

# 1968

# *Bronco*

# 1969

# *Econoline* and *Club Wagon*

# SHOP MANUAL

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## **1968 Bronco 1969 Econoline and Club Wagon Shop Manual**

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# 1968 BRONCO 1969 ECONOLINE and CLUB WAGON

# SHOP MANUAL



SERVICE PUBLICATIONS

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## FOREWORD

*This shop manual provides the Service Technician with information for the proper servicing of the 1968 Bronco, 1969 Econoline and Club Wagon.*

*The maintenance schedule and procedures for maintenance operations are published in the 1968 Truck Maintenance and Lubrication Manual.*

*The information in this manual 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 date.*

*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 PUBLICATIONS**

# Vehicle Identification

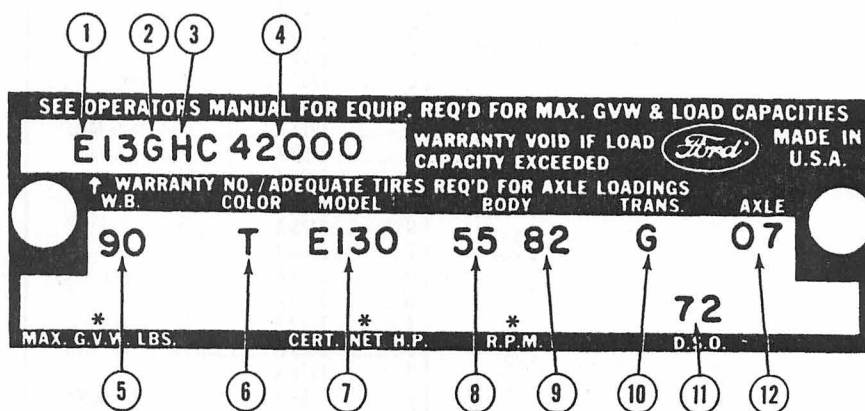
GROUP

1

Figure 1 illustrates a typical Econoline Rating Plate which is riveted to the left front door lock face panel. The Bronco Rating Plate (similar to Fig. 1) is mounted on the inside panel of the glove box door.

For vehicle identification, use the Vehicle Identification number stamped on top of the right front frame rail approximately 12 inches behind the shock absorber.

Official serial numbers are preceded and followed by asterisks to prevent unauthorized altering of numbers or symbols. Do not use the Vehicle Warranty Number which appears on the Rating Plate for title or registration purposes.



- 1 VEHICLE SERIES CODE
- 2 ENGINE CODE
- 3 ASSEMBLY PLANT CODE
- 4 CONSECUTIVE UNIT NUMBER
- 5 WHEELBASE (INCHES)
- 6 EXTERIOR PAINT COLOR CODE
- 7 MODEL CODE
- 8 TRIM CODE
- 9 BODY TYPE CODE
- 10 TRANSMISSION CODE
- 11 DISTRICT/SPEC. ORDER CODES
- 12 AXLE CODE

\* NOT SHOWN FOR BRONCO OR CLUB WAGON

P1146-B

FIG. 1—Typical Rating Plate—  
Chateau Club Wagon Show

## VEHICLE WARRANTY NUMBER

The Warranty Number is the first line of numbers and letters appearing on the Rating Plates (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.

## VEHICLE DATA

The Vehicle Data appears on the Rating Plate on the two lines following the Warranty Number. The first two or 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.

Econoline Club Wagons and Bronco 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 over 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.

## CONSECUTIVE UNIT NUMBER

Basically, the system assigns a monthly block of serial numbers as follows, beginning with November, 1967.

November .....	C 42,000 - C 55,999
December .....	C 56,000 - C 69,999
January .....	C 70,000 - C 83,999
February .....	C 84,000 - C 97,999
March .....	C 98,000 - C111,999
April .....	D 12,000 - D 25,999
May .....	D 26,000 - D 39,999
June .....	D 40,000 - D 53,999
July .....	D 54,000 - D 67,999
August .....	D 68,000 - D 81,999

## ASSEMBLY PLANT CODES

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

## TRANSMISSION CODES

Code	Transmission
C .....	3-Spd Manual Shift
G .....	C-4 Automatic

## ENGINE CODES

Code	Low Comp. Code	Engine
F	6	6 Cyl. 170 CID (1V)
A	1	6 Cyl. 240 CID (1V)
N	—	8 Cyl. 289 CID (2V)
G	7	8 Cyl. 302 CID (2V)

## SERIES AND MODEL CODES

Bronco			
Series	Model	Body	Type
U13 .....	U130 .....	.96 .....	Open Body (Roadster)
U13 .....	U132 .....	.96 .....	HD Package
U14 .....	U140 .....	.97 .....	Sports Utility
U14 .....	U142 .....	.97 .....	HD Package
U15 .....	U150 .....	.98 .....	Long Roof (Wagon)
U15 .....	U152 .....	.98 .....	HD Package

Econoline Club and Chateau Wagons			
Series	Model	Body	Type
E11/21/31...	E110/210/310	.82	Club Wagon
E12/22/32...	E120/220/320	.82	Custom Club Wagon
E13/23/33...	E130/230/330	.82	Chateau Wagon
E31/32/33...	E311/321/331	.82	HD Payload

Econoline Vans (All Body Code 89)	
Series (Model)	GVW
E14(0)	4,000
E14(1)	4,200
E14(2)	4,500
E15(0)	4,000
E15(1)	4,200
E15(2)	4,500
E16(0)	4,000
E16(1)	4,200
E16(2)	4,500
E24(0)	5,100
E24(1)	5,100
E24(2)	5,400
E24(3)	5,400
E25(0)	5,100
E25(1)	5,100
E25(2)	5,400
E25(3)	5,400
E26(0)	5,100
E26(1)	5,100
E26(2)	5,400
E26(3)	5,400
E34(0)	6,050
E34(1)	6,800
E34(2)	7,400
E34(3)	7,400
E34(4)	7,600
E34(5)	7,600
E35(0)	6,050
E35(1)	6,800
E35(2)	7,400
E35(3)	7,400
E35(4)	7,600
E35(5)	7,600
E36(0)	6,050
E36(1)	6,800
E36(2)	7,400
E36(3)	7,400
E36(4)	7,600
E36(5)	7,600

**EXTERIOR PAINT COLOR CODES**

Code	"M" Spec. No.	Color
A	1724-A	Black
B	556-A	Turquoise
D	1638-A	Med. Turquoise
E	1906-A	Lt. Blue
F	1226-A	Lt. Blue
G	1526-A	Chrome Yellow
J	1515-A	Red
L	1237-A	Dk. Green
M	1619-A	White
N	1911-A	Med. Beige Met.
P	3150-A	Med. Ivy Green
O	3286-A	Dk. Blue
Q	1624-A	Med. Blue Met.
R	3125-A	Lt. Ivy
T	2008-A	Red
U	2097-A	Med. Green
W	3120-A	Yellow
X	1742-A	Med. Blue
Z	2025-A	Signal Flare Red
2	1878-A	Med. Beige
4	3069-A	Lt. Ivy Green Met.
6	1631-A	Lt. Beige
7	2098-A	Dk. Blue

**DISTRICT CODES**

Code	District
11	Boston
13	New York
15	Newark
16	Philadelphia
17	Washington
21	Atlanta
22	Charlotte
24	Jacksonville
25	Richmond
27	Cincinnati
28	Louisville
32	Cleveland
33	Detroit
34	Indianapolis
35	Lansing
37	Buffalo
38	Pittsburgh
41	Chicago
42	Fargo
43	Milwaukee
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
75	Phoenix
81	Ford of Canada
83	Government
84	Home Office Reserve
85	American Red Cross
89	Transportation Services
90-99	Export

**INTERIOR TRIM SCHEMES AND CODES — BRONCO**

Vinyl Seats	Paster Parchment
Bench ⊕	1
Right and Left Bucket	94
Right and Left Bucket and Bench Seat	94
Sport Bench	9
⊕ Standard trim	

**INTERIOR TRIM SCHEMES AND CODES — CLUB WAGON AND ECONOLINE**

	Beige	Blue	Ivy Gold	Parchment ⊕	Red ⊕
Club Wagon Seats — Vinyl					
1st and 2nd Row	33	23	43	13	53
1st, 2nd and 3rd Row	34	24	44	14	54
1st, 2nd 3rd and 4th Row	35	25	45	15	55
Van Seats — Vinyl					
L.H. Driver	3	2	4		5
Stationary Passenger	31	21	41		51
Flip Passenger	32	22	42		52
Deluxe L.H. Driver	16-A	26-B	46-D		
Deluxe L.H. Driver					
Deluxe Stationary Passenger	17-A1	27-B1	47-D1		
Deluxe L.H. Driver and Flip Passenger	18-A2	28-B2	48-D2		
⊕ Standard trim only				⊕ Deluxe trim only	

**W.B. (WHEELBASE)**

The wheelbase will be stamped in inches on the rating plates under W.B. according to the production order against which the unit is to be built. It will be shown for Bronco and Club Wagons only.

The following information (except District Codes) does not apply to Bronco and Club Wagon rating 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 stamped at this location.

D.S.O. — If the vehicle is built on a D.S.O., F.S.O. or D.T.O. (special orders), the complete order number will be reflected over the DSO space after the District Code Number.

# Brakes

Group

2

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## PART 2-1 General Brake Service

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### 1 DIAGNOSIS AND TESTING

#### DIAGNOSIS

A guide to the diagnosis of brake problems will be found at the back of this section in Fig. 3, Brake Trouble Symptoms and Possible Causes.

#### PRELIMINARY TESTS

1. Check the fluid level in the master cylinder. If the fluid level is not within 1/4 inch of the top of the master cylinder reservoirs, add Rotunda Brake Fluid Extra Heavy Duty, C6AZ-19542-A or equivalent to obtain the specified level. **This brake fluid is colored blue for identification purposes. Do not mix low temperature brake fluids with the specified fluid.**

2. If the brake pedal movement feels spongy, bleed the hydraulic brake system to remove air from the lines and cylinder. Refer to Hydraulic System Bleeding, Part 2-1, Section 2. Also, check for leaks or insufficient fluid.

3. Brake pedal lash (free play) is

controlled by the master cylinder. Refer to Part 2-2, Section 2.

4. **Turn the ignition switch ON.** If the light on the brake warning lamp remains on, the condition may be caused by a defective switch, grounded switch wires or the differential pressure valve is not centered. Center the pressure valve as outlined under Hydraulic System Bleeding, Centralizing the Pressure Differential Valve (Part 2-1, Section 2). If the warning light remains on, check the wire for a grounded condition and repair or replace the wire. If the condition of the wire is good, replace the brake warning lamp switch.

5. If the brake warning lamp does not light when a pressure differential condition exists in the brake system, and the ignition switch is ON (check position), the warning lamp bulb may be burned out, the warning lamp switch is inoperative or the switch to lamp wiring has an open circuit. Check the bulb and replace it, if required. Check the switch to lamp

wires for an open circuit and repair or replace them, if required. If the warning lamp still does not light, replace the switch.

6. 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 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 Fig. 3, 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 Fig. 3. To check for brake chatter or surge, apply the brakes lightly from approximately 50 mph.

### 2 COMMON ADJUSTMENTS AND REPAIRS

#### BRAKE PEDAL ADJUSTMENT

The brake system of the Bronco

and Econoline vehicles is designed to permit the full stroke of the master

cylinder when the brake pedal is fully depressed. **If required, check for pro-**

per installation of the pedal mechanism and master cylinder when the master cylinder outlet lines are disconnected. With the lines disconnected, place a sheet of paper on the floorboard under the pedal, and depress the pedal as far as possible with approximately 50 pounds force. If the paper can be removed without tearing, the master cylinder is properly installed.

### BRONCO AND ECONOLINE

The brake pedal adjustment or lash (free travel) of all vehicles is controlled by the stroke of the master cylinder. No brake pedal adjustment is required.

### 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.

After a brake hydraulic system malfunction has been corrected and the hydraulic system has been bled, the **dual brake warning lamp will continue to burn when the ignition switch is turned to ON.** This is due to the pressure differential created during the bleeding operation, causing the valve to move to an off-center position (low pressure side). **The differential valve will remain off center and the warning lamp will remain lit until the valve is centralized.** To centralize the valve, a pressure differential must again be created on the side opposite the brake hydraulic system that was bled last. For example: If the primary (front brake) system was bled last, the pressure differential required to centralize the valve will be created on the secondary system (rear brake) side of the differential valve.

