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1965 FORD TRUCK

SHOP MANUAL

COMPLETE SET
ALL THREE VOLUMES

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1965 FORD

TRUCK

SHOP MANUAL
VOLUME ONE

1965 FORD TRUCK

SHOP MANUAL

VOLUME ONE

SERVICE DEPARTMENT
FORD DIVISION
Ford MOTOR COMPANY

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GROUP INDEX

VOLUME TWO

VOLUME THREE

SPECIFICATIONS AND SPECIAL SERVICE TOOLS AT END OF EACH GROUP

FOREWORD

The three volumes of this shop manual provide the Service Technician with complete information for the proper servicing of all 1965 Ford Trucks except Econoline and Ranchero.

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

VEHICLE IDENTIFICATION

GROUP 1

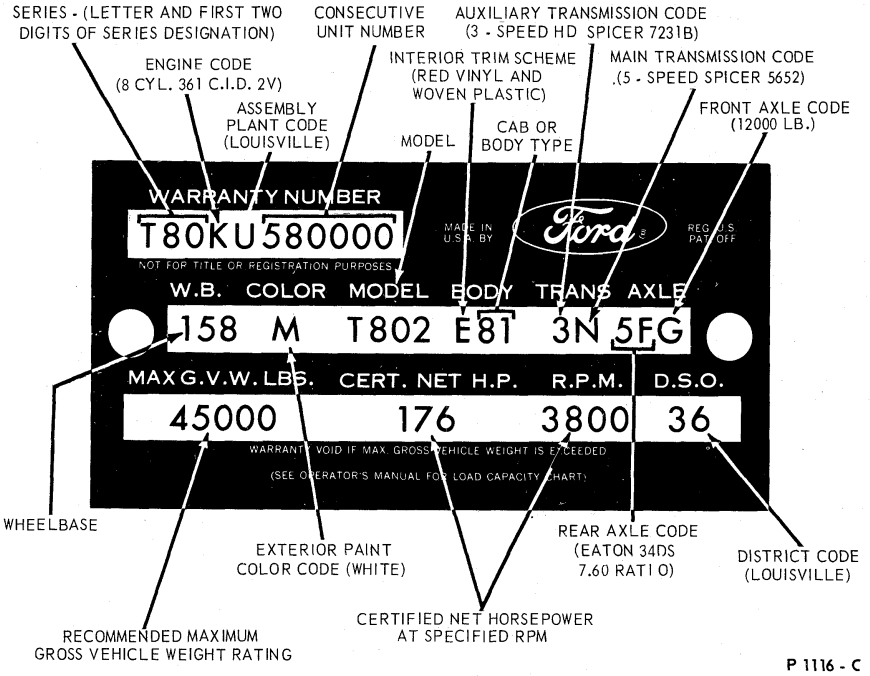

FIG. 1—Typical Truck Rating Plate

Figure 1 illustrates a typical truck Rating Plate. The Rating Plate is riveted to the rear (lock) face of the left front door on Conventional Cabs, 89 inch BBC (bumper-to-back of cab) and Tilt Cab trucks. On cowl and windshield units, the Rating Plate is mounted on the glove compartment inner panel inside the glove compartment door.

The Official Serial Number, for title and registration purposes, is stamped on the following locations: P-Series—right frame side rail approximately 4 inches to rear of the front crossmember; N, NT, F, T and B-Series—right frame side rail approximately 24 inches forward of the No. 2 crossmember; C-Series—10 inches forward of the rear cab support on the upper flange of the right frame side rail.

Do not use the Warranty Number which appears on the Rating Plate for title or registration purposes.

VEHICLE WARRANTY NUMBER

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

VEHICLE DATA

The Vehicle Data appears on the Rating Plate on the two lines following the Warranty Number. The first three digits under W.B. designate the wheelbase in inches. The one or two letters under COLOR identify the exterior paint color (two letters designate a two-tone). The letter and three digits under MODEL designate the truck model within a series. The letter and numerals under BODY designate the interior trim and body type (the letter identifies the interior trim scheme and the numerals identify the body or cab type). The transmission installed in the vehicle is identified under TRANS by either a numeric or alphabetical code (if two symbols appear, the first identifies the auxiliary transmission, if so equipped, and the second symbol identifies the main transmission). A letter and a number or two numbers under AXLE identify the rear axle ratio (when required, a letter is also stamped behind the rear axle code to identify the front axle capacity). The maximum gross vehicle weight in pounds is stamped under MAX. G.V.W. Following MAX. G.V.W., the horse power rating of the engine with which the vehicle is equipped, is stamped under CERT. NET H.P. and the rpm required to develop the given horsepower is stamped under R.P.M. A two-digit number is stamped under D.S.O. to identify the district which ordered the vehicle. If the vehicle is built to special order (Domestic Special Order, Foreign Special Order, Limited Production Option, or other special order), the complete order number will also appear under D.S.O. The charts that follow list the various vehicle data codes.

MODEL CODE

Prefix	Type
A	Fwd. Axle Tilt Cab Tandem Rear Axle—Diesel
B	School Bus Chassis—Gas
C	Tilt Cab 2 Axle—Gas
D	Tilt Cab 2 Axle—Diesel
F	Conventional 2 Axle—Gas
H	Forward Axle Tilt Cab 2 Axle—Gas
J	Fwd. Axle Tilt Cab Tandem Rear Axle—Gas
K	Conventional 2 Axle—Diesel
L	Tilt Cab Tandem Rear Axle—Gas
N	89" BBC Conventional 2 Axle—Gas
P	Parcel Delivery
U	Conventional Tandem Rear Axle—Diesel
R	89" BBC Conventional 2 Axle—Diesel
S	89" BBC Conventional Tandem Rear Axle—Gas
T	Conventional Tandem Rear Axle—Gas
W	89" Conventional Tandem Rear Axle—Diesel
Y	Fwd. Axle Tilt Cab 2 Axle—Diesel

ENGINE CODES

Code	Engine
A	6 Cyl. 330 CID (2V-MD)
B	6 Cyl. 300 CID (1V)
D	8 Cyl. 352 CID (4V)
E	6 Cyl. 330 CID Diesel (DGHM)
F	6 Cyl. 1673 Caterpillar Diesel
G	8 Cyl. 401 CID (2V)
H	8 Cyl. 477 CID (2V)
I	6 Cyl. CF 180 Diesel
J	6 Cyl. 240 CID (1V)
K	8 Cyl. 361 CID (2V)
M	8 Cyl. 330 CID (2V HD)
N	6 Cyl. C 180 Diesel
O	6 Cyl. 855 CID Cummins (NH-250)
P	8 Cyl. 401 CID (4V)
Q	8 Cyl. 477 CID (4V)
R	8 Cyl. 534 CID (4V)
S	6 Cyl. 200 CID (1V)
T	6 Cyl. 170 CID (1V)
V	6 Cyl. 672 CID Cummins (NH-180)
X	6 Cyl. 743 CID Cummins (NH-220)
Y	6 Cyl. 743 CID Cummins (NH-180)
Z	6 Cyl. 743 CID Cummins (NH-195)
2	6 Cyl. C 160 Diesel
3	8 Cyl. 784 CID Cummins (V8-265)-
4	4 Cyl. 220 CID Diesel (DGHM)
6	6 Cyl. 588 CID Cummins (V6E-195)
7	8 Cyl. 785 CID Cummins (V8E-235)
8	6 Cyl. 855 CID Cummins (NHE-225)
9	8 Cyl. 391 CID (4V)
K	6 Cyl. 300 CID (1V)*
S	8 Cyl. 361 CID (2V)*
W	8 Cyl. 330 CID (2V-MD)*
1	6 Cyl. 240 CID (1V)*
2	6 Cyl. 200 CID (1V)*
3	6 Cyl. 170 CID (1V)*
5	8 Cyl. 330 CID (2V-HD)*

* Low Compression

ASSEMBLY PLANT CODES

Code Letter	Assembly Plant
A	Atlanta
D	Dallas
E	Mahwah
G	Chicago
H	Lorain
J	Los Angeles
K	Kansas City
L	Michigan Truck
N	Norfolk

Code Letter	Assembly Plant
P	Twin Cities
R	San Jose
S	Pilot Plant
T	Metuchen
U	Louisville
W	Wayne
Y	Wixom
Z	St. Louis

CONSECUTIVE UNIT NUMBER

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

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

W.B. (WHEELBASE)

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

EXTERIOR PAINT COLOR CODES

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

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

SERIES, MODEL CODES, AND GROSS VEHICLE WEIGHT (G.V.W.)—100-350 AND P SERIES

Series	Model Code	Rating GVW (lb)	Nominal (ton)
F-100	F-100	5,000	½
	F-101	4,200	½
	F-102	5,000	½
F-100 (4x4)	F-110	5,600	½
	F-111	4,900	½
	F-112	5,600	½
P-100	P-100	4,300	½
	P-101	5,000	½
F-250	F-250	7,500	¾
	F-251	4,800	½
F-250 (4x4)	F-260	6,800	¾
	F-261	4,900	½
	F-262	7,700	¾
F-350	F-350	10,000	1
	F-351	8,000	¾
P-100	P-100	4,300	½
	P-101	5,000	½
P-350	P-350	8,000	¾
	P-351	5,900	½
P-400	P-400	10,000	1
	P-401	7,700	¾
P-500	P-500	15,000	1½
	P-501	10,000	1
P-600	P-600	17,000	2
	P-601	15,000	1½
P-3500	G-350	8,000	¾
	G-351	5,900	½
P-4000	G-400	10,000	1
	G-401	7,700	¾
P-5000	G-500	15 000	1½
	G-501	10,000	1

SERIES, MODEL CODES, AND GROSS VEHICLE WEIGHT (G.V.W.)—500-800 SERIES

Series	Model Code	Rating GVW (lbs)	Nominal (ton)
B-500	B-500	15,000	1½
	B-501	10,000	1
	B-502	16,000	1½
	B-503	17,000	2
	B-504	18,000	2
	B-505	20,000	2
B-600	B-600	17,000	2
	B-601	15,000	1½
	B-602	20,000	2
B-610	B-610	21,000	2½
	B-611	22,000	2½
	B-612	23,000	2½
B-700	B-700	20,500	2½
	B-701	17,000	2
	B-702	21,000	2½
	B-703	22,500	2½
	B-704	23,000	2½
	B-705	24,000	2½
	B-706	23,500	3
	B-707	23,000	2½
	B-708	23,000	2½
B-750	B-750	22,500	2½
	B-751	17,000	2
	B-752	23,000	2½
	B-753	24,000	2½
	B-754	25,500	3
	B-755	23,000	2½
	B-756	23,000	2½
C-550	C-550	15,000	1½
	C-551	10,000	1
	C-552	17,000	2
	C-553	19,000	2
	C-554	20,000	2
C-600	C-600	20,000	2
	C-601	15,000	1½
	C-610	21,000	2½
	C-611	22,000	2½
	C-612	22,000	2½
	C-613	22,000	2½
	C-614	22,000	2½
C-700	C-700	24,000	2½
	C-701	17,000	2
	C-702	25,500	3
	C-703	25,500	3
C-750	C-750	24,000	2½
	C-751	17,000	2
	C-752	25,500	3
	C-753	25,500	3

Series	Model Code	Rating GVW (lbs)	Nominal (ton)
C-800	C-800	27,000	3½
	C-801	20,000	2
	C-802	27,500	3½
	C-803	27,500	3½
	C-804	27,500	3½
	C-805	27,500	3½
CT-750	L-750	39,000	3½
	L-751	27,000	2½
	L-752	41,000	4
CT-800	L-800	43,000	4
	L-801	27,000	2½
	L-802	39,000	3½
	L-803	45,000	4
	L-804	49,000	5
F-500	F-500	15,000	1½
	F-501	10,000	1
	F-502	16,000	1½
	F-503	17,000	2
	F-504	18,000	2
	F-505	20,000	2
F-600	F-600	17,000	2
	F-601	15,000	1½
	F-602	20,000	2
	F-610	21,000	2½
	F-611	22,000	2½
	F-612	23,000	2½
	F-613	23,000	2½
	F-614	23,000	2½
F-700	F-700	22,000	2½
	F-701	17,000	2
	F-702	23,000	2½
	F-703	24,000	2½
	F-704	25,500	3
	F-705	23,000	2½
	F-706	23,000	2½
	F-707	25,500	3
F-750	F-750	22,500	2½
	F-751	17,000	2
	F-752	23,000	2½
	F-753	24,000	2½
	F-754	25,500	3
	F-755	23,000	2½
	F-756	25,500	3
F-800	F-800	23,000	2½
	F-801	17,000	2
	F-802	24,000	2½
	F-803	25,500	3
	F-804	27,500	3½

Series	Model Code	Rating GVW (lbs)	Nominal (ton)
F-800	F-805	23,000	2½
	F-806	25,500	3
	F-807	27,500	3½
	F-808	27,500	3½
N-500	N-500	15,000	1½
	N-501	10,000	1
	N-502	16,000	1½
	N-503	17,000	2
	N-504	18,000	2
	N-505	20,000	2
N-600	N-600	17,000	2
	N-601	15,000	1½
	N-602	20,000	2
	N-610	21,000	2½
	N-611	22,000	2½
	N-612	23,000	2½
	N-613	23,000	2½
	N-614	23,000	2½
N-700	N-700	22,000	2½
	N-701	17,000	2
	N-702	23,000	2½
	N-703	24,000	2½
	N-704	25,500	3
	N-705	23,000	2½
	N-706	23,000	2½
	N-707	25,500	3
N-750	N-750	22,500	2½
	N-751	17,000	2
	N-752	23,000	2½
	N-753	24,000	2½
	N-754	25,500	3
	N-755	23,000	2½
	N-756	25,500	3
T-700	T-700	28,000	3
	T-701	22,000	2
	T-702	29,000	3
	T-703	36,000	3½
	T-704	37,000	3½
T-750	T-750	37,000	3½
	T-751	27,000	2½
	T-752	39,000	3½
	T-753	41,000	4
T-800	T-800	43,000	4
	T-801	27,000	2½
	T-802	45,000	4
	T-803	49,000	5
	T-804	43,000	4

SERIES, MODEL CODES, AND GROSS VEHICLE WEIGHT (G.V.W.)—DAGENHAM 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

Series	Model Code	RATING	
		GVW (lbs)	Nominal (ton)
C-7000	D-702	25,500	2½
	D-703	25,500	3
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

Series	Model Code	RATING	
		GVW (lbs)	Nominal (ton)
N-7000	R-700	22,000	2½
	R-701	17,000	2
	R-702	23,000	2½
	R-703	24,000	2½
	R-704	25,500	3
	R-705	23,000	2½
	R-706	23,000	2½

SERIES, MODEL CODES, AND GROSS VEHICLE WEIGHT (G.V.W.)—850-1100 SERIES

Series	Model Code	GVW (lbs)	Nominal (ton)
F-850	F-850	25,000	3
	F-851	20,000	2
	F-852	25,000	3
	F-853	27,000	3½
	F-854	27,000	3½
	F-855	27,000	3½
	F-856	25,500	3
	F-857	27,500	3½
F-950	F-950	28,000	3½
	F-951	24,000	2½
	F-952	30,000	4
	F-953	30,000	4
	F-954	32,000	4½
	F-955	32,000	4½
	F-956	34,000	5
	F-957	29,000	3½
	F-958	31,000	4
	F-959	33,000	4½
HT-850	J-850	41,000	
	J-851	32 000	
	J-852	45,000	
	J-853	48,000	
H-950	H-950	30,000	
	H-951	24,000	
	H-952	32,000	
	H-953	34,000	
CT-850	L-850	39,000	3½
	L-851	27,000	2½
	L-852	41,000	4
	L-853	43,000	4
	L-854	45,000	4
	L-855	49,000	5
CT-950	L-950	47,000	5
	L-951	30,000	3½
	L-952	49,000	5
	L-953	53,000	6
N-850	N-850	25,000	3
	N-851	20,000	2
	N-852	25,000	3
	N-853	27,000	3½
	N-854	27 000	3½
	N-855	27,000	3½
	N-856	25,500	3
	N-857	27,500	3½
*F-1000-D	K-000	32,000	4½
	K-001	26 000	3
	K-002	34 000	5
	K-003	36,000	5
HT-1000-D	Y-000	32 000	
	Y-001	26,600	
	Y-002	34,000	
N-1000	N-000	32,000	4½
	N-001	26 000	3
	N-002	34,000	5
	N-003	36,000	5
F-1000	F-000	32,000	4½
	F-001	26 000	3
	F-002	34,000	5
	F-003	36,000	5
F-1100	F-010	38,000	5½
	F-011	30,000	3½

Series	Model Code	GVW (lbs)	Nominal (ton)
C-850	C-850	27,000	3½
	C-851	20,000	2
	C-852	27,000	3½
	C-853	27,000	3½
	C-854	27,000	3½
	C-855	27,500	3½
HT-950	J-950	41,000	4
	J-951	32,000	3
	J-952	45,000	4
	J-953	49,000	5
H-1000	H-000	30,000	4
	H-001	24,000	2½
	H-002	32,000	4½
	H-003	34,000	5
*H-1000-D	Y-000	32,000	4½
	Y-001	26,000	3
	Y-002	34,000	5
*N-1000-D	R-000	32 000	4½
	R-001	26,000	3
	R-002	34,000	5
	R-003	36,000	5
	R-004	27,500	3½
NT-850	S-850	39,000	3½
	S-851	27,000	2½
	S-852	41,000	4
	S-853	43,000	4
	S-854	43,000	4
	S-855	45,000	4
	S-856	49,000	5
NT-850-D	W-850	43,000	4
	W-851	27,000	2½
	W-852	39,000	3½
	W-853	41,000	4
	W-854	45,000	4
	W-855	49,000	5
*F-1100-D	K-010	38,000	5½
	K-011	30,000	3½
*T-850-D	U-850	39,000	3½
	U-851	27 000	2½
	U-852	41,000	4
	U-853	43,000	4
	U-854	45 000	4
	U-855	49,000	5
	U-856	51,000	6
*F-950-D	K-950	28,000	3½
	K-951	24,000	2½
	K-952	30,000	4
	K-953	30,000	4
	K-954	32,000	4½
	K-955	32,000	4½
	K-956	34 000	5
	K-957	29,000	3½
	K-958	31 000	4
	K-959	33,000	4½
	K-960	25 500	3
	K-961	27,500	3½
C-950	C-950	30,000	4
	C-951	24,000	2½
	C-952	30 000	4
	C-953	32,000	4½
	C-954	32,000	4½
	C-955	34 000	5
	C-956	34 000	5
	C-957	31,000	4
	C-958	33,000	4½

Series	Model Code	GVW (lbs)	Nominal (ton)
C-1000	C-000	32 000	4½
	C-001	26 000	3
	C-002	34 000	5
	C-003	36,000	5
C-1100	C-010	36,000	5
	C-011	30,000	3½
T-850	T-850	39,000	3½
	T-851	27,000	2½
	T-852	41,000	4
	T-853	43,000	4
	T-854	43,000	4
	T-855	45,000	4
	T-856	49,000	5
	T-859	51,000	6
T-950	T-950	47,000	5
	T-951	30,000	3½
	T-952	49 000	5
	T-953	53,000	6
	T-954	55,000	7
	T-955	59 000	8
	T-956	65,000	9
	T-957	75 000	10
	T-958	78,000	10
N-950	N-950	28,000	3½
	N-951	24,000	2½
	N-952	30 000	4
	N-953	30 000	4
	N-954	32 000	4½
	N-955	32,000	4½
	N-956	34,000	5
	N-957	29,000	3½
	N-958	31,000	4
	N-959	33,000	4½
*N-950-D	R-950	28 000	3½
	R-951	24,000	2½
	R-952	30,000	4
	R-953	30 000	4
	R-954	32 000	4½
	R-955	32 000	4½
	R-956	34 000	5
	R-957	29,000	3½
	R-958	31,000	4
	R-959	33,000	4½
	R-960	25,500	3
	R-961	27,500	3½
NT-950	S-950	47,000	5
	S-951	30,000	3½
	S-952	49 000	5
	S-953	53,000	6
	U-954	56,000	7
*NT-950-D	W-950	47,000	5
	W-951	30 000	3½
	W-952	49,000	5
	W-953	53,000	6
*T-950-D	U-950	47,000	5
	U-951	30,000	3½
	U-952	49,000	5
	U-953	53,000	6
	U-954	56,000	7
*HT-950-D	A-950	41,000	4
	A-951	32,000	3
	A-952	45,000	4
	A-953	49,000	5
*N-1100-D	R-010	38 000	5½
	R-011	30,000	3½
N-1100	N-010	38 000	5½
	N-011	30,000	3½

*Diesel engines

INTERIOR TRIM CODES

Code	Trim Scheme
2	Blue Vinyl
3	Green Vinyl
4	Beige Vinyl
5	Red Vinyl
6	Black Vinyl
A	Grey Woven Plastic and Vinyl
B	Blue Woven Plastic and Blue Vinyl W/Foam Cushion
C	Green Woven Plastic and Green Vinyl W/Foam Cushion
D	Beige Woven Plastic and Beige Vinyl W/Foam Cushion
E	Red Woven Plastic and Red Vinyl W/Foam Cushion
J	Grey Vinyl W/Foam Cushion
K	Blue Woven Plastic and Blue Vinyl W/Foam Cushion
L	Green Woven Plastic and Green Vinyl W/Foam Cushion
M	Beige Woven Plastic and Beige Vinyl W/Foam Cushion
N	Red Woven Plastic and Red Vinyl W/Foam Cushion
O	Black Vinyl

BODY CODES

Code	Body Type
81	Conventional Cab
84	Cowl and Chassis
85	Cowl and Windshield
91	Tilt Cab

AUXILIARY TRANSMISSION CODES*—500-1100 SERIES

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".

TRANSMISSION CODES—100-350 SERIES

Code	Description
A	3-Speed Ford Standard Duty
B	3-Speed Ford W/Warner T86 Overdrive
D	3-Speed Warner T89-C (MD)
E	3-Speed Warner T87-E (HD)
F	4-Speed Warner T98-A
G	3-Speed HD Cruise-O-Matic
J	5-Speed Clark 250-V Direct
K	5-Speed Clark 251-VO Overdrive
L	5-Speed Clark 2653 VI Direct
M	5-Speed Clark 264 VO Overdrive
N	4-Speed New Process 435
W	5-Speed Clark 2622 VI Direct

TRANSMISSION CODES—500-1100 SERIES

Code	Description
A	4 Speed New Process 435
B	5 Speed Spicer 8051-C Overdrive (Iron)
C	5 Speed Spicer 8052 Direct (Iron)
D	10 Speed Fuller R-96 Direct (Iron)
E	10 Speed Fuller RA-96 Direct (Alum)
F	Clark 305V Direct
G	10 Speed Fuller RA-960 Overdrive (Alum)
J	5 Speed Clark 250-V Direct
K	5 Speed Clark 251-VO Overdrive
L	5 Speed Clark 2653 VI Direct
M	5 Speed Clark 264-VO Overdrive
N	5 Speed Spicer 5652 Direct
O	12 Speed Spicer 8125 Overdrive (Alum)
P	5 Speed Spicer 5756-B Direct
Q	5 Speed Spicer 6352 Direct (Iron)
R	5 Speed Spicer 6852-G Direct (Iron)
S	5 Speed Spicer 6453-A Overdrive (Iron)
U	5 Speed Spicer 6352-B Direct (Iron)
V	5 Speed Spicer 6452-A Direct (Iron)
W	5 Speed Clark 2622 VI Direct
X	5 Speed 5H74 Fuller
Y	5 Speed Spicer 8055-C Overdrive (Alum)
Z	5 Speed Spicer 8054 Direct (Alum)
1	Clark 307V Direct
2	6 Speed Transmatic MT-40
3	6 Speed Transmatic MT-42
4	5 Speed Spicer 6354 Direct (Alum)
5	5 Speed Spicer 6455-A Overdrive (Alum)
6	5 Speed Spicer 6854-G Direct (Alum)
7	5 Speed Spicer 6454-A Direct (Alum)
9	5 Speed 5H75 Fuller

REAR AXLE CODES—100-600 AND P SERIES

Code	Ratio and Rating
07	3.25—3.3M*
08	3.50—3.3M*
09	3.70—3.3M*
10	4.11—3.3M*
22	4.88—7.2M*
23	5.13—7.2M*
24	4.10—5.2M*
25	4.56—5.2M*
26	4.88—5.2M*
29	5.87—7.2M*
30	5.29—11M*
32	6.20—11M*
34	6.80—11M*
41	5.83—13M*

Code	Ratio and Rating
42	6.20—13M*
44	6.80—13M*
62	6.20—15M*
64	6.80—15M*
66	7.20—15M*
73	6.50—17M*
74	6.80—17M*
75	7.17—17M*
76	7.20—17M*
87	6.50—18M*
88	7.17—18M*
89	7.67—18M*
A8	3.54—3.3M*
A9	3.54—3.3M*

Code	Ratio and Rating
B4	4.10—5.2M*
B5	4.56—5.2M*
B6	4.88—5.2M*
C1	3.31—3.3M*
C2	3.73—3.3M*
C3	3.92—3.3M*
C4	4.09—3.3M*
C5	4.10—3.3M*
D1	5.83/8.11—13M*
F7	5.83/8.11—15M*
F8	6.33/8.81—15M*
G3	6.50/9.04—17M*
H7	6.50/8.87—18M*
H8	7.17/9.77—18M*

*Pounds Capacity in Thousands

REAR AXLE CODES— 500-1100 SERIES

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

1F	4.56—34M*
2F	4.88—34M*
3F	5.57—34M*
4F	6.14—34M*
5F	6.50—34M*
6F	7.17—34M*
7F	7.60—34M*
8F	4.11—34M*
9F	4.33—34M*

EATON 34 M

1E	4.56—34M*
2E	5.85—34M*
3E	6.69—34M*
4E	7.80—34M*
6E	8.60—34M*

EATON 34 DTA

W1	4.33/5.91—34M*
W2	4.56/6.21—34M*
W3	4.88/6.65—34M*
W4	5.57/7.60—34M*
W5	6.14/8.38—34M*
W6	6.50/8.87—34M*
W7	7.17/9.77—34M*
W8	4.11/5.61—34M*

EATON 30 D-3

3S	4.63/5.53/6.43—32M*
4S	4.88/5.83/6.77—32M*
5S	5.57/6.66/7.75—32M*
6S	6.14/7.35/8.55—32M*
7S	6.50/7.77/9.04—32M*

EATON 34 D-3

1T	4.11/4.86/5.61—34M*
2T	4.33/5.12/5.91—34M*
3T	4.56/5.39/6.21—34M*
4T	4.88/5.76/6.65—34M*
5T	5.57/6.59/7.60—34M*
6T	6.14/7.26/8.38—34M*
7T	6.14/7.25/8.87—34M*

EATON 38 D-3

1U	4.11/4.86/5.61—38M*
2U	4.33/5.12/5.91—38M*
3U	4.56/5.39/6.21—38M*
4U	4.88/5.76/6.65—38M*
5U	5.57/6.59/7.60—38M*
6U	6.14/7.26/8.38—38M*
7U	6.50/7.68/8.87—38M*

EATON 38 DS

17	5.57—38M*
27	4.56—38M*
37	6.14—38M*
47	6.50—38M*
57	4.88—38M*

EATON 42 DP

Code	Ratio and Rating
13	7.60—44M*
23	8.38—44M*

EATON 38 DP

18	7.60—38M*
38	8.38—38M*
48	5.05—38M*
58	5.60—38M*
68	5.91—38M*
78	6.21—38M*
98	6.65—38M*

EATON 22M

1A	6.70—22M*
2A	7.79—22M*

EATON 1790—A—91A

81	4.33—18.5M*
82	4.56—18.5M*
83	4.88—18.5M*
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*

EATON 17800-01

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 1880-1

K1	4.88—22M*
K2	5.57—22M*
K3	6.50—22M*
K4	7.17—22M*
K5	6.14—22M*

EATON 18802-3

S1	4.88/6.65—22M*
S2	5.57/7.60—22M*
S3	6.50/8.87—22M*
S4	7.17/9.77—22M*
S5	4.33/5.91—22M*
S6	4.56/6.21—22M*
S7	6.14/8.38—22M*

EATON 1911

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

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

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	6.67/9.08—23M*

EATON 9503

N3	5.89—23M*
N4	6.63—23M*

EATON 8802-3

J1	5.91—22M*
J2	6.65—22M*
J3	6.21—22M*

EATON 1919

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 19801

VB	4.33/5.89—34M*
VC	4.88/6.63—34M*
VD	5.43/7.39—34M*
VE	6.14/8.36—34M*
VF	6.71/9.13—34M*

EATON 19503

UB	4.33/5.89—34M*
UC	4.88/6.63—34M*
UD	5.43/7.39—34M*
UE	6.14/8.36—34M*
UF	6.14/8.36—34M*

EATON 30 DP

1D	7.75—32M*
2D	8.55—32M*
3D	6.43—32M*
4D	6.78—32M*

EATON 30 DS

1C	4.63—32M*
2C	4.88—32M*
3C	5.57—32M*
4C	6.14—32M*
5C	6.50—32M*
6C	7.17—32M*
7C	7.60—32M*

EATON 30 DTA

1L	4.63/6.43—32M*
2L	4.88/6.77—32M*
3L	5.57/7.75—32M*
5L	6.14/8.54—32M*
6L	6.50/9.04—32M*
7L	7.17/9.77—32M*

EATON 1350

D1	5.83/8.11—13M*

EATON 13802

F7	5.83/8.11—15M*
F8	6.33/8.81—15M*

EATON 1614-15

73	6.50—17M*
75	7.17—17M*

*M—Pounds Capacity in Thousands

REAR AXLE CODES— 500-1100 SERIES (Cont'd)

EATON 16802-3

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

TIMKEN Q246P

L1	4.92—22M*
L2	5.63—22M*
L3	6.39—22M*
L4	7.27—22M*
L5	6.04—22M*

TIMKEN Q346-P

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 RT-241P

P1	4.62—23M*
P2	4.99—23M*
P3	5.46—23M*
P4	6.10—23M*
P5	7.21—23M*

TIMKEN RT-341P

X1	4.68/5.88—23M*
X2	5.06/6.35—23M*
X3	5.34/6.71—23M*
X4	6.18/7.76—23M*
X5	7.01/8.80—23M*

TIMKEN R-202P

Q1	4.41—23M*
Q2	4.77—23M*
Q3	5.54—23M*
Q6	6.26—23M*
Q7	7.09—23M*

TIMKEN R-302P

Y1	4.41/5.64—23M*
Y2	4.89/6.23—23M*
Y3	5.54/7.09—23M*
Y4	6.42/8.38—23M*
Y5	7.09/9.07—23M*

TIMKEN U200

R1	6.38—29M*
R2	7.03—29M*
R3	7.79—29M*
R4	5.91—29M*

TIMKEN U300

Z1	6.42/8.38—29M*
Z2	7.09/9.07—29M*
Z3	5.54/7.09—29M*

TIMKEN SLDD

4G	7.67—34M*
5G	8.44—34M*

TIMKEN C-100

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-106

62	6.2—15M*
64	6.8—15M*
66	7.2—15M*

TIMKEN H-140

76	7.20—17M*

TIMKEN R-302P

YA	4.41/5.64—34M*
YB	4.89/6.23—34M*
YC	5.54/7.09—34M*
YD	6.42/8.38—34M*
YE	7.09/9.07—34M*

TIMKEN SRDD

14	7.54—44M*
24	8.31—44M*

TIMKEN SUDD

15	7.98—50M*
25	9.00—50M*

TIMKEN SFDD 4640

16	8.07—60M*
26	9.03—60M*
36	10.16—60M*

TIMKEN SLHD

1H	4.63—34M*
2H	5.29—34M*
3H	5.83—34M*
4H	6.83—34M*
5H	7.80—34M*
6H	8.60—34M*
7H	4.11—34M*
8H	4.44—34M*

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

AH	4.63—34M*
BH	5.29—34M*
CH	5.83—34M*
DH	6.83—34M*
EH	7.80—34M*
FH	8.60—34M*
GH	4.11—34M*
HH	4.44—34M*

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

AQ	4.63—34M*
BQ	5.29—34M*
CQ	5.83—34M*
DQ	6.83—34M*
EQ	7.80—34M*
FQ	8.60—34M*
GQ	4.11—34M*
HQ	4.44—34M*

TIMKEN SQHD

Code	Ratio and Rating
19	4.11—38M*
39	4.63—38M*
49	5.29—38M*
59	5.83—38M*
69	6.83—38M*
79	7.80—38M*
99	8.60—38M*
29	4.44—38M*

TIMKEN SQHD (W/Lt. Wt. Susp.) (MALLEABLE)

AR	4.11—38M*
BR	4.44—38M*
CR	4.63—38M*
DR	5.29—38M*
ER	5.83—38M*
FR	6.83—38M*
GR	7.80—38M*
HR	8.60—38M*

TIMKEN SQDD

11	7.54—38M*
21	8.31—38M*

TIMKEN R171-P

90	4.11—23M*
91	4.33—23M*
92	4.63—23M*
93	4.88—23M*
94	5.29—23M*
95	5.86—23M*
96	6.14—23M*
97	6.83—23M*

TIMKEN R-202P

QA	4.41—34M*
QB	4.77—34M*
QC	5.54—34M*
QF	6.26—34M*
QG	7.09—34M*

TIMKEN RT-341-P

XA	4.68/5.88—34M*
XB	5.06/6.35—34M*
XC	5.34/6.71—34M*
XD	6.18/7.76—34M*
XE	7.01/8.80—34M*

* M—Pounds Capacity in Thousands

FRONT AXLE CODES

Code	Capacity
A	5.5M*
B	5.5M*
C	6M*
D	7M*
E	9M*
F	11M*
G	12M*
H	15M*
I	18M*
L	6M*†
M	6M*† or 7M*†
N	9M*†

* Pounds Capacity in Thousands
† Heavy Duty Front Brakes

MAX. G.V.W. LBS.

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

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

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

D.S.O.

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

DISTRICT CODES

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

Code	District
45	Davenport
51	Denver
52	Des Moines
53	Kansas City
54	Omaha
55	St. Louis
61	Dallas
62	Houston
63	Memphis
64	New Orleans
65	Oklahoma City
71	Los Angeles
72	San Jose
73	Salt Lake City
74	Seattle
81	Ford of Canada
83	Government
84	Home Office Reserve
85	American Red Cross
89	Transportation Services
90-99	Export

BRAKES

GROUP 2

PART 2-1 GENERAL BRAKE SERVICE

Hydraulically operated service brakes are standard equipment on all 100 through 800 Series and on some 850 and 950 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 booster units is given in Parts 2-4 and 2-5.

The full air brake system, optional on some models and standard on most 850 through 1100 models, is covered in Part 2-7.

1 DIAGNOSIS AND TESTING

HYDRAULIC BRAKES

The trouble-diagnosis symptoms, causes, and corrections given under "Diagnosis Guide–Standard Hydraulic Brakes," 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.

DIAGNOSIS GUIDE—STANDARD HYDRAULIC BRAKES

BRAKES DO NOT APPLY	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. 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 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 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.
EXCESSIVE PEDAL TRAVEL	Check for air in the brake lines and bleed the system if necessary. Ad-	just or reline the brakes as needed.
UNEVEN NOISY, GRABBING, OR HARD OPERATING BRAKES	Remove the brake drums so that a complete inspection of the brake assemblies can be made to determine the cause of the trouble. 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. Drums which are out-of-round or loose at the hub; frozen master cylinder or brake cylinder piston(s); defective check valve; improper brake	shoe adjustment; warped or misaligned shoes; webs glazed or greasy linings; and 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. **Always adjust the brakes after correcting any of these brake troubles.**
BRAKES DO NOT RELEASE	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. 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. **Clean the entire hy-**	**draulic system with clean denatured alcohol before adding new brake fluid.** If the trouble is in the master cylinder, remove and rebuild the cylinder. **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.**

PRELIMINARY TESTS—POWER BRAKES

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.

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.

BOOSTER TEST—BENDIX PISTON TYPE

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.

BOOSTER TEST—MIDLAND DIAPHRAGM TYPE

Remove the pipe plug from the rear half of the booster chamber, and install 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 higher 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.

DIAGNOSIS GUIDE—POWER BRAKES VACUUM BOOSTERS—FRAME MOUNTED

BRAKE PEDAL KICKS BACK WHEN APPLIED	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.
ROUGH ENGINE IDLE WITH BRAKES RELEASED	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.

CONTINUED ON NEXT PAGE

DIAGNOSIS GUIDE—POWER BRAKES VACUUM BOOSTERS—FRAME MOUNTED—(Cont'd)

ROUGH ENGINE IDLE OR STALL AND HARD PEDAL WITH BRAKES APPLIED	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.
INTERMITTENT HARD BRAKE PEDAL	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.
HARD PEDAL—BOOSTER DIAPHRAGM RUPTURED	When a ruptured diaphragm is found, check for gasoline odor on the diaphragm. Gasoline will deteriorate the diaphragm and cause a premature failure.	Gasoline can get on the diaphragm from the intake manifold if the vacuum check valve is defective or if hoses are not routed correctly.
BRAKES DO NOT RELEASE	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.

DIAGNOSIS GUIDE—POWER BRAKES VACUUM BOOSTER—MIDLAND DASH MOUNTED

BOOSTER INOPERATIVE HARD PEDAL	Check as follows to see if the power unit is operating: With the engine stopped, depress the brake pedal several times to eliminate all vacuum from the system. Apply the brakes, and while maintaining pressure on the pedal, start the engine. If the unit is operating, the brake pedal will move forward slightly when engine vacuum power is added to the foot pressure on the pedal. If the unit is not operating, there will be no pedal action. If this check shows that the unit is not operating, check for the following:	Brake pedal linkage sticking. Faulty vacuum check valve. Collapsed or leaking vacuum hose. Plugged vacuum fittings. Leaking vacuum chamber. Vacuum check valve stuck in closed position. Leak in bellows assembly. Diaphragm assembly out of place in housing locating radii: Vacuum leak in automatic transmission T.V. vacuum line connection or fitting. Vacuum leak in forward, vacuum housing.
BRAKES DRAG	Sticking valve plunger.	
BRAKES GRAB	Sticking actuating valve assembly.	
SELF APPLICATION OF BRAKES WHEN ENGINE STARTS	Leak in rear housing. Diaphragm out of locating radii in housings and allowing atmos-	pheric pressure into rear chamber. Sticking or unseated atmospheric valve.

CONTINUED ON NEXT PAGE

DIAGNOSIS GUIDE—POWER BRAKES VACUUM BOOSTER—BENDIX DASH MOUNTED

BOOSTER INOPERATIVE—HARD PEDAL	The trouble may be caused by vacuum leakage. Disconnect the vacuum line at the booster, remove the vacuum manifold and check valve assembly, and look for a sticking or faulty check valve. Check all vacuum connections for leakage or obstruction. Check all hoses for a leaking or collapsed condition. Repair or replace parts as necessary. If the foregoing procedure does not eliminate the trouble, remove the	booster from the car. Separate the front shell from the rear shell, and check the valve and rod assembly reaction disc, diaphragm plate, and diaphragm assembly for damage that would cause leaks. When assembling, be sure that the diaphragm assembly is properly positioned. Improper location could cause leakage between the vacuum and atmospheric sides of the diaphragm.
BRAKES DRAG OR GRAB	The condition is probably caused by a sticking valve plunger assembly. Remove and disassemble the booster.	Clean, inspect, and replace parts as necessary.
SELF APPLICATION OF BRAKES WHEN ENGINE STARTS	Remove and disassemble the booster. Check for a leak in the rear shell. Check the diaphragm for being out of locating radii in the housing. Check for a sticking or unseated	valve poppet. Clean, inspect, and replace parts as necessary. Be sure that the diaphragm is properly located when assembling.

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.

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.

DIAGNOSIS GUIDE—AIR SUPPLY SYSTEM

AIR PRESSURE BELOW NORMAL	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.
AIR PRESSURE RISES ABOVE NORMAL	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.
CONTINUOUS OR INTERMITTENT COMPRESSOR KNOCKS	Loose drive pulley. Worn or burned out compressor bearings.	Excessive carbon deposits in the compressor cylinder head.
SAFETY VALVE "BLOWS-OFF"	Governor "cut-out" setting adjusted too high.	Above normal system pressure. Defective or improperly adjusted safety valve.
EXCESSIVE OIL OR WATER IN THE BRAKE SYSTEM	Failure to drain the reservoirs at regular intervals.	Worn compressor piston rings. Dirty compressor air filter.

AIR-HYDRAULIC BRAKES

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

First make the trouble diagnosis checks outlined under "Hydraulic Brakes" and "Air Supply System." Then perform the tests outlined in the following paragraphs.

OPERATING TESTS

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.

DIAGNOSIS GUIDE—AIR-HYDRAULIC BRAKES

INSUFFICIENT BRAKING	Binding control valve piston due to swollen piston seals.	Defective hydraulic cylinder piston.
BRAKES APPLY TOO SLOWLY	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.
BRAKES RELEASE TOO SLOWLY	Weak control valve piston return spring. Restricted control valve exhaust port.	Hydraulic piston binding in the cylinder.
BRAKES DO NOT APPLY	Restricted or broken lines or hoses. Clogged or damaged control valve.	Dented or damaged booster body.
BRAKES DO NOT RELEASE	Defective control valve piston. Defective hydraulic piston. Clogged master cylinder vent.	Broken booster piston return spring.
BRAKES GRAB	Intermittent bind in the control valve piston.	

AIR BRAKES

Some of the air brake 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.

First make the trouble diagnosis checks outlined under "Air Supply System," and then perform the tests outlined in the following paragraphs.

OPERATING TESTS

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.

DIAGNOSIS GUIDE—AIR BRAKES

INSUFFICIENT BRAKING ACTION	Low reservoir pressure. Brakes need lubrication, adjustment, or relining. Foot control valve delivery pressure too low due to a malfunction in the valve or incorrect adjustment of the treadle linkage.	
SLOW BRAKE ACTION	**SLOW APPLICATION** 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.	**SLOW RELEASE** 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.

CONTINUED ON NEXT PAGE

DIAGNOSIS GUIDE—AIR BRAKES (Continued)

BRAKES INOPERATIVE	**BRAKES DO NOT RELEASE** Restricted brake lines. Weak return spring or other defect in foot control valve. Broken brake shoe retracting springs or rusted front anchor pins.	**BRAKES DO NOT APPLY** Low reservoir pressure. Restricted or broken pipes or hoses. Defective foot control valve.
UNEVEN OR GRABBING BRAKES	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.
QUICK AIR PRESSURE DROP WITH ENGINE STOPPED	**BRAKES RELEASED** Excessive leakage at foot control valve, governor, compressor discharge valve, or at other points in the system.	**BRAKES APPLIED** Excessive leakage in brake chambers, brake chamber diaphragms, tube and hose connections, or foot control valve.

2 COMMON ADJUSTMENTS AND REPAIRS

BRAKE PEDAL ADJUSTMENT

When 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 3/16 inch or more than 3/8 inch (Fig. 1), the pedal should be adjusted.

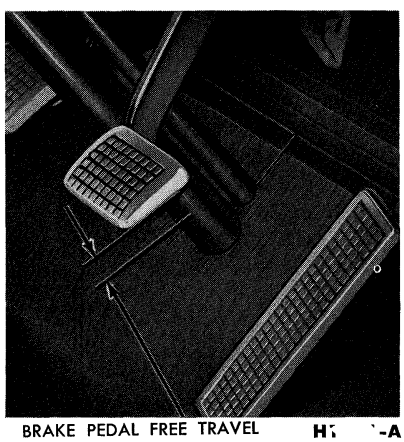

FIG. 1—Pedal Free Travel Check

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 3/16-3/8 inch.

On a P-Series truck, turn the hex head of the push rod to obtain the required free-travel.

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.

BRAKE DRUM REPAIR 250 THROUGH 1100 SERIES EXCEPT 4-WHEEL DRIVE-FRONT

The service procedures covered here apply to both hydraulic and air brakes. Since the F- and P-100 (front and rear) and the 4-wheel drive front brake drum procedures apply to hydraulic brakes only, they are covered in Section 3 of Part 2-2.

FRONT BRAKE DRUM

1. Raise the truck until the wheel and tire clear the floor and remove the wheel and tire from the hub. Back off the brake shoe adjusting screw so that the shoes do not contact the brake drum. Remove the grease cap and the gasket (if so equipped) from the hub.

2. With 4,000 through 7,000 lb. front axles remove the cotter pin, adjusting nut and flat washer from the spindle.

On trucks with a 9,000 lb. or 11,000 or 15,000 lb. axle, remove the lock nut, the dimpled washer, the locking ring and the adjusting nut and pin assembly.

3. Remove the outer bearing cone and roller. Pull the hub and drum assembly off the wheel spindle.

4. 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.

5. Remove the brake drum retainers and retaining bolts, screws, or bolts and nuts.

6. 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. Place the brake drum to the hub and install the retainers and retaining bolts, screws, or bolts and nuts.

9. Install the hub and drum on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads.**

10. With 4,000 through 7,000 lb. front axles, install the outer bearing cone and roller and the flat washer on the spindle, then install the adjusting nut. With front axles of 9,000 lbs., 11,000 or 15,000 lbs. capacity, install the outer bearing cone and roller and the bearing adjusting nut and pin assembly.

11. Install the wheel and tire on the hub, then install the clamps (cast type only), and the wheel stud nuts.

12. With 4,000 through 7,000 lb front axles, torque the adjusting nut to specifications while rotating the wheel. Back off the adjusting nut at least one, but not more than two

castellations (about ⅛ to ¼ turn). Lock the adjusting nut in this position with a new cotter pin.

With 9,000 lb., 11,000 or 15,000 lb. axles, torque the adjusting nut to specifications while rotating the wheel. Back off the nut ¼ to ⅓ turn, and install the locking ring. **Do not exceed the ¼ to ⅓ turn if the adjusting nut must be moved to align the nut pin with a hole in the locking ring.**

Install the dimpled washer with the dimple indexed in one of the holes in the adjusting nut. Install the lock nut and torque to specifications. Bend the dimpled washer over a flat of the lock nut.

13. Install the gasket (if so equipped) and the grease cap, and torque the wheel stud nuts to specifications. Install the hub cap if so equipped, and adjust the brakes.

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 with-

in 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 ½ 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 (on 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 rewashed 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

1 DESCRIPTION AND OPERATION

Hydraulically operated service brakes (Fig. 1) are standard equipment on all 100 through 800 Series and on some 850 and 950 Series Ford trucks.

The standard hydraulic brake sys-

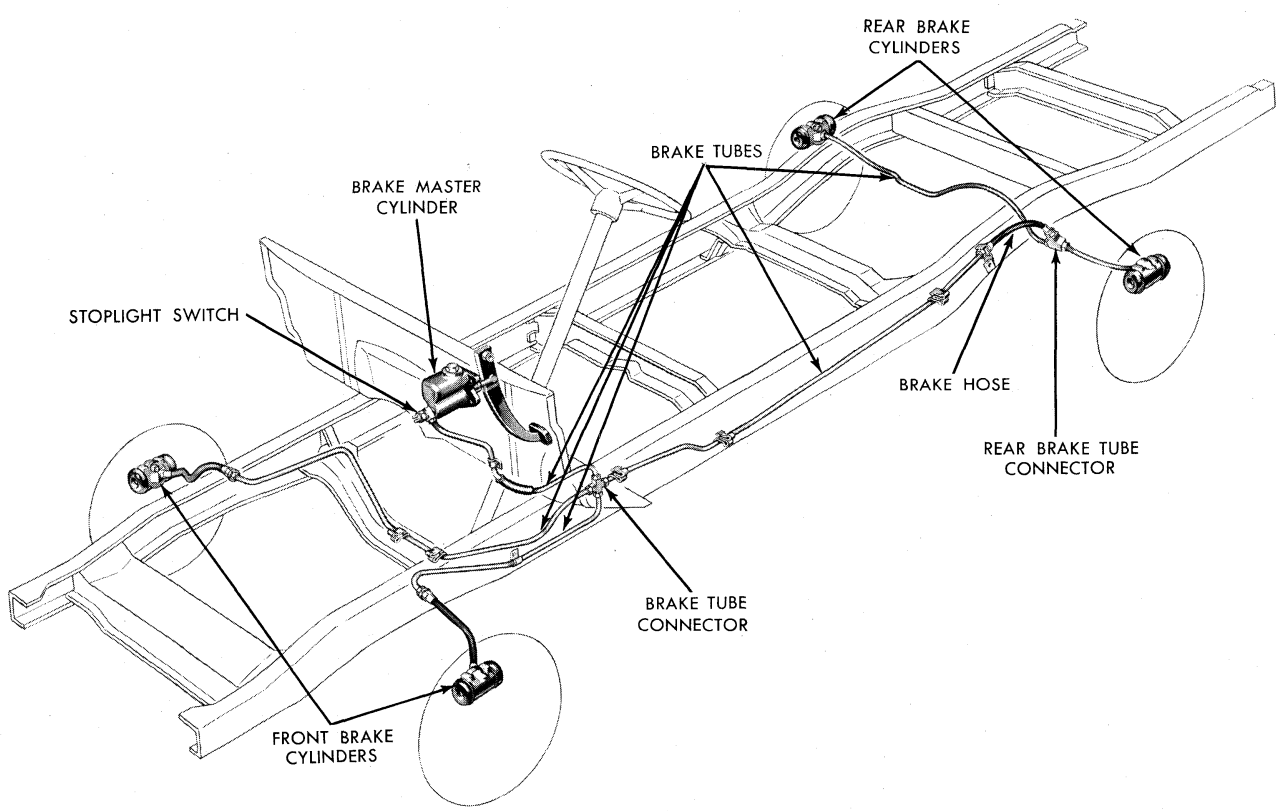

FIG. 1—Typical Hydraulic Brake System

tem 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.

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

All Ford truck brakes have internal expanding shoes. The different types of brake assembly vary in the way that the shoes are anchored, in the number of wheel cylinders used at each wheel, and in the number of pistons in the wheel cylinder.

In the single anchor type, both brake shoes are mounted to the same anchor and are actuated by one wheel cylinder. In the uni-servo, single anchor brake, the wheel cylinder has only one piston which exerts force against the upper end of the primary shoe (Fig. 12). In the duo-servo, single anchor brake, the wheel cylinder has two pistons. One piston exerts force against the upper end of the primary shoe; the other piston exerts force against the upper end of the secondary shoe (Fig. 2).

In the double anchor type, each shoe is mounted to a separate anchor. The shoes are actuated by one duo-servo (two piston) cylinder at the upper end (Fig. 5).

The front wheels of some trucks are equipped with two cylinders, each having one piston (Fig. 13). The piston in one cylinder exerts force against one end of one shoe; the piston in the other cylinder exerts force against the opposite end of the other shoe.

The rear wheels of some trucks are equipped with two cylinders, each having two pistons (four pistons total). Each of the four pistons exerts force against one end of one shoe (Figs. 14 and 15).

SELF ADJUSTING BRAKES

Single anchor duo servo type brake assemblies equipped with a self adjusting mechanism are used front and rear on F- and P-100 trucks.

The self-adjusting brake mechanism consists of a cable, cable guide, adjusting lever, and adjuster spring (Fig. 2). The cable is hooked over the anchor pin at the top and is connected to the lever at the bottom. The cable is connected to the secondary brake shoe by means of the cable guide. The adjuster spring is hooked to the primary brake shoe and to the lever.

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

With the truck moving rearward and the brakes applied, the "wrap-around" action of the shoes following the drum forces the upper end of the primary shoe against the anchor pin. The action of the wheel cylinder moves the upper end of the secondary shoe away from the anchor pin. The movement of the secondary shoe causes the cable to pull the adjusting lever upward and against the end of a tooth on the adjusting screw star-wheel. The upward travel of the lever increases as lining wear increases. When the lever can move upward far enough it passes over the end of the tooth and engages the tooth. When the brakes are released, the adjuster spring pulls the lever downward causing the star-wheel to turn and expand the shoes. The star-wheel is turned 1 tooth at a time as the linings progressively wear.

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

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

The anchor pins on F- and P-100 brakes are fixed and non-adjustable.

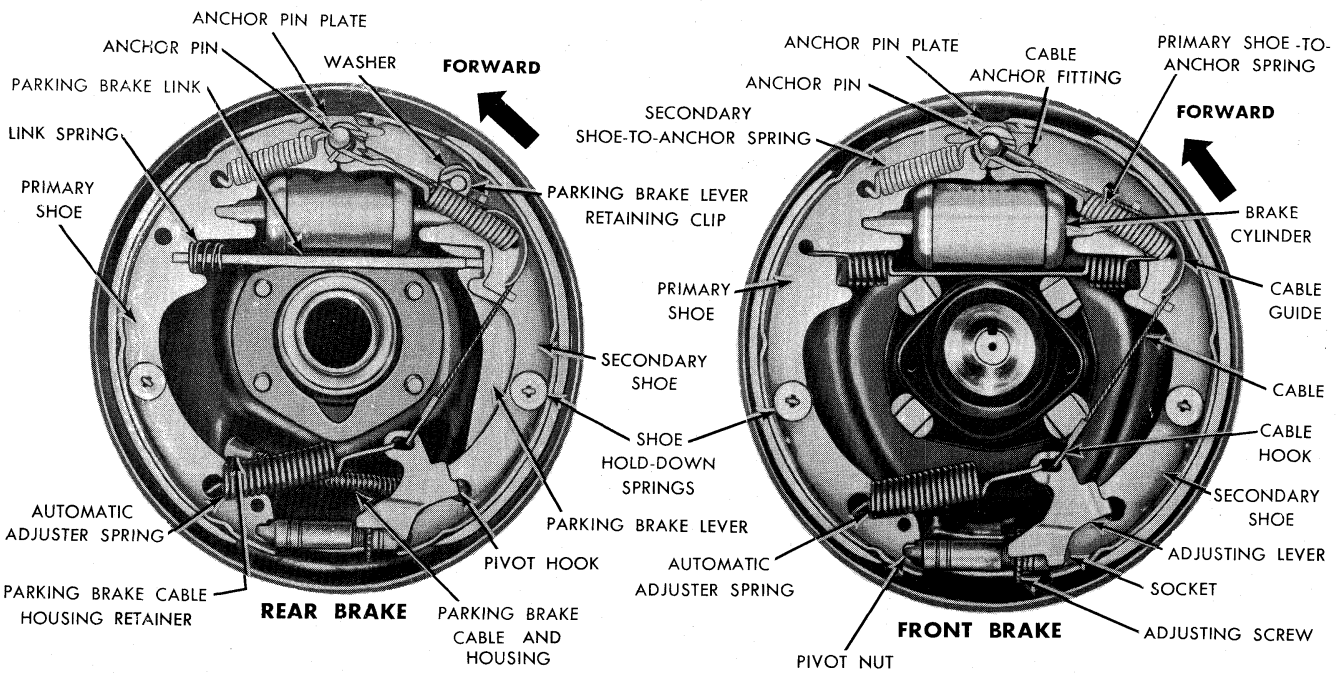

FIG. 2—Self Adjusting Brake Assemblies

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.

