

# 1964 FORD

# TRUCK 500-800 SERIES

# SHOP MANUAL

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## **1964 Ford Truck Shop Manual (500-800 Series)**

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# 1964 FORD TRUCK 500-800 SERIES

## SHOP MANUAL

SERVICE DEPARTMENT  
FORD DIVISION  
 MOTOR COMPANY

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**SPECIFICATIONS AT END OF EACH GROUP**

## FOREWORD

*This shop manual provides the Service Technician with complete information for the proper servicing of the 1964 500–800 Series Trucks.*

*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, maintenance information 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**

# 1964 FORD TRUCK IDENTIFICATION

### WARRANTY NUMBER

The Warranty Number identifies the vehicle series, engine type, assembly plant, and consecutive unit number (Fig. 1).

The complete official Serial Number is stamped on various frame and body locations. This number is the same as the Warranty Number but is preceded and followed by asterisks.

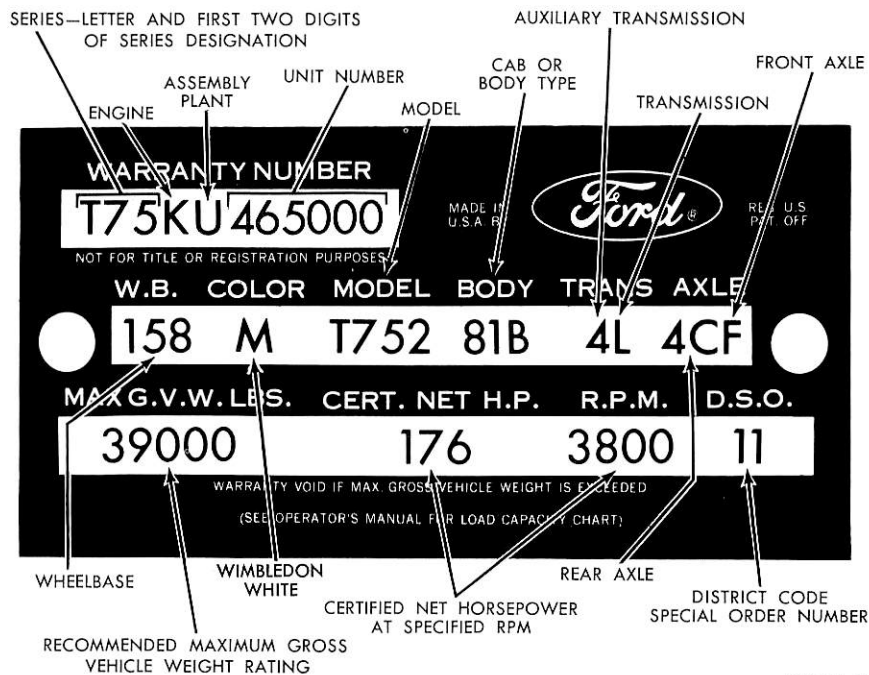
### MODEL DESIGNATIONS

Model designations consist of two elements, a letter and a three or four-

digit number. The letter determines the type of truck and the number indicates the size, as follows:

- F..... Conventional Series
- C..... Tilt Cab Series
- T..... Tandem Axle Series
- B..... School Bus Series
- N..... Cab Over Engine
- 500, 550, 600..... Medium Duty Models
- 700, 750, 800..... Heavy Duty Models
- 3500, 4000, 5000, 6000, 7000..... Dagenham Diesel

For example: The C-600 is a medium-duty tilt cab model.



P1116-B

FIG. 1—Typical Truck Rating Plate

### TRUCK REGISTRATION RATINGS

Series	Model Code	RATING		Series	Model Code	RATING		Series	Model Code	RATING	
		GVW (lb)	Nominal (ton)			GVW (lb)	Nominal (ton)			GVW (lb)	Nominal (ton)
B-500	B-500	15,000	1½	B-700	B-707	23,000	2½	C-600	C-612	22,000	2½
	B-501	10,000	1		B-708	23,000	2½		C-613	22,000	2½
	B-502	16,000	1½	B-750	B-750	22,500	2½		C-614	22,000	2½
	B-503	18,000	2		B-751	17,000	2	C-700	C-700	24,000	2½
	B-504	20,000	2		B-752	23,000	2½		C-701	17,000	2
B-600	B-600	17,000	2	B-753	24,000	2½	C-702		25,500	2½	
	B-601	15,000	1½	B-754	25,500	3	C-703	25,500	3		
	B-602	20,000	2	C-550	C-550	15,000	1½	C-750	C-750	24,000	2½
B-700	B-700	20,500	2½		C-551	10,000	1		C-751	17,000	2
	B-701	17,000	2		C-552	17,000	2		C-752	25,500	3
	B-702	21,000	2½	C-553	19,000	2	C-753		25,500	3	
	B-703	22,500	2½	C-600	C-600	20,000	2	C-800	C-800	27,000	3½
	B-704	23,000	2½		C-601	15,000	1½		C-801	20,000	2
	B-705	24,000	2½		C-610	21,000	2½		C-802	27,500	3½
B-706	23,500	3	C-611	22,000	2½						

TRUCK REGISTRATION RATINGS (Continued)

Series	Model Code	RATING		Series	Model Code	RATING		Series	Model Code	RATING		
		GVW (lb)	Nominal (ton)			GVW (lb)	Nominal (ton)			GVW (lb)	Nominal (ton)	
C-800	C-803	27,500	3½	F-750	F-750	22,500	2½	N-700	N-700	22,000	2½	
	C-804	27,500	3½		F-751	17,000	2		N-701	17,000	2	
CT-750	L-750	39,000	3½		F-752	23,000	2½		N-702	23,000	2½	
	L-751	27,000	2½		F-753	24,000	2½		N-703	24,000	2½	
	L-752	41,000	4		F-754	25,500	3		N-704	25,500	3	
					F-755	23,000	2½		N-705	23,000	2½	
CT-800	L-800	43,000	4		F-756	25,500	3		N-706	23,000	2½	
	L-801	27,000	2½		F-800	F-800	23,000	2½	N-707	25,500	3	
	L-802	39,000	4			F-801	17,000	2	N-750	N-750	22,500	2½
	L-803	45,000	4			F-802	24,000	2½		N-751	17,000	2
	L-804	49,000	5			F-803	25,500	3		N-752	23,000	2½
F-500	F-500	15,000	1½			F-804	27,500	3½		N-753	24,000	2½
	F-501	10,000	1	F-805		23,000	2½	N-754		25,500	3	
	F-502	16,000	1½	F-806		25,500	3	N-755		23,000	2½	
	F-503	18,000	2	F-807		27,500	3½	N-756	25,500	3		
	F-504	20,000	2	F-808	27,500	3½	T-700	T-700	28,000	3		
F-600	F-600	17,000	2	N-500	N-500	15,000		1½	T-701	22,000	2	
	F-601	15,000	1½		N-501	10,000		1	T-702	29,000	3	
	F-602	20,000	2		N-502	16,000		1½	T-703	36,000	3½	
	F-610	21,000	2½		N-503	18,000	2	T-704	37,000	3½		
	F-611	22,000	2½	N-504	20,000	2	T-750	T-750	37,000	3½		
	F-612	23,000	2½	N-600	N-600	17,000		2	T-751	27,000	2½	
	F-613	23,000	2½		N-601	15,000		1½	T-752	39,000	3½	
	F-614	23,000	2½		N-602	20,000		2	T-753	41,000	4	
F-700	F-700	22,000	2½		N-610	21,000	2½	T-800	T-800	43,000	4	
	F-701	17,000	2		N-611	22,000	2½		T-801	27,000	2½	
	F-702	23,000	2½		N-612	23,000	2½		T-802	45,000	4	
	F-703	24,000	2½		N-613	23,000	2½		T-803	49,000	5	
	F-704	25,500	2½		N-614	23,000	2½	T-804	43,000	4		
	F-705	23,000	2½									
	F-706	23,000	2½									
	F-707	25,500	3									

ENGINE CODE

Code	Cubic Inch Displacement
A.....	330-2V (MD)
B.....	262-1V
C.....	292-2V
D.....	292-4V
E.....	330 Diesel Ford (DGHM)
J.....	223-1V
K.....	361-2V
L.....	292-2V (Low Compression)
M.....	330-2V (HD)
U.....	292-4V (Low Compression)
1.....	223-1V (Low Compression)
4.....	220 Diesel Ford (DGHM)
5.....	330-2V (HD, Low Compression)
9.....	391-4V

AUXILIARY TRANSMISSION CODES\*

Code	Type	Ratio
1	3 Speed Spicer.....5831-C	1.27/ .85
2	3 Speed Spicer.....5831-D	2.0 / .85
3	3 Speed H.D. Spicer.....7231-B	1.24/ .86
4	3 Speed H.D. Spicer.....7231-D	2.14/ .86
5	4 Speed Spicer.....8341-C	2.40/1.29/.84
6	3 Speed Spicer.....8031-C	2.59/ .79
7	3 Speed Spicer.....8031-P	1.19/ .84
8	4 Speed Spicer.....7041	2.31/1.21/.83

NOTE: When required, the auxiliary transmission code will be stamped directly in front of the transmission code.

\*If the "New Process" transmission is installed, the auxiliary transmission code will bear the suffix "N".

CONSECUTIVE UNIT NUMBER

Basically, the system requires the monthly assignment of serial numbers into blocks.

1964 MODEL YEAR

August.....	445,000 thru 449,999
September.....	450,000 thru 459,999
October.....	460,000 thru 469,999
November.....	470,000 thru 479,999

December.....	480,000 thru 489,999
January.....	490,000 thru 499,999
February.....	500,000 thru 509,999
March.....	510,000 thru 519,999
April.....	520,000 thru 529,999
May.....	530,000 thru 539,999
June.....	540,000 thru 549,999
July.....	550,000 thru 559,999
August.....	560,000 thru 569,999
September.....	570,000 thru 579,999

**ASSEMBLY PLANT CODES**

Code	Plant Location
D.....	Dallas
E.....	Mahwah
G.....	Chicago
H.....	Lorain (Ohio)
K.....	Kansas City
L.....	Michigan Truck
N.....	Norfolk
P.....	Twin City (St. Paul)
R.....	San Jose
S.....	Pilot Plant
U.....	Louisville

**COLOR CODE**

Code	Sales Name	*Paint Spec. Number
A.....	Raven Black.....	M30J-1724
B.....	Caribbean Turquoise.....	M30J-556
C.....	Pure White.....	M30J-1525
Y.....	Glacier Blue.....	M30J-1623
G.....	Chrome Yellow.....	M30J-1526
J.....	Rangoon Red.....	M30J-1515
L.....	Holly Green.....	M30J-1237
M.....	Wimbledon White.....	M30J-1619
T.....	Navajo Beige.....	M30J-1631
V.....	Academy Blue.....	M30J-1024
K.....	Bengal Tan.....	M30J-1706
S.....	Mint Green.....	M30J-1373

\*"M32J" alternate with "M30J"

**DSO**

Trucks built to Domestic Special Order have the order number and the District Code number of the district which ordered the unit stamped in this space. If the truck is a regular production unit, only the District Code will appear.

**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
86.....	Diplomatic Service Comm.
89.....	Transportation Service
90-99.....	Export

**TRANSMISSION CODE**

Code	Description
F.....	4-Speed Warner T98-A
A.....	4-Speed New Process 435
X.....	5-Speed 5H74 Fuller
9.....	5-Speed 5H75 Fuller
J.....	5-Speed Clark 250-V Direct
K.....	5-Speed Clark 251-VO Overdrive
L.....	5-Speed Clark 2653-V1 Direct
M.....	5-Speed Clark 264-VO Overdrive
W.....	5-Speed Clark 2622-V1 Direct
N.....	5-Speed Spicer 5652 Direct
P.....	5-Speed Spicer 5756-B Direct
Q.....	5-Speed Spicer 6352 Direct (Iron)
4.....	5-Speed Spicer 6354 Direct (Alum.)
U.....	5-Speed Spicer 6352-B Direct (Iron)
8.....	5-Speed Spicer 6354-B Direct (Alum.)
V.....	5-Speed Spicer 6452-A Direct (Iron)
7.....	5-Speed Spicer 6454-A Direct (Alum.)
S.....	5-Speed Spicer 6453-A Overdrive (Iron)
5.....	5-Speed Spicer 6455-A Overdr. (Alum.)
R.....	5-Speed Spicer 6852-G Direct (Iron)
6.....	5-Speed Spicer 6854-G Direct (Alum.)
A.....	5-Speed Fuller 5-H-74 Direct
B.....	5-Speed Spicer 8051-C Overdrive (Iron)
Y.....	5-Speed Spicer 8055-C Overdr. (Alum.)
C.....	5-Speed Spicer 8052 Direct (Iron)
Z.....	5-Speed Spicer 8054 Direct (Alum.)
H.....	6-Speed Transmatic MT-30
2.....	6-Speed Transmatic MT-40
3.....	6-Speed Transmatic MT-42
T.....	8-Speed Fuller R-46 Direct
D.....	10-Speed Fuller R-96 Direct (Iron)
E.....	10-Speed Fuller RA-96 Direct (Alum.)
I.....	10-Speed Fuller R-960 Overdr. (Iron)
G.....	10-Speed Fuller RA-960 Overdr. (Alum.)
O.....	12-Speed Spicer 8125 Overdr. (Alum.)