### MANUAL BLEEDING

The primary and secondary (front and rear) hydraulic brake systems are individual systems and are bled separately. Bleed the longest line first on the individual system being serviced. **During the complete bleeding operation, DO NOT allow the reservoir to run dry.** Keep the master cylinder reservoir filled with Rotunda Brake Fluid Extra Heavy Duty, C6AZ-19542-A. **This brake fluid is colored blue for**

identification purposes. Do not mix low temperature brake fluids with the specified fluid during the bleeding operations. Never use brake fluid which has been drained from the hydraulic system.

1. Bleed the master cylinder at the outlet port side of the system being serviced. To bleed the master cylinder, loosen the master cylinder to hydraulic line nut. Operate the brake pedal slowly until the brake fluid at the outlet connection is free of bubbles, and tighten the nut securely.

2. 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.

3. 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 brake wheel cylinder on the opposite side. Refill the master cylinder reservoir after each wheel cylinder is bled. When the bleeding operation is completed, the fluid level should be filled to within 1/4 inch from the top of the reservoirs.

6. Centralize the pressure differential valve. Refer to the Centralizing of the Pressure Differential Valve procedures which follow.

### PRESSURE BLEEDING

Bleed the longest lines first. The bleeder tank should contain enough new Rotunda Brake Fluid—Extra Heavy Duty, C6AZ-19542-A to complete the bleeding operation. The tank should be charged with approximately 10 to 30 pounds of air pressure. Never exceed 50 pounds pressure. **This brake fluid is colored blue for identification purposes. Do not mix low temperature brake fluids with the specified fluid during the bleeding operations. Never use brake fluid that has been drained from the hydraulic system.**

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

2. Remove the master cylinder reservoir cover and rubber gasket, and fill the master cylinder reservoir with the specified brake fluid. Install the pressure bleeder adapter tool, to the master cylinder, and attach the bleeder tank hose to the fitting on the adapter.

Master cylinder pressure bleeder

adapter tools can be obtained from the various manufacturers of pressure bleeding equipment. Follow the instructions of the manufacturer when installing the adapter.

3. Position a 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.

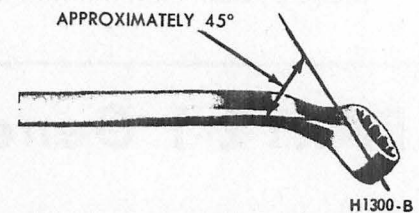


FIG. 1—Wrench for Bleeding Brake Hydraulic System

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 steps 3 through 6 at the opposite wheel cylinder of the system being bled.

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

9. Remove the Pressure Bleeder Adapter Tool. Fill the master cylinder reservoirs to within 1/4 inch from the top. Install the master cylinder cover and gasket.

10. Centralize the pressure differential valve, using the procedure which follows:

### CENTRALIZING THE PRESSURE DIFFERENTIAL VALVE

1. Turn the ignition switch to the ON position. Loosen the pressure differential valve inlet tube nut of the unfailed system, or the side opposite the system that was bled last. Operate the brake pedal carefully and gradually until the pressure differential valve is returned to a centralized position and the brake warning light goes out.

2. Check the fluid level in the master cylinder reservoirs and fill them to within 1/4 inch of the top with the specified brake fluid.



3. Turn the ignition switch off.

### PARKING BRAKE LINKAGE ADJUSTMENT

#### ECONOLINE

Check the parking brake cables when the brakes are fully engaged. If the cables are below the specified tension, adjust them as follows:

1. Fully engage the parking brake by moving the handle all the way up.
2. Raise the vehicle.
3. Refer to Fig. 19, Part 2-2 and install a cable tension gauge to each cable in turn in the area indicated.
4. Turn the adjusting nut forward against the equalizer until a cable tension of 275-325 lbs. (E-100 and E-200), 200-250 lbs. (E-300) is obtained.
5. On E-300 models the rear drums must be removed after the service and parking brakes have been adjusted. Check the clearance between the parking brake lever and the cam plate (Fig. 2). The clearance should be 0.015 inch with the brakes fully released. If the clearance is not within specifications, readjust the parking brake cable.

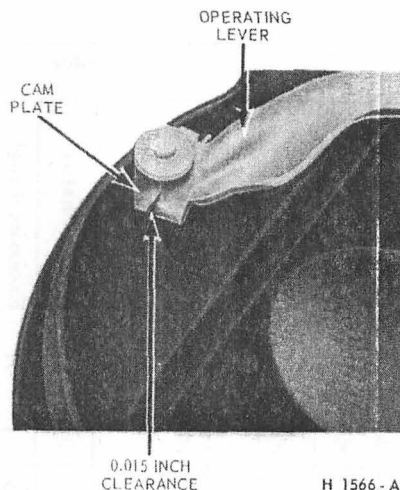


FIG. 2—Parking Brake  
Operating Lever and  
Cam Plate Clearance

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.

#### BRONCO

Check the parking brake cables when the brakes are fully released. If the cables are loose, adjust them as follows:

1. Apply the parking brake control pedal until the first notch of the ratchet is engaged.
2. Raise the vehicle on a suitable hoist or jack.
3. Refer to Fig. 19, Part 2-2 and install a cable tension gauge to each cable in turn, in the area indicated in Fig. 19.
4. Loosen the locknut in front of the equalizer, and tighten the adjusting nut until a cable tension of 80-90 lbs. is registered on the gauge.
5. If a tension gauge is not available, tighten the adjusting nut until a medium drag is felt on each rear brake. Release the control pedal and make sure the brakes are free of the drum, so that the shoes are not pulled off their anchors.
6. Lock the adjustment with the locknut, and lower the vehicle.

## 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 1/32 inch of any rivet head or if the shoes are damaged, they must be replaced. Re-

place 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.

Trouble Symptoms															
Possible Causes of 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	Warning Lamp Stays Lighted	Warning Lamp Does Not Light
Mechanical Resistance at Pedal or Shoes		X	X											X	
Brake Line Restricted	X	X	X		X									X	
Leaks or Insufficient Fluid				X				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		X	
Faulty Retracting Spring	X				X										
Drum Out of Round	X				X		X								
Linings Glazed or Worn			X		X	X	X	X			X	X	X		
Oil or Grease on Lining			X		X	X	X			X		X	X		
Loose Backing Plate	X					X	X								
Loose Lining							X								
Scored Drum									X		X				
Dirt on Drum-Lining Surface											X				
Faulty Brake Cylinder	X				X	X						X		X	
Dirty Brake Fluid	X	X								X			X		
Faulty Master Cylinder		X						X	X				X	X	
Air in Hydraulic System	X			X				X					X		
Self Adjusters Not Operating					X			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							
One Section of Dual System is Inoperative								X		X			X	X	
Differential Pressure Valve is Not Centered														X	
Wiring to Warning Lamp or Switch is Grounded														X	
Warning Lamp Switch is Grounded														X	
Warning Lamp Bulb is Burned Out															X
Wiring to Lamp or Switch has an Open Circuit															X
Warning Lamp Switch is Inoperative															X

FIG. 3 — BRAKE TROUBLE SYMPTOMS AND POSSIBLE CAUSES

# PART 2-2 Brake System

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## 1 DESCRIPTION AND OPERATION

### HYDRAULIC, SELF-ADJUSTING BRAKE SYSTEM

Single-anchor, internal-expanding duo-servo self-adjusting hydraulic brakes with a safety, dual master cylinder are used on Econoline (Figs. 1, 2 and 3) and Bronco (Figs. 1 and 3) vehicles.

The master cylinder converts physical force from the brake pedal 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 dual, safety-type master cylinder contains a double hydraulic cylinder with two fluid reservoirs, two hydraulic pistons (a primary and secondary) and two residual check valves, located in the outlet ports (Figs. 2 and 3). The master cylinder secondary outlet port is connected to the rear brakes and the primary brake outlet port is connected to the front brakes.

The master cylinder primary and secondary pistons function together when the primary and secondary systems are fully operative.

With the master cylinder and front

and rear brake systems filled and bled, a solid column of fluid is located on both the primary (front brake) and secondary (rear brake) pistons. Upon application of the brakes at the brake pedal, fluid is displaced by the pistons, into the wheel cylinders to activate both the front and rear brakes. Upon release of brake application the brake fluid returns from the wheel cylinders through the front and rear brake lines and residual valves to the master cylinder bore.

Failure in either the front or rear brake system does not result in failure of the entire hydraulic brake system. Should hydraulic failure occur in the rear brake system, the hydraulic pressure from the primary piston (which actuates the front brakes) causes the unresisted secondary piston (which actuates the rear brakes) to bottom out in its bore. The primary piston then proceeds to actuate the front brakes with the continued stroke of the brake pedal. Fluid under pressure will continue to be displaced by the front brake (primary) system allowing braking at the front wheels.

Should a failure occur in the primary (front brake) hydraulic system:

the initial brake pedal stroke would cause the unresisted primary piston to bottom out on the secondary piston. Continued pedal stroke will move both pistons, and the fluid under pressure applied by secondary piston will apply the rear brakes.

Failure in one independent hydraulic system does not affect the hydraulic fluid displacement of the other independent system. In addition, hydraulic output pressure remains basically the same for the same pedal effort.

The increased pedal travel and pedal effort required to compensate for the loss of the failed portion of the brake system provides adequate warning that partial brake failure has occurred. **With the ignition switch turned ON, a dual brake warning light on the instrument panel will also indicate a brake system failure.**

Brake lines (tubes) are connected from the brake master cylinder primary and secondary system outlet ports to the pressure differential valve assembly (Figs. 8 and 9). The electrical brake warning switch, and the brake lines (tubes) leading from the differential valve assembly to the front and rear wheel brake cylinders are

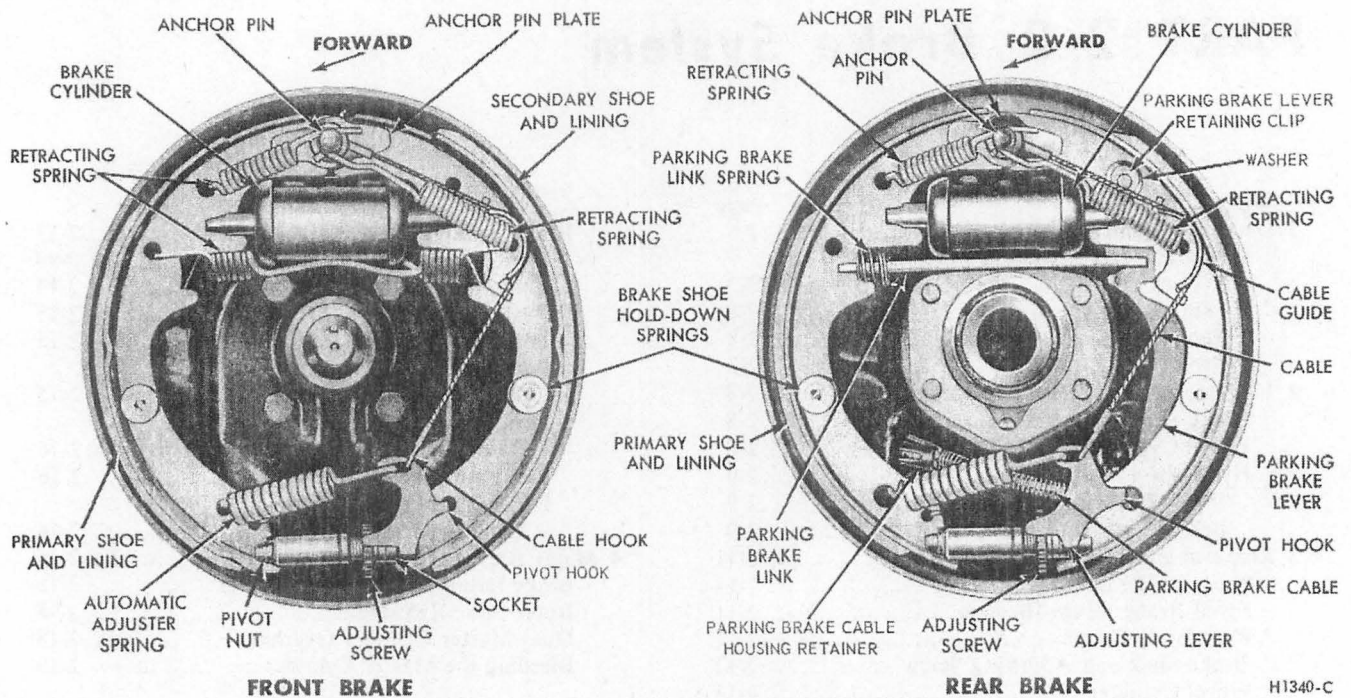


FIG. 1—Self-Adjusting Brake Assemblies—Bronco and Econline (E-100,200)