SELF ADJUSTING BRAKES

The brake shoes are automatically adjusted when the truck is driven in reverse and the brakes applied. A manual adjustment is required only after the brake shoes have been relined or replaced.

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

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

2. Remove the adjusting hole cover from the carrier plate and, from the carrier plate side, turn the adjusting screw upward to expand the shoe. Expand the shoes until a slight drag is felt when the drum is rotated.

3. Remove the drum. Mark the tooth on the star wheel where the lever contacts the adjusting screw. While holding the adjusting lever out of engagement with the adjusting screw, back off the adjusting screw ¾ of a turn with the fingers. If finger movement will not turn the screw, free it up; otherwise, the self-adjusting lever will not turn the screw. Lubricate the screw with a thin uniform coating of high temperature grease.

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

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

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

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

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

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

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

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

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 adjusting 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. 3).

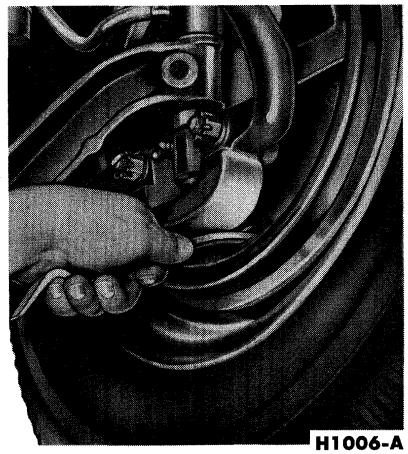

FIG. 3—Single Anchor Brake Shoe Adjustment

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 set-

ting, 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. 4).

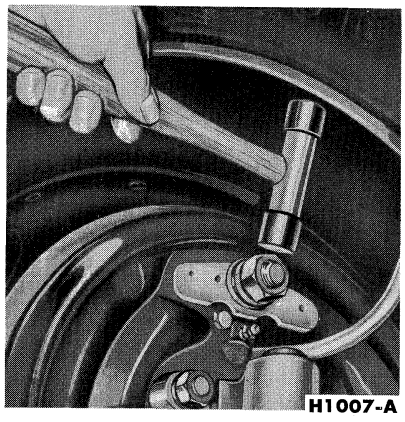

FIG. 4—Anchor Pin Adjustment

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. 5 until the shoe drags against the drum.

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. 5). 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.

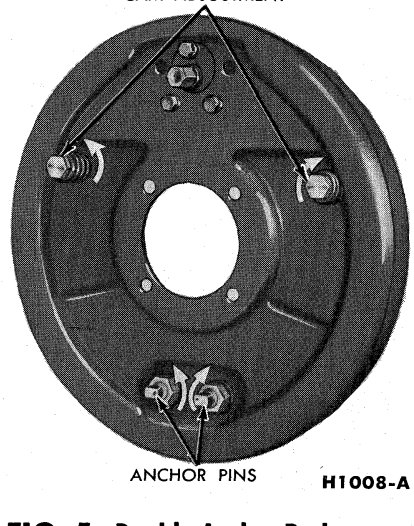

FIG. 5—Double Anchor Brake Adjustment

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. 14 and 15) 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 hookup, and in the design of the adjusting 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. 6).

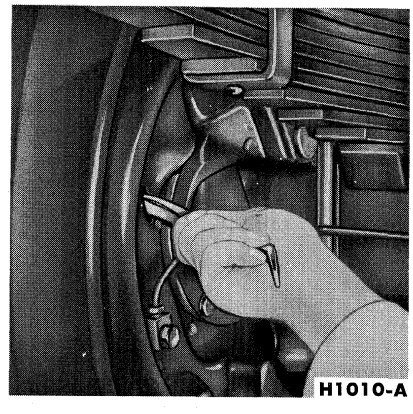

FIG. 6—Two-Cylinder Brake Shoe Adjustment

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.

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 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 ½ inch from the top of the filler neck.

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

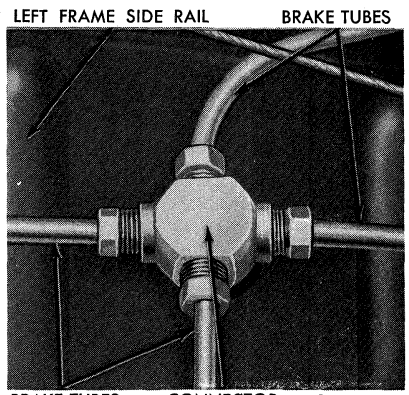

FIG. 7—Front Brake Tube Connector

rear brake tube connector (Fig. 8)

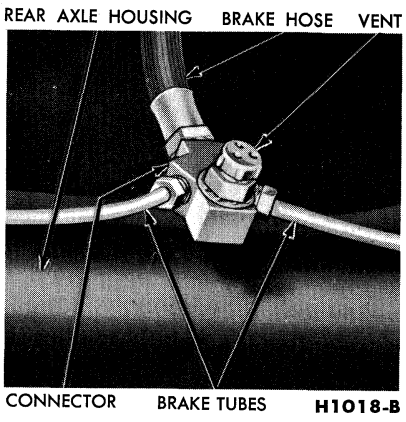

FIG. 8—Rear Brake Tube Connector

and the rear brake cylinders. Flexible hoses connect the brake tube to the front brake cylinders and to the 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

BRAKE DRUMS—F- AND P-100 WITH SELF ADJUSTING BRAKES

FRONT BRAKE DRUM

Removal

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

2. Remove the wheel cover or hub cap, wheel, and bearing dust cap. Remove the cotter pin, nut lock, nut, and washer.

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

If the brake drum will not come off, insert a narrow screwdriver through the brake adjusting hole in the carrier plate, and disengage the adjusting lever from the adjusting screw. While thus holding the adjusting lever away from the adjusting screw, back off the adjusting screw with the brake adjusting tool (Fig. 9). **Back off the adjustment only if the drum cannot be removed. Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise, the self adjusting mechanism will not function properly.**

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

Installation

1. If the drum is being replaced, remove the protective coating from the new drum with carburetor degreaser. Install new bearings and grease retainer. Soak the new grease retainer in light engine oil at least 30 minutes before installation. Pack the wheel bearings, install the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer.

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

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

3. Adjust the wheel bearing, install the nut lock and cotter pin, then install the grease cap.

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

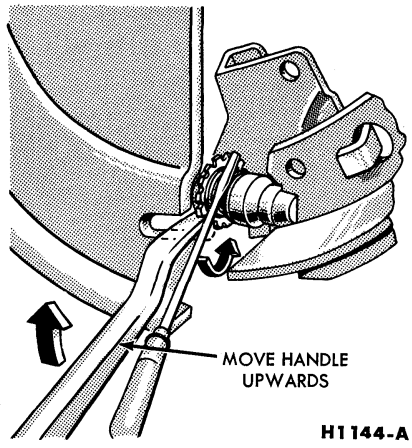

FIG. 9—Backing Off Brake Adjustment

REAR BRAKE DRUM

Removal

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

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

If the brake drum will not come off, insert a narrow screw driver through the brake adjusting hole in the carrier plate, and disengage the adjusting lever from the adjusting screw. While thus holding the adjusting lever away from the adjusting screw, back off the adjusting screw with the brake adjusting tool (Fig. 9). **Back off the adjustment only if the drum cannot be removed. Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise, the self adjusting mechanism will not function properly.**

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

Installation

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

2. Place the drum over the brake assembly and into position. Adjust the brakes as outlined under "Brake Shoe Adjustments."

3. Install the three Tinnerman nuts and tighten securely. Install the wheel on the axle shaft flange studs against the drum, and tighten the retaining nuts to specifications.

FRONT BRAKE DRUM— 4-WHEEL DRIVE TRUCKS

REMOVAL

1. Raise the truck and install stands.
2. Back off the brake shoe adjustment. Remove the hub dust cap.

Remove the hub retaining snap ring, and slide the splined driving hub from between the axle shaft and the wheel hub. Remove the driving hub spacer.

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

If the truck is equipped with a locking type hub refer to Part 4-4.

5. Remove the front wheel to hub retaining nuts. Remove the wheel and tire from the hub and drum.
6. Remove the brake drum retaining bolts and nuts.
7. Remove the brake drum from the hub.

INSTALLATION

1. Place the brake drum to the hub and install the retaining bolts and nuts.
2. Install the wheel and tire to the hub and start the retaining nuts.
3. Install the wheel hub and drum assembly on the spindle. Install the driving hub spacer and then the wheel outer bearing cone and the adjusting nut with the dowel outboard.
4. Rotate the wheel in both directions and at the same time tighten the bearing adjusting nut with tool T59T-1197-A, to bring the bearing rollers into proper contact. After the bearings are firmly seated, back off the adjusting nut ⅛ turn (45°).
5. Install the adjusting nut lock on the spindle so that a hole on the lock will go over the dowel on the adjusting nut. Install the lock nut and torque to specifications.
6. Slide the driving hub on the axle shaft and install the snap ring.

If the truck is equipped with a locking type hub, refer to Part 4-4.

7. Adjust the brake, and then torque the wheel nuts.
8. Install the dust cap.
9. Remove the stands and lower the truck.

BRAKE DRUMS 250 THROUGH 1100 SERIES EXCEPT 4-WHEEL DRIVE— FRONT

Since the brake drum service procedures for these models apply to both hydraulic and air brakes, they are covered under "Common Adjustments and Repairs" in Part 2-1.

BRAKE SHOE AND ADJUSTING SCREW F- AND P-100 TRUCKS

REMOVAL

1. With the wheel and drum removed, install a clamp over the ends of the brake cylinder as shown in Fig. 11.
2. Contract the shoes as follows:

a. Disengage the adjusting lever from the adjusting screw by pulling backward on the adjusting lever (Fig. 2).

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

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

On front brakes, remove the shoe retracting assist spring.

5. Remove the secondary shoe to anchor spring with the tool shown in Fig. 11. With the same tool, remove the primary shoe to anchor spring and unhook the cable anchor.
6. Remove the cable guide from the secondary shoe (Fig. 2).
7. Remove the shoe hold-down springs, shoes, adjusting screw, pivot nut, and socket.
8. On rear brakes, remove the parking brake link and spring. Disconnect the parking brake cable from the parking brake lever.
9. After removing the rear brake secondary shoe, disassemble the parking brake lever from the shoe by removing the retaining clip and spring washer (Fig. 2).

INSTALLATION

1. Before installing the rear brake shoes, assemble the parking brake lever to the secondary shoe and secure with the spring washer and retaining clip.
2. Apply a light coating of high-temperature grease at the points where the brake shoes contact the carrier plate.
3. Position the brake shoes on the carrier plate, and install the hold-down spring pins, springs, and cups. Use the aluminum colored spring on the primary shoe and the purple spring on the secondary shoe. On the rear brake, install the parking brake link, spring and washer. Connect the parking brake cable to the parking brake lever (Fig. 2).
4. Place the cable anchor over the anchor pin with the crimped side toward the carrier plate.
5. Install the primary shoe to anchor spring with the tool shown in Fig. 11.
6. Install the cable guide on the secondary shoe web with the flanged holes fitted into the hole in the secondary shoe web. Thread the cable around the cable guide groove (Fig. 2).

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

7. Install the secondary shoe to anchor (long) spring (Fig. 11).

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

On front brakes, install the shoe retracting assist spring.

8. Apply high-temperature grease to the threads and the socket end of the adjusting screw. Turn the adjusting screw into the adjusting pivot nut to the limit of the threads and then back off ½ turn.

Interchanging the brake shoe adjusting screw assemblies from one side of the truck to the other would cause the brake shoes to retract rather than expand each time the automatic adjusting mechanism operated. To prevent installation on the wrong side of the truck, the socket end of the adjusting screw is stamped with an R or L (Fig. 10). The adjusting pivot nuts can be distinguished by the number of lines machined around the body of the nut. Two lines indicate a right hand nut; one line indicates a left hand nut.

9. Place the adjusting socket on the screw and install this assembly between the shoe ends with the adjusting screw nearest the secondary shoe.
10. Hook the cable hook into the

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

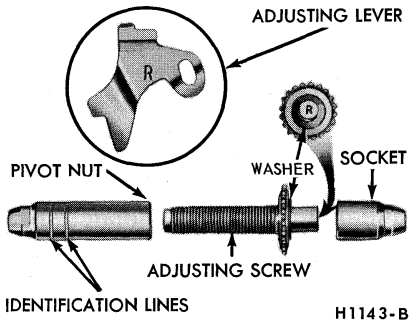

FIG. 10—Adjusting Screw and Lever Identification

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

12. Pull the adjuster lever, cable and automatic adjuster spring down and toward the rear to engage the pivot hook in the large hole in the secondary shoe web (Fig. 2).

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

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

To determine the cause of this condition:

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

b. Check the cable length. The cable should measure 11¼ inches (plus or minus 1/64 inch) from the far edge of the cable anchor hole to the inside edge of the cable hook.

c. Check the cable guide for damage. The cable groove should be parallel to the shoe web, and the body of the guide should lie flat against the web. Replace the guide if it shows damage.

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

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

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.**

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. 11).

3. Remove the anchor pin plate (Fig. 12).

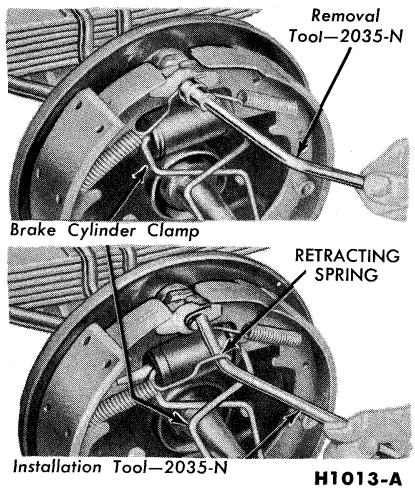

FIG. 11—Spring Replacement

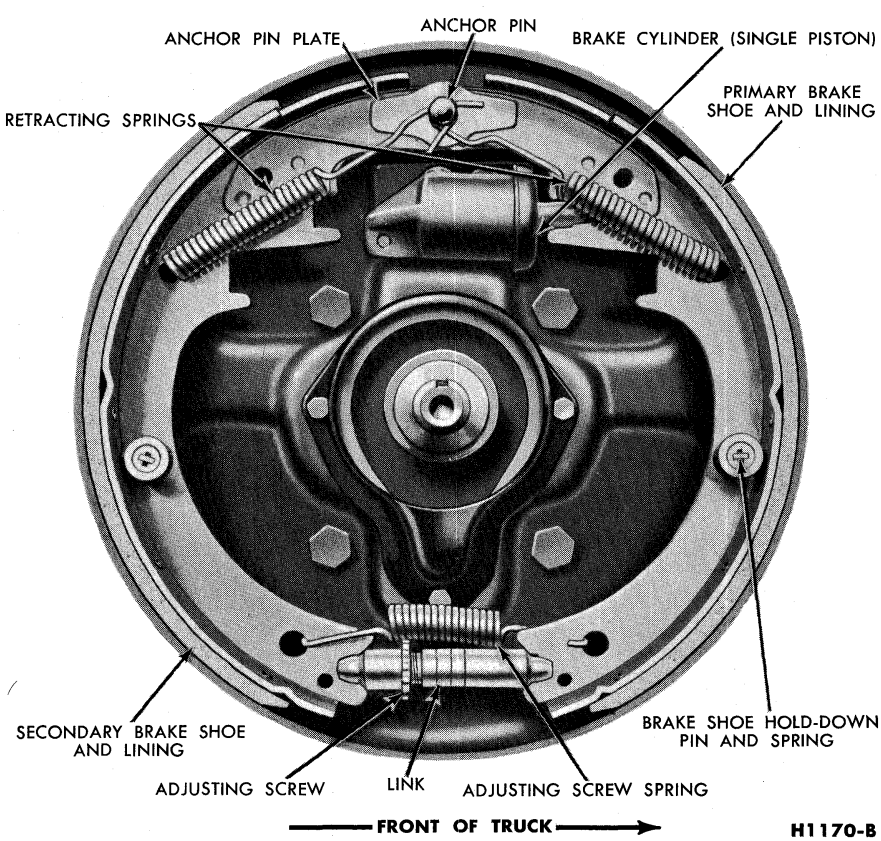

FIG. 12—Single Anchor Brake Assembly

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 assembly, 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. 11), 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. 13) using brake spring pliers.

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

4. After installing both shoes, install the brake shoe return springs (Fig. 13). To install each spring, place

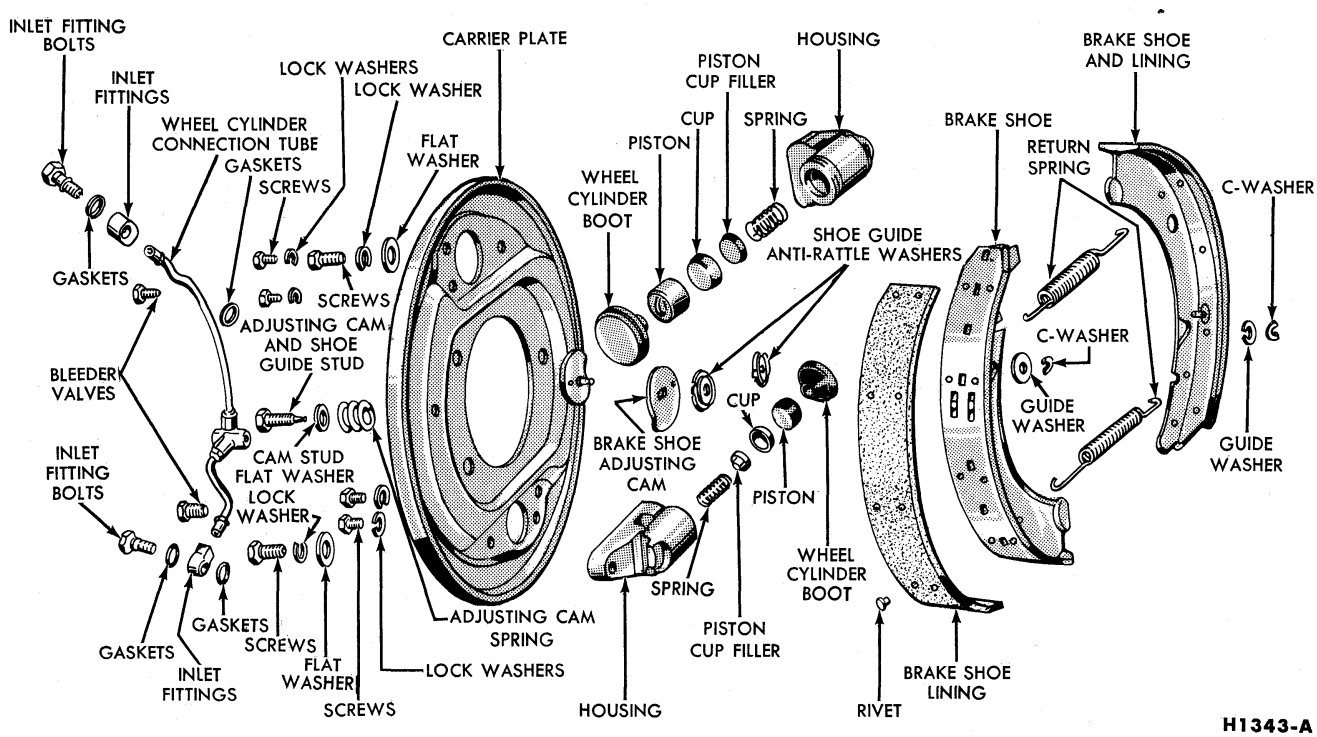

FIG. 13—Two-Cylinder Brake—Front

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 —REAR

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. On a unit equipped with retracting springs of unequal lengths (Fig. 14), remove the brake shoes as follows:

a. Clamp the brake cylinder boots against the ends of the cylinder, note the location of each brake shoe retracting spring, and remove the four brake shoe retracting springs with the tool shown in Fig. 11.

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. 15), 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. 11.

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. 14).

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. 14. 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. 15). 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. 11.

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.

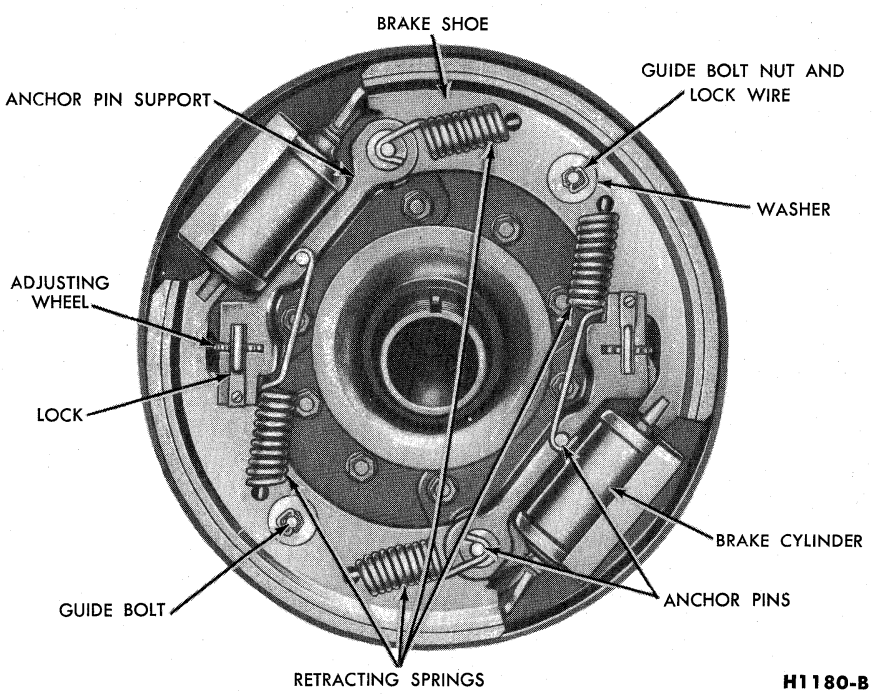

FIG. 14—Two-Cylinder Brake—Unequal Length Springs

BRAKE WHEEL CYLINDER

REMOVAL

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

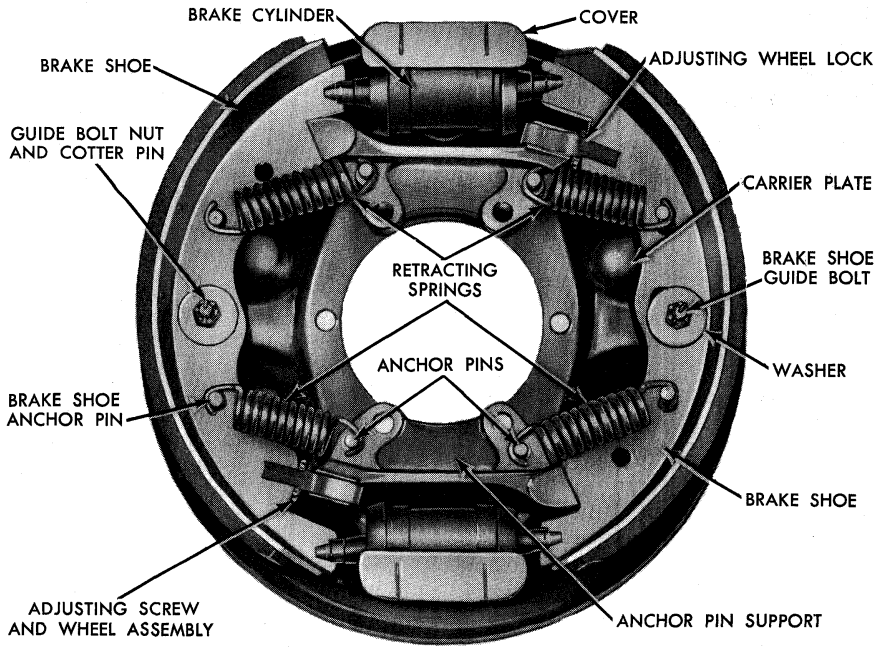

FIG. 15—Two-Cylinder Brake—Equal Length Springs

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.

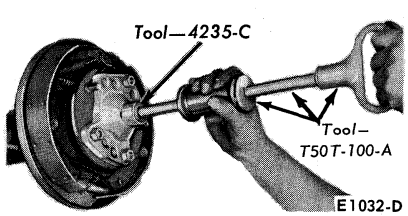

FIG. 16—Axle Shaft Removal

BRAKE CARRIER PLATE—F-100 AND P-100 SERIES TRUCKS EXCEPT 4-WHEEL DRIVE—FRONT

REMOVAL

1. Remove the wheel and brake drum. Disconnect the brake line from the brake cylinder and submerge the end of the brake line in a can containing a small amount of brake fluid. This will minimize hydraulic line bleeding. Remove the brake shoes and the brake cylinder. On the rear wheels, disconnect the parking brake lever from the cable.

2. If the rear carrier plate is being remodeled, rotate the axle shaft so that the hole in the axle shaft flange aligns with the carrier plate retaining nuts, then remove the nuts. Pull the axle shaft assembly out of the housing with tool 4235-C, and a slide hammer tool T50T-100-C (Fig. 16). Lift off the carrier plate.

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

INSTALLATION

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

Position the front carrier plate on the wheel spindle and install the retaining bolts and nuts.

2. Install the brake cylinder and brake shoes. On a rear brake, connect the parking brake cable to the lever.

3. Connect the brake line to the brake cylinder, then install the wheel and brake drum. Adjust the brake shoes and bleed the hydraulic system.

BRAKE CARRIER PLATE—TRUCKS WITH 4-WHEEL DRIVE—FRONT

REMOVAL

1. Raise the truck on a hoist.

2. Remove the hub grease cap. Remove the hub retaining snap ring, and slide the splined driving hub from between the axle shaft and the wheel hub. Remove the driving hub spacer.

If the truck is equipped with a locking type hub, refer to Part 4-4.

3. Remove the lock nut, washer, and wheel bearing adjusting nut from the steering spindle. Remove the wheel, hub and drum as an assembly (Fig. 17). The wheel outer bearing will be forced off the spindle at the same time. Remove the wheel inner bearing cone.

4. Place a drain pan under the spindle arm assembly. Remove the oil baffle from the brake carrier plate.

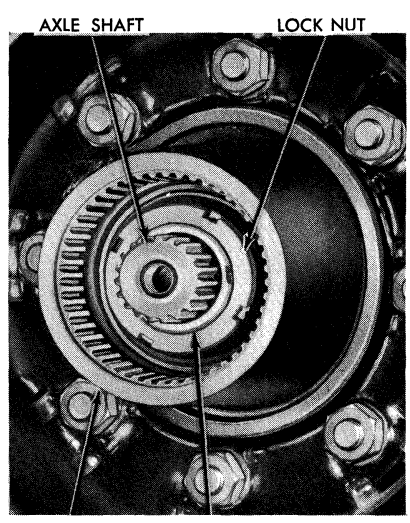

FIG. 17—Front Wheel Hub—4-Wheel Drive

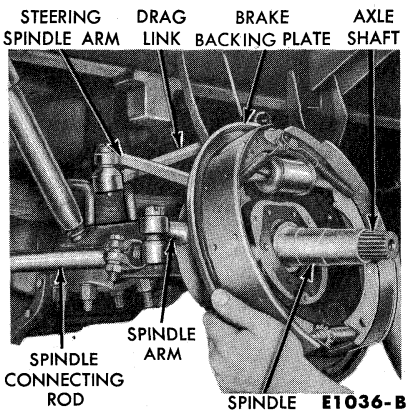

FIG. 18—Brake Carrier Plate Removal or Installation

5. Remove the cap screws which retain the brake carrier plate and spindle to the spindle arm. Remove the brake carrier plate and spindle (Fig. 18).

INSTALLATION

1. Position the spindle and the brake carrier plate on the steering arm, and then install the retaining cap screws (Fig. 18). Install the oil baffle.

2. Install the wheel inner bearing cone on the spindle. Install the wheel hub and drum. Install the driving hub spacer and then the wheel outer bearing cone and adjusting nut.

3. Rotate the wheel in both directions and at the same time tighten the bearing adjusting nut to bring the bearing rollers into proper contact. After the bearings are firmly seated, back off the adjusting nut ⅛ turn (45°). Place the bearing adjusting lock washer on the spindle. Make sure the locking dowel on the adjusting nut enters the lock washer hole which most closely aligns with the dowel. Install the lock nut and torque to 40 ft-lbs. (Fig. 17).

4. Install the driving hub and snap ring. Install the grease cap.

5. Fill the spindle arm with the proper grade and amount of lubricant.

BRAKE CARRIER PLATE—250 THROUGH 950 SERIES TRUCKS EXCEPT 4-WHEEL DRIVE—FRONT

REMOVAL

1. From front wheel spindles, remove the hub and drum attaching parts (axles under 9,000 lbs capacity—grease cap and gasket if so equipped, cotter pin, bearing adjusting nut and flat washer) (Axles 9,000 lbs capacity or over—grease cap and gasket, lock nut, dimpled washer, locking ring, and bearing adjusting nut and pin assembly). Then, remove the outer wheel bearing and the hub and drum assembly from the spindle.

On rear wheels, remove the rear axle shaft flange retaining nuts and axle shaft. Remove the rear wheel bearing lock nut, lock washer, and adjusting nut, then remove the hub and drum assembly from the axle housing.

3. Remove the brake shoes and adjusting screw from the carrier plate as outlined in this section. Disconnect the brake line from the brake cylinder and submerge the end of the brake line in a can containing a small amount of brake fluid. This will minimize hydraulic line bleeding.

4. Remove the carrier plate retaining bolts and nuts, then remove the carrier plate from the front wheel spindle or rear axle housing.

5. Remove the retaining bolts and lock washers, and the brake cylinder from the carrier plate.

INSTALLATION

1. Assemble the brake cylinder to the carrier plate with the retaining bolts and lock washers.

2. Mount the carrier plate to the front wheel spindle or to the rear axle housing flange, and secure with the retaining bolts and nuts.

3. Install the brake shoes and adjusting screw to the carrier plate as outlined in this section. Connect the brake line to the brake cylinder.

4. Install a front wheel hub and drum assembly and the outer wheel bearing to the spindle. Install the hub and drum attaching parts (axles under 9,000 lbs capacity—flat washer, bearing adjusting nut, cotter pin, grease cap, and gasket if so equipped) (axles 9,000 lbs. capacity or overbearing adjusting nut and pin assembly, locking ring, dimpled washer, lock nut, and grease cap and gasket). Adjust the front wheel bearings as outlined in Part 3-5.

Install a rear wheel hub and drum assembly on the rear axle housing. Install the outer bearing and the adjusting nut, then adjust the wheel bearings. Install the lock washer and lock nut, then torque to specifications. Install the rear axle shaft, gasket and retaining nuts, then torque to specifications.

5. Install the wheel and tire.

6. Bleed the hydraulic system and adjust the brake shoes.

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.

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. On a truck with conventional brakes, disconnect the rubber boot from the rear end of the master cylinder in the cab. 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 trucks equipped with a dash-mounted booster, remove the nuts and washers that secure the master cylinder to the power booster unit, and remove the master cylinder.

INSTALLATION

1. On a truck with conventional brakes, position 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 specifications.

On trucks equipped with a dash-mounted booster, install the master cylinder over the push rod onto the two studs in the power booster body. Install the lock washers and retaining nuts. Torque the nuts to specifications.

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 trucks equipped with dash-mounted booster, the cylinder can be bled at the bleed screw on the cylinder.

On a truck with a frame-mounted 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—P-SERIES TRUCKS

REMOVAL

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

2. Turn the front wheels all the way to the left, and remove the fender apron attaching screws so that the apron can be moved to provide access to the master cylinder.

3. Disconnect the stoplight switch wires from the switch.

4. Disconnect the brake line from the brake tube fitting.

5. 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.

6. Disconnect the rubber boot from the end of the master cylinder.

7. Remove the brake pedal return spring, remove the cotter pin from the clevis pin, and remove the master cylinder push rod and boot. Remove the three mounting bolts and remove the master cylinder from the mounting bracket and away from the truck.

INSTALLATION

1. Assemble the master cylinder to the mounting bracket and secure with the three mounting bolts. Install the push rod and boot to the front of the master cylinder. Connect the front end of the push rod to the upper holes of the brake pedal extension with the clevis pin, and secure with a cotter pin. On a truck equipped with a vacuum booster, connect the push rod and insert the clevis pin at the lower holes of the pedal extension. Install the brake pedal retracting spring.

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

3. Fill the master cylinder with heavy-duty brake fluid to the specified level.

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. 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.

5. After seeing that the master cylinder reservoir is filled with heavy-duty brake fluid to the specified level, install the filler cap. Wipe off the fluid from the outside of the cylinder and brake line.

6. Connect the stoplight switch wires to the switch.

7. Connect the rubber boot to the end of the cylinder. Reposition the fender apron and secure with the five retaining bolts.

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 specificatons.

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 AND P-100 TRUCK

REMOVAL

1. Remove the brake pedal retracting spring (Fig. 19).

2. Remove the brake master cyl-

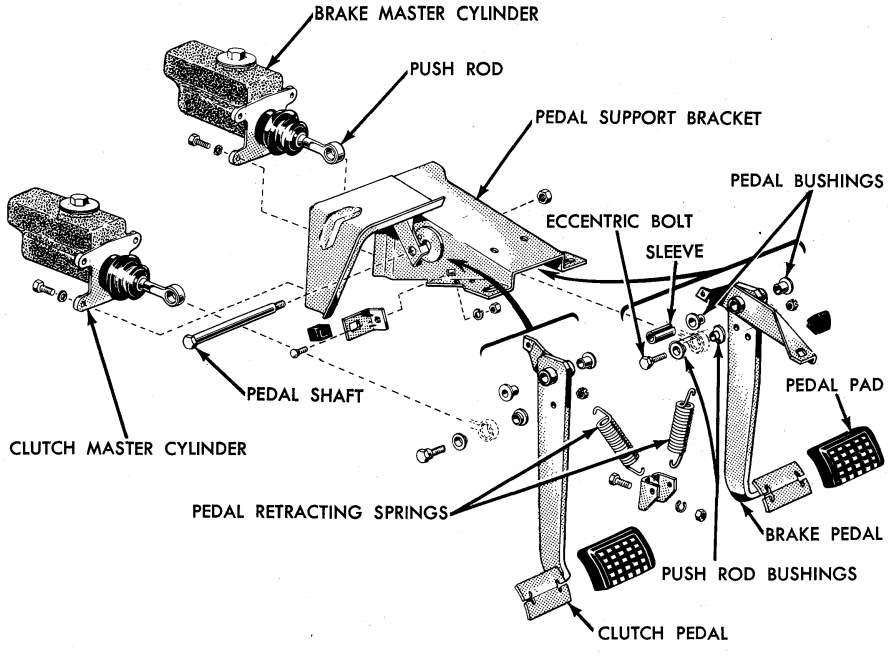

FIG. 19—B-, F-, N-, or T-Series and P-100 Brake Pedal and Related Parts

inder 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.

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 9/16-5/8 inch (Fig. 1, Part 2-1). Torque the eccentric bolt nut to specifications.

BRAKE PEDAL—P-SERIES TRUCKS EXCEPT P-100

REMOVAL

1. Open the hood and disconnect the transmission gearshift rods from the shaft levers. Set the rods so that the maximum working space is obtained at the pedal support bracket.

2. Remove the pedal pads from the clutch and brake pedal (Fig. 20).

3. Remove the eight screws that retain the two floor covers at the steering column, and remove the covers. Unlatch the engine cover assembly and open.

4. Remove the eight floor plate retaining screws. Pull the accelerator pedal from the accelerator linkage and remove the floor plate.

5. Disconnect the clutch and brake pedal retracting springs.

6. Loosen the pedal support bracket clamp bolt. Remove the cotter pins and clevis pins from the clutch and brake pedals.

7. Turn the front wheels full left. Through the left front fender apron, remove the locking pin from the clutch pedal and remove the pedal. Push the pedal shaft toward the centerline of the truck. From inside the cab, slide the pedal shaft and clutch pedal lever to the right and out of the support bracket. Remove the brake pedal from the support bracket, then remove the bushings from the pedal and the pedal support bracket.

INSTALLATION

1. Coat all bushings and the pedal shaft with a small quantity of Lubriplate or an equivalent lubricant. Install new bushings in the pedal support bracket and the brake pedal.

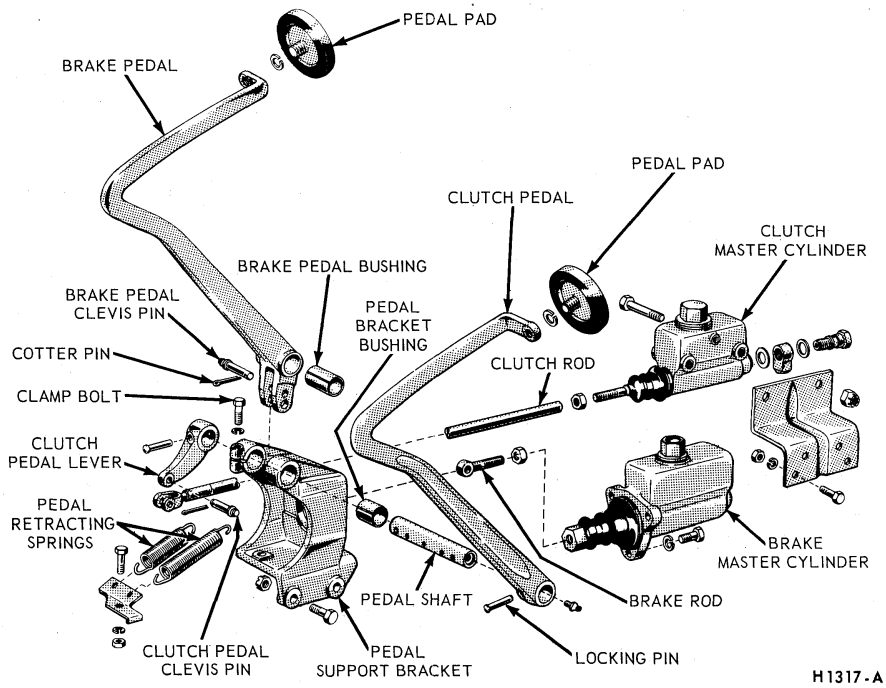

FIG. 20—P-Series Brake Pedal and Related Parts Except P-100

2. Position the brake pedal in the support bracket, and slide the pedal shaft and clutch pedal lever through the bracket and pedal.

3. Through the left front fender apron, install the clutch pedal on the shaft and secure it with a new locking pin.

4. Position the clutch rod on the clutch pedal lever, install the clevis pin and secure it with a new cotter pin.

5. Position the brake master cylinder push rod in the brake pedal, install the clevis pin and secure it with a new cotter pin.

6. Install the clutch and brake pedal retracting springs.

7. Adjust the brake pedal by removing the clevis pin from the master cylinder push rod and turning the hex head of the push rod until the specified free travel is obtained.

BRAKE PEDAL — C-SERIES TRUCK

REMOVAL

1. Remove the brake pedal retracting spring (Fig. 21).

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 the brake pedal assembly, sleeve and bushing.

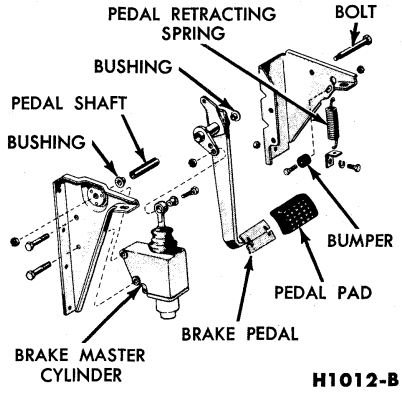

FIG. 21—C-Series Brake Pedal

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 3/16-3/8 inch. Torque the eccentric bolt nut to specifications.

4 MAJOR REPAIR OPERATIONS

BRAKE WHEEL CYLINDER

DISASSEMBLY

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. 22 or 23).

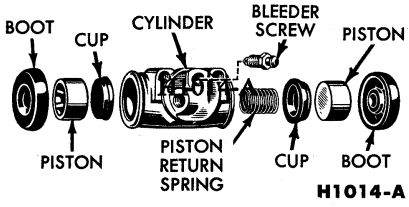

FIG. 22—Double Servo Brake Cylinder

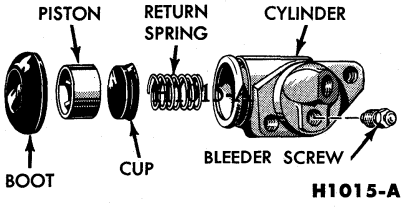

FIG. 23—Single Servo Brake Cylinder

2. Remove the bleeder screw from the cylinder.

3. Coat all brake cylinder parts with clean heavy-duty brake fluid.

4. Install the bleeder screw (Fig. 22 or 23) 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. **When a brake cylinder repair kit is used, install all of the parts supplied in the kit.**

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.

On a C-Series truck master cylinder (Fig. 25), remove the 4 bolts that hold the cylinder body on the reservoir, and remove the gasket. Press down on the piston to compress the return spring, and remove the snap ring. Remove the piston, primary cup, piston filler, return spring, check valve, and check valve seat.

On trucks equipped with a frame-mounted vacuum or air-hydraulic brake booster, the check valve is installed in the booster instead of in the master cylinder.

2. On a B-, F-, N-, P-, or T-Series truck master cylinder with a box-shaped reservoir, remove the stoplight switch if it is mounted on the

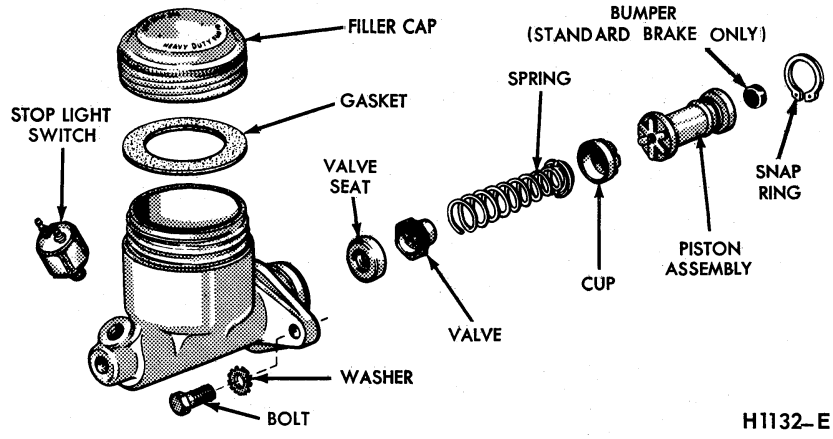

FIG. 24—Typical B-, F-, N-, or T-Series Brake Master Cylinder—Cylindrical Reservoir

master cylinder, brake bolt, fitting, and gaskets from the forward end of the cylinder (Fig. 26). 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 B-, F-, N-, or T-Series truck master cylinder with a cylindrical reservoir, remove the stop light switch and gasket, if it is mounted on the master cylinder. Remove the bolt type fitting from the forward end of the cylinder. Remove the snap ring from the bore at the rear end of the cylinder, and remove the piston, cup, spring, and valve seat (Fig. 24). Remove the rubber bumper from the piston (systems without booster only).

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-, P-, or T-Series truck with a box-shaped master cylinder reservoir, install the brake fitting, bolt, and new gaskets (Fig. 26) 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.

On a B-, F-, N-, or T-Series truck with a cylindrical master cylinder reservoir, install the bolt-type fitting on the forward end of the master cylinder. If the stoplight switch mounts on the master cylinder, install the switch and tighten it securely. In systems without a booster install the rubber bumper in the piston. Insert the valve seat, valve, spring, cup, and piston into the cylinder bore. Compress the piston against the valve spring, and install the snap ring (Fig. 24).

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 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. 27). Pour out any brake fluid remaining in the

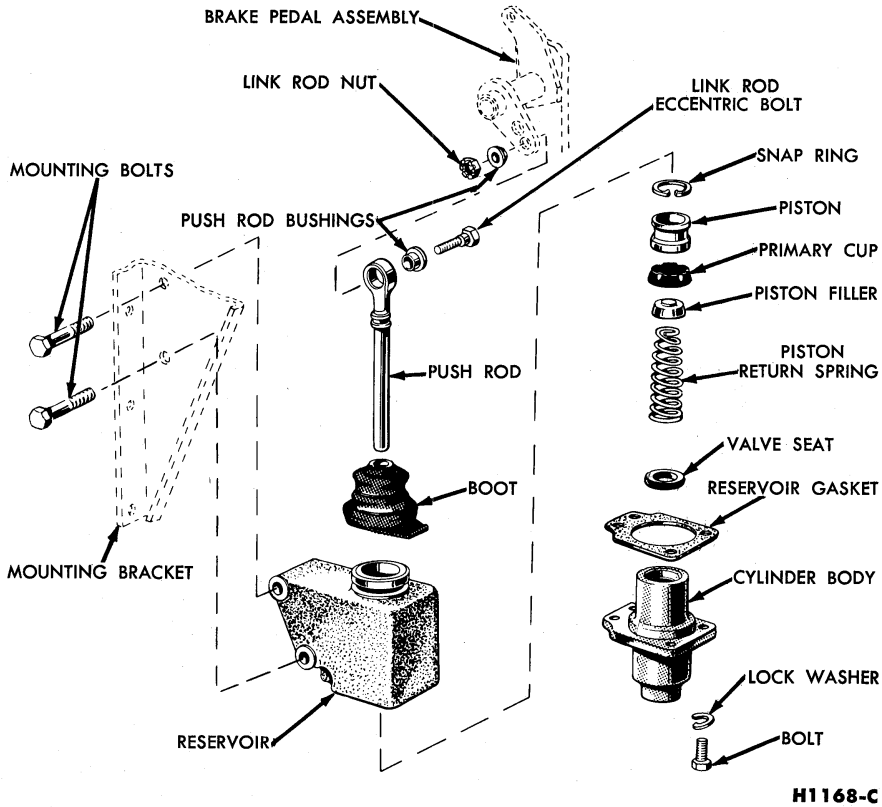

FIG. 25 — C-Series Brake Master Cylinder

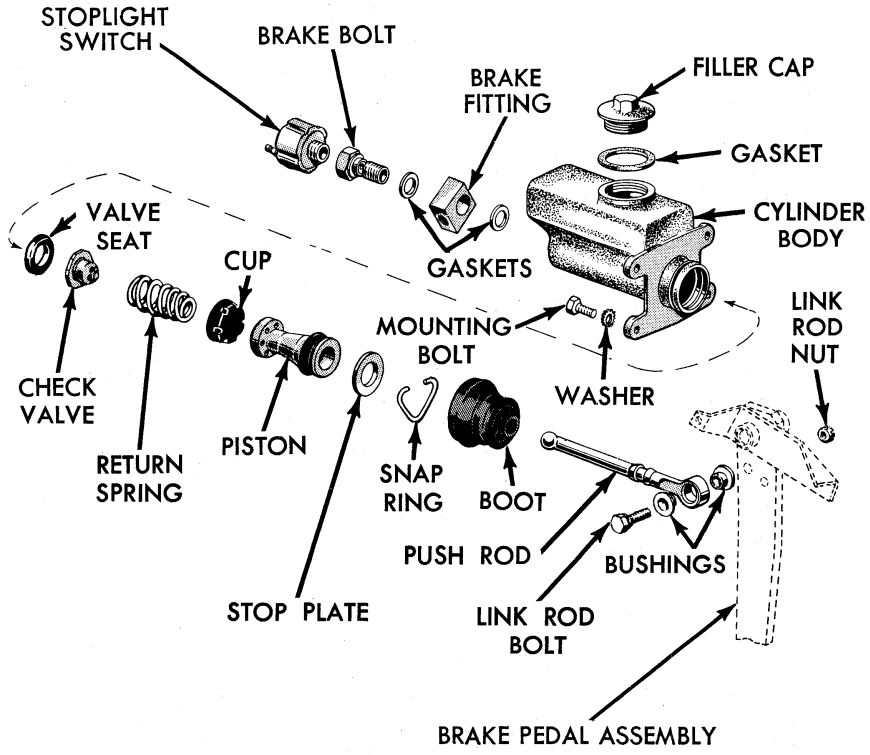

FIG. 26—B-, F-, N-, P- or T-Series Brake Master Cylinder—Box-Shaped Reservoir H1167-A

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. 28).

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. 27).

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. 27).

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. 27).

5. Install the O-ring on the bushing. Slide the washer, the retainer, the "Block Vee" type seal, and the bushing onto the push rod (Fig. 29). **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. 30 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. 27).

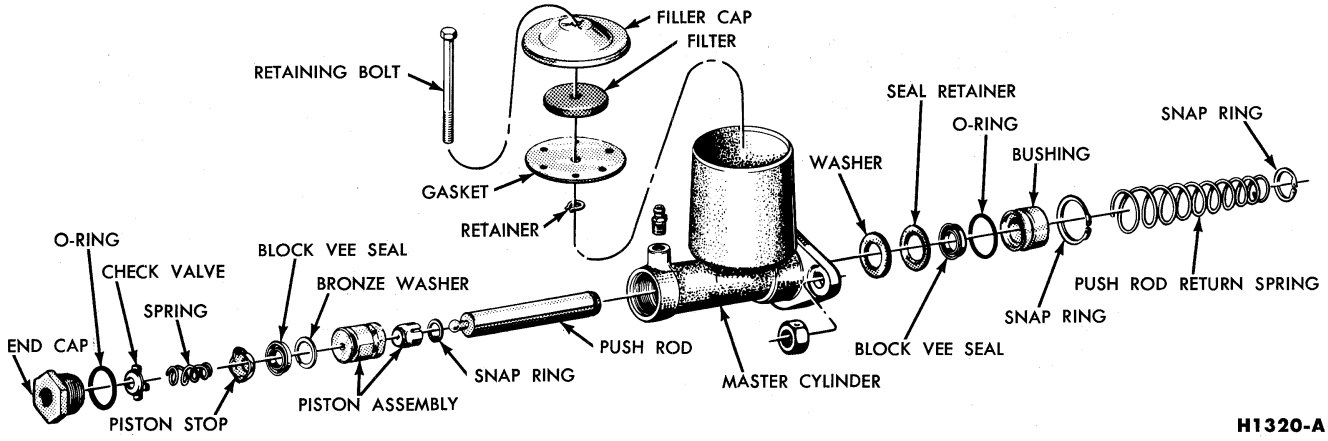

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FIG. 27—Dash-Mounted Master Cylinder Disassembled

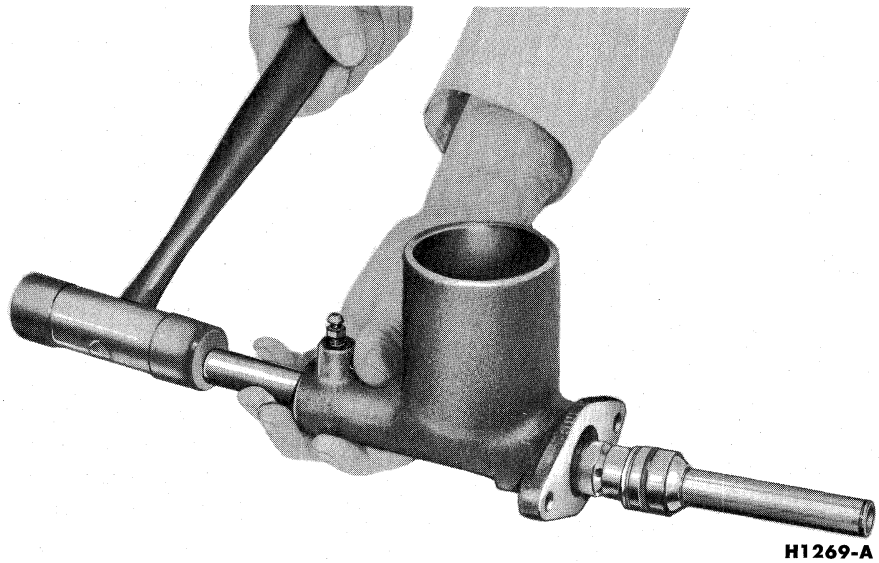

FIG. 28—Master Cylinder Push Rod, Piston, and Bushing Removal

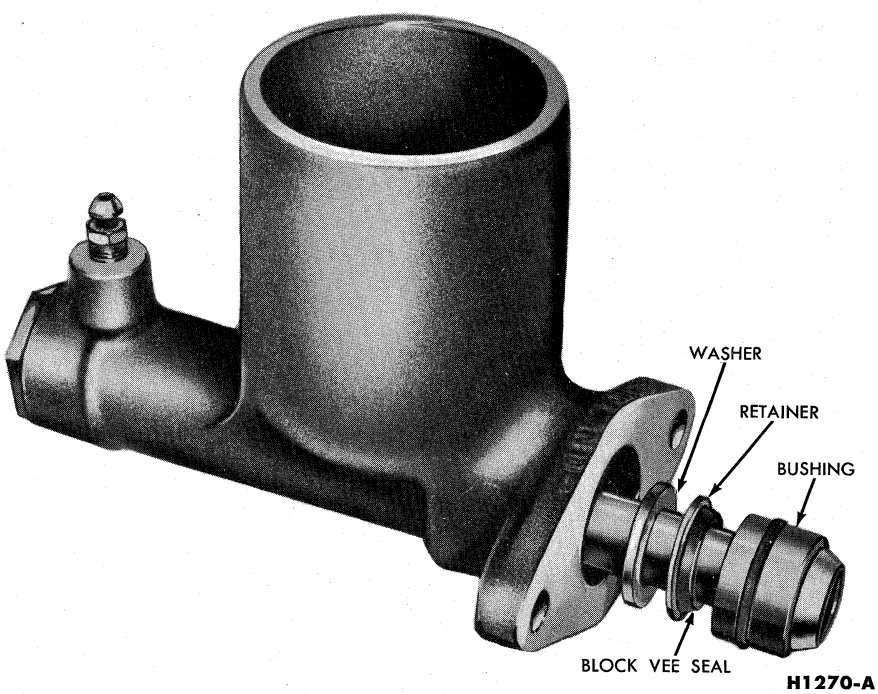

FIG. 29—Assembly of Seal and Bushing Components to Master Cylinder Push Rod

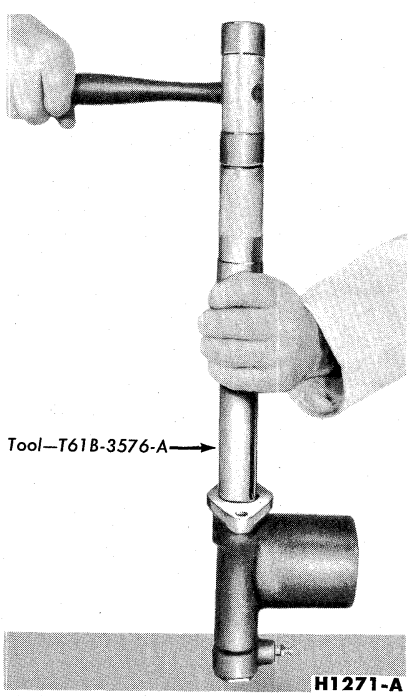

FIG. 30—Master Cylinder Bushing Installation

PART 2-3 PARKING BRAKES

1 DESCRIPTION AND OPERATION

CABLE ACTUATED REAR WHEEL PARKING BRAKE

On a F-100, F-250, or P-350 Series truck with a 3-speed light or medium-duty transmission, a cable actuated parking brake assembly is contained in each rear wheel brake assembly (Fig. 1).