**TRUCK REGISTRATION RATINGS—  
DAGENRAM DIESEL POWERED UNITS**

Series	Model Code	RATING	
		GVW (lbs)	Nominal (ton)
C-6000	D-600	20,000	2
	D-601	15,000	1½
	D-610	21,000	2½
	D-611	22,000	2½
	D-612	22,000	2½
	D-613	22,000	2½
	D-614	22,000	2½
C-7000	D-700	24,000	2½
	D-701	17,000	2
	D-702	25,500	2½
	D-703	25,500	3

Series	Model Code	RATING	
		GVW (lbs)	Nominal (ton)
N-6000	R-600	20,000	2
	R-601	15,000	1½
	R-610	21,000	2½
	R-611	22,000	2½
	R-612	23,000	2½
	R-613	23,000	2½
	R-614	23,000	2½
	N-7000	R-700	22,000
R-701		17,000	2
R-702		23,000	2½
R-703		24,000	2½
R-704		25,500	2½
R-705		23,000	2½
R-706		23,000	2½

## REAR AXLE CODES

## EATON 30 DP

Code	Ratio and Rating
1D	7.75—32M*
2D	8.55—32M*
3D	6.43—32M*
4D	6.78—32M*
5D	7.17—32M*
6D	7.60—32M*

## EATON 30 DS

Code	Ratio and Rating
1C	4.63—32M*
2C	4.88—32M*
3C	5.57—32M*
4C	6.50—32M*
5C	7.17—32M*
6C	7.60—32M*

## EATON 34 DP

Code	Ratio and Rating
1N	7.60—34M*
3N	8.38—34M*
4N	5.05—34M*
5N	5.60—34M*
6N	5.91—34M*
7N	6.21—34M*
8N	6.65—34M*

## EATON 34 DS

Code	Ratio and Rating
1F	4.56—34M*
2F	4.88—34M*
3F	5.57—34M*
4F	6.50—34M*
5F	7.17—34M*
6F	7.60—34M*
7F	4.11—34M*
8F	4.33—34M*

## EATON 34 M

Code	Ratio and Rating
1E	4.56—34M*
2E	5.85—34M*
3E	6.69—34M*
4E	7.80—34M*
6E	8.60—34M*

## EATON 22M

Code	Ratio and Rating
1A	6.70—22M*
2A	7.79—22M*

## EATON 1790-A-91A

Code	Ratio and Rating
84	5.57—18.5M*
86	6.14—18.5M*
87	6.50—18.5M*
88	7.17—18.5M*
89	7.67—18.5M*
91	4.33—18.5M*
92	4.56—18.5M*
93	4.88—18.5M*

## EATON 17800-01

Code	Ratio and Rating
H1	4.33/5.91—18.5M*
H2	4.56/6.21—18.5M*
H3	4.88/6.65—18.5M*
H4	5.57/7.60—18.5M*
H6	6.14/8.38—18.5M*
H7	6.50/8.87—18.5M*
H8	7.17/9.77—18.5M*

## EATON 1911

Code	Ratio and Rating
M1	4.11—23M*
M2	4.33—23M*
M3	4.88—23M*
M4	5.43—23M*
M5	6.17—23M*
M6	6.67—23M*

## EATON 1919

Code	Ratio and Rating
N1	4.11—23M*
N2	4.33—23M*
N5	4.88—23M*
N6	5.43—23M*
N7	6.17—23M*
N8	6.67—23M*

## EATON 19503

Code	Ratio and Rating
U2	4.33/5.89—23M*
U3	4.88/6.63—23M*
U4	5.43/7.39—23M*
U5	6.14/8.36—23M*
U6	6.71/9.13—23M*

## EATON 19801

Code	Ratio and Rating
V2	4.33/5.89—23M*
V3	4.88/6.63—23M*
V4	5.43/7.39—23M*
V5	6.14/8.36—23M*
V6	6.71/9.13—23M*

## EATON 9503

Code	Ratio and Rating
N3	5.89—23M*
N4	6.63—23M*

## EATON 8802-3

Code	Ratio and Rating
J1	5.91—22M*
J2	6.65—22M*
J3	6.21—22M*

## EATON 1911

Code	Ratio and Rating
MA	4.11—34M*
MB	4.33—34M*
MC	4.88—34M*
MO	5.43—34M*
ME	6.17—34M*
MF	6.67—34M*

## EATON 1919

Code	Ratio and Rating
NA	4.11—34M*
NB	4.33—34M*
NE	4.88—34M*
NF	5.43—34M*
NG	6.17—34M*
NH	6.67—34M*

## EATON 1350

Code	Ratio and Rating
D1	5.83/8.11—13M*

## EATON 13800

Code	Ratio and Rating
F1	5.83/8.11—15M*
F2	6.33/8.81—15M*

## EATON 13802

Code	Ratio and Rating
F7	5.83/8.11—15M*
F8	6.33/8.81—15M*

## EATON 1614-15

Code	Ratio and Rating
73	6.50—17M*
75	7.17—17M*

## EATON 16802-3

Code	Ratio and Rating
G3	6.50/9.04—17M*

## TIMKEN Q246P

Code	Ratio and Rating
L1	4.92—22M*
L2	5.63—22M*
L3	6.39—22M*
L4	7.27—22M*
L5	6.04—22M*

## TIMKEN SLDD

Code	Ratio and Rating
4G	7.67—34M*
5G	8.43—34M*

## TIMKEN SLHD

Code	Ratio and Rating
1H	4.63—34M*
2H	5.29—34M*
3H	5.83—34M*
4H	6.83—34M*
5H	7.80—34M*
6H	8.60—34M*

TIMKEN SLHD (W/Lt. Wt. Susp.)  
(Aluminum)

Code	Ratio and Rating
AH	4.63—34M*
BH	5.29—34M*
CH	5.83—34M*
DH	6.83—34M*
EH	7.80—34M*
FH	8.60—34M*

\*M-Pounds Capacity in Thousands



**REAR AXLE CODES (Cont'd)**

**TIMKEN Q346-P**

Code	Ratio and Rating
T1	4.92/6.76—22M*
T2	5.63/7.73—22M*
T3	6.39/8.78—22M*
T4	7.33/10.07—22M*
T5	6.00/8.24—22M*

**TIMKEN R141-P**

Code	Ratio and Rating
φ1	4.11—23M*
φ2	4.33—23M*
φ3	4.63—23M*
φ4	5.29—23M*
φ5	5.57—23M*
φ6	6.14—23M*
φ7	6.83—23M*

**TIMKEN RT-241P**

Code	Ratio and Rating
P1	4.62—23M*
P2	4.99—23M*
P3	5.46—23M*
P4	6.10—23M*
P5	7.21—23M*

**TIMKEN SLHD (W/Lt. Wt. Susp.)  
(Malleable)**

Code	Ratio and Rating
AQ	4.63—34M*
BQ	5.29—34M*
CQ	5.83—34M*
DQ	6.83—34M*
EQ	7.80—34M*
FQ	8.60—34M*

**TIMKEN C-100**

Code	Ratio and Rating
32	6.20—11M*
34	6.80—11M*

**TIMKEN D-100**

Code	Ratio and Rating
41	5.83—13M*
42	6.20—13M*
44	6.80—13M*

**TIMKEN F-104**

Code	Ratio and Rating
52	6.20—14M*
54	6.80—14M*

**TIMKEN F-106**

Code	Ratio and Rating
62	6.2—15M*
64	6.8—15M*
66	7.2—15M*

**TIMKEN H-140**

Code	Ratio and Rating
76	7.20—17M*

**FRONT AXLE CODES**

When required, the front axle code is embossed directly in back of the rear axle code (Fig. 1).

Code	Capacity
A	5.5M*
B	12M*
C	5M*
D	6M*
E	7M*
F	9M*
G	11M*
H	15M*
O	9M*†
U	6M*†

\*M—Pounds Capacity in Thousands  
†—Heavy Duty Front Brakes

<h1 style="margin: 0;">BRAKES</h1>	<h1 style="margin: 0;">GROUP 2</h1>
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## PART 2-1      GENERAL BRAKE SERVICE

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Hydraulically operated service brakes are standard equipment on all 500 through 800 Series Ford trucks.

The standard hydraulic brake system on some trucks is assisted by a

vacuum booster which may be installed as either standard or optional equipment. Other trucks use an optional compressed air booster (air-hydraulic unit) to provide a power assist to the hydraulic brakes. Service

information on these two units is given in Parts 2-4 and 2-5.

The full air brake system, also optional on some models, is covered in Part 2-7.

### 1      DIAGNOSIS AND TESTING

#### HYDRAULIC BRAKES

The trouble-shooting symptoms, causes, and corrections given in the following chart apply to all truck hydraulic brakes including those with a vacuum booster or an air-hydraulic unit.

#### PRELIMINARY CHECKS

Push the brake pedal down as far

as it will go. If the pedal travels more than halfway between the released position and the floor, adjust the brakes.

Road test the truck and apply the brakes at a speed of about 20 mph to see if the truck stops evenly. If not, the brakes should be adjusted.

**Perform the road test only when the**

**brakes will apply and the truck can be safely stopped.**

Apply steady pressure to the brake pedal. If it moves slowly toward the floor, check for leaks in the master cylinder, brake cylinders, or elsewhere in the hydraulic system. If the brake pedal feels spongy, bleed the system to remove air from the lines.

## DIAGNOSIS GUIDE—HYDRAULIC BRAKES

<p><b>BRAKES DO NOT APPLY</b></p>	<p>If the brake pedal travels all the way down to the floor without noticeable brake action, check the brake fluid level in the master cylinder reservoir. Refill the reservoir if necessary. Check the entire hydraulic system for fluid leaks, and make the necessary adjustments.</p> <p>If the brake pedal feels spongy when pushed down, air has entered the hydraulic lines. Air can enter the lines if the fluid level in the master cylinder reservoir is too low, or if the brake wheel cylinder pistons are not held firmly in place when the brake shoes are serviced. A defective check</p>	<p>valve can cause a loss of residual pressure in the system causing air to enter at the wheel cylinder piston. Bleed the system to remove air from the lines, and adjust the brakes. Refill the master cylinder reservoir with heavy-duty brake fluid. If the brakes do not apply after making these checks and adjustments, fluid may be leaking from a cracked line, a loose line connection, past the piston cups in the master cylinder or brake wheel cylinder(s). If the trouble is in the master cylinder or brake wheel cylinder(s), remove and repair.</p>
<p><b>EXCESSIVE PEDAL TRAVEL</b></p>	<p>Check for air in the brake lines and bleed the system if necessary. Ad-</p>	<p>just or reline the brakes as needed.</p>
<p><b>UNEVEN NOISY, GRABBING, OR HARD OPERATING BRAKES</b></p>	<p>Remove the brake drums so that a complete inspection of the brake assemblies can be made to determine the cause of the trouble.</p> <p>Excessive dust and dirt in the brake lining rivet holes or in the brake drum can cause brake squeal. Remove the dirt with a scraper and an air hose.</p> <p>Drums which are out of round, or loose at the hub, frozen master cylinder or brake cylinder piston(s), defective check valve, improper brake</p>	<p>shoe adjustment, warped or misaligned shoes and webs, glazed or greasy linings, incorrectly ground or wrong linings are a few of the causes for uneven, noisy, pulling, grabbing, or hard brakes. Adjust or replace the parts as needed to eliminate the trouble. Lining glaze can be removed by rubbing the lining with medium-grade sandpaper until the lining has a dull finish. <b>Always adjust the brakes and bleed the system after correcting any of these brake troubles.</b></p>
<p><b>BRAKES DO NOT RELEASE</b></p>	<p>Check for an improperly adjusted brake pedal, a restricted by-pass port in the master cylinder, or swollen master cylinder piston cups. Check for a defective check valve restricting fluid passing through the system. Check for sticking brake cylinder pistons caused by dirty or contaminated brake fluid.</p> <p>Adjust the brake pedal if necessary. If the adjustment does not correct the trouble, check the condition of the brake fluid. Replace dirty or contaminated fluid. <b>Clean the entire hy-</b></p>	<p><b>draulic system with clean denatured alcohol before adding new brake fluid.</b></p> <p>If the trouble is in the master cylinder, remove and rebuild the cylinder.</p> <p><b>If the truck must be moved when the brakes are locked, open a brake cylinder bleeder screw for a moment to let out a few drops of brake fluid. This operation will release the brakes but will not eliminate the cause of the trouble.</b></p>

**VACUUM BOOSTERS**

The trouble shooting information given here applies only to the vacuum boosters and vacuum system parts.

**PRELIMINARY CHECKS**

With the engine stopped, eliminate all vacuum from the system by

pumping the brake pedal several times. Then push the pedal down as far as it will go, and note the effort required to hold it in this position. If the pedal gradually moves downward under this pressure, the hydraulic system is leaking and should be checked by a hydraulic pressure test.

With the brake pedal still pushed down, start the engine. If the vacuum system is operating properly, the pedal will move downward. If the pedal position does not change, the vacuum system is not operating properly and should be checked by a vacuum test.

## DIAGNOSIS GUIDE—VACUUM BOOSTERS

<b>BRAKE PEDAL KICKS BACK WHEN APPLIED</b>	This condition may be caused by a defective hydraulic piston check valve or slave cylinder piston cup.	Replace the slave cylinder piston and/or piston cup.
<b>ROUGH ENGINE IDLE WITH BRAKES RELEASED</b>	Check for vacuum leaks in the vacuum line, loose hose connections, a loose body clamp, or a weak control valve piston return spring. Check all connections and tighten them or replace damaged parts as required. This	condition may also be caused by vacuum leaks at the control valve diaphragm, at the valve piston assembly, or at the power diaphragm. Remove and overhaul the booster assembly.
<b>ROUGH ENGINE IDLE OR STALL AND HARD PEDAL WITH BRAKES APPLIED</b>	Check the condition of the air cleaner. If it is clogged with dirt, replace the air cleaner felt. A sticking control valve piston, leaks at the control valve diaphragm or atmospheric valve seal, dirt on the control valve	plate, or the control valve piston not seating properly on the plate may also cause this condition. In addition, the booster diaphragm may be damaged. Remove and overhaul the booster assembly.
<b>INTERMITTENT HARD BRAKE PEDAL</b>	Check for an obstructed air cleaner, a defective vacuum check valve, or a slave cylinder piston sticking in the bore due to dirt or inferior hy-	draulic fluid. Clean or replace damaged parts, refill the hydraulic system with new heavy-duty type brake fluid, and bleed the system.
<b>HARD PEDAL—BOOSTER DIAPHRAGM RUPTURED</b>	When a ruptured diaphragm is found, check for gasoline odor on the diaphragm. Gasoline will deteriorate the diaphragm and cause a pre-	mature failure. Gasoline can get on the diaphragm from the intake manifold if the vacuum check valve is defective.
<b>BRAKES DO NOT RELEASE</b>	Check the rear of the vacuum chamber for damage. This condition may also be caused by a sticking control valve piston, a faulty slave cylinder piston check valve, dirty brake fluid, a sticking slave cylinder piston, a sticking push rod, or a faulty check valve in the end cap. Remove and overhaul the booster.	In case of emergency, if a sticking control valve piston holds the brakes in an applied position, disconnect the booster vacuum line from the vacuum check valve and install a pipe plug in the check valve opening. This permits the brakes to release. Manual application of brakes may then be made without assistance from the booster.

## VACUUM TESTS

**Check Valve Test.** Disconnect the line from the bottom of the vacuum check valve, and connect a vacuum gauge to the valve. Start the engine, run it at idle speed, and check the reading on the vacuum gauge.

The gauge should register 18-21 inches of vacuum. Stop the engine and note the rate of vacuum drop. If the vacuum drops more than one inch in 15 seconds, the check valve is leaking. If the vacuum reading does not reach 18 inches or is unsteady, an engine tune-up is needed.

Remove the gauge and reconnect the vacuum line to the check valve.

**Bendix (Hydrovac) Booster Test.** Disconnect the vacuum line from the booster end plate. Install a tee fitting in the end plate, and connect a vacuum gauge (No. 1) and the vacuum line to the fitting. Install a second vacuum gauge (No. 2) in place of the pipe plug in the booster control valve body.

Start the engine, and note the vacuum reading on both gauges. If both gauges do not register manifold vacuum, air is leaking into the vacuum system. If both gauges register manifold vacuum, stop the engine and note the rate of vacuum drop on both gauges. If the drop exceeds one inch in 15 seconds on either gauge, air is leaking into the vacuum system. Tighten all vacuum connections and repeat the test. If leakage still exists, the leak may be localized as follows:

1. Disconnect the vacuum line and gauge (No. 1) from the booster.

2. Connect vacuum gauge No. 1 directly to the vacuum line. Start the engine and note the gauge reading. Stop the engine and check the rate of vacuum drop. If gauge No. 1 does not register manifold vacuum, or if the vacuum drop exceeds 1 inch in 15 seconds, the leak is in the vacuum line or check valve connections.

3. Reconnect vacuum gauge No. 1 and the vacuum line to the tee fitting.

Start the engine, and run it at idle speed for one minute. Depress the brake pedal sufficiently to cause vacuum gauge No. 2 to read from zero to 1 inch of vacuum. Gauge No. 1 should register manifold vacuum of 18-20 inches. If the drop of vacuum on gauge No. 2 is slow, the air cleaner, or air cleaner line, may be plugged. Inspect and clean the air cleaner if necessary.