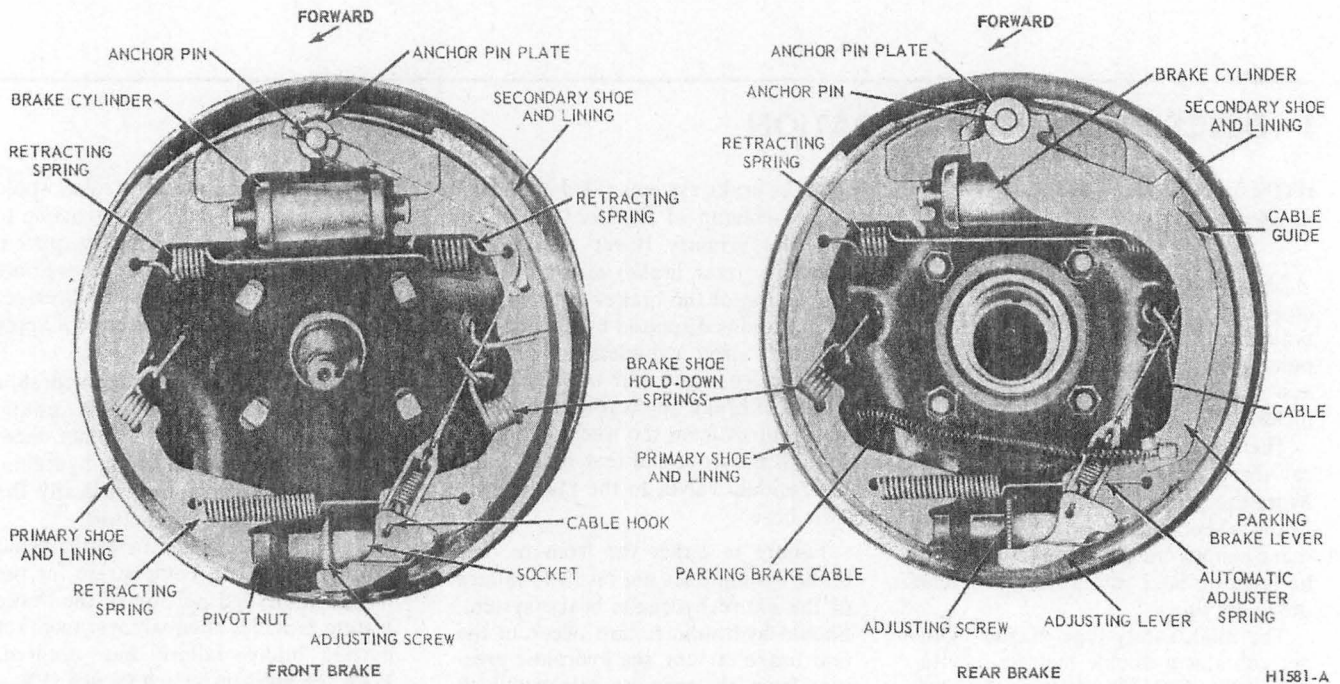


FIG. 2—Self-Adjusting Brake Assemblies—Econline (E-300)

also shown in Figs. 8 and 9.

The brake system hydraulic pressure differential valve assembly and the mechanically operated electrical switch operates the dual brake system warning light.

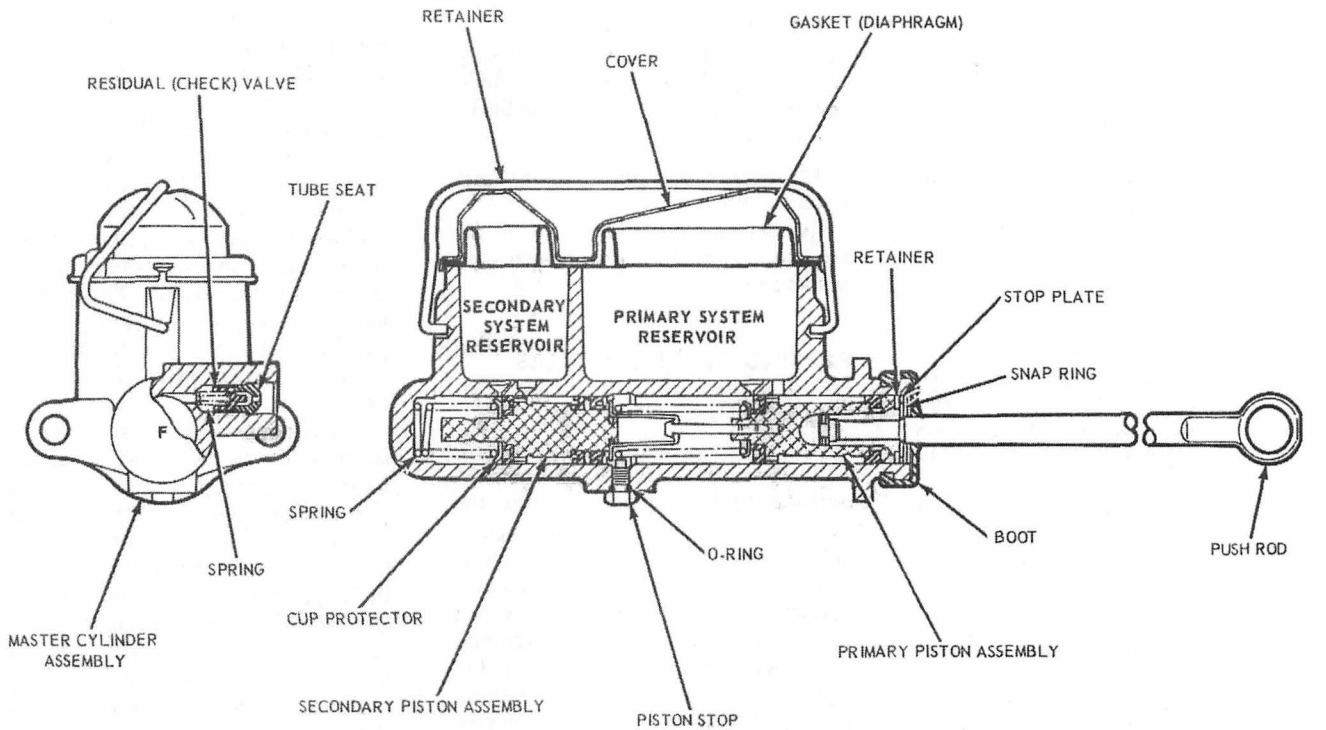
The spring-loaded switch plunger contacts the bottom of a tapered shoulder groove in the center of the differential valve. O-ring seals are used

in the seal ring lands near each end of the valve (Fig. 4).

Should a failure of the rear brake system occur, hydraulic fluid pressure in the rear brake (secondary) system would drop. During brake pedal operation, the fluid pressure build up of the front (primary) brake system would force the differential valve toward the low pressure area (rear brake

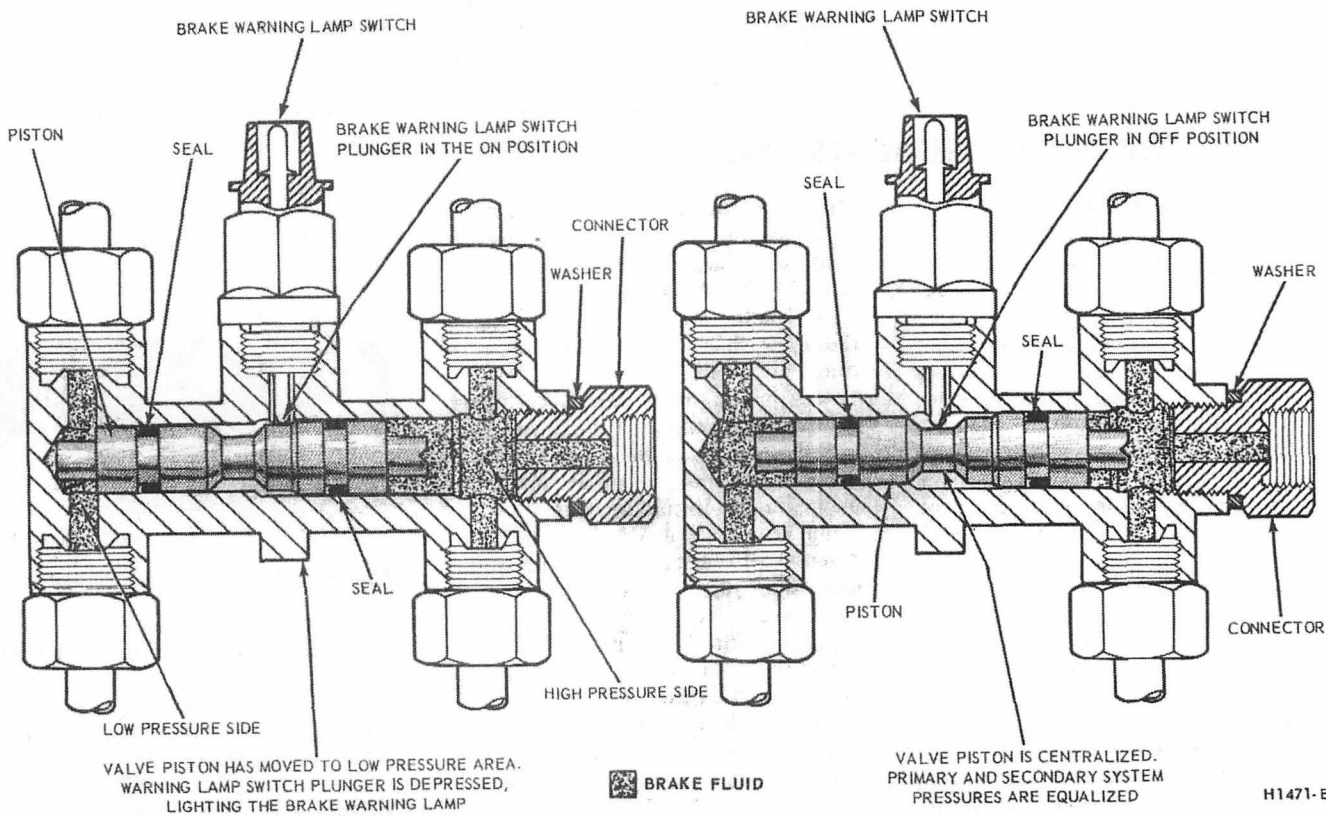
system outlet port). Movement of the differential valve forces the switch plunger upward over the tapered shoulder to close the switch electrical contacts and light the dual brake system warning lamp, signaling a brake system failure.

The self-adjusting brake mechanism consists of a cable, cable guide, adjusting lever, and adjuster spring (Figs. 1



H1470-B

FIG. 3—Dual-Master Cylinder



H1471-B

FIG. 4—Differential Valve System—Typical

and 2). The cable is hooked over the anchor pin at the top and is connected to the lever at the bottom. The cable is connected to the secondary brake shoe by means of the cable guide. The adjuster spring is hooked to the primary brake shoe and to the lever.

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 upward 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 assemblies.

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

Installation of the brake pedals for the Bronco and Econoline vehicles are shown in Figs. 15 and 16.

## PARKING BRAKE CONTROLS

### ECONOLINE

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 Figs. 1 and 2.

When the handle is raised the primary and secondary brake shoes are forced against the rear brake drums. The handle is held in the applied position by the over center action of the control handle. Lowering the handle releases the brakes.

### BRONCO

An independent foot-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. The rear brake cables connect the equalizer assembly to the parking brake lever at each rear secondary shoe (Fig. 19).

When the pedal is depressed the secondary brake shoes are forced against the rear brake drums. The pedal is held in the applied position by the engagement of a spring-loaded pawl with a ratchet in the control assembly (Fig. 19).

