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Econoline

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**SPECIFICATIONS AND SPECIAL SERVICE TOOLS
AT END OF EACH GROUP**

FOREWORD

This shop manual provides the Service Technician with complete information for the proper servicing of the 1965 Econoline, Falcon Station Bus and Club Wagons.

The information is grouped according to the type of work being performed, such as diagnosis and testing, frequently performed adjustments and repairs, in-vehicle adjustments, overhaul, etc. Specifications and recommended special tools are included.

Refer to the opposite page for important vehicle identification data.

The descriptions and specifications in this manual were in effect at the time this manual was approved for printing. The Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design, without notice and without incurring obligation.

**SERVICE DEPARTMENT
FORD MOTOR COMPANY**



VEHICLE IDENTIFICATION

GROUP 1

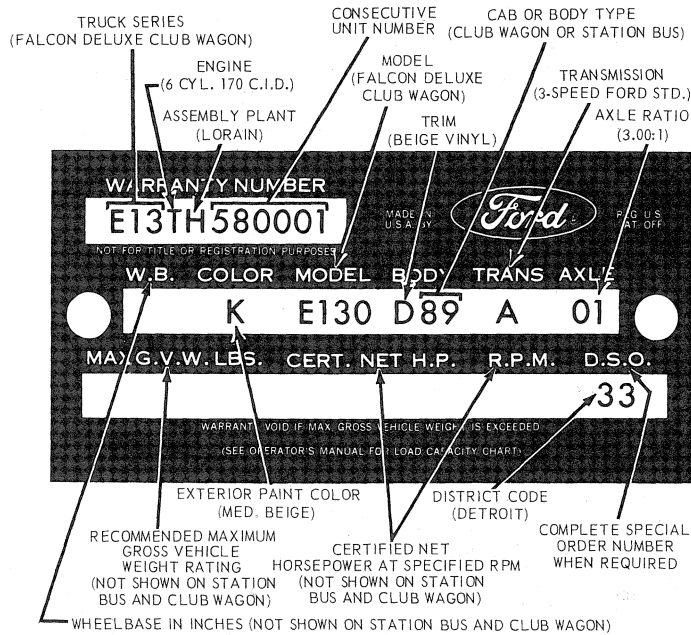


FIG. 1 - Typical Rating Plate

P 1114-C

Figure 1 illustrates the Econoline Rating Plate. The rating plate is attached to the rear (lock) face of the left front door. The official serial number, for title and registration purposes, is stamped on the right rear quarter body reinforcement gusset near the spare wheel retaining bracket. The official serial number is preceded and followed by an asterisk to prevent unauthorized altering of numbers or symbols. Do not use the Vehicle Warranty Number which appears on the Warranty Plate for title or registration purposes.

VEHICLE DATA

The Vehicle Data appears on the Rating Plate on the two lines following the Warranty Number. The first three digits under W.B. identify the wheel base in inches. The one or two letters under COLOR identify the exterior paint color (two letters designate a two-tone). The letter and three digits under MODEL designate the truck type within a series. The letter and numerals under BODY, designate the interior trim and body type. The letter identifies the interior trim scheme and the two numerals identify the body or cab type. The transmission installed in the vehicle is identified under TRANS by a letter code. The axle ratio is identified by either a letter and a number or two numbers under AXLE. Falcon Station Buses and Club Wagons will not show the code information under W.B. (wheelbase), MAX. G.V.W. LBS. (maximum gross vehicle weight pounds), CERT. NET H.P. (certified net horsepower) or R.P.M. (at revolutions per minute). The District Code (two-digit number), which appears between R.P.M. and D.S.O., identifies the district which ordered the vehicle. The numerals under D.S.O. reflect the Special Order Number (if the unit is other than standard production). The charts that follow list in detail the various vehicle data codes.

VEHICLE WARRANTY NUMBER

The Warranty Number is the first line of numbers and letters appearing on the Rating Plate. (Fig. 1). The first letter and two numbers indicate the truck series. The letter following the truck series code designates the engine identification code. The letter following the engine identification code indicates the assembly plant at which the vehicle was built. The remaining numbers indicate the consecutive unit number. The charts that follow, list the various vehicle warranty number codes.

SERIES AND MODEL CODES

Series	Model	Type
E10	E-100	Regular Pick-Up
	E-104	Heavy Pick-Up
E11	E-110	Std. Station Bus
E12	E-120	Custom Club Wagon
E13	E-130	Deluxe Club Wagon
E14	E-143	Regular Van
	E-144	Heavy Van
E15	E-150	Panel Van

ASSEMBLY PLANT CODES

Code	Assembly Plant
A	Atlanta
D	Dallas
E	Mahwah
G	Chicago
H	Lorain
J	Los Angeles
K	Kansas City
L	Michigan Truck
N	Norfolk
P	Twin Cities
	San Jose
	Pilot Plant
	Metuchen
	Louisville
	Wayne
	Wixom
	St. Louis

CONSECUTIVE UNIT NUMBER

Basically, the system assigns the monthly assignment of serial numbers into blocks as follows, beginning with August 1964:

August	580,000 thru 587,999
September	588,000 thru 599,999
October	600,000 thru 611,999
November	612,000 thru 623,999
December	624,000 thru 635,999
January	636,000 thru 647,999
February	648,000 thru 659,999
March	660,000 thru 671,999
April	672,000 thru 683,999
May	684,000 thru 695,999
June	696,000 thru 707,999
July	708,000 thru 719,999
August	720,000 thru 731,999

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W.B. (WHEELBASE)

The wheelbase in inches is entered in this space. The Falcon bus and Club Wagon wheelbase will not be recorded.

EXTERIOR PAINT COLOR CODES

Code	M-30J/M-32J* Spec. Number	Color
A	1734-A	Black
B	556-A	Turquoise
C	1525-A	Special White (RPO)
G	1526-A	Chrome Yellow
J	1515-A	Red
K	1706-A	Tan
L	1237-A	Dk. Green
M	1619-A	White
O	1732-A	Lt. Peacock
P	1738-A	Palomino Met.
V	1729-A	Yellow
W	1742-A	Med. Blue

*"M-32-J" Acrylic Paint Alternate with "M-30-J"

INTERIOR TRIM CODES

Code	Trim Scheme
2	Blue Vinyl
3	Green Vinyl
4	Beige Vinyl
5	Red Vinyl
B	Blue Woven Plastic and Blue Vinyl
C	Green Woven Plastic and Green Vinyl
E	Red Woven Plastic and Red Vinyl

**BODY CODES
ECONOLINE**

A87	Standard Pick-up
B87	Custom Pick-up
A89	Standard Van
E89	Std. Van R.H. Fixed Window
F89	Std. Van R & L Fixed Windows
G89	Std. Van R & L Doors

FALCON STATION BUS AND CLUB WAGONS

B89	Standard Station Bus
C89	Custom Standard Bus
D89	Club Wagon

TRANSMISSION

Code	
G	3-Speed Manual-Shift
A	C-4 Automatic
F	4-Speed Manual-Shift

AXLE

Code	Ratio
01	3.50
02	4.00
03	4.11
04	4.55

The following information (except District Code) does not apply to the Falcon Station Bus or Club Wagon warranty plates.

MAX. G.V.W. LBS.

The maximum gross vehicle weight in pounds is recorded in this space.

CERT. NET H.P. R.P.M.

The certified net horsepower at specified rpm is marked at this location.

D.S.O.

If the vehicle is built on a D.S.O., F.S.O., L.P.O. (special orders) the complete order number will be reflected under the DSO space including the District Code Number.