On the F-100 and F-250 Series, the manually operated parking brake lever cable is routed to the equalizer lever (Fig. 5), which through the equalizer assembly and brake cables connects to the parking brake lever assembly in each rear wheel.

On the P-350 Series, the operating procedure is the same except that the equalizer lever is not used. The lever cable is routed directly to the equalizer assembly.

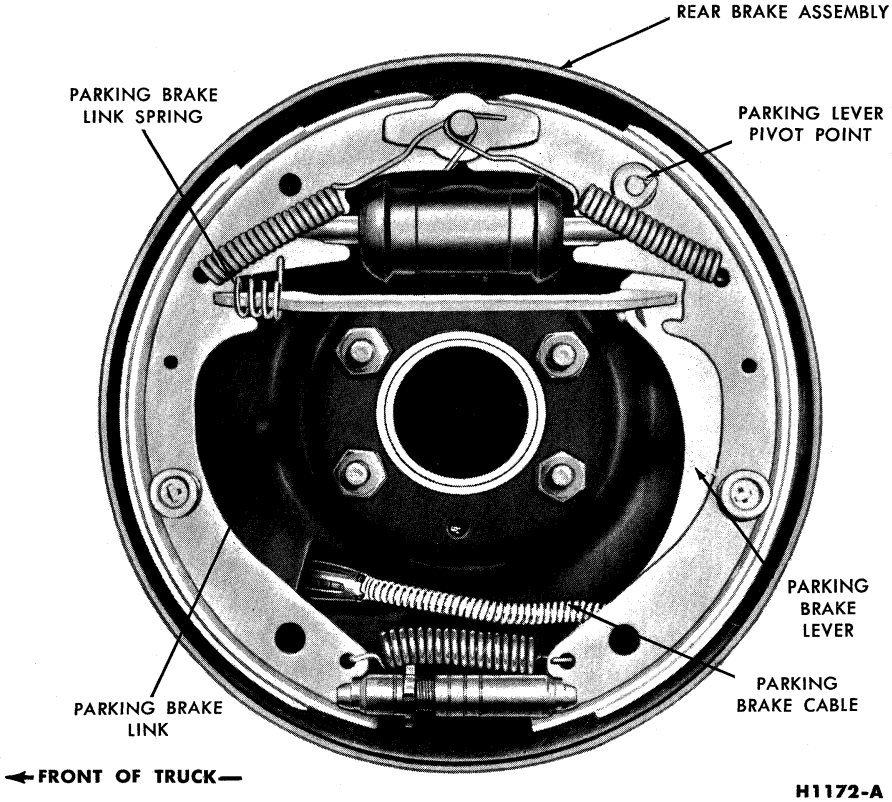

FIG. 1—Parking Brake Assembly

EXTERNAL CONTRACTING BAND TYPE PARKING BRAKE

The band type parking brake consists of a brake drum bolted to the transmission main shaft companion flange, and an external contracting type band mounted on the rear of the transmission (Fig. 6).

INTERNAL EXPANDING SHOE TYPE PARKING BRAKE

The internal shoe-type parking brake, mounted on the transmission 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. The brake with the 9-inch drum is used on 500 through 700 Series trucks (Fig. 7). The 12-inch drum is used on 700 through 1100 Series trucks (Fig. 7).

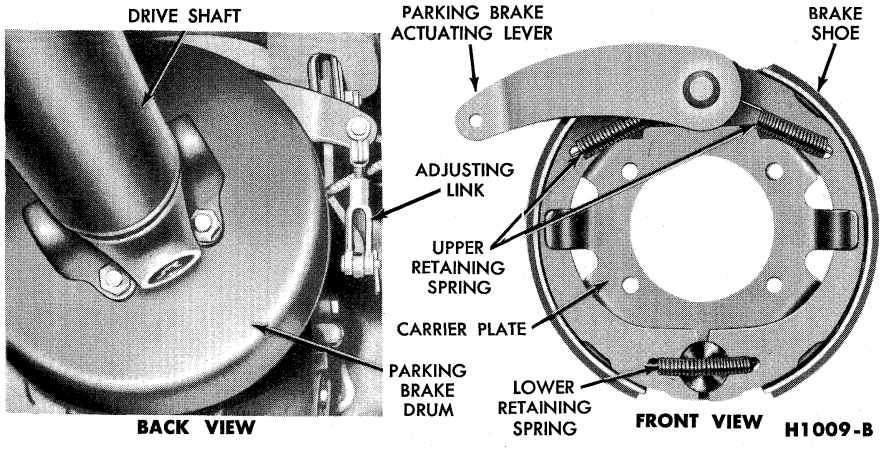

FIG. 2—Shoe-Type Parking Brake—Nine-inch Diameter Drum

MAXIBRAKE

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. 3).

System air pressure applied to the safety chamber and piston keeps the safety piston spring compressed, while metered pressure from the service brake control valve applies against the diaphragm and service push rod for normal service operation (Fig. 9). In case of system pressure loss, the safety piston spring will release against the safety piston and push rod for automatic application of the brakes.

If air pressure cannot be restored, it will be necessary to compress the safety spring by introducing pressure from an auxiliary source so that the truck can be moved. Connect the auxiliary air line to the emergency air supply valve which is located near the brake chambers. Turn the valve handle 90 degrees to cut off the normal air supply system and open the auxiliary system. This action admits air to release the Maxibrakes, but prevents the air from escaping through the break-down area.

A manual control valve located in the cab exhausts the air from the safety chamber for safety stops, or to set the service brakes for parking.

FAIL-SAFE—SPRING BRAKE

The Fail-Safe unit combines normal brake operation with parking and safety brake action. The Stopmaster brake with the Fail-Safe assembly is the same as that shown in Fig. 23, Part 2-7, except that the pressure housing is replaced by the Fail-Safe unit (Fig. 4).

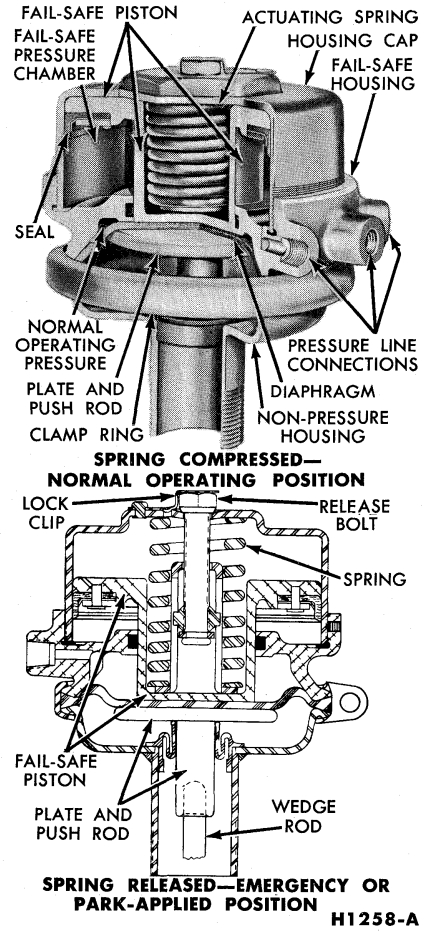

FIG. 4 – Fail-Safe Operation

NORMAL OPERATION

There are three air pressure line connections on the Fail-Safe housing. The two outer connections allow

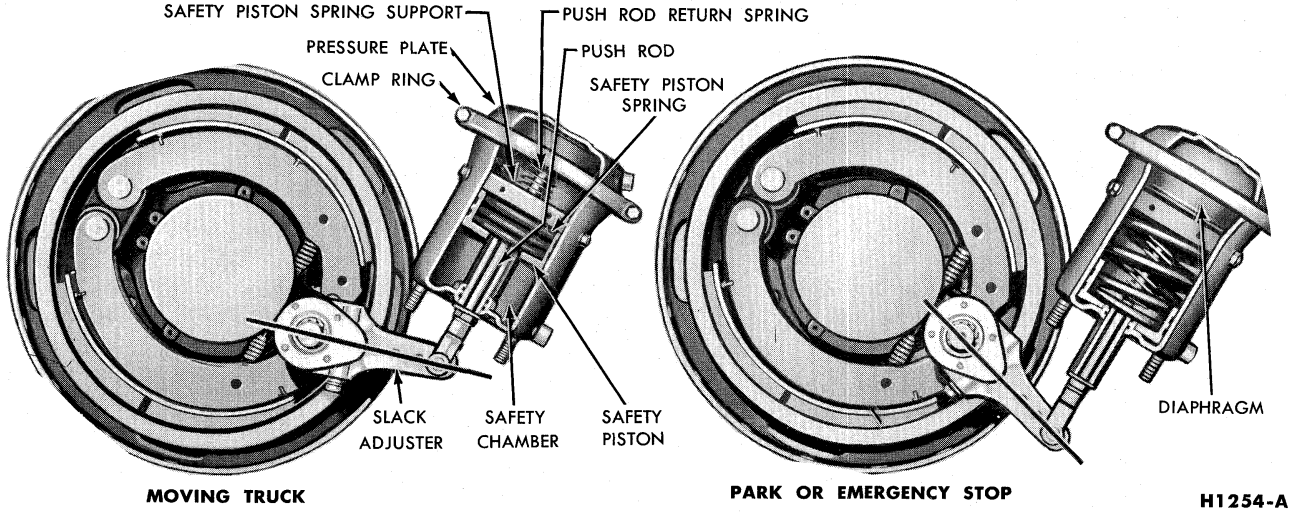

FIG. 3—Maxibrake Operation

system pressure to enter the Fail-Safe pressure chamber. System pressure, in the Fail-Safe or safety chamber, bears against the Fail-Safe piston holding the actuating spring in its compressed position (Fig. 4). The center connection allows metered pressure from the service brake control valve to enter the diaphragm chamber for normal brake operation.

SAFETY OPERATION

In case of pressure loss, the actuating spring will release and force the Fail-Safe piston against the diaphragm and the plate and push rod to apply the brakes mechanically (Fig. 4).

If air pressure cannot be restored immediately, it will be necessary to compress the actuating spring manually in order to move the truck. Loosen the lock clip retaining screw and disengage the lock clip from the release bolt (Fig. 8). To compress the spring, turn the release bolt clockwise until it bottoms (approximately 18 turns).

Be sure to release the spring as soon as normal air pressure is restored. To release the spring, turn the release bolt counterclockwise until it bottoms (approximately 18 turns). Lock the release bolt with the lock clip.

PARKING OPERATION

For parking, a control valve is provided in the cab. Pulling the valve knob out will release the air from the Fail-Safe pressure chamber. The actuating spring will then apply the brakes mechanically as in emergency operation. The spring will be compressed again and the brakes released, as soon as system air pressure is restored by the compressor.

2 IN-TRUCK ADJUSTMENTS AND REPAIR

PARKING BRAKE ADJUSTMENT—CABLE ACTUATED REAR WHEEL TYPE

Adjust the service brakes before attempting to adjust the parking brake cables.

Place the parking brake lever in the fully released position, then check for slack in the parking brake two rear cables (Fig. 5).

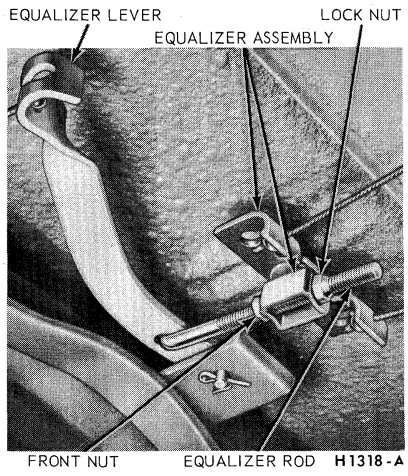

FIG. 5—Parking Brake Cable Adjustment

The cables should be tight enough to provide full application of the rear brake shoes, when the parking brake lever is placed in the fully applied position, yet loose enough to ensure complete release of the brake shoes when the lever is in the released position.

If the cables are loose, adjust them as follows:

1. Loosen the locknut on the equalizer rod, and then turn the nut in front of the equalizer several turns forward.

2. Turn the locknut forward against the equalizer until the cables are just tight enough to remove the slack. **Excessive tightening may pull the brake shoes off their anchors.**

3. When the cables are properly adjusted, tighten both nuts against the equalizer.

PARKING BRAKE ADJUSTMENT—EXTERNAL BAND TYPE

1. On cable-controlled parking brakes (Fig. 6), move the parking brake lever to the fully released position. On a truck with a rod-type linkage, set the lever at the first notch.

2. Check the position of the cam to make sure the flat portion is resting on the brake band bracket. If the cam is not flat with the bracket, remove the clevis pin from the upper part of the cam, and adjust the clevis rod to allow the flat portion of the cam to rest on the brake band bracket. Install the clevis pin and cotter pin (Fig. 6).

3. Remove the lock wire from the anchor adjusting screw, and turn the adjusting screw clockwise until a clearance of 0.010 inch is established between the brake lining and the brake drum at the anchor bracket. Install the lock wire in the anchor adjusting screw.

4. Loosen the lock nut on the adjusting screw for the lower half of the brake band, and adjust the screw to establish a 0.010 inch clearance between the lining and the brake drum at the lower half of the brake band (Fig. 6). Tighten the lock nut.

5. Turn the upper band adjusting rod nut until a 0.010 inch clearance is established between the upper half of the band and the drum.

PARKING BRAKE ADJUSTMENT—INTERNAL SHOE TYPE

NINE-INCH DIAMETER DRUM

1. Release the parking brake lever in the cab.

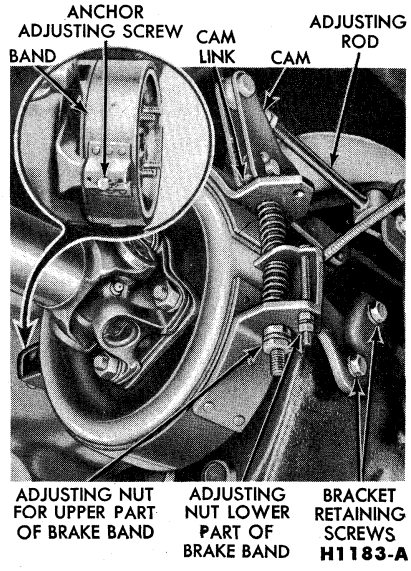

FIG. 6—Typical Band Type Parking Brake

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

3. Lengthen the parking brake adjusting link by turning the clevis. Continue to lengthen the adjusting link until the shoes seat against the drum when the clevis pin is installed.

4. Remove the clevis pin and shorten the linkage adjustment until there is 0.010 inch clearance between the shoes and the drum. The measurement should be taken at all points around the drum with the clevis pin installed.

5. Install a new cotter pin in the clevis retaining pin and check the brake operation.

TWELVE-INCH DIAMETER DRUM

There is no internal adjustment on this brake. Adjustment is made on the linkage. Remove the clevis pin, loosen the nuts on the adjusting rod, and turn the clevis on the rod until a ¼-⅜ inch free play is obtained at the brake lever (Fig. 7). Tighten the nuts, and connect the clevis to the bellcrank with the clevis pin.

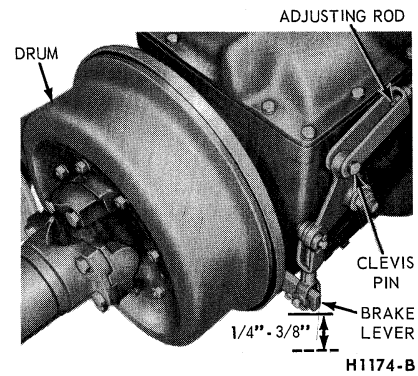

FIG. 7—Shoe-Type Parking Brake —Twelve-Inch Drum

3 REMOVAL AND INSTALLATION

PARKING BRAKE EQUALIZER TO CONTROL ASSEMBLY CABLE

This procedure applies only to trucks equipped with cable actuated parking brakes.

REMOVAL

1. Raise the truck on a hoist. Push the equalizer lever slightly forward, and disconnect the cable rear (ball) end from the lever (Fig. 5).
2. Remove the parking brake cable retaining U-clip at the crossmember.
3. Lower the truck, open the hood, and remove the cable retaining clamp on the fender apron.
4. Remove the cable retaining U-clip at the handle assembly. Remove the cable from the truck.

INSTALLATION

1. Position the new cable through the dash panel and connect it to the parking brake handle assembly. Secure the cable to the handle assembly with the U-clip.
2. Install the cable retaining clamp to the fender apron, and raise the truck on a hoist.
3. Route the cable through the crossmember and secure in place with the U-clip.
4. Push the equalizer lever forward and connect the cable rear (ball) end to the lever. Adjust the parking brake cable at the equalizer assembly.

PARKING BRAKE EQUALIZER TO REAR WHEEL CABLE

This procedure applies only to trucks equipped with cable actuated parking brakes.

REMOVAL

1. Raise the truck and remove the hub cap, wheel, and brake drum. Loosen the lock nut on the equalizer rod and disconnect the cable from the equalizer.
2. Remove the horseshoe-type clip that retains the cable housing to the frame bracket and pull the cable and housing out of the bracket.
3. Working on the wheel side (Fig. 1), compress the prongs on the cable retainer so that they can pass through the hole in the carrier plate. Draw the cable retainer out of the hole.
4. With the spring tension off the parking brake lever, lift the cable out of the slot in the lever, and remove the cable through the carrier plate hole.

INSTALLATION

1. Pull enough of the cable through the housing so that the end of the cable may be inserted over the slot in the parking brake lever. Pull the excess slack from the cable and insert the cable housing into the carrier plate access hole so that the retainer prongs expand (Fig. 1).
2. Thread the front end of the cable housing through the frame bracket and install the horseshoe-type retaining clip. Insert the ball end of the cable into the equalizer and tighten the lock nut on the equalizer slightly.
3. Install the rear brake drum, wheel, and hub cap, then adjust the rear brake shoes.
4. Tighten the lock nut on the equalizer rod until the slack is taken out of the cables.
5. Rotate both rear wheels to make sure that the parking brakes are not dragging.

BAND AND DRUM—(BAND TYPE PARKING BRAKE)

This procedure applies to F-350 series trucks, and P-Series trucks that are equipped with a 3-speed H. D. transmission.

REMOVAL

1. Shift the transmission into low gear and disconnect the drive shaft companion flange from the transmission output shaft flange by removing the four nuts (Fig. 6).
2. Apply the parking brake, remove the transmission output shaft flange retaining nut, then release the parking brake.
3. Remove the cotter pin and clevis pin, and disconnect the adjusting rod from the cam.
4. Remove the cotter pin and clevis pin, and remove the cam link from the cam.
5. Remove the lock wire and the anchor adjusting screw.
6. Remove the brake band adjusting bolts and nuts.
7. Remove the brake bracket retaining cap screws.
8. Lift the brake band and lining assembly off the drum.
9. Inspect the brake lining, and replace it if the distance between the brake lining surface and the top of the rivet is less than $\frac{1}{32}$ inch.

When relining a parking brake band, follow the procedure used in Part 2-1.

10. Inspect the drum braking surface. If the drum is rough or scored, it should be replaced. Remove the drum and output shaft flange as an assembly.

INSTALLATION

1. Position the parking brake drum and output shaft flange assembly to the transmission output shaft, and install the retaining nut.
2. Position the parking brake band assembly over the drum, and install the bracket retaining screws.
3. Install the brake band adjusting bolt and nuts and springs.
4. Connect the cam link to the lower end of the cam with clevis and cotter pin.
5. Connect the adjusting rod to the upper end of the cam with clevis and cotter pin.
6. Adjust the parking brake, and install a lock wire in the anchor adjusting screw.
7. Apply the parking brake, torque the transmission output shaft flange nut to specifications, then release the parking brake.
8. With the transmission in low gear, connect the drive shaft at the flange and torque the four retaining nuts.

INTERNAL SHOE PARKING BRAKE

REMOVAL

1. Remove the universal joint assembly and drive shaft from the parking brake drum.
2. Remove the drum. Disconnect the parking brake actuating lever from the linkage.
3. On all transmissions except Transmatic Drive, remove the transmission spline flange. Remove the bolts retaining the carrier plate to the transmission housing. Slide the carrier plate with the brake shoes and retaining springs from the transmission. Remove the actuating lever, shoe retaining springs, and then remove the shoes.
4. On Transmatic Drive, pry the parking brake shoe lower retaining spring from the shoes. Remove the bolts and lockwashers retaining the carrier plate to the transmission. **Do not remove the bolt that retains the spline flange to the output shaft.**
5. With one hand on the actuating lever, slide the carrier plate away from the transmission housing and at the same time remove the actuating lever. Rotate the carrier plate and shoes as an assembly approximately 180 degrees, disconnect the brake shoe upper retaining springs, and remove the shoes.

INSTALLATION

If the brakes require relining, see Part 2-1 for relining procedures.

1. On all transmissions except Transmatic Drive, install the brake shoe lower retaining spring on the shoes. Position the shoes and lower retaining spring on the back side of the carrier plate, install the shoe upper retaining springs and the actuating lever. Place the assembly on the transmission and install the retaining bolts. Install the transmission spline flange.
2. On Transmatic Drive, position the brake shoe lower retaining spring in place. Lift the two shoes and spring as an assembly and place on the top back side of the carrier plate. The spring should be on the transmission side of the shoes. The carrier plate is still 180 degrees out of its normal position to facilitate the installation of the shoe upper retaining springs.
3. Install the brake shoe upper retaining springs. Rotate the carrier plate 180 degrees, position the actuating lever in the ball socket, and push the carrier plate toward the transmission. **Be sure the ends of the actuating lever are properly seated.** Install the lockwashers and bolts to retain the carrier plate to the transmission housing.
4. Install the brake drum and the drive shaft.
5. Connect the actuating lever to the parking brake linkage. Check the brake operation and adjust the linkage as necessary.

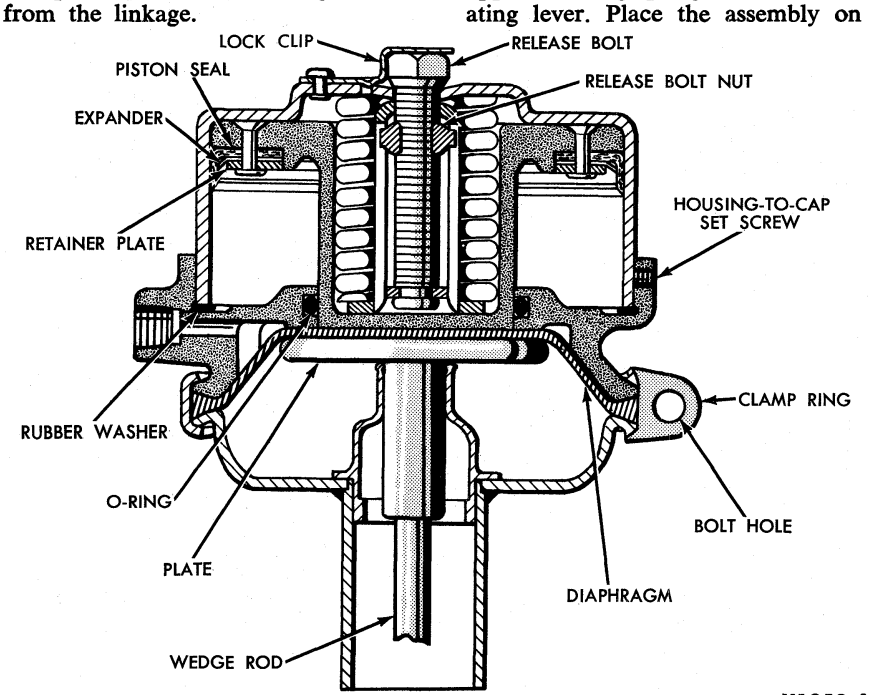

FIG. 8—Spring Manually Compressed for Removal and Repair of Fail-Safe Unit

MAXIBRAKE

REMOVAL

1. Release all the air from the system, and then disconnect the air lines from the brake chamber.
2. Disconnect the push rod yoke from the slack adjuster.
3. Remove the mounting nuts and remove the brake chamber.

INSTALLATION

1. Position the brake chamber assembly on the mounting bracket and install the retaining nuts.
2. Connect the push rod yoke to the slack adjuster.
3. Connect the air lines to the brake chamber and build up the air pressure.

FAIL SAFE UNIT

REMOVAL

1. Exhaust the air from the system by opening the reservoir drain cocks. Disconnect the air lines from the Fail-Safe housing.
2. Loosen the lock clip retaining screw and disengage the lock clip from the release bolt. Compress the actuating spring by turning the release bolt (Fig. 8) clockwise until

the release bolt nut bottoms (approximately 18 turns).

3. To avoid possible injury, be sure that the actuating spring is mechanically compressed before removing the clamp ring. Remove the clamp bolt, expand the clamp ring, and slide it off the Fail-Safe and non-pressure housings.

4. Remove the Fail-Safe unit from the non-pressure housing.

INSTALLATION

1. If the diaphragm is worn or damaged, replace it. Check the wedge assembly to be sure that the parts have not been disengaged during disassembly. Be sure that the wedge rod fits into the socket of the diaphragm plate and push rod assembly (Fig. 8).

2. Install the diaphragm against the plate and push rod assembly, and mount the Fail-Safe unit against the diaphragm and non-pressure housing. Secure the Fail-Safe unit to the non-pressure housing with the clamp ring. Tighten the clamp ring bolt and nut, then install the warning tag.

3. Turn the release bolt counterclockwise (approximately 18 turns) to release the manual compression of the actuating spring.

4. Start the engine and compressor to build up system pressure for air compression of the spring.

4 MAJOR REPAIR OPERATIONS

MAXIBRAKE

DISASSEMBLY

Before disassembling the brake chamber, mark both the pressure plate and cylinder assembly with relation to the clamping ring and the air line fittings, so that the unit can be reassembled in the same position. This will eliminate the possibility of installation interference and assure correct positioning of the air line fittings.

1. Remove the clevis yoke and the flanged nut from the push rod and install a ¾ inch OD x ⅝ inch ID flat washer and a ⅝ NF nut on the push rod—tighten the nut until the plate end of the push rod is seated on the safety piston spring support. It is necessary to compress the push rod return spring and the safety piston spring, so the unit may be disassembled safely without spring pressure on the safety piston spring support, and the diaphragm and pressure plate assembly (Fig. 9).

2. Remove the clamp ring, pressure plate, and the service diaphragm from the cylinder assembly.

3. Remove the eight cap screws that secure the safety piston spring support to the cylinder body and remove the complete inner assembly.

4. Set the push rod and piston assembly on a work bench and unthread and remove the nut and washer used to compress the springs. With the spring tension removed, disassemble the push rod, return spring, safety piston, safety piston spring, and the spring seat.

5. Remove the push rod seal from the bore of the piston and remove the O-ring seals from the piston and the cylinder.

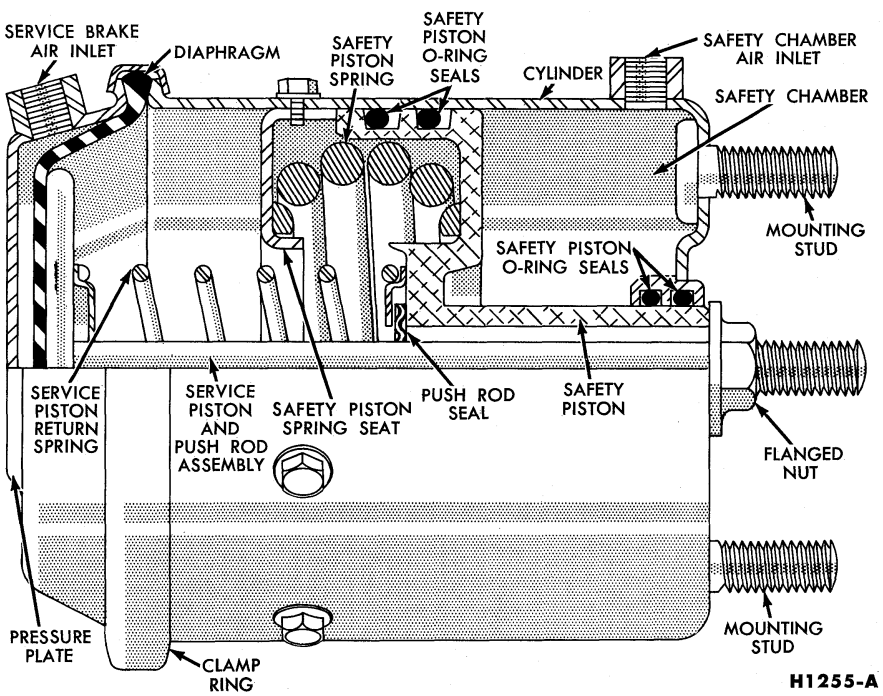

FIG. 9—Maxibrake—Sectional View

ASSEMBLY

Always be sure that the correct return spring is used in any brake chamber. Also be sure that the brake chamber on the opposite side of the axle has the same return spring; otherwise uneven braking will result.

If a new diaphragm is installed in the brake chamber on one side of the axle, a new one should be installed in the corresponding brake chamber on the opposite side also; otherwise uneven braking may result.

1. Coat the safety piston and the inside of the cylinder assembly with a light coat of Lubriplate or other suitable lubricant.

2. Rest the push rod upright on a flat surface and assemble in order—the push rod return spring, safety piston spring seat and spring, and the safety piston. Compress the push rod and safety piston springs by installing the nut and flat washer used in the disassembly procedure.

3. Install the push rod seal in the piston bore and install the O-ring seals on the piston and in the cylinder assembly.

4. Position the piston and spring assembly into the cylinder assembly. Align the threaded holes in the safety piston spring support with the holes in the side of the cylinder, and install the retaining cap screws.

5. Position the diaphragm and pressure plate with the clamp ring to the cylinder assembly, align the marks made prior to disassembly and tighten the clamp ring.

6. Remove the nut and washer used to compress the piston and push rod return spring.

7. Connect the air lines to the brake chamber and build up the air pressure.

8. With the safety chamber under pressure, and the safety piston in a retracted position, run the flange nut up snug on the push rod and install the clevis yoke.

Maintain a distance of $2\frac{13}{16} \pm \frac{1}{16}$ of an inch between the centerline of the clevis pin holes in the yoke, and the mounting flats of the cylinder assembly. Tighten the flange nut against the yoke to lock it in place.

FAIL-SAFE UNIT

DISASSEMBLY

1. Loosen the housing to cap set screws, and unscrew the housing from the cap (Figs. 7 and 8). Remove the O-ring and the rubber washer from the Fail-Safe housing.

2. Pull the Fail-Safe piston from the housing cap. If the piston cannot be withdrawn easily, loosen the release bolt a few turns. If the Fail-Safe piston seal is worn or damaged, replace the entire piston assembly.

3. If the housing cap assembly is damaged, replace the complete cap assembly. **Do not attempt to remove the spring from the assembly. Serious injury could result.**

Inspection. Check all components for wear or damage and replace as necessary. Clean all parts. **Do not use solvent on the leather seal.** Brush coat all internal surfaces (Fail-Safe housing and housing cap) with specified grease (M1C-69-A) or equivalent before assembly.

ASSEMBLY

1. Insert the piston in the housing cap.

2. Install a new rubber washer and a new O-ring in the Fail-Safe housing.

3. Screw the housing onto the cap, and tighten the housing to cap set screws.

PART 2-4 VACUUM BOOSTERS

1 DESCRIPTION AND OPERATION

Three different types of vacuum boosters—diaphragm, piston, and tandem piston—are used either as standard or optional equipment with Ford truck hydraulic brakes. A typical frame-mounted vacuum booster installation is shown in Fig. 1.

Service information for only the vacuum boosters is given here. Adjustments and repairs for the hydraulic brake systems are given in Part 2-2.

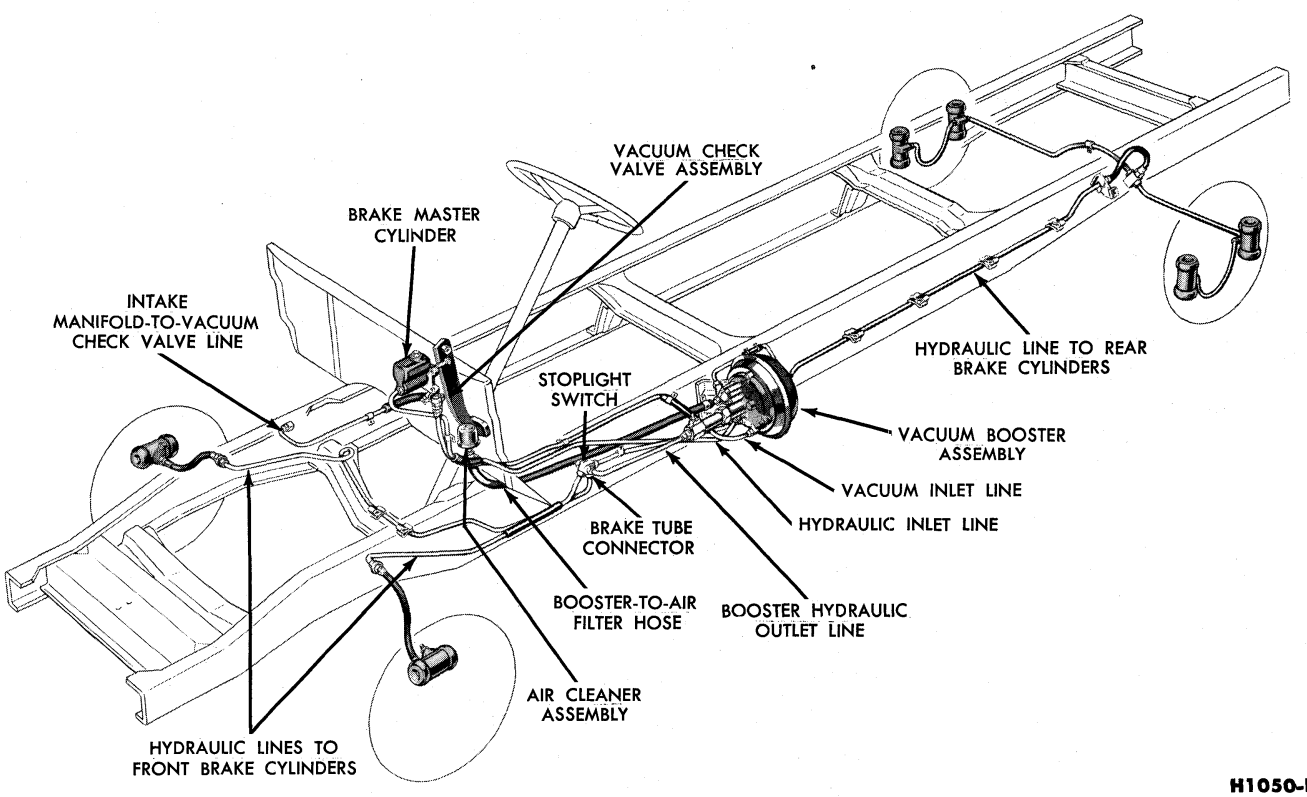

FIG. 1—Typical Frame-Mounted Vacuum Booster Installation—Diaphragm Type Shown

BENDIX DIAPHRAGM-TYPE, DASH-MOUNTED, BOOSTER— F-100 AND 250

The diaphragm-type brake booster is a self contained vacuum-hydraulic braking unit mounted on the engine side of the dash panel.

The vacuum power chamber consists of a front and rear shell locked together. Within the vacuum chamber are the rubber diaphragm and the integral valve hub and diaphragm plate. The rubber diaphragm fits over the plate, and the outer bead of the diaphragm is locked between the front and rear shells (Fig. 2). The diaphragm return spring is located between the diaphragm plate and the front shell.

The valve hub section of the diaphragm plate protrudes from the rear shell. A synthetic rubber and plastic seal is used between the valve hub and the rear shell. The seal and the valve hub are protected from dirt by a plastic shield located between the dash panel and the rear shell. The control valve assembly fits into the hub and is connected to the brake pedal by the valve operating rod. The control valve assembly consists of a plunger, a valve body which supports a single poppet of flexible rubber, and two return springs. When the brake pedal is in the released position the valve return spring holds the valve assembly and operating rod away from the diaphragm plate. In this position, the poppet on the valve body is off the vacuum port seat which is a part of the diaphragm plate. The poppet return spring likewise holds the poppet against the atmospheric port seat which is a part of the plunger.

The hydraulic master cylinder which contains all of the components of the conventional master cylinder is bolted to the booster front shell. The hydraulic push rod forms the link between the master cylinder piston and the vacuum power diaphragm assembly. The end of the push rod, that enters the master cylinder piston, is equipped with a self-locking adjusting screw. The opposite end has a piston head which enters the diaphragm plate. A seal, located in the front shell, seals the opening between the hydraulic push rod and the shell.

Engine manifold vacuum is supplied to the booster through a vacuum check valve located in the front shell. Air is admitted through the air filter located at the end of the valve hub. The hydraulic push rod is actuated by pedal pressure assisted by the diaphragm, which derives power from the pressure differential existing between the vacuum on its front side and atmospheric pressure on its rear side. A passage in the diaphragm plate permits vacuum to pass from the front to the rear side of the diaphragm when the vacuum port opens as the brakes are released.

RELEASED POSITION

With the engine running and the brakes released (Fig. 3), vacuum from the intake manifold is admitted through the check valve to the front (constant vacuum) chamber of the power unit. In the released position (no pressure applied to the brake pedal), the valve operating rod and valve plunger are held to the rear of the valve hub by the valve return spring to CLOSE the atmospheric port and OPEN the vacuum port. With the valve in this position, the rear (control vacuum) chamber is also open to vacuum through the porting in the diaphragm and valve hub assembly. The vacuum power diaphragm is then "balanced" or suspended in vacuum, since vacuum is present on both sides of the power diaphragm. With the power diaphragm balanced in vacuum, the diaphragm return spring holds the diaphragm and hydraulic push rod in the fully released position. With the hydraulic push rod in this position, the hydraulic compensating port in the hydraulic master cylinder is OPEN. The open port permits

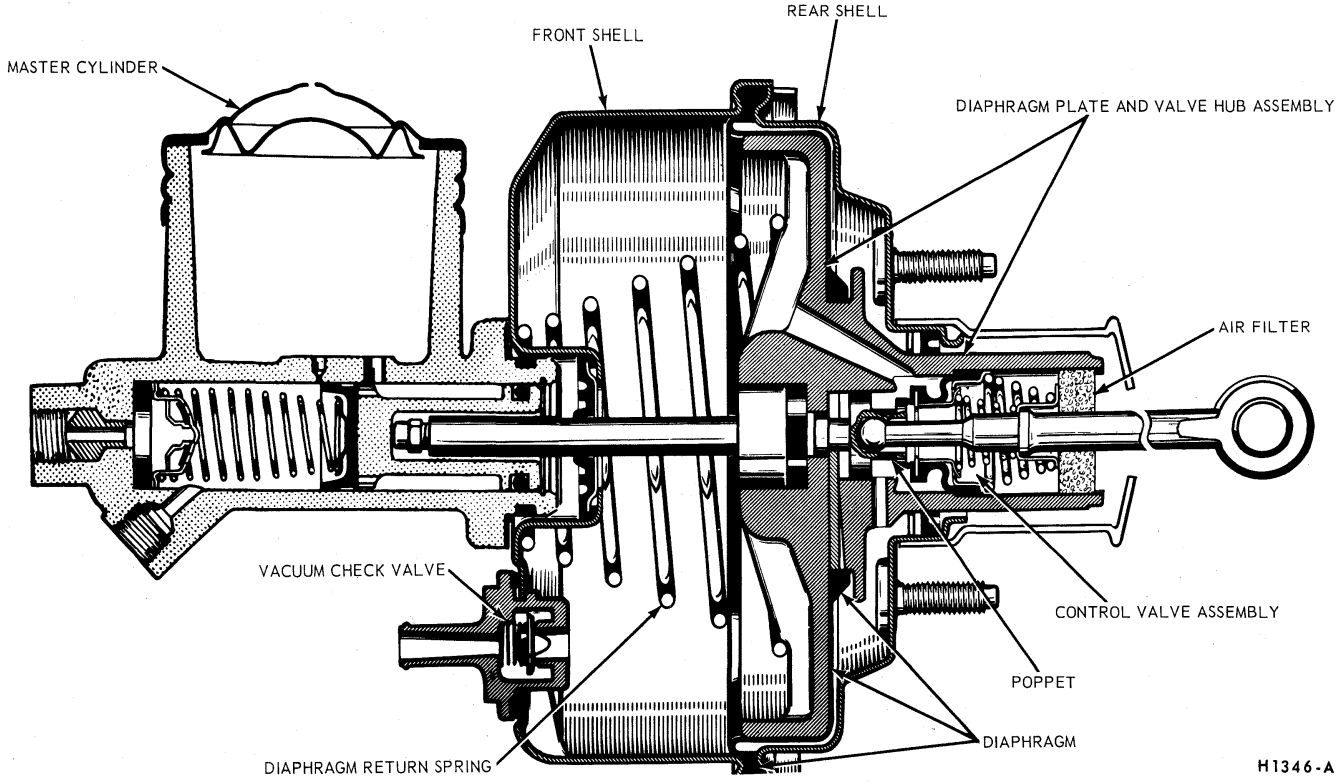

FIG. 2—Cutaway View of Vacuum Booster

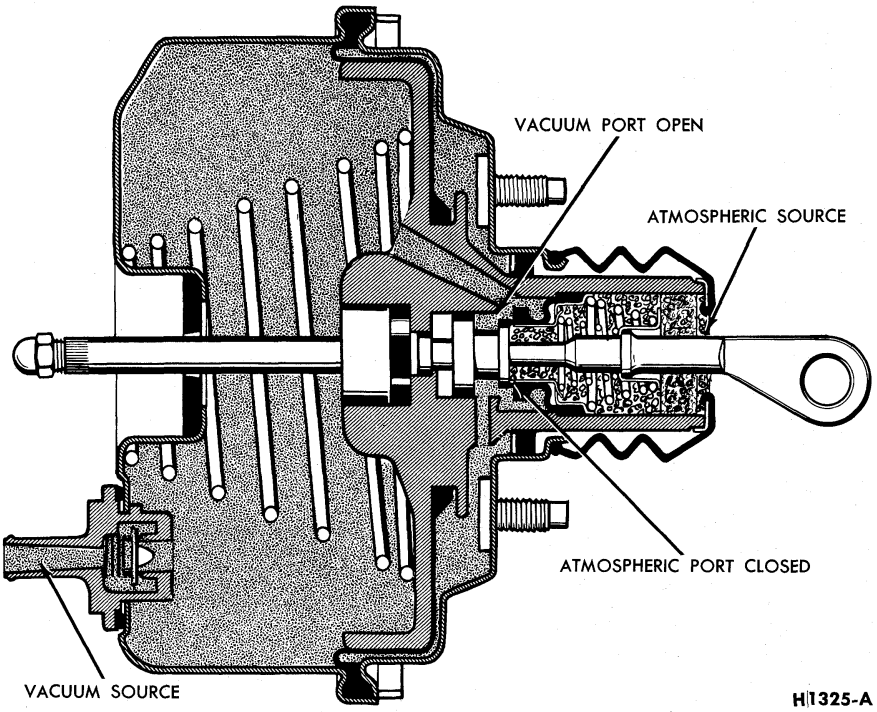

FIG. 3—Booster in Released Position

brake fluid to either return from the brake system to the fluid reservoir or enter the brake system from the fluid reservoir to compensate for any gain or loss in fluid volume.

APPLIED POSITION

When the brakes are applied (Fig. 4), the valve operating rod and valve plunger move forward in the valve hub section of the diaphragm plate to compress the valve return spring and force the poppet valve against the vacuum valve seat in the diaphragm plate to "CLOSE" the vacuum port. Any additional movement of the valve operating rod in the applied direction moves the valve plunger away from the poppet valve to "OPEN" the atmospheric port and admit atmosphere through the air cleaner and passages in the diaphragm plate to the rear side of the power chamber. With vacuum present on the front side of the diaphragm and valve hub and atmospheric pressure present on the rear side of the diaphragm, a force is developed to move the vacuum power diaphragm assembly, hydraulic push rod and master cylinder piston forward to close the compensating port and force hydraulic fluid under pressure through the residual check valve and brake tubes into the brake wheel cylinders. As hydraulic pressure is developed in the brake master cylinder, a counter force (to the rear) acting through the hydraulic push rod, sets up a reaction force against the diaphragm assembly and valve plunger through the rubber reaction disc (located at the end of the hydraulic push rod). The rubber reaction disc acts similar to a column of fluid to distribute the pressure between the vacuum power diaphragm assembly and the valve plunger in proportion to their respective contact areas. The pressure acting against the valve plunger and valve operating rod tends to move the valve plunger slightly to the rear in relation to the diaphragm and valve hub assembly to close off the atmospheric port. The driver is thus assured a "feel" of the brake, since part of the counter force reacts through the valve plunger, valve operating rod, and pedal linkage against the driver's foot. This reaction force is in direct proportion to the hydraulic pressure developed within the brake system.

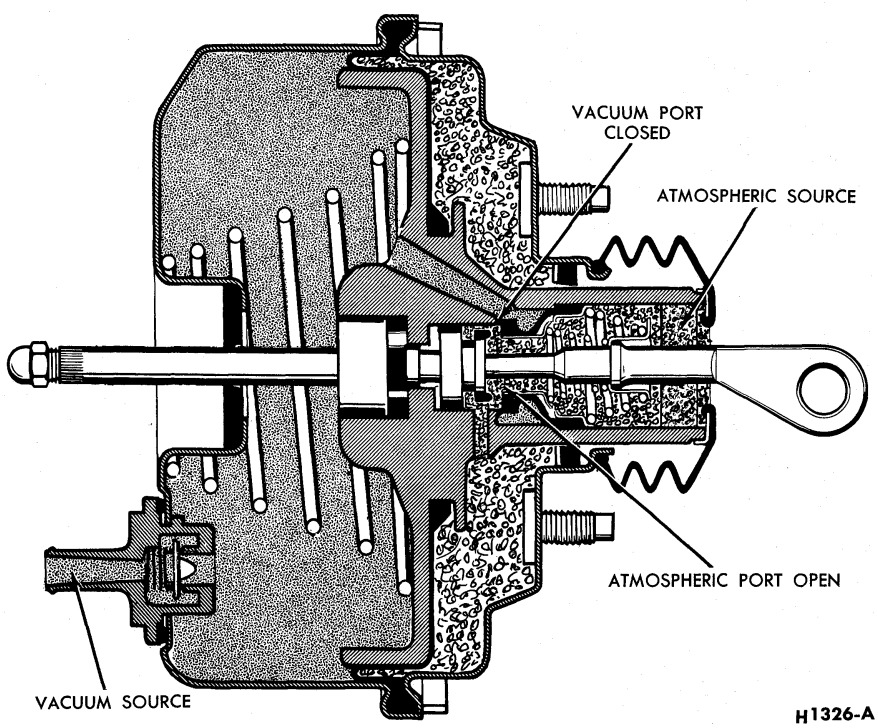

FIG. 4—Booster in Applied Position

HOLDING POSITION

During brake application, the "reaction" force which opposes the force applied by the driver, tends to close the atmospheric port. When both atmospheric and vacuum ports are CLOSED, the booster is said to be in the holding position (Fig. 5). With both valves closed, any degree of brake application attained will be held until either the atmospheric port is **reopened** by an increase in pedal pressure to further increase the brake application or by a decrease in pedal pressure to **reopen** the vacuum port to decrease the brake application. Whenever the pressure applied to the brake pedal is held constant for a moment, the valve returns to its holding position. However, upon reaching the fully applied position the

force applied to the brake pedal overrules the reaction force. In this position the valve plunger and atmospheric valve seat are held away from the valve poppet to admit maximum atmospheric pressure to the rear chamber. With the front chamber open to manifold vacuum, full power application is attained which is referred to as the "run-out" of the power unit. Any increase in hydraulic pressure beyond this point must be supplied by physical effort of the driver.

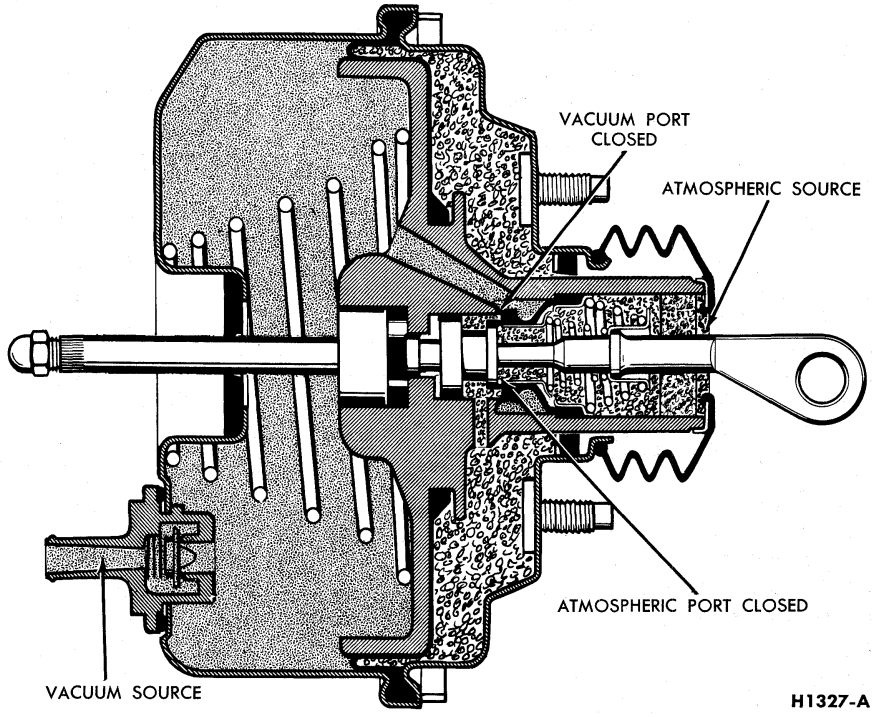

FIG. 5—Booster in Holding Position

NO POWER CONDITION

It should be noted that in case of engine failure and consequent loss of engine vacuum, at least one full power brake application may be made from the vacuum in the booster. With the engine off and no vacuum in the power system, the brakes can be applied in the conventional manner by applying more physical effort to the brake pedal.

FRAME-MOUNTED DIAPHRAGM, AND PISTON TYPE BOOSTER

Each frame-mounted diaphragm-type and piston-type vacuum booster consists of a vacuum chamber, a hydraulically actuated vacuum control valve, and a hydraulic cylinder, all in a single sealed unit. A vacuum check valve, of the spring loaded disc type, is installed in the system adjacent to the vacuum source for maintaining maximum vacuum in the system.

When the brake pedal is pushed down, hydraulic pressure is built up in the system. This initial pressure unseats the check ball in the hydraulic cylinder piston (Fig. 6) and opens the check valve, permitting the pressure to be transmitted to the brake cylinders, where braking action begins.

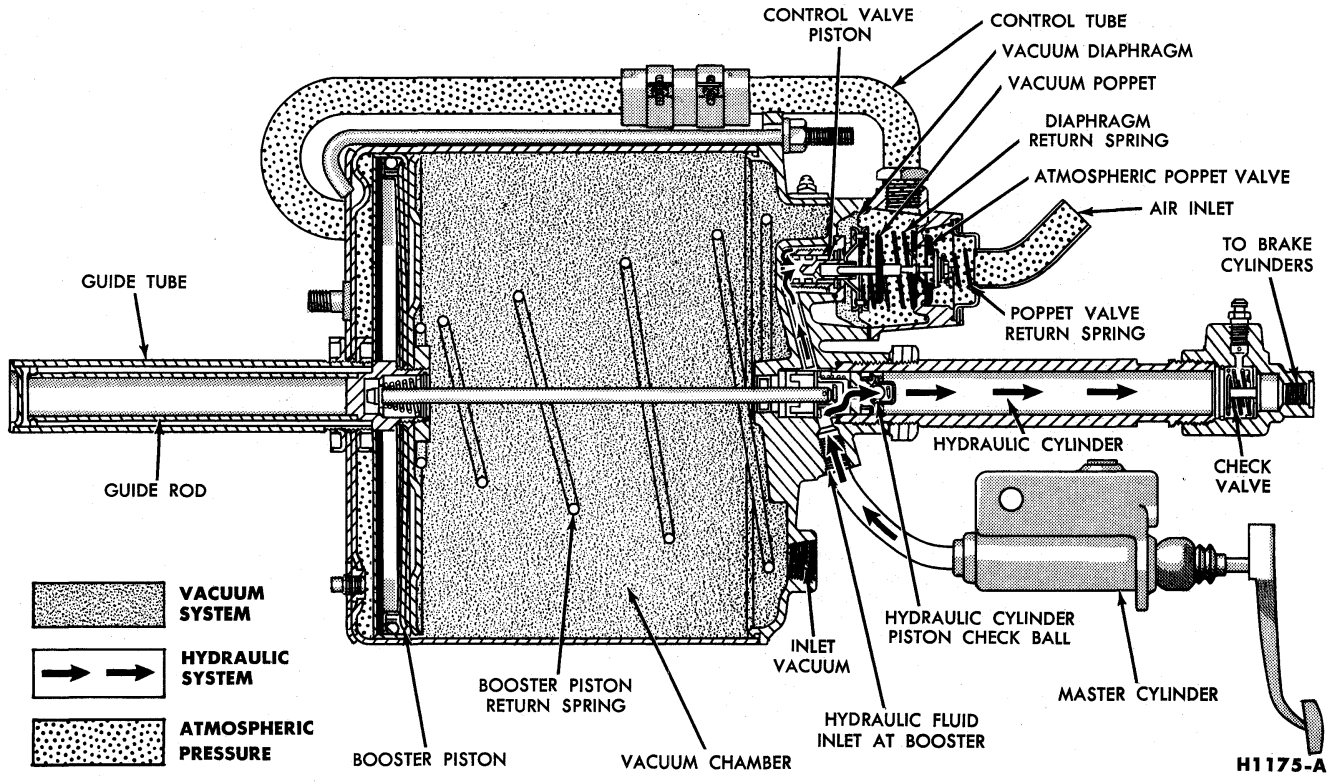

FIG. 6—Typical Frame-Mounted Vacuum Booster Operation—Piston Type

As soon as hydraulic pressure builds up high enough to move the control valve piston against diaphragm return spring pressure, the movement of the piston seats the vacuum poppet at the center of the diaphragm assembly. Further movement of the diaphragm unseats the atmospheric poppet valve, allowing air to pass around the poppet through the control tube and into the booster cylinder to the rear side of the booster piston. The force of air on the booster piston, working with vacuum on the front side of the piston, drives the hydraulic piston forward. The check ball then seats to prevent the return of brake fluid to the master cylinder during brake application.