The parking brake control assembly is mounted to the cowl inner side panel. The pedal pivots on a stationary pedal mount. A spring-loaded pawl and a release lever are assembled to the pedal. A ratchet is assembled to the upper end of the pedal. The pawl contacts the ratchet at such an angle that the ratchet teeth will slide over the pawl as the pedal is depressed; however, when the applying motion stops and the pedal starts to release, the pawl engages the ratchet and thus locks the brakes in the applied position.

When the manual release lever is pulled back, (Fig. 19), the cam action of the lever on the pawl cam pin will disengage 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.

Considerable time savings can be made when performing one of these operations, by using Rotunda Tool HRE 8650 to adjust the brake shoes while the drum is removed. Use the following procedure:

1. Insert the tool into the brake drum as shown in Fig. 5. Adjust the spread of the tool and lock in place with the lock knob.

2. Reverse the tool as shown in Fig. 6 and apply to the brake shoes. Adjust the brake shoe diameter to fit the gauge. **Hold the automatic adjusting lever out of engagement while rotating the adjusting screw, to prevent burring the screw slots.** Make sure the adjust-

ing screw rotates freely. If necessary, lubricate the adjusting screw threads with a thin, uniform coating of CIAZ-19590-B Grease.

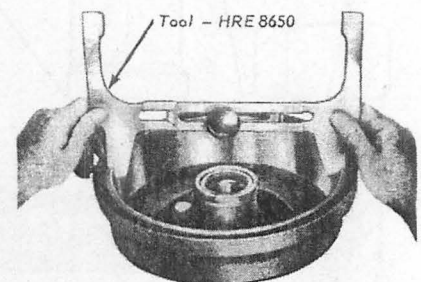
3. Rotate Tool HRE 8650 around the brake shoes to be sure of the setting.

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

On Bronco front wheels, install the outer wheel bearing cone and adjusting nut. Adjust the front wheel bearings as detailed in Part 3. If the vehicle is equipped with free-running lock-out hubs, refer to Front Wheel Drive Lock-Out Hub Installation, Part 4.

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

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



H 1411-B

FIG. 5—Measuring The Brake Drum

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

6. Complete the adjustment by applying the brakes several times while backing the vehicle.

### WHEEL CYLINDER REPAIR

The cylinder does not have to be removed from the backing plate for di-

sassembly, inspection, or overhaul. However, if the inspection reveals severe scoring or damage, the cylinder must be removed for replacement. Refer to Section 3, Removal and Installation.

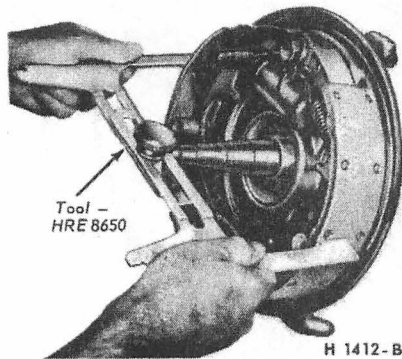


FIG. 6—Measuring The Brake Shoes

#### 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 isopropyl alcohol, and dry with compressed air.
2. Check all internal parts for ex-

cessive 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 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.

#### 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. Also, primary and secondary system hoses lead from the master cylinder to the differential valve assembly (Figs. 8 and 9).

Always bleed the 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 double-flared properly to provide good leak-proof connections. Clean the brake tubing by flushing with clean isopropyl 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 contact 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 (Figs. 8 and 9).

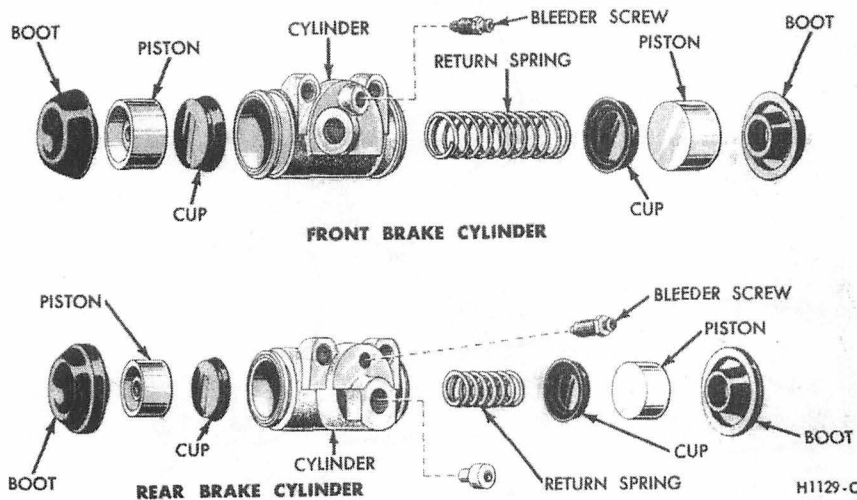


FIG. 7—Front and Rear Wheel Cylinders—Typical





### 3 REMOVAL AND INSTALLATION

#### FRONT BRAKE DRUM— ECONOLINE

##### 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 backing 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 (Figs. 10 and 11). **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. If the screw is damaged 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.

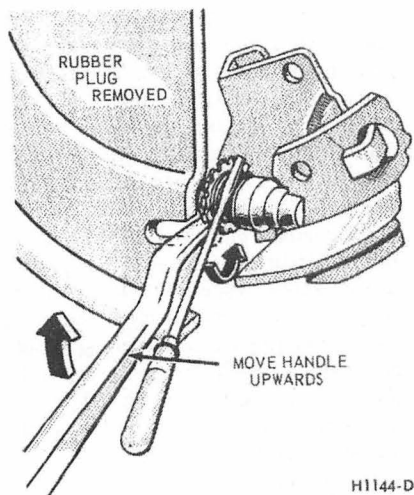


FIG. 10—Backing Off The Brake Adjustment—Typical

##### INSTALLATION

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

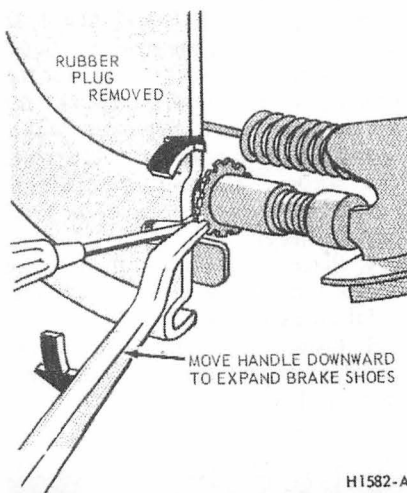


FIG. 11—Backing Off The Brake Adjustment—E-100

er. Pack the wheel bearings, install the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer. See Part 3-6, Section 2.

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

2. Refer to Brake Shoe Adjustment in this section and adjust the brake shoes as outlined, using Rotunda Tool HRE 8650. Adjust the brake shoes as outlined using Rotunda Tool HRE 8650.

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

4. Adjust the wheel bearing as outlined in Part 3-6, Section 2. Install the nut lock and cotter pin. Then install the grease cap.

5. Install the wheel and hub cap.

#### FRONT BRAKE DRUM —BRONCO

##### REMOVAL

1. Raise the vehicle and install safety stands.

2. Back off the brake adjusting screw, if necessary. Remove the wheel cover, if installed.

3. Remove the front grease cap. Remove the driving hub retaining snap ring and slide the splined driving hub from between the axle shaft and the wheel hub. Remove the driving hub spacer. (If equipped with free-running lock-out hubs, refer to Front Wheel Drive Lock-Out Hub Removal, Part 4-1).

4. With tool T59T-1197-B, remove the lock nut, washer, and wheel bearing adjusting nut from the spindle. Remove the wheel, hub and drum as an assembly. The wheel outer bearing will be forced off the spindle at the same time. Protect the spindle and inner bearing cone from dirt.

5. Remove the wheel and tire from the hub.

6. Press the hub bolts from the hub and drum and remove the drum.

##### INSTALLATION

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

2. Inspect the hub grease seal and bearing cups. Replace as necessary.

3. Press new hub bolts into the hub and drum assembly.

4. Install the hub and drum assembly on the spindle.

5. Install the outer wheel bearing cone and adjusting nut. Adjust the front wheel bearings as detailed in Part 3. (If equipped with free running lockout hubs, refer to Front Wheel Drive Lock-Out Hub Installation, Part 4-1).

#### REAR BRAKE DRUM

##### REMOVAL

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

2. Remove the hub cap and wheel and tire. Remove the three attaching nuts and remove 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 (Figs. 10 and 11). **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 degreaser.

2. Adjust the brake shoes as outlined under Brake Shoe Adjustment in

this section, using Rotunda Tool HRE 8650.

3. Place the drum over the brake assembly and into position.

4. Install the three attaching nuts and tighten securely. Install the wheel on the axle shaft flange studs against the drum, and tighten the 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. 12.

2. Remove the secondary shoe to anchor spring with the tool shown in Fig. 12. With the same tool, remove the primary shoe to anchor spring. Unhook the cable anchor.

3. Remove the cable guide from the secondary shoe (Figs. 1 and 2).

4. Remove the shoe hold-down springs, shoes, adjusting screw, pivot nut, socket and automatic brake adjusting parts.

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

6. After removing the rear brake secondary shoe, disassemble the parking brake lever from the shoe by removing the retaining clip and spring washer (Figs. 1 and 2).

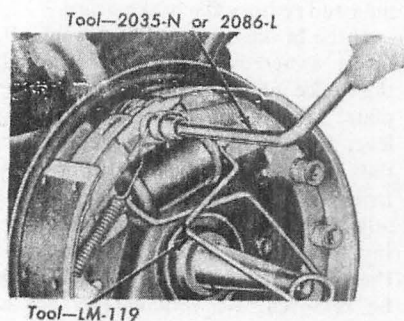


FIG. 12—Typical Retracting Spring Removal

### 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 backing plate.

3. Position the brake shoes on the backing 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 (Figs. 1 and 2).

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

5. Install the primary shoe to anchor (short) spring with the tool shown in Fig. 13.

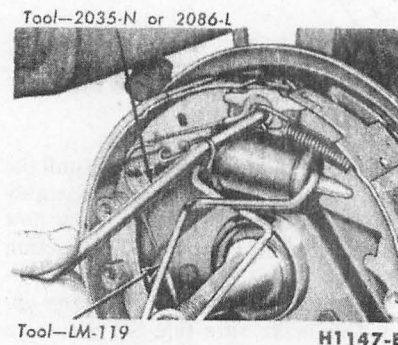


FIG. 13—Typical Retracting Spring Installation

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 (Figs. 1 and 2).

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. 13).

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.

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 vehicle 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. 14). The adjusting pivot nuts can be distinguished by the number of lines machined around the body of the nut. Two lines indicate a right nut; one line indicates a left nut.

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 brake assembly (Fig. 14).

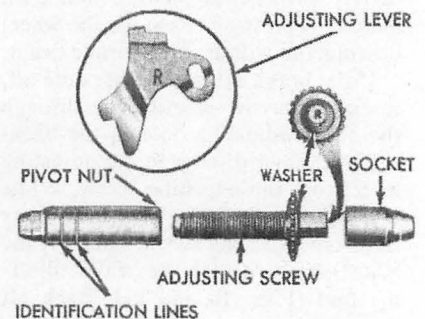


FIG. 14—Adjusting Screw and Lever Identification

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.

12. Pull the adjuster lever, cable and automatic adjuster spring down and toward the rear to engage the pivot hook in the large hole in the secondary shoe web (Fig. 13).

13. After installation, check the action of the adjuster by pulling the 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 the specified length (Part 2-3), 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.

14. Remove the clamp from the brake cylinder. Perform a brake adjustment. Install the drum and wheel. Adjust the brakes as required.

## WHEEL CYLINDER

### 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 backing plate, and remove the cylinder.

## INSTALLATION

1. Place the brake cylinder into position against the backing 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 BACKING PLATE

### 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 backing plate is being replaced, rotate the axle shaft so that the hole in the axle shaft flange lines up with the backing 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 backing plate.

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

### INSTALLATION

1. Position a new rear backing 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 attaching bolts and against the backing plate. Install the attaching nuts through the access hole in the axle shaft flange, and torque to specification.

Position a new front backing plate to the wheel spindle, install the attaching 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.