4. Release the brake pedal and observe the action of gauge No. 2. Upon releasing the pedal, the vacuum gauge must register increasing vacuum until manifold vacuum is reached. The rate of increase must be smooth, with no lag or slowness in the return to manifold vacuum. If the gauge readings are not as outlined, the booster is not operating properly and should be removed and overhauled.

**Midland (Hy-Power) Booster Test.** Remove the pipe plug from the rear half of the booster chamber, and in-

stall a vacuum gauge. Start the engine and run it at idle speed. The gauge should register 18-21 inches of vacuum.

1. With the engine running, depress the brake pedal with enough pressure to show a zero reading on the vacuum gauge. Hold the pedal in the applied position for one minute. Any downward movement of the pedal during this time indicates a brake fluid leak. Any kickback (upward movement) of the pedal indicates brake fluid is leaking past the hydraulic piston check valve.

2. With the engine running, push down on the brake pedal with sufficient pressure to show a zero reading on the vacuum gauge. Hold the pedal down, and shut the engine off. Maintain pedal position for one minute. A kickback of the pedal indicates a vacuum leak in the vacuum check

valve, in the vacuum line connections, or in the booster.

#### HYDRAULIC PRESSURE TEST

Connect a 2000-psi hydraulic pressure gauge to a bleeder screw opening at one of the brake cylinders. **Bleed the air from the hydraulic system at the point of attachment of the gauge.**

Remove the pipe plug from the rear of the booster body or the trailer brake control line port, and connect a vacuum gauge at this point. With the engine running, apply the brakes enough to obtain a zero reading on the vacuum gauge. Then note the reading on the pressure gauge. The minimum hydraulic pressure for each type and size of vacuum booster is given in Part 2-8. **If the engine vacuum is higher or lower than 20 inches Hg, the vacuum booster hydraulic pressure will be proportionately high-**

**er or lower than the pressure given in Part 2-8.**

Hold the brakes in the fully-applied position for at least one minute, and note the reading on the pressure gauge. The hydraulic system should hold pressure for at least one minute without losing pressure. A low pressure reading or a drop in pressure indicates leakage in the booster or in the hydraulic system.

#### AIR-HYDRAULIC BRAKES

The trouble-shooting procedures given here apply only to the booster unit and the applicable air system components.

#### PRELIMINARY CHECKS

**First make the trouble shooting checks outlined in the diagnosis guide, then perform the tests outlined in the following paragraphs.**

#### DIAGNOSIS GUIDE—AIR—HYDRAULIC BRAKES

<b>INSUFFICIENT BRAKING</b>	Binding control valve piston due to swollen piston seals.	Defective hydraulic cylinder piston.
<b>BRAKES APPLY TOO SLOWLY</b>	Brake shoes improperly adjusted. Low system air pressure. Control valve delivery pressure too low.	Excessive air leakage when brakes are applied. Restricted brake lines or hoses.
<b>BRAKES RELEASE TOO SLOWLY</b>	Weak control valve piston return spring. Restricted control valve exhaust port.	Hydraulic piston binding in the cylinder.
<b>BRAKES DO NOT APPLY</b>	Restricted or broken lines or hoses. Clogged or damaged control valve.	Dented or damaged booster body.
<b>BRAKES DO NOT RELEASE</b>	Defective control valve piston. Defective hydraulic piston. Clogged master cylinder vent.	Broken booster piston return spring.
<b>BRAKES GRAB</b>	Intermittent bind in the control valve piston.	

**Air Discharge Test.** With the air pressure at 90 psi, depress the brake pedal several times and listen for air discharge as the pedal is released. Rapid release of air pressure indicates that the booster unit is operating. If no air discharge is heard, the booster control valve is defective or the connecting lines are restricted.

**Air Leak Test.** Operate the engine until the air pressure builds up to 90 psi. Stop the engine and watch the pressure gauge. If the air pressure drops more than 5 pounds in 15 seconds, check for internal leaks in the system, particularly at hose or pipe connections, a defective valve or piston in the booster, a defective air gauge (registering incorrectly), or leaking governor or compressor discharge valves.

**Hydraulic Pressure Test.** Connect a hydraulic pressure gauge (capable of reading at least 1200 psi pressure) to a bleeder screw opening at one of the brake cylinders.

Remove the lubrication pipe plug from the rear of the booster body assembly and connect an air pressure test gauge at this point. Apply the brakes until approximately 60 psi is registered on the air gauge. Note the reading on the hydraulic pressure gauge. Hydraulic pressure should be 950 to 1100 psi when air pressure is at 60 psi. If air pressure is higher or lower than 60 psi, hydraulic pressure will be proportionately higher or lower than 950 to 1100 psi.

Hold the brakes in the fully applied position for at least one minute.

Note the reading on the hydraulic pressure gauge. A low pressure reading, or a drop in pressure indicates leakage in the booster unit or in the other hydraulic system components.

**Booster Test.** With the air pressure at 90 psi, depress the brake pedal. Measure and record the distance from the pedal to the floor.

Release the pedal and bleed all the air from the system. Depress the pedal, and again measure the distance from the pedal to the floor. The second measurement should be approximately ½ inch more than the dimension obtained with the booster system operating under air pressure. If there is no noticeable difference in the measurements, the booster is defective.

**AIR SUPPLY SYSTEM**

The same air supply system is used with either the air booster brake system (Part 2-5) or the full air brake system (Part 2-7). In the air booster

system, air pressure increases or "boosts" the hydraulic pressure applied to the shoes. In the full air system, air pressure is applied directly to the shoes through a diaphragm

and mechanical linkage.

If either of these two brake systems is not operating properly, the air supply system should be checked first.

**DIAGNOSIS GUIDE—AIR SUPPLY SYSTEM**

<b>AIR PRESSURE BELOW NORMAL</b>	Defective air gauge. Compressor worn out. Compressor discharge valve leakage. Slipping compressor drive belt. Open reservoir drain cock. Excessive leakage at lines and fittings to reservoir tank.	Low engine speed. Excessive carbon in the compressor head or discharge line. Clogged compressor air strainer. Defective or improperly adjusted governor. Compressor inlet valves stuck closed.
<b>AIR PRESSURE RISES ABOVE NORMAL</b>	Defective or improperly adjusted governor. Compressor unloading valves stuck closed. Restriction in the passage between the governor and the compressor unloading mechanism. Defective air gauge.	Excessive clearance at the compressor unloading valves. Leak at compressor unloading piston seal. Carbon deposits in cavities beneath unloading piston and passages in the compressor cylinder head.
<b>CONTINUOUS OR INTERMITTENT COMPRESSOR KNOCKS</b>	Loose drive pulley. Worn or burned out compressor bearings.	Excessive carbon deposits in the compressor cylinder head.
<b>SAFETY VALVE "BLOWS-OFF"</b>	Governor "cut-out" setting adjusted too high.	Above normal system pressure. Defective or improperly adjusted safety valve.
<b>EXCESSIVE OIL OR WATER IN THE BRAKE SYSTEM</b>	Failure to drain the reservoirs at regular intervals.	Worn compressor piston rings. Dirty compressor air filter.

**OPERATING TESTS**

Before performing any of the following tests, operate the engine until the air pressure builds up to 90 psi. With the air brake system charged, open the drain cocks in each reservoir. Close the drain cocks after all moisture is drained from the reservoirs.

**Low Pressure Indicator.** Exhaust the brake system pressure and observe the pressure at which the warning buzzer sounds. The contacts in the indicator should close the circuit to the buzzer, when reservoir pressure is between 54 psi minimum and 66 psi maximum. If the buzzer does not start to sound within this pressure range during discharge, or if a sounding buzzer does not stop within this pressure range during the pressure build-up, the electrical connections are loose or the indicator valve is defective.

**Reservoir Safety Valve.** To determine if the safety valve is operative, pull the exposed end of the valve stem. If the safety valve does not "blow off" when the stem is pulled, the valve ball is probably stuck in its

seat. In such a case, remove and disassemble the valve for cleaning.

**Governor.** With the engine running, build up air pressure in the system, and observe at what pressure reading on the dash gauge the pressure stops climbing. This is the point of governor cutout which should be between 100 and 105 pounds.

With the engine still running, slowly reduce the air pressure in the system by applying and releasing the brakes. Observe the pressure reading on the dash gauge at the point where the pressure starts to build up again. This is the point of governor cut-in which should be between 80 and 85 pounds.

If the governor does not cut the compressor in and out according to these specifications, adjust the governor pressure settings. Before adjusting the governor, check the accuracy of the dash gauge with a test gauge.

**Check Pressure Build-Up.** With the engine running at fast idle speed, observe the time required to raise system pressure from 50 to 90 pounds. If more than five minutes is

required, perform the leak tests as outlined in the following paragraphs.

Also check for no unloading valve clearance, low engine idle speed, a slipping compressor drive belt, excessive carbon in the compressor cylinder head, or a worn out air compressor.

**LEAK TESTS**

**Compressor.** With the engine stopped, discharge valve leakage can be detected by carefully listening at the compressor for the sound of escaping air. With air pressure applied to the unloader cavity (with governor cut-out), remove the air filter or the air pick up tube on SD V-8 engines and check for air leaks by squirting oil around the unloader plunger and stem. If excessive air leaks are found, replace the unloader piston seal.

**Governor.** With the governor in the "cutout" position, test for leakage at the exhaust valve by applying soap suds to the exhaust vent in the body.

With the governor in the "cut-in" position, test for leakage of the inlet valve by applying soap suds to the

exhaust vent in the body.

In either of the foregoing tests, leakage in excess of 1 inch soap bubble in three seconds indicates a defective governor.

Coat the entire governor with soap suds to detect diaphragm, gasket, and cap screw leakage. No leakage is permissible.

**Reservoir Safety Valve.** Coat the

end of the safety valve with soap suds. Leaks causing not more than a 3-inch soap bubble in three seconds are permissible.

#### AIR BRAKES

Full air brakes are available as optional equipment on F-, B-, and C-600 through 750, F- and C-800, and T-700 series trucks.

Some of the system components

vary slightly from one truck model to another in design or location. However, all components are essentially the same in principle and service procedure.

#### PRELIMINARY CHECKS

**First make the trouble shooting checks outlined in the Diagnosis Guide, and then perform the tests outlined in the following paragraphs.**

#### DIAGNOSIS GUIDE—AIR BRAKES

<b>INSUFFICIENT BRAKING ACTION</b>	Low reservoir pressure. Brakes need lubrication, adjustment, or relining. Foot control valve delivery pres-	sure too low due to a malfunction in the valve or incorrect adjustment of the treadle linkage.
<b>SLOW BRAKE ACTION</b>	<b>SLOW APPLICATION</b> Lack of lubrication at brake shoe camshafts. Low reservoir pressure. Excessive leakage during brake application. Restricted or damaged pipes or hoses. Defective foot control valve and treadle linkage.	<b>SLOW RELEASE</b> Restricted port, weak return spring, or other defect in foot control valve. Brakes require lubrication or adjustment. Restricted or damaged pipes or hoses. Defective or restricted quick release valve or relay valve. Broken retraction springs or binding hold pins.
<b>BRAKES INOPERATIVE</b>	<b>BRAKES DO NOT RELEASE</b> Restricted brake lines. Weak return spring or other defect in foot control valve. Broken brake shoe retracting springs or rusted front anchor pins.	<b>BRAKES DO NOT APPLY</b> Low reservoir pressure. Restricted or broken pipes or hoses. Defective foot control valve.
<b>UNEVEN OR GRABBING BRAKES</b>	Grease on brake linings. Out-of-round brake drums. Bind in brake shoe mountings. Defective foot control valve. Wet brakes.	Brakes need adjustment, lubrication, or relining. Leaking brake chambers. Broken brake chamber piston return spring.
<b>QUICK AIR PRESSURE DROP WITH ENGINE STOPPED</b>	<b>BRAKES RELEASED</b> Excessive leakage at foot control valve, governor, compressor discharge valve, or at other points in the system.	<b>BRAKES APPLIED</b> Excessive leakage in brake chambers, brake chamber diaphragms, tube and hose connections, or foot control valve.

**Check Stop Light Switch.** With all air pressure exhausted from the air brake system, start the engine and move the brake valve to the applied position. Stop lights should light before the dash gauge registers 10 psi pressure. Release the brakes.

**Quick Release Valve and Relay Valve.** With the air brake system fully charged, apply the brakes. Inspect the brake action on the wheels controlled by the quick release valve or relay valve in question. The brakes should apply promptly. Release the brakes and inspect to be sure that the air pressure is exhausted rapidly from the exhaust port. Be sure the exhaust port is not restricted.

#### LEAK TESTS

With the engine stopped and the brakes fully **applied**, watch the rate of drop in air pressure as registered by the dash gauge. If the pressure drops faster than 3 pounds per minute, check the items outlined in the following paragraphs.

**Brake Valve.** With the pedal fully released, coat the exhaust port with soap suds to check for leaks. With the pedal fully applied, coat the exhaust port with soap suds and check for leaks. Leaks causing not more than a three-inch soap bubble in three seconds are permissible.

**Brake Chambers.** With the brakes

fully applied, coat the clamp ring and bolt flanges holding the diaphragm in place with soap suds. No leaks are permissible.

**Quick Release Valve.** With brakes applied, coat the exhaust port with soap suds to detect leakage. Leakage in excess of a 3 inch soap bubble in three seconds is not permissible.

**Relay Valve.** With the brakes released, coat the exhaust port with soap suds and observe the leakage. With the brakes fully **applied**, coat the exhaust port with soap suds and observe the leakage.

Leakage in either of the foregoing tests should not exceed a 3 inch soap bubble in three seconds.

## 2 COMMON ADJUSTMENTS AND REPAIRS

### BRAKE DRUM REPAIR

#### FRONT BRAKE DRUM

500 thru 750 Series Trucks (except all 800 thru C-750 trucks equipped with the 9000 thru 15000-pound axle).

1. Raise the truck and install stands.
2. Back off the brake shoe adjustment. Remove the hub cap and/or dust cap.
3. Remove the spindle nut cotter pin, spindle nut, and washer.
4. Remove the wheel assembly.
5. Remove the front wheel to hub retaining nuts or rim and tire retaining nuts. Remove the wheel or rim and tire from the hub and drum.
6. Remove the brake drum retainers and retaining bolts, screws, or bolts and nuts.
7. Remove the brake drum from the hub.
8. Check the drum for defects or wear, and repair or replace as necessary. If a new drum is to be installed, be sure to remove the protective coating with a suitable degreaser.
9. Place the brake drum to the hub and install the retainers and retaining bolts, screws, or bolts and nuts.
10. Install the wheel or rim and tire to the hub and start the retaining nuts.
11. Position the wheel assembly on the spindle.
12. Adjust the spindle nut and install the cotter pin.
13. Adjust the brake, and then torque the wheel nuts.
14. Install the dust cap or hub cap.
15. Remove the stands and lower the truck.

#### FRONT BRAKE DRUM

All 800 Series trucks and C-750 Series trucks equipped with the 9000 thru 15000-pound axle.