As the booster piston travels, hydraulic fluid under high pressure is transmitted to the brake cylinders to actuate the brakes. The initial hydraulic pressure is thus multiplied several times.

When the brake pedal is released, hydraulic pressure in the master cylinder and in the control valve piston cavity of the booster decreases. The vacuum diaphragm return spring moves the diaphragm and the control valve piston rearward, permitting spring pressure to seat the atmospheric poppet and unseat the vacuum poppet. The check valve in the hydraulic cylinder closes. As the vacuum poppet opens, air in the booster cylinder is exhausted into the intake manifold of the engine, allowing the booster piston return spring to return the booster and hydraulic cylinder pistons to their released position. As the hydraulic cylinder piston returns, the check ball opens permitting brake fluid to flow through the piston, allowing it to return to its fully released position.

The larger (9½ inch) Bendix piston-type booster has a longer hydraulic piston stroke requiring greater booster piston movement. For this reason, a two-stage atmospheric poppet is used in the control valve chamber. The first-stage atmospheric poppet is used during normal operation of the booster unit and provides a means of smooth initial booster application.

The second-stage atmospheric poppet is used when a fast, hard brake stop is made. Under such conditions, hydraulic pressure moves the control valve piston to the full length of its travel, unseating both the first- and second-stage atmospheric poppets, thus permitting a greater volume of air to enter the booster than that permitted by the smaller first stage poppet.

FRAME-MOUNTED TANDEM PISTON-TYPE BOOSTER

The Bendix (Hydrovac) tandem piston-type booster (Fig. 7) consists of a hydraulically actuated vacuum control valve, a vacuum power cylinder, a fast application valve, and a hydraulic cylinder (slave cylinder). These units are controlled by hydraulic pressure developed in the master cylinder. A vacuum check valve is incorporated in the system for maintaining maximum vacuum in the system. Air is admitted to the booster, through an air inlet hose, at the control valve housing, and through the center plate.

As the brake pedal is depressed, initial hydraulic pressure is transmitted from the master cylinder to the hydraulic cylinder of the booster and through the hydraulic by-pass tube to the control valve piston (Fig. 7). This initial pressure unseats the check ball in the hydraulic piston and opens the check valve, permitting the pressure to be transmitted to the brake cylinders where braking action begins.

As soon as hydraulic pressure builds up sufficiently, it moves the control valve piston, overcoming diaphragm return spring pressure. Continued hydraulic pressure brings the diaphragm against the vacuum valve, seating the vacuum valve on the center portion of the diaphragm. Further movement of the diaphragm unseats the small atmospheric valve admitting an initial volume of air into the booster. The volume of air entering the booster is increased as the large atmospheric valve is unseated

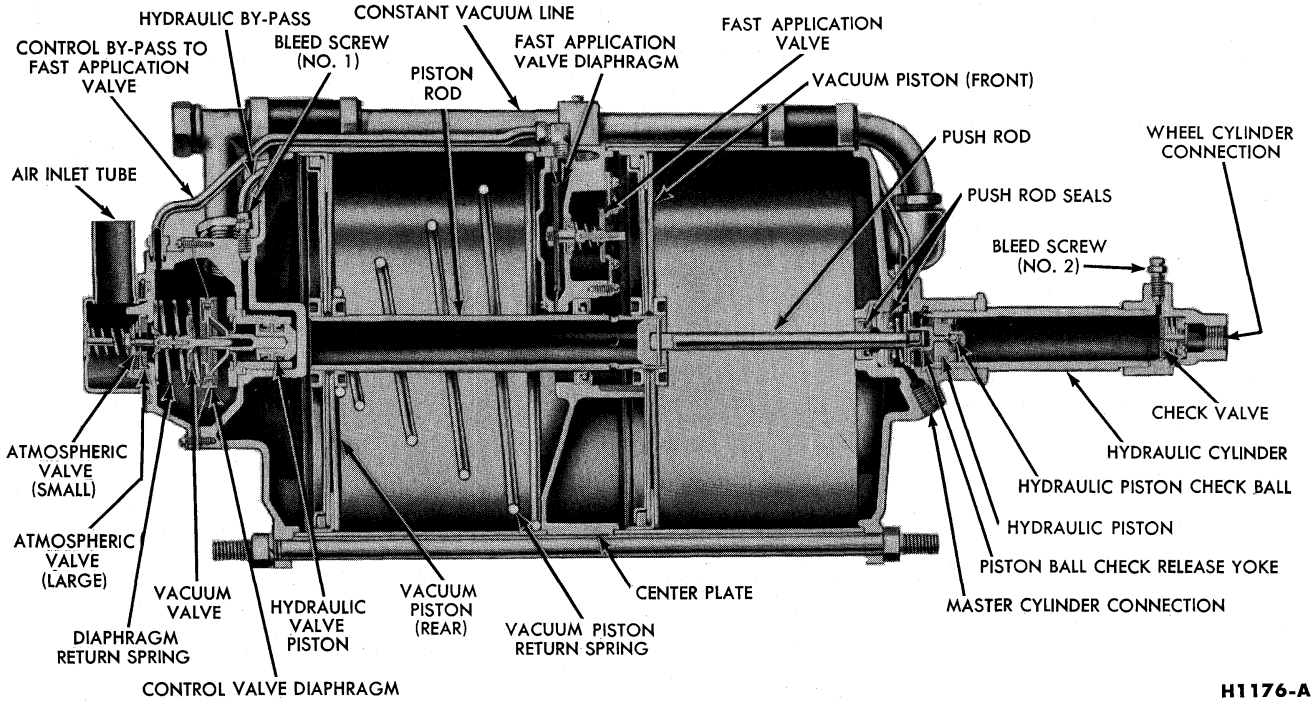

FIG. 7—Frame-Mounted Vacuum Booster Operation—Tandem Piston Type

by additional movement of the control valve diaphragm.

As the air is admitted, it flows through a cavity in the control valve housing to the back side of the rear vacuum piston, through the piston rod, out the four holes in the piston rod to the back side of the front vacuum piston. Air pressure on the back side of both pistons working with vacuum on the front side of both pistons, sets the pistons in motion transmitting their combined force to the hydraulic piston in the hydraulic cylinder, through the push rod.

As the hydraulic piston starts to move, the check ball seats, trapping fluid under pressure ahead of the piston. This initial hydraulic pressure from the master cylinder is multiplied several times.

When the brake pedal is released, hydraulic pressure in the master cylinder, and in the control valve piston cavity of the booster, decreases. The vacuum diaphragm return spring moves the diaphragm and the control valve piston rearward permitting spring pressure to seat the atmospheric valves, and unseat the vacuum valve. The check valve in the hydraulic cylinder closes. As the vacuum valve opens, air in the booster is exhausted into the intake manifold of the engine, allowing the vacuum piston return spring to return the vacuum and hydraulic cylinder pistons to their released position. As the hydraulic cylinder piston returns, the check ball opens permitting brake fluid to flow through the piston, allowing it to return to its fully released position.

Normal operation of the booster is such that both vacuum pistons are set in motion at the same time. However, when a fast, hard brake stop is made, the front vacuum piston may lag behind the rear vacuum piston. A fast application is used to overcome the lag of the front piston by admitting an additional volume of air to the back side of the front piston. Vacuum, from the constant vacuum line, is applied to the back side of the fast application valve diaphragm. The fast application valve is held in a closed position by a spring. When a fast or hard brake stop is made, atmospheric pressure is transmitted through the control by-pass tube to the front side of the fast application valve diaphragm. This causes the diaphragm to move to the left, lifting the valve from its seat and admitting a large volume of air from the air inlet by-pass hose to the back side of the front piston, thus providing the same degree of power to both vacuum pistons.

MIDLAND DIAPHRAGM-TYPE, DASH-MOUNTED BOOSTER

The booster consists of a vacuum chamber, atmospheric valve, control valve plunger assembly, diaphragm and an atmospheric chamber (Figs. 8, 9, and 10).

Atmospheric pressure is present at all times in the atmospheric chamber at the front side of the atmospheric valve. The air intake to the atmospheric chamber is protected by an air filter. The atmospheric chamber is separated from the vacuum chamber by the bellows assembly within the vacuum chamber.

Vacuum is present at all times in that area of the vacuum chamber forward of the diaphragm. Vacuum is supplied through a hose from the intake manifold to the vacuum manifold and check valve assembly on the booster body. With this integral check valve and vacuum chamber, it is possible to obtain several power assisted brake applications with the engine shut off. This arrangement makes a vacuum reservoir unnecessary. For a greater reserve, however, a vacuum reservoir is available as optional equipment on some trucks.

Either vacuum from the forward side of the diaphragm or air from the bellows (atmospheric chamber) can be connected to the rear side of the diaphragm through porting in the control valve hub and the plunger assembly.

APPLIED POSITION

As the brake pedal is depressed, the valve operating rod and valve plunger assembly move forward com-

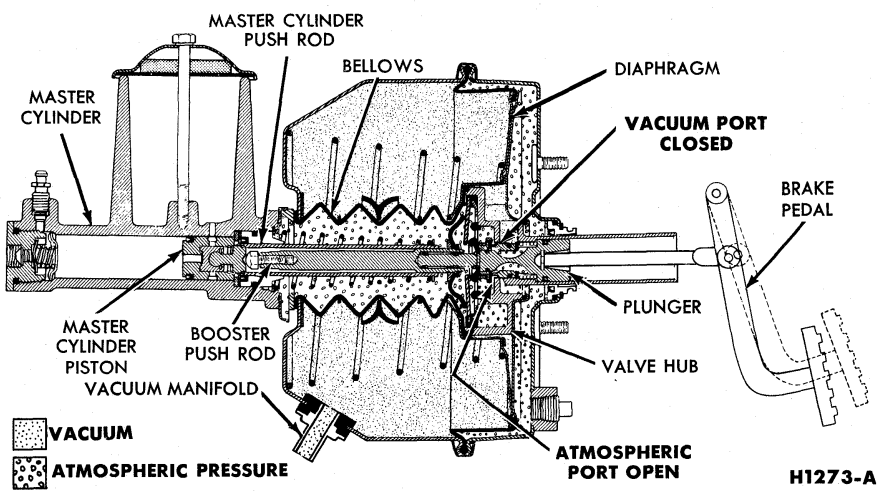

FIG. 8—Booster in Applied Position

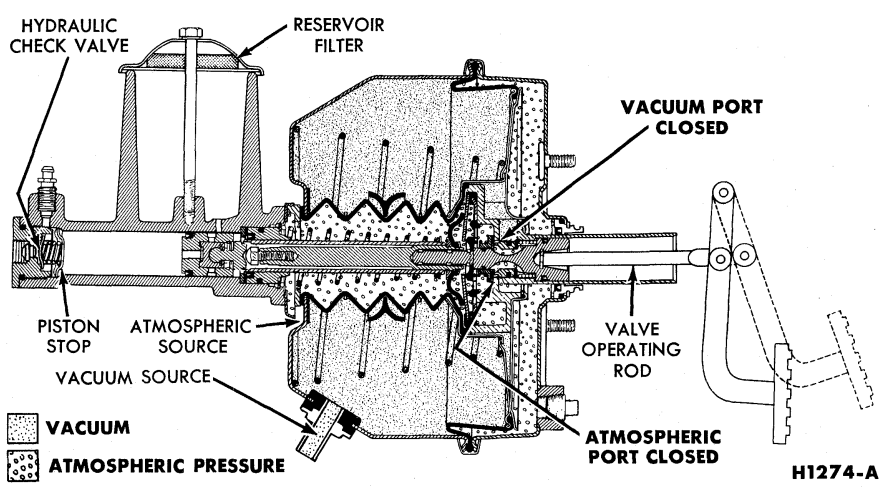

FIG. 9—Booster in Holding Position

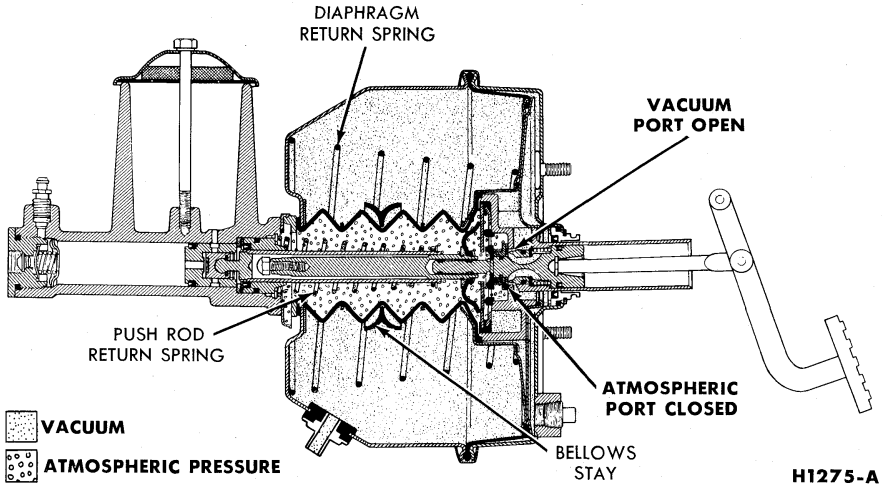

FIG. 10—Booster in Released Position

pressing the plunger return spring (Fig. 8). The initial movement of the plunger closes the porting from the vacuum chamber preventing further evacuation of the area back of the diaphragm. Further movement of the plunger forces the atmospheric valve off its seat so that atmospheric pressure from the bellows can enter the hub porting that leads to the rear side of the diaphragm.

With vacuum on the front side of the diaphragm, and atmospheric pressure on the back side of the diaphragm, a force is developed to move the diaphragm, push rods and master cylinder piston forward to close the compensating port and force hydraulic fluid under pressure through the hydraulic check valve and brake tubes to the wheel brakes.

As hydraulic pressure is developed in the hydraulic system, a reaction counter-force acts against the reaction lever and ring assembly. This reaction lever and ring assembly is designed to transmit the reaction forces back through the actuating control valve assembly to the brake pedal and provide the driver with a resistance that is in proportion to the brake hydraulic apply forces. This is the means of providing the proper "driver feel" to the power brake unit.

HOLDING POSITION

When the forward motion of the brake pedal is stopped and held, the valve operating rod ceases to move the control valve plunger forward. However, the un-balanced forces of atmospheric pressure and vacuum on each side of the diaphragm will continue to move the outer sleeve of the control valve plunger forward keeping the vacuum porting closed. At the same time, the reaction force acting through the reaction ring and lever assembly will tend to move the atmospheric valve to the closed position (Fig. 9). When these combined forces balance, the porting to the vacuum supply will remain closed and the atmospheric valve will cut off any further passage of atmospheric pressure to the area behind the diaphragm. Therefore, the power assist force acting on the master cylinder piston will stabilize and the hydraulic force applying the brakes will be maintained at a constant level.

RELEASED POSITION

When the pedal presure is released from the valve operating rod and plunger assembly, the plunger return spring moves the plunger away from the atmospheric valve allowing the valve to seat against the hub (Fig. 10). This seating of the valve closes off the bellows chamber from the hub porting that connects to the rear side of the diaphragm. At the same time, the rearward movement of the plunger opens the porting from the vacuum chamber and draws out the air from the rear side of the power diaphragm.

With vacuum on both sides of the diaphragm, the assist force against the master cylinder push rod is eliminated. The brake shoe retracting springs will, therefore, cause the hydraulic fluid to return the master cylinder piston, push rods, control valve plunger assembly and the diaphragm to the released position.

With the piston and push rods in the released position, the hydraulic compensating port in the master cylinder is open. The open port permits fluid either to return from the brake system to the fluid reservoir, or enter the brake system from the reservoir.

2 IN-TRUCK ADJUSTMENTS AND REPAIRS

DASH-MOUNTED BOOSTER PUSH ROD ADJUSTMENT

The push rod is provided with an adjustment screw to maintain the correct relationship between the booster control valve plunger and the master cylinder piston. Failure to maintain this relationship will prevent the master cylinder piston from completely releasing hydraulic pressure and can cause the brakes to drag. Remove the master cylinder for access to the booster push rod.

To check the adjustment of the screw, fabricate a gauge of the dimensions shown in Figs. 11 or 12. Then place the gauge against the master cylinder mounting surface of the booster body as shown in Figs. 13 or 14. The push rod screw should be adjusted so that the end of the screw just touches the inner edge of the slot in the gauge.

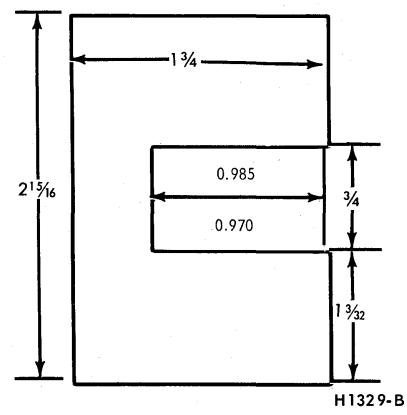

FIG. 11—Push Rod Gauge Dimensions Bendix Booster—F-100 and F-250

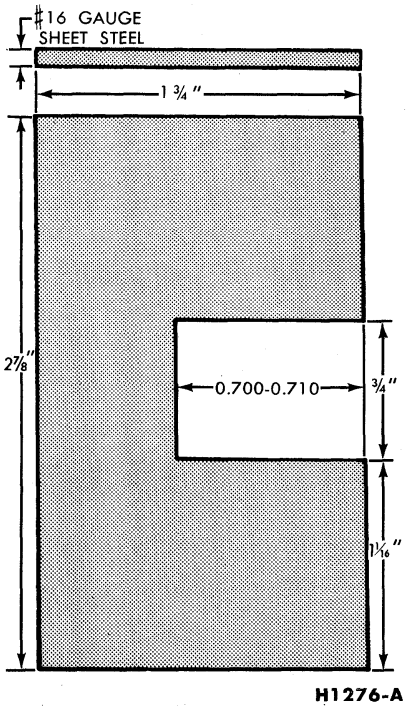

FIG. 12—Push Rod Gauge Dimensions

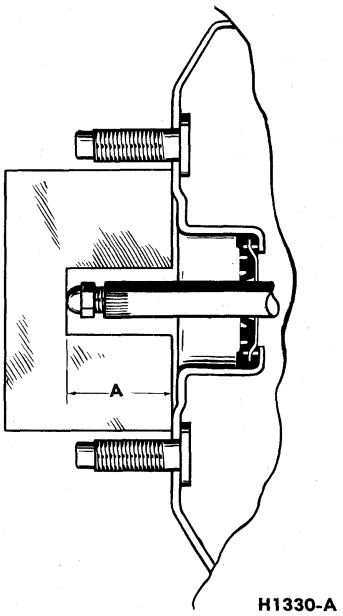

FIG. 13—Push Rod Adjustment —Midland Booster

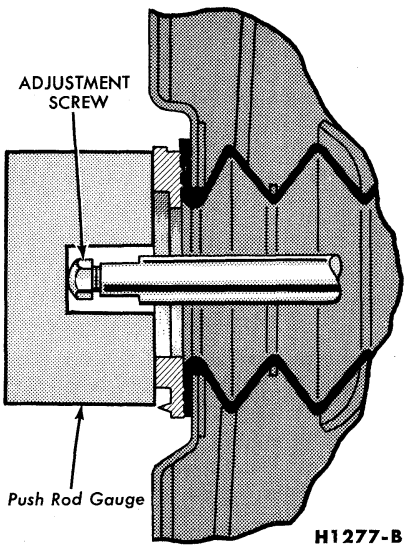

FIG. 14—Push Rod Adjustment

3 REMOVAL AND INSTALLATION

BENDIX DIAPHRAGM-TYPE, DASH-MOUNTED BOOSTER—F-100 AND 250

REMOVAL

1. Support the master cylinder with a prop from the underside.
2. Remove the master cylinder-to-booster retaining nuts.
3. Loosen the clamp that secures the manifold vacuum hose to the booster, and then remove the hose.
4. Pull the master cylinder off the booster and leave it supported by the prop far enough away to allow removal of the booster assembly.
5. From inside the cab, remove the attaching bolt, nut and plastic bushings and disconnect the valve rod from the brake pedal. Remove the nuts that retain the booster mounting bracket to the dash panel.
6. Remove the booster assembly from the engine compartment.

INSTALLATION

1. Mount the booster and bracket assembly to the engine side of the dash panel by sliding the bracket mounting bolts and valve operating rod in through the holes in the dash panel.
2. From inside the cab, install the booster mounting bracket-to-dash panel retaining nuts.
3. Position the master cylinder to the booster assembly, install the retaining nuts and remove the prop from underneath the master cylinder.
4. Connect the manifold vacuum hose to the booster and secure with the clamp.
5. From inside the cab connect the booster valve operating rod to the brake pedal with the attaching bolt, nut and plastic bushings.
6. Start the engine and check the operation of the brake system.

BENDIX DIAPHRAGM-TYPE, FRAME-MOUNTED BOOSTER

REMOVAL

1. Depress the brake pedal several times to remove all vacuum from the system.
2. Loosen the booster air inlet tube clamp, and remove the tube.
3. Disconnect the hydraulic lines and vacuum hose from the booster.
4. Remove the booster mounting bolts, and remove the booster from the bracket.

INSTALLATION

1. Position the booster on the mounting bracket. Then, install the mounting bolts using new lockwashers.
2. Connect the hydraulic lines. Tighten the connections securely.
3. Connect the air inlet tube to the booster. Tighten the hose clamp securely.
4. Bleed the brake system as outlined under "Hydraulic System Bleeding," Part 2-2.
5. Connect the vacuum tube to booster hose to the booster. Tighten the hose clamps securely.
6. Perform the checks and tests as outlined in Part 2-1.

MIDLAND DIAPHRAGM-TYPE, DASH-MOUNTED BOOSTER

REMOVAL

1. Support the master cylinder with a prop from the underside.

2. Remove the master cylinder-to-booster retaining nuts.

3. Remove the clip that retains the master cylinder outlet line to the bracket on the dash panel.

4. Loosen the clamp that secures the manifold vacuum hose to the booster and remove the hose. Remove the reservoir hose from the booster unit, if so equipped.

5. Pull the master cylinder off the booster, and leave it supported by the prop far enough away to allow removal of the booster assembly.

6. From inside the cab, remove the eccentric bolt and lock nut that secure the booster valve operating rod to the brake pedal. Remove the nuts that retain the booster mounting bracket to the dash panel.

7. Remove the booster assembly from the engine compartment.

INSTALLATION

1. Mount the booster and bracket assembly to the engine side of the dash panel by sliding the bracket mounting studs and the valve operating rod in through the holes in the dash panel.

2. From inside the cab, install the booster mounting bracket-to-dash panel retaining nuts.

3. Position the master cylinder to the booster assembly, install the retaining nuts, and remove the prop.

4. Position the master cylinder outlet line to the bracket on the dash panel, and install the retaining clip.

5. Connect the manifold vacuum hose to the booster and secure with the clamp. Connect the reservoir hose to the booster, if so equipped.

6. From inside the cab, connect the booster valve operating rod to the brake pedal with the eccentric bolt and lock nut. Adjust the brake pedal free travel as described in Part 2-2.

7. Start the engine and check the operation of the brake system.

MIDLAND DIAPHRAGM-TYPE, FRAME-MOUNTED BOOSTER

REMOVAL

1. With the engine stopped, depress the brake pedal several times to remove all vacuum from the booster system.

2. Disconnect the 2 hydraulic lines and vacuum hose from the booster.

3. Loosen the air breather hose clamp and disconnect the hose from the booster.

4. Remove the 3 mounting bolts and lock washers and remove the booster.

Do not remove the breather or the vacuum check valve unless operating conditions indicate repairs are necessary.

INSTALLATION

1. Position the brake booster on the mounting bracket, and install the mounting bolts, using new lockwashers.

2. Connect the hydraulic lines to the booster. Tighten connections securely.

3. Attach the air intake hose to the control valve air inlet fitting, and tighten the clamp securely. If necessary, clean the air inlet element.

4. Bleed the brake system as outlined under "Hydraulic System Bleeding," Part 2-2.

5. Connect the vacuum hose to the vacuum check valve (or tube) on the booster. Tighten the clamps securely.

6. Perform the checks and tests as outlined in Part 2-1.

BENDIX (HYDROVAC) BOOSTER PISTON TYPE

REMOVAL

1. Depress the brake pedal several times to remove all vacuum from the system.

2. Loosen the booster air inlet tube clamp, and remove the tube. Disconnect the hydraulic lines and the vacuum hose at the booster.

3. Remove the booster mounting bolts, then remove the booster. **Do not remove the breather or the vacuum check valve unless operating conditions indicate repairs are necessary.**

INSTALLATION

1. Position the booster on the mounting bracket, and install the mounting bolts, using new lockwashers.

2. Connect the hydraulic lines to the booster. Tighten connections securely.

3. Connect the air intake hose to the control valve air inlet tube. Tighten the hose clamp securely. If necessary, clean the air inlet element.

4. Bleed the brake system as outlined under "Hydraulic System Bleeding," Part 2-2.

5. Connect the vacuum tube to booster hose to the booster. Tighten the hose clamps securely.

6. Perform the checks and tests as outlined in Part 2-1.

BENDIX (HYDROVAC) BOOSTER TANDEM PISTON TYPE

REMOVAL

1. Depress the brake pedal several times to remove all vacuum from the system.

2. Loosen the air inlet hose clamp at the center plate and air inlet tube, and disconnect the hose from the booster.

3. Disconnect the master cylinder and brake cylinder to booster hydraulic lines from the booster.

4. Loosen the vacuum line to booster hose clamps at the booster, and disconnect the line.

5. Remove the booster to mounting bracket bolts, and remove the booster.

INSTALLATION

1. Position the assembly on the mounting brackets, and install the attaching bolts. Tighten the bolts firmly.

2. Connect the master cylinder hydraulic line to the front end plate. Connect the brake cylinder hydraulic line to the hydraulic cylinder end cap.

3. Attach the air inlet hose to the control valve air inlet fitting, and check and tighten all connections.

4. Bleed the brake system as outlined under "Hydraulic System Bleeding," Part 2-2.

5. Attach the vacuum hose to the booster, then tighten the clamp securely.

6. Perform the checks and tests as outlined in Part 2-1.

4 MAJOR REPAIR OPERATIONS

BENDIX DIAPHRAGM-TYPE, DASH-MOUNTED BOOSTER— F-100 AND 250

DISASSEMBLY

1. Remove the retaining nuts and lock washers and remove the mounting brackets from the rear shell (Fig. 15).

2. Slide the plastic dust shield off the valve hub.

3. Pull the hydraulic push rod and front seal (Fig. 16) from the front shell.

4. Scribe an index mark across the front and rear shells.

5. Place the booster in a vise as shown in Fig. 17. Press downward on the rear shell and at the same time, turn it counterclockwise with a flat bar to release it from the front shell. Release the pressure on the rear shell slowly to prevent the diaphragm plate return spring from flying out.

6. Separate the two shells and remove the return spring.

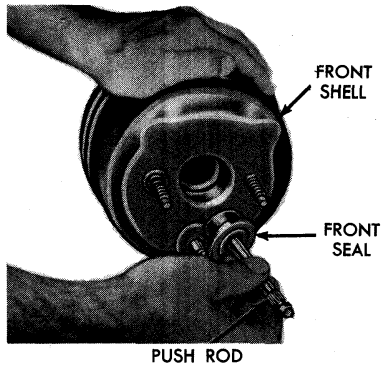

FIG. 16—Removing Front Seal and Push Rod

7. Withdraw the diaphragm plate and diaphragm from the rear shell.

8. Remove the diaphragm from the diaphragm plate as shown in Fig. 18.

9. Pry the filter retainer off the diaphragm plate being careful not to chip or damage the plate.

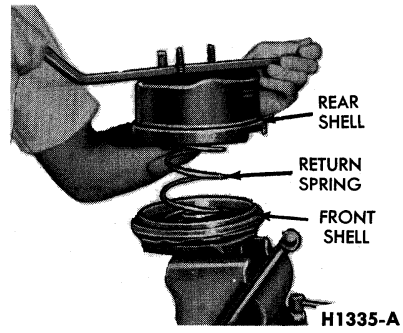

FIG. 17—Separating Booster Shells

10. Hold the diaphragm plate so that the valve retainer is facing downward. Press the valve push rod inward to release the tension on the retainer and allow it to drop out of the plate (Fig. 19).

11. Withdraw the valve and rod from the plate.

12. Press the reaction disc out of the diaphragm plate.

13. Drive the seal out of the rear

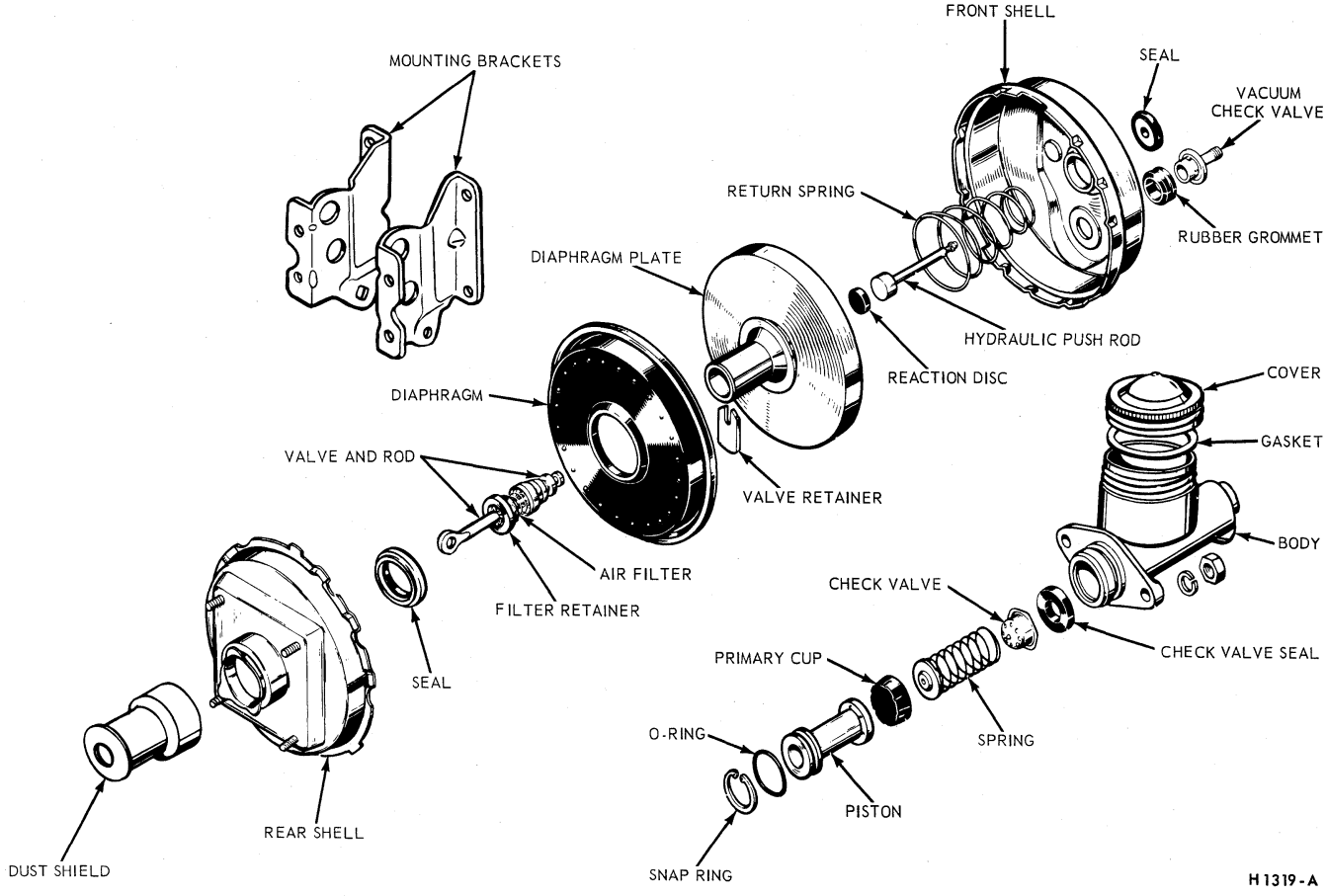

FIG. 15—Bendix Dash-Mounted Booster Disassembled

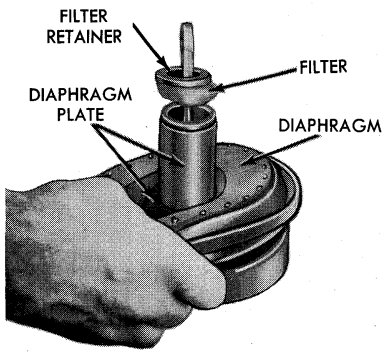

FIG. 18—Removing Diaphragm

shell with a punch or screwdriver (Fig. 15). Discard the seal.

14. Working from the inside of the front shell, cut the bead off the check valve grommet. Remove the check valve.

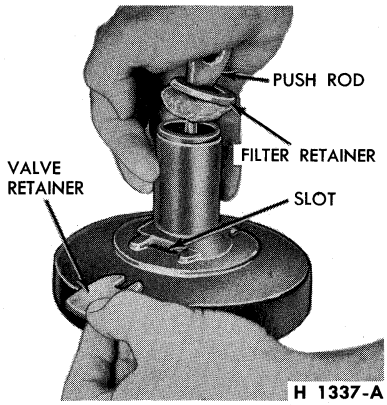

FIG. 19—Removing Valve Retainer

ASSEMBLY

1. Place the rear shell on two wood blocks as shown in Fig. 20. Press a new seal, plastic side first, into the recess on the inside of the shell to a depth of ¼ inch.

2. Dip a new check valve grommet (Fig. 15) in alcohol and install it in the front shell making sure that the beveled edge is toward the inside. Make sure that the grommet is seated. Dip the shoulder of the check valve in alcohol and install it in the grommet. Press check valve into grommet until the flange contacts the grommet.

3. Apply silicone grease to the outer surface of the diaphragm plate hub and to the bearing and rubber surfaces of the valve.

4. Insert the valve and rod into the hub of the diaphragm plate. Push the rod inward until the retaining groove is aligned with the slot, and then slide the retainer into the groove (Fig. 19).

5. Tuck the filter into place in the plate hub. Press the filter retainer onto the hub being careful not to chip or damage the plastic (Fig. 18).

6. Install the diaphragm on the diaphragm plate, making sure that the diaphragm lip is tucked in all around the recess between the hub and plate (Fig. 19).

7. Place the rear shell in a vise. Apply silicone lubricant generously to the top outer flange of the shell. Apply silicone grease to the seal in the rear shell.

8. Carefully guide the valve rod and diaphragm plate hub through the seal in the rear shell.

9. Center the large end of the return spring on the diaphragm plate.

10. Align the index mark on the front shell with the one on the rear shell. Place a flat bar on the front shell and compress the spring until the tangs on the rear shell contact the notched sections of the front shell, and then rotate it clockwise to lock it in place.

11. Apply lubricant sparingly to the stem of the hydraulic push rod keeping it away from the adjusting screw area. Apply silicone grease liberally to the piston area of the push rod and to the reaction disc.

12. Center the reaction disc on the push rod piston. Guide the disc and push rod into the base of the diaphragm plate, and press the rod inward until the disc is bottomed (Fig. 21).

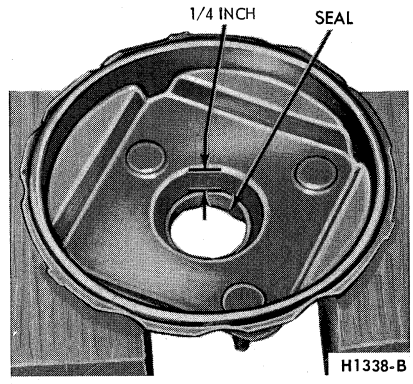

FIG. 20—Installing Rear Shell Seal

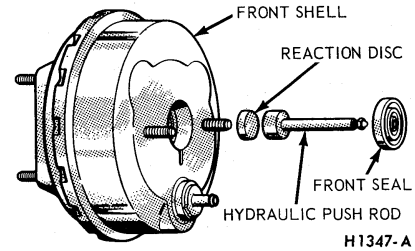

FIG. 21—Installing Reaction Disc, Push Rod, and Front Seal

13. Press a new front seal into the front shell until it bottoms in the recess (Fig. 21).

14. Install the plastic dust shield over the push rod and against the rear shell (Fig. 15).

15. Position the two mounting brackets on the rear shell studs, and install the retaining nuts and lockwashers (Fig. 15).

BENDIX (HYDROVAC) BOOSTER DIAPHRAGM-TYPE—FRAME-MOUNTED

DISASSEMBLY

1. Loosen the check nut (Fig. 22), screw the hydraulic cylinder from the end plate, and remove the hydraulic piston cup, hydraulic piston, and return spring.

2. Mount the end cap in a vise, loosen the hydraulic cylinder, and remove the hydraulic cylinder and seal from the end cap. Remove the 2 snap rings, spring retainer, washer, spring and check valve (Fig. 22). **A check valve is mounted in the end cap on the truck equipped with this booster. Therefore, a check valve is not used in the master cylinder.**

3. Scribe a line across the 2 halves of the diaphragm chamber and also across the end plate and control valve housing.

4. Loosen the hose clamps on the control tube, and slide the hose toward the control valve housing. Loosen the tube nut on the control valve and turn the tube away from the diaphragm chamber.

5. Remove the nuts and lockwashers from the end plate. Separate the end plate from the power chamber. Remove the return spring.

6. Remove the snap ring, guide bearing, tube seal, push rod seal, and stop washer from the end plate (Fig. 22).

7. Remove the air inlet tube lock ring and remove the tube, gasket,

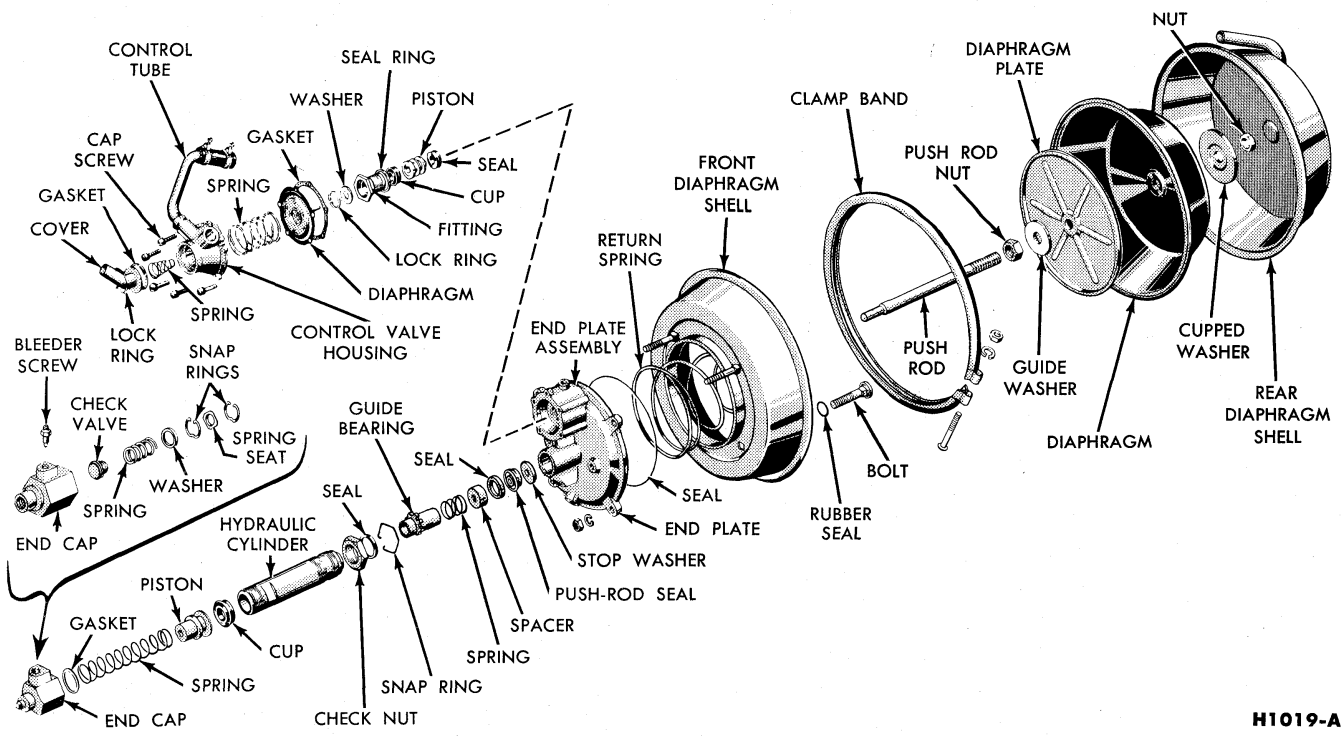

FIG. 22—Disassembled Bendix Hydrovac Booster

and spring from the control valve housing (Fig. 22).

8. Remove the 5 control valve housing mounting screws, and remove the housing, return spring, diaphragm, and gasket from the end plate.

9. Remove the control valve piston fitting lock ring and washer. Remove the fitting, and press out the control valve piston.

10. Remove the cup and seal from the piston. Remove the seal from the fitting.

11. Remove the nut, lock washer, and bolt from the clamp band, and remove the clamp band (Fig. 22). Separate the front and rear diaphragm shells. If the diaphragm is to be disassembled, secure the rear push rod nut in a vise. Remove the nut, cupped washer, diaphragm, diaphragm plate, and guide washer.

ASSEMBLY

1. If the push rod and diaphragm were disassembled, thread the push rod nut on the rod to the limit of the thread (Fig. 22). The flat side of the nut should face the diaphragm. Position the guide washer and diaphragm plate on the push rod. Position the diaphragm and cupped washer with the concave side of the washer next to the diaphragm. Install the nut, and stake the nut in place.

2. If the front diaphragm shell bolts were removed, install the bolts using new rubber seals (Fig. 22). Stake the bolts to the shell. Place the rear shell on the bench. Position the push rod and diaphragm assembly on the shell. Install the front shell and align the front and rear shells to the scribed mark and to the bead on the diaphragm. Install the clamp band over the rim of the two shells and tighten securely.

3. Dip the control valve piston cup and seal in brake fluid, and position the cup with the lip away from the hole end of the piston (Fig. 22). Position the seal on the piston with the lip flare opposite that of the cup flare.

4. Insert the piston into the fitting. Place the seal on the fitting, then install the fitting on the end plate. Install the washer and lock ring.

5. Position the gasket, diaphragm, and spring on the end plate.

6. Position the control valve housing over the spring. Align the scribed marks on the control valve housing and end plate, and install the cap screws. Tighten the screws securely.

7. Position the spring in the valve housing with the small end toward the valve housing. Install the gasket, cover and lock ring.

8. Install a new ring seal in the groove of the end plate (Fig. 22).

9. Place the small end of the return spring over the guide washer of the diaphragm.

10. Position the end plate over the return spring, and align the scribed marks located on the end plate and diaphragm chamber. Install the nuts and lock washers, and tighten the nuts uniformly.

11. Slide the hose over the control tube, then tighten the hose clamps.

12. Install the check valve, spring, washer, snap ring, spring retainer, and second snap ring in the end cap.

13. Install the lock nut and a new seal on the hydraulic cylinder.

14. Dip the piston cup in brake fluid, and position the cup on the piston with the lip of the cup toward the small diameter end of the piston.

15. Position the return spring over the small end of the piston. Insert the spring and piston into the hydraulic cylinder.

16. Install the stop washer with the chamfered edge toward the diaphragm. Install the push rod seal with the flared edge toward the hydraulic cylinder, the spacer with the chamfered edge toward the seal, the spring, and the guide bearing with the serrated end outward. Install the

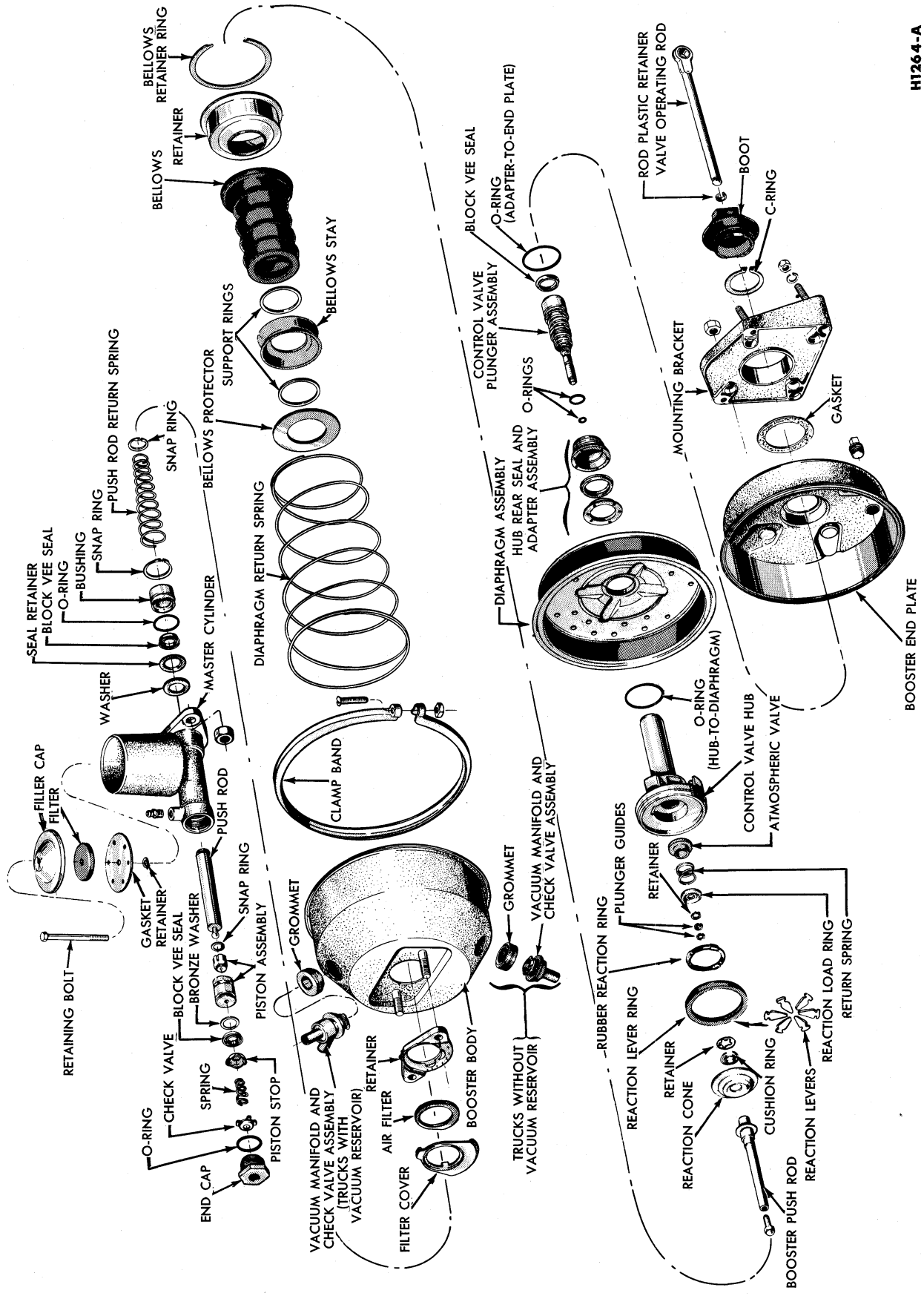

FIG. 23—Dash-Mounted Booster Disassembled

snap ring and a new seal in the end plate.

17. Screw the cylinder into the end plate, align the bleeder screw on the end cap with the bleeder screw on the end plate, then tighten the lock nut.

18. Position a new copper washer in the end cap on the check nut and screw the hydraulic cylinder into the end cap. Tighten the cylinder securely.

MIDLAND (DASH-MOUNTED) BOOSTER, DIAPHRAGM-TYPE

DISASSEMBLY

1. Remove the air filter cover, air filter, and retainer assembly from the booster body (Fig. 23).

2. Remove the vacuum manifold and check valve assembly, and the rubber grommet from the booster body.

3. Remove the rubber boot from the mounting bracket and valve operating rod.

4. Remove the retaining nuts, and disassemble the mounting bracket from the booster end plate. Remove the gasket from the end plate.

5. Remove the large C-ring that retains the rear seal adapter assembly to the booster end plate (Fig. 23).

6. Disengage the bellows from the booster body by pushing the bellows into the vacuum chamber (Fig. 24).

7. Scribe a line across the booster body and end plate to facilitate proper alignment at assembly. Remove the bolt and nut from the clamp band, remove the clamp band, and separate the end plate from the booster body. Remove the diaphragm return spring.

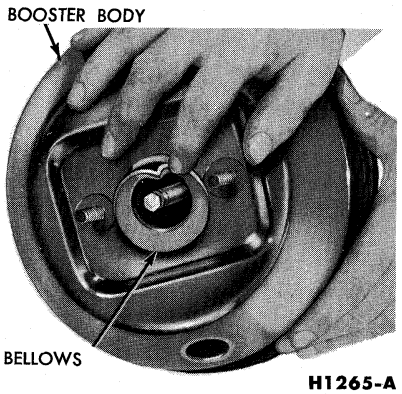

FIG. 24—Bellows-to-Booster Body Engagement

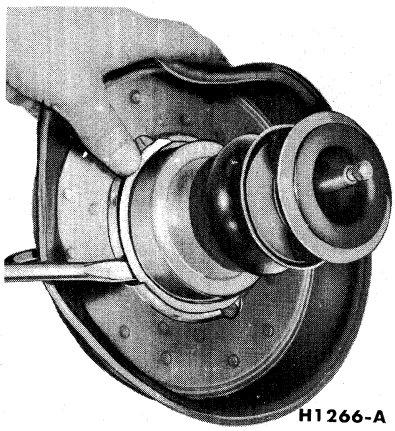

FIG. 25—Bellows Removal or Installation

8. Separate the bellows, control valve, and diaphragm assembly from the end plate. Remove the O-ring that fits between the hub rear seal adapter assembly and the end plate (Fig. 23).

9. Remove the large bellows retainer ring and the bellows assembly from the diaphragm and valve assembly (Fig. 25).

10. Remove the retainer, support rings, bellows stay, and protector from the bellows (Fig. 23).

11. Remove the booster push rod assembly, the reaction lever and ring assembly, and the rubber reaction ring from the control valve hub (Fig. 26). Remove the two plastic plunger guides from the control valve plunger.

12. Remove the retainer, the cushion ring, and the reaction cone from the booster push rod, then disassemble the levers from the reaction ring (Figs. 26 and 23).

13. Remove the hub rear seal and adapter assembly from the rear of the control valve hub, then separate the hub and plunger assembly from the diaphragm. Remove the retainer, the reaction load ring, the return spring, and the atmospheric valve from the hub and plunger, then slide the plunger out of the hub (Fig. 27). Remove the O-ring from the front side of the diaphragm. Remove the hub rear seal from the adapter assembly.

14. Remove the O-rings and the "Block Vee" type seal from the valve plunger (Fig. 28).

15. Do not remove the valve operating rod from the control valve plunger unless the plunger assembly or the rod is to be replaced. To remove, hold the rod firmly and force the plunger off the rod, breaking the plastic retainer. Remove all the broken pieces of the plastic retainer from the groove in the plunger, if the plunger is to be used again with a replacement rod.

ASSEMBLY

1. If the valve operating rod was removed from the plunger, assemble a new plastic retainer to the end of the rod (Fig. 23). Insert the rod into the plunger so that the retainer engages the groove in the plunger.

2. Install the "Block Vee" type seal and the O-rings on the valve plunger assembly (Fig. 28).

3. Insert the control valve plunger into the control valve hub from the rear of the hub (Fig. 27).

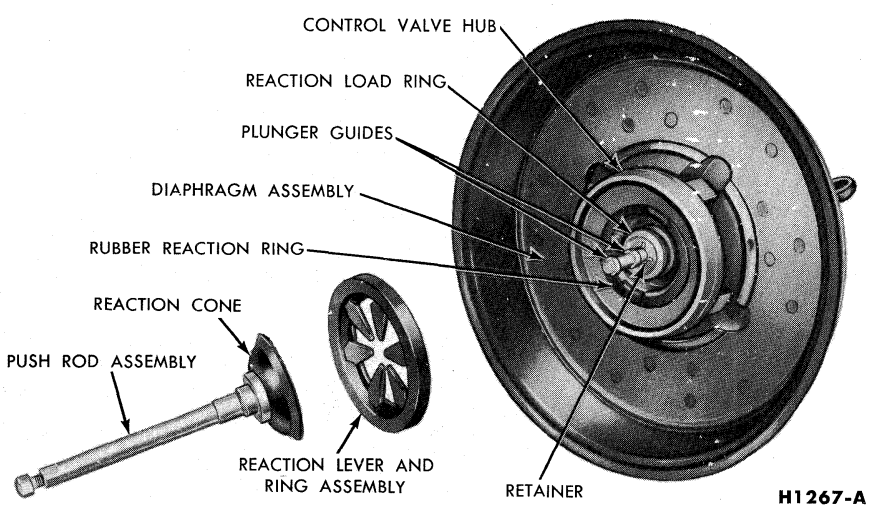

FIG. 26—Disassembly or Assembly—Reaction Components and Push Rod-to-Valve Hub

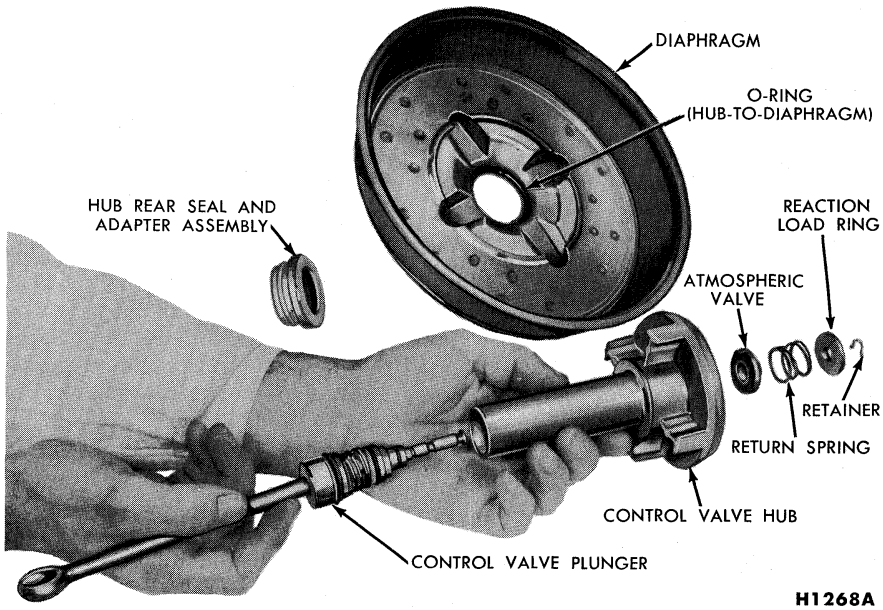

FIG. 27—Disassembly or Assembly—Control Valve Components-to-Hub and Diaphragm

4. Assemble the atmospheric valve, the return spring, and the reaction load ring to the valve plunger and hub.

5. Push the control valve plunger assembly forward and the reaction load ring backward against the return spring in order to install the retainer in the groove of the plunger.