## MASTER CYLINDER

### REMOVAL

1. Disconnect the wires from the stoplight switch (Figs. 15 and 16).

2. Disconnect the brake hydraulic system lines at the master cylinder.

3. On Bronco models, remove the hair pin retainer and slide the stop light switch off the brake pedal pin just far enough for the switch outer hole to clear the pin. Remove the stoplight switch from the pin.

4. Slide the master cylinder push rod off the brake pedal pin. Remove the bushing and washers.

5. Remove the master cylinder retaining bolts and remove the master cylinder.

### INSTALLATION

1. Position the master cylinder assembly on the dash panel and install the retaining bolts. Torque the bolts to specification.

2. Connect the hydraulic brake system lines to the master cylinder.

3. Lubricate the push rod bushing with lubricant (Rotunda Engine Oil SAE 10W-20W-30). Insert the bushing in the push rod. Coat the washers with the lubricant, and position the push rod and bushing, washers and stoplight switch on the brake pedal pin. Install the hair pin type retainer.

5. Connect the stop light switch wires to the switch.

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

## DIFFERENTIAL VALVE

### REMOVAL

1. Raise the front end of the vehicle and position safety stands.

2. Disconnect the wires from the brake warning lamp switch. **To prevent damage to the brake warning switch wire connector, expand the plastic lugs to allow removal of the shell-wire connector from the switch body.**

3. Disconnect the hydraulic brake system lines at the differential valve assembly.

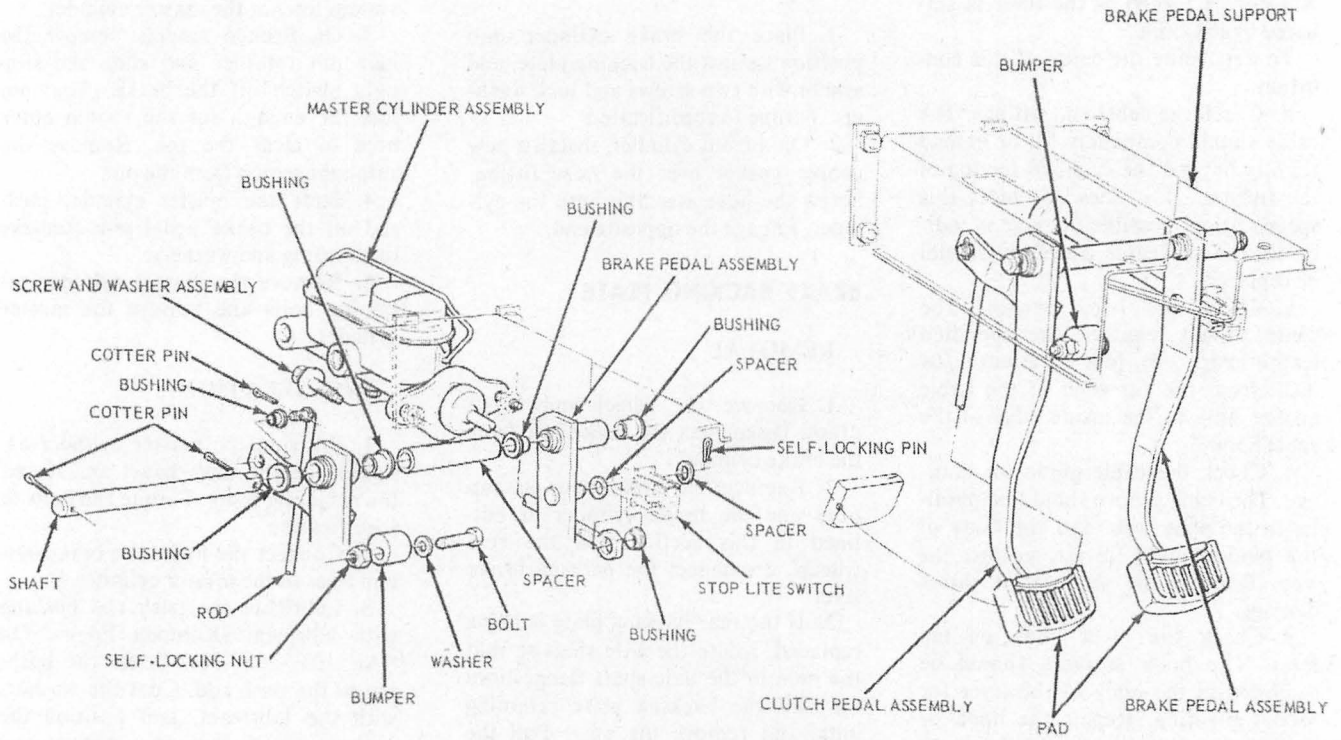
4. Remove the bolt and lockwasher securing the differential valve assembly to the underbody or frame member.

5. If the differential valve is to be replaced, remove the brake warning lamp switch from the old valve and install it on the new valve.

### INSTALLATION

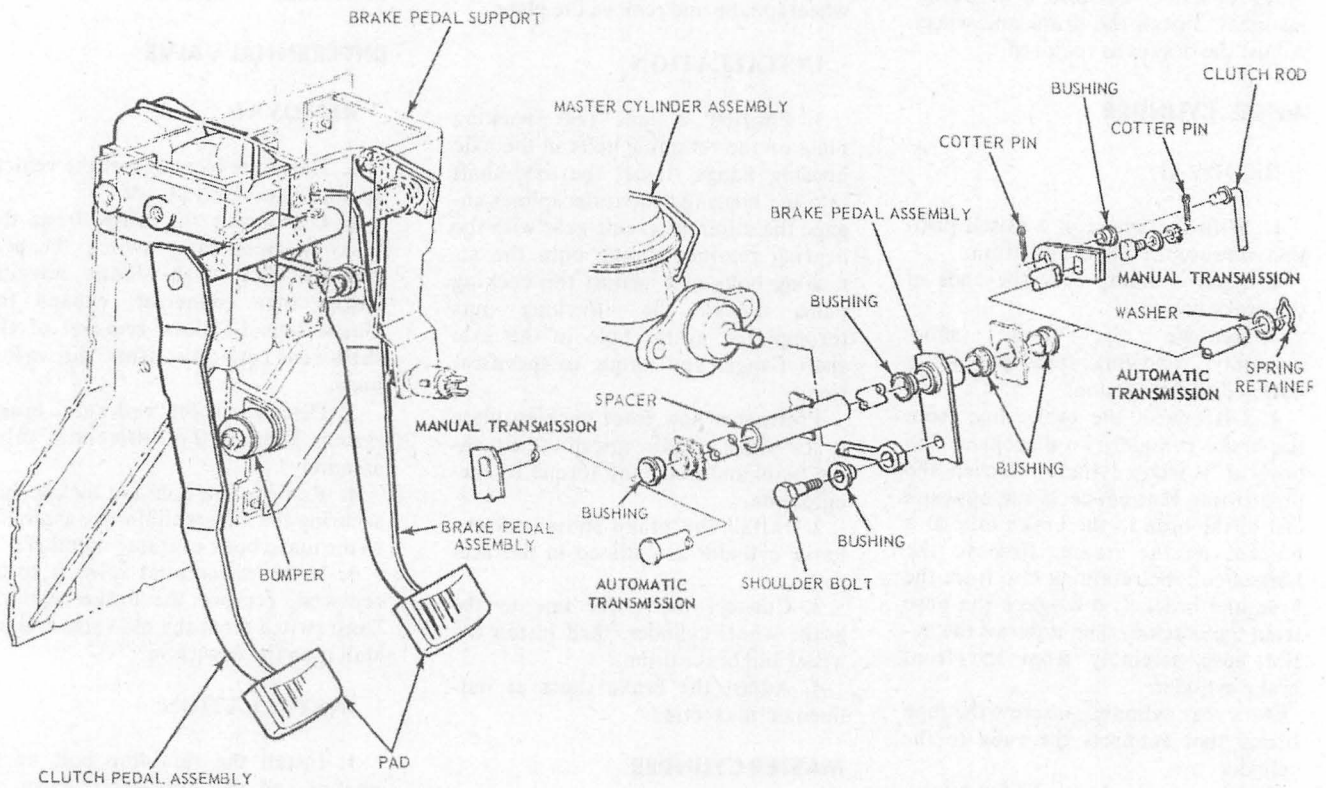
1. Install the retaining bolt, lockwasher and the differential valve on the underbody member, and tighten the retaining bolt.

2. Connect the brake hydraulic sys-



H1475-A

FIG. 15—Brake Master Cylinder and Brake Pedal Installation — Bronco



H1584-A

FIG. 16—Brake Master Cylinder and Brake Pedal Installed — Econoline

tem lines to the differential valve.

3. Connect the shell-wire connector to the brake warning lamp switch. **Make sure the plastic lugs on the connector are holding the connector securely to the switch.**

4. Bleed the brakes. Refer to Part 2-1, Section 2 for the proper procedure.

5. Remove the safety support stands and lower the vehicle.

## BRAKE PEDAL

Refer to Figs. 15 and 16.

### REMOVAL

1. Disconnect the wires from the stoplight switch.

2. Remove the hair pin retainer (Fig. 15) and slide the stop light switch off the brake pedal pin just far enough for the switch outer hole to clear the pin. Remove the stoplight switch from the pin.

3. Slide the master cylinder push rod off the brake pedal pin. Remove the bushing and washers.

4. Remove the cotter pin from the right side of the brake and clutch pedal shaft.

5. Slide the shaft toward the left, just enough to allow removal of the brake pedal and two brake pedal bushings.

### INSTALLATION

1. Coat the brake pedal bushings and the shaft with lubricant (Rotunda Engine Oil SAE 10W-20W-30).

2. Position the bushings, pedal and shaft on the brake pedal support and install the retaining cotter pin (Fig. 15). Spread the cotter pin ends.

3. Lubricate the master cylinder push rod bushing with the lubricant. Insert the bushing in the push rod. Coat the washers with the lubricant, and position the push rod and bushing, washers and stop light switch on the brake pedal pin. Install the hair pin type retainer.

4. Connect the wires to the stop light switch.

## PARKING BRAKE HANDLE —ECONOLINE

Refer to Figs. 17 and 18.

### REMOVAL

1. Push the equalizer lever slightly forward, and disconnect the ball end

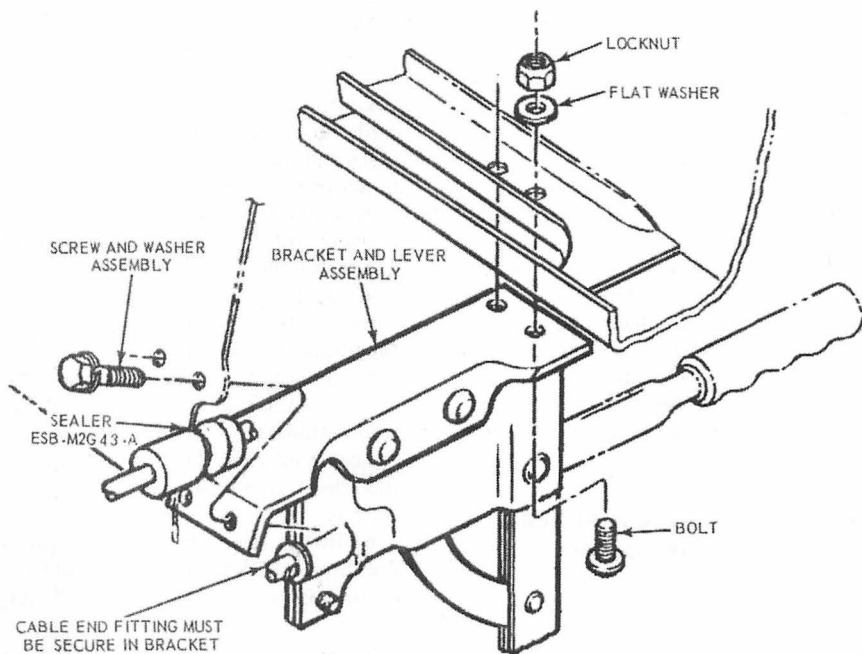


FIG. 17—Parking Brake Handle

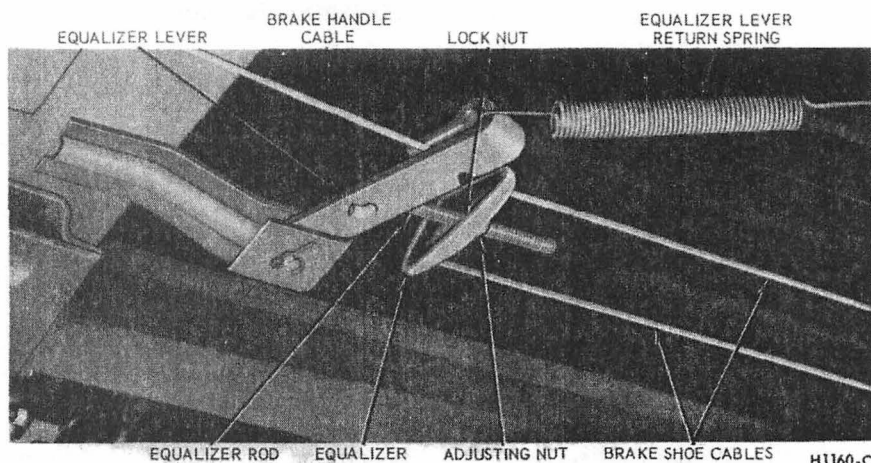


FIG. 18—Parking Brake Linkage

of the cable from the equalizer lever (Fig. 18).