DISTRICT CODE

Code	District
11	Boston
12	Buffalo
13	New York
14	Pittsburgh
15	Newark
21	Atlanta
22	Charlotte
23	Philadelphia
24	Jacksonville
25	Richmond
26	Washington
31	Buffalo
32	Cleveland
33	Detroit
34	Indianapolis
35	Lansing
36	Louisville
41	Chicago
42	Fargo
43	Rockford
44	Twin Cities
45	Davenport
51	Denver
52	Des Moines
53	Kansas City
54	Omaha
55	St. Louis
61	Dallas
62	Houston
63	Memphis
64	New Orleans
65	Oklahoma City
71	Los Angeles
72	San Jose
73	Salt Lake City
74	Seattle
81	Ford of Canada
83	Government
84	Home Office Reserve
85	American Red Cross
89	Transportation Services
90-99	Export



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BRAKES

GROUP 2

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PART 2-1 GENERAL BRAKE SERVICE

Section	Page	Section	Page
1 Diagnosis and Testing	2-1	3 Cleaning and Inspection	2-3
2 Common Adjustments and Repairs	2-1		

1 DIAGNOSIS AND TESTING

PRELIMINARY TESTS

1. Check the fluid level in the master cylinder and add FoMoCo heavy-duty brake fluid as required.

2. Push the brake pedal down as far as it will go while the vehicle is standing. If the brake pedal travels more than halfway between the released position and the floor, check the operation of the automatic adjusters. To check adjuster operation, inspect the brake shoes and the adjuster mechanisms for binding or improper installation, follow the procedure described under "Brake Shoe Adjustments" in Part 2-2, Section 2.

Make several reverse stops to insure uniform adjustment at all wheels.

3. If the brake pedal movement feels spongy, bleed the hydraulic system to remove air from the lines and cylinder. Refer to "Hydraulic System Bleeding". Also, check for leaks or insufficient fluid.

4. Should one of the brakes be locked and the vehicle must be moved, open the brake cylinder bleeder screw long enough to let out a few drops of brake fluid. **This bleeding operation will release the brakes, but it will not correct the cause of the trouble.**

ROAD TEST

The vehicle should be road tested only if the brakes will safely stop the vehicle. Apply the brakes at a speed of 25-30 mph to check for the existence of the trouble symptoms listed in Table 1, with the exception of those resolved in the preliminary tests and brake chatter. For each of the symptoms encountered, check and eliminate the causes which are also listed in Table 1. To check for brake chatter or surge, apply the brakes lightly from approximately 50 mph.

2 COMMON ADJUSTMENTS AND REPAIRS

BRAKE PEDAL ADJUSTMENT

When the brake pedal free-travel is the movement of the brake before the push rod touches

the free-travel is not within specifications, raise the front end of the truck and position safety stands.

2. From underneath the truck, remove the retaining bolts and the forward splash shield.

3. Loosen the locknut on the eccentric bolt and rotate the bolt (Fig. Part 2-2) until the free-travel is in $\frac{1}{4}$ - $\frac{7}{16}$ inch.

4. Hold the bolt securely, and torque the locknut to 12-24 ft-lbs.

5. Recheck the pedal free-travel to make sure that the adjustment did not change when the locknut was tightened.

6. Install the forward splash shield and retaining bolts, remove the safety stands, and lower the vehicle.

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TABLE 1—Brake Trouble Symptoms and Possible Causes

Possible Causes of Trouble Symptoms	Trouble Symptoms												
	One Brake Drags	All Brakes Drag	Hard Pedal	Spongy Pedal	Vehicle Pulls to One Side	One Wheel Locks	Brakes Chatter	Excessive Pedal Travel	Pedal Gradually Goes to Floor	Brakes Uneven	Shoe Click After Release	Noisy or Grabbing Brakes	Brakes Do Not Apply
Mechanical Resistance at Pedal or Shoes		X	X					X					
Brake Line Restricted	X	X	X		X								
Leaks or Insufficient Fluid				X				X	X				X
Improper Tire Pressure					X					X			
Improperly Adjusted or Worn Wheel Bearings	X				X								
Distorted or Improperly Adjusted Brake Shoe	X	X	X		X	X		X			X	X	
Faulty Retracting Spring	X				X								
Drum Out of Round	X				X		X						
Linings Glazed or Worn			X		X	X	X			X	X	X	
Oil or Grease on Lining			X		X	X	X		X		X	X	
Loose Carrier Plate	X					X	X						
Loose Lining							X						
Scored Drum									X		X		
Dirt on Drum-Lining Surface											X		
Faulty Brake Cylinder	X				X	X					X		
Dirty Brake Fluid	X	X							X				X
Faulty Master Cylinder		X						X	X				X
Air in Hydraulic System	X			X				X					X
Self Adjusters Not Operating					X			X					
Insufficient Shoe-to-Carrier Plate Lubrication	X												X
Tire Tread Worn						X				X			
Poor Lining to Drum Contact							X						
Loose Front Suspension							X						
Threads Left by Drum Turning Tool Pulls Shoes Sideways										X			
Cracked Drum								X					

HYDRAULIC SYSTEM BLEEDING

When any part of the hydraulic system has been disconnected for repair or replacement air may enter the system and cause spongy pedal action. Bleed the hydraulic system after it has been properly connected to be sure that all air is expelled.

The hydraulic system can be bled manually or with pressure bleeding equipment.

MANUAL BLEEDING

Bleed the longest lines first. Keep the master cylinder reservoir filled with new heavy-duty brake fluid during the bleeding operation.

cylinder. Attach a rubber drain tube to the bleeder fitting. **The end of the tube should fit snugly around the bleeder fitting.**

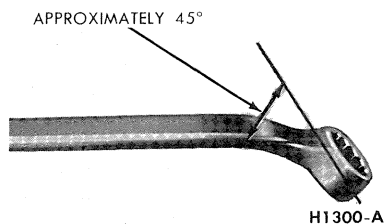


FIG. 1—Wrench for Bleeding Brake Hydraulic System

- Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting approximately 3/4 turn.
- Push the brake pedal down slowly thru its full travel. Close the

bleeder fitting, then return the pedal to the fully-released position. Repeat this operation until air bubbles cease to appear at the submerged end of the bleeder tube.

4. When the fluid is completely free of air bubbles, close the bleeder fitting and remove the bleeder tube.

5. Repeat this procedure at each brake wheel cylinder in the following order: left rear, right front, and left front. Refill the master cylinder reservoir after each wheel cylinder is bled and when the bleeding operation is completed. The fluid level should be within 3/8 inch from the top of the reservoir.

PRESSURE BLEEDING

Bleed the longest lines first. **Never use brake fluid which has been drained from the hydraulic system.** The bleeder tank should contain

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enough new heavy-duty brake fluid to complete the bleeding operation, and it should be charged with 10-30 pounds of air pressure.

1. Clean all dirt from the master cylinder reservoir cap.

2. Remove the master cylinder reservoir cap, install an adapter cap to the reservoir, and attach the bleeder tank hose to the fitting on the adapter cap. Adapter cap tool 2162 can be used, or an adapter cap can be fabricated by cutting a hole in the center of a filler cap and soldering a fitting at the hole.

3. Position a $\frac{3}{8}$ -inch box wrench (Fig. 1) on the bleeder fitting on the right rear brake wheel cylinder. Attach a bleeder tube to the bleeder fitting. **The end of the tube should fit snugly around the bleeder fitting.**

4. Open the valve on the bleeder tank to admit pressurized brake fluid to the master cylinder reservoir.

5. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting.

6. When air bubbles cease to appear in the fluid at the submerged end of the bleeder tube, close the bleeder fitting and remove the tube.

7. Repeat this procedure at each brake wheel cylinder in the following order: left rear, right front, and left front.

8. When the bleeding operation is completed, close the bleeder tank valve and remove the tank hose from the adapter fitting.

9. Remove the adapter cap, refill the master cylinder reservoir to within $\frac{3}{8}$ inch from the top of the reservoir, and install the filler cap.

PARKING BRAKE LINKAGE ADJUSTMENT

Check the parking brake cables when the brakes are fully released.

If the cables are loose, adjust them as follows.

1. Fully release the parking brake by turning the handle counterclockwise and pushing it down.

2. Pull the parking brake handle up one notch from its normal released position.

3. Raise the vehicle.

4. Turn the lock nut in front of the equalizer (Fig 12, Part 2-2) several turns forward.

5. Turn the adjusting nut forward against the equalizer until a moderate drag is felt when turning the rear wheels in the direction of forward rotation.

6. When the cables are properly adjusted, tighten the lock nut.

7. Release the parking brake, and make sure that the brake shoes return to the fully released position and no drag is felt when turning the rear wheels.

3 CLEANING AND INSPECTION

BRAKE ASSEMBLY

1. Remove the wheel from the drum, then remove the drum as outlined in Part 2-2, Section 2. Wash all the parts except the brake shoes in a cleaning fluid and dry them with compressed air.