6. Install the O-ring in the groove at the front side of the diaphragm. Assemble the valve plunger and hub assembly to the diaphragm so that the operating rod and the small-diameter end of the hub enter the front side of the diaphragm and protrude from the rear side.

7. Install the "Block Vee" type seal in the hub rear seal adapter, with the sealing lip toward the rear. Slide the seal and adapter assembly over the rear end of the valve hub so that the large-diameter side of the adapter bears against the diaphragm.

8. Install the two plastic plunger guides in their grooves on the valve plunger assembly (Fig. 26).

9. Install the rubber reaction ring in the valve hub so that the ring locating knob indexes in the notch in the hub, with the ring tips toward the front (Fig. 26).

10. Assemble the reaction lever and ring assembly, then install the assembly in the valve hub (Fig. 26).

11. Assemble the reaction cone and cushion ring to the push rod, and secure to the rod with the retainer (Fig. 23). Install the push rod assembly to the valve hub so that the valve plunger indexes in the push rod (Fig. 26).

12. Assemble the bellows retainer to the rear fold of the bellows. Install the bellows stay and the two support rings. The plastic stay is located in the center fold of the bellows with a support ring in the fold at each side of the stay (Fig. 23). Assemble the bellows protector to the front fold.

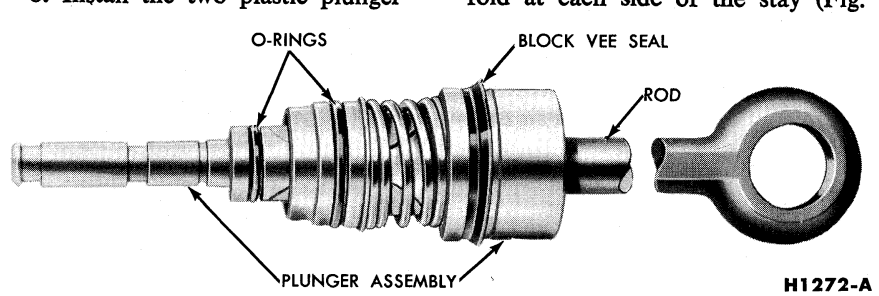

FIG. 28—Valve Operating Rod and Plunger Assembly

13. Position the bellows assembly over the push rod against the front side of the diaphragm. Secure the bellows to the diaphragm by installing the retainer ring (Fig. 25). **Make sure that the retainer ring is fully seated.**

14. Install the O-ring in the groove at the front side of the end plate. Assemble the bellows, control valve, and diaphragm assembly to the end plate by inserting the valve hub through the front side of the end plate with the small-diameter side of the seal adapter protruding from the rear side of the end plate (Fig. 23).

15. Install the large C-ring to the rear seal adapter at the rear side of the end plate.

16. Install the diaphragm return spring in the booster body, and assemble the end plate to the booster body so that the marks scribed during disassembly are in alignment. **Be sure that the lip of the diaphragm is evenly positioned between the retaining flanges of the booster body and end plate.** Secure the booster body, diaphragm, and end plate together with the clamp band, and tighten the clamp bolt and nut.

17. Pull the front lip of the bellows through the booster body and position it around the outer face of the booster body (Fig. 24).

18. Place the gasket on the end plate, slide the mounting bracket over the end plate studs, and install the retaining nuts (Fig. 23).

19. Slide the rubber boot over the valve operating rod and engage the boot with the groove on the mounting bracket.

20. Install the rubber grommet in the vacuum port in the booster body. The large-diameter side of the grommet should be to the outside of the booster. Force the vacuum manifold and check valve assembly through the grommet. **Do not push the grommet into the vacuum chamber.**

21. Install the air filter cover, filter, and retainer assembly to the booster body.

22. Check the booster push rod adjustment as described in Section 2.

MIDLAND (HY-POWER) BOOSTER DIAPHRAGM-TYPE —FRAME-MOUNTED

DISASSEMBLY

1. Remove the by-pass tube from both the control valve body and the rear body (Fig. 29).

2. Mark both halves of the diaphragm body with a scriber. Mark the flanges of the control valve body and the slave cylinder body so the parts can be assembled in their original positions.

3. Carefully remove the body clamp. Then, remove the rear body and the diaphragm with the return spring.

4. Remove the push rod, spring retainer and collar from the coils of the return spring.

5. Remove the valve body cover and gasket. Scribe a line on the side of the valve body cover and valve body.

6. Remove the valve body, spring, and the piston and diaphragm assembly from the slave cylinder body.

7. Remove the end plug, copper gasket, spring (and spring seat, on frame mounted units) and spring retainer from the end of the slave cylinder.

8. Remove the piston cup and hydraulic piston assembly from the cylinder. If the assembly does not fall free of the cylinder bore, it may be pushed out by inserting the push rod in the bushing.

9. Remove the check valve retainer, check valve and return spring from the hydraulic piston.

10. Mount the slave cylinder body in a vise, and remove the push rod bushing, lockwasher, and front body from the slave cylinder body.

11. Remove the gasket, rubber seal, and transfer bushing from the slave cylinder body. Remove the 2 push rod bushing snap rings, and remove the washer and 2 seals from the bushing. Remove the O-ring seal from the outside diameter of the push rod bushing.

12. Remove the seal from the lower end of the control valve piston. Remove the seal from the piston boss.

13. Remove the retainer nut from the piston boss by prying the inner tangs of the nut away from the boss, and remove the diaphragm plate and control valve diaphragm.

14. Remove the screw, lockwasher, spacer, spring, disc, and seal from the control valve body.

ASSEMBLY

1. Position a new seal in the control valve body. Assemble the spring and spacer in the valve body and secure with the screw and lockwasher. Tighten the screw securely.

2. Position the control valve diaphragm and plate and secure it in place with the retainer nut.

3. Install the control valve piston seal on the piston.

4. Insert the check valve spring, valve, and retainer in the hydraulic piston. Be sure the check valve floats freely and does not bind in the bore.

5. Install the transfer bushing, rubber seal, and gasket on the front body end of the slave cylinder body.

6. Install the push rod seals, washer, and snap rings in the push rod bushing. Both push rod seals should be installed with the open end of the seal facing the slave cylinder body. Install the lock washer over the end of the bushing. Install the bushing seal.

7. Mount the slave cylinder body in a vise. Position the front body over the end of the slave cylinder, inserting the transfer bushing with proper hole in the front body.

8. Thread the push rod bushing in place. Be sure the front body

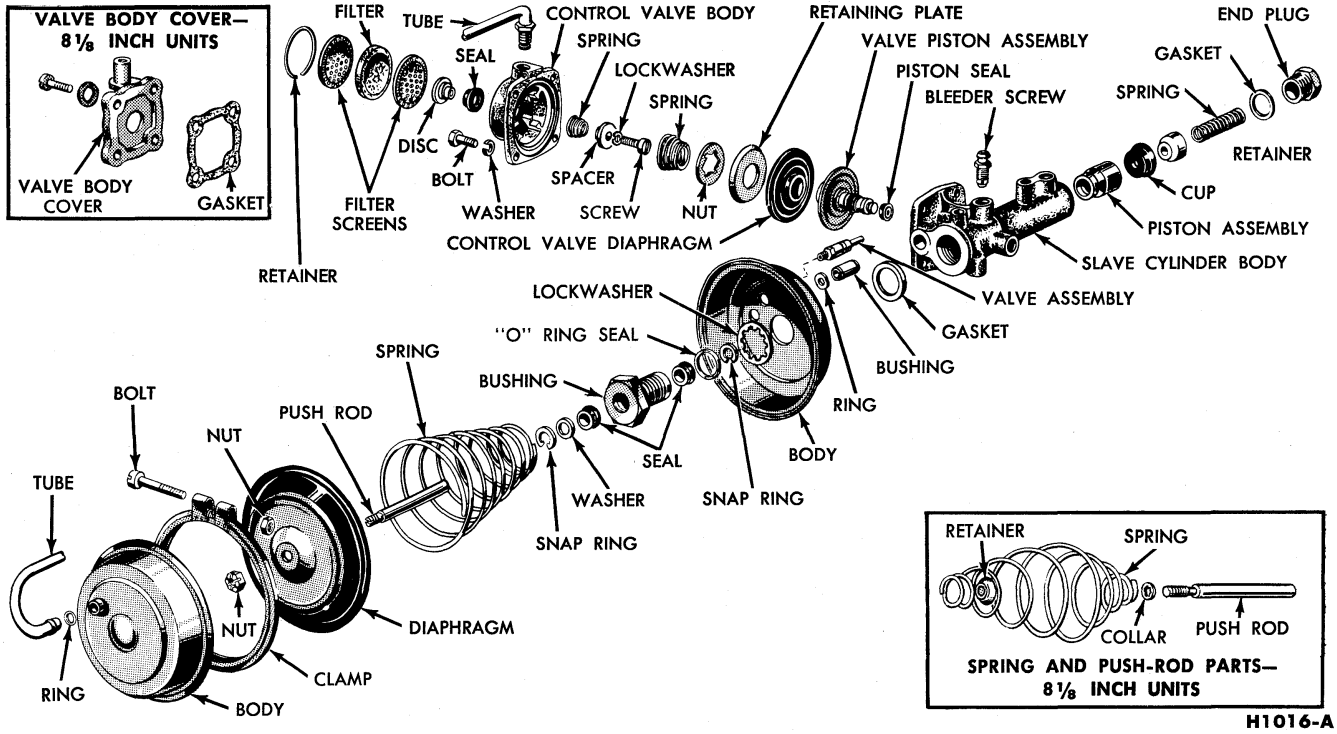

FIG. 29—Disassembled Midland Hy-Power Vacuum Booster

seats squarely on the slave cylinder body, and tighten the bushing securely.

9. Coat the piston bores in the slave cylinder body with heavy-duty brake fluid. Dip the hydraulic cylinder piston, seals, spring retainer, and spring in the brake fluid.

10. Install the hydraulic piston in the slave cylinder bore with the recessed end (or the large bore of the piston) toward the push rod bushing. Carefully position the piston cup with the recessed end toward the large spring, spring retainer, and spring on top of the piston.

On a frame-mounted booster, install the spring seat in the spring coils.

11. Position a new copper gasket on the end plug and screw the plug in the slave cylinder. Tighten the end plug securely.

12. Dip the control valve piston and diaphragm in the heavy-duty brake fluid. Position the control valve spring on the diaphragm with the small end of the spring over the piston boss.

13. Position the control valve body over the spring, align the scribe marks, install the valve body on the slave cylinder body and secure with 4 attaching bolts and lock washers. Tighten the bolts securely.

14. Position a new gasket on the control valve body, position the valve body cover over the gasket and secure the cover with 4 bolts and lock washers. Tighten the bolts securely.

15. Position the collar over the threaded end of the push rod. Position the spring retainer in the spring as shown in the insert in Fig. 29. Insert the push rod and collar in the coils of the spring and through the retainer. Position the diaphragm over the threaded end of the push rod and secure it with the push rod nut. Tighten the nut securely. After the nut is tightened coat the threads of the push rod with shellac to prevent leakage. Coat the push rod with heavy-duty type brake fluid.

16. Place the return spring over the push rod bushing.

17. Place the rear body on top of the diaphragm with the scriber mark on the rear body in alignment with that on the front body. Compress the return spring, and install and tighten the clamp, making certain the diaphragm bead is properly positioned between the 2 halves of the body.

18. Install the by-pass tube.

BENDIX (HYDROVAC) BOOSTER PISTON TYPE

Since the 6¾-inch and 9½-inch diameter piston-type boosters are similar in design, the disassembly and assembly procedures are the same

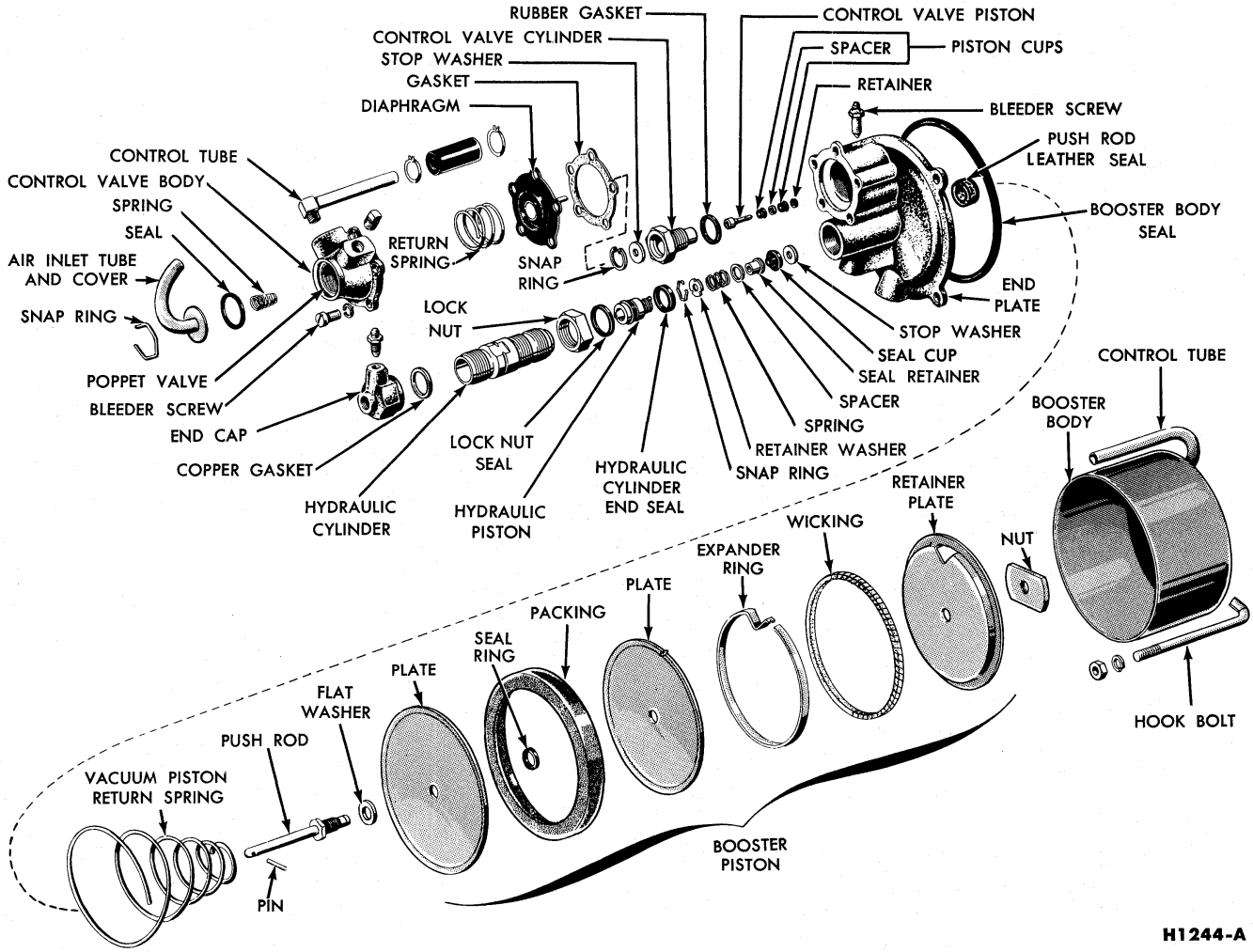

FIG. 30—Piston Type 6¾-Inch Booster—Disassembled

except where indicated in the procedure steps and illustrations.

DISASSEMBLY

1. Loosen the control tube hose clamps and slide the hose off the end of the tube (Figs. 30 and 31).

2. Remove the air inlet tube snap ring and remove the air inlet tube, seal, and spring from the control valve body.

3. Remove the five control valve body mounting screws and remove the body, return spring, diaphragm, and gasket from the end plate. The poppet valve cannot be removed from the valve body.

4. Mount the end cap in a vise, loosen the hydraulic cylinder lock nut, and unscrew the end plate and booster body assembly from the hydraulic cylinder.

5. Unscrew the hydraulic cylinder from the end cap, then remove the lock nut and seal from the cylinder. Remove the bleeder screw and copper gasket from the end cap then remove the end cap from the vise (Figs. 30 and 31).

On a 9½-inch booster, remove the check valve snap ring, washer, spring, and check valve (Fig. 31). **A truck with a 9½-inch booster has a check valve mounted in the end cap. Therefore, a check valve is not used in the master cylinder on these trucks.**

6. Scribe a line across the booster body and end plate so that these parts can be reassembled in their original position. Remove the four hook bolts, and slide the booster body from the vacuum piston assembly.

7. Compress the vacuum piston return spring by pressing down on the end plate and using hook-type clamps similar to those in Fig. 32. Hold the spring compressed.

8. Remove the hydraulic piston from the push rod by sliding the retainer spring (on the hydraulic piston) back, and removing the retainer pin.

9. Remove the hook clamps and separate the vacuum piston and push rod assembly, and the return spring from the end plate.

10. Clamp one of the bolt flanges of the end plate in a vise. Unscrew the control valve cylinder from the end plate, then remove the rubber gasket from the cylinder. Remove the snap ring retainer and stop washer, then press the control valve piston assembly from the cylinder (Figs. 30 and 31). The piston should come out of the front end of the cylinder to avoid damage to the cups.

11. On a 6¾-inch booster, remove the small retainer, then remove the piston cups and spacer from the control valve piston (Fig. 30).

On a 9½-inch booster, remove the cups from the piston (Fig. 31).

12. Remove the hydraulic cylinder end seal from the end plate (Figs. 30 and 31). Remove the snap ring, then remove the push rod seal cup parts from the end plate (6¾-inch—retainer washer, spring spacer, seal retainer, seal cup and stop washer as shown in Fig. 30). (9½-inch—washer, spring, retainer washer, seal cup, and stop washer as shown in Fig. 32.)

13. Remove the end plate from the vise and place it on two wooden blocks with the hydraulic cylinder side up. Drive the push rod leather seal assembly out of the end plate, using a flat end rod or drift.

14. On a 6¾-inch booster, clamp the vacuum piston and push rod assembly in a vise at the hexagonal nut. Remove the vacuum piston retaining

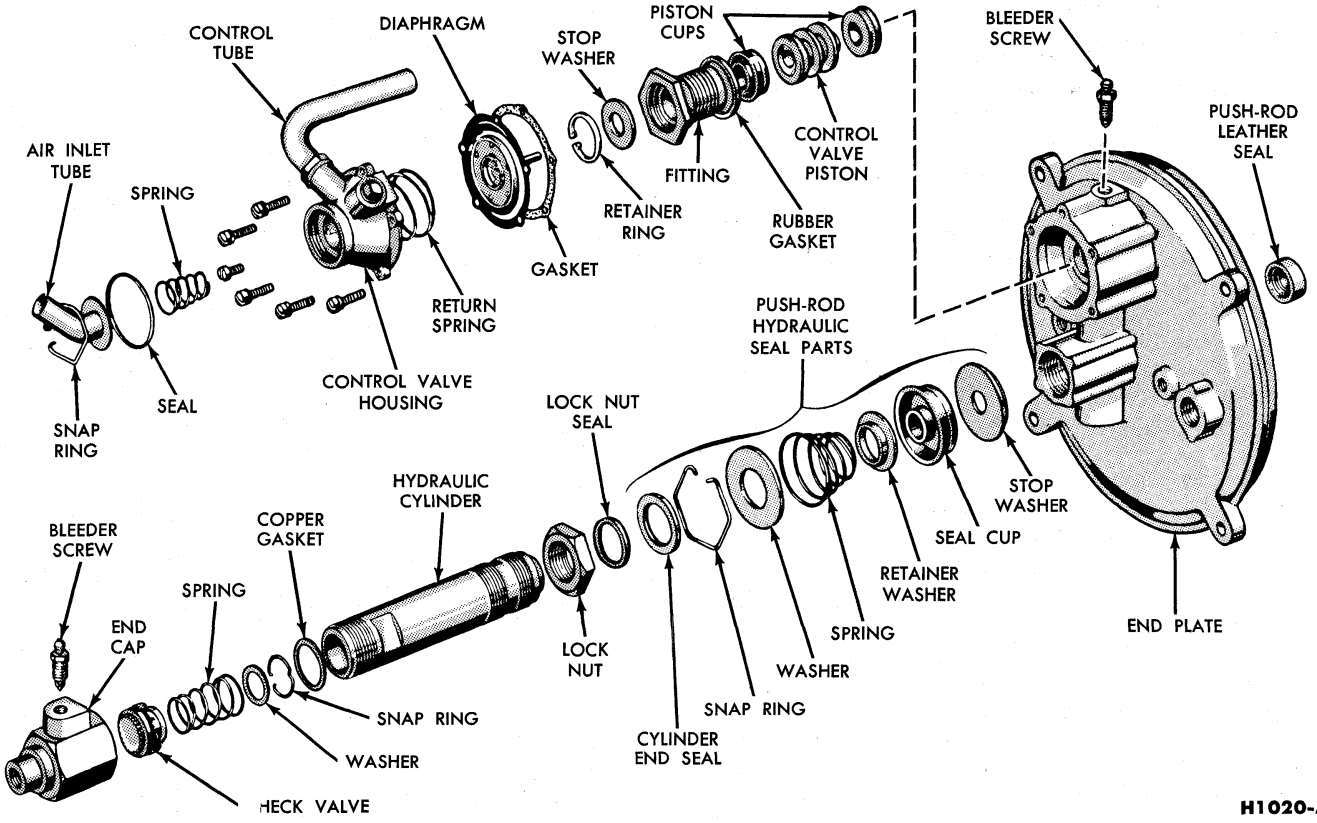

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FIG. 31—End Play Disassembled—9½-Inch Booster

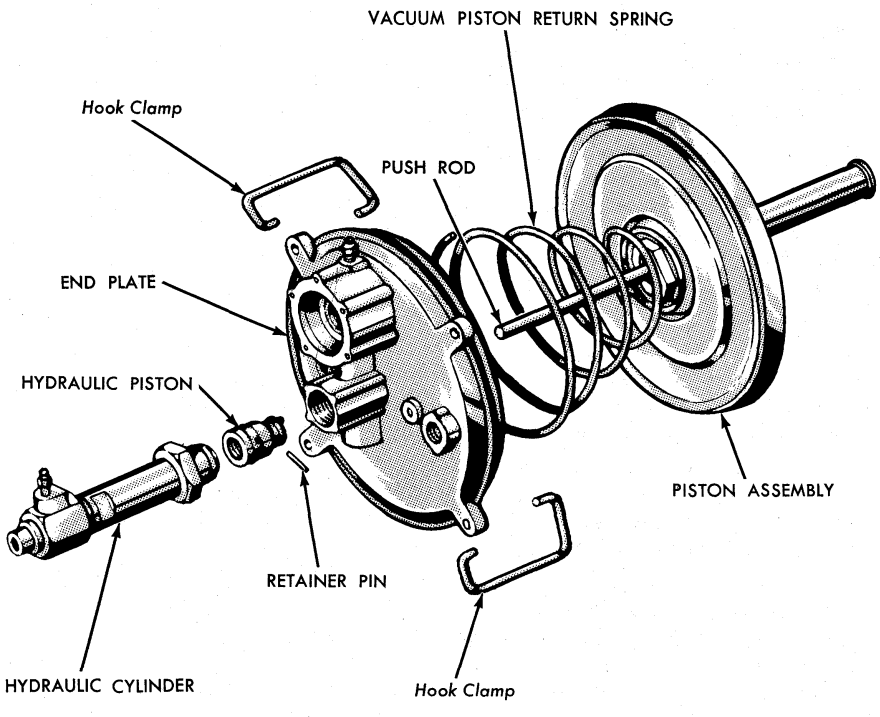

FIG. 32—Vacuum Piston, End Plate, and Hydraulic Cylinder

nut and disassemble the vacuum piston from the push rod (Fig. 30). Remove the flat washer.

On a 9½-inch booster, disassemble the vacuum piston as follows:

(a). Remove the push rod lock ring from the groove in the piston guide (Fig. 33). Remove the spring retainer, and lift out the push rod, spring, bottom spring retainer, and bottom snap ring.

(b). Clamp the hexagonal section of the piston guide in a vise. Remove the vacuum piston retaining nut, and disassemble the vacuum piston from the push rod (Fig. 34). Remove the guide, seal ring, and flat washer.

(c). Loosen the tube nut, and remove the reinforcing plate assembly from the cylinder shell (Fig. 35). Remove the tube nut, guide tube and seal.

ASSEMBLY

1. On a 9½-inch unit, assemble the check valve parts in the end cap (Fig. 31), and secure them with the lock ring. **Be sure the lock ring is firmly seated in the groove.**

Install the bleeder screw and a new copper gasket in the end cap, and place the end cap in a vise. Thread the hydraulic cylinder into the end cap with the milled flats on the cylinder next to the end cap (Figs. 30 and 31). Place a wrench on the milled flats and tighten the cylinder securely.

2. Thread the lock nut on the hydraulic cylinder to the limit of the threads. Position a new lock nut seal between the two sections of thread on the hydraulic cylinder.

3. Place the end plate on two wooden blocks with the hydraulic cylinder side of the end plate up. Press the push rod leather seal into the end plate with the lip of the leather seal toward the hydraulic cylinder side of the end plate.

4. On a 6¾-inch booster, dip the control valve piston seals in heavy duty brake fluid, assemble the seals on the piston with the spacer between the two seals, and secure with the C-type retainer (Fig. 30). The lip of each piston should point toward the retainer end of the piston. Insert the piston assembly into the control valve cylinder from the rear side of the cylinder. Install the stop washer at the front end of the cylinder against the piston, and secure in place with the snap ring.

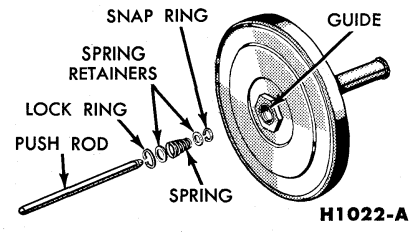

FIG. 33—Push Rod Parts—9½-Inch Booster

On a 9½-inch unit, assemble the piston cups into the grooves of the piston. The cups must be assembled with their lips pointing **away** from each other (Fig. 31). Insert the piston and cups into the fitting with the hole end of the piston next to the stop washer.

5. Clamp the end plate in a vise at one of the bolt flanges. Place a new rubber gasket over the threaded end of the control valve cylinder (fitting on 9½-inch unit), thread the cylinder (fitting) into the end plate, and tighten securely with a 1⅛-inch socket.

6. To assemble the push rod seal cup parts (Figs. 30 and 31), insert the push rod through the leather seal at the rear side of the end plate. The rod will hold the parts in alignment as they are installed. Install the stop washer with the chamfered side toward the end plate, the seal cup with the lip of the cup away from the stop washer, the seal retainer with the flanged end next to the cup.

On a 6¾-inch unit, install the spacer with the chamfered end next to the cup. Install the spring over the seal retainer and against the flat side of the spacer.

On a 9½-inch unit, install the spring against the seal retainer flange.

On both units, place the retainer washer against the spring, and compress the spring until the washer is to

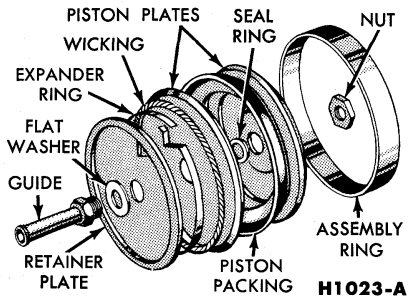

FIG. 34—Disassembled Vacuum Piston—9½-Inch Booster

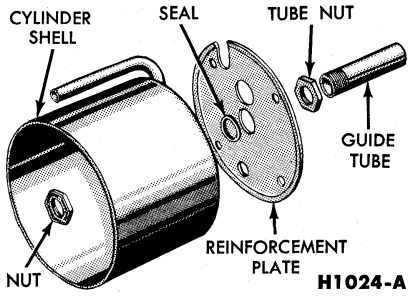

FIG. 35—Disassembled Cylinder Shell and Guide Tube

the inner side of the snap ring groove. Install the snap ring in the groove, then remove the push rod. Install a new cylinder end seal.

7. Fabricate a vacuum piston assembly ring by cutting a 1-inch section from an old cylinder shell of correct size. Place the assembly ring (Figs. 34 and 36) on the bench and assemble the vacuum piston parts in the assembly ring, installing the larger diameter piston plate with the chamfered side of the hole up, the leather piston packing with the lip of the packing **up** on a 6¾-inch unit and **down** on a 9½-inch unit, the seal ring, and the small diameter piston plate with the chamfered side of the hole down.

8. Cut the wicking to the required length, and assemble it against the inner face of the piston packing lip.

9. Position the expander ring inside the wicking, with the gripper points up and the notch at the loop end of the expander ring under the clip near the opposite end of the expander ring.

10. Assemble the retainer plate with the cut-out portion over the loop of the expander ring.

11. On a 6¾-inch unit, assemble the push rod and booster piston as follows:

(a). Hold the push rod in a vertical position, and assemble the flat washer over the threaded end. With the assembly ring still in position over the booster piston, guide the piston assembly over the push rod. Secure the booster piston to the push rod with the large retaining nut.

(b). Place the vacuum piston return spring over the push rod with the small end of the spring next to the vacuum piston.

On a 9½-inch unit, assemble the guide assembly, piston and push rod as follows:

(a). Thread the tube nut on the guide tube to the limit of the threads (Fig. 35).

(b). Assemble the reinforcing plate and seal over the threads of the guide tube. **Use care not to damage the seal.**

(c). Position the guide tube and reinforcement plate assembly against the cylinder shell. From inside the shell, install and thread the nut onto the guide tube until it is flush with the end of the guide tube. Stake the nut securely in 2 places, and tighten the tube nut up against the reinforcing plate to insure a good seal between the guide tube and the cylinder shell.

(d). Hold the guide in a vertical position and assemble the flat washer over the threaded end.

(e). With the assembly ring still in position over the vacuum piston, turn the vacuum piston and assembly ring upside down, and assemble them onto the guide. To prevent damage to the seal ring, remove the larger diameter piston plate while guiding the seal ring over the threads (Fig. 34).

(f). Replace the piston plate, and assemble the nut onto the guide. Tighten the nut securely, and stake the nut in 2 places. Do not remove the assembly ring until the piston is installed in the cylinder shell.

(g). Clamp the hexagonal section of the guide firmly in a vise. Assemble the push rod attaching parts over the beveled end of the push rod, as shown in Fig. 33, starting with the lock ring. Use care in assembling the snap ring in the groove at the lower end of the push rod, to avoid distorting the lock ring.

(h). Insert the end of the push rod in the recess at the end of the guide. Attach the push rod to the guide by compressing the spring and inserting the lock ring in the groove of the guide. Be sure the lock ring is firmly seated in the groove of the guide.

(i). Mount the vacuum piston and guide in a vise, at the hex portion of the guide. Place the vacuum piston return spring over the push rod with the small end of the spring next to the vacuum piston (Fig. 32).

12. Carefully guide the push rod through the leather seal of the end plate, compress the spring, and install the hook clamps to hold the spring compressed (Fig. 32).

13. Position the hydraulic piston on the push rod and secure with the retainer pin. Slide the retainer spring over the hole in the piston to hold the retainer pin in place.

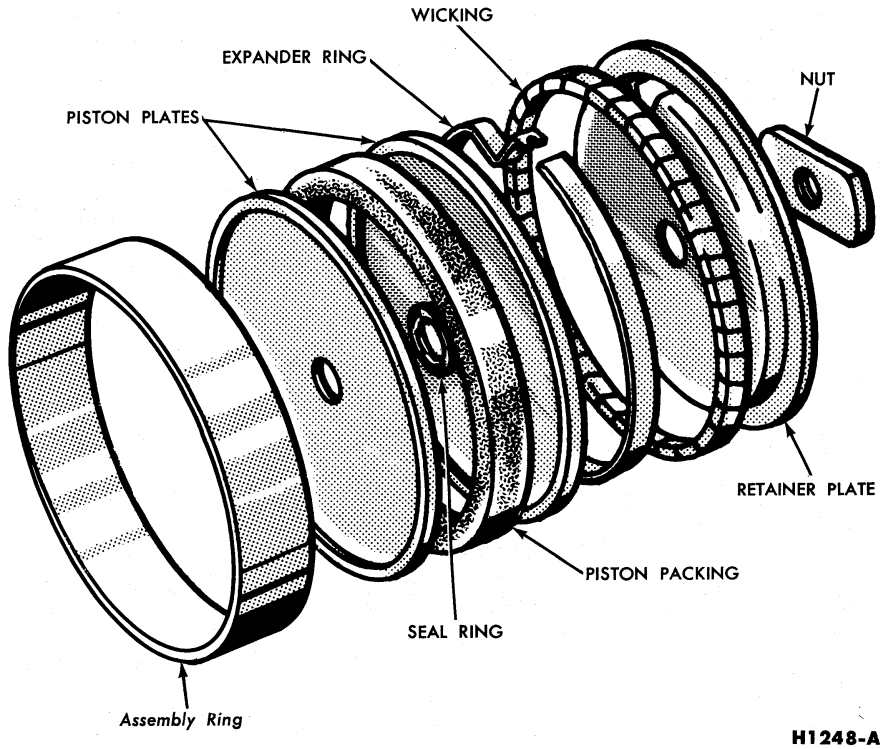

FIG. 36—Disassembled Vacuum Piston—6¾-Inch Booster

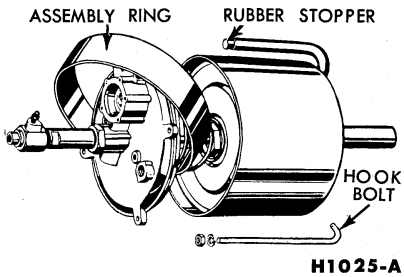

FIG. 37—Assembly Ring Removal

14. Carefully guide the hydraulic cylinder over the lip of the piston cup, and thread the hydraulic cylinder into the end plate, finger-tight. Remove the hook clamps and remove the unit from the vise.

15. Hold a 6¾-inch booster body in a vertical position, and mount it in a vise at the control tube. Mount the 9½-inch unit in the vise at the guide tube nut.

16. Insert a rubber stopper into the control tube (Fig. 37).

17. With the top face of the vacuum piston flush with the top edge of the assembly ring, line up the assembly ring with the booster body, and guide the vacuum piston into the booster body. (On 9½-inch units, if the vacuum piston is permitted to tip slightly, the vacuum piston guide will not enter the guide tube.)

18. As soon as the piston has entered the booster body (the guide has entered the guide tube—9½-inch), lift the assembly ring to permit inspection of the piston packing. If the leather packing has started to enter the booster body without any part of the packing folded back, remove the rubber stopper, press the vacuum piston into the booster body approximately 2 inches, and replace the rubber stopper. If inspection reveals that any part of the piston packing has been folded back, repeat the above operation.

19. With the rubber stopper still in the control line tube, slide the assembly ring over the end plate, as shown in Fig. 37, and remove the rubber stopper from the control line.

20. Assemble a new rubber gasket in the groove of the end plate, and align the end plate with the booster body at the scribe marks. Install the hook bolts and tighten uniformly (Fig. 30).

21. Drop the two hose clamps over the control tube on the booster body and assemble the hose on the control tube. If the control valve body on a 6¾-inch unit is being replaced, transfer the removable control tube from the old to the new body.

22. The use of guide pins, threaded into the end plate, will simplify the assembly of the control valve body and components to the end plate, and will reduce the possibility of damaging the diaphragm during assembly. Guide pins may be made by cutting the heads from five 32 x 2½-inch machine screws.

Install the guide pins, position a new gasket and the diaphragm over the pins, then position the return spring in the recess of the diaphragm (Figs. 30 and 31).

23. Assemble the control valve body over the pins so that the control tube on the valve body enters the hose on the booster body tube. Hold the control valve body and parts against the end plate, and remove one guide pin at a time, replacing it with a screw and lock washer. Tighten the screws securely.

24. Secure the hose clamps in position.

25. Install the spring, the seal, and the air inlet tube and cover assembly to the control valve body and secure in place with the snap ring. (Figs. 30 and 31.)

26. Align the bleeder screw in the end cap with the bleeder screw in the end plate by manually turning the hydraulic cylinder in the end plate threads. While holding the hydraulic cylinder in this properly aligned position, securely tighten the cylinder lock nut (Figs. 30 and 31).

27. Make sure that all bolts, nuts, washers, and screws are in place and securely tightened.

BENDIX (HYDROVAC) BOOSTER TANDEM PISTON TYPE

DISASSEMBLY

1. Disconnect the hydraulic and vacuum by-pass tubes from the control valve body, remove the air inlet retainer, and remove the air inlet fitting, gasket, and spring from the control valve body.

2. Remove the screws retaining the control valve body to the end plate, and remove the control valve body spring, gasket and diaphragm from the rear end plate (Fig. 38).

3. Remove the retaining nut, remove the small and large atmospheric valves, and the vacuum valve from the control valve body.

4. Loosen the hydraulic cylinder lock nut, and remove the hydraulic cylinder and seal (Fig. 38).

5. Install the booster assembly in an arbor press and insert a brass drift through the atmospheric port in the rear end plate. Press the vacuum cyl-

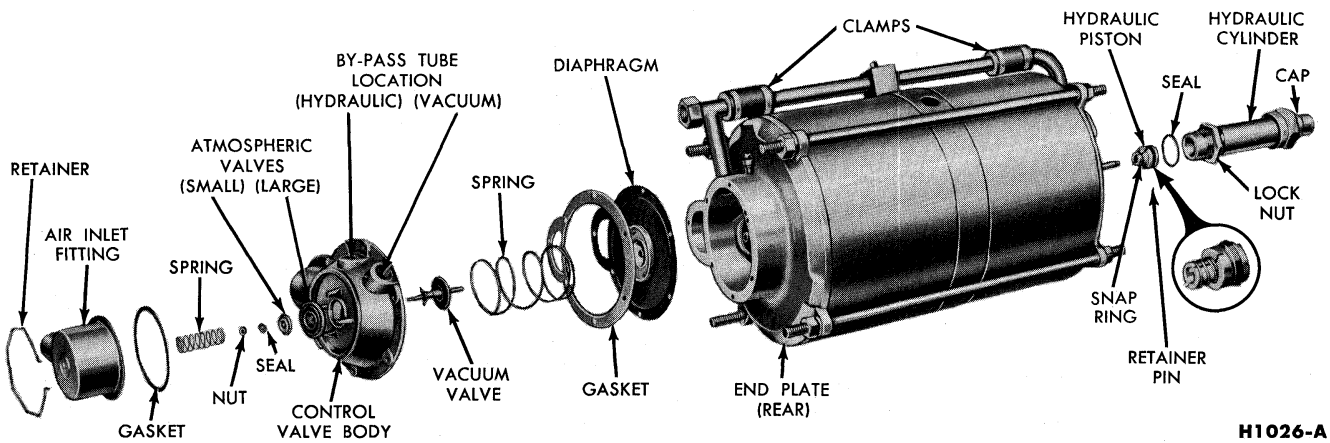

FIG. 38—Tandem Piston-Type Vacuum Booster

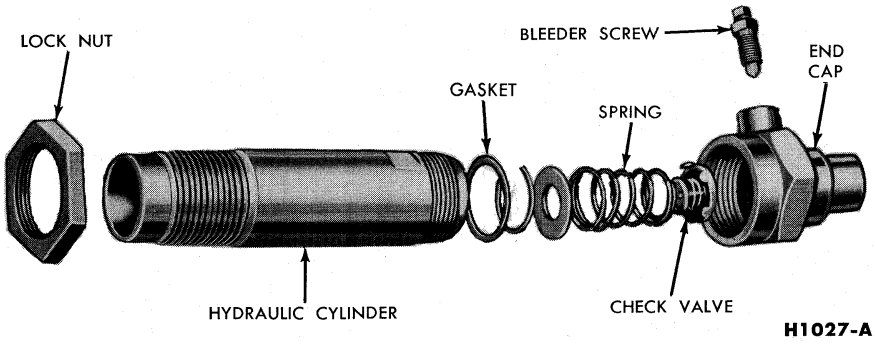

FIG. 39—Hydraulic Cylinder, Check Valve and End Cap

inder piston until the hydraulic piston is exposed at the hydraulic cylinder opening in the end plate.

6. Compress the push rod pin retaining spring (on the hydraulic piston), remove the retainer pin, and remove the hydraulic piston from the push rod. Disassemble the hydraulic piston.

7. Remove the booster assembly from the arbor press.

8. Hold the end cap in a vise, and remove the hydraulic cylinder from the end cap (Fig. 39). Remove the snap ring from the end cap, and remove the washer, spring, and check valve.

9. Loosen the vacuum hose clamps, and slide both hoses on the vacuum tube toward the center plate.

10. Remove the hydraulic by-pass tube from the rear end plate.

11. Remove the nuts and studs from the power cylinder, and disassemble the end plates, cylinder shells, and center plate assembly (Fig. 40).

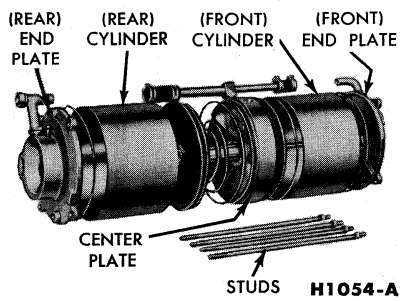

FIG. 40—Power Cylinder Separation

12. Force the center plate and rear vacuum piston together, and insert a rod through the hole in the piston rod to hold the piston return spring in the compressed position (Fig. 41).

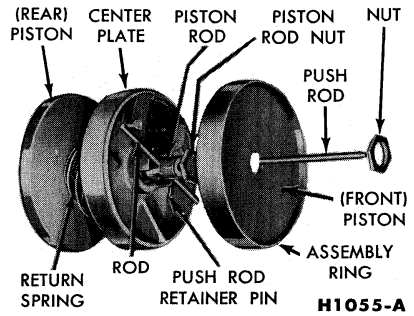

FIG. 41—Push Rod, Pistons and Center Plate

13. Fabricate 2 assembly rings from an old cylinder. Place an assembly ring over the front piston, and remove the nut securing the front piston to the piston rod. Then, remove the piston rod nut, push rod retainer pin, and the push rod. Remove the front piston assembly, but keep the piston parts assembled in the assembly ring.

14. Disassemble the rear piston by pressing down on the return spring. Then, remove the rod, center plate, and return spring from the piston rod (Fig. 42).

15. Remove the nut from the rear piston end of the piston rod, and carefully remove the retainer plate, wick retainer, wick, 2 piston plates, and leather packing.

16. Remove the rubber seal ring from the threads of the piston rod.

17. Remove the vacuum tubes and tee fitting from the center plate.

18. Position the plate on a flat surface. Remove the fast application valve cover (Fig. 43).

19. To disassemble the diaphragm assembly, hold the valve shaft with

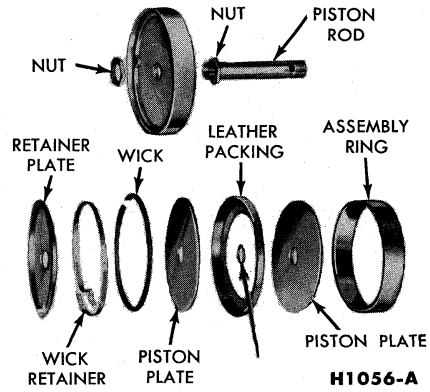

FIG. 42—Rear Vacuum Piston and Rod Assembly

a screwdriver, and remove the nut. Lift the 2 plates, diaphragm, and gasket off the valve shaft (Fig. 43).

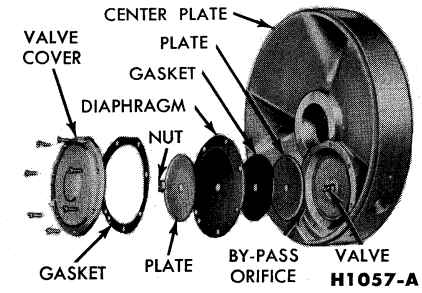

FIG. 43—Fast Application Valve and Diaphragm Removal

20. Turn the center plate over and remove the valve seat plate screws and plate, the gasket, valve, and return spring from the center plate (Fig. 44).

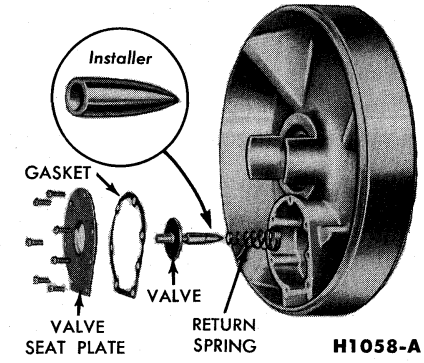

FIG. 44—Fast Application Valve and Seat

21. Remove the valve shaft and piston rod seals (Fig. 45).

22. Position the front end plate assembly on a flat surface with the

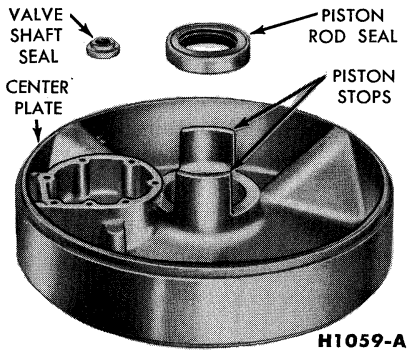

FIG. 45—Fast Application Valve and Piston Rod Seals

flat side down. Remove the O-ring seal, snap ring and retainer washer, flange washer, push rod seal, and stop washer from the end plate (Fig. 46).

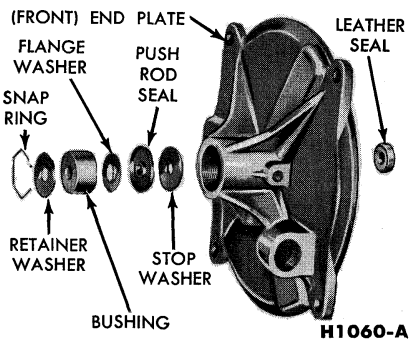

FIG. 46—Hydraulic Cylinder Push Rod Seals

23. Drive the push rod leather seal out of the end plate.

24. Remove the retainer and stop washer from the valve fitting and remove the fitting. Push the hydraulic piston out of the valve fitting, and remove the gasket from the valve fitting (Fig. 47).

25. Remove the cups from the hydraulic piston.

ASSEMBLY

1. Assemble the rear vacuum piston by installing the nut on the rear vacuum piston end of the piston rod with the flat side of the nut upward (Fig. 42).

2. Position the larger diameter piston plate on the piston rod with the chamfered side of the hole at the top. Guide the rubber seal ring over the threads of the piston rod.

3. Place an assembly ring on a flat surface and install the leather

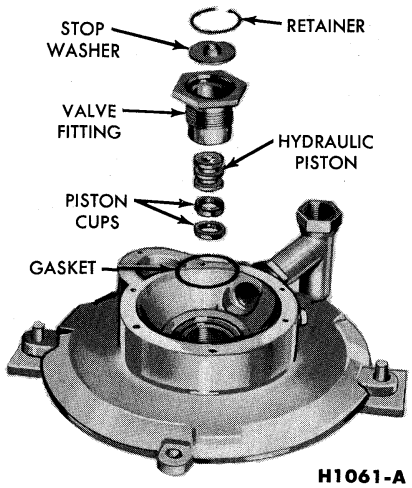

FIG. 47—Hydraulic Control Valve Piston and Fitting

packing, with the lip side upward. Then position the smaller diameter piston plate, with chamfered side of the hole downward, in the ring.

4. Cut a new piece of wick to the required length, then place it against the inner face of the leather packing lip. Assemble the wick retainer, with the gripper points upward, against the wick, and hook the notched end of the retainer under the clip near the opposite end of the ring.

5. Position the cut-out of the retainer plate over the loop of the wick retainer.

6. Hold the piston parts in the assembly ring, assemble them on the end of the piston rod, then install the nut on top of the piston assembly. Tighten the nut until it is flush with the end of the piston rod. Stake the nut securely at two places. Clamp the staked nut firmly in a vise, and tighten the nut on the opposite side of the piston plate solidly against the piston plate.

7. Press the fast application valve shaft and rod seals (Fig. 45), into the center plate. The piston valve shaft seal must be flush with the bottom of the hole. The piston rod seal should rest against the shoulder of the center plate.

8. Position the center plate as shown in Fig. 44, then place the return spring on top of the seal with the small end at the top. Install the bullet-nosed tool on the threaded end of the valve shaft, and insert the valve shaft through the seal. Position the gasket on the center plate.

9. Place the valve seat plate, with the seat side downward, on the gasket, and install the screws and lockwashers.

10. Turn the center plate over. Place the lower diaphragm plate, with the rounded edge up, on the valve shaft, then place the diaphragm gasket on top of the plate (Fig. 43). Position the diaphragm on top of the gasket so the screw holes and the by-pass hole index with the identical holes in the center plate. Install the other diaphragm plate with the rounded edge facing the diaphragm.

11. Install the nut on the valve shaft. Use a screwdriver to prevent the shaft from turning, and tighten the nut. Stake the nut securely at 2 opposite points.

12. Position the gasket and valve cover on the center plate, then install the screws and lock washers.

13. Place the return spring over the piston rod with the small end of the spring at the bottom (Fig. 41).

14. Carefully guide the piston rod through the seal in the center plate, with the piston stop flanges of the center plate facing upward. Press the center plate down against the spring, and insert a rod in the piston rod.

15. Assemble the large end of the push rod in the end of the piston rod, and install the pin.

16. Thread the piston rod nut on the piston rod, with the flat side of the nut upward, to the limit of the threads.

17. If the front piston was disassembled to replace the leather piston packing, the cotton wicking, or other parts, assemble the piston parts in the assembly ring in the same order as the rear piston (Fig. 42). Hold the parts in the ring and turn the assembly ring over. Remove the larger diameter piston plate and seal. With the assembly ring still in place, guide the remaining piston parts over the end of the push rod and against the piston rod nut (Fig. 48). Carefully install the seal over the threads of the piston rod. Place the larger diameter piston plate on the piston rod, with the chamfered side of the hole toward the seal.

18. Install the piston rod nut, with the flat side downward, on the end of the piston rod. Tighten the

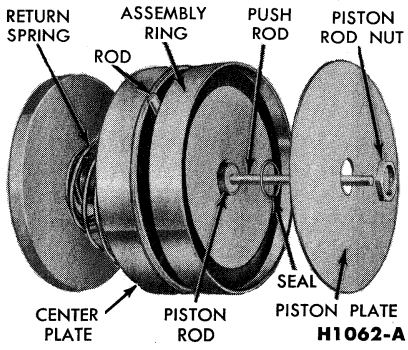

FIG. 48—Rear Vacuum Piston, Return Spring, and Outer Plate Assembly

nut until it is flush with the face of the piston rod, and stake the nut securely at opposite points.

19. Hold the piston rod nut in a vise or with a wrench, and tighten the inner nut securely against the piston. Care must be exercised when tightening the inner nut to prevent the retainer plate from shifting.

20. Remove the assembly ring, then remove the rod holding the return spring compressed.

21. Hold the end cap in a vise, and assemble the parts as shown in Fig. 39. The small end of the spring must be placed inside the check valve clips.

22. Install a new copper gasket in the end cap. The hydraulic cylinder must be assembled with the milled flats next to the end cap. Tighten the hydraulic cylinder solidly in the end cap, and thread the lock nut on the hydraulic cylinder up to the limit of the threads.

23. Install the lock nut seal (if used) in the groove of the cylinder tube. Install the bleeder screw in the cap.

24. Press the leather seal into the hydraulic cylinder bore of the front end of the plate from the inner side of the plate with the lip of the seal toward the outer end of the plate (Fig. 46).

25. Install the push rod seal and related parts in the order shown in Fig. 46. The chamfered side of the washer is down, the lip of the push rod seal is up, the flat side of the flange washer is next to the seal. Install the retaining washer.

26. Install the snap ring in the inner groove of the end plate.

27. Place the rear end plate on the holding fixture (Fig. 47), and install the stop washer with the flat side in the valve fitting. Install the retainer.

28. Dip the hydraulic piston cups in brake fluid, and assemble them on the hydraulic piston with the lips of the cups positioned away from each other.

29. Insert the piston into the valve fitting with the open end of the piston toward the stop washer.

30. Install a new gasket on the valve fitting (copper gasket on the fitting without the groove, and a rubber seal gasket on the fitting with the groove).

31. Install the valve fitting in the end plate. Tighten the fitting equipped with a rubber gasket firmly. Torque the fitting equipped with a copper gasket to 325-330 ft-lbs.

32. Assemble the vacuum control valve parts in the control body in sequence shown in Fig. 38. Install a new lead washer.

33. Install the tee fitting and tubes on the center plate. The small diameter pipe on the vacuum tee should be toward the front end plate.

34. Dip the front piston leather packing and wicking in vacuum cylinder oil, and allow the excess oil to drain off.

35. Position a new gasket on the front edge of the center plate. Install the front cylinder to the center plate (Fig. 49). Coat the interior of the cylinder with vacuum oil. Carefully guide the push rod through the seal in the front end plate. At the same time, align the vacuum tube in the end plate with the vacuum tube on the center plate.