2. Remove the bolts retaining the parking brake handle assembly to the dash panel and instrument panel. Remove the handle assembly.

### INSTALLATION

1. Position the parking brake handle assembly under the instrument panel and install the bolts retaining the handle to the dash panel and instrument panel.

2. Push the equalizer lever slightly forward, and insert the ball end of the

cable in the slot on the equalizer lever (Fig. 18).

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

## PARKING BRAKE EQUALIZER TO HANDLE CABLE—ECONOLINE

### REMOVAL

1. Remove the parking brake handle as outlined in this section.

2. Remove the ball end of the cable from the parking brake handle.

3. Remove the cable clip at the

frame crossmember below the steering gear.

4. Remove the ball end of the cable from the equalizer and remove the cable.

### INSTALLATION

1. Place the cable ball in the equalizer slot.

2. Install the parking brake handle as outlined in this section.

3. Push the equalizer slightly forward and install the cable ball end in the parking brake handle.

4. Install the retaining clip at the frame crossmember below the steering gear.

### PARKING BRAKE EQUALIZER TO REAR WHEEL CABLE

#### REMOVAL

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

2. Remove the three attaching 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 (Figs. 17, 18 and 19).

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.

5. On Econoline models, remove the spring retaining the right hand cable to the frame crossmember.

6. On Bronco models, remove the spring retaining the cable assembly to the frame siderail (Fig. 19). Working on the wheel side of the rear brake assembly (Figs. 1 and 2), 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 (Figs. 1 and 2).

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.

4. On Econoline models, install the spring to the right hand cable and to the frame crossmember.

5. On Bronco models, install the spring to the cable assembly and the frame siderail. Insert the ball end of the cable into the equalizer and tighten the adjusting nut on the equalizer rod slightly.

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

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

### PARKING BRAKE CONTROL—BRONCO

#### REMOVAL

1. Loosen the adjusting nut at the equalizer if necessary, and remove the ball-end of the control cable from the equalizer lever (Fig. 19).

2. Open the hood and remove the two nuts attaching the parking brake control assembly to the dash panel.

3. Working under the instrument panel, remove the bolt and nut attaching the control assembly to the lower flange of the instrument panel.

4. Remove the forward ball-end of the parking brake cable from the control assembly clevis and remove the control.

#### INSTALLATION

1. Connect the forward ball-end of the parking brake cable to the clevis of the control assembly.

2. Position the control assembly to the lower flange of the instrument

panel and install the attaching bolt and nut.

3. Working in the engine compartment, install and tighten the two nuts attaching the parking brake control assembly to the dash panel. Lower the hood.

4. Connect the ball-end of the control cable to equalizer lever (Fig. 19).

5. Adjust the parking brake equalizer lever to its original position. Check cable tension and adjust the parking brake, if necessary, following the instructions given in Parking Brake Adjustment.

### PARKING BRAKE CONTROL TO EQUALIZER CABLE—BRONCO

#### REMOVAL

1. Raise the vehicle on a hoist.

2. Loosen the adjusting nut at the equalizer assembly (Fig. 19) and remove ball end of the brake control to equalizer cable from the equalizer arm. Remove the clip retaining the cable housing to the bracket.

3. Lower the vehicle.

4. From inside of vehicle, disconnect the cable at the parking brake control clevis.

5. Raise the vehicle on a hoist.

6. Pull the parking brake control to equalizer cable through the hole in the dash panel and remove it from the vehicle.

#### INSTALLATION

1. Position the parking brake control to equalizer cable upward through the hole in the dash panel. Position the cable to the mounting bracket.

2. Lower the vehicle on a hoist.

3. Connect the cable to the parking brake control clevis.

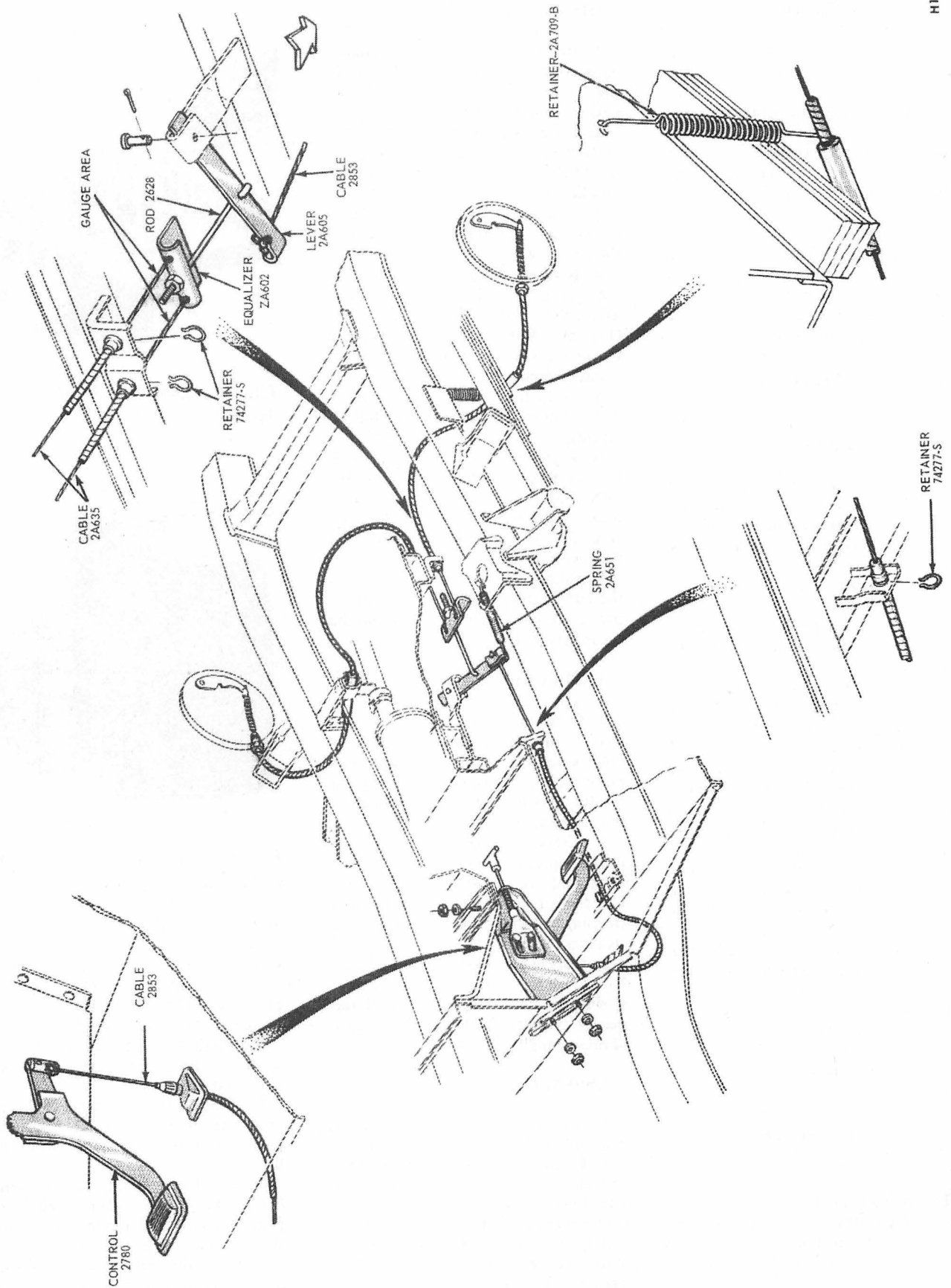
4. Raise the vehicle on the hoist.

5. Position the cable housing to the bracket and install the retaining clip.

6. Connect the ball end of cable to the equalizer arm and install the adjusting nut.

7. Adjust the parking brakes (Part 2-1, Section 2).

8. Lower the vehicle. Check the operation of the parking brake control.



H1417-B

FIG. 19—Parking Brake System—Bronco

## 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 true up the drum. The refinished diameter must not exceed 0.060 inch oversize.

After a drum is turned down, wipe the refinished surface with a cloth soaked in clean denatured alcohol. If one drum is turned down, the opposite drum on the same axle should also be cut down to the same size.

### BRAKE SHOE RELINING

Brake linings that are worn to within 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.

### DUAL-MASTER CYLINDER OVERHAUL

The master cylinder must be removed from the vehicle to be overhauled. Refer to Part 2-2, Section 3 for the removal and installation procedures.

### DISASSEMBLY

1. Remove the master cylinder cover and empty the brake fluid from the reservoir. Remove the rubber gasket from the cover (Fig. 3).

2. Unscrew the piston stop from the bottom of the cylinder body. Remove the O-ring seal from the piston stop. Discard the seal.

3. Remove the boot from the master cylinder. Pull the boot rearward on the push rod.

4. Remove the snap ring retaining the primary and secondary piston assemblies within the cylinder body (Fig. 20). Remove the push rod and the primary piston assembly from the master cylinder.

5. Invert the assembly and tap lightly to remove the secondary piston assembly.

6. With the use of a 6-32 self-tapping screw and flat washer, pry the tube seats out of the front and rear brake outlet bores in the cylinder body (Fig. 21). Discard the tube seats and the check valves.

7. Remove the return spring and the cup protector from the secondary piston. Discard the rubber seals on the secondary piston.

### INSPECTION AND REPAIR

1. Clean all parts in clean isopropyl alcohol and inspect the parts for chipping, excessive wear or damage. Replace them as required. **When using a master cylinder repair kit, install all of the parts supplied.**

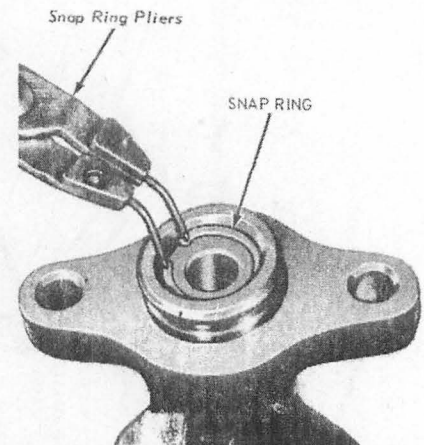
2. Check all recesses, openings and internal passages to be sure they are open and free from foreign matter. Use the air hose to blow out dirt and cleaning solvent. Place all parts on a clean pan or paper.

3. Inspect the hydraulic master cylinder bore for signs of etching, pitting, scoring or rust. **Replacement of the master cylinder will be required if any of these conditions exist.**

### ASSEMBLY

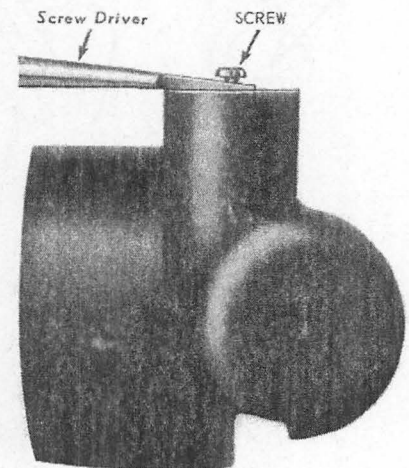
1. Dip all parts except the cylinder body in clean, heavy-duty brake fluid.