2. Brush all dust from the backing plates and the interior of the brake drums.

3. Inspect the brake shoes for excessive lining wear or shoe damage. If the lining is worn to within $\frac{1}{32}$ inch of any rivet head or if the shoes are damaged, they must be replaced. Replace any lining that has been oil

saturated. Replace lining in axle sets. Prior to replacement of lining, the drum diameter should be checked to determine if oversize linings must be installed.

4. Check the condition of the brake shoes, retracting springs, and drum for signs of overheating. If the springs show any loss of load or change in free length, indicating overheating, replacement of the retracting and hold down springs is necessary. **Overheated springs lose their pull and could cause the new lining to wear prematurely, if they are not replaced.**

5. If the vehicle has 24,000 or more miles of operation on the brake linings or signs of overheating are present when relining brakes, the wheel cylinders should be disassembled and inspected for wear and entrance of dirt into the cylinder. The cylinder cups should be replaced at this time to avoid future problems.

6. Inspect all other brake parts and replace any that are worn or damaged.

7. Inspect the brake drums and, if necessary, refinish them. Refer to Part 2-2, Section 4 for refinishing.

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PART 2-2 BRAKE SYSTEM

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1 DESCRIPTION AND OPERATION

HYDRAULIC SELF ADJUSTING BRAKE SYSTEM

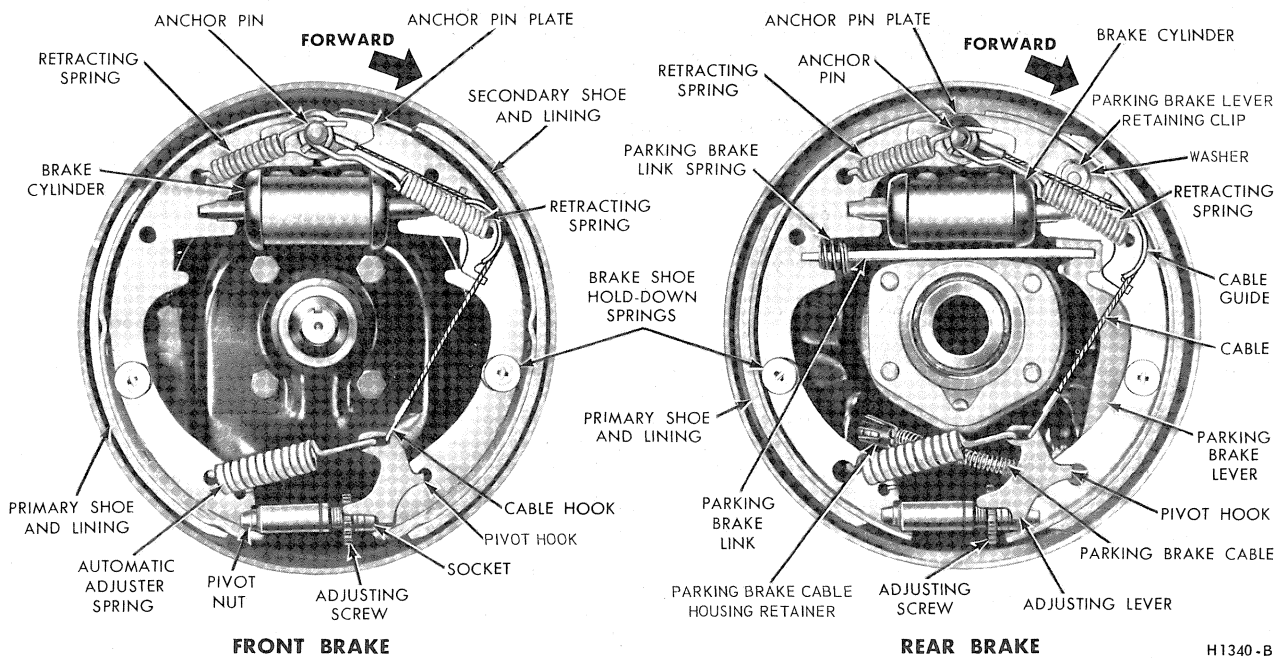


FIG. 1—Self-Adjusting Brake Assemblies

Single-anchor, internal-expanding, and self-adjusting hydraulic brakes are used on Econoline vehicles.

The master cylinder converts physical force from the brake pedal and booster into hydraulic pressure against the pistons in the wheel cylinders. The wheel cylinder pistons in turn convert hydraulic pressure back into physical force at the brake shoes.

The self-adjusting brake mechanism consists of a cable, cable guide, parking lever, and adjuster spring. The cable is hooked over

The automatic adjuster operates only while the vehicle is moving rearward and the brake pedal pressure is firmly applied.

With the vehicle moving rearward and the brakes applied, the "wrap-around" action of the shoes following the drum forces the upper end of the primary shoe against the anchor pin. The action of the wheel cylinder moves the upper end of the secondary shoe away from the anchor pin. The movement of the secondary shoe causes the cable to pull the adjusting lever upward and against the end of a tooth on the adjusting screw star-wheel. The upward travel of the lever increases as lining wear increases. When the lever can move forward far enough it passes over the end of the tooth and engages the

tooth. When the brakes are released, the adjuster spring pulls the lever downward causing the star-wheel to turn and expand the shoes. The star-wheel is turned one tooth at a time as the linings progressively wear.

With the vehicle moving forward and the brakes applied, the secondary shoe is against the anchor pin and the primary shoe is moved toward the drum. Therefore, the adjuster does not operate.

The rear brake assembly is basically the same as the front brake. The conventional parking brake lever, link, and spring are used in the rear brake.

The anchor pins on all brakes are fixed and non-adjustable.

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PARKING BRAKE

An independent hand-operated parking brake control actuates the rear wheel brake shoes through a cable linkage. The operating cable is routed from the parking brake control assembly to the equalizer

lever which is attached to the equalizer assembly. The rear brake cables connect the equalizer assembly to the parking brake lever at each rear secondary shoe as shown in Fig. 1.

When the handle is pulled the primary and secondary brake shoes are

forced against the rear brake drums. The handle is held in the applied position by the engagement of a spring loaded pawl with a ratchet. Turning the handle counterclockwise disengages the pawl from the ratchet to release the brakes.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS**BRAKE SHOE ADJUSTMENT**

The hydraulic service brakes are self-adjusting and require a manual adjustment only after the brake shoes have been relined, replaced, or when the length of the adjusting screw has been changed while performing some other service operation.

The brake drums should be at normal room temperature when adjusting the brake shoes. If the shoes are adjusted when the drums are hot and expanded, the shoes may drag when the drums are cool and contracted.

1. After the shoes have been installed or the adjusting screw has been turned, install the drum. Be sure that all excess grease, oil, and other foreign material are wiped off the backing plate and drum.

Before installing the brake drum on the front wheel spindle, wipe the spindle completely free of grease. Install the drum carefully so that the grease seal retainers within the hub will not be damaged.

2. Remove the adjusting hole cover from the backing plate. Working from the backing plate side, turn the adjusting screw upward to expand the shoes (Fig. 2). Expand

the shoes until a drag is felt when the drum is rotated.

3. **Remove the drum.** Mark the tooth on the star-wheel where the adjusting lever contacts it. While holding the adjusting lever out of engagement with the adjusting screw, back off the adjusting screw $\frac{3}{4}$ of a turn with the fingers. If finger movement will not turn the screw, free it up; otherwise, the self-adjusting lever will not turn the screw. Lubricate the screw with a thin uniform coating of C4AZ-19590-A grease.

Any other adjustment procedure may cause damage to the adjusting screw with consequent self adjuster problems.

4. Apply a small quantity of high-temperature grease to the points where the shoes contact the carrier plate, being careful not to get the lubricant on the linings. Install the drum.

On front wheels, install the wheel outer bearing, washer, and adjusting nut, then adjust the wheel bearings as outlined in Part 3-4, Section 2.

On the rear wheels, install the three Tinnerman nuts and tighten securely.

5. Install the wheel on the drum and tighten the mounting nuts to specification.

6. Install the adjusting hole cover on the brake carrier plate.

7. When adjusting the rear brake shoes, check the parking brake cables for proper adjustment. Make sure that the equalizer lever operates freely.