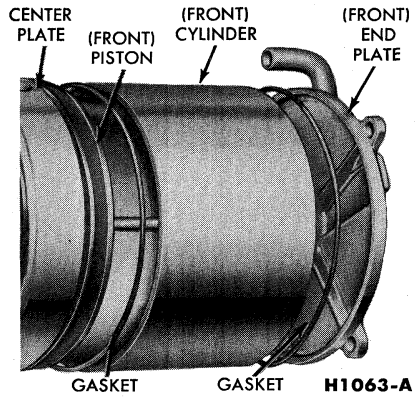

FIG. 49—Front Cylinder and End Plate Installation

36. Position a new gasket on the front end plate and place on the front cylinder.

37. Slide the hose in place to connect the 2 vacuum tubes.

38. Position a new gasket on the other edge of the center plate (Fig. 40). Coat the interior of the rear cylinder with vacuum cylinder oil, then tip the front cylinder and end plate assembly at a 45-degree angle to prevent damage to the rear piston leather packing. Carefully push the rear cylinder over the rear piston and onto the center plate.

39. Place a new gasket on the rear end plate, then install the end plate on the rear cylinder, aligning the end plate vacuum tube and center plate vacuum tube.

40. Install the cylinder studs and tighten the nuts evenly.

41. Position the vacuum hoses on the tubes, and tighten the hose clamps firmly.

42. Connect the hydraulic by-pass tube to the front and rear end plates. Install the by-pass tube retaining clip and screw to the center plate.

43. To assemble the hydraulic piston parts, place the large end of the spring in the retainer cup, and install the check ball in the piston body behind the spring.

44. Dip a new piston cup in brake fluid, and install it on the piston with the lip of the cup toward the check ball.

45. Install the booster assembly in an arbor press, and insert a brass drift through the atmospheric port in the rear end plate. Press the hydraulic cylinder piston until the piston rod is exposed at the front end plate. Assemble the hydraulic piston on the push rod and install the retaining pin. Remove the assembly from the press. Install the seal on the hydraulic cylinder.

46. Carefully guide the hydraulic cylinder over the piston cup, and thread the cylinder into the end plate. Align the bleeder screw in the end cap with the bleeder screw in control valve. Adjust the hydraulic cylinder to a minimum of $8\frac{13}{16}$ inches (Fig. 50). Tighten the lock nut.

47. Install 5 guide pins, made from 8-32 x 2½-inch machine

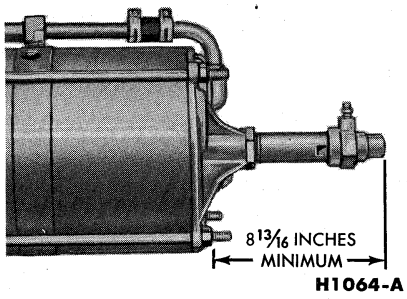

FIG. 50—Hydraulic Cylinder Adjustment

screws with the heads cut off, in the rear end plate.

48. Install the air inlet fitting gasket and spring in the control valve body, then install the retainer.

49. Install the diaphragm inserting the diaphragm stem into the piston hole. Place the diaphragm spring, gasket and control valve body on top of the diaphragm.

50. Remove the guide pins, one at a time, and replace each guide pin with an attaching screw and a new lockwasher. Tighten the screws progressively and firmly.

51. Install the hydraulic and vacuum by-pass tubes.

52. Inspect the assembly to see that all the bolts, nuts, screws, washers, and plugs are in place, and that all tubes, clamps, and fittings are firmly tightened.

53. Remove the lubricating plugs from the end and center plates. Add vacuum cylinder oil to the level of the filler plug holes.

54. Install and tighten the plugs.

PART 2-5 AIR-HYDRAULIC BOOSTER

1 DESCRIPTION AND OPERATION

The air-hydraulic brake system (Fig. 1) uses a compressed air booster-type unit to assist the hydraulic brakes. The air-hydraulic unit consists of a booster cylinder, a hydraulic cylinder, and a hydraulically operated control valve.

Depressing the brake pedal builds up hydraulic pressure in the system. This initial pressure unseats the check ball in the hydraulic cylinder piston, and opens the check valve, permitting the pressure to be transmitted to the brake cylinders, where braking action begins (Fig. 2).

As soon as hydraulic pressure builds up sufficiently, it moves the control valve piston forcing the diaphragm against spring pressure. Movement of the control valve piston unseats the poppet valve, allowing compressed air from the air system reservoir to pass around the poppet valve and into the booster cylinder. The force of air on the booster piston drives the hydraulic cylinder piston forward, seating the check ball, to prevent the return of brake fluid to the master cylinder during brake application.

As the booster piston travels, additional hydraulic pressure is transmitted to the brake cylinders to actuate the brakes. The initial hydraulic pressure is thus multiplied several times.

The amount of braking action can be controlled because the poppet valve is subject to both hydraulic pressure and applied air pressure. The opposing forces, hydraulic pressure and air pressure, control the movement of the diaphragm (and control valve piston) which, in turn, control the amount of booster action.

When the brake pedal is released, hydraulic pressure in the master cylinder and control valve piston cavity decreases. Spring pressure closes the air inlet side of the poppet valve and opens the atmospheric side of the valve. The check valve in the hydraulic cylinder closes. As the atmospheric poppet opens, compressed air in the booster cylinder rushes out through the exhaust port, allowing the booster piston return spring to return the hydraulic cylinder and booster pistons to their released position. As the hydraulic cylinder piston returns, the check ball opens permitting brake fluid to flow through the piston, allowing it to return to its fully released position.

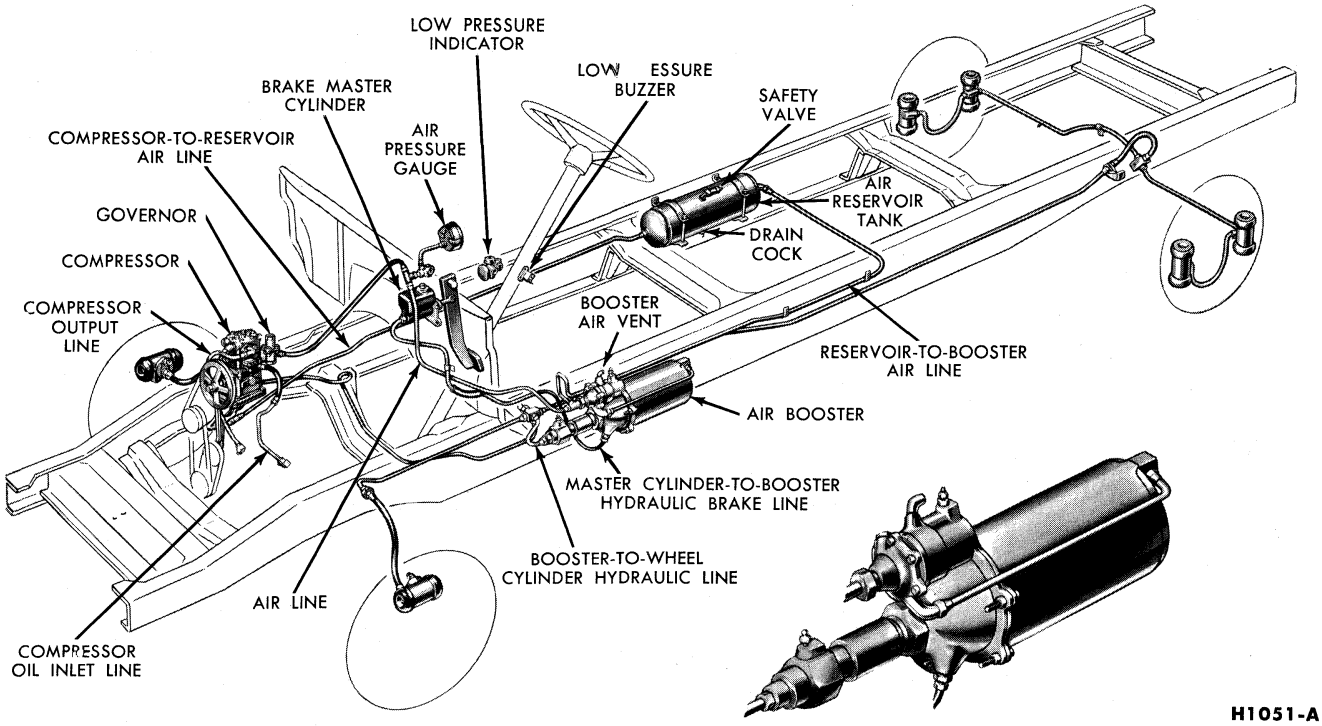

FIG. 1—Air-Hydraulic Brake System

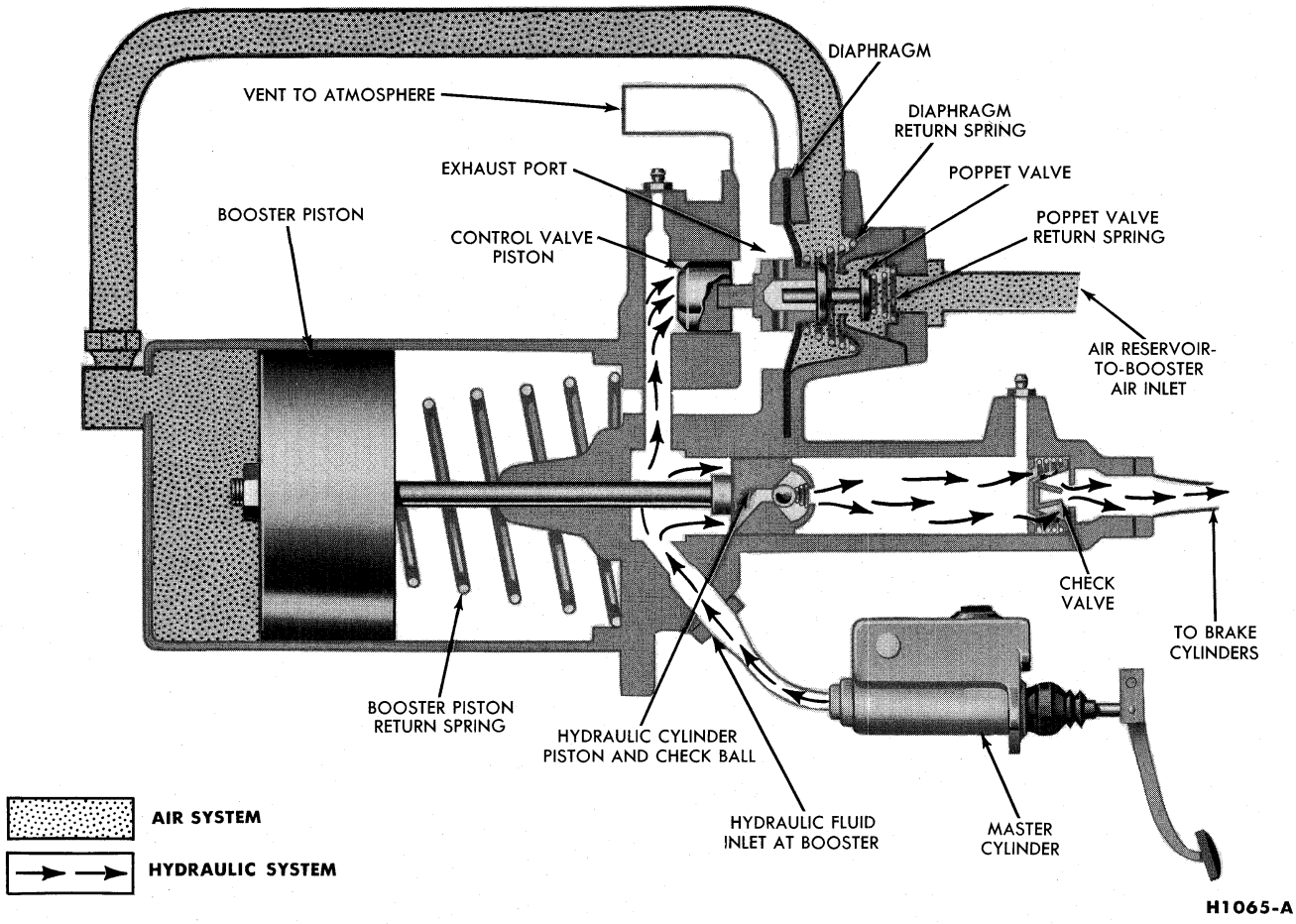

FIG. 2—Air-Hydraulic Booster

2 IN-TRUCK ADJUSTMENTS AND REPAIRS

(Not applicable to this section.)

3 REMOVAL AND INSTALLATION

AIR-HYDRAULIC BOOSTER

REMOVAL

The truck should be on level ground, with the engine stopped, and the service brakes completely released.

1. Check the air gauge reading. If the gauge indicates compressed air in the system, open the drain cock on the reservoir to release the pressure.

2. Disconnect the air supply line attached to the end plate assembly. Cover the open line to prevent dirt from getting into the air system.

3. Disconnect the two hydraulic lines from the ports.

4. Remove the mounting nuts and remove the booster unit from the mounting brackets and away from the truck.

5. Drain excess hydraulic fluid from the booster unit.

INSTALLATION

1. Position the booster on the truck. Install the mounting bracket bolts.

2. Connect the air and hydraulic lines at the booster unit.

3. Remove the ⅛ inch filler plug at the rear of the air-hydraulic unit. Add vacuum cylinder oil until the oil runs out of the port.

4. Install and tighten the plug.

During lubrication, do not run the engine or apply the brakes. **Do not lubricate the unit until it has been installed in the truck.**

5. Bleed the brake system as outlined under "Bleeding Hydraulic Brakes" in Part 2-2.

6. Test the booster unit for leaks and operation.

4 MAJOR REPAIR OPERATIONS

AIR-HYDRAULIC BOOSTER

DISASSEMBLY

Use extreme care in the handling of hydraulic piston cups, seals and other internal parts to prevent contact with mineral oil or grease.

1. Disconnect the control tube (Fig. 3) from the booster control body and end plate assemblies. Remove the control tube seal from the control body with the control tube.

2. Scribe a line on the end plate and control body assembly, and also on the end plate and booster control body. These marks will assure proper alignment during installation.

Booster Control Body

1. Remove the six bolts from the booster control body-to-end plate assembly.

2. Lightly tap the booster control body off the end plate assembly and remove the diaphragm return spring, diaphragm assembly and stop washer.

3. Clamp the control body in a vise. Using a wrench, unscrew the air inlet fitting (adapter). Remove the adapter seal and spring. Remove the control body from the vise.

Diaphragm

1. To disassemble the diaphragm, clamp the diaphragm nut in a vise.

2. Insert a drift through one of the holes in the stem assembly, and turn to loosen the nut.

3. Remove the stem, diaphragm, and washers. Remove the nut from the vise.

Booster Body

1. Remove the six bolts which attach the end plate assembly to the booster body assembly. Note the location of the two short bolts.

2. Separate the booster body assembly from the end plate assembly by gently tapping the body assembly with a fiber mallet. Remove the body assembly and seal.

3. Remove the booster piston as-

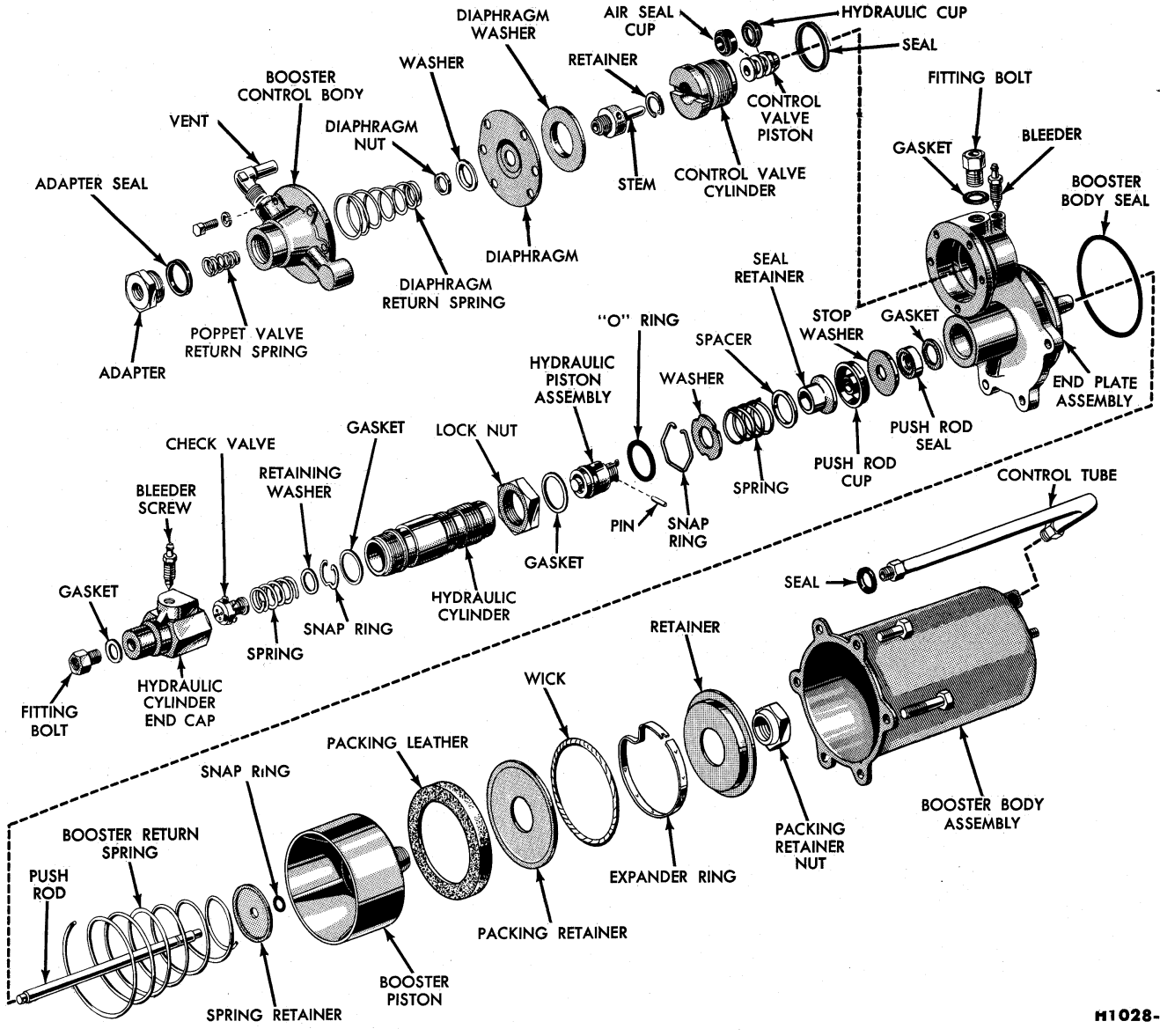

FIG. 3—Air-Hydraulic Booster—Disassembled

sembly from the body assembly by gently tapping the body on a flat surface.

Hydraulic Cylinder

1. Clamp the hydraulic cylinder end cap in a vise.

2. With a wrench, loosen the hydraulic cylinder lock nut. Unscrew the end plate from the hydraulic cylinder.

3. Unscrew the hydraulic cylinder from the end cap. Remove the end cap from the vise.

End Plate

1. To disengage the push rod from the hydraulic piston assembly, place the booster piston assembly over the booster return spring (Fig. 4). Compress the booster return spring by pressing toward the end plate to move the push rod forward. Remove the pin retaining the hydraulic piston to the push rod. Remove the hydraulic piston assembly.

2. Remove the booster piston assembly, booster return spring, and push rod from the end plate assembly. **A hook clamp may be used to hold the booster return spring in the compressed position while removing the pin (Fig. 4). The clamp should hook through one of the holes in the end plate and over the end of the booster piston assembly. The clamp should be fabricated as shown in Fig. 4.**

3. Remove the hydraulic piston O-ring (Fig. 5). Remove the snap ring, washer, seal retainer and spacer, cup, fiber stop washer, and spring from the bore of the end plate.

4. To remove the push rod seal and gasket from the end plate, thread a ¼ inch pipe tap into the seal. Drive the seal out from the booster body assembly end of the end plate using a short piece of rod against the pipe tap. Remove the gasket.

5. With a special tool (Fig. 5), remove the control valve cylinder from the end plate. Remove the seal.

6. Remove the bleeder screw. Remove the fitting bolt and gaskets.

7. Remove the end plate from the vise.

Control Valve Cylinder

1. Remove the retainer from the control valve cylinder and press the control valve piston out of the valve cylinder.

2. Remove the two cups from the piston.

Hydraulic Cylinder End Cap

1. Clamp the hydraulic cylinder end cap in a vise.

2. Remove the snap ring from the end cap. Remove the retaining washer, spring, and check valve.

3. Remove the bleeder screw. Remove the fitting bolt and gasket.

Booster Piston

1. To disassemble the booster piston, use a holding fixture (Fig. 6), to prevent damaging the piston.

2. Mount the holding fixture in a vise and place the booster piston assembly over the fixture.

3. Remove the packing retainer nut. Separate the retainer, expander ring, wick, packing retainer, and packing leather from the top of the piston.

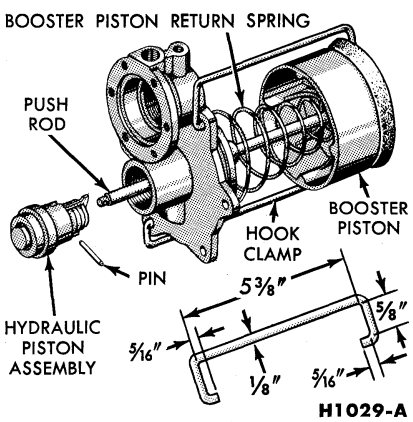

FIG. 4—Push Rod Pin Removal

ASSEMBLY

When assembling the air-hydraulic booster, use extreme care in the handling of the hydraulic system parts. Do not allow any of the parts to come in contact with mineral oil or grease.

Booster Piston

1. To aid in the reassembly of the booster piston, make an assem-

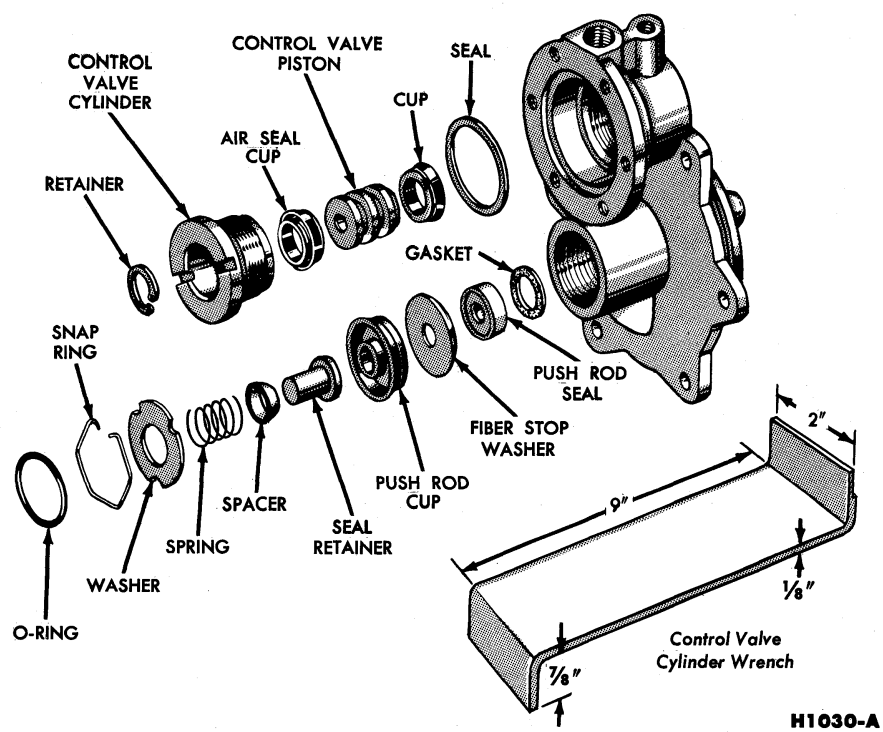

FIG. 5—End Plate—Disassembled

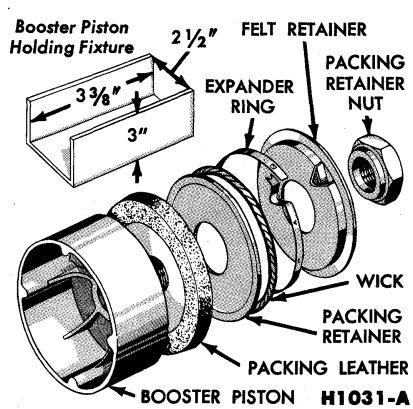

FIG. 6—Booster Piston—Disassembled

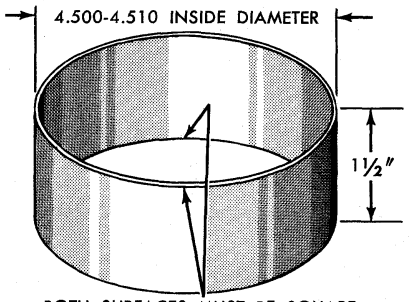

FIG. 7—Assembly Ring

bly ring which can be fabricated from an old booster body assembly (Fig. 7).

2. With the assembly ring flat on the work bench, insert a **new** packing leather inside the ring with the lip up (Fig. 6). Place the packing retainer over the packing leather with the cupped edge pointing toward the packing leather.

3. Cut a **new** wick to length. Dip the wick in vacuum cylinder oil. Assemble the wick against the inner lip of the packing leather.

4. Position a **new** expander ring on the inner side of the wick, with the gripping points up. Engage the notch at the loop-end of the ring with the hook near the opposite end of the ring.

5. Position the retainer over the expander ring, with the cutout in the retainer lining up with the loop in the expander ring.

6. Place the assembly ring, with the assembled parts, over the threaded boss of the booster piston. Install the packing retainer nut finger tight.

7. Clamp the piston holding fixture in a vise. Place the booster piston and assembly ring on the holding fixture. Tighten the packing retainer nut securely. **Do not remove the assembly ring from the piston assembly until the assembly is to be inserted into the booster body.**

8. Remove the piston assembly and holding fixture from the vise.

Hydraulic Cylinder End Cap

1. Clamp the hydraulic cylinder end cap in a vise.

2. Insert the check valve, spring (with small end of the spring inside the tabs on the check valve), and retaining washer in the cap bore. Compress the spring and insert a **new** snap ring. Be sure the snap ring is engaged in its recess.

Hydraulic Cylinder

1. Place a **new** copper gasket in the end cap. Screw the hydraulic cylinder into the end cap and tighten.

2. Screw the lock nut onto the inner threaded portion of the cylinder. Dip a **new** gasket in brake fluid and place it between the threaded portions of the cylinder.

3. Install the bleeder screw.

4. Remove the end cap, and hydraulic cylinder, from the vise.

Control Valve Cylinder

1. Dip a **new** control valve piston, hydraulic cup, and an air seal cup in brake fluid. Assemble the hydraulic cup in the recess of the valve piston **at the chamfered end of the piston.** The lip of the hydraulic cup must be pointing toward the chamfered end of the piston.

2. Assemble the air seal (identified by a red dot) in the other recess of the valve piston, with the lip pointing opposite to that of the hydraulic cup. **Be careful not to damage the hydraulic cup or air seal during assembly.**

3. Insert the retainer into the recess in the notched end of the control valve cylinder.

4. Place the piston assembly into the valve cylinder, from the opposite side of the retainer ring groove, with the hole end of the piston next to the retainer.

Diaphragm

1. Place a **new** diaphragm over the threaded end of the stem assembly, with the concave side of the diaphragm toward the threaded end.

2. Place the flat side of the washer facing the nut. Screw the diaphragm nut onto the threaded end of the stem assembly finger tight.

3. Clamp the diaphragm assembly nut in a vise. Tighten the assembly by using a drift in one of the adapter holes.

4. Remove the diaphragm assembly from the vise and stake the nut.

End Plate

1. Clamp the flange of the end plate in a vise.

2. Position a **new** seal gasket, and a leather push rod seal, into the recess in the end of the base of the end plate, with the push rod seal lip pointing towards the seal gasket.

3. Seat the push rod seal in the recess by using a length of ⅞ or 15/16 inch O.D. rod and tapping the rod with a fiber mallet. Insert a **new** fiber stop washer, with the chamfered side toward the push rod seal.

4. Dip a **new** cup in brake fluid and place it against the washer, with the lip of the cup pointing away from the stop washer.

5. Position the seal retainer and spacer in the bore, with the counterbore of the retainer next to the cup (Fig. 5). Install the spring and washer.

6. Hold the assembled parts in place by installing the stop ring into its recess in the end plate bore. Dip a **new** O-ring in brake fluid and insert it in the recess in the bore of the end plate.

7. Dip a **new** control valve cylinder seal in brake fluid and install it in the recess of the control valve cylinder.

8. Screw the control valve cylinder into the end plate assembly. Tighten the cylinder using the tool shown in Fig. 5.

9. Install the bleeder screw. Install the fitting bolt and gasket.

10. Dip the hydraulic piston assembly in brake fluid. The lip of the cup must point toward the hydraulic cylinder end cap.

11. Slide the push rod, with the booster return spring, through the end plate seals and cup assembled in steps 2 through 6.

12. Place the booster piston assembly (with the assembly ring), over the end of the push rod and spring retainer.

13. Compress the booster return spring and slide the hydraulic piston assembly onto the other end of the push rod (Fig. 4). Line up the hydraulic piston assembly, pull back the spring of the hydraulic piston, and install the pin in the push rod hole. Release the pressure on the booster return spring and remove the booster piston assembly.

The hook clamp (Fig. 4) may be used to hold the booster return spring in the compressed position while installing the pin. The clamps should hook through one of the holes in the end plate and over the end of the booster piston.

14. Carefully guide the hydraulic cylinder, and hydraulic cylinder end cap, over the lip of the hydraulic piston assembly cup, and then thread the cylinder into the end plate finger tight.

15. Remove the end plate assembly from the vise.

Booster Body Assembly

1. Insert a **new** booster body seal in the groove of the end plate. Make sure the seal is properly seated.

2. Apply a light coat of vacuum cylinder oil to the inner walls of the booster body assembly. **Do not use engine oil.**

3. Insert the booster piston assembly in the booster body, wick end first, being careful not to damage or roll over the leather lip. Remove the assembly ring.

4. Assemble the booster body to the end plate assembly by placing the body over the return spring. Line up the booster body-to-end plate alignment marks. Secure the body to the end plate using two short bolts at each upper end of the body assembly.

5. Install the four remaining bolts. Tighten each bolt evenly until all bolts are uniformly tight.

6. Adjust the length of the hydraulic cylinder to 7⅞ inches, measured from the outer end of the hydraulic cylinder end cap to the facing surface of the end plate assembly (Fig. 8).

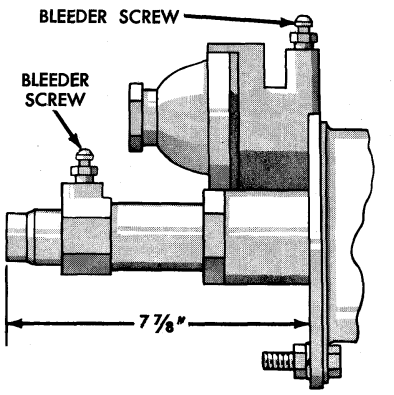

FIG. 8—Hydraulic Cylinder Length Setting

7. Align the bleeder screw on the hydraulic cylinder end fitting with the bleeder screw on the end plate assembly. Tighten the lock nut securely.

8. Install the fitting bolt and gasket into the end of the hydraulic cylinder end cap.

Booster Control Body

1. Place a **new** seal on the adapter. Position the small end of the spring in the body bore, over the poppet valve stem, and install the adapter.

2. Remove the body from the vise.

3. Place the diaphragm washer in the recess of the end plate assembly, with the flat side facing outward.

4. Position the diaphragm return spring and diaphragm assembly in the booster control body.

5. Position the booster control body on the end plate. Align the diaphragm holes and the control body-to-end plate alignment marks. Install the six bolts and lock washers and tighten them securely.

6. Install a new seal on the control body end of the air control tube. Connect the air control tube to the booster control body and to the booster body assembly.

PART 2-6 AIR SUPPLY SYSTEM

1 DESCRIPTION AND OPERATION

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

The air supply system consists of the compressor, reservoirs, governor, low pressure indicator and dash gauge.

The compressing action of the compressor is controlled by the governor. When reservoir air pressure reaches 100-105 pounds, the governor cuts out the compressor. When reservoir pressure drops to 80-85 pounds, the governor allows the compressor to cut in again. When reservoir air pressure drops below 60 pounds, the low pressure indicator valve closes an electrical circuit to a warning buzzer.

COMPRESSOR

The compressor is a two-piston air pump with an engine pressure lubricating system and water cooled cylinder head and block (Fig. 1).

During the downward stroke of the compressor pistons, a partial vacuum is created above the piston and inlet valve. This vacuum above the inlet valve together with the atmospheric pressure below the valve automatically opens the inlet valve and allows air to be drawn through the intake filter (air pick up tube on SD V-8 engines) into the cylinder above the piston.

As the piston starts moving upward, the air is compressed, and the air pressure on top of the inlet valve together with the inlet valve spring force automatically closes the inlet valve (Fig. 1). As the piston continues moving upward, the air is further compressed until the pressure lifts the discharge valve and allows the air to enter the reservoir. As each piston starts its downward stroke, the discharge valve closes to prevent the compressed air from returning to the cylinder.

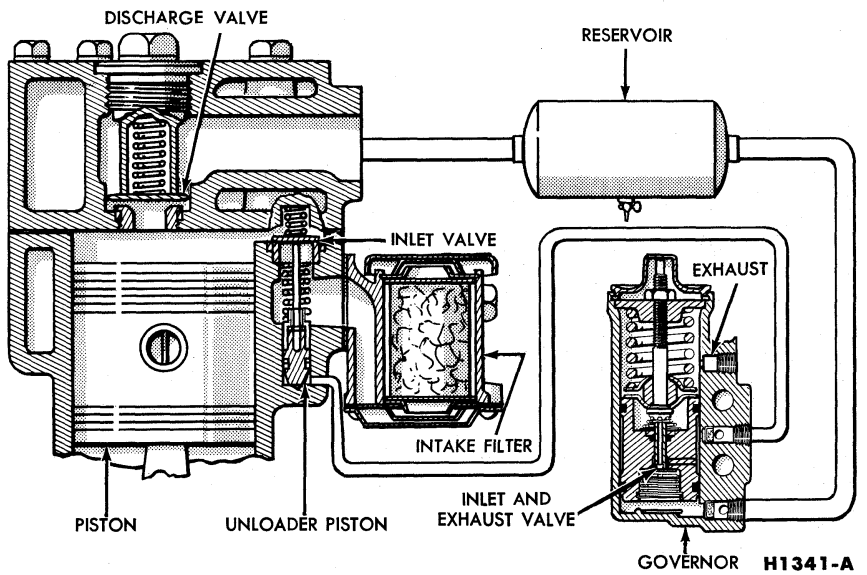

FIG. 1—Air Compressor Operation

GOVERNOR

The governor (Fig. 2), operating in conjunction with the compressor unloading mechanism, automatically controls the air pressure in the air brake or air supply system between the desired, predetermined maximum and minimum pressures. The compressor runs continually while the engine runs, but the actual compression of air is controlled by the governor which stops or starts compression when the maximum or minimum reservoir pressures are reached. The D-2 governor has a piston upon which air pressure acts to overcome the pressure setting spring and control the inlet and exhaust valve to either admit or exhaust air to or from the compressor unloading mechanism.

Connections in this system are to the reservoir and compressor unloading ports. There also is an exhaust port.

Reservoir air pressure enters the D-2 governor at one of its reservoir ports and acts on the area of the piston and beneath the inlet and exhaust valve. As the air pressure builds up, the piston moves against the resistance of the pressure setting spring. The piston and inlet and exhaust valve move up when the reservoir air pressure reaches the cut-out setting of the governor.

The exhaust stem seats on the inlet and exhaust valve and then the inlet passage opens. Reservoir air pressure then flows by the open inlet valve, through the passage in the piston, and out the unloader port to the compressor unloading mechanism. The air, besides flowing to the compressor unloading mechanism, also flows around the piston and acts on the additional area of the piston. This additive force, which results from a larger area on the piston, assures a positive action and fully opens the inlet valve.

As the system reservoir air pressure drops to the cut-in setting of the governor, the force exerted by the air pressure on the piston will be reduced so that the pressure setting spring will move the piston down.

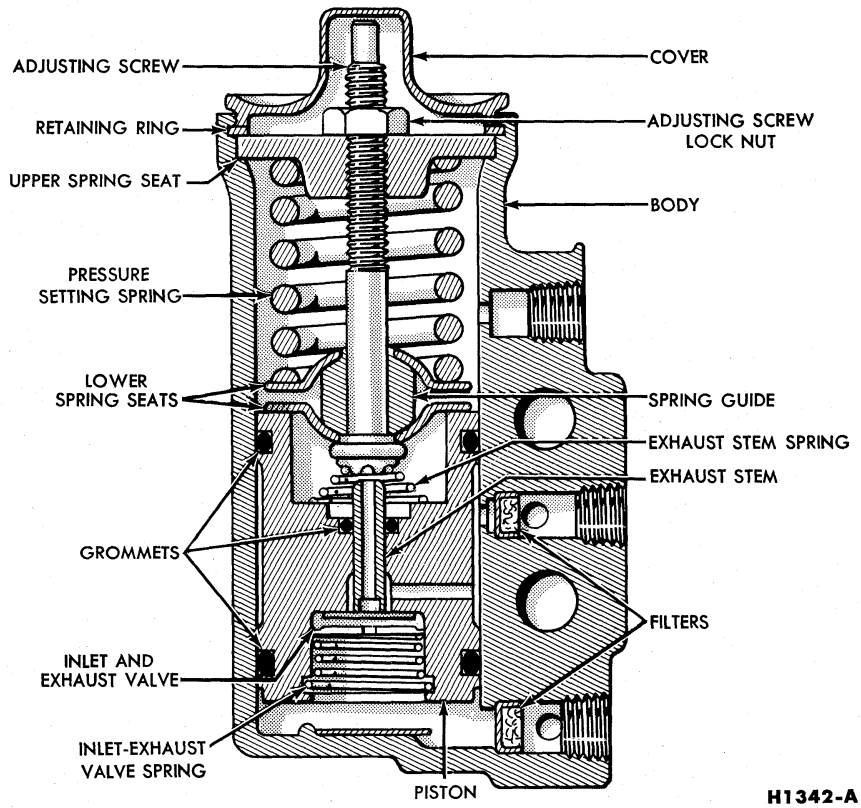

FIG. 2—Compressor Governor

The inlet valve will close and the exhaust will open. With the exhaust open, the air in the unloader line will escape back through the piston, through the exhaust stem and out the exhaust port.

2 IN-TRUCK ADJUSTMENTS AND REPAIRS

AIR COMPRESSOR DRIVE BELT ADJUSTMENT

If the reservoir pressure will not rise to normal or rises too slowly, a slipping compressor drive belt could be the cause.

VERTICALLY-MOUNTED COMPRESSOR

1. Loosen the bolts that retain the compressor to the mounting bracket (Fig. 3).

2. Slide the compressor away from the fan pulley until a ½ inch belt deflection (with thumb pressure) is established.

3. Tighten the compressor mounting bolts.

SIDE-MOUNTED COMPRESSOR

1. Loosen the idler pulley bracket pivot bolt and adjusting bolt (Fig. 4).

2. Pivot the idler bracket and pulley against the belt until ½ inch belt deflection (with thumb pressure) is established.

3. Tighten the adjusting bolt and pivot bolt with the idler bracket and pulley assembly in the properly adjusted position.

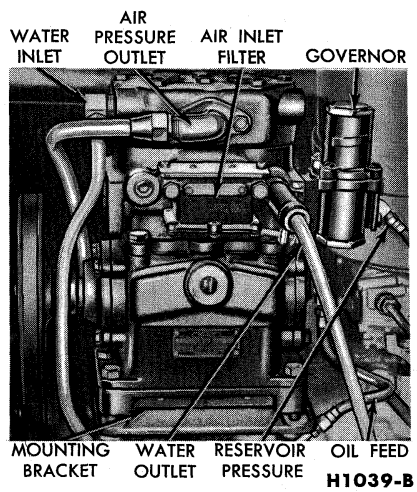

FIG. 3—Air Compressor—Vertically Mounted

GOVERNOR ADJUSTMENT

Before adjusting the pressure settings of the governor, determine the accuracy of the dash gauge by checking gauge readings against an accu-

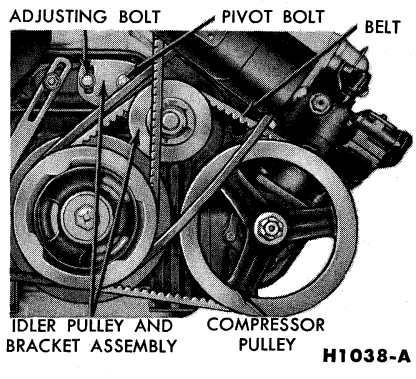

FIG. 4—Belt Adjustment on Side-Mounted Compressor

rate test gauge. The cut-in and cut-out setting is made at the adjusting screw (Fig. 2).

1. With the engine running, build up air pressure in the system and observe the pressure registered by the dash gauge.

2. If the pressure build-up continues beyond 105 pounds before the governor cuts out, remove the cover from the top of the governor and loosen the lock nut. Turn the adjusting screw clockwise to lower the cut-out pressure.

3. With the engine running, slowly reduce the system air pressure by applying and releasing the brakes and observe the dash gauge pressure.

4. If the pressure drops below 80 pounds before the governor cuts in again, turn the adjusting screw counterclockwise to raise the pressure. Tighten the lock nut and install the cover after completing the adjustment. **The air pressure range between cut-out pressure (maximum) and cut-in pressure (minimum) is fixed at about 20-25 pounds and cannot be adjusted.**

AIR RESERVOIR SAFETY VALVE

The air reservoirs are connected into the air brake system. Drain cocks are provided at the bottom of each reservoir. A safety valve is installed on one of the reservoirs.

When servicing the reservoirs, removal or installation of the air tube between the reservoirs can be made by loosening the reservoirs from the frame.

To set the safety valve, loosen the lock nut, and turn the screw clockwise to increase the pressure setting, or counterclockwise to decrease the pressure setting. Connect regulated pressure to the reservoir and adjust the valve to relieve the pressure at 150 psi. Tighten the lock nut after making the proper adjustment.

3 REMOVAL AND INSTALLATION

VERTICALLY-MOUNTED COMPRESSOR—WITH GAS-ENGINE TRUCKS

REMOVAL

Depending upon the particular truck model and engine, compressors are mounted in various locations. Removal and installation procedures differ between vertically mounted units and side-mounted units.

1. Open the reservoir drain cocks to exhaust air pressure from the system.

2. Drain the cooling system.

3. At the compressor, disconnect the compressor air outlet line, the water inlet and outlet lines and the oil feed and oil return lines (Fig. 3).

4. Since the reservoir pressure hose is difficult to remove at the governor, disconnect the hose at the fitting on the opposite end. If the hose is to be replaced, disconnect it from the governor after the compressor has been removed.

5. Remove the four compressor to base plate bolts, slide the compressor inward on the base plate and disengage the drive belt; then remove the compressor.

INSTALLATION

1. Transfer the pulley, Woodruff key and retaining nut to the new compressor.

2. Transfer the air outlet elbow and gasket, the water inlet and outlet fittings, and the oil inlet and outlet fittings to the new compressor. Apply sealer to all these parts.

3. Transfer the governor and gasket to the new compressor (two retaining bolts). Apply sealer. If the reservoir pressure hose is to be replaced, connect it to the governor at this time.

4. Transfer the air inlet filter and gasket to the new compressor (two retaining bolts). Apply sealer.

5. Position the compressor on the base plate and engage the drive belt to the pulley.

6. Install the four mounting bolts, slide the compressor away from the fan pulley until a ½ inch belt deflection is obtained, and tighten the bolts.

7. Connect the compressor air outlet line, the water inlet line and the water outlet line to the compressor. Connect the oil feed and the oil return lines to the compressor.

8. Connect the hose from the governor to the fitting on the reservoir pressure line.

9. Fill the cooling system, close the reservoir drain cocks, and build up pressure in the system.

SIDE-MOUNTED COMPRESSOR —WITH GAS-ENGINE TRUCKS

REMOVAL

1. Drain the cooling system, and open the reservoir drain cocks to exhaust air pressure from the system.

2. Loosen the idler pivot bolt and adjusting bolt, and remove the compressor belt (Fig. 4).

3. At the compressor, disconnect the air outlet line, and the water inlet and outlet lines.

4. Disconnect the reservoir pressure line from the governor.

5. Remove the bracket bolt at the cylinder head and the bracket bolt and washer at the manifold, then remove the bracket between the exhaust manifold and the cylinder head.

6. If equipped with power steering, remove the retaining bolt nut and lock washer from the clip at the frame side rail. Also, remove the power steering hose retaining bolt, nut, and lock washer at the frame crossmember and set the hoses out of the way.

7. Remove the two front compressor to base plate retaining bolts. The clearance between the compressor base plate and the engine mount is very small.

8. Remove the three remaining mounting bolts.

9. Remove the air compressor from underneath the truck in a rearward direction and discard the base gasket.

INSTALLATION

1. Remove the compressor pulley cotter pin and Woodruff key, then pull the pulley off the shaft with a puller.

2. On C-Series trucks, install the compressor pulley on the replacement compressor at this point. On all other models with a side-mounted compressor, do not install the pulley until after the compressor has been installed in the truck.

3. Transfer the air outlet and the water inlet and outlet fittings to the

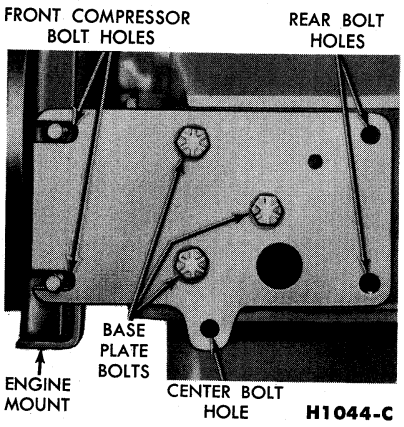

FIG. 5—Base Plate—Side-Mounted Compressor

replacement compressor. Coat the threads with sealer.

4. Transfer the air inlet strainer and gasket to the replacement compressor (two mounting bolts). Apply sealer.

5. Transfer the governor and gasket to the new compressor (two retaining bolts). Apply sealer.

6. Clean the compressor base and cylinder block base plate (Fig. 5).

7. Apply sealing compound to both sides of base gasket.

8. Install pilot studs in the two rear bolt holes shown in Fig. 5, and position the base gasket to the base plate over the studs. From underneath the truck, mount the compressor to the pilot studs and install three retaining bolts. Remove the pilot studs and install the remaining two bolts.

9. If equipped with power steering, position the power steering hose at the frame cross member and install the clip retainer, bolt, lock washer, and nut.

10. Connect the water outlet line to the compressor.

11. Disconnect the reservoir pressure line at the governor.

12. Position the power steering tube clips at the frame side rail and secure with bolt, lock washer, and retainer nut.

13. Connect the water inlet line to the compressor.

14. On all except C-Series, loosen the two power steering belt adjustment bolts and loosen the belt to provide clearance for installation of the compressor pulley. Install the compressor pulley to the shaft and secure with retainer nut and cotter pin.

15. Position the power steering belt on the pulleys and adjust the belt tension.

16. Position the air compressor belt on the pulleys and adjust the belt tension (Fig. 4).

17. Connect the air outlet line to the compressor.

18. Connect the reservoir pressure line at the governor.

19. Fill the cooling system, close the air reservoir drain cocks, and build up pressure in the system.

AIR COMPRESSOR WITH FORD DIESEL ENGINES

REMOVAL

1. On C-Series trucks, release the cab locks and tilt the cab forward.

2. Drain the cooling system. Open the air reservoir drain cocks to exhaust air pressure from the system.

3. Loosen the air outlet line at the air compressor (Fig. 6), and allow the air to escape. Disconnect the air outlet line. Disconnect the governor air line at the air compressor governor.

4. Disconnect the water supply and return lines at the air compressor (Fig. 7).

5. Disconnect the oil supply and oil return lines at the air compressor (Fig. 7).

6. Remove the four compressor mounting bolts. Disengage the drive belt, and remove the compressor.

INSTALLATION

1. Position the air compressor on the mounting bracket attached to the engine front support plate. Place the drive belt in the compressor pulley,

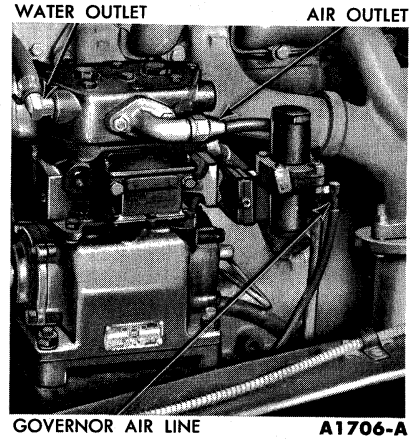

FIG. 6—Air Compressor Air Lines—Ford Diesel

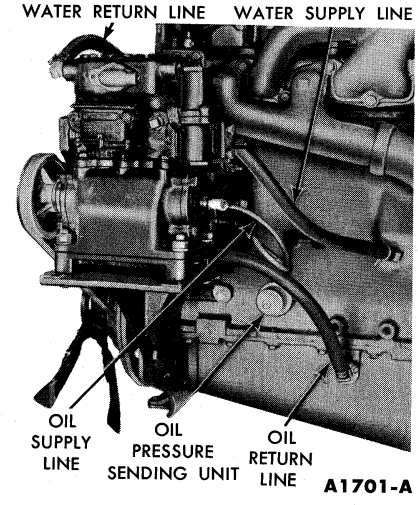

FIG. 7—Air Compressor Oil and Coolant Lines—Ford Diesel

and install the compressor mounting bolts. Adjust the belt tension to specifications, using a belt tension gauge (T63L-8620-A).

2. Connect the oil supply and return lines to the compressor (Fig. 7).

3. Connect the water supply and return lines to the compressor.

4. Connect the governor air line and the air outlet line to the compressor (Fig. 6).

5. Fill and bleed the cooling system.

6. Close the air reservoir drain cocks.

7. Start the engine and check for air, coolant and oil leaks.

8. On C-Series, tilt the cab rearward and secure with the cab locks.

AIR COMPRESSOR—CUMMINS DIESEL N-H SERIES ENGINES

The air compressor is flange mounted to the accessory drive and is driven by a splined-sleeve type drive coupling from the accessory drive shaft. The fuel pump is flange mounted to the rear of the air compressor and must be removed before the air compressor can be removed.

The following procedures and illustrations are for the standard Bendix-Westinghouse unit, but are typical of the Cummins unit which is mounted in the same manner.

REMOVAL

1. Unlock the tilt cab on H-Series trucks. Partially drain the cooling system, and exhaust the air reservoirs.

2. Disconnect the throttle linkage and lines from the fuel pump, and

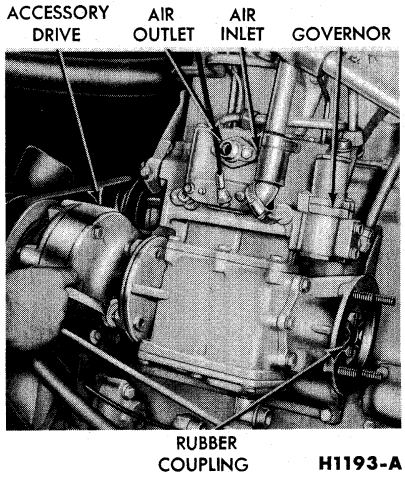

FIG. 8—Removing or Installing Air Compressor—Cummins

remove the fuel pump from the air compressor as described in Group 10.

3. Remove the rubber coupling from the drive unit (Fig. 8).

4. Remove the two governor-to-compressor retaining screws, and position the governor out of the way.

5. Disconnect the air compressor oil inlet line at the engine block (Fig. 9).

6. Remove the oil return tube from the bottom of the compressor and the engine block.

7. Disconnect the water inlet and outlet lines and the air inlet and outlet lines from the compressor (Figs. 8 and 9).

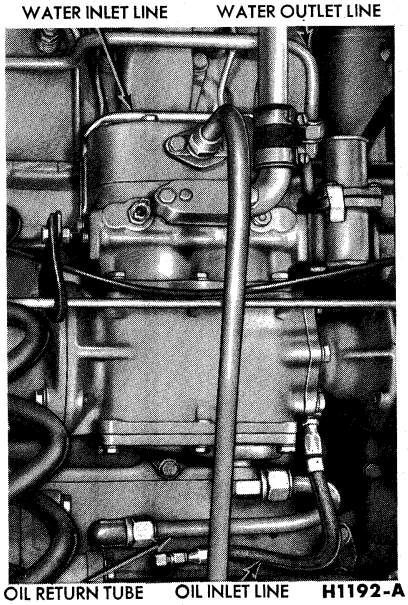

FIG. 9—Air Compressor and Fuel Pump Installed

8. Remove the two nuts and lockwashers that hold the compressor to the support bracket, and the four capscrews and lock washers that hold the compressor to the accessory drive (Fig. 8).

9. Remove the compressor and the splined accessory drive coupling (Fig. 10). Discard the old gasket.

INSTALLATION

1. Assemble the splined accessory drive coupling to the compressor drive gear (Fig. 10), and mount the compressor to the accessory drive, using a new gasket. Install and tighten the four capscrews and lock washers (Fig. 8).

2. Attach the compressor to the support bracket with two nuts and lock washers.

3. Connect the water inlet and outlet lines (Fig. 9), and the air inlet and outlet lines to the compressor (Figs. 8 and 9).

4. Connect the air compressor oil return tube at the bottom of the compressor and at the engine block (Fig. 9).

5. Connect the air compressor oil inlet line to the engine block.

6. Mount the governor to the compressor, and install the two governor-to-compressor retaining screws (Fig. 8).

7. Install the fuel pump to the compressor rear flange with a new gasket and rubber coupling in position (Figs. 8 and 10), then connect the throttle linkage and lines as described in Group 10.

8. Fill the cooling system, and charge the reservoirs.

REPLACEMENT

1. Remove the old compressor as described under "Removal."

2. Remove the compressor drive gear retaining nut, then remove the drive gear from the compressor crankshaft using a universal puller (Fig. 10).

3. Remove the retaining nut and the fuel pump drive gear from the rear end of the compressor crankshaft.

4. Transfer the water inlet and outlet fittings, the air outlet fitting, and the oil return fitting from the old to the new compressor (Figs. 8, 9 and 10).

5. Transfer the air inlet housing and screen from the old to the new compressor (Fig. 10).

6. Remove the oil inlet line from the compressor drive and fuel pump flange, and install it to the new compressor.

7. Install the fuel pump drive gear and retaining nut on the rear end of the new compressor crankshaft.

8. Install the splined compressor drive gear to the crankshaft of the new compressor, and secure with a flat washer, lock washer and nut (Fig. 10).