2. Position the check valve springs, new check valves and tube seats (flat-side toward the check valve) in the front (primary system) and rear (secondary system) brake outlet bores. With the use of tube nuts and a wrench, press the tube seat inward



H1477-B

FIG. 20—Removing Snap Ring—Typical



H1478-A

FIG. 21—Removing Tube Seat and Check Valve—Typical

until they bottom (Fig. 22). Remove the tube nuts.

3. Assemble the new seals, spring and cup protector to the secondary piston. Install the secondary piston assembly in the master cylinder.

4. Install a new O-ring on the piston stop, and start the stop in the cylinder body.

5. Position the retainer clip in the groove in the push rod. Assemble the push rod to the primary piston assembly.

6. Install the primary piston assembly in the master cylinder, push the piston inward and tighten the piston stop to retain the pistons in the bore.

7. Press the push rod and pistons inward and install the snap ring in the



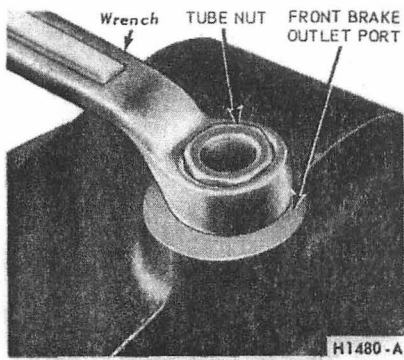


FIG. 22—Installing Tube Seat and Check Valve

cylinder body. Connect the boot to the lip of the master cylinder.

8. Install the rubber gasket in the master cylinder cover. **Make sure the gasket is properly seated.**

9. Bleed the master cylinder.

#### BLEEDING THE MASTER CYLINDER

Before the master cylinder is installed on the vehicle, the unit must be bled.

1. Support the master cylinder body

in a vise and fill both fluid reservoirs with the specified brake fluid.

2. Loosely install plugs in the front and rear brake outlet bores. Depress the push rod several times until air bubbles cease to appear in the brake fluid.

3. Tighten the plugs and attempt to depress the piston. **The piston travel should be restricted after all air is expelled.**

4. Remove the plugs. Install the cover assembly, and make sure the cover retainer is tightened securely.

## PART 2-3— Specifications

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

### TORQUE LIMITS (Ft-Lbs)

Description		Description	Econoline	Bronco
Master Cylinder Bolt to Brake Pedal Assembly	8-12	Rear Brake Backing Plating to Axle	50-70	50-70
Brake Tube Fitting	5-7	Brake Hose	12-18	12-18
Rear Brake Assembly and Bearing Retainer to Rear Axle Housing	30-35	Brake Line Connection to Rear Axle Housing (Vent)	12-18	
Brake Cylinder to Brake Carrier Plate	11-19	Front Brake Backing Plate to Spindle	45-60	30-40
Parking Brake Control	10-12	Wheel Nuts	65-90 E100/200 125-175 E300	65-90
Master Cylinder to Mounting Bracket	16-20			

### CHECKS AND ADJUSTMENTS

Description	Econoline	Bronco	Description	Econoline	Bronco
Lining Maximum Wear Limit (From Top of Rivets or Shoe Rim)	1/32	1/32	Master Cylinder Stroke	1.160	1.160
Lining Maximum Clearance to Shoe (Midway Between Rivets)	0.008	0.008	Master Cylinder Fluid Level - Distance From Top of Reservoir - Inches ①	1/4 to 1/2	1/4 to 1/2

① Use Ford Brake Fluid Extra Heavy Duty, C6AZ - 19542-A, only.

### BORE DIAMETERS — BRAKE DRUM, WHEEL CYLINDER AND MASTER CYLINDER

Models	Brake Drum		Wheel Cylinder Bore Diameter		Master Cylinder Bore Diameter	
	Inside Diameter	① Boring Limit (Maximum)	② Front	② Rear	With Power Brake	Less Power Brake
Econoline	10.000	10.060	1.125	0.8125	—	1.000
Bronco	Rear (2780 Lb Axle)	10.000	—	0.8125	—	1.000
	Rear (3300 Lb Axle)	11.000	—	—	—	—
	Front	11.000	—	0.8125	—	—

① Maximum Runout 0.007

② Maximum Allowable Hone 0.003

### LINING DIMENSIONS — INCHES

Description		Econoline			Bronco		
		Front	Rear		Front	Rear	
			2300 Lb Axle	3050 Lb Axle		2780 Lb Axle	3300 Lb Axle
Lining Width	Primary	2.50	1.75	2.50	2.00	2.5	1.75
	Secondary	2.50	1.75	2.50	2.00	2.5	1.75

# Suspension, Steering, Wheels And Tires

GROUP  
**3**

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## PART 3-1—Suspension, Steering, Wheels And Tires General Service

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Shock Absorber Tests .....	3-2	Checking and Adding Steering	
2 Common Adjustments and Repairs .....	3-2	Gear Lubricant .....	3-5
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Wheel Balancing .....	3-3		

### 1 DIAGNOSIS AND TESTING

Fig. 6 lists various suspension, steering, and wheel and tire trouble symptoms and their possible causes. The possible causes are listed in the order in which they should be checked. For example, refer to the fourth trouble symptom in Fig. 6, 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

The caster and camber angles on the Bronco are designed into the front axle and cannot be adjusted.

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, perform all inspection operations on a level floor.

1. Drive the vehicle in a straight line far enough to establish the straight-ahead position of the front wheels, and then place corresponding 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.

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.

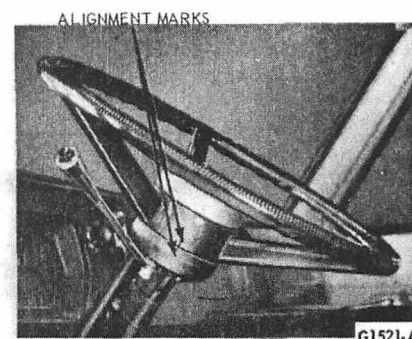


FIG. 1—Straight Ahead Position Marks—Econoline

#### CAMBER—ECONOLINE ONLY

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) tilt, is listed in the specifications section. The maximum difference between both front wheel camber angles should not exceed 1/2 degrees.

#### CASTER—ECONOLINE ONLY

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 3-7. The maximum difference between both front wheel caster angles should not exceed 1/2 degrees.

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.

#### TOE-IN

Check the toe-in with the front wheels in the straight-ahead position. Measure the distance between the extreme front and also between the extreme rear of both front wheels. Both of these measurements (front and rear of wheels) should be taken at an equal distance from the floor and at the approximate center line of the spindle. The difference between these two distances is the amount that the wheels

toe-in or toe-out. The wheels should always be adjusted to toe-in according to specifications.

After front wheel alignment factors have been checked, make the necessary adjustments.

#### FRONT WHEEL TURNING ANGLE—ECONOLINE ONLY

When the inside wheel is turned 20 degrees, the turning angle of the outside wheel should be specified in the specifications section. The turning angle cannot be adjusted directly, because it is a result of the combination of caster, camber, and toe-in adjustments and should, therefore, be measured only after these adjustments have been made. If the turning angle does not measure to specifications, check the spindle or other suspension parts for a bent condition.

#### SHOCK ABSORBER TESTS

##### ON VEHICLE TESTS

1. Check the shock absorber to be sure it is securely and properly installed. Check the shock absorber insulators for damage and wear.

Replace any defective insulators and tighten attachments to the specified torque (on a shock absorber which incorporates integral insulators, replace the shock absorber).

2. Inspect the shock absorber for evidence of fluid leakage. A light film of fluid is permissible. Be sure any fluid observed is not from sources other than the shock absorber.

Replace the shock absorber if leakage is severe.

3. Disconnect one end of the shock absorber. Extend and compress the shock absorber as fast as possible, using as much travel as possible. Action should become smooth and uniform throughout each stroke. Higher resistance on extension than on compression is a normal condition. Faint swish noises are also normal.

Remove the shock absorber for a bench test if action is erratic. If the action is smooth, but the shock absorbers are suspected of being weak follow step 4:

4. Repeat step 3 on the mating shock absorber installed on the opposite side of the vehicle, and compare results of both tests. If the action is similar, it is unlikely that either shock absorber is defective. Reconnect both shock absorbers.

Replace the shock absorber having the lower resistance. Ensure that the part number of the replacement is the same as that of the original shock absorber. The replacement shock absorber resistance will appear to be higher than either original due to initial friction of the rod seal.

##### BENCH TEST

With the shock absorber right side up (as installed in vehicle), extend it fully. Then turn the shock absorber up side down and fully compress it. Repeat this procedure at least three times to ensure that any entrapped air has been expelled. Now place the shock absorber right side up in a vise, and hand stroke the shock absorber as described on On Vehicle Tests, step 3. If action is not now smooth and uniform, install a new shock absorber.

## 2 COMMON ADJUSTMENTS AND REPAIRS

### FRONT WHEEL ALIGNMENT ADJUSTMENTS

After front wheel alignment factors have been checked, make the necessary adjustments. Camber, caster, and toe-in can be adjusted if not within specifications. **Caster and camber adjustments do not apply to Bronco models.** Before performing wheel alignment adjustments, be sure the vehicle is under normal load conditions.

#### CAMBER—ECONOLINE ONLY

Camber can be increased or decreased by bending the axle beam with

the tools shown in Fig. 2 and 3. In all cases, the tools should be installed and located as shown. **Do not heat the axle to bend it.**

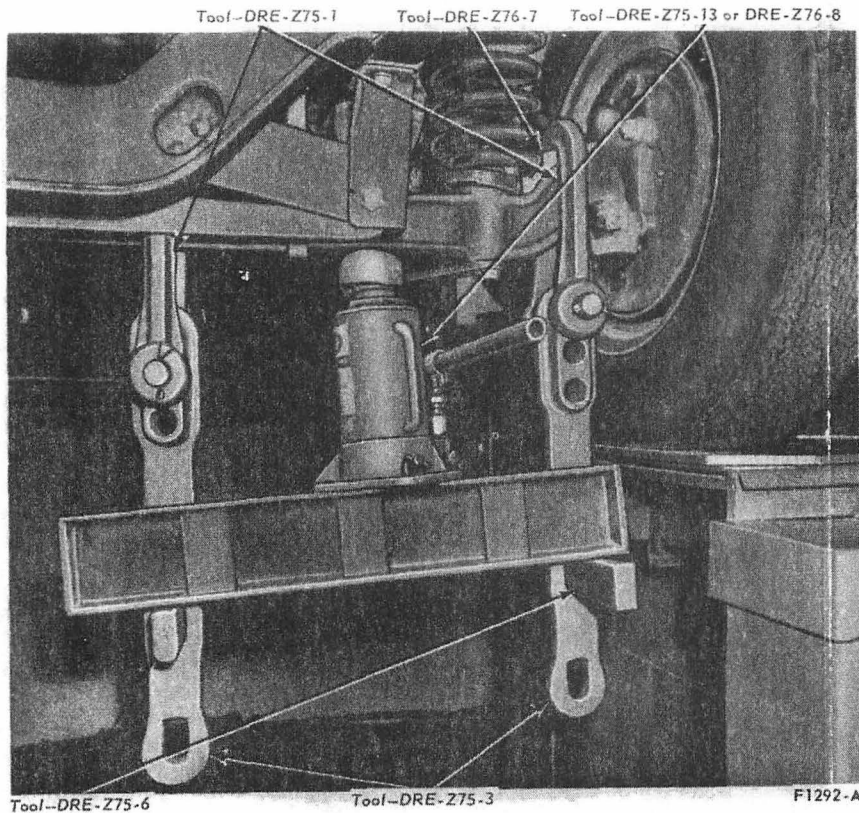
#### CASTER—ECONOLINE ONLY

##### Caster

Caster is adjusted by twisting the axle beam outboard of the radius arm (strut) attachment with the tools shown in Figs. 4 and 5. In all cases, the tools should be installed and located as shown. **Do not heat the axle to bend it.**

#### TOE-IN

If the toe-in is incorrect, loosen the clamp bolts at each end of the left tie rod. Rotate the tube until the correct toe-in is obtained, and torque the clamp bolts to specifications (Part 3-7). Recheck the toe-in to make sure that no changes occurred when the bolts were tightened. The clamps on Econoline models should be positioned 3/16 inch from the end of the rod with the clamp bolt at right angles and adjacent to the slot in the rod (Part 3-2, Fig. 5). The clamps on Bronco models should be positioned 3/16 inch from the end of the rod with the clamp



