101	All types	78499 (8)	7906
1966 & earlier	All with 3/16" line	All types	42324	7900
1966 & earlier	All with 1/4" line	All types	42323	7900

(1) Running Change during 1971 Model Year.
(2) 1970-69 Coronet or Belvedere station wagon w/383 or 440 engines has inboard port; clearance between manifold and hydraulic line must be greater than 3/4 inch.
(3) 1974-67 may be inserted at the rear brake side of the failure lamp switch.
(4) Some 1968-67 Ford, Mercury & Meteor sedan models with disc brakes use K-H Tee Fitting #78496.
(5) Must be inserted at the failure lamp switch.
(6) 1975 1/2 Granada, Monarch w/disc F & R and all others w/power brakes use 42324, Montego use 78499
(7) Lincoln w/disc front, drum rear use 94971.
(8) Installation for American Motor Corp. for 1967 and later model cars.

Disc Brake Booster Shroud Assembly

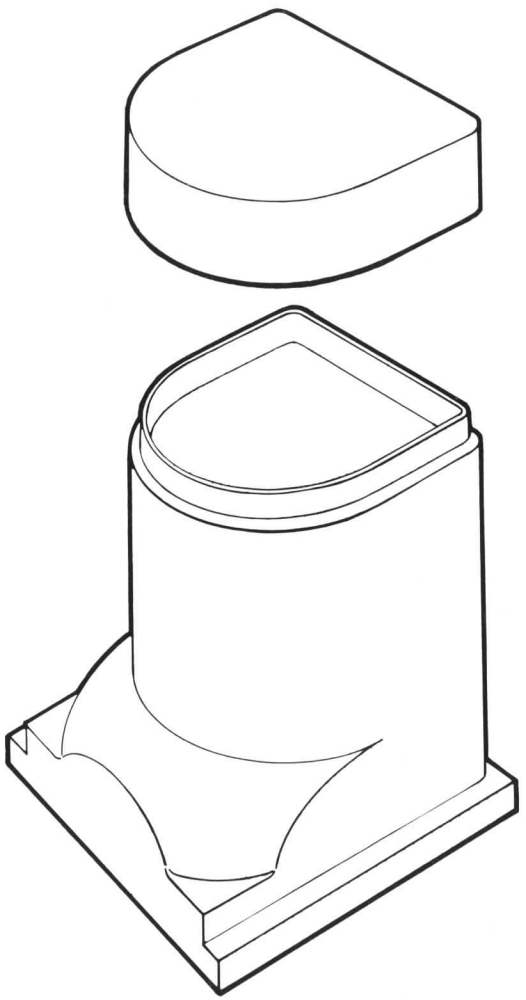


Fig. 48

No.	Part No.	Description
–	200277	Vacuum booster cover assembly