9. Install the new compressor as described under "Installation."

AIR COMPRESSOR—CUMMINS DIESEL V-6 ENGINES

The Cummins air compressor is used on trucks equipped with V-6 engines. The compressor is flange mounted to an accessory gear case which is located at the rear of the engine between the two cylinder banks. The unit is driven by a gear which is

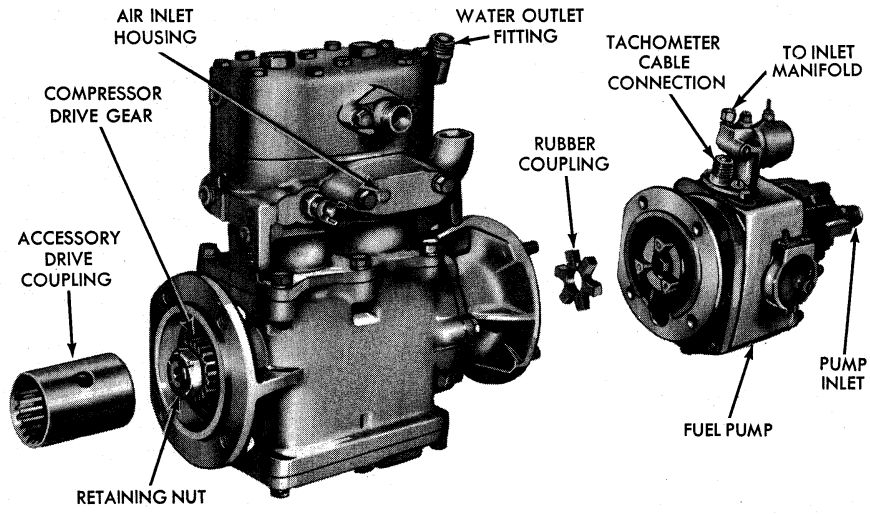

FIG. 10—Air Compressor and Fuel Pump Removed

keyed to the compressor crankshaft, and which enters the accessory gear case where it is driven by the camshaft gear. The fuel pump is flange mounted to the front of the air compressor and must be removed before the air compressor can be removed.

REMOVAL

On H-Series trucks, unlock the tilt cab. On H- and N-Series trucks, the air intake system components have to be removed to obtain access for compressor removal.

Air Intake Lines—H- and N-Series Trucks Only

1. Disconnect the air intake duct from the air cross-over manifold (Fig. 11).

2. Loosen the hose clamps on the cross-over manifold connection hose.

3. Loosen the compressor air intake hose at the air cross-over manifold and at the compressor.

4. Remove the retaining bolts and the right hand air cross-over manifold from the intake manifold.

Fuel Pump and Air Compressor—F-, H-, T-, and N-Series Trucks

1. Disconnect the throttle linkage and lines from the fuel pump, and remove the fuel pump from the front of the compressor as described in Group 10.

2. Drain the cooling system and exhaust the air reservoirs.

3. Disconnect the air outlet line from the compressor.

4. On F- and T-Series trucks, loosen the compressor air intake hose clamps at the main intake duct and at the compressor.

5. On F-, T- and N-Series trucks, remove the floor pan cover at the gear shift lever to obtain access to the line connections and the rear of the compressor.

On H-Series trucks, this access is obtained by tilting the cab at the beginning of the removal procedure.

6. Disconnect all air lines at the governor.

7. Disconnect the water lines at the air compressor, the cylinder block, and at the water crossover connection.

8. Unclamp any water or air lines as necessary to provide clearance for compressor removal.

9. On F-, T- and N-Series trucks, remove the water crossover pipe from the rear of the cylinder heads in order to gain access to the accessory drive rear support plate. On H-Series trucks, it is not necessary to remove the crossover pipe because the crossover pipe goes over the top of the accessory gear case as shown in Fig. 12.

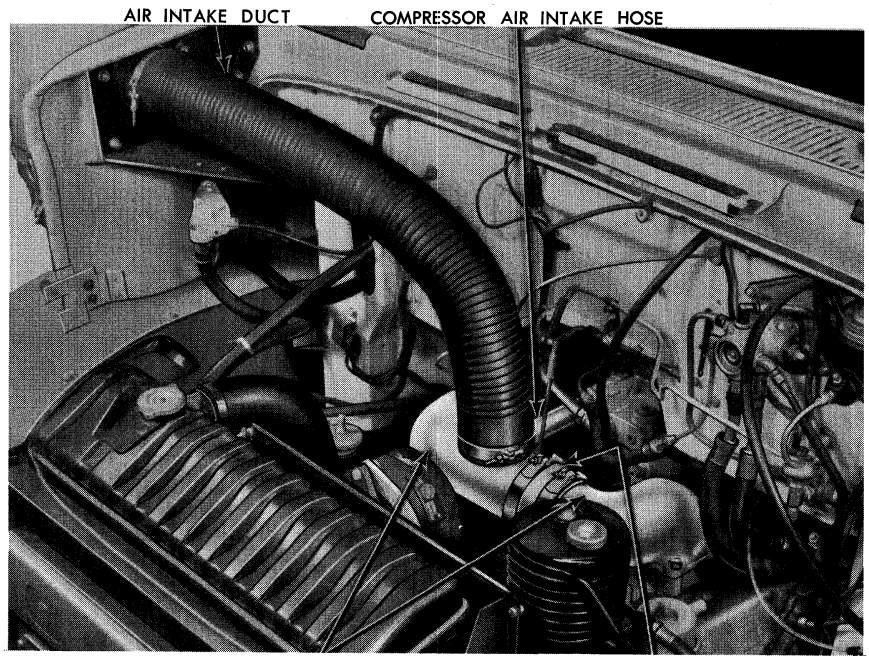

FIG. 11—Air Intake System—N-Series—Typical of H-Series

10. Remove the bolts and lock washers that secure the rear support plate and the compressor to the accessory gear case. Remove the rear support plate from the rear side of the gear case (Fig. 12), and remove the compressor from the front side of the gear case.

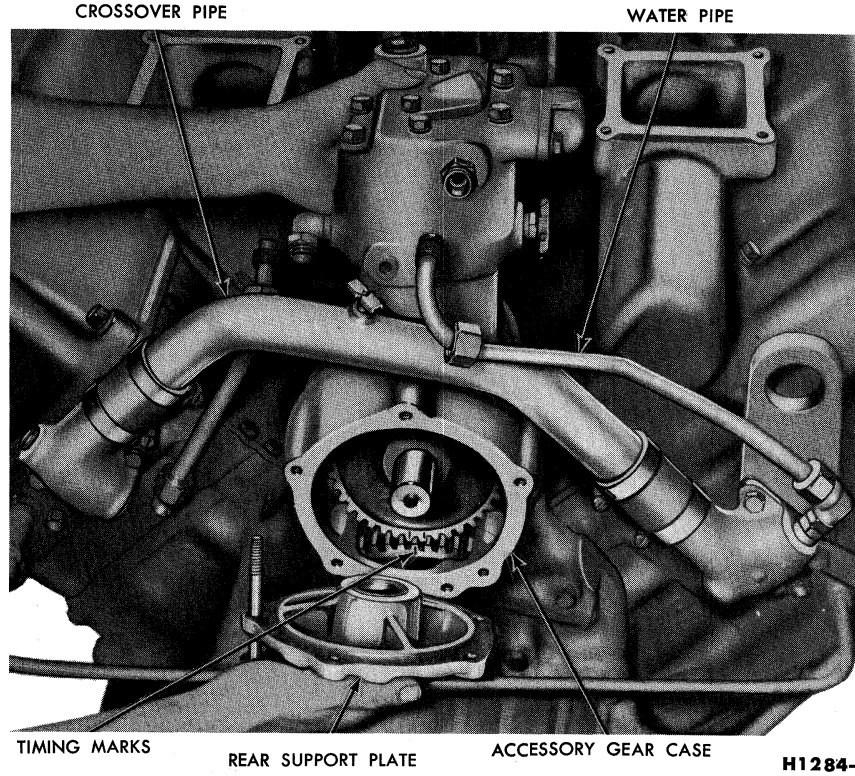

FIG. 12—Removing or Installing V-6 Air Compressor—H-Series Typical of F-, T-, and N-Series

INSTALLATION

Fuel Pump and Air Compressor—F-, H-, T- and N-Series Trucks

1. Clean the gasket material from the compressor, gear case, and accessory drive rear support plate.

2. Position the air compressor with a new gasket to the front side of the gear case so that the timing marks on the air compressor drive gear are aligned with the marks on the camshaft gear (Fig. 12). Be sure that the gears mesh properly.

3. Position the accessory drive rear support plate with a new gasket to the rear side of the gear case, then secure the support plate and air compressor to the gear case with the lockwashers and retaining bolts.

4. On F-, T- and N-Series trucks, clean the gasket material from the water crossover pipe and the rear of the cylinder heads. Position the crossover pipe to the cylinder heads with new gaskets and install the retaining bolts.

5. Connect the two water lines (compressor - to - cylinder block and compressor-to-water crossover connection).

6. Connect the main air outlet line to the compressor.

7. Connect to the governor all air lines that were disconnected during removal.

8. On F- and T-Series trucks, connect the compressor air intake hose and secure with two clamps.

9. Secure any water or air line-to-sheet metal clamps that were disconnected during removal.

10. On F-, T- and N-Series trucks, install the floor pan cover at the gear shift lever.

11. Clean the gasket material from the pump mounting surfaces, position a new gasket, install the fuel pump to the front side of the compressor, and connect the throttle linkage and lines as described in Group 10.

12. On F- and T-Series trucks, fill the cooling system, charge the reservoirs and check for leaks.

On H- and N-Series trucks, first install the air intake system components as outlined in the following procedure.

Air Intake Lines—H- and N-Series Trucks Only

1. Install the right air cross-over manifold to the engine intake manifold, connect the compressor air intake hose to the cross-over manifold and to the compressor, and position the connection hose on the right and left cross-over manifolds (Fig. 11).

2. Install the air cross-over manifold retaining bolts, and tighten the two clamps on the compressor air intake hose.

3. Tighten the clamps on the connection hose.

4. Connect the air intake duct to the air cross-over manifold and tighten the clamp.

5. Fill the cooling system, charge the reservoirs, and check for leaks.

GOVERNOR

REMOVAL

The governor is mounted to the compressor with two retaining bolts. Mating ports in the governor and compressor bodies connect governor pressure to the unloading pistons in the compressor. Reservoir pressure is connected to the governor through a hose or tube.

1. Exhaust the air brake system.

2. On vertically-mounted units, disconnect the governor hose (end opposite governor) from the fitting in the reservoir pressure line. On side-mounted units, disconnect the pressure line at the governor.

3. Remove the two mounting bolts, then remove the governor.

INSTALLATION

1. On vertically-mounted units, transfer the hose to the replacement governor.

2. Install the governor and gasket and the two retaining bolts to the compressor. Apply sealer.

3. On vertically-mounted units, connect the hose to the fitting on the reservoir pressure line. On side-mounted units, connect the pressure line to the governor.

4. Test the governor as outlined in Part 2-1.

PRESSURE INDICATOR VALVE

The low pressure indicator valve is mounted at the passenger side of the dash panel (Fig. 13), and taps into a reservoir pressure line on the engine side of the panel.

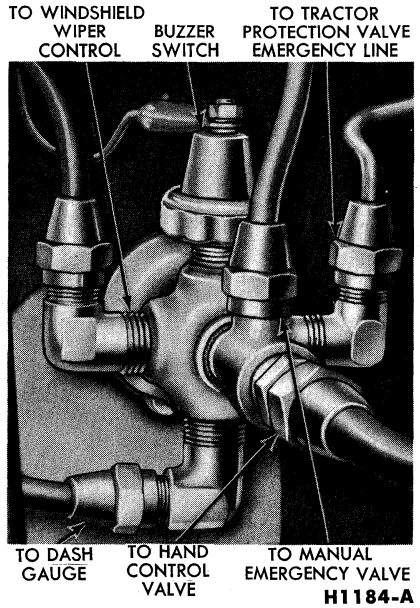

FIG. 13—Pressure Indicator Valve

REMOVAL

1. Turn the ignition switch to the "off" position and exhaust the air from the brake system.

2. Disconnect the wire at the buzzer switch.

3. Disconnect the air line to the dash gauge and the line to the windshield wiper control. On some full air systems, also disconnect the lines to the tractor protection valve, to the manual emergency valve, and to the hand control valve (Fig. 13).

4. Unscrew the pressure indicator fitting at the engine side of the dash panel, and remove the assembly from the passenger side.

INSTALLATION

1. Mount the replacement unit to the passenger side of the dash panel and secure it to the panel by screwing on the pressure indicator fitting at the engine side.

2. Connect the wire to the buzzer switch, and connect the dash gauge and windshield wiper control lines. On some full air systems, connect the other lines as shown in Fig. 13.

4 MAJOR REPAIR OPERATIONS

Major repair operations are not applicable to this section. If the compressor, reservoirs, governor, low pressure indicator, and/or dash gauge is defective, the component must be replaced.

PART 2-7 AIR BRAKES

1 DESCRIPTION AND OPERATION

Full air brakes are available on all 600 through 1100 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.

TRACTOR AIR BRAKE SYSTEM

The full air brake system consists of the air supply system described in Part 2-6 and the braking system.

BRAKING SYSTEM

The braking system consists of the foot control valve, the four brake chambers and slack adjusters, and two quick releasing valves (Fig. 1). The distance the brake treadle is depressed regulates the amount of compressed air delivered by the foot control valve to the brake chambers. The amount of air, in turn, determines the braking force applied by the slack adjusters to the shoes.

Foot Control Valve

APPLYING POSITION. Depressing the treadle forces the plunger, rubber graduating spring, and piston downward against the resistance of the return spring (Fig. 2). As the piston moves down against the exhaust seat, it closes the passage between the brake chamber ports and

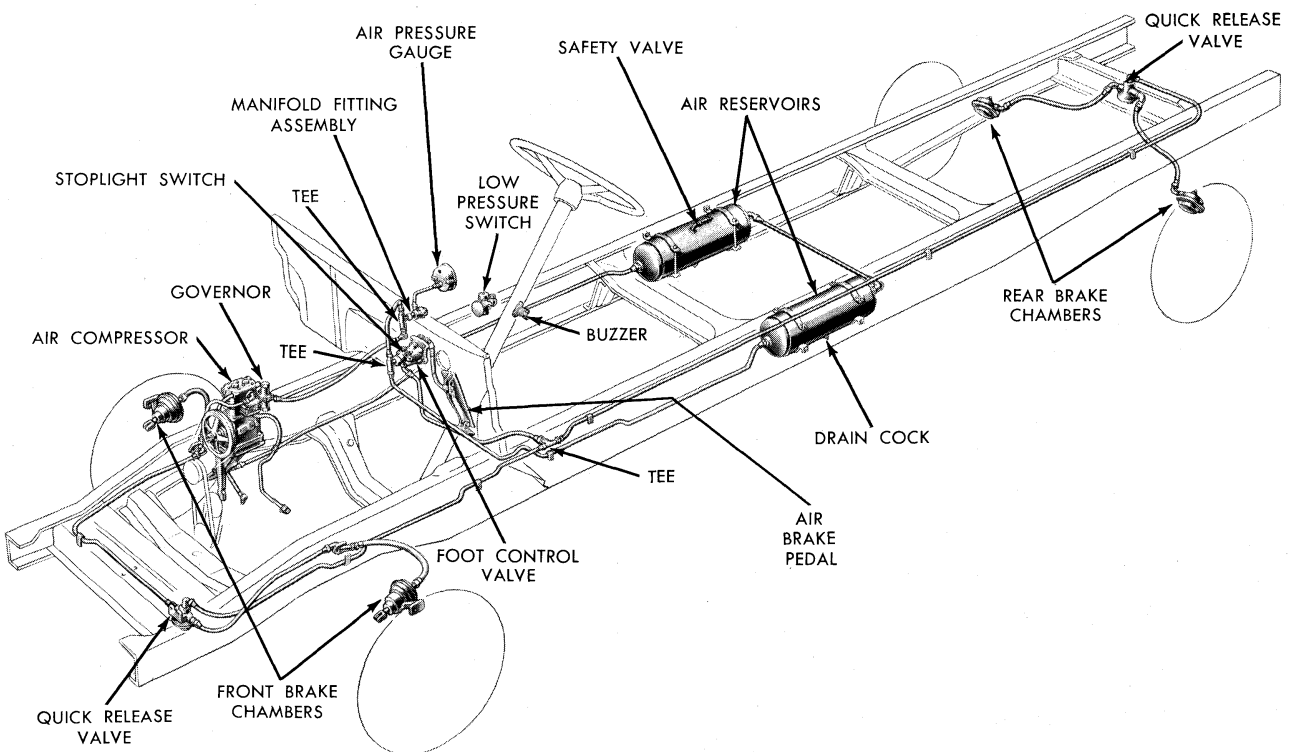

FIG. 1—Typical Air Brake System

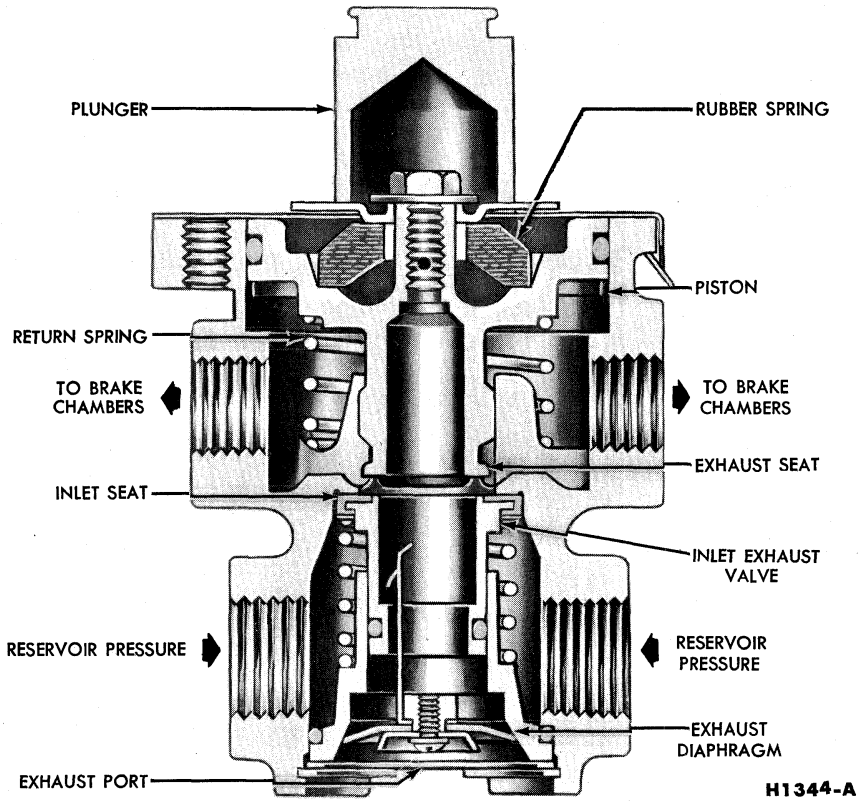

FIG. 2—Foot Control Valve Operation

the exhaust port. Further downward movement of the piston forces the inlet-exhaust valve from the inlet seat (Fig. 2) to open the passage between the reservoir pressure ports and the brake chamber ports.

BALANCED POSITION. When the air pressure in the cavity beneath the piston and the air pressure being delivered to the brake chambers equals the mechanical force on top of the piston, the piston lifts and the inlet valve closes, cutting off any further flow of air from the reservoir pressure ports through the valve body. The exhaust valve remains closed, however, because the mechanical pressure at the treadle holds the piston (seat) down against the valve. With both valves closed, no more air can enter and air already admitted can not escape. The valve is thus in a balanced position.

If the treadle is depressed further, mechanical pressure overcomes air pressure in the cavity beneath the piston opening the inlet valve again. This permits more reservoir air to enter until the pressure below the piston equals the mechanical pressure above and the inlet valve closes again. Complete depression of the treadle releases full reservoir pressure to the brake chambers.

RELEASED POSITION. If the treadle is partially released, air pressure beneath the piston overcomes the mechanical pressure above, raising the piston and the inlet-exhaust valve assembly. This action closes the intake valve and opens the exhaust valve allowing air pressure from the brake chambers and lines to be released through the exhaust port. The air continues to exhaust until air pressure below the piston equals the mechanical pressure above. The foot control valve is again in balanced position. If the treadle is allowed to return to the fully released position, the exhaust valve remains open to exhaust all air from the chambers and fully release the brakes.

Brake Chamber and Slack Adjuster. Compressed air, admitted to the brake chamber by the foot control valve, enters the chamber behind a diaphragm which forces the push rod outward (Fig. 12). The outward movement of the push rod rotates the slack adjuster which in turn rotates the brake camshaft and cam forcing the shoes against the drum.

When the air pressure is released from the brake chamber, the brake shoe release springs and the brake chamber release springs return the brake shoes, brake cam, slack adjuster, and the pushrod and diaphragm assembly to released position.

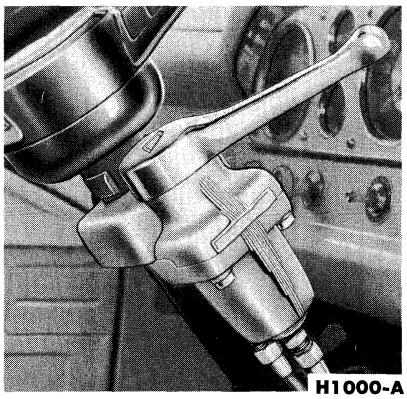

FIG. 3—Hand Control Valve

Quick Release Valves and Relay Valve. The quick release valve (Fig. 1) reduces the time required to release the brakes by hastening the exhaust of air from the brake chambers. The valve body contains a spring-loaded diaphragm so arranged as to permit supply pressure from the control valve to flow through the release valve to the brake chambers in one direction. When supply pressure is reduced, the air, which has passed through, is permitted to escape rapidly through the exhaust port.

The quick release valve is used with both front and rear brake chambers, or with front chambers only as in the case of a T-Series truck.

On a T-Series truck, the relay valve is used in place of the rear quick release valve (Fig. 20). The relay valve functions somewhat the same as the quick release valve, except that it services four rear brake chambers on a T-Series truck instead of two. The relay valve is also more sensitive to the action of the control valve in that it can assume a balanced position as well as apply and release.

TRACTOR-TRAILER AIR BRAKE SYSTEM

Tractor-trailer air brake equipment is available as a regular production option. The following items are included in the package.

HAND CONTROL VALVE

The hand operated brake application valve (Fig. 3) is mounted on the steering column. It controls the application of the trailer brakes independent of the tractor brakes.

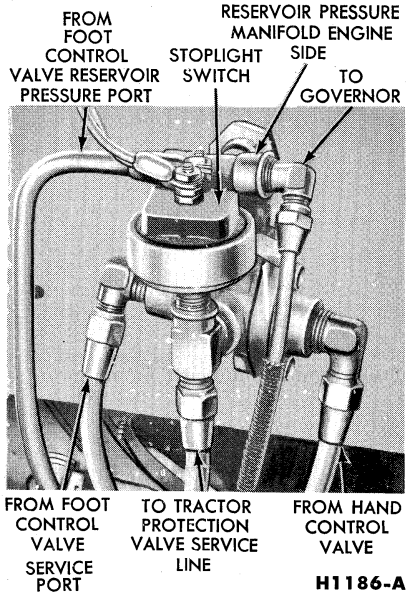

FIG. 4—Double Check Valve

DOUBLE CHECK VALVE

The double check valve is a shuttle type valve which is connected between the hand operated and foot operated brake control valves. The double check valve prevents air from exhausting through one of the brake control valves while the other is being applied.

In a typical installation (Fig. 4), the double check valve is connected to a reservoir pressure manifold mounted to the engine side of the dash panel. The pressure indicator valve also ties into this manifold from the passenger side (Part 2-6, Fig. 13).

MANUAL EMERGENCY VALVE

The manual emergency valve is mounted under the edge of the instrument panel (Fig. 5). This is a two-way valve by which the operator manually controls the operation of the tractor protection valve for either normal or emergency operation of the brakes.

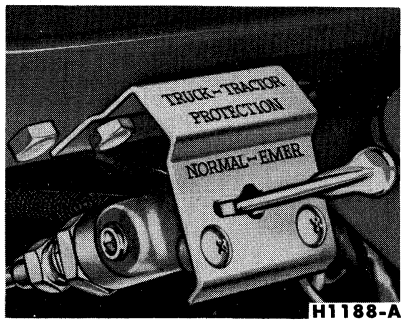

FIG. 5—Manual Emergency Valve

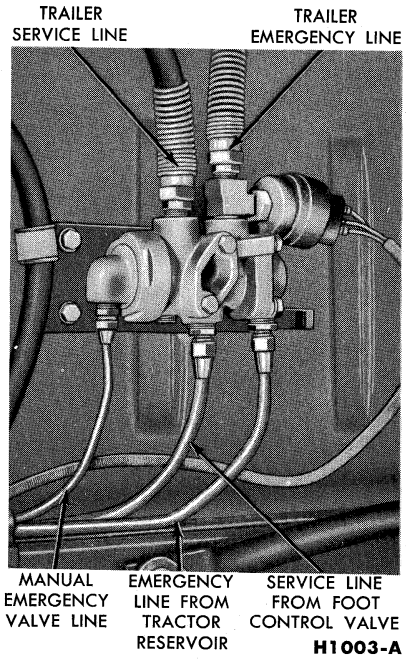

FIG. 6—Tractor Protection Valve

TRACTOR PROTECTION VALVE

The tractor protection valve is mounted on the rear of the cab (Fig. 6). When the tractor protection valve is open it keeps the service and emergency lines open to the trailer for normal operation. When closed the tractor protection valve performs the following function:

1. Closes automatically when tractor reservoir pressure drops below normal operating pressure (24 psi). This stops passage of air to the trailer until tractor reservoir pressure builds up again.

2. Closes by action of the manual emergency control valve to effect emergency application of the trailer brakes in the event of tractor brake failure.

3. Closes by action of the manual emergency control valve, if the trailer breaks away, to prevent the loss of tractor reservoir pressure.

RELAY EMERGENCY VALVE

The relay emergency valve is located on the trailer near the trailer reservoir. During normal operation it charges the trailer reservoir and applies and releases the trailer brakes in unison with the tractor brakes. During emergency operation, or in the case of trailer break-away, the relay emergency valve automatically applies the trailer brakes.

HOSE HANGERS AND CONNECTORS

The trailer brake hoses (emergency line and service line) are suspended from the center of the cab, above the rear cab window, by coil springs (Fig. 7). When the trailer is not in use, the connectors are hung

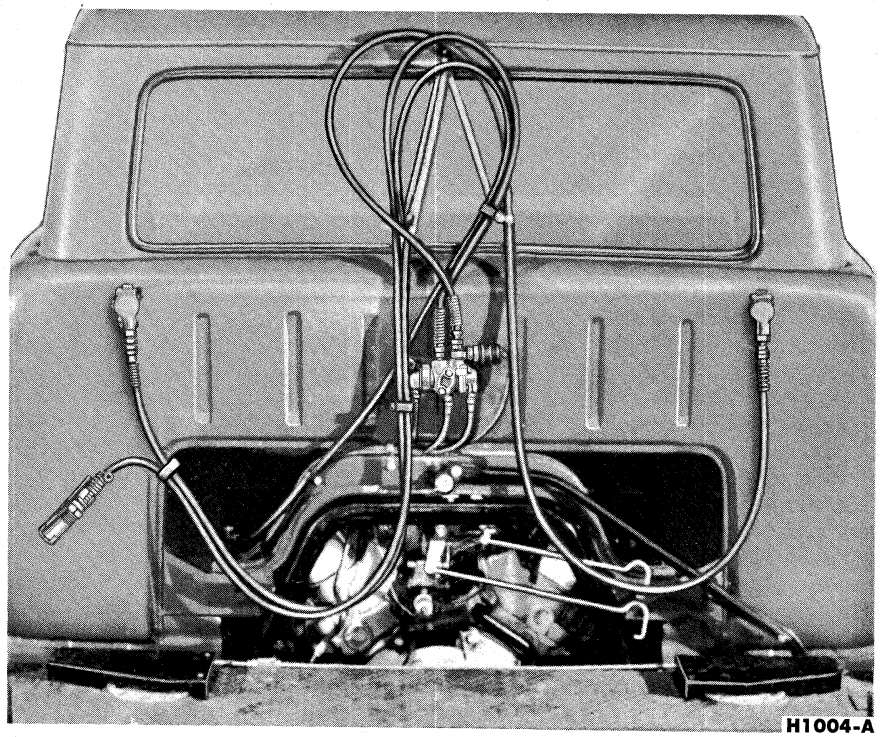

FIG. 7—Trailer Brake Hoses and Connections

on brackets at either side of the rear of the cab.

OPERATING PRINCIPLES

The trailer system has its own reservoir and has a brake chamber and slack adjuster for each wheel the same as the tractor system. Both systems are supplied by the one air compressor and are controlled by the foot control brake valve. The two systems are connected by two hoses running between the tractor protection valve mounted on the cab and the relay emergency valve on the trailer.

The foot controlled brake valve operates both tractor and trailer brakes simultaneously. The hand controlled brake valve operates the trailer brakes only. Although they operate independently of each other, both hand and foot controlled brake valves apply pressure through the same service line going to the trailer. Both valves operate the trailer brakes in exactly the same manner.

Normal Operation. When its control lever is in the NORMAL position, the manual emergency valve directs tractor reservoir pressure to the top side of the diaphragm in the tractor protection valve. The reservoir pressure depresses the diaphragm and forces the valve plungers down holding open the two valves (service-exhaust and disc) in the tractor protection valve assembly. With the disc valve open, tractor reservoir pressure can flow through the emergency line to the relay emergency valve on the trailer.

As tractor reservoir pressure flows into the relay emergency valve, it forces the emergency diaphragm up, holding the emergency valve open and the port closed.

CHARGING THE TRAILER RESERVOIR. Since the emergency port is held closed by the diaphragm and the supply valve is held closed by spring pressure, no reservoir pressure can go to the trailer brake chambers. Tractor reservoir pressure, however, does open the check valve allowing air to flow from the tractor reservoir to the trailer reservoir. As soon as the pressure in the two reservoirs becomes equalized, the check valve will close.

APPLIED POSITION. Operation of either the hand or the foot control brake valve directs tractor reservoir pressure through the service line and through the open service valve (within the tractor protection valve assembly) to the relay emergency valve on the trailer.

As the pressure enters the top of the relay emergency valve, it forces the relay diaphragm down against spring pressure to open the supply valve. Also the emergency valve is still being held open by pressure from the emergency line applied against the emergency diaphragm. Therefore, pressure flows from the trailer reservoir through the open supply and emergency valves to the trailer brake chambers.

BALANCED POSITION. If the brake valve is actuated and then held at a partially applied position, the bleeder passage will allow the pressure on each side of the relay diaphragm to equalize and, thus, return the diaphragm to its normal position. With the diaphragm neither depressed nor raised, both the supply valve and the exhaust port are closed. Pressure can neither enter nor leave the brake chambers. The brakes hold.

RELEASED POSITION. When the brake valve is released, it exhausts the pressure from the upper side of the relay diaphragm. As a result, the higher pressure from the brake chambers raises the outer ends of the diaphragm to open the exhaust port. With the exhaust port open, air exhausts from the brake chambers releasing the trailer brakes.

Emergency Operation. The manual emergency valve is moved from the NORMAL to the EMERGENCY position in either of two cases: if the trailer breaks away from the tractor; or when emergency application is desired at the trailer brakes because of tractor brake failure. In either case, moving the manual valve to the EMERGENCY position exhausts air pressure from the upper side of the diaphragm in the tractor protection valve. As the diaphragm is released, spring pressure raises the valve plungers and closes the two valves in the tractor protection valve assembly. The closed service and exhaust valve shuts off the service line; the closed disc valve shuts off the emergency line; therefore, tractor reservoir pressure is prevented from passing through the two trailer lines.

TRACTOR BREAK-AWAY. If the tractor breaks away, the pressure underneath the emergency diaphragm in the relay emergency valve exhausts through the broken emergency line to atmosphere. This escape of air allows the diaphragm to drop back to its released position which closes the emergency valve and opens the emergency port. With the supply, emergency, and check valves all closed, the trailer reservoir can not exhaust to atmosphere. The opening of the emergency port automatically connects trailer reservoir pressure to the trailer brake chambers.

EMERGENCY APPLICATION –TRAILER ATTACHED. If the two-way manual valve is moved to the EMERGENCY position when the trailer is still attached, the pressure from underneath the emergency diaphragm (in the relay emergency valve) exhausts through the tractor protection valve instead of the broken emergency hose. The alternate route of the exhaust air is through the unbroken hose. Since the tractor protection valve is in the emergency position, the valve plungers are no longer seated against the valves; therefore, air from the trailer lines exhausts through the drilled passages in the valve plungers and out the exhaust port.

Front Wheel Limiting Valve. The limiting valve instantly limits air pressure delivery at the front wheel brake chambers according to road and load conditions and while the truck is in motion. This limited pressure at the front brakes permits the rear brakes to function with greater force than the front brakes.

The limiting valve is mounted on the dash. An air line from the delivery port of the brake control valve connects to the inlet port of the limiting valve. Another air line connects the delivery port of the limiting valve to the front quick release valve.

The delivery pressure from the limiting valve is controlled by a spring-loaded piston, which closes the inlet valve when the pressure setting of the spring is reached. The pressure setting of the spring is controlled by a hand knob, which may be set for four different pressures indicated on the dial: (1) at FULL, approximately full reservoir pressure delivered to the front brakes; (2) the next setting delivers 55 lbs. pressure; (3) the next 44 lbs., and LOW delivers 20 lbs. Under normal conditions, the limiting valve should always be set at the FULL position. Lower settings should be used only when required by unusual road and load conditions.

STOPMASTER BRAKES

The Stopmaster brakes are available as optional equipment on H-Model trucks. The Fail-Safe units and automatic adjusters are available as additional optional features for use with the Stopmaster brake. The Fail-Safe unit is covered in Part 2-3.

Two air chamber and actuator assemblies, one at each end of the brake shoes, force the shoes against the drum (Fig. 14). With this design both shoes do an equal amount of work resulting in a balanced and equal braking force in either direction of truck travel.

System air pressure enters each pressure housing and moves the diaphragm and plate against the wedge (Fig. 23). The diaphragm plate and push rod assembly pushes the wedge between the two rollers forcing the plungers against the brake shoes to apply the brakes (Fig. 14). As pressure is released, the wedge springs pull the wedges out of the rollers allowing the shoe retracting springs to pull the shoes away from the drum and force the plungers back into their actuator housings.

2 IN-TRUCK ADJUSTMENTS AND REPAIRS

FOOT CONTROL VALVE ADJUSTMENT

F-, B-, C-, N- AND T-SERIES TRUCKS

The foot control valve is bolted to a mounting plate (Fig. 17) on the lower dash panel (engine side). The brake treadle pivots on a pin in a support that is integral with the same mounting plate on the passenger side of the dash panel (Fig. 18). This type of mounting eliminates treadle arm and stop adjustments; therefore, the only external factors that would interfere with proper brake application and release are dirt or other foreign material between the heel of the treadle and the body, or a bind at the treadle pivot pin. If the brakes do not release promptly and/or apply fully after eliminating any possible bind at the treadle heel or pivot pin, replace the valve or remove it for overhaul.

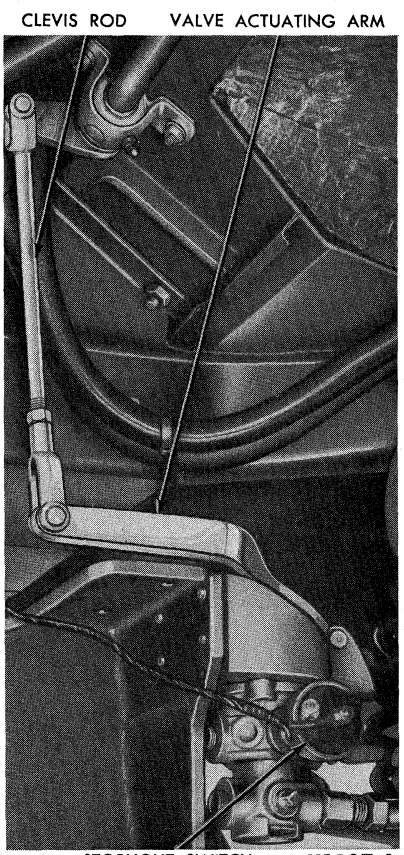

FIG. 8—H-Series Control Valve Linkage

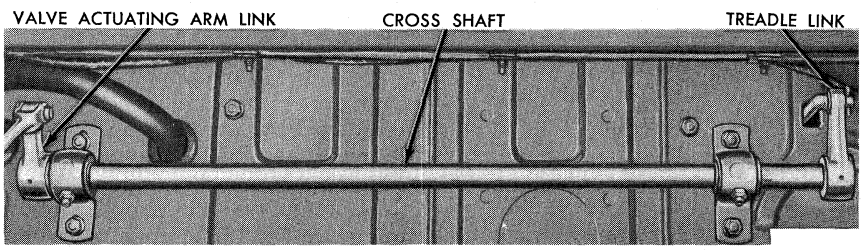

FIG. 9—Control Valve Linkage Cross Shaft—H-Series

To determine if the brakes are applying properly, proceed as follows:

1. Install a pressure gauge anywhere in the circuit between the control valve and the brake chambers, or install the gauge in one of the extra brake service ports (upper row of ports).

2. Fully depress the brake treadle. The test gauge reading should approximate reservoir pressure as indicated by the dash gauge.

H-SERIES TRUCKS

On H-Series trucks, the control valve is mounted on a bracket that is bolted to the right side cab pivot support (Fig. 8). The valve is operated by an actuating arm connected to a clevis rod which is, in turn, connected through a link to a cross shaft (Fig. 9). The treadle link on the opposite end of the cross shaft connects to a clevis rod that is fastened to the brake treadle in the cab (Fig. 10).

1. Make sure that the linkage components operate freely, then disconnect the clevis rod from the valve actuating arm by removing the clevis pin (Fig. 8).

2. Move the floor mat to one side,

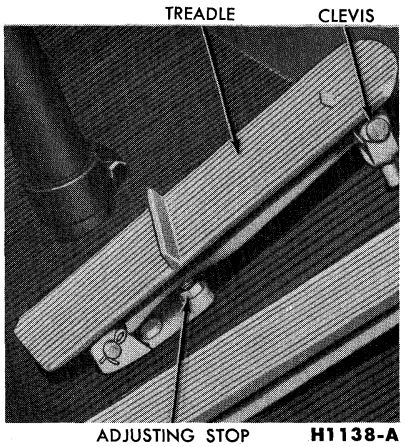

FIG. 10—H-Series Treadle Stop Adjustment

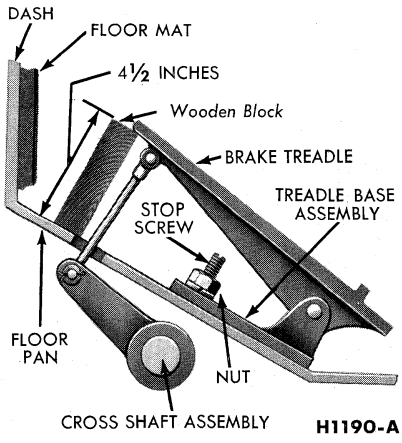

FIG. 11—Treadle and Linkage Adjustment

and place a 4½ inch wood block between the brake treadle and the floor pan sheet metal (Fig. 11).

3. While holding the treadle against the wood block (Fig. 11), adjust the clevis rod (Fig. 8), so that the clevis pin can be inserted through the adjusting clevis and the valve actuating arm.

4. Remove the wood block and tilt the cab. With the cab tilted, observe the rear stop lights. If the lights are "on", shorten the clevis rod by turning the clevis (Fig. 8) one turn at a time until the stop lights go "out".

SLACK ADJUSTER ADJUSTMENT

Apply the brakes and measure the travel of the brake chamber push rod (Fig. 12). If equipped with a Maxibrake unit, the minimum air pressure should be 90 psi while measuring the travel. The travel should be kept to the minimum possible without causing the brakes to drag. The maximum travel should not exceed the dimensions listed in Table 1. **Adjustment of the yoke on the brake chamber push rod should not be changed. When new, the yoke is adjusted so that the slack adjuster-brake chamber push rod angle is slightly greater than 90° when the brakes are properly adjusted and the brakes are applied. Brake lining wear will not change this angle as long as the slack adjusters are kept adjusted to compensate for lining wear.**

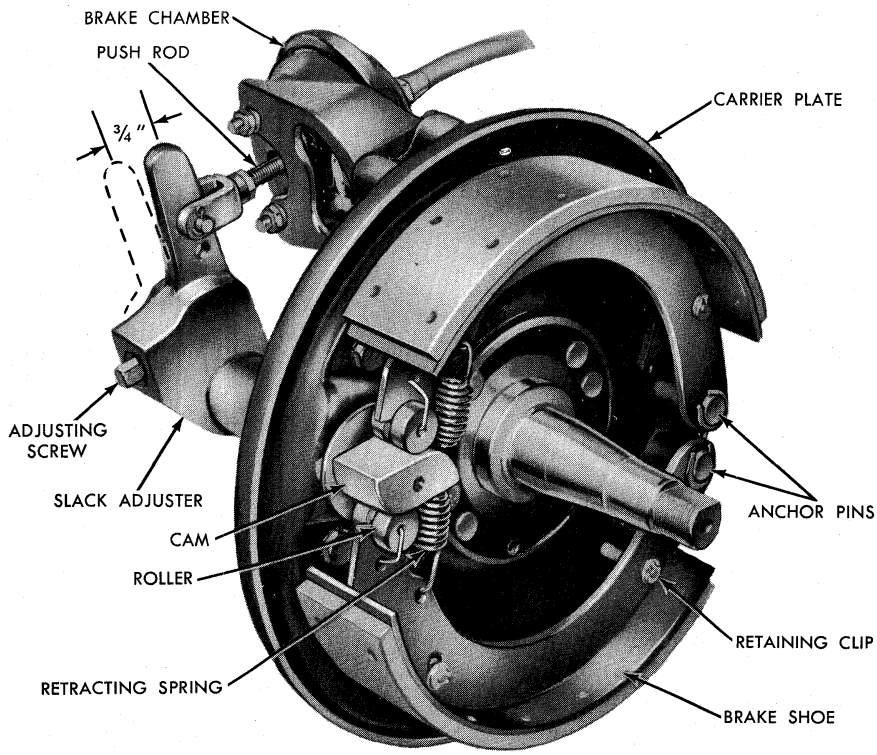

FIG. 12—Typical Front Brake Assembly

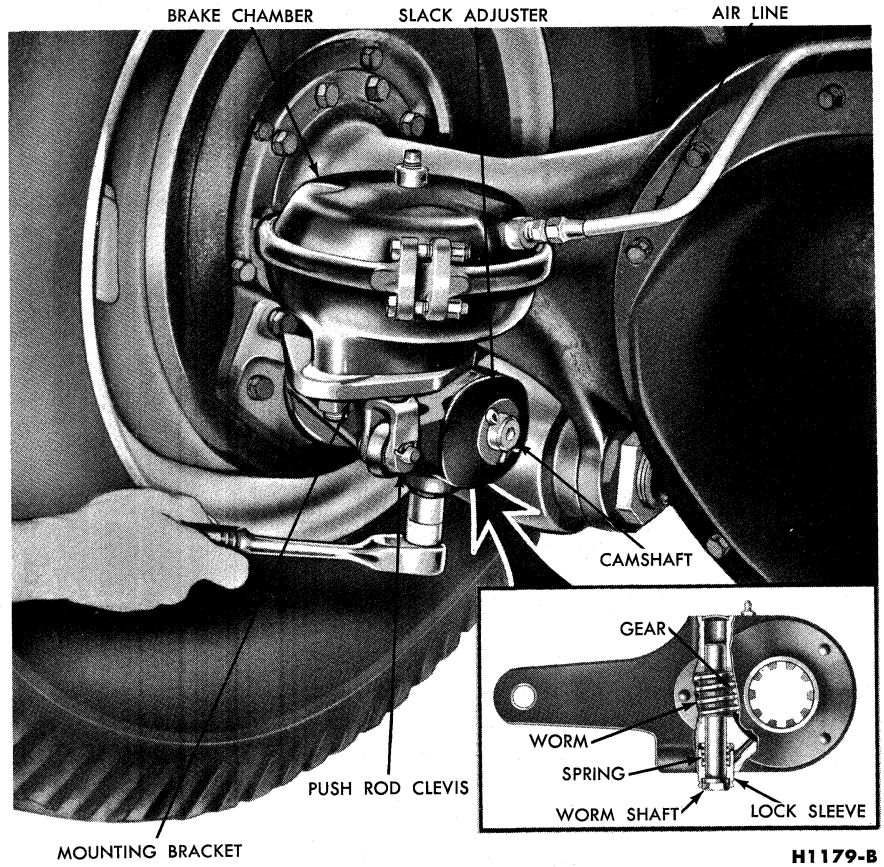

FIG. 13—Rear Brake Adjustment

FRONT

This procedure applies only to trucks equipped with standard type slack adjusters.

A push rod travel, that reaches or exceeds the maximum listed in the "Brake Chamber Push Rod Adjustment" table in Part 2-8, indicates need of adjustment. Turn the adjusting screw clockwise until the push rod travels ¾ inch in going from released to fully applied position (Fig. 12). When making the adjustment, turn the screw in quarter turns.

REAR

This procedure applies to trucks equipped with either standard or Maxibrake type slack adjusters.

A push rod travel, that reaches or exceeds the maximum listed in the "Brake Chamber Push Rod Adjustment" table in Part 2-8, indicates need of adjustment. Depress the lock sleeve and turn the hexagon head of the wormshaft clockwise until the push rod travels one inch in going from released to fully applied position (Fig. 13). Be sure that the lock sleeve comes back out and engages the hexagon head of the wormshaft so as to lock the adjustment.

When adjusting either front or rear slack adjusters, raise the wheels and make certain that there is no brake drag.

STOPMASTER BRAKE SHOE ADJUSTMENT—MANUAL ADJUSTERS

1. Raise the wheel clear of the floor and remove the covers from both adjusting slots in the carrier plate.

2. With a brake adjusting tool, turn the adjusting bolt or star wheel on one shoe at a time (Fig. 14). All adjusting bolts have right-hand threads. Turn the adjusting bolt **out** of the actuator housing until a heavy drag is felt. Back off the adjustment (turn the bolt **into** the actuator housing) until the shoe has a very light drag.

3. Repeat step 2 for the other shoe on the same wheel.

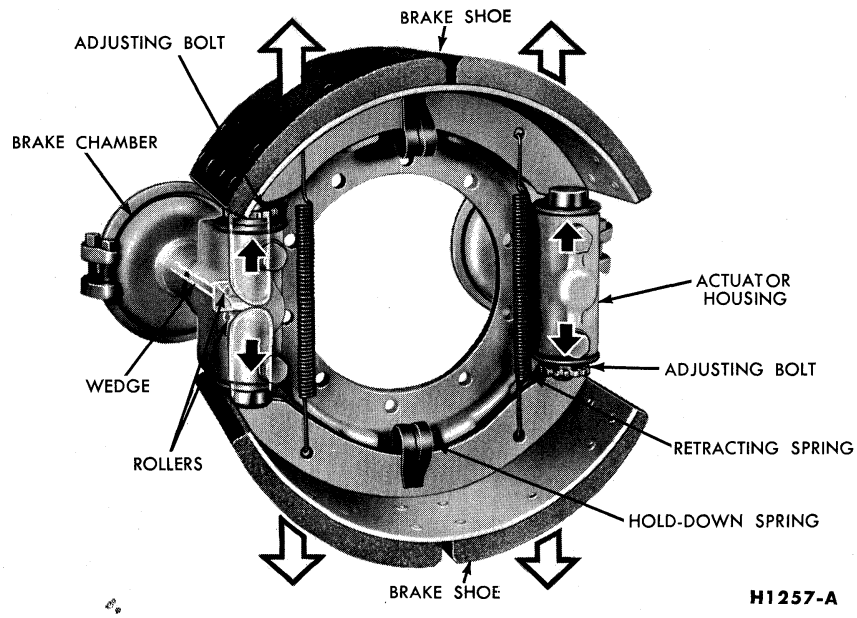

FIG. 14—Stopmaster Brake Operation and Adjustment

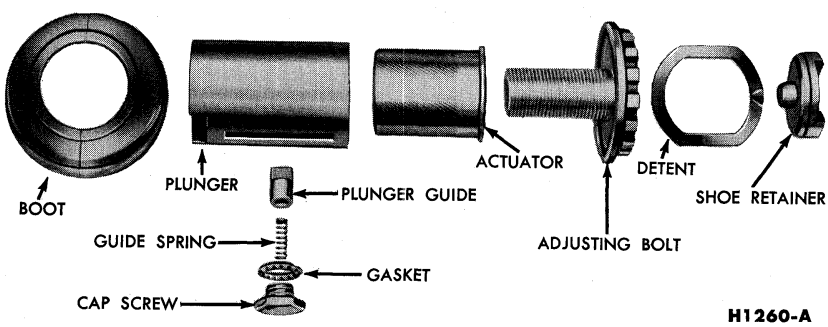

FIG. 15—Automatic Adjuster

4. Repeat the foregoing procedure on the opposite wheel.

STOPMASTER AUTOMATIC ADJUSTER

Brakes equipped with automatic adjusters require adjustment only when the adjusters have been disassembled.

Whenever the brakes are relined, the automatic adjusters should be disassembled and inspected for general condition of all moving parts.

The following procedure is accomplished with the brake shoes removed.

1. Remove the cap screw and gasket, then pull the guide spring and guide out of the plunger (Fig. 15).

2. Pull the actuator, adjusting bolt, detent and shoe retainer out of the plunger as an assembly. The boot may be pulled free of the shoe retainer.

3. Coat all threads, the entire plunger, and the tip of the plunger guide with specified grease (M1C-69-A) or equivalent.

4. Screw the adjusting bolt all the way into the actuator, and install all the components into the actuator housing (Fig. 14).

5. From fully bottomed position, back off the adjusting screw ¼ turn.

6. Install the plunger guide with the notched side toward the brake shoe. Insert the guide spring, and install the gasket and cap screw.

7. After the shoes and drum have been installed, manually adjust the brakes as described under "Brake Shoe Adjustment – Manual Adjusters".

3 REMOVAL AND INSTALLATION

BRAKE CHAMBER

REMOVAL

1. Release all air from the system, then disconnect the air line at the brake chamber (Figs. 12 and 13).
2. Disconnect the push rod clevis from the slack adjuster.
3. Remove the mounting nuts and the brake chamber assembly.

INSTALLATION

1. If a replacement chamber is being installed, transfer the brake line fitting to the replacement brake chamber.
2. Position the brake chamber assembly on the mounting bracket and install the mounting nuts.
3. Install the clevis and cotter pin.
4. Connect the air line to the brake chamber.
5. Build up pressure in the system and inspect for leaks.
6. Adjust the brakes.

SLACK ADJUSTER

REMOVAL

1. Remove the clevis pin attaching the slack adjuster to the brake chamber push rod (Figs. 12 and 13).
2. Remove the lock ring (front) or cotter pin (rear) attaching the slack adjuster to the camshaft.
3. Mark the position of the slack adjuster on the camshaft, then slide the slack adjuster off the shaft.

INSTALLATION

1. Place the slack adjuster on the camshaft, aligning the locating marks. Excessive front camshaft end play may be remedied by installing an additional spacer at the cam end of the camshaft. Install the lock ring (front) or the cotter pin (rear).
2. Connect the brake chamber push rod to the slack adjuster by installing the clevis pin in the upper hole, and install the cotter pin.
3. Lubricate the slack adjuster, and adjust the brakes.

FRONT BRAKE AND CAMSHAFT

REMOVAL

1. Remove the wheel and hub and drum assembly.
2. Remove the brake shoe retracting spring from the brake shoes and the C-washer from each anchor pin (Fig. 12).
3. Remove the four brake shoe retaining clips, then slide the brake shoes off the anchor pins.
4. Mark the position of the slack adjuster on the camshaft housing.
5. Disconnect the brake chamber clevis, and remove the slack adjuster lock ring and the slack adjuster from the camshaft.
6. Pull the camshaft out of the camshaft housing.

INSTALLATION

1. Install the camshaft in the camshaft housing.
2. Slide the brake shoes on the anchor pins, and install a new C-washer on each anchor pin. Tighten the anchor pin lock nuts. Install the brake shoe hold down clips.
3. Install the brake shoe retracting spring.
4. Install the slack adjuster on the camshaft, lining up the marks. Install the camshaft snap ring.
5. Connect the brake chamber push rod clevis to the slack adjuster by installing the pin the upper hole of the slack adjuster.
6. Install the hub and drum and wheel.

REAR BRAKE AND CAMSHAFT

REMOVAL

1. Remove the axle shaft, wheels, and hub and drum assembly.
2. Remove the retracting springs and anchor springs, then remove the brake shoes and cam roller assemblies (Fig. 16).

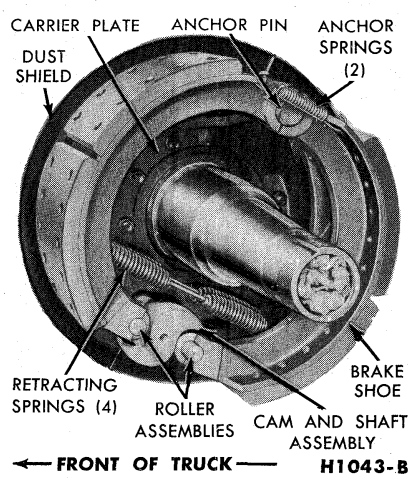

FIG. 16—Rear Brake Assembly

3. Mark the position of the slack adjuster on the camshaft, then remove the slack adjuster (Fig. 9).
4. Remove the camshaft from the carrier plate.

INSTALLATION

1. Insert the camshaft through the carrier plate and into the camshaft housing.
2. Install the brake chamber and bracket assembly.
3. Install the slack adjuster on the camshaft, aligning the locating marks, and install the cotter pin (Fig. 13).
4. Lubricate the camshaft, rollers, and pins with Lubriplate. **Do not lubricate the cam face.**
5. Position the cam rollers and pins in the brake shoes, then place the brake shoes in position on the anchor pin and cam (Fig. 16).
6. Install the retracting springs and anchor springs.
7. Install the hub, wheels, and axle shaft.
8. Adjust the brakes and slack adjuster.