8. After the brake shoes have been properly adjusted, check the operation of the brakes.

FRONT BRAKE DRUM**REMOVAL**

1. Raise the vehicle so that the wheel is clear of the floor.

2. Remove the wheel cover or hub cap, wheel, and bearing dust cap.

Remove the cotter pin, nut lock, nut, and washer.

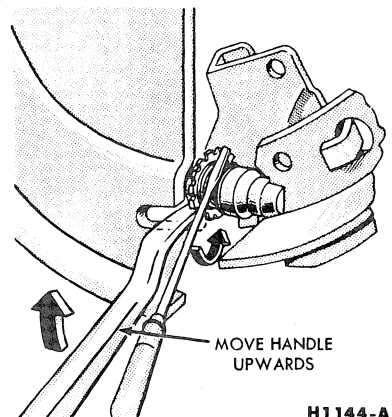
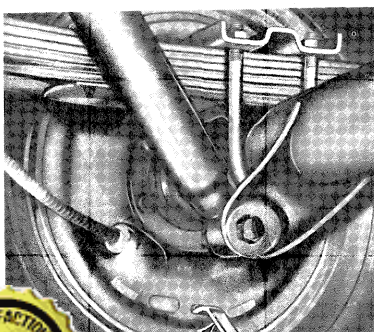
3. Pull the brake drum approximately two inches forward and push back into position. Remove the wheel bearing and withdraw the brake drum.

If the brake drum will not come off, insert a narrow screwdriver through the brake adjusting hole in the carrier plate, and disengage the adjusting lever from the adjusting screw. While thus holding the adjusting lever away from the adjusting screw, back off the adjusting screw with the brake adjusting tool (Fig. 3). **Back off the adjustment only if the drum cannot be removed. Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise, the self adjusting mechanism will not function properly.**

If the adjusting screw was backed off, check to make sure that the adjusting lever is still properly seated in the shoe web.

INSTALLATION

1. If the drum is being replaced, remove the protective coating from the new drum with carburetor degreaser. Install new bearings and



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FIG. 3—Backing Off Brake Adjustment

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grease retainer. Soak the new grease retainer in light engine oil at least 30 minutes before installation. Pack the wheel bearings, install the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer. See Part 3-4, Section 4.

If the original drum is being installed, make sure that the grease in the hub is clean and adequate.

2. Install the drum assembly, outer wheel bearing, washer and adjusting nut.

3. Adjust the wheel bearing as outlined in Part 3-1, Section 2. Install the nut lock and cotter pin. Then install the grease cap.

4. Install the wheel and hub cap. If the adjustment was backed off, adjust the brake as outlined under "Brake Shoe Adjustment".

REAR BRAKE DRUM

REMOVAL

1. Raise the truck so that the wheel is clear of the floor.

2. Remove the hub cap and wheel and tire assembly. Remove the three Tinnerman nuts and remove the brake drum.

If the brake drum will not come off, insert a narrow screw driver through the brake adjusting hole in the carrier plate, and disengage the adjusting lever from the adjusting screw. While thus holding the adjusting lever away from the adjusting screw, back off the adjusting screw with the brake adjusting tool (Fig. 3). **Back off the adjustment only if the drum cannot be removed. Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise, the self adjusting mechanism will not function properly.**

If the adjusting screw was backed off, check to make sure that the adjusting lever is still properly seated in the shoe web.

INSTALLATION

1. Remove the protective coating from a new drum with carburetor de-

against the drum, and tighten the retaining nuts to specifications.

BRAKE SHOE AND ADJUSTING SCREW

REMOVAL

1. With the wheel and drum removed, install a clamp over the ends of the brake cylinder as shown in Fig. 4.

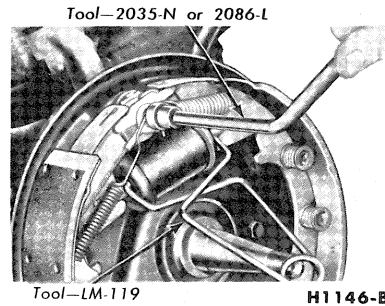


FIG. 4—Typical Retracting Spring Removal

2. Contract the shoes as follows:
a. Disengage the adjusting lever from the adjusting screw by pulling backward on the adjusting lever (Fig. 1).

b. Move the outboard side of the adjusting screw upward and back off the pivot nut as far as it will go.

3. Pull the adjusting lever, cable and automatic adjuster spring down and toward the rear to unhook the pivot hook from the large hole in the secondary shoe web. **Do not attempt to pry the pivot hook out of the hole.**

4. Remove the automatic adjuster spring and adjusting lever.

On front brakes, remove the shoe retracting assist spring.

5. Remove the secondary shoe to anchor spring with the tool shown in Fig. 5. With the same tool, remove the primary shoe to anchor spring and unhook the cable anchor.

6. Remove the cable guide from the secondary shoe (Fig. 1).

7. Remove the shoe hold-down springs, shoes, adjusting screw, pivot nut, and socket.

8. On rear brakes, remove the parking brake link and spring. Disconnect the parking brake cable from the parking brake lever.

9. After removing the rear brake secondary shoe, disassemble the parking brake lever from the shoe

by removing the retaining clip and spring washer (Fig. 1).

INSTALLATION

1. Before installing the rear brake shoes, assemble the parking brake lever to the secondary shoe and secure with the spring washer and retaining clip.

2. Apply a light coating of high-temperature grease at the points where the brake shoes contact the carrier plate.

3. Position the brake shoes on the carrier plate, and install the hold-down spring pins, springs, and cups. Use aluminum colored springs for the primary shoe and purple springs for the secondary shoe. On the rear brake, install the parking brake link, spring, and washer. Connect the parking brake cable to the parking brake lever (Fig. 1).

4. Place the cable anchor over the anchor pin with the crimped side toward the carrier plate.

5. Install the primary shoe to anchor (short) spring with the tool shown in Fig. 5.

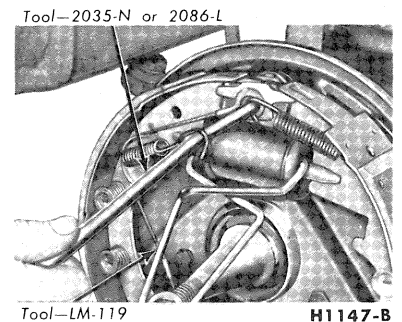


FIG. 5—Typical Retracting Spring Installation

6. Install the cable guide on the secondary shoe web with the flanged hole fitted into the hole in the secondary shoe web. Thread the cable around the cable guide groove (Fig. 1).

It is imperative that the cable be positioned in this groove and not between the guide and the shoe web.

7. Install the secondary shoe to anchor (long) spring (Fig. 5).

Be certain that the cable end is not cocked or binding on the anchor pin when installed. All parts should be flat on the anchor pin. Remove the brake cylinder clamp.

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On front brakes, install the shoe retracting assist spring.

8. Apply high-temperature (C4AZ-19590-A) grease to the threads of the socket end of the adjusting screw. Turn the adjusting screw into the adjusting pivot nut to the limit of the threads and then back off 1/2 turn.

Interchanging the brake shoe adjusting screw assemblies from one side of the truck to the other would cause the brake shoes to retract rather than expand each time the automatic adjusting mechanism operated. To prevent installation on the wrong side of the truck, the socket end of the adjusting screw is stamped with an R or L (Fig. 6) The adjusting pivot nuts can be distinguished by the number of lines machined around the body of the nut. Two lines indicate a right-hand nut; one line indicates a left-hand nut.

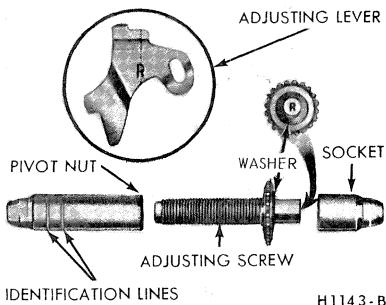


FIG. 6—Adjusting Screw and Lever Identification

9. Place the adjusting socket on the screw and install this assembly between the shoe ends with the adjusting screw nearest the secondary shoe.