1. Raise the truck and install stands.
2. Back off the brake shoe adjustment. Remove the hub cap and/or dust cap.
3. Bend the locktab, remove the

wheel bearing adjusting nut lock nut, the wheel bearing adjusting nut, and the lock spacer.

4. Remove the wheel assembly.
5. Remove the front wheel to hub retaining nuts or rim and tire retaining nuts. Remove the wheel or rim and tire from the hub and drum.
6. Remove the brake drum retainers and retaining bolts, screws, or bolts and nuts.
7. Remove the brake drum from the hub.
8. Check the drum for defects or wear, and repair or replace as necessary. If a new drum is to be installed, be sure to remove the protective coating with a suitable degreaser.
9. Place the brake drum to the hub and install the retainers and retaining bolts, screws, or bolts and nuts.
10. Install the wheel or rim and tire to the hub and start the retaining nuts.
11. Position the wheel assembly on the spindle.
12. Adjust the wheel bearing adjusting nut. Install the lock spacer, locknut locktab, and locknut, and then bend the locktab.
13. Adjust the brake, and then torque the wheel nuts.
14. Install the dust cap or hub cap.
15. Remove the stands and lower the truck.

#### REAR BRAKE DRUM

1. Raise the truck and install stands.
2. Remove the wheel and tire as an assembly. Then back off the rear brake shoe adjustment.
3. Remove the rear axle shaft retaining nuts, adapters, axle shaft, and grease seal.
4. Remove the wheel bearing locknut, lockwasher, and adjusting nut.
5. Remove the hub and drum from the axle.
6. Remove the brake drum to hub retaining screws, bolts, or bolts and nuts. Then remove the brake drum from the hub.
7. Check the drum for defects or

wear, and repair or replace as necessary. If a new drum is to be installed, be sure to remove the protective coating with a suitable degreaser.

8. Position the brake drum to the hub and install the retaining screws, bolts, or bolts and nuts.
9. Position the hub and drum as an assembly on the axle and start the adjusting nut.
10. Adjust the wheel bearing nut and then install the wheel bearing lockwasher and locknut.
11. Install a new rear axle oil seal, axle shaft and gasket, stud adapters, and retaining nuts.
12. Install the wheel and tire as an assembly.
13. Adjust the brake shoes and then remove the stand and lower the truck.

#### BRAKE DRUM REFINISHING

Minor scores on a brake drum can be removed with fine emery cloth, provided the emery is thoroughly cleaned off the drum after the operation.

A badly scored, rough, or out-of-round drum should be ground or turned on a drum lathe. Do not remove any more material from the drum than is necessary to provide a smooth surface for the brake shoe contact. The refinished diameter should not be more than 0.060 inch oversize for steel backed drums and 0.090 for cast iron drums. For original brake drum sizes, see Part 2-8.

If the diameter of the drum is less than 0.030 inch oversize after refinishing, install standard linings on the brake assemblies. If the diameter is over 0.030 inch, install oversize or shimmed linings.

#### BRAKE SHOE RELINING

1. Remove the rivets and remove the old lining.
2. Clean the shoe thoroughly with cleaning fluid, especially the rim surface. Wipe the shoe dry and remove all burrs or rough spots from the shoe.
3. Check the inside diameter of the brake drum. If the diameter is less than 0.030 inch oversize, install standard linings. If the diameter is 0.030-0.060 inch oversize, install oversize or shimmed linings.



4. Position the new lining on the shoe and install new rivets, beginning with the rivet holes near the center of the shoe. On some trucks, the primary lining is shorter than the secondary lining. If this condition exists, position the shorter (primary) lining to line up with the heel end of the

shoe. **Do not let oil or grease touch the brake lining. If a brake lining kit is used to replace the worn linings, install all the parts supplied in the kit.**

5. Check the clearance between the lining and shoe rim. The lining must seat snugly against the rim with not more than 0.005 inch separation

midway between any two rivets. If only the linings are replaced on duo-servo single anchor brakes with fixed anchor pins, the brake linings must be cam ground 0.010 inch at the ends after the linings are riveted to the brake shoe.

### 3 CLEANING AND INSPECTION

#### BRAKE CYLINDER

1. Clean all brake cylinder parts in clean denatured alcohol. Inspect all parts for wear or damage. Check the cylinder bore for rust, scores, or other damage. Be sure that the bleeder screw passage is clean and open. Replace all parts that are worn or damaged.

2. If dirt is found in any part of the hydraulic system, flush the entire system with clean denatured alcohol.

#### MASTER CYLINDER

1. Clean all master cylinder parts in clean denatured alcohol, and inspect the parts for wear or damage, replacing them as required. **When a master cylinder repair kit is used, install all of the parts supplied in the kit.**

2. Check the ports and vents in the master cylinder to make sure that all are open and free of foreign matter.

3. If the spring valve (riveted to the front end of the piston) is loose or has moved so that the piston ports are open, replace the piston.

4. Inspect the cylinder walls for scores or rust, and recondition them if necessary. Hone the cylinder walls no more than necessary (0.003 inch maximum), either to remove scores and rust, or to obtain a smooth wall surface. Remove any burrs or loose metal that may have resulted from the honing operation, and clean the cylinder with clean denatured alcohol.

#### BRAKE DRUMS AND LININGS

1. After removing one front wheel and drum from the truck, inspect the drum and brake shoe linings for wear or damage that would affect brake operation. **Do not let oil or grease touch the drum or linings.**

2. A brake shoe should be relined when the lining face is worn to within  $\frac{1}{32}$  inch of any rivet head, or when the lining has been soaked with oil or grease. If a worn lining is not replaced, the brake drum may become severely damaged. **Always replace the primary and secondary brake shoe lining assemblies on both front or both rear brake assemblies at the same time.**

3. Before relining a brake shoe, inspect the shoe for distortion, cracks, or looseness between the rim and web. If one of these conditions exists, replace the shoe. **Do not attempt to repair a damaged brake shoe.**

4. If the drum and linings are in good condition, install the wheel and drum. **The condition of the drums and linings of the other three wheels will usually be about the same as that found at the wheel that was removed.**

5. Add enough heavy-duty brake fluid to the master cylinder reservoir to bring the level to within  $\frac{1}{2}$  inch of the top of the filler neck.

6. Check to be sure that the parking brake handle is fully released before making any brake adjustment.

7. Check the front brake anchor pin nut with a wrench (or brake assemblies with an adjustable anchor pin). If the bolt is loose, torque it to 80-100 ft-lbs.

#### BRAKE BOOSTER

1. After disassembly, immerse all metal parts in a suitable solvent. Use only alcohol on rubber parts or parts containing rubber. After the parts have been thoroughly cleaned and rinsed in cleaning solvent, the metal parts which come in contact with hydraulic brake fluid should be re-washed in clean alcohol before assembly. Use an air hose to blow dirt and cleaning fluid from the recesses and internal passages. When overhauling a power booster, use all parts furnished in the repair kit. **Discard all old rubber parts.**

2. Inspect all other parts for damage or excessive wear. Replace damaged or excessively worn parts. If the inside of the booster body is rusted or corroded, polish it with steel wool or fine emery cloth. Replace the body shell when scored. Inspect the master cylinder bore for signs of scoring, rust, pitting or etching. Any of these conditions will require replacement of the cylinder.

#### AIR BRAKE AND CAMSHAFT

1. Inspect the camshaft bushings and replace if worn or damaged.

2. Check the anchor pins and shoe-to-cam rollers for wear or damage, and replace, if required.

3. Check thickness of the brake lining at the center of the shoe, and replace, if necessary.

4. Clean, inspect, and replace worn or damaged parts. Coat the anchor pins and cam lobes with Lubriplate before installing the shoes.

# PART 2-2 HYDRAULIC BRAKES

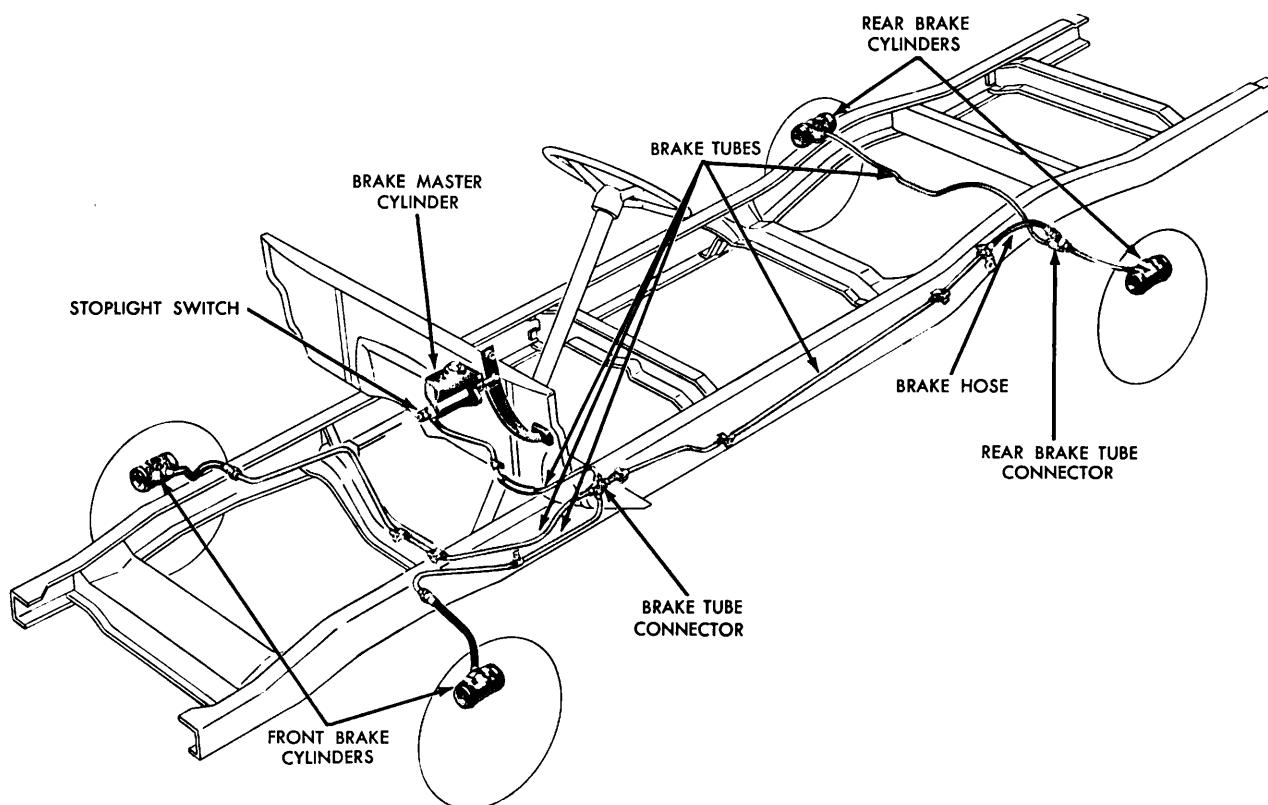
Section	Page	Section	Page
1 Description and Operation .....	2-9	3 Removal and Installation .....	2-13
2 In-Truck Adjustments and Repairs .....	2-9	4 Major Repair Operations .....	2-17

## 1 DESCRIPTION AND OPERATION

Hydraulically operated service brakes (Fig. 1) are standard equipment on all 500 through 800 Series Ford trucks.

The standard hydraulic brake system on some trucks is assisted by a vacuum booster which may be installed as either standard or optional

equipment. Other trucks use an optional compressed air booster (air-hydraulic unit) to provide a power assist to the hydraulic brakes.



H1166-A

FIG. 1—Typical Hydraulic Brake System

## 2 IN-TRUCK ADJUSTMENTS AND REPAIRS

### BRAKE SHOE ADJUSTMENT

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

A minor brake adjustment re-establishes the brake lining-to-drum

clearance and compensates for normal lining wear.

A major brake adjustment includes the adjustment of the brake shoe anchor pins, as well as the brake shoes. Adjustment of the anchor pin permits the centering of the brake shoes in the drum.

Adjustment procedures for each type of brake assembly are given

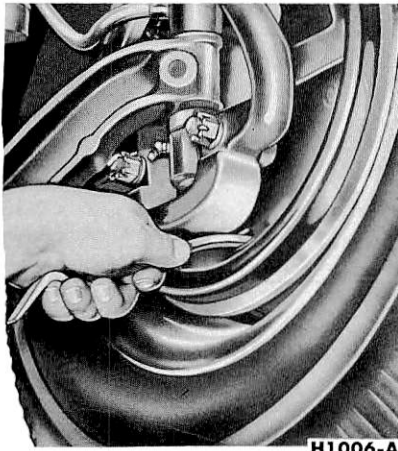
under the applicable heading.

### SINGLE ANCHOR BRAKE

**Minor Adjustment.** The single servo anchor brake is adjusted by turning an adjusting screw located between the lower ends of the shoes.

1. Raise the truck until the wheels clear the floor.

2. Remove the cover from the ad-



**FIG. 2—Single Anchor Brake Shoe Adjustment**

justing hole at the bottom of the brake carrier plate, and turn the adjusting screw inside the hole to expand the brake shoes until they drag against the brake drum (Fig. 2).

3. When the shoes are against the drum, back off the adjusting screw 10 to 12 notches so that the drum rotates freely without drag. If the drum does not rotate freely, remove the wheel and drum, and then blow out the dust and dirt from the linings. With sandpaper, remove all rust from the points where the shoes contact the carrier plate and apply a light coating of high temperature grease. Be careful not to get the lubricant on the linings.

4. Install the wheel and drum, and adjust the shoes. Install the adjusting hole cover on the brake carrier plate.

5. Check and adjust the other three brake assemblies.

6. Apply the brakes. If the pedal travels more than halfway down between the released position and the floor, too much clearance exists between the brake shoes and the drums. Repeat steps 2 and 3 above.

7. When all brake shoes have been properly adjusted, lower the truck. Road test the truck and check the operation of the brakes. **Perform the road test only when the brakes will apply and the truck can be safely stopped.**

**Major Adjustment.** A major brake adjustment should be made when dragging brakes are not corrected by a minor adjustment, when brake shoes are relined or replaced, or when brake drums are machined.

1. Raise the truck until the wheel clears the floor.

2. Rotate the drum until the feeler slot is opposite the lower end of the secondary (rear) brake shoe.

3. Insert a 0.010 inch feeler gauge through the slot in the drum. Move the feeler up along the secondary shoe until it is wedged between the secondary shoe and the drum.

4. Turn the adjusting screw (star wheel) to expand the brake shoes until a heavy drag is felt against the drum. Back off the adjusting screw just enough to establish a clearance of 0.010 inch, between the shoe and the drum at a point 1½ inches from each end of the secondary shoe. This adjustment will provide correct operating clearance for both the primary and secondary shoes. If the 0.010-inch clearance cannot be obtained at both ends of the secondary shoe, the anchor pin must be adjusted.

5. To adjust the anchor pin setting, loosen the anchor pin nut just enough to permit moving the pin up or down by tapping the nut with a soft hammer. **Do not back the nut off too far or the shoes will move out of position when the nut is tightened.** Tap the anchor pin in a direction that will allow the shoes to center in the drum and provide an operating clearance of 0.010 inch (Fig. 3).



**FIG. 3—Anchor Pin Adjustment**

Torque the anchor pin nut to 80-100 ft-lbs. Recheck the secondary shoe clearance at both the heel and toe ends of the shoe. Install the adjusting hole cover.