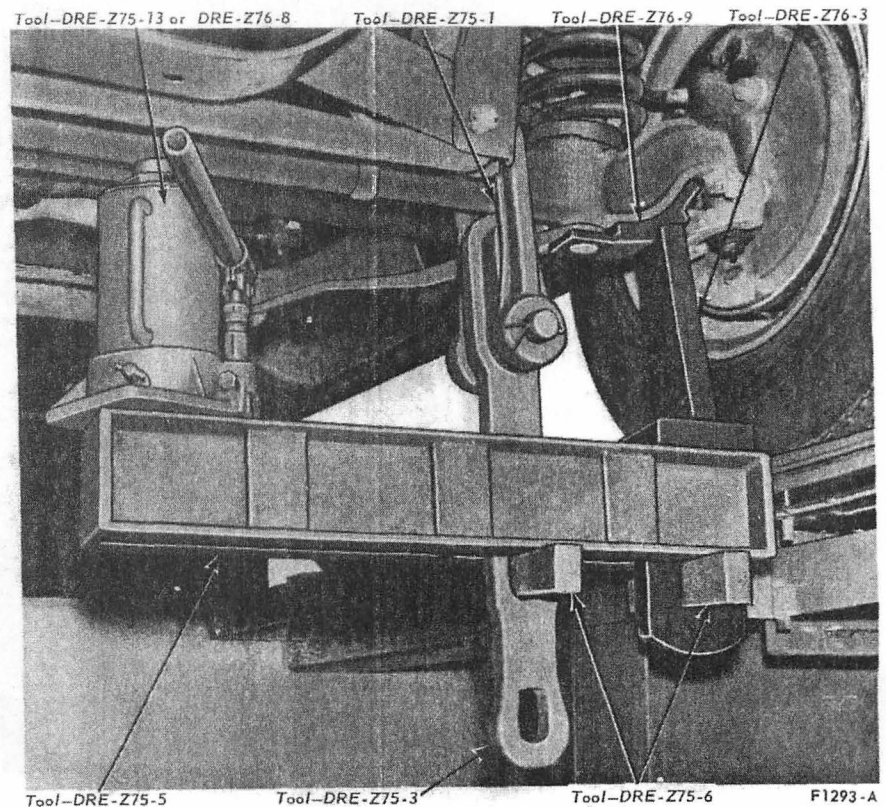
**FIG. 2 — Twin I-Beam Camber Increase Tool Installation**

bolts in a vertical position in front of the tube, with the nut down.

### WHEEL BALANCING

Wheel balancing is the proper distribution of weight around a wheel and tire to counteract centrifugal forces acting upon the heavy area. The purpose of wheel balancing is to maintain a true running wheel perpendicular to its rotating axis. A properly balanced wheel will eliminate vibration and abnormal wear of suspension parts and tire wear.

To balance a wheel, carefully follow the instructions provided with the Rotunda Wheel Balancer.



**FIG. 3 — Twin I-Beam Camber Decrease Tool Installation**

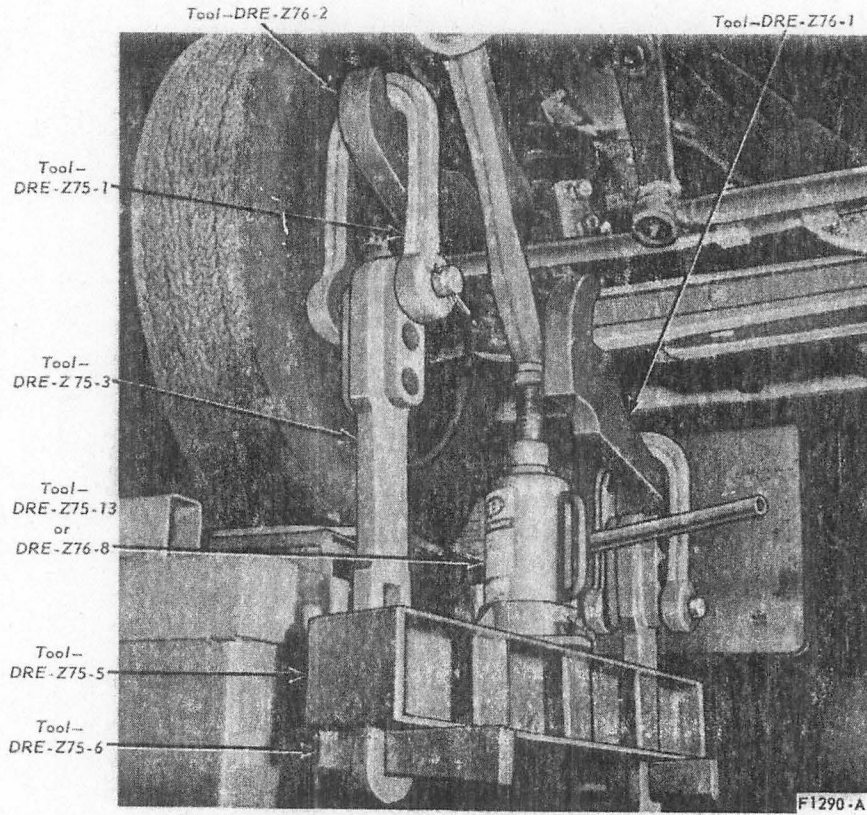


FIG.4—Twin-l-Beam Caster Increase Tool Installation

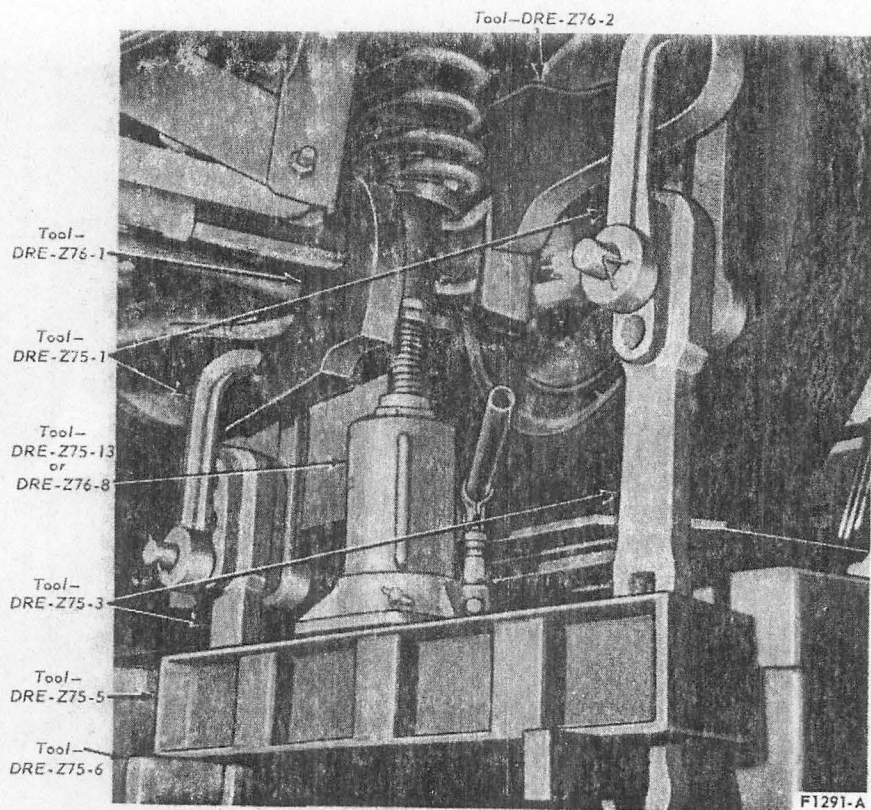
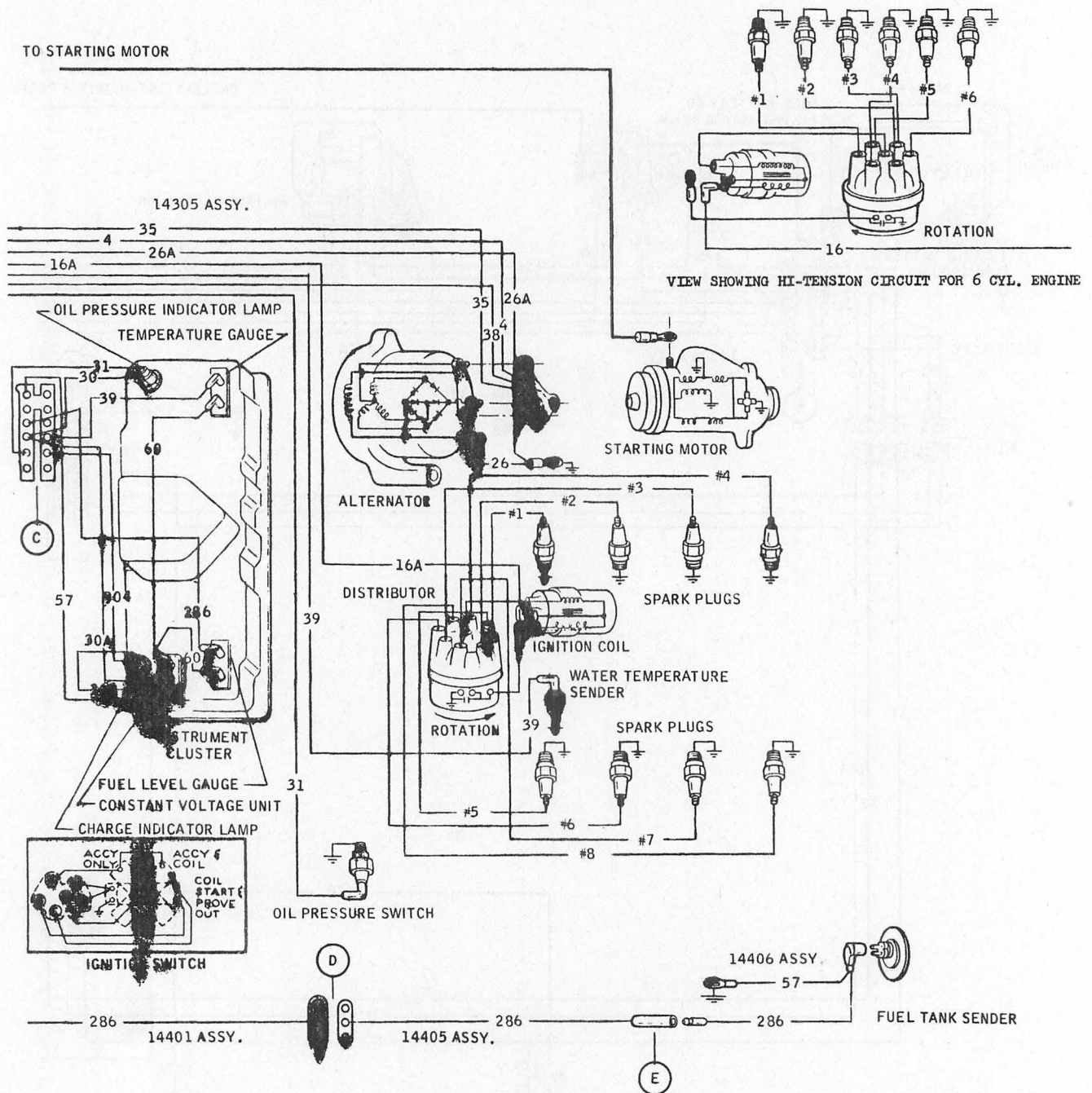


FIG.5—Twin-l-Beam Caster Decrease Tool Installation



WIRING COLOR CODE

	4	WHITE-BLACK STRIPE	32	RED-BLUE STRIPE
	16A 16	RED-GREEN STRIPE	286.	35 ORANGE
	Ø 16A	PINK-RESISTOR WIRE	37A	37 BLACK-YELLOW STRIPE
152A	152 21	YELLOW	57	38 BLACK
	26A 26	BLACK-RED STRIPE	39	39 RED-WHITE STRIPE
297B 297A 297	30 30A	BLACK-GREEN STRIPE	60A 60	60 BLACK-WHITE STRIPE
	31	WHITE-RED STRIPE	262	262 BROWN
			904	904 GREEN-RED STRIPE
			•	SPLICE
			⊕	GROUND

FIG. 15 — Econoline Ignition, Starting, Charging and Gauges (Continued)