10. Hook the cable hook into the hole in the adjusting lever from the backing plate side. The adjusting levers are stamped with an R or L to indicate their installation on a right or left-hand brake assembly (Fig. 6).

11. Position the hooked end of the adjuster spring into the large hole in the primary shoe web, and connect the loop end of the spring to the adjuster lever hole.

section of the cable between the cable guide and the adjusting lever toward the secondary shoe web far enough to lift the lever past a tooth on the adjusting screw wheel. The lever should snap into position behind the next tooth, and release of the cable should cause the adjuster spring to return the lever to its original position. This return action of the lever will turn the adjusting screw one tooth.

If pulling the cable does not produce the action described, or if the lever action is sluggish instead of positive and sharp, check the position of the lever on the adjusting screw toothed wheel. With the brake in a vertical position (anchor at the top), the lever should contact the adjusting wheel one tooth above the center line of the adjusting screw. If the contact point is below this center line, the lever will not lock on the teeth in the adjusting screw wheel, and the screw will not be turned as the lever is actuated by the cable.

To determine the cause of this condition:

a. Check the cable end fittings. The cable should completely fill or extend slightly beyond the crimped section of the fittings. If it does not meet this specification, possible damage is indicated and the cable assembly should be replaced.

b. Check the cable length. The cable should measure 11 1/4 inches (plus or minus 1/64 inch) from the far edge of the cable anchor hole to the inside edge of the cable hook.

c. Check the cable guide for damage. The cable groove should be parallel to the shoe web, and the body

of the guide should lie flat against the web. Replace the guide if it shows damage.

d. Check the pivot hook on the lever. The hook surfaces should be square with the body of the lever for proper pivoting. Repair the hook or replace the lever if the hook shows damage.

e. See that the adjusting screw socket is properly seated in the notch in the shoe web.

WHEEL CYLINDER REPAIR

The cylinder does not have to be removed from the carrier plate for disassembly, inspection, or overhaul. However, if the inspection reveals severe scoring or damage, the cylinder must be removed for replacement.

DISASSEMBLY

1. Remove the rubber boots (Fig. 7). Remove the pistons, cups, and return spring from the cylinder bore.
2. Remove the bleeder screw.

INSPECTION

1. Wash all parts in clean denatured alcohol, and dry with compressed air.
2. Check all internal parts for excessive wear or damage. **If any internal part requires replacing, all should be replaced.**
3. Inspect the cylinder bore for score marks and rust. If either condition is present, the cylinder must be honed. **However, the cylinder should not be honed more than**

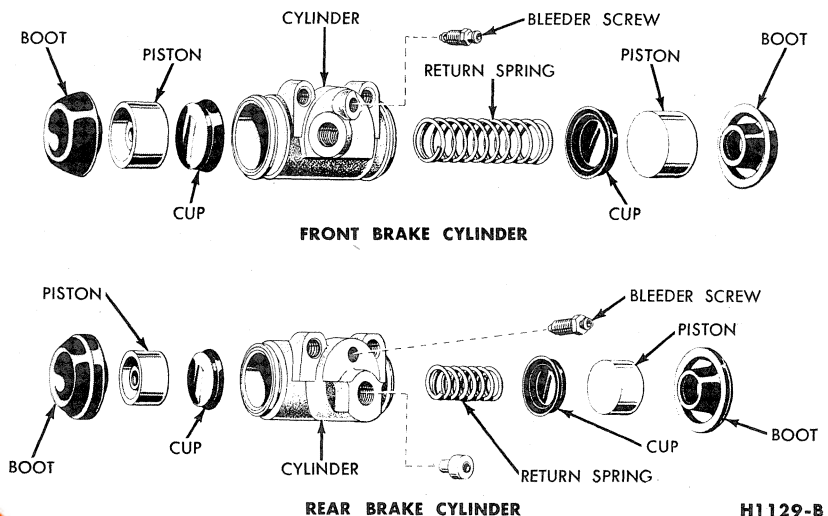


FIG. 7—Front and Rear Wheel Cylinders

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0.003 inch beyond its original diameter.

4. Check to be sure that the bleeder hole is open.

ASSEMBLY

1. Apply a coating of heavy-duty brake fluid to all internal parts.

2. Thread the bleeder screw into the cylinder and tighten securely.

3. Insert the return spring, cups, and pistons (Fig. 7) in their respective positions in the cylinder bore. Place a boot over each end of the cylinder.

WHEEL CYLINDER REPLACEMENT

REMOVAL

1. With the wheel in a raised position, remove the wheel and drum.

2. Place a clamp over the ends of the brake cylinder.

3. Remove the brake shoe assembly, following steps previously outlined in this section.

4. Disconnect the brake line from the brake cylinder. To disconnect the hose at a front cylinder, loosen the pipe fitting that connects the opposite end of the hose to the brake tube at a bracket on the frame. Remove the horseshoe-type retaining clip from the hose and bracket, disengage the hose from the bracket, then unscrew the entire hose assembly from the front brake cylinder.

At a rear cylinder, unscrew the pipe fitting that connects the tube to the cylinder.

5. Remove the two cylinder retaining screws at the back side of the carrier plate, and remove the cylinder.

INSTALLATION

1. Place the brake cylinder into position against the carrier plate, and secure with two screws and lock washers. Torque to specification.

2. On a front cylinder, install a new copper gasket over the hose fitting. Screw the hose assembly into

the cylinder. Engage the opposite end.

BRAKE CARRIER PLATE REPLACEMENT

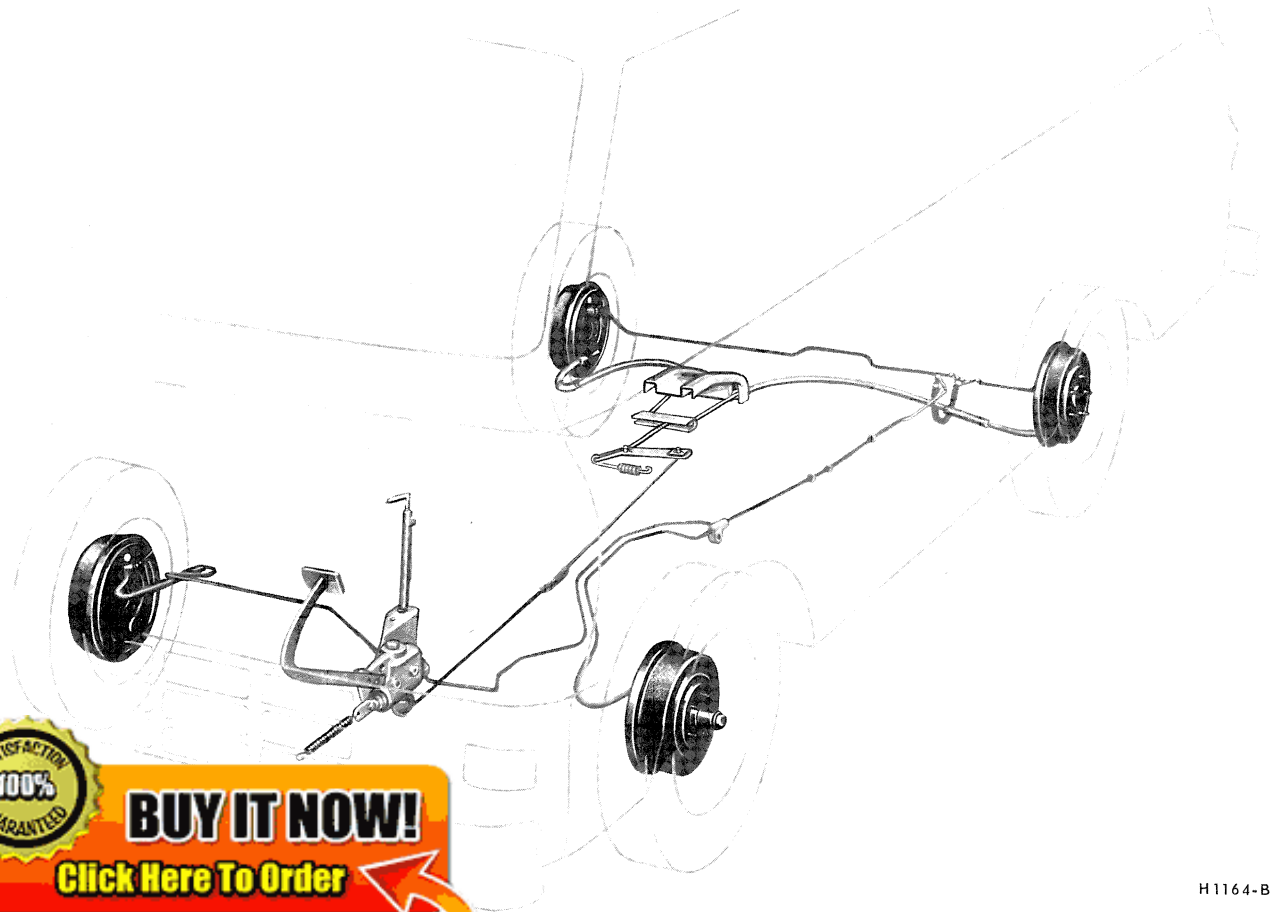
REMOVAL

1. Remove the wheel and brake drum. Disconnect the brake line from the brake cylinder.

2. Remove the brake shoe assemblies and the brake cylinder as outlined in this section. On the rear wheels, disconnect the parking brake lever.