6. Check and adjust the other brake assemblies.

7. When all brake shoes and anchor pins have been properly adjusted, lower the truck. Road test the truck and check the operation of the brakes. **Perform the road test only when the brakes will apply and the truck can be safely stopped.**

## DOUBLE ANCHOR BRAKE

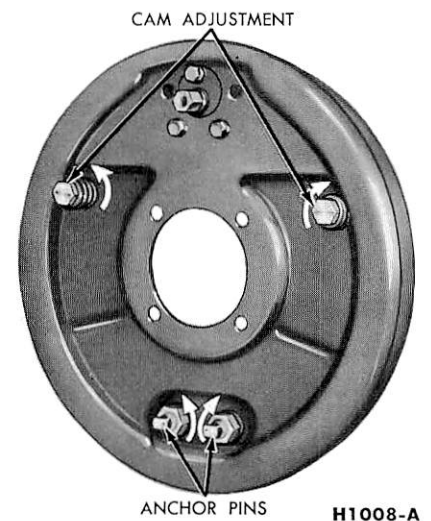
**Minor Adjustment.** Each brake shoe is adjusted by turning a cam located at the back side of the carrier plate.

The bottom of each brake shoe is independently anchored by an adjustable eccentric anchor pin.

1. Raise the truck until the wheels clear the floor.

2. With the drums at normal room temperature, check to see that the wheels turn freely without drag. If necessary, turn the adjusting cams in the opposite direction to that shown in Fig. 4 to free the brakes.

3. Turn the adjusting cam of the forward (primary) shoe in the direction shown in Fig. 4 until the shoe drags against the drum.



**FIG. 4—Double Anchor Brake Adjustment**

4. Turn the adjusting cam in the opposite direction until the wheel rotates freely without drag.

5. Adjust the rear (secondary) brake shoe in the same manner. Check and adjust the other brake assemblies.

6. Apply the brakes. If the pedal travels more than halfway down between the released position and the floor, too much clearance exists between the brake shoes and the drums, and further adjustment is necessary.

7. When all brake shoes have been properly adjusted, lower the truck. Road test the truck and check the operation of the brakes. **Perform the road test only when the brakes will apply and the truck can be safely stopped.**

**Major Adjustment.** A major brake adjustment should be performed when dragging brakes are not corrected by a minor adjustment, when brake shoes are relined or replaced, or when brake drums are machined.

1. Raise the truck until the wheels clear the floor.

2. Rotate the drum until the feeler slot is opposite the lower (heel) end of the secondary (rear) brake shoe.

3. Insert a 0.007 inch feeler gauge through the slot in the drum. Move the feeler up along the secondary shoe until it is wedged between the shoe and the drum.

4. Loosen the secondary shoe anchor pin nut (Fig. 4). Turn the secondary shoe anchor pin until the brake shoe-to-drum clearance at a point 1½ inches from the heel end of the shoe is 0.007 inch. Remove the feeler gauge.

5. Rotate the drum until the feeler slot is opposite the upper (toe) end of the secondary brake shoe.

6. Insert a 0.010 inch feeler gauge through the slot in the drum. Move the feeler gauge down along the secondary shoe until it is wedged between the shoe and the drum. Turn the adjusting cam, to expand the brake shoe, until a heavy drag is felt against the drum.

7. Turn the anchor pin until the brake shoe-to-drum clearance at a point 1½ inches from the toe end of the shoe is 0.010 inch. Remove the feeler gauge.

8. Torque the anchor pin nut to 80-100 ft-lbs. Recheck the heel and toe clearances.

9. Using the preceding secondary brake shoe adjustment procedure as a guide, adjust the primary brake shoe-to-drum clearance.

10. Lower the truck. Road test the truck and check the operation of the brakes. **Perform the road test only when the brakes will apply and the truck can be safely stopped.**

## TWO-CYLINDER BRAKE

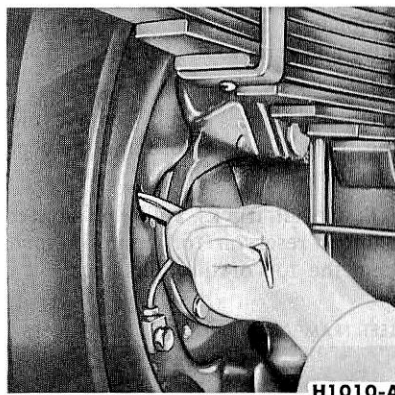
The two-cylinder brake assembly (Figs. 12 and 13) brake shoes are adjusted by turning adjusting wheels reached through slots in the carrier plate.

Two types of two-cylinder brake assemblies are used on truck rear wheels. The assemblies differ primarily in the retracting spring hook-up, and in the design of the adjust-

ing screws and locks. However, the service procedures are the same for both assemblies.

The brake adjustment is made with the truck raised. Check the brake drag by rotating the drum in the direction of forward rotation as the adjustment is made.

1. Remove the adjusting slot covers from the carrier plate (Fig. 5).



**FIG. 5—Two-Cylinder Brake Shoe Adjustment**

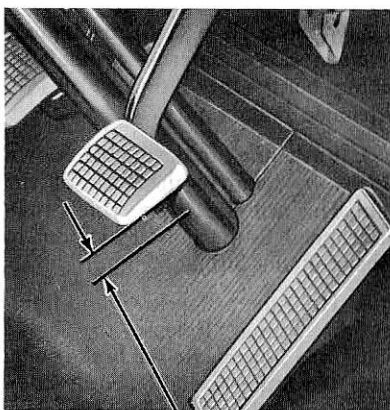
2. Turn the rear (secondary shoe) adjusting screw inside the hole to expand the brake shoe until it drags against the brake drum.

3. Back off the adjusting screw so that the drum rotates freely without drag. Depress the brake pedal to center the brake shoes, and back off the adjusting screw an additional notch to provide operating clearance.

4. Repeat the above procedure on the front (primary) brake shoe.

5. Replace the adjusting hole covers.

**Brake Pedal Adjustment.** When



**FIG. 6—Pedal Free Travel Check**

the brake pedal free travel, which is the movement of the brake pedal before the push rod touches the master cylinder piston, is less than ⅜ inch or more than ⅝ inch (Fig. 6), the pedal should be adjusted. Figures 14 and 15 show the brake pedal and related parts.

1. Push the brake pedal down by hand pressure, and check the free travel.

2. Loosen the lock nut on the eccentric bolt, and rotate the eccentric bolt until the free travel is within ⅜-⅝ inch.

3. Hold the bolt securely, and torque the lock nut to 30-35 ft-lbs.

4. Recheck the pedal free travel to make sure that the adjustment did not change when the lock nut was tightened.

## HYDRAULIC SYSTEM BLEEDING

When any part of the hydraulic system (Fig. 1) has been disconnected for repair or replacement, air may get into the lines and cause spongy pedal action. This requires the bleeding of the hydraulic system after it has been properly connected to be sure all air is expelled from the brake cylinders and lines. The hydraulic system can be bled manually or with pressure bleeding equipment.

**When bleeding the brake system, bleed one brake cylinder at a time, beginning at the cylinder with the longest hydraulic line first. If the brake assembly is equipped with two cylinders, always bleed the upper cylinder first. Keep the master cylinder reservoir filled with new heavy-duty brake fluid during the bleeding operation. Never use brake fluid which has been drained from the hydraulic system.**

The procedure for bleeding the master cylinder on a C-Series truck is presented separately from the standard hydraulic system bleeding procedures.

If the hydraulic system is equipped with a vacuum or air-hydraulic booster, bleed the hydraulic section of the booster **before** bleeding the rest of the hydraulic system. **The bleeding operation must be done with the engine off and with no vacuum or air pressure in the system.**

To bleed the hydraulic section of a vacuum or air booster, follow steps 1 through 4 of the manual bleeding

procedure, attaching the drain tube to the bleeder screw at the end plate of the booster (or the bleeder screw nearest the power chamber). Repeat this procedure at the other bleeder screw if the booster is so equipped.

### Manual Bleeding

1. Attach a rubber drain tube to the bleeder screw of the brake wheel cylinder. The end of the tube should fit snugly around the bleeder screw.

2. Submerge the free end of the tube in a container partially filled with clean brake fluid. Loosen the bleeder screw.

3. Push the brake pedal down slowly by hand, allowing it to return slowly to the fully-released position. Repeat this operation until air bubbles cease to appear at the submerged end of the tube.

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

5. Repeat this procedure at each brake cylinder. Refill the master cylinder reservoir after each brake cylinder is bled and when the bleeding operation is completed.

**Pressure Bleeding.** Be sure that the tank is clean and there is enough new heavy-duty brake fluid in the bleeder tank to complete the bleeding operation and that the tank is charged with 10-30 pounds of air pressure.

On a C-Series truck, the master cylinder can only be bled manually. Therefore, bleed the entire hydraulic system **first** before bleeding the master cylinder.

1. On a B-, F-, N-, or T-Series truck, clean all dirt from around the filler hole on the top of the master cylinder reservoir, and attach the bleeder tank hose to the filler hole.

On a C-Series truck, disconnect the line from the bottom of the master cylinder and connect the line to the pressure bleeder tank hose. Install a  $\frac{5}{16}$  inch Weatherhead plug into the bottom of the master cylinder.

2. Attach a rubber drain tube to the bleeder screw of the brake cylinder. The end of the tube should fit snugly around the bleed screw.

3. Submerge the free end of the tube in a container partially filled with clean brake fluid and then loosen the bleeder screw.

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

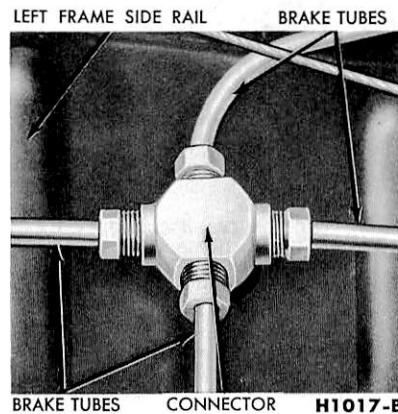
5. When air bubbles cease to appear in the fluid at the submerged end of the drain tube, close the bleeder screw and remove the tube.

6. Repeat this procedure at each brake cylinder.

7. When the bleeding operation is completed, close the bleeder tank valve and remove the tank hose from the filler hole.

On a C-Series truck, remove the line from the tank hose and connect it to the master cylinder.

8. On all trucks, refill the master cylinder reservoir to within  $\frac{1}{2}$  inch from the top of the filler neck.



**FIG. 7—Front Brake Tube Connector**

### C-Series Truck Master Cylinder Bleeding

1. Loosen the fitting at the bottom of the master cylinder, approximately one turn.

2. Wrap a shop cloth, or a piece of clean waste material, around the tubing below the fitting to absorb expended brake fluid.

3. Push the brake pedal down slowly by hand to the floor of the cab. This will force air which may be trapped in the master cylinder to escape at the fitting.

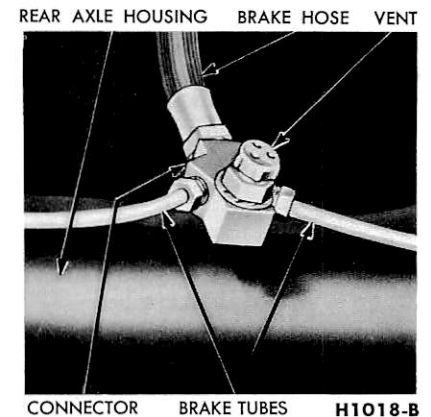
4. Hold the pedal down and tighten the fitting. Release the brake pedal. **Do not release the brake pedal until the fitting is tightened as additional air will be introduced into the master cylinder.**

5. Repeat this procedure until air

ceases to escape at the fitting and a firm pedal is obtained.

### HYDRAULIC LINE REPLACEMENT

Steel tubing is used in the hydraulic lines between the master cylinder and the front brake tube connector (Fig. 7), and between the rear brake tube connector (Fig. 8) and the rear brake cylinders. Flexible hoses connect the brake tube to the front brake cylinders and to the rear brake tube connector.



**FIG. 8—Rear Brake Tube Connector**

When replacing hydraulic brake tubing, hoses, or connectors, tighten all connections securely. After replacement, bleed the brake system at the wheel cylinders and at the booster, if so equipped.

### BRAKE TUBE REPLACEMENT

If a section of the brake tube 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 the hydraulic system.** When bending brake tubing to fit the frame or rear axle contours, be careful not to kink or crack the tube.

All brake tubing should be double flared to provide good leak-proof connections. Always clean the inside of a new brake tube with clean denatured alcohol.

### BRAKE HOSE REPLACEMENT

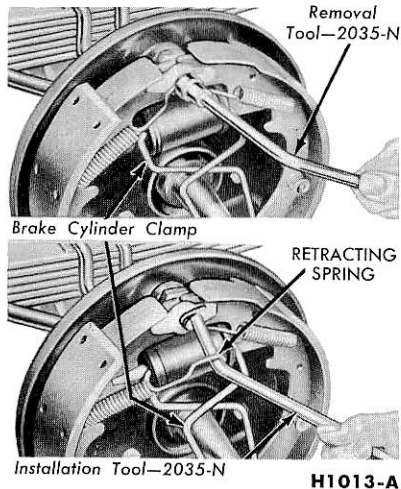
A flexible brake hose should be replaced if it shows signs of softening, cracking, or other damage.

When installing a new brake hose, position the hose to avoid contact with other truck parts.

### 3 REMOVAL AND INSTALLATION

#### SINGLE ANCHOR BRAKE SHOE REMOVAL

1. Raise the truck until the wheels clear the floor. Then remove the wheel and drum. **Do not push down the brake pedal after the brake drum has been removed.**



H1013-A

FIG. 9—Spring Replacement

On a truck equipped with a vacuum or air booster, be sure the engine is stopped and there is no vacuum or air pressure in the system before disconnecting the hydraulic lines.

2. Clamp the brake cylinder boots against the ends of the cylinder, and remove the brake shoe retracting springs from both shoes (Fig. 9).

3. Remove the anchor pin plate (Fig. 10).

4. Remove the hold-down spring cups and springs from the shoes, and remove the shoes and the adjusting screw parts from the carrier plate. **Do not let oil or grease touch the brake linings.** If the shoes on a rear brake assembly are being removed, remove the parking brake lever, link, and spring with the shoes. Unhook the parking brake cable from the lever as the shoes are being removed.

5. Remove the hold-down spring pins from the carrier plate.

6. Remove the adjusting screw parts from the brake shoes. If the shoes are from a rear brake assem-

bly, remove the parking brake lever from the secondary shoe.

#### INSTALLATION

1. Coat all points of contact between the brake shoes and the other brake assembly parts with Lubriplate or a similar lubricant. Lubricate the adjusting screw threads.

2. Place the adjusting screw, socket, and nut on the brake shoes so that the star wheel on the screw is opposite the adjusting hole in the carrier plate. Then install the adjusting screw spring.

3. Position the brake shoes and the adjusting screw parts on the carrier plate, and install the hold-down spring pins, springs, and cups. When assembling a rear brake, connect the parking brake lever to the secondary shoe, and install the link and spring with the shoes. Be sure to hook the parking brake cable to the lever.