STOPMASTER BRAKE SHOES

REMOVAL

1. Back off the brake shoe adjustment and remove the wheel, hub, and drum assembly. **If equipped with Fail-Safe units, be sure that the brakes are released (actuating spring compressed by turning the release bolt approximately 18 turns clockwise).**
2. Remove the brake shoe retracting springs (Figs. 14 and 23).
3. Loosen the mounting bolt on the shoe hold-down springs, and remove the shoes. **To avoid damage to the springs, do not force the shoes out of the springs.** Loosen the mounting bolts further, if necessary.

INSTALLATION

1. Mount the ends of the brake shoes in the grooves in the actuating plungers. When installing rear shoes, make certain that the end, marked "A" in Fig. 23, is mounted on a plunger having an adjusting or star wheel.
2. Fasten the shoe to the spider with the hold-down spring, and tighten the spring bolt and nut. Make certain that the hold-down spring

applies pressure to the shoe web to avoid cocking the shoe.

3. Install the shoe retracting springs.

4. Install the wheel, hub, and drum assembly. **If equipped with Fail-Safe Units, turn the release bolt counterclockwise (approximately 18 turns) to release the manual compression of the actuating spring.**

FOOT CONTROL VALVE

The brake valve has two tiers of four ports each (Figs. 17 and 19). The lower tier of ports connects to the reservoir pressure lines; the upper tier connects to the lines carrying brake service pressure. Of the four lower ports, one receives reservoir pressure; one sends reservoir pressure to the governor; and the other two (depending upon the model) either send reservoir pressure to some other part of the system, or they are plugged. On tractors, for example, the trailer emergency line connects to one of these ports in order to carry tractor reservoir pressure to the trailer reservoir.

One of the four upper ports sends valve delivery pressure to the stop light switch. Any or all of the three remaining ports (depending upon the model) can be used to deliver service pressure to the brake chambers or to the trailer. Any unused ports are plugged.

F-, B-, C-, N-, and T-SERIES TRUCKS

REMOVAL

1. Open the reservoir drain cock(s) to exhaust the system.

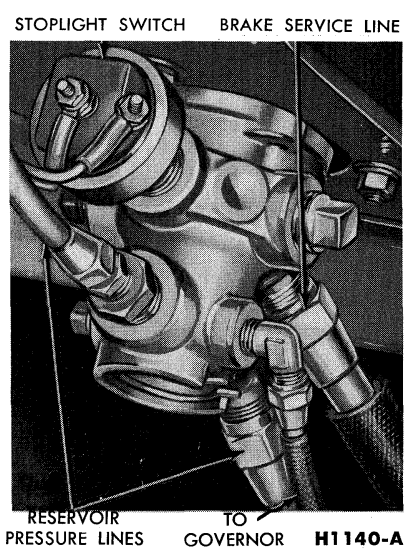

FIG. 17—Typical Foot Control Valve Installation

2. Disconnect all but one line from the valve ports (Fig. 17). Loosen, but do not disconnect, the remaining line. This line will prevent the valve from falling when the retaining bolts are removed.

3. Remove the cotter key and pivot pin that connect the brake treadle to the control valve mounting plate.

4. Remove the three control valve retaining bolts (Fig. 18).

5. Disconnect the remaining air line from the control valve and remove the control valve.

INSTALLATION

1. If a replacement valve is being installed, transfer all brass fittings and the stop light switch to the replacement. Apply sealer to the threads before installation.

2. Remove the actuating button and the rubber seal from the control valve mounting plate to facilitate the positioning of the new valve (Fig. 18).

3. Position the new valve to the lower dash panel and mounting plate, then install three retaining bolts.

4. Install the actuating button in the mounting plate bore, then install the rubber seal to the button and mounting plate.

5. Assemble the brake treadle to the control valve mounting plate with the pivot pin and cotter key.

6. Connect the stop light wires

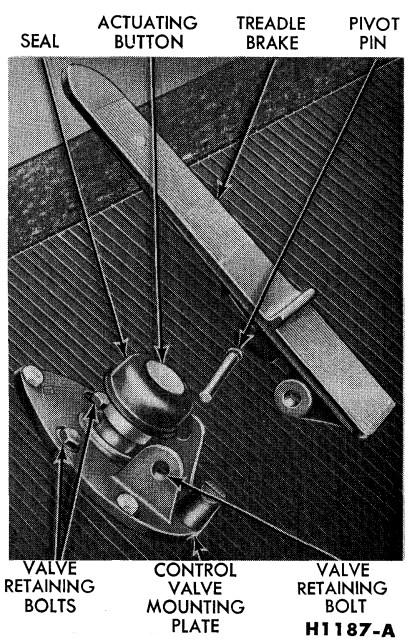

FIG. 18—Brake Treadle and Mounting Plate

(two nuts and flat washers), and connect the battery cable (Fig. 17).

7. Connect the brake service line(s) to the upper ports in the valve.

8. Connect the compressor governor line and the reservoir pressure line(s) to the lower ports in the valve.

9. Start the engine to build up pressure. Check for leaks.

H-SERIES TRUCKS

Removal

1. Open the reservoir drain cock(s) to exhaust the system.

2. Disconnect the compressor governor line and the reservoir pressure line(s) (Fig. 19).

3. Disconnect the brake service line(s).

4. Disconnect the battery cable, then disconnect the two wires from the stop light switch (Fig. 8).

5. Disconnect the control valve actuating arm from the valve mounting bracket by removing the cotter pin and clevis pin (Fig. 19).

6. Remove the three retaining bolts and the valve assembly from the mounting bracket.

Installation

1. If the valve is being replaced, transfer all brass fittings and the stop light switch to their corresponding ports on the replacement valve. Apply sealer to the threads before installation.

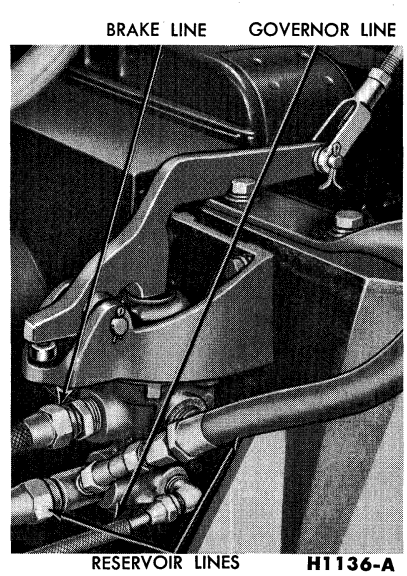

FIG. 19—H-Series Brake Valve Installation

2. Position the valve assembly to the mounting bracket and install three retaining bolts.

3. Assemble the control valve actuating arm to the mounting bracket with clevis and cotter key (Fig. 19).

4. Connect the stop light wires (2 nuts and flat washers), and connect the battery cable.

5. Connect the brake service line(s) to the upper ports in the valve.

6. Connect the compressor governor line and the reservoir pressure line(s) to the lower ports in the valve.

7. Start the engine to build up pressure and check for leaks.

8. Adjust the valve linkage.

STOP LIGHT SWITCH

If the stop light does not operate, connect a jumper wire across the two switch terminals (Fig. 17). If the light now lights, replace the switch. If the light still does not light, repair or replace the two switch lead wires as necessary.

REMOVAL

1. Disconnect the wires from the two terminals.

2. Turn the assembly out of the outlet port of the control valve.

INSTALLATION

1. Screw the new switch into the port, and connect the wires to the switch terminals.

QUICK RELEASE VALVE AND RELAY VALVE

The quick release valve is mounted as shown in Fig. 1. The relay valve is used on tandem models and is mounted as shown in Fig. 20. The following procedure applies to both valves with one exception. Before removing the relay valve, the system must be exhausted of air pressure. This is unnecessary when removing the quick release valve.

REMOVAL

1. Disconnect the air lines at the valve.

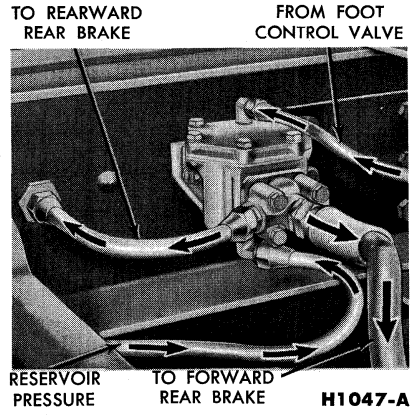

FIG. 20—Relay Valve

2. Remove the mounting bolts and remove the valve.

INSTALLATION

1. Mount the valve in place and install and tighten the mounting bolts and nuts.

2. Inspect the exhaust port to be sure that it is not plugged.

3. Connect the air lines as shown in Fig 20.

4 MAJOR REPAIR OPERATIONS

Major repair operation is applicable only to the brake chamber. If any of the components listed below are found to be defective they must be replaced:

Slack Adjuster
Front Camshaft
Rear Camshaft
Foot Control Valve
Stop Light Switch
Quick Release Valve
Relay Valve

BRAKE CHAMBER

DISASSEMBLY

1. Before disassembling the brake chamber, mark both the non-pressure and pressure plates with relation to the clamping ring so that the bolts of the clamping ring can be placed at the same location during assembly. This will eliminate the possibility of installation interference when the brake chamber is installed on the truck.

2. Pull the push rod outward against the spring so as to compress the spring and thus relieve the tension of the spring on the diaphragm and clamp ring (Fig. 21). Clamp the push rod in this position by using a vise or vise grip pliers on the rod at the non-pressure plate.

3. Remove the two clamp ring nuts and bolts. Spread the clamp ring slightly, and push the clamp ring off of the non-pressure plate half of the chamber and onto the pressure plate half.

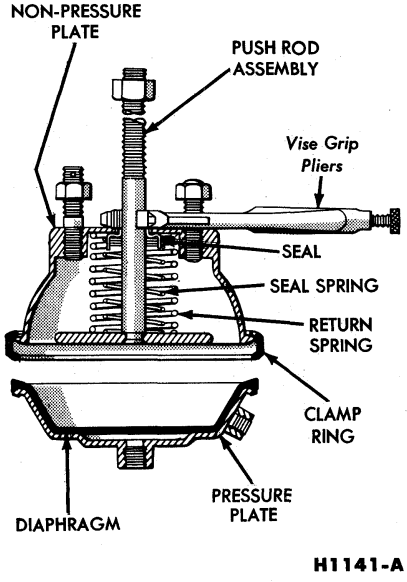

FIG. 21—Brake Chamber Assembly

4. Remove the pressure plate and diaphragm assembly from the non-pressure plate half of the chamber.

5. Remove the yoke and lock nut from the push rod. Release the vise clamp from the push rod. Remove the push rod assembly, return spring, seal, and seal spring from the non-pressure plate half of the chamber.

ASSEMBLY

Always be sure that the correct return spring is used in any brake chamber. Also be sure that the brake chamber on the opposite side of the axle has the same return spring; otherwise uneven braking will result.

If a new diaphragm is installed in the brake chamber on one side of the axle, a new one should be installed in the corresponding brake chamber on the opposite side also; otherwise uneven braking may result.

1. Rest the push rod assembly upright on a flat surface, then position in order the seal spring, push rod seal, return spring, and non-pressure plate over the push rod.

2. Force the non-pressure plate half of the chamber down against the spring until it rests on the flat surface. While holding the non-pressure plate against the tension of the return spring, clamp the push rod at the non-pressure plate with vise grip pliers or a similar tool (Fig. 21).

3. With the push rod held secure to the non-pressure plate, place the clamp ring over the clamping surface of the non-pressure plate, aligning the marks made before disassembly.

4. Position the diaphragm in the pressure plate half of the chamber and join with the open end of the non-pressure plate half, aligning the marks made during disassembly. While holding the two halves together, work the clamp ring over the clamping surface of the pressure plate half.

5. Using a vise grip pliers or similar tool, clamp one set of clamp ring lugs and draw them together. Assemble the bolt and nut in the other set of lugs and tighten. Remove the vise grip pliers and install the remaining bolt and nut. Tighten each clamp ring bolt and nut only enough to prevent leakage at the clamp ring surface.

STOPMASTER BRAKE CHAMBER AND/OR DIAPHRAGM

1. Disconnect the air lines from the brake chamber.

2. Note the number of threads showing on the brake chamber tube so that it can be turned in the same distance upon installation. Loosen the spanner nut and lock washer on the tube, and unscrew the complete brake chamber from the actuator housing (Fig. 22).

3. Remove the two bolts and nuts from the clamping ring to separate the pressure housing and diaphragm from the non-pressure housing.

4. Install the new diaphragm against the head of the diaphragm plate (Fig. 23). Secure the pressure housing to the non-pressure housing with the clamp ring and the two clamp ring bolts and nuts.

5. Screw the brake chamber into the actuator housing up to the mark made on the threads at removal. Tighten the spanner nut.

6. Connect the air lines to the brake chamber.

STOPMASTER BRAKE ACTUATING SYSTEM

DISASSEMBLY

1. Remove the wheel hub and drum assembly, and the brake shoes.

2. Exhaust the air from the system and disconnect the air lines from the air chamber housings.

3. Loosen the spanner nut and lock washer on each brake chamber tube, and unscrew the brake chambers from their actuator housings (Fig. 22).

4. At each actuator housing, remove the wedge, roller, and spring assembly by pulling it straight out of the housing (Fig. 23).

5. Remove the plunger guide cap screws, then pull both plungers out of each housing.

6. On front brakes, the actuation housings can be removed by taking out four mounting bolts. On rear brakes, the housings are integral with the spider. If a rear brake actuator housing needs replacement, remove the entire spider.

7. Clean and inspect all components. Replace all parts that are worn, bent or damaged. Coat all parts with M1C-69-A grease or equivalent before assembly.

ASSEMBLY

1. On front brakes, install the actuator housings to the spider, and secure each housing with four mounting bolts. If the brake spider and housing assembly was removed from a rear brake, install a new assembly to the carrier plate.

2. Install the plungers in their actuator housings in such a way that the guide slots face away from the spider to receive the plunger guide cap screws. **Note the relative posi-**

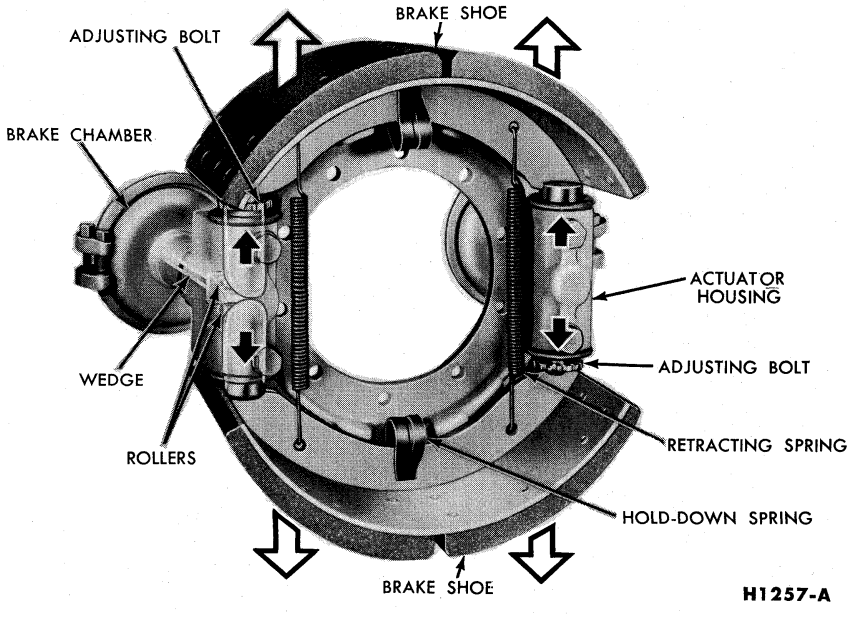

FIG. 22—Stopmaster Brake Operation

tion of the adjusting plungers and the anchor plungers in Fig. 23.

3. Install the plunger guide cap screws in each housing.

4. Install the wedge, roller, and spring assembly in each housing.

5. Any time the internal parts of the actuation system have been replaced or interchanged, the brake chamber assembly must be properly adjusted when it is installed.

Place a "C" clamp over the plungers and thread the brake chamber housing into the actuator housing until tight. **Do not use force.** If necessary, unscrew the brake chamber housing until the air line fittings are in proper location for line connection. At this point, lock the spanner nut and lock washer.

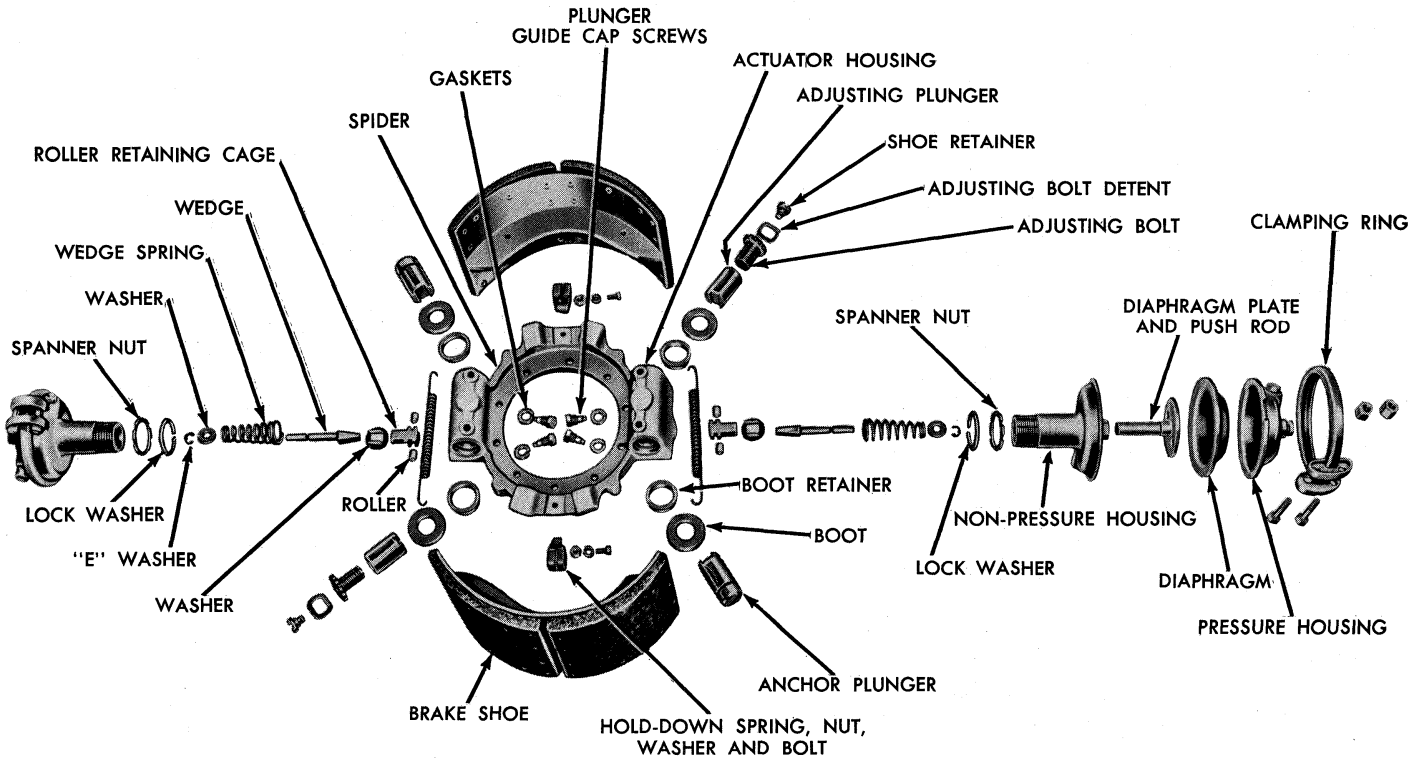

FIG. 23—Stopmaster Brake—Disassembled

H1256-A

PART 2-8 SPECIFICATIONS

HYDRAULIC BRAKE DIMENSIONS—F-100 THROUGH 350 AND P-SERIES—FRONT AND REAR

Truck Model		Brake Drum Diameter (Inches)		Brake Lining Dimensions (Inches)						Brake Cylinder Bore Diameter (Inches)	Brake Master Cylinder Piston Diameter (Inches)
				Length		Width		Thickness			
		Normal	Maximum Oversize	Primary	Secondary	Primary	Secondary	Primary	Secondary		
F-100 and P-100	Front	11	11.060	10.65	11.91	2	2	0.187	0.250	1 1/16	1 1/16
	Rear	11	11.060	10.65	11.91	1 3/4	1 3/4	0.187	0.250	7/8	
F-250	Front	12 1/8	12.185	13.09	13.09	2	2	0.250	0.250	1 1/8	1 1/4
	Rear	12 1/8	12.185	13.09	13.09	2	2	0.250	0.250	1 1/8	
F-350	Front	12 1/8	12.185	13.09	13.09	2	2	0.250	0.300	1 1/8	1 1/4
	Rear	13	13.060	12.71	13.95	2	2	0.250	0.250	1 1/4	
P-350 (Spicer 60)	Front	12 1/8	12.185	13.09	13.09	2	2	0.250	0.300	1 1/8	1 1/4
	Rear	12 1/8	12.185	13.09	13.09	2	2	0.250	0.300	1 1/8	
P-350, P-400-3500-P-4000	Front	12 1/8	12.185	13.09	13.09	2	2	0.250	0.300	1 1/8	1 1/4
	Rear	13	13.060	12.71	13.95	2	2	0.250	0.250	1 1/4	
P-500, P-5000	Front	13	13.060	12.68	13.95	2 1/4	2 1/4	0.250	0.250	15/16	1 1/4
	Rear	14 1/8	14.185	14.42	14.42	3	3	0.375	0.375	1 1/2	

HYDRAULIC BRAKE DIMENSIONS—FRONT BRAKES

SINGLE SERVO SINGLE ANCHOR										
Truck Model	Brake Drum Diameter (Inches)		Brake Lining Dimensions (Inches)						Brake Cylinder Bore Diam. (Inches)
			Length		Width		Thickness		
	Normal	Maximum Oversize	Primary	Secondary	Primary	Secondary	Primary	Secondary	
F-N-B-500-600, C-550-600-6000, F-B-N-700-750, F-800, T-700, N-6000-7000	14	14.060	13.66	15.03	2 1/2	2 1/2	1/4	5/16	1

HYDRAULIC BRAKE DIMENSIONS—FRONT BRAKES

DOUBLE ANCHOR, SINGLE CYLINDER									
Truck Model	Brake Drum Diameter (Inches)		Brake Lining Dimensions (Inches)						Brake Cylinder Bore Diam. (Inches)
			Length		Width		Thickness		
	Normal	Maximum Oversize	Primary	Secondary	Primary	Secondary	Primary	Secondary	
F-B-C-N-600-700-750, N-6000-7000, C-7000, F-800, T-700-750	15	15.060	16.62	16.62	3	3	5/16	5/16	1 1/8
F-C-T-800, T-750 (9000 and 12000 lb. Front Axle)	15	15.060	16.62	16.62	3	3	5/16	5/16	1 1/4

FRONT HYDRAULIC BRAKE DIMENSIONS—FRONT BRAKES

Double Anchor, Two-Cylinder									
Truck Model	Brake Drum Diameter (Inches)		Brake Lining Dimensions (Inches)						Brake Cylinder Bore Diam. (Inches)
			Length		Width		Thickness		
	Normal	Maximum Oversize	Primary	Secondary	Primary	Secondary	Primary	Secondary	
F-N-850-950 (7000-lb Front Axle)	15	15.60	16.62	16.62	3	3	5/16	5/16	1⅛
C-F-N-850-950 (9000-lb Front Axle)	15	15.60	16.62	16.62	3	3	5/16	5/16	1¼
T-NT-850 (9000-lb and 12000-lb Front Axle)	15	15.60	16.62	16.62	3	3	5/16	5/16	1¼

HYDRAULIC BRAKE DIMENSIONS—REAR BRAKES

TWO-CYLINDER									
Truck Model	Brake Drum Diameter (Inches)		Brake Lining Dimensions (Inches)						Brake Cylinder Bore Diam. (Inches)
			Length		Width		Thickness		
	Normal	Maximum Oversize	Primary	Secondary	Primary	Secondary	Primary	Secondary	
F-B-N-500-600, C-550-600-6000, N-6000, T-700 (13000 lb, 14000 lb, 15000 lb, and 22000 lb Rear Axles)	15	15.060	15.315	15.315	4	4	⅜	⅜	1½
F-B-N-600, N-6000, C-600-6000 (15000 lb Rear Axle)	15	15.060	15.84	15.84	4½	4½	½	½	1 1/16
F-B-N-600-700-750, C-600-6000-700-750-7000, N-6000-7000, F-800 (17000 lb Rear Axle)	15	15.060	15.315	15.315	5	5	½	½	1 1/16
T-700-750 (30000 lb Rear Axle)	15	15.060	15.315	15.315	5	5	½	½	1 1/16
F-B-C-N-700-750, C-N-7000, F-C-800 (18500 lb Rear Axle)	16	16.060	16.89	16.89	5	5	½	½	1¾
T-800 (34000 lb Rear Axle)	16	16.060	16.89	16.89	5	5	½	½	1¾
F-C-800 (22000 lb Rear Axle)	16	16.060	16.89	16.89	6	6	½	½	1 13/16
T-NT-850 (30000-lb Rear Axle)	15	15.60	15.84	15.84	5	5	½	½	1⅝
C-F-N-850 (18500 lb Rear Axle)	16	16.60	16.89	16.89	5	5	½	½	1¾
T-NT-850 (34000-lb Rear Axle)	16	16.60	16.89	16.89	5	5	½	½	1¾
C-F-N-850-950 (22000-lb Rear Axle)	16	16.60	16.89	16.89	6	6	½	½	1⅞

HYDRAULIC BRAKE PEDAL FREE TRAVEL

All Trucks	3/16-⅜ Inch

VACUUM BOOSTERS—LIGHT TRUCKS

Make and Type	Effective Diameter (Inches)	Slave Cylinder Diameter (Inches)	Minimum Hydraulic Pressure (psi) at 20 Inches Hg	Truck Application
Bendix (Hydrovac) Piston—Frame-Mounted	6¾	1	625	P-400, P-4000, P-350
Midland—Diaphragm—Dash-Mounted	8⅛	.97		F-350

VACUUM BOOSTERS—MEDIUM DUTY TRUCKS

Make and Type	Effective Diameter (Inches)	Slave Cylinder Diameter (Inches)	Minimum Hydraulic Pressure (psi) at 20 Inches Hg	Truck Application
Midland (Hy-Power) Diaphragm—Frame Mounted	8⅛	⅞	960	F-, B-500-600, C-550-600 N-500, 600, 6000 P-500, P-5000
Bendix (Hydrovac) Diaphragm	10¼	⅞	1420	F-, B-, C-700, 750, F-, C-800 N-700, 750, 7000
Bendix (Hydrovac) Piston	9½	1 3/16	1325	T-700
Bendix (Hydrovac) Tandem Piston	9½	1⅛	1300	T-750-800

VACUUM BOOSTERS—HEAVY DUTY TRUCKS

Truck Series				
	*STD.	T-850 NT-850	F-950 N-950 T-850 NT-850	C-850 F-850 N-850
	*RPO		F-850 N-850 C-850 C-950	
Type		Diaphragm	Piston	Diaphragm
Make		Bendix	Bendix	Bendix
Outside Diameter (Inches)		11.00	(Piston Dia.) 9.50	12.75
Effective Area (Sq. In.)		57	70.88	76.50
Slave Cylinder Diameter (Inches)		.75	.812	.875
Stroke (Inches)		3.75	6.25	4.55
Displacement (Cubic Inches)		1.1	3.2	2.6
Vacuum Booster Weight (Lbs.)				19.5

*Frame Mounted.

AIR BOOSTER

Make	Bendix Air-Pac
Effective Diameter	4½ inches
Slave Cylinder Diameter	1⅛ inches
Stroke	3¾ inches
Displacement (Cubic Inches)	3½
Truck Application	F-600-800, N-600-6000-750-7000, C-600-800-6000-7000, B-600-750, T-700
	C-850, C-950 F-850, F-950 N-850, N-950

HYDRAULIC BRAKE MASTER CYLINDER

Piston Diameter (Inches)	1.25	1.50	1.75
Stroke (Inches)		1.44	

REAR BRAKE CABLE ACTUATING TYPE PARKING BRAKE

Truck Model		Lining Type	Lining Thickness (Inches)	Drum Diameter (Inches)	Drum Width (Inches)
F-100	2-Wheel Drive	Moulded	Pri. -.1875 Sec.-.1875	11.00	1.75
	4-Wheel Drive	Moulded	Pri. -.1875 Sec.-2.50	11.00	1.75
F-250		Moulded	.250	12.12	2.00
P-350 with 3-speed LD & MD Transmissions		Moulded	Pri. -.250 Sec.-.250	12.12	2.00

EXTERNAL CONTRACTING BAND TYPE PARKING BRAKE

Truck Model	Lining Type	Lining Thickness (Inches)	No. of Pieces and Length (Inches)	Drum Diameter (Inches)	Drum Width (Inches)
F-350	Woven	.156	1—24.63	8.00	2.00
P-350, P-400, P-500, P-4000, P-5000	Moulded	.250	2—7.89 1—7.30	7.812	2.50

INTERNAL EXPANDING SHOE TYPE PARKING BRAKE—500-800 SERIES

Truck Model	Transmissions	Lining Thickness (Inches)	No. of Pieces and Length (Inches)	Drum Diameter (Inches)	Drum Width (Inches)
F-B-N-500-600-700, C-550-600-700	Warner T-98 4-Speed	0.21	2 @ 10.57	9.00	2.00
F-B-N-500-600, C-550-600-6000, N-6000	5-Speed M.D. Clark 250-V, 251-V0, 2622-2653-V1 H.D. 264-V0 H.D.				
F-B-N-600-700, C-550-600-700, C-N-6000-7000	New Process 435NP (Use with 330 Engine)				
F-B-C-N-T-700, C-N-7000	5-Speed M.D. Clark 250-V, 251-V0	0.21	2 @ 10.57	9.00	3.00
F-C-700-750-800, B-700-750, N-700-750, C-7000	5-Speed H.D. Clark 264-V0, 2622-V1				
F-B-N-700-750, T-C-700-750, C-7000-800, T-800, CT-750-800	5-Speed H.D. Clark 2653-V1				
F-B-N-750	5-Speed EHD Spicer 5652, 5756-B				
C-T-700	6-Speed MT-30 Transmatic				
F-800, C-T-CT-750-800	6-Speed MT40 Transmatic				
C-CT-750-800, F-800	5-Speed EHD, Spicer 5652, 5756-B	0.25	2 @ 13.95	12.00	4.00
T-CT-750-800	5-Speed Fuller R-46				

INTERNAL EXPANDING SHOE TYPE PARKING BRAKE—850-1100 SERIES

TRUCK SERIES	F-850 F-950 C-850 C-950 N-850 N-950 NT-850	CT-850 CT-950 NT-950	F-850 F-950 F-950-D F-1000 F-1000-D F-1100 F-1100-D	C-850 C-950 C-1000 C-1100 CT-850 CT-950 N-850 N-950 N-950-D N-1000 N-1000-D N-1100 N-1100-D	NT-850 NT-850-D NT-950 NT-950-D T-850 T-850-D T-950 T-950-D	F-950 F-950-D F-1000 F-1000-D F-1100 F-1100-D C-950 C-1000 C-1100 N-950 N-950-D N-1000 N-1000-D N-1100 N-1100-D NT-850-D NT-950-D T-850-D T-950-D	F-950 N-1000-D NT-850-D NT-950-D T-950-D	F-950-D F-1000-D N-950-D N-1000-D NT-850-D NT-950-D T-850-D T-950-D	F-950-D F-1000-D N-950-D N-1000-D NT-850-D	F-850 F-950 F-950-D F-1000 F-1000-D F-1100-D C-850 C-950 C-1000 N-850 N-950 N-950-D N-1000 N-1000-D N-1100-D NT-850-D NT-950-D T-850-D	F-950-D F-1000-D N-950-D N-1000-D NT-850-D T-850-D
TRANSMISSION	5-Spd. Exclusive HD Spicer—5652, 5756-B	5-Spd. Excl. HD Spicer 5652		5-Spd. Exclusive HD Spicer—6352		5-Spd. Exclusive HD Spicer—6352-B	5-Spd. Excl. HD Spicer 6354	5-Spd. Excl. HD Spicer 6354	5-Spd. Excl. HD Spicer 6452-A	5-Spd. Exclusive HD Spicer—6453-A	5-Spd. Excl. HD Spicer 6454-A
Handbrake—Type	Rockwell Standard Internal Shoe										
Drum Part Number											
Diameter	12.00										
Width	4.00										
Lining	Molded										
Type											
Length and Number of Pieces	2 @ 13.95										
Width	4.00										
Thickness—Primary	0.25										
Thickness—Secondary	0.25										
Material	Marshall 9051-C American Brake Bloc 693-539										
Area Sq. In.	111.60										
Location	Rear of Main or Auxiliary Transmission										
Hand Control Std.	Floor Lever										
Hand Control RPO											
Handbrake Assy. Weight	50.00										

TRUCK SERIES	F-950-D F-1000-D N-950-D N-1000-D T-850-D NT-850-D NT-950-D	F-850 F-950 F-950-D F-1000 F-1000-D C-850 C-950 C-1000 N-850 N-950 N-950-D N-1000 N-1000-D NT-850 NT-850-D NT-950-D	F-950-D F-1000-D N-950-D N-1000-D NT-850-D NT-950-D	N-950-D N-1000-D N-1100-D NT-850-D NT-950-D	N-950-D N-1000-D NT-850-D NT-850-D	F-850 F-950 F-1000 N-850 N-950 N-1000 C-850 C-950 C-1000 T-850 T-950 CT-850 CT-950 NT-850 NT-950	F-950-D F-1000 F-1000-D F-1100 F-1100-D N-950-D N-1000 N-1000-D N-1100 N-1100-D T-850 T-850-D T-950 T-950-D NT-850 NT-850-D NT-950 NT-950-D C-1000 C-1100	F-950-D F-1000 F-1000-D F-1100 F-1100-D N-950-D N-1000 N-1000-D N-1100-D T-850 T-850-D T-950 T-950-D NT-850 NT-850-D NT-950 NT-950-D C-1000 C-1100	F-1000 F-1000-D F-1100 F-1100-D N-950-D N-1000-D N-1100-D C-1000 C-1100 T-850 T-850-D T-950 T-950-D NT-850-D NT-950-D	F-850 F-950 C-850 C-950 T-850 T-950	F-850 F-950 F-1000 F-1100 C-850 C-950 C-1000 C-1100 T-850 T-950
TRANSMISSION	5-Spd. Excl. HD Spicer 6455-A	5-Spd. Excluding HD Spicer—6852-G	5-Spd. Excl. HD Spicer 6854-G	5-Spd. Max. Duty Spicer 8051-C, 8052	5-Spd. Max. Duty Spicer 8054, 8055-C	5-Spd. Fuller R-46	10-Spd. Max. Duty Fuller R-96, R-960	10-Spd. Max. Duty Fuller RA-96, RA-960	12-Spd. Max. Duty Spicer 8125	6-Spd. Transmatic MT-40	6-Spd. Transmatic MT-42
Handbrake—Type	Rockwell Standard Internal Shoe										
Drum Part Number											
Diameter	12.00										
Width	4.00										
Lining	Molded										
Type											
Length and Number of Pieces	2 @ 13.95										
Width	4.00										
Thickness—Primary	0.25										
Thickness—Secondary	0.25										
Material	Marshall 9051-C American Brake Bloc 683-539										
Area Sq. In.	111.60										
Location	Rear of Main or Auxiliary Transmission										
Hand Control Std.	Floor Lever										
Hand Control RPO											
Handbrake Assy. Weight	50.00										

MAXI PARKING BRAKE

Truck Applications	B-C-F-600-700-750, F-800, N-600 thru 750, T-700 thru 800	B-C-F-N-700-750, C-F-T-800	F-C-800
Transmission			
Rear Axle (Pounds)	16000 30000	18000 34000	21000
Chamber Area (Square Inches)	20	24	30
Overall Diameter (Inches)	6.78	7.25	8.125

MAXI PARKING BRAKE—Continued

Truck Applications	B-C-F-600-700-750, F-800, N-600 thru 750, T-700 thru 800	B-C-F-N-700-750, C-F-T-800	F-C-800
Maximum Stroke (Inches)	2.25	2.25	2.50
Spring Force at "O" Stroke (Pounds)	1925	1925	1925
Spring Force at Normal Working Stroke (Pounds)	1550	1550	1550

BRAKE AIR COMPRESSOR

Truck Series	All 600 through 800 Series F- and N-850 through 11000 C-850 through 11000 CT-850-950 T-NT-850-950 H-1000, HT-950	F-C-N-850 through 1100 T-CT-NT-850 and 950 HT-950, H-1000	F-950-D through 1100-D N-950-D through 1100-D T-NT-850, D-950-D HT-950-D, H-1000-D	NT-850-D and 950-D N-1000-D H-1000-D
Type (2 Cyl. Water Cooled)	Bendix Westinghouse	Bendix Westinghouse	Cummins	Bendix
Bore and Stroke (Inches)	2.06 x 1.50	2.50 x 1.69	3.44 x 1.90	2.50 x 1.69
Displacement and Engine rpm	7.25 Cu. Ft. @ 1250 rpm	12 Cu. Ft. @ 1250 rpm	12 Cu. Ft. @ 1250 rpm	12 Cu. Ft. @ 1250 rpm
Operated Speed Recommended		3000 rpm		
H.P. @ Rated Speed of 1250 rpm and 100 psi	1.2		1.8	
Oil Type		Same as Engine		

AIR BRAKE SYSTEM PRESSURE SETTINGS

Working Pressure	123-127 psi
Safety Valve Setting (Air Reservoir)	150 psi
Warning Buzzer Operating Pressure	60 psi
Cut-out Pressure (Governor)	100-105 psi
Cut-in Pressure (Governor)	80-85 psi

SLACK ADJUSTERS

	Front	Rear
Type	Rod and Lever	360° Rotating Worm and Gear
Length of Arm (Inches)	5	6
Cab Radius	0.5	

AIR BRAKE VALVE

Type Pre-Loaded	Bendix—Westinghouse
Operation—Valve Treadle Assembly	
Force for Full Brake Application	100 lbs.

AIR BRAKE SHOE CAMSHAFT

	Front	Rear
Diameter at Bushing (Inches)	1.493-1.495	1.493-1.495
Bushing I.D. (Inches)	1.499-1.501	1.499-1.501

BRAKE CHAMBER PUSH ROD ADJUSTMENT TABLE

Brake Chamber Type		Maximum Travel	Readjustment Travel
Front—Type (standard)	# 9	1⅜ Inch	¾ Inch
	#12	1⅜ Inch	¾ Inch
	#16	1¾ Inch	¾ Inch
Rear—Type (standard)	#20	1¾ Inch	1 Inch
	#24	1¾ Inch	1 Inch
	#30	2 Inch	1 Inch
	#36	2¼ Inch	1 Inch
Rear—Type (Maxibrake)	#20	1¾ Inch	1 Inch
	#24	1¾ Inch	1 Inch
	#30	2 Inch	1 Inch

FRONT AIR BRAKE CHAMBER

Front Axle	6,000	7,000		9,000						11,000
Truck Series	F-B-N-600-700-750, F-800, C-600 N-C-6000-7000	F-700-850, B-N-700-750 C-600-700-750-6000-7000, N-850-7000, T-700	F-950 F-950-D N-950 N-950-D	CT-750-800 F-C-800 T-750-800 F-850 F-950 F-950-D F-1000 F-1000-D F-1100 F-1100-D	N-850 N-950 N-950-D N-1000 N-1000-D N-1100 N-1100-D	NT-850 NT-850-D NT-950 NT-950-D C-950 C-1000 C-1100	CT-850 CT-950 T-850 T-950	T-850-D T-950-D H-1000 H-1000-D	F-850 N-850 NT-850 NT-850-D T-850 T-850-D	C-850 CT-850
Area (Square Inches)		9					12			
Overall Diameter (Inches)		5.25					5.69			
Maximum Stroke (Inches)		1.75					1.75			
Maximum Stroke at which Brake should be adjusted (Inches)		1.375					1.375			
Spring Force at "0" Stroke		7.75					12.25			
Increase Per Inch of Stroke		1.25					2.50			
Adjust To:		0.75					0.75			
A.L. Factor		45					60			

FRONT AIR BRAKE CHAMBER

Front Axle	11,000 and 12,000				15,000			
Truck Series	T-800 C-CT-800 F-950 F-950-D F-1000 F-1000-D F-1100 F-1100-D	N-950 N-950-D N-1000 N-1000-D N-1100 N-1100-D NT-950 NT-950-D	C-950 C-1000 C-1100 CT-950 T-950 T-950-D	HT-950 HT-950-D H-1000 H-1000-D	T-850-D T-950 T-950-D NT-850 NT-850-D NT-950 NT-950-D	CT-850 CT-950 C-850 C-950 C-1000 C-1100	F-1000 F-1000-D F-1100 F-1100-D N-1000 N-1000-D N-1100 N-1100-D	HT-950 HT-950-D H-1000 H-1000-D
Area (Square Inches)				16				
Overall Diameter (Inches)				6.38				
Maximum Stroke (Inches)				2.25				
Maximum Stroke at which Brake should be Adjusted (Inches)				1.75				
Spring Force at "0" Stroke				18.50				
Increase Per Inch of Stroke				4.50				
Adjust To:				0.75				
A.L. Factor		80				88		

REAR AIR BRAKE CHAMBER

Rear Axle	30,000		18,000		34,000	29,000
Truck Series	CT-850 T-850-D	NT-850 NT-850-D HT-950 HT-950-D	F-850 N-850 C-850 H-1000	H-1000-D NT-850-D HT-950 HT-950-D	T-850 T-850-D CT-850 NT-850 NT-850-D HT-950 HT-950-D	F-1100 F-1100-D N-1100 N-1100-D C-1100
Area (Square Inches)	20			24		36
Overall Diameter (Inches)	6.78			7.25		9.00
Maximum Stroke (Inches)	2.25			2.25		3.00
Maximum Stroke at which Brake should be Adjusted (Inches)	1.75			1.75		2.25

REAR AIR BRAKE CHAMBER

Rear Axle	22,000		23,000		38,000	44,000	50,000	60,000
Truck Series	F-850 F-950 F-950-D N-850 N-950 N-950-D	C-850 C-950 H-1000 H-1000-D	F-950 F-950-D F-1000 F-1000-D N-950 N-950-D N-1000 N-1000-D	C-950 C-1000 HT-950 HT-950-D H-1000 H-1000-D	NT-850-D NT-950 NT-950-D T-950 T-950-D HT-950 HT-950-D	T-950 T-950-D	T-950	ET-950
Area (Square Inches)				30				
Overall Diameter (Inches)				8.125				
Maximum Stroke (Inches)				2.50				
Maximum Stroke at which Brake should be Adjusted (Inches)				2.00				

AIR BRAKE CHAMBERS

	Rear		
	F-B-C-N-600-700-750, N-C-6000-7000, CT-750, T-700-750-800, F-800	F-B-C-N-700-750, C-N-7000, F-C-T-CT-800	F-C-800
Type and Area (Square Inches)	20	24	30
Overall Diameter (Inches)	$6\frac{25}{32}$	$7\frac{1}{4}$	$8\frac{1}{8}$
Maximum Stroke (Inches)	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$
Maximum Stroke when Brakes are to be adjusted (Inches)	$1\frac{3}{4}$	$1\frac{3}{4}$	2
Spring Force "O" Stroke (Pounds)	$25\frac{3}{4}$	$30\frac{3}{4}$	$39\frac{1}{2}$
Increase per Inch of Stroke (Pounds)	$6\frac{1}{4}$	8	$10\frac{1}{2}$
Adjust Stroke to (Inches)	1	1	1

STOPMASTER BRAKE CHAMBERS

Front Axle	9,000	11,000 and 12,000					
Rear Axle			18,000	34,000	22,000	23,000	38,000
Truck Series	H-1000 H-1000-D	H-1000 H-1000-D HT-950 HT-950-D	H-1000 H-1000-D HT-950 HT-950-D	HT-950 HT-950-D	H-1000 H-1000-D HT-950 HT-950-D		HT-950 HT-950-D
Area (Square Inches)	12	16	9			12	
Overall Diameter (Inches)	5.68	6.38	5.25			5.68	
Maximum Stroke (Inches)	1.31	1.31	1.31			1.31	
Maximum Stroke at which Brake should be Adjusted (Inches)	1.06	1.06	1.06			10.6	
Adjust To:	50	50	38			38	

AIR BRAKE SHOE RETURN SPRING

Brake Usage	Free Length (Inches)	Extended Length		Application
		Inches	@ Lbs. Load	
Front	6.25	6.875	50	All Models Except 15,000 Lb. Front Axle
Front	6.875	7.312	70	15,000 Lb. Front Axle
Rear	10.62	11.50	75	All 16½" Brakes Except 4½" Width
Rear	10.62	11.50	100	16½" x 4½" Brakes only

FRONT AIR BRAKE DIMENSIONS— 600 THROUGH 800 SERIES TRUCKS

Truck Model	Front Axle Capacity (Pounds)	Brake Drum		Brake Lining Length (Inches)
		Length (Inches)	Width (Inches)	
F-B-N-600, N-6000	6000	16	2½	16¾
F-B-N-700-750, C-600-6000-7000, N-7000	6000 7000			
C-700-750-7000	7000			
F-800	6000 7000 9000			
T-700	6000			
T-700-750	7000			
T-CT-750-800	9000			
T-CT-750, F-C-T-CT-800	9000 11000 12000	16¼	3½	17 1/64
T-CT-800	15000	17¼	3½	18 1/16

REAR AIR BRAKE DIMENSIONS— 600 THROUGH 800 SERIES TRUCKS

Truck Model	Rear Axle Capacity (Pounds)	Brake Drum		Brake Lining Length (Inches)
		Length (Inches)	Width (Inches)	
F-B-C-N-600, C-N-6000	17000	16	2½	16¾
F-B-C-N-700-750, C-N-7000	17000 18500			
F-800	17000 18500 22000			
C-800	18500 22000			
T-700-750, CT-750	30000			
T-CT-800	34000			
F-800	17000 18500 22000	16¼	3½	17 1/64
C-800	18500 22000			
T-CT-750	30000			
T-CT-800	34000			
T-CT-800	34000	17¼	3½	18 1/16

AIR BRAKE DIMENSIONS 850 THROUGH 1100 SERIES TRUCKS

FRONT AIR BRAKE LINING—16.00 x 2.50 Inches

Truck Series		F-850 N-850	C-850	F-950 F-950-D N-950 N-950-D	C-950 H-1000	F-1000 N-1000 C-1000 F-1000-D	N-1000-D H-1000-D	F-1100 F-1100-D N-1100 N-1100-D C-1100	T-850 T-850-D NT-850 NT-850-D CT-850	T-850 T-850-D NT-850 NT-850-D CT-850	NT-850-D NT-850	NT-850-D T-950 T-950-D NT-950 NT-950-D CT-950
AXLE USAGE	Front	7,000 9,000	9,000	7,000 9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
	Rear	18,000 22,000	18,000 21,000	22,000 23,000 18,500	22,000 23,000	23,000	18,000 18,500 22,000 23,000	29,000	30,000	34,000	18,000 DA 23,000	38,000
No. Pieces per Shoe							One					
Thickness (Inches)							0.31					
Length (in.) Primary							16.75					
Length (in.) Secondary							16.75					

FRONT AIR BRAKE LINING—16.25 x 3.50 Inches

Truck Series		F-850 N-850 C-850	F-950 F-950-D N-950 N-950-D C-950 H-1000	F-1000 C-1000 F-1000-D N-1000	N-1000-D H-1000-D	F-1100 F-1100-D N-1100 C-1100 N-1100-D	T-850 NT-850 T-850-D CT-850	T-850 NT-850 T-850-D CT-850	NT-850-D NT-850	T-950 T-950-D NT-950 NT-950-D CT-950	HT-950 HT-950-D	T-950
AXLE USAGE	Front	9,000 11,000 12,000				9,000 11,000 12,000					11,000 12,000	
	Rear	18,500 22,000	18,500 22,000 23,000	23,000	18,000 18,500 21,000 23,000	29,000	30,000	34,000	18,000DA 23,000 30,000 34,000 38,000	38,000	18,000DA 23,000 30,000 34,000 38,000	44,000
No. of Pieces per Shoe							One					
Thickness (Inches)							0.44					
Length (in.) Primary							17.02					
Length (in.) Secondary							17.02					

FRONT AIR BRAKE LINING—15.0 x 3.50 Inches

Truck Series		H-1000 H-1000-D	HT-950 HT-950-D			
AXLE USAGE	Front	9,000 11,000	11,000			
	Rear	18,000 21,000 23,000	18,000 DA	23,000	34,000	38,000
No. Pieces per Shoe				Two		
Thickness (Inches)				0.31		
Length (in.) Primary				16.5 (Total)		
Length (in.) Secondary				16.5 (Total)		

FRONT AIR BRAKE LINING—17.25 x 3.50 Inches

Truck Series		F-1000 N-1000 C-1000 F-1000-D	N-1000-D H-1000-D	C-950 H-1000	F-1100 N-1100 F-1100-D C-1100 N-1100-D	T-850 T-850-D CT-850 NT-850	T-950	NT-850-D HT-950 HT-950-D	T-950-D CT-950 NT-950 NT-950-D
AXLE USAGE	Front				15,000				
	Rear	23,000	18,000 18,500 22,000 23,000	22,000 23,000	29,000	30,000 34,000	38,000 44,000 50,000 60,000	18,000DA 23,000 30,000* 34,000 38,000	38,000
No. Pieces per Shoe					One				
Thickness (Inches)					0.44				
Length (in.) Primary					18.06				
Length (in.) Secondary					18.06				

*Used W/HT-Model w/15,000 Lb. Front Axle Only.

REAR AIR BRAKE LINING—16.50 x 4.50 Inches

Truck Series		T-850 T-850-D CT-850 NT-850 NT-850-D	HT-950 HT-950-D
AXLE USAGE	Front	9,000 11,000 12,000	11,000 12,000 15,000
	Rear	30,000	
No. Pieces Per Shoe		Two	
Thickness (Inches)		.075	
Length (In.) Primary		8.75 Per Block	
Length (In.) Secondary		8.75 Per Block	

REAR AIR BRAKE LINING—16.50 x 5.50 Inches

Truck Series		T-850 T-850-D CT-850 NT-850 NT-850-D	HT-950 HT-950-D
AXLE USAGE	Front	9,000 11,000 12,000 15,000	11,000 12,000 15,000
	Rear	34,000	
No. Pieces Per Shoe		Two	
Thickness (Inches)		0.75	
Length (In.) Primary		8.75 Per Block	
Length (In.) Secondary		8.75 Per Block	

REAR AIR BRAKE LINING—16.50 x 7.00 Inches

Truck Series		F-950 F-950-D N-950 N-950-D	HT-950 HT-950-D	NT-850-D C-950 F-1000 C-1000 H-1000 N-1000 F-1000-D NT-850	N-1000-D H-1000-D	F-1100 F-1100-D C-1100 N-1100 N-1100-D	T-950	T-950
AXLE USAGE	Front	7,000 9,000 11,000 12,000	11,000 12,000 15,000	9,000 11,000 12,000 15,000	9,000 11,000 12,000 15,000	9,000 11,000 12,000 15,000	11,000 12,000	15,000
	Rear		23,000		18,000 23,000	29,000	44,000	44,000 50,000 60,000
No. Pieces Per Shoe					Two			
Thickness (inches)					0.75			
Length (in.) Primary					8.75 Per Block			
Length (in.) Secondary					8.75 Per Block			

STOPMASTER FRONT BRAKE LINING—15.00 x 3.50 Inches

Truck Series		H-1000	H-1000-D	HT-950 HT-950-D			
AXLE USAGE	Front	9,000 11,000 12,000			11,000 12,000		
	Rear	22,000 23,000	18,000 23,000	18,000	34,000	38,000	23,000
No. Pieces Per Shoe				Two			
Thickness (Inches)				0.31			
Length (In.) Primary				16.5			
Length (In.) Secondary				16.5			

STOPMASTER REAR BRAKE LINING—15.00 x 6.00 Inches

Truck Series		HT-950 HT-950-D		H-1000	H-1000-D	HT-950 HT-950-D
AXLE USAGE	Front	11,000 12,000		9,000 11,000 12,000		11,000 12,000
	Rear 18,000 D.A.	34,000	38,000	22,000 23,000	18,000 23,000	23,000
No. of Pieces Per Shoe			Two			
Thickness (Inches)			0.75			
Length (In.) Primary			7.45 Per Block			
Length (In.) Secondary			7.45 Per Block			

STOPMASTER REAR BRAKE LINING—15.00 x 7.00 Inches

Truck Series		H-1000	H-1000-D	HT-950 HT-950-D
AXLE USAGE	Front	9,000 11,000 12,000		11,000 12,000
	Rear	22,000 23,000	18,000 23,000	23,000
No. Pieces Per Shoe			Two	
Thickness (Inches)			0.31	
Length (In.) Primary			16.5	
Length (In.) Secondary			16.5	

BRAKE TORQUE SPECIFICATIONS

Part Name	Bolt or Nut Size and Torque Limits (Ft-Lbs)			
Front Hub and Drum Nuts	1/2-20 58-72		5/8-18 115-140	
Front Hub and Drum Nuts—Cast Drum		1/2-13 50-70		
Front and Rear Backing Plates to Spindle or Axle	1/2-20 45-55	1/2-20 58-72 (T-750, T-800)		7/16-20 40-45
Rear Hub and Drum Nuts	5/8-11 110-135		1/2-13 50-70	
Clutch and Brake Pedal Bumper Nut	5/16-24 15-20			
Master Cylinder Push Rod	3/8-24 15-22			
Parking Brake to Transmission Rear Bearing Retainer Bolt	5/8-18 180-220	7/16-20 50-70	3/8-24 24-30	1/2-20 45-55

Part Name	Bolt or Nut Size and Torque Limits (Ft-Lbs)		
Parking Brake Drum to Companion Flange Nut	3/8-24 35-45		7/16-20 50-70
Parking Brake Drum to U-Joint Flange Nut	7/16-20 45-50	1/2-20 75-80	3/8-24 30-35
Brake Master Cylinder to Pedal Bracket Bolts	5/16-24 12-15		3/8-24 24-30
Brake Air Compressor to Bracket	7/16-20 45-60		3/8-16 20-25
Brake Air Compressor to Adaptor	7/16-14 30-38		
Brake Air Compressor to Cylinder Block	7/16-14 30-38		