3. If the rear carrier plate is being replaced, rotate the axle shaft so that the hole in the axle shaft flange lines up with the carrier plate retaining nuts, and remove the nuts. Pull the axle shaft assembly out of the housing with Tool T60K-4234-A and T50T-100-A, then remove the carrier plate.

If the front carrier plate is being replaced, remove the four bolts and nuts that secure the plate to the front wheel spindle and remove the plate.



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INSTALLATION

1. Position a new rear carrier plate on the retaining bolts in the axle housing flange. Insert the axle shaft into the housing so that the splines engage the differential side gear with the bearing retainer sliding onto the retaining bolts and against the carrier plate. Install the retaining nuts through the access hole in the axle shaft flange, and torque to specification.

Position a new front carrier plate to the wheel spindle, install the retaining bolts and nuts, and torque to specification.

2. Install the brake shoes and the brake cylinder as outlined in this section.

3. Connect the brake line to the brake wheel cylinder, then install the wheel and brake drum.

4. Adjust the brake shoes as outlined in this section.

HYDRAULIC LINES

Steel tubing is used throughout the brake system with the exception of the flexible hoses at the front wheels and at the rear axle housing brake tube connector (Fig. 8).

Always bleed the entire hydraulic system after any hose or line replacement.

BRAKE TUBE REPLACEMENT

If a section of the brake tubing becomes damaged, the entire section should be replaced with tubing of the same type, size, shape, and

length. **Copper tubing should not be used in a hydraulic system.** When bending brake tubing to fit underbody or rear axle contours, be careful not to kink or crack the tube.

All brake tubing should be flared properly to provide good leak-proof connections. Clean the brake tubing by flushing with clean denatured alcohol, before installation.

When connecting a tube to a hose, tube connector, or brake cylinder, tighten the tube fitting nut to specified torque with Milbar tool 1112-144 or equivalent.

BRAKE HOSE REPLACEMENT

A flexible brake hose should be replaced if it shows signs of softening, cracking, or other damage.

When installing a new front brake hose, position the hose to avoid con-

tact with other chassis parts. Place a new copper gasket over the hose fitting and screw the hose assembly into the front brake cylinder. Engage the opposite end of the hose to the bracket on the frame. Install the horseshoe-type retaining clip, and connect the tube to the hose with the tube fitting nut.

A rear brake hose should be installed so that it does not touch the muffler outlet pipe or shock absorber.

Place a new gasket over the rear hose fitting and screw the hose assembly into the rear brake tube connector. Engage the front end of the hose to the bracket on the frame. Install the horseshoe-type retaining clip, and connect the tube to the hose with the tube fitting nut (Fig. 9).

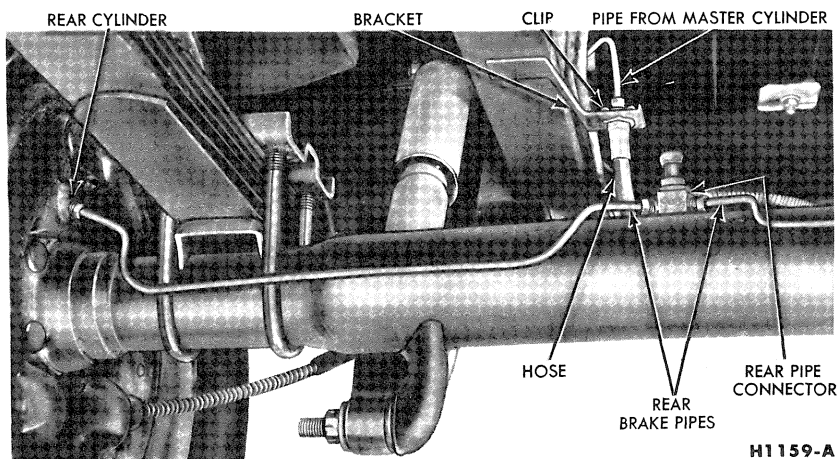


FIG. 9—Rear Brake Hose and Pipe Connections

3 REMOVAL AND INSTALLATION

MASTER CYLINDER

REMOVAL

1. Raise the front end of the truck and position safety stands.
2. Remove the retaining bolts and the forward splash shield.
3. Disconnect the brake pedal return spring (Fig. 10).
4. Remove the locknut and the eccentric bolt, which connect the return spring bracket and the master

of the cylinder) and two washers. The outlet fitting will remain suspended by the brake lines (Fig. 11).

7. Remove the two mounting bolts that secure the cylinder between the two mounting brackets. To prevent the brake pedal and master cylinder from swinging freely after the mounting bolts are removed, hold the master cylinder firmly when removing the mounting bolts.

8. Swing the cylinder down, and remove it from the brake pedal pivot pin.

cylinder body. Mount the cylinder on the pivot pin.

2. Swing the cylinder up and into position between the mounting brackets (Fig. 11). Install the mounting bolts and the pivot-pin snap ring (Fig. 10). Torque the mounting bolts to 23-29 ft.-lbs.

3. Connect the outlet fitting to the master cylinder by installing the fitting bolt and new washers (one washer on each side of the outlet fitting).

4. Connect the push rod and the return spring bracket to the brake pedal with the eccentric bolt and nut.

5. Connect the return spring to the bracket (Fig. 10).

INSTALLATION

1. Place the brake pedal pivot pin washers in the pivot-pin bore in the

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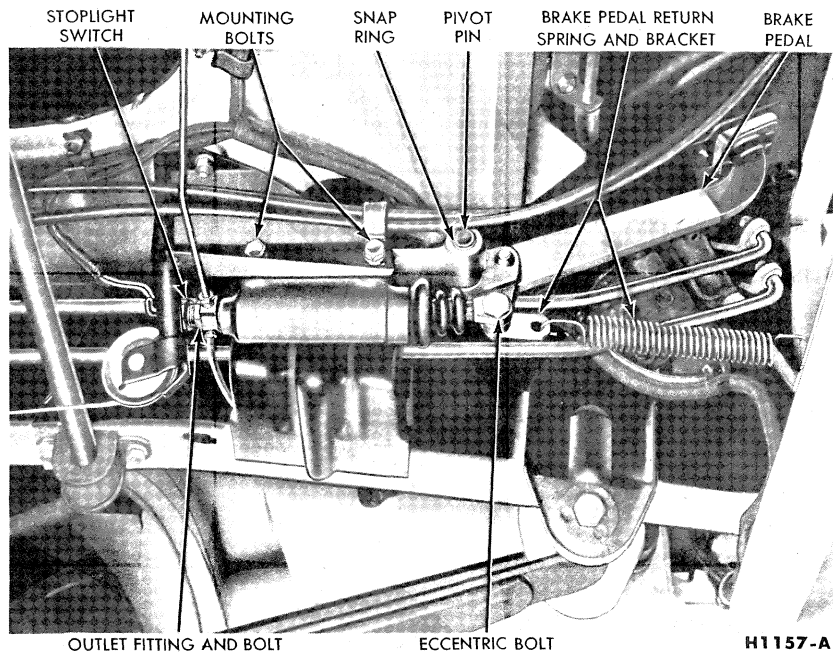


FIG. 10—Brake Master Cylinder—Installed

6. Bleed the hydraulic system as outlined in Part 2-2.

7. Adjust the brake pedal free-travel at the eccentric bolt as outlined under BRAKE PEDAL ADJUSTMENT in Part 2-1. Torque the eccentric bolt nut to 12-24 ft.-lbs.