4. Install the anchor pin plate on the pin.

5. Install the brake shoe retracting springs on both shoes (Fig. 9), being careful not to bend the hooks or to stretch the springs beyond the attaching points. **The primary shoe spring must be installed first.**

6. Remove the clamp from the brake cylinder boots.

7. Install the wheel and drum.

8. Bleed the system and adjust the brakes. Check the brake pedal operation after bleeding the system. Then lower the truck.

#### TWO-CYLINDER BRAKE SHOE —FRONT

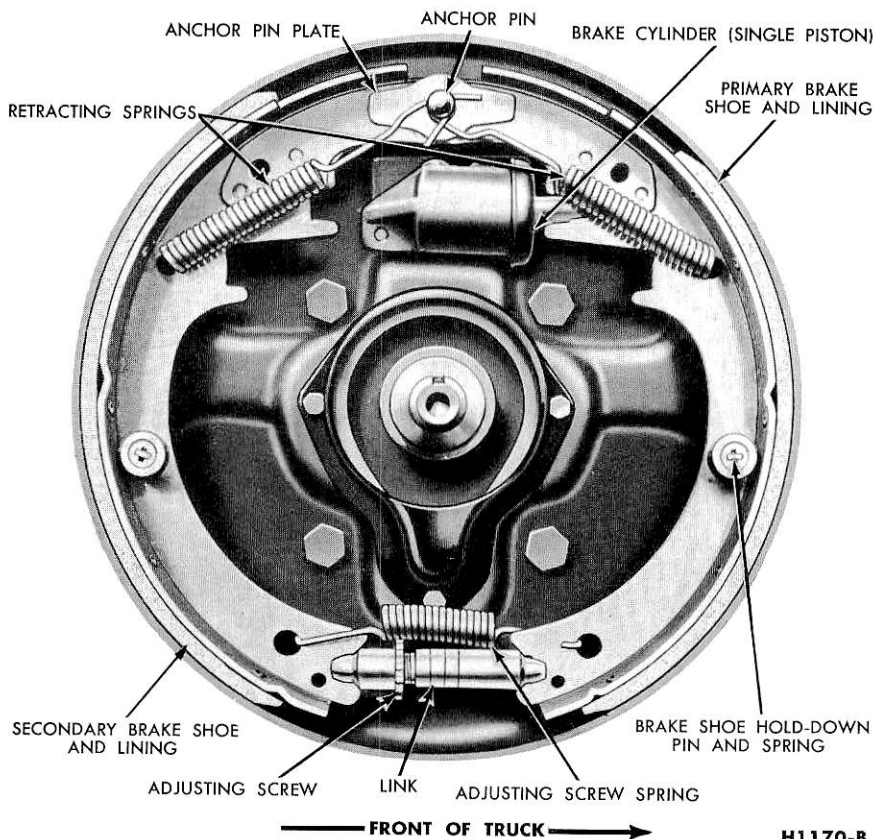
##### REMOVAL

1. Raise the truck until the wheels clear the floor. Remove the wheel, and then remove the drum or the hub and drum assembly. **Mark the hub and drum to aid assembly in the same position.**

On a truck equipped with a vacuum or air booster, be sure the engine is stopped and there is no vacuum or air pressure in the system before disconnecting the hydraulic lines.

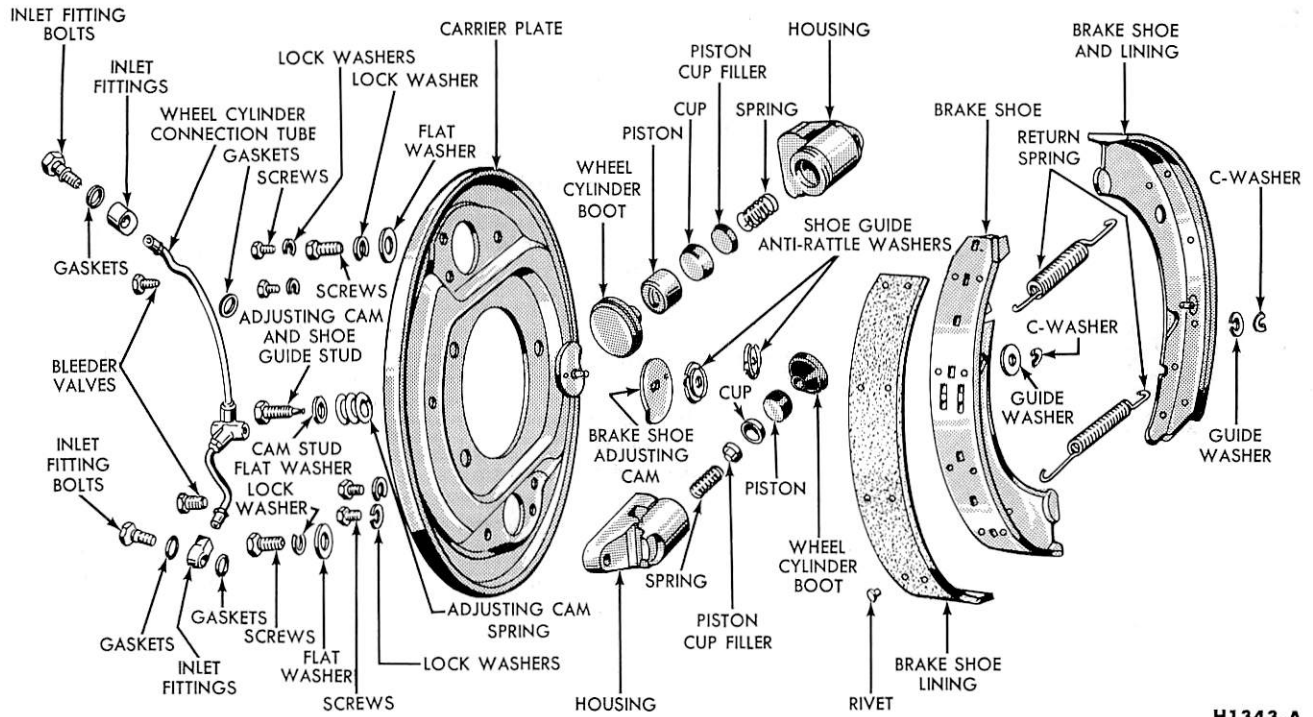
2. Remove both brake shoe return springs (Fig. 11) using brake spring pliers.

3. Remove the C-washer and the flat washer from the adjusting cam



H1170-B

FIG. 10—Single Anchor Brake Assembly



H1343-A

FIG. 11—Two-Cylinder Brake—Front

and hold-down stud. Lift the shoes off the carrier plate.

**INSTALLATION**

1. Install the anti-rattle spring washer on each cam and shoe guide stud, with the pronged side facing the adjusting cam.

2. Place a shoe assembly on the backing plate with the cam and shoe guide stud inserted through the hole in the shoe web. Locate the shoe toe in the wheel cylinder piston shoe guide and position shoe heel in the slot in the anchor block.

3. Install the flat washer and the C-washer on the cam and shoe guide stud. Crimp the ends of C-washer together.

4. After installing both shoes, install the brake shoe return springs (Fig. 11). To install each spring, place the spring end with the short hook in the toe of shoe, then using brake spring pliers, stretch the spring and secure the long hook end in the heel of the opposite shoe.

5. Install the hub and brake drum assembly.

6. Adjust the brakes as detailed in Section 2.

**TWO-CYLINDER BRAKE SHOE REMOVAL—REAR**

1. Raise the truck until the wheels clear the floor. Remove the wheel,

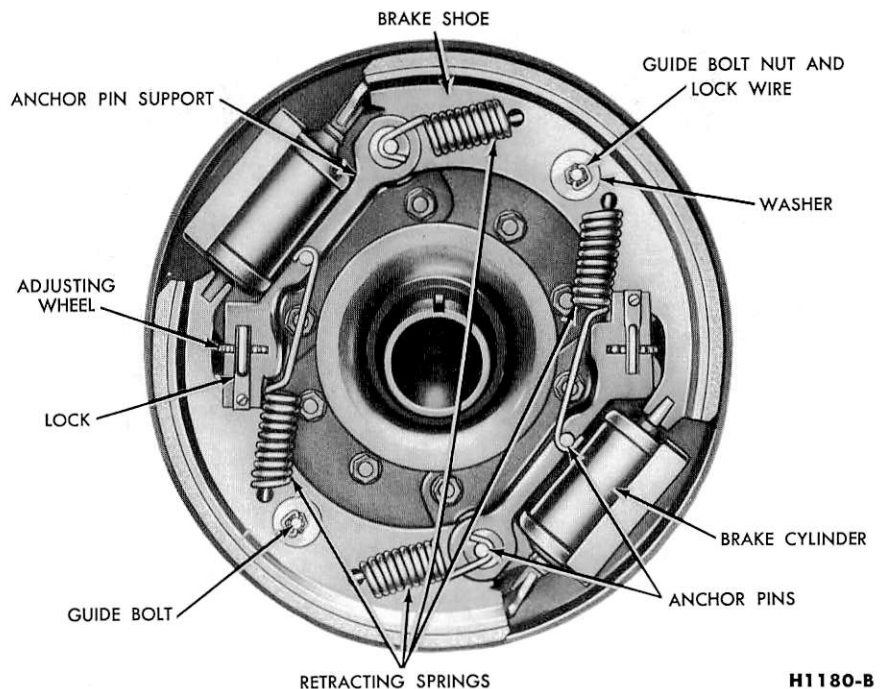
and then remove the drum or the hub and drum assembly. **Mark the hub and drum to aid assembly in the same position.**

**On a truck equipped with a vacuum or air booster, be sure the engine is stopped and there is no vacuum or air pressure in the system**

**before disconnecting the hydraulic lines.**

2. On a unit equipped with retracting springs of unequal lengths (Fig. 12), remove the brake shoes as follows:

a. Clamp the brake cylinder boots against the ends of the cylinder, note



H1180-B

FIG. 12—Two-Cylinder Brake—Unequal Length Springs

the location of each brake shoe retracting spring, and remove the four brake shoe retracting springs with the tool shown in Fig. 9.

b. Remove the brake shoe guide bolt lockwire, nut, washer, and bolt from both shoes, and remove the shoes from the carrier plate.

c. Remove the screw that secures the adjusting wheel lock to the anchor pin support. Thread the adjusting screw and wheel assembly out of the anchor pin support by turning the adjusting wheel. After the assembly is unthreaded drive out the adjusting screw and remove the adjusting wheel.

3. On a unit equipped with retracting springs of equal lengths (Fig. 13), remove the brake shoes as follows:

a. Clamp the brake cylinder boots against the ends of the cylinder and remove the four brake shoe retracting springs with the tool shown in Fig. 9.

b. Remove the brake shoe guide bolt cotter pin, nut, washer, and bolt from both shoes and remove the shoes from the carrier plate.

c. Remove the clamp-type adjusting wheel lock from the anchor pin support, and unthread the adjusting screw and wheel assembly from the anchor pin support.

### INSTALLATION

1. Coat all points of contact between the brake shoes and other

brake assembly parts with high temperature grease.

2. Replace the brake shoes on a unit with retracting springs of unequal lengths as follows:

a. Position the adjusting wheel, and slide the adjusting screw through the anchor pin support, indexing the adjusting wheel tab in the slot on the adjusting screw. Install and secure the adjusting wheel lock.

b. Position the brake shoes in the anchor pin slot on the anchor support bracket, and engage the other end of the brake shoe in the brake cylinder link (Fig. 12).

c. Install the brake shoe guide bolt, washer, and nut. Finger tighten the nut, then back off one full turn, and install the lockwire.

d. Install the four brake retracting springs with tool shown in Fig. 9. Make sure the retracting springs are replaced as shown in Fig. 12. Improper installation of the springs may result in uneven brake lining wear, due to dragging, and unsatisfactory brake operation.

3. Replace the brake shoes on a unit with retracting springs of equal length as follows:

a. Thread the adjusting screw and wheel assembly into the anchor pin support and install the clamp-type adjusting wheel lock. Thread the adjusting wheel into the support so that

the brake shoe will rest against the adjusting wheel end.

b. Place the brake shoe over the two retracting spring anchor pins, insert the ends in the brake cylinder links, and install the shoe guide bolt, washer, and nut (Fig. 13). Finger tighten the nut, then back off one full turn, and install the cotter pin.

c. Install the four retracting springs with the tool shown in Fig. 9.

4. Remove the cylinder clamps, install the drum or the hub and drum assembly, then install the wheel assembly. **Align the marks on the hub and drum during installation.**

5. Bleed the brake system and adjust the brakes. Lower the truck.

### BRAKE WHEEL CYLINDER

#### REMOVAL

1. Remove the wheel, drum, and brake shoes. Remove the cylinder-to-shoe connecting links.

2. Disconnect the brake line from the brake cylinder. **On a truck equipped with a vacuum or air booster, be sure the engine is stopped and there is no vacuum or air pressure in the system before disconnecting the hydraulic lines.**

3. Remove the brake cylinder retaining bolts and lockwashers, and then remove the cylinder from the carrier plate. On the two-cylinder brake assemblies, remove the cover with the brake cylinder.

#### INSTALLATION

1. Position the brake cylinder on the carrier plate and install the retaining bolts and lockwashers. On the two-cylinder brake assemblies, install the cover with the brake cylinder.

2. Install a new gasket on the brake line fitting and connect the line to the brake cylinder(s).

3. Install the brake shoes and the connecting links between the shoes and cylinder. Install the drum and the wheel.

### MASTER CYLINDER--B-, F-, N-, AND T-SERIES TRUCKS

#### REMOVAL

If the truck is equipped with a vacuum or air booster, the engine must be stopped and all vacuum or air pressure must be expelled from the booster system before the hydraulic lines are disconnected.

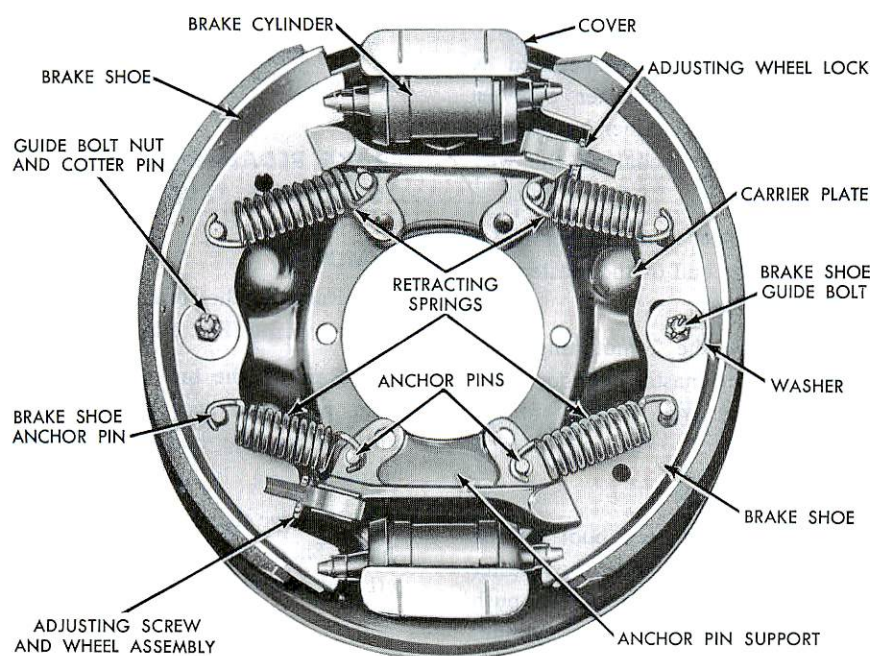


FIG. 13—Two-Cylinder Brake—Equal Length Springs



1. If the stoplight switch is mounted on the master cylinder, disconnect the stoplight switch wires from the switch, and disconnect the brake line from the brake fitting.

2. Force as much brake fluid as possible from the master cylinder into a suitable container by pushing down the brake pedal all the way several times.

3. Disconnect the rubber boot from the rear end of the master cylinder in the cab.

4. Remove the bolts that hold the master cylinder against the dash panel, and lift the cylinder away from the push rod and out of the engine compartment.

On a truck equipped with a dash-mounted booster, remove the two nuts that retain the master cylinder to the booster assembly, and remove the master cylinder.

#### INSTALLATION

1. With the rubber boot on the piston push rod, guide the master cylinder over the end of the push rod, and position the cylinder against the mounting surface. Install the mounting bolts, and torque them to 12-18 foot-pounds.

On a truck equipped with a dash-mounted booster, position the master cylinder on the two mounting studs on the booster assembly, and install the retaining nuts.

2. Connect the brake line to the master cylinder fitting, but leave the brake line fitting loose.

3. Fill the master cylinder reservoir with heavy-duty brake fluid to within ½ inch of the top of the filler neck.

4. Push the brake pedal down slowly by hand several times to let air escape at the brake line fitting. Hold the pedal down and tighten the brake line fitting. Release the brake pedal. **Do not release the brake pedal until the fitting is tightened as additional air will be introduced into the master cylinder.**

On a truck with a brake booster assembly, the master cylinder can be bled at the booster bleed screw(s).

5. After seeing that the master cylinder reservoir is filled with heavy-duty brake fluid to within ½ inch of the top of the filler neck, install the filler cap. Wipe off any fluid from the outside of the cylinder and brake line.

6. If the stoplight switch is mounted on the master cylinder, connect the stoplight switch wires to the switch.

7. Connect the rubber boot to the end of the cylinder.

8. Check and, if necessary, adjust the brake pedal free-travel.

#### MASTER CYLINDER—C-SERIES TRUCK

##### REMOVAL

If the truck is equipped with a vacuum or air booster, the engine must be stopped and all vacuum or air pressure must be expelled from the booster system before the hydraulic lines are disconnected.

1. Roll back the floor mat, remove the floor plate, and then disconnect the hydraulic line from the master cylinder.

2. Force as much brake fluid as possible from the master cylinder into a suitable container by pushing down the brake pedal all the way several times.

3. Disconnect the rubber boot from the rear end of the master cylinder in the cab.

4. Remove the 2 mounting bolts and lower the master cylinder away from the push rod and out of the cab.

##### INSTALLATION

1. With the rubber boot on the piston push rod, guide the master cylinder over the end of the push rod, and position the cylinder against the mounting surface. Install the mounting bolts, and torque them to 12-18 foot-pounds.

2. Connect the brake line to the master cylinder fitting, but leave the brake line fitting loose.

3. Fill the master cylinder reservoir with heavy-duty brake fluid to within ½ inch of the top of the filler neck.

4. Push the brake pedal down slowly by hand. Hold the pedal down and tighten the brake line fitting. Release the brake pedal. **Do not release the brake pedal until the fitting is tightened as additional air will be introduced into the master cylinder.** Repeat this procedure until air ceases to escape at the fitting and a firm pedal is obtained.

On a truck with a brake booster assembly, the master cylinder can be bled at the booster bleed screw(s).

5. After seeing that the master cylinder reservoir is filled with heavy-duty brake fluid to within ½ inch of the top of the filler neck, install the filler cap. Wipe off any fluid from the outside of the cylinder and brake line.

6. Connect the rubber boot to the end of the cylinder. Install the floor plate and secure with the 7 retaining screws, and place the floor mat in its proper position.

7. Check and, if necessary, adjust the brake pedal free-travel.

#### BRAKE PEDAL—B-, F-, N-, OR T-SERIES TRUCK

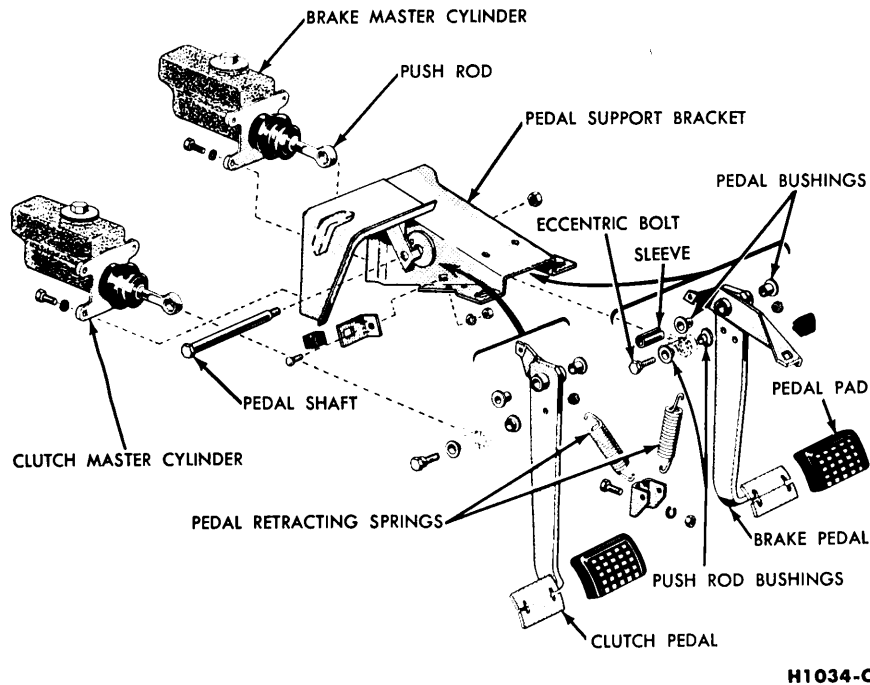
##### REMOVAL

1. Remove the brake pedal retracting spring (Fig. 14).

2. Remove the brake master cylinder push rod eccentric bolt nut, and remove the bolt and 2 nylon bushings.

3. Remove the nut from the pedal shaft. Then slide the shaft to the left and remove the brake pedal and sleeve.

4. Remove the 2 bushings from the pedal, and remove the bumper from the pedal extension bracket.



**FIG. 14—B-, F-, N-, or T-Series Brake Pedal and Related Parts**

#### INSTALLATION

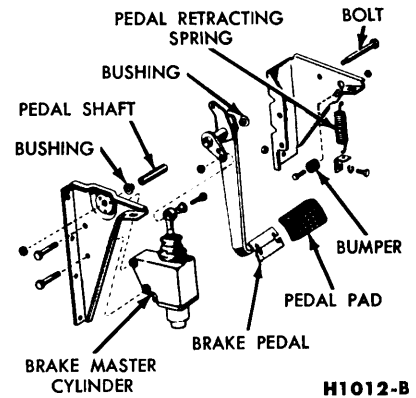
1. Coat all bushings and the pedal shaft with a small quantity of Lubriplate or an equivalent lubricant.
2. Install the bumper on the pedal extension bracket, and position the nylon bushings in the brake pedal shaft bore.
3. Position the brake pedal assembly and sleeve in the pedal support bracket. Slide the pedal shaft through the sleeve and pedal and secure with the nut. Torque the nut to specifications.
4. Position the nylon bushings in the bore of the push rod. Connect the push rod to the brake pedal with the eccentric bolt and nut. Install the pedal retracting spring.
5. Adjust the brake pedal free travel to  $\frac{3}{16}$ - $\frac{3}{8}$  inch (Fig. 6). Torque

the eccentric bolt nut to specifications.

#### BRAKE PEDAL—C-SERIES TRUCK

##### REMOVAL

1. Remove the brake pedal retracting spring (Fig. 15).
2. Remove the brake master cylinder push rod eccentric bolt nut, bolt, and 2 nylon bushings.
3. Remove the brake pedal bumper-to-bracket retaining nut. Then remove the bolt and bumper.
4. Remove the master cylinder push rod by pulling up on the tab on the push rod boot, and remove the push rod and boot from the cylinder.
5. Remove the nut from the bolt, slide the bolt to the right and remove



**FIG. 15—C-Series Brake Pedal**

the brake pedal assembly, sleeve and bushing.

6. Remove the bushings from the pedal assembly.

#### INSTALLATION

1. Coat all bushings and the pedal shaft, with a small quantity of Lubriplate or an equivalent lubricant. Position the nylon bushings in the brake pedal shaft bore.
2. Position the brake pedal assembly sleeve and bushing in the pedal support bracket, slide the bolt to the left and install the nut. Torque the nut to specifications.
3. Install the push rod and boot in the master cylinder.
4. Install the pedal bumper bolt, bumper and nut. Tighten the nut securely.
5. Install the 2 nylon bushings in the push rod bore, and install the push rod eccentric bolt and nut.
6. Install the pedal retracting spring.
7. Adjust the brake pedal free-travel to  $\frac{3}{16}$ - $\frac{3}{8}$  inch. Torque the eccentric bolt nut to specifications.

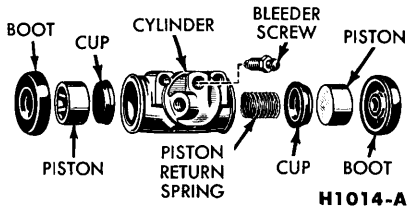
## 4 MAJOR REPAIR OPERATIONS

### BRAKE WHEEL CYLINDER

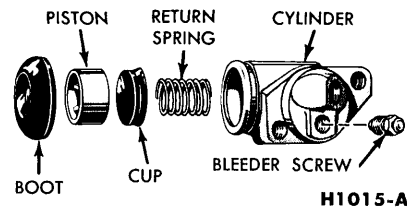
1. With the wheel cylinder removed, remove the rubber boots

from the end(s) of the brake cylinder. Remove the piston(s), cup(s), and piston return spring from the cylinder (Fig. 16 or 17).

2. Remove the bleeder screw from the cylinder.
3. Coat all brake cylinder parts with clean heavy-duty brake fluid.



**FIG. 16—Double Servo Brake Cylinder**



**FIG. 17—Single Servo Brake Cylinder**

4. Install the bleeder screw (Fig. 16 or 17) in the brake cylinder.

5. Place the piston return spring, cup(s), and piston(s) in the cylinder bore, and clamp the brake cylinder pistons against the end(s) of the cylinder.

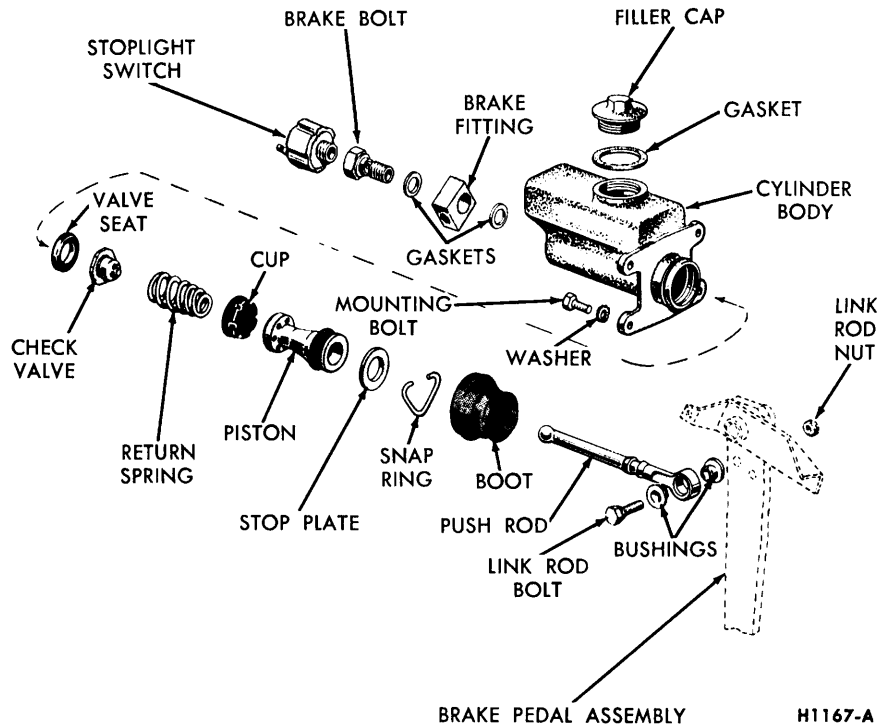
## MASTER CYLINDER

### DISASSEMBLY

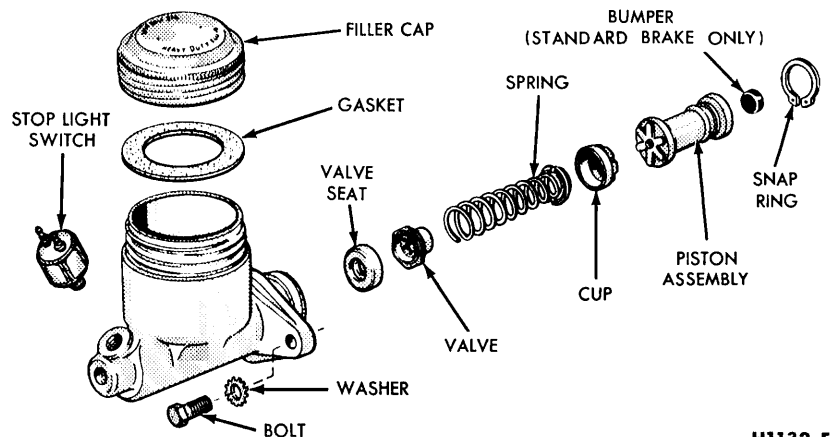
1. With the master cylinder removed, clean the outside of the master cylinder, and remove the filler cap and gasket. Pour out any brake fluid that may remain in the cylinder and reservoir.

2. On a B-, F-, N-, or T-Series truck master cylinder, remove the stoplight switch if it is mounted on the master cylinder, brake bolt, fitting, and gaskets from the forward end of the cylinder (Figs. 18 and 19). Discard the gaskets. Remove the snap ring from the bore at the rear end of the cylinder, and remove the stop plate, piston, cup, spring, check valve, and seat from the cylinder bore. If necessary, blow through the forward bolt hole to remove the parts.

On a C-Series truck master cylinder (Fig. 20), remove the 4 bolts that hold the cylinder body on the reservoir, and remove the gasket. Press down on the piston to compress the



**FIG. 18—B-, F-, N-, or T-Series Brake Master Cylinder**



**FIG. 19—Brake Master Cylinder (Typical on B-, F-, N-, or T-Series Truck)**

return spring, and remove the snap ring. Remove the piston, primary cup, piston filler, return spring, check valve, and check valve seat.