8. Apply chassis lubricant to the grease fitting at the brake pedal pivot.

9. Install the splash shield and retaining bolts, remove the safety stands, and lower the truck.

BRAKE PEDAL

REMOVAL

1. Working inside the cab, fold back the floor mat and remove the retaining screws and the steering column floor pan cover. Pull up the rubber seal.

2. Raise the front end of the truck, and place safety stands into position.

3. From underneath the truck, remove the retaining bolts and the forward splash shield.

4. Disconnect the brake pedal return spring and remove the brake pedal.

5. Lower the assembly from the left side of the floor pan.

6. Remove the bushings from the pivot pin bore in the master cylinder.

INSTALLATION

1. Install the pivot pin bushings in the pivot pin bore in the master cylinder.

2. Insert the brake pedal pivot pin into the bore, then connect the master cylinder push rod and the return spring bracket with the eccentric bolt and nut. Do not tighten the nut at this time.

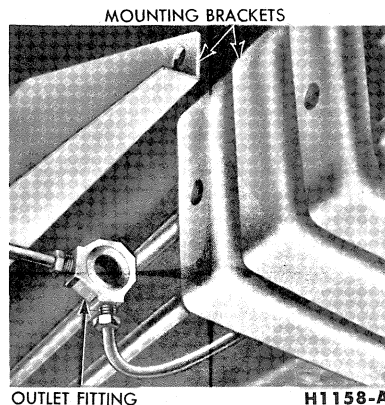


FIG. 11—Brake Master Cylinder Mounting Bracket

3. Connect the brake pedal return spring at the bracket, and install the snap ring on the pivot pin.

4. Adjust the brake pedal free-travel, and torque the eccentric nut to 12-24 ft.-lbs.

5. Apply chassis lubricant to the grease fitting at the brake pedal pivot.

6. Replace the forward splash shield, and secure with retaining bolts. Remove the safety stands and lower the truck.

7. Position the rubber seal at the brake pedal in the cab, install the steering column floor pan and secure with retaining screws.

PARKING BRAKE HANDLE

REMOVAL

1. Push the equalizer lever slightly forward, and disconnect the ball end of the cable from the lever (Fig. 12).

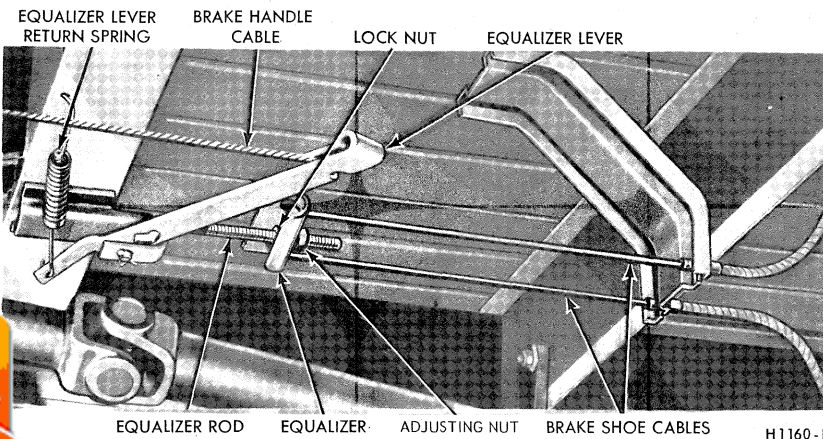


FIG. 12—Parking Brake Linkage

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2. Pull the brake handle up, and disconnect the cable end from the ratchet bar.

3. Remove the lock pin from the ratchet bar, and remove the brake handle from the brake handle housing assembly.

INSTALLATION

1. Position the ratchet bar in the brake handle housing assembly.

2. Install the lock pin in the ratchet bar, and connect the cable end to the ratchet bar.

3. Push the equalizer lever slightly forward, and insert the ball end of the cable in the slot on the equalizer lever (Fig. 12).

4. Adjust the parking brakes as outlined in Part 2-1.

PARKING BRAKE EQUALIZER TO HANDLE CABLE

REMOVAL

1. Push the equalizer lever slightly forward, and disconnect the ball end of the cable from the lever (Fig. 12).

2. Remove the cotter pin, clevis, and pulley from the parking brake bracket.

3. Raise the ratchet bar retainer out of the last (full release stop) notch of the ratchet bar, and allow the ratchet bar to slide down the housing until it bottoms.

4. Remove the cable from the ratchet bar.

5. Remove the cable from the cable guide.

INSTALLATION

1. Place the cable ball in the ratchet bar cable slot, and raise the ratchet bar until the ratchet bar retainer engages the full release stop notch of the ratchet bar.

2. Position the cable in the pulley, and install the pulley in the parking brake bracket with the clevis and cotter pin.

3. Route the cable rearward, through the cable guide, and connect it to the equalizer lever.

4. Check the operation of the brake handle, and adjust the equalizer rod until the cables are free of any slack.

PARKING BRAKE EQUALIZER TO REAR WHEEL CABLE

REMOVAL

1. Raise the car and remove the hub cap and wheel.

2. Remove the three Tinnerman nuts that hold the brake drum in place, back off the brake shoes, and remove the drum.

3. Loosen the adjusting nut on the equalizer rod, and disconnect the cable from the equalizer (Fig. 12).

4. Remove the hair pin retainer that holds the cable housing to the bracket on the crossmember and pull the cable and housing out of the bracket (Fig. 12).

5. Remove the bolt, nut and lock washer that connect the cable rear clip to the frame side member. Remove the clip from the cable.

6. Working on the wheel side

of the rear brake assembly (Fig. 1), compress the prongs on the cable retainer so that they can pass through the hole in the carrier plate. Draw the cable retainer out of the hole.

7. With the spring tension off the parking brake lever, lift the cable out of the slot in the lever and remove through the carrier plate hole.

INSTALLATION

1. Pull enough of the cable through the housing so that the end of the cable may be inserted over the slot in the parking brake lever (Fig. 1).

2. Pulling the excess slack from the cable, insert the cable housing into the carrier plate access hole so that the retainer prongs expand.

3. Thread the front end of the cable housing through the frame bracket and install the hair pin retainer (Fig. 12).

4. Install the rear clip on the cable, and fasten the clip to the bracket on the frame sidemember with the attaching bolt, lock washer and nut.

5. Insert the ball end of the cable into the equalizer and tighten the adjusting nut on the equalizer rod slightly (Fig. 12).

6. Install the rear drum. Tighten the three Tinnerman nuts that retain the drum, and install the wheel and hub cap.

7. Adjust the rear brake shoes as outlined in Section 2. Adjust the parking brake linkage as outlined in Part 2-1, Section 2.

4 MAJOR REPAIR OPERATIONS

BRAKE DRUM REFINISHING

Minor scores on a brake drum can be removed with a fine emery cloth. A drum that is excessively scored or shows a total indicator runout of over 0.005 inch should be turned down. Remove only enough stock to eliminate the scores and turn up the drum. The refinished drum must not exceed 0.060 inch

should also be cut down to the same size.

BRAKE SHOE RELINING

Brake linings that are worn to within $\frac{1}{32}$ inch of the rivet head or have been saturated with grease or oil should be replaced. Worn linings can score the brake drum. **When any lining requires replacement, it should be replaced in sets of two—both front or both rear wheels.**

Inspect brake shoes for distortion, cracks and looseness. If any of these conditions exist, the shoe should be discarded. **Do not repair a defective brake shoe.**

1. Wash the brake shoes thoroughly in a cleaning solvent. Remove all burrs and rough spots from the shoe.

2. Check the inside diameter of the brake drum. If the drum is less than 0.030 inch oversize, standard lining may be installed. Oversize lining should be installed, if the drum is 0.030-0.060 inch oversize.