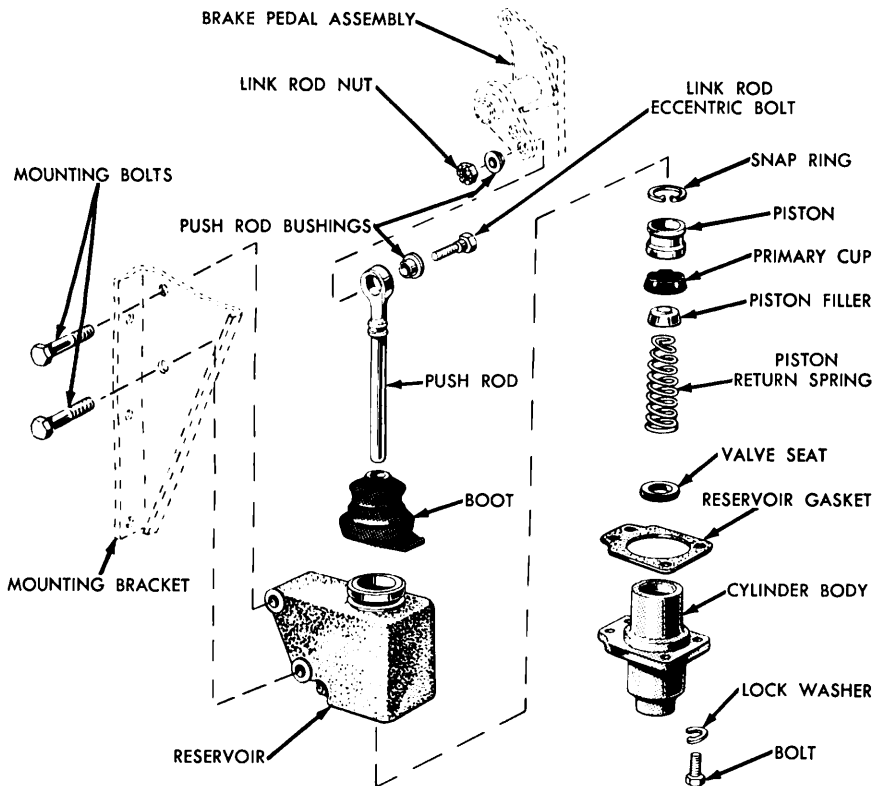
**On 700 through 800 Series trucks equipped with a vacuum or air-hydraulic brake booster, the check valve is installed in the booster instead of in the master cylinder.**

### ASSEMBLY

1. Dip all parts except the master cylinder body in clean hydraulic brake fluid. Use only heavy-duty brake fluid.

2. On a B-, F-, N-, or T-Series truck, install the brake fitting, bolt, and new gaskets (Figs. 18 and 19) on the forward end of the cylinder. If the stoplight switch mounts on the master cylinder, attach the switch to the brake bolt. Install the valve seat, valve, spring, cup, piston, and stop plate in the cylinder bore. Install the snap ring in the rear end of the bore.

3. On a C-Series truck master cylinder, install the valve seat, valve, spring, piston filler, cup and piston in the cylinder bore. Push down on



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FIG. 20—C-Series Brake Master Cylinder

the piston to compress the spring, and install the snap ring in the bore. Position a new gasket over the cylinder body and mount the body to the reservoir. Secure with 4 bolts. Tighten bolts securely.

**MASTER CYLINDER—TRUCKS  
EQUIPPED WITH A  
DASH-MOUNTED BOOSTER  
DISASSEMBLY**

1. Clean the outside of the master cylinder, loosen the retaining bolt,

and remove the filler cap, filter and gasket assembly (Fig. 21). Pour out any brake fluid remaining in the cylinder or reservoir.

2. Remove the retaining snap ring and slide the return spring off the master cylinder push rod.

3. Remove the end cap, check valve and spring, and piston stop from the front end of the master cylinder bore. Remove the O-ring from the end cap.

4. Remove the bushing snap ring from the rear end of the cylinder, insert a drift through the front end of the cylinder bore against the piston, and knock out the master cylinder push rod, piston, and bushing as an assembly (Fig. 22).

5. Slide the bushing assembly off the push rod. Remove the small snap ring and separate the push rod from the piston.

6. Remove the "Block Vee" type seal and bronze washer from the piston (Fig. 21).

7. Disassemble the washer, retainer, "Block Vee" type seal, and the O-ring from the bushing.

**ASSEMBLY**

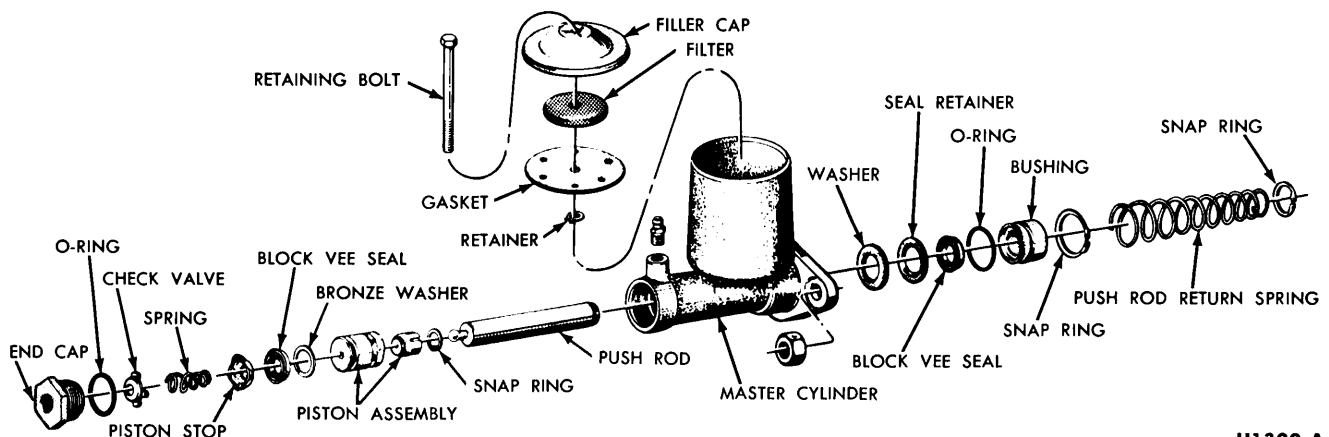
1. Install the bronze washer and the "Block Vee" type seal on the piston assembly (Fig. 21).

2. Assemble the piston assembly to the master cylinder push rod and secure these parts together with the snap ring.

3. Insert the push rod and piston assembly through the front end of the cylinder bore, and push in about half the length of the bore.

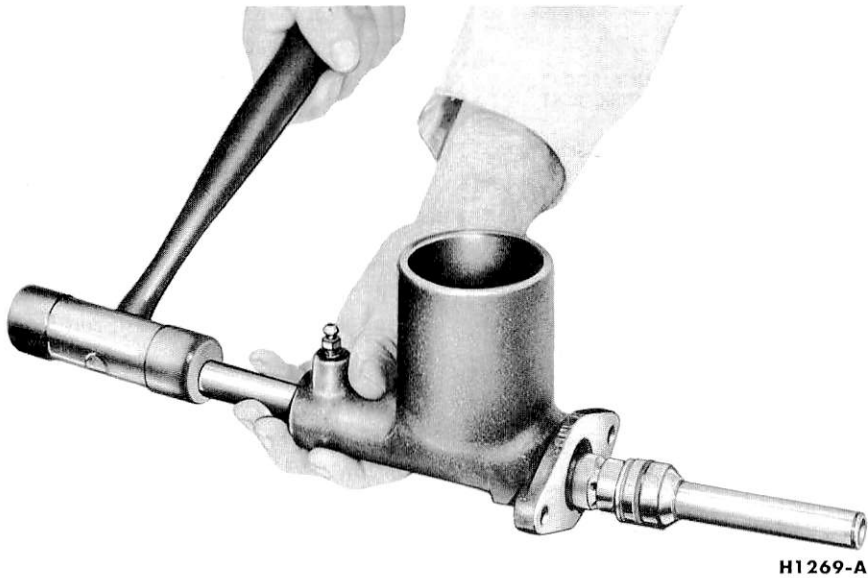
4. Install the O-ring on the end cap. Install the piston stop, spring, check valve, and the end cap in the front end of the cylinder (Fig. 21).

5. Install the O-ring on the bushing. Slide the washer, the retainer,

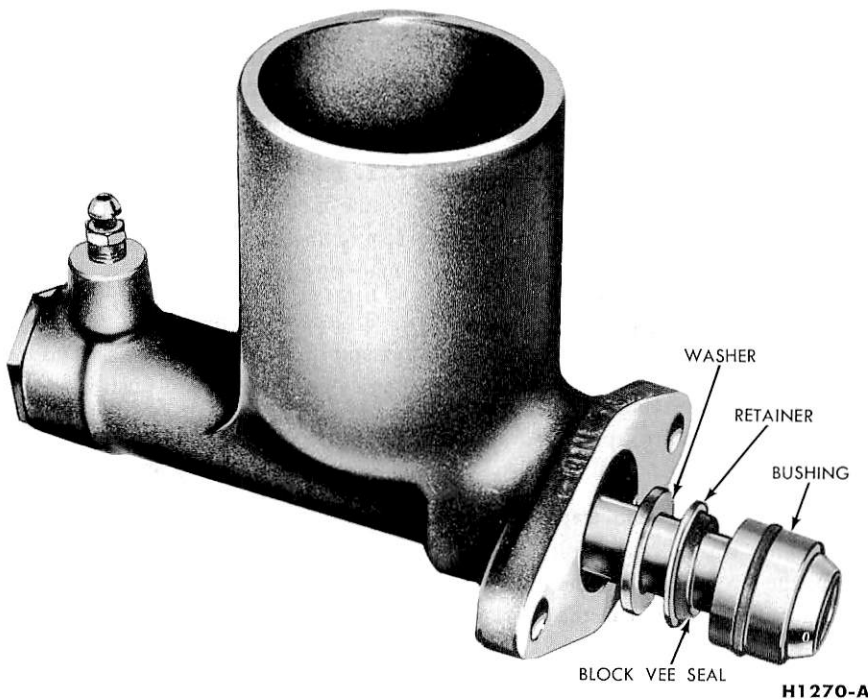


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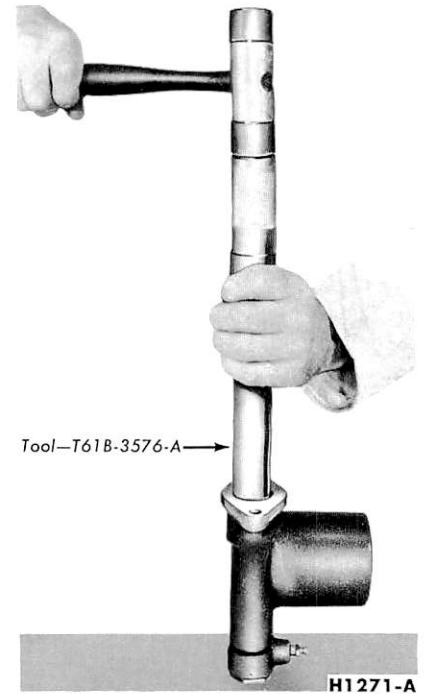
FIG. 21—Dash-Mounted Master Cylinder Disassembled



**FIG. 22—Master Cylinder Push Rod, Piston, and Bushing Removal**



**FIG. 23—Assembly of Seal and Bushing Components to Master Cylinder Push Rod**



**FIG. 24—Master Cylinder Bushing Installation**

the “Block Vee” type seal, and the bushing onto the push rod (Fig. 23). **Take care to avoid damaging the seal when sliding it onto the push rod.** Assemble the seal to the retainer flange as shown.

6. Being careful not to scratch the surface of the push rod, slide all the bushing and seal components against the retaining flange at the rear of the master cylinder bore. Force the parts into place with the tool shown in Fig. 24 and install the bushing snap ring.

7. Slide the return spring onto the master cylinder push rod, compress the spring, and install the retaining snap ring (Fig. 21).

# PART 2-3 PARKING BRAKES

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2 In-Truck Adjustments and Repairs .....	2-21	4 Major Repair Operations .....	2-23

## 1 DESCRIPTION AND OPERATION

500 thru 800 Series trucks are equipped with a transmission-mounted (internal expanding shoe) parking brake.

The parking brake includes a brake drum attached to the drive shaft (or coupling shaft), two brake shoes, an actuating cam mechanism, and rod-type linkage connected to a parking brake lever.

On trucks equipped with full air

brakes, a Maxibrake emergency stop safety feature is available.

The Maxibrake air brake chamber (used on the rear axle only) is much like the conventional brake chamber, and differs only in that it contains an independently operated spring loaded piston which, when released due to low air pressure, will set the service brakes (Fig. 1).

Normal air pressure applied to the safety chamber and piston keeps the

piston spring compressed, while the service brakes continue to operate normally.

A manual control valve, located in the cab, exhausts the air from the safety chamber, so that the safety piston spring pressure can be used for emergency stops.

The control valve and safety chamber spring and piston are also used to set the service brakes for parking.

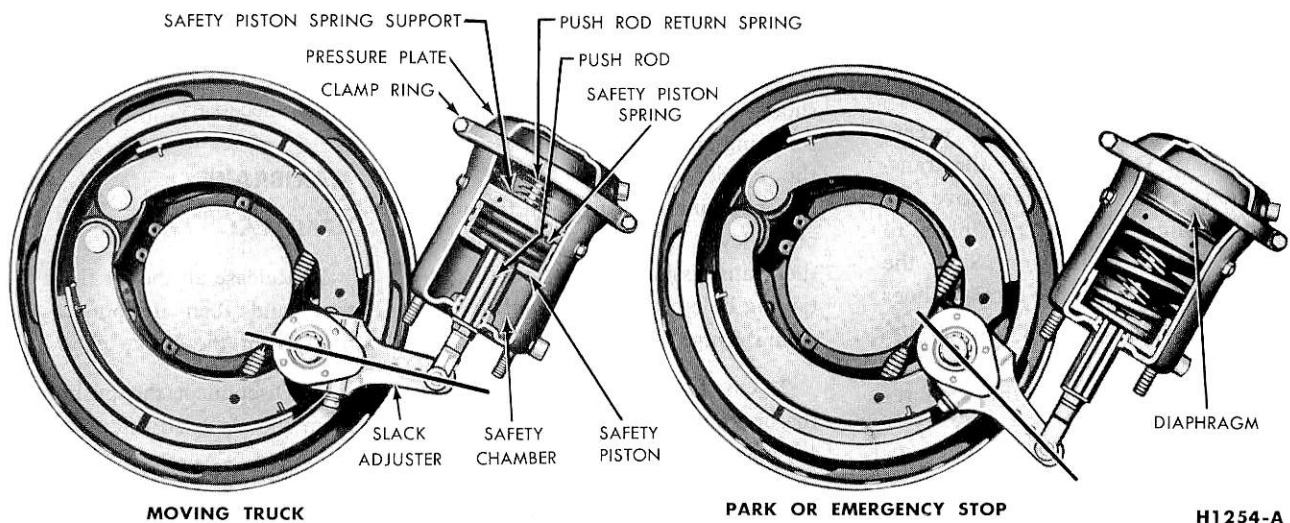


FIG. 1—Maxibrake Operation

## 2 IN-TRUCK ADJUSTMENTS AND REPA

### INTERNAL SHOE PARKING BRAKE ADJUSTMENT

1. Release the parking brake lever in the cab.

2. From under the truck, remove the cotter pin from the brake linkage adjusting (Fig. 2). Remove the cle