3. Position the new lining on the shoe. Insert and secure the rivets at the center holes. Install the remaining rivets. Install all parts supplied in the kit. **Ford replacement linings are ground, and no further grinding is required.**

4. Check the clearance between

the lining and shoe. The lining must seat tightly against the shoe with not more than 0.005 inch clearance between any two rivets.

MASTER CYLINDER OVERHAUL

The master cylinder will have to be removed from the truck and overhauled on the bench. Follow the foregoing procedure for removal and installation.

DISASSEMBLY

1. Clean the outside of the cylinder, remove the filler cap and gasket

(Fig. 13), and pour out any remaining fluid.

2. Place the cylinder in a vise, and remove the rubber boot from the push rod end of the cylinder.

3. Remove the retainer spring from the push rod end of the cylinder, then remove the retainer, piston, cup, spring and valve assembly, and valve seat from the cylinder bore.

INSPECTION AND REPAIR

1. Clean all parts in clean denatured alcohol and inspect the parts for wear or damage, replacing them

as required. When using a master cylinder repair kit, install all of the parts supplied.

2. Check all openings to be sure they are open and free from foreign matter.

3. Check the spring valve at the forward end of the piston. If the spring is loose or has moved so that the piston parts are open, replace the piston.

4. Inspect the cylinder bore for score marks and rust. If either condition is present, the cylinder should be honed. **When honing, do not remove more than 0.003 inch as oversize parts are not available.**

5. Remove any burrs or loose metal that may have resulted from honing. Then clean the cylinder with denatured alcohol.

ASSEMBLY

1. Dip all parts except the cylinder body in clean, heavy-duty brake fluid.

2. Position the gasket and filler cap in the cylinder body, and finger tighten the cap.

3. Insert the valve seat, spring and valve assembly, and cup into the cylinder bore (Fig. 13).

4. Compress the piston against the cup, and install the retainer and retainer spring.

5. Position the push rod in the rubber boot, insert the push rod against the piston, and install the rubber boot on the cylinder body.

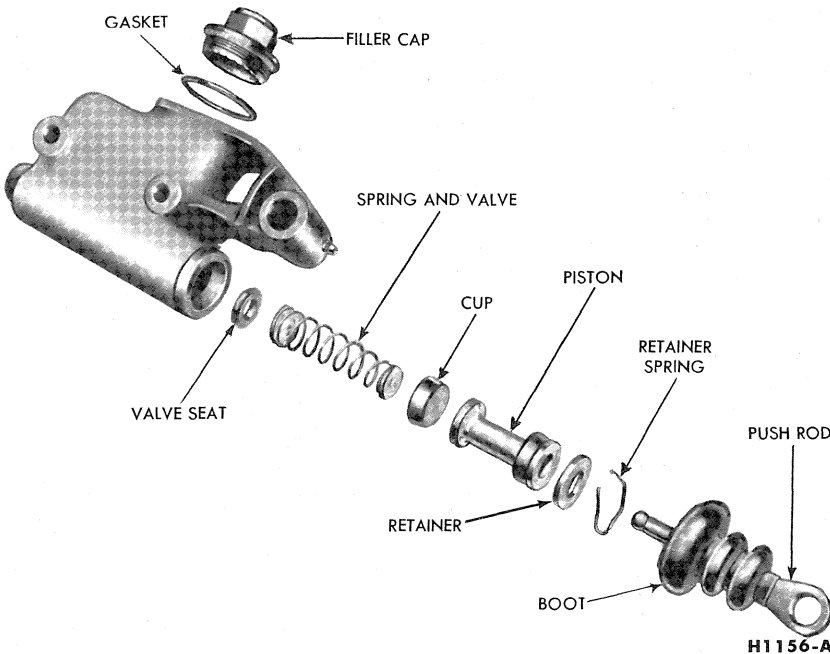


FIG. 13—Brake Master Cylinder—Disassembled

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PART 2-3 SPECIFICATIONS

NOTE: All specifications are given in inches unless otherwise noted.

BRAKE CHECKS AND ADJUSTMENTS

Type of Check or Adjustment	Specification
Brake Pedal	Pedal Free Play $\frac{1}{4}$ - $\frac{7}{16}$ inch
Brake Shoe Repair	Brake Lining Clearance (Midway between Rivets) Maximum 0.005 inch Lining Wear Limit (From Top of Rivets) Maximum $\frac{1}{32}$ inch
	Hydraulic Master Cylinder Bore, Honed Diameter, Maximum 1.003 inch

DIMENSIONS

Description	Front	Rear
Drum Inside Diameter	10.000	
Drum Maximum Boring Limit	10.060	
Lining Width	Primary	2.50 1.75
	Secondary	2.50 1.75
Wheel Cylinder Bore Diameter	1.125	0.8125
Master Cylinder Bore Diameter	1.000	

TORQUE LIMITS

Description	Foot-Pounds
Master Cylinder Eccentric Bolt to Brake Pedal Assembly	12-24
Brake Tube Fitting	10-12½
Rear Brake Assy. & Bearing Retainer to Rear Axle Housing	30-35
Brake Cylinder to Brake Carrier Plate	11-19
Parking Brake Control to Front Floor	7-15
Master Cylinder to Mounting Bracket	23-29
Parking Brake Control to Mounting Bracket	23-29
Brake Hose	12-18
Brake Line Connection or Rear Axle Housing Bolt	12-18
Front Brake Carrier Plate to Spindle	45-60
Wheel Nuts	55-85



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SUSPENSION, STEERING, WHEELS AND TIRES

GROUP 3

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PART 3-1 SUSPENSION, STEERING, WHEELS AND TIRES GENERAL SERVICE

Section	Page	Section	Page
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2 Common Adjustments and Repairs	3-3		

1 DIAGNOSIS AND TESTING

Table 1 lists various suspension, steering, and wheel and tire trouble symptoms and their possible causes. The possible causes are listed in the table in the order in which they should be checked. For example, refer to the fourth trouble symptom in Table 1, "Hard Turning When Stationary." When checking the possible causes, check item 1 (tire pressure) and item 2 (tire size) before proceeding with items 4, 11, 13 and 17 as indicated.

FRONT WHEEL ALIGNMENT CHECKS

Do not attempt to check and adjust front wheel alignment without first making a preliminary inspection of the front end parts.

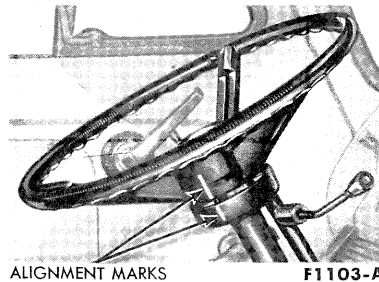
Check all factors of front wheel alignment before making adjustments.

EQUIPMENT INSTALLATION

Equipment used for front wheel alignment inspection must be accurate. If portable equipment is being used, make sure all inspection opera-

ing chalk marks on the steering column and steering wheel hub (Fig. 1).

Do not adjust the steering wheel spoke position at this time. If the front wheels are turned at any time during the inspection, align the chalk marks to bring the wheels back to the straight-ahead position.



**FIG. 1 – Straight-Ahead
Position Marks**

2. Install the wheel alignment equipment on the vehicle. Whichever type of equipment is used, follow the installation and inspection instructions provided by the equipment manufacturer.

CAMBER

Check the camber angle at each front wheel.

Camber is the amount the front wheels are tilted at the top. If a wheel

tilts outward, camber is positive. If a wheel tilts inward, camber is negative. The correct camber angle, or outward (positive) tilts, is listed in Part 3-5. The maximum difference between both front wheel camber angles should not exceed $\frac{1}{4}^{\circ}$.

CASTER

Check the caster angle at each front wheel.

Caster is the forward or rearward tilt of the top of the spindle bolt. If the spindle bolt tilts to the rear, caster is positive. If the spindle bolt tilts to the front, caster is negative. The correct caster angle, or backward (positive) tilt, is listed in Part 3-5. The maximum difference between both front wheel caster angles should not exceed $\frac{1}{2}^{\circ}$.

The caster angle reading on the gauge is true only when the vehicle frame is horizontal from front to rear. If sagging springs on the front, or large tires on the rear, cause the frame not to be level, the caster angle reading must be modified to take this into consideration. Setting the front wheels on blocks of appropriate height, or letting air out of the rear tires to level the frame are other methods of compensation.

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