

TM 9-1827C

WAR DEPARTMENT TECHNICAL MANUAL

ORDNANCE MAINTENANCE

Hydraulic Brakes (Wagner Lockheed)

WAR DEPARTMENT

•

21 JANUARY 1944

FOR ORDNANCE PERSONNEL ONLY

WAR DEPARTMENT TECHNICAL MANUAL
TM 9-1827C

ORDNANCE MAINTENANCE

Hydraulic Brakes
(Wagner Lockheed)



WAR DEPARTMENT

•

21 JANUARY 1944

WAR DEPARTMENT
Washington 25, D. C., 21 January 1944

TM 9-1827C, Ordnance Maintenance: Hydraulic Brakes (Wagner Lockheed), is published for the information and guidance of all concerned.

[A.G. 300.7 (14 Sep 43)
O.O.M. 461/(TM 9) R.A. (21 Jan 44)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
*Major General,
The Adjutant General.*

DISTRIBUTION: R 9 (4); Bn 9 (2); C 9 (5).

(For explanation of symbols, see FM 21-6.)

CONTENTS

	Paragraphs	Pages
CHAPTER 1. INTRODUCTION	1- 2	4
CHAPTER 2. TESTS AND ADJUSTMENTS.....	3- 6	5- 8
CHAPTER 3. MASTER CYLINDER ASSEMBLIES..	7-21	9-25
SECTION I. Combination type	7-11	9-16
II. Box type	12-16	16-21
III. Twin-bore type.....	17-21	22-25
CHAPTER 4. WHEEL CYLINDER ASSEMBLIES...	22-41	26-40
SECTION I. Straight-bore or standard-type....	22-26	26-31
II. Step-bore or compound type.....	27-31	31-34
III. L-type	32-36	34-37
IV. Twinplex type	37-41	38-40
CHAPTER 5. WHEEL BRAKE ASSEMBLIES.....	42-61	41-54
SECTION I. Channel section brake.....	42-46	41-44
II. Cast-shoe brake.....	47-51	44-47
III. T-section brake	52-56	47-50
IV. Hi-Tork brake	57-61	50-54
REFERENCES		55-56
INDEX.....		57-60

TM 9-1827C**1-2****ORDNANCE MAINTENANCE — HYDRAULIC BRAKES (WAGNER LOCKHEED)****CHAPTER 1
INTRODUCTION**

	Paragraph
Scope	1
Arrangement.....	2

1. SCOPE.

a. The instructions contained in this manual are for the information and guidance of personnel charged with the maintenance and repair of hydraulic brakes (Lockheed). These instructions are supplementary to field and technical manuals prepared for the using arms. This manual does not contain information which is intended primarily for the using arms, since such information is available to ordnance maintenance personnel in 100-series TM's or FM's.

b. The manual contains a description of, and procedure for disassembly, inspection, repair, and assembly of hydraulic brakes.

2. ARRANGEMENT.

a. Chapter 2 covers tests and adjustments of hydraulic brake assemblies. Chapter 3 discusses construction and operation, and procedures for disassembly, repair, and assembly of master cylinder assemblies. Chapter 4 covers wheel cylinder assemblies, and chapter 5 describes like procedures for wheel brake assemblies.

CHAPTER 2

TESTS AND ADJUSTMENTS

	Paragraph
Brake inspection	3
Brake pedal tests	4
Brake pedal adjustment	5
Bleeding the system	6

3. BRAKE INSPECTION.

a. Check fluid level in master cylinder, making sure that all dirt is removed from around filler plug to prevent entrance to cylinder reservoir. *NOTE: Level should be 1/2 inch from reservoir top or cover.* Check pedal to make certain it has free play before pressure stroke starts.

b. Check pedal for binding on pedal shaft; lubricate if necessary. A mixture of engine oil and graphite is usually satisfactory for pedal mounting and cable clevises. Be sure pedal returns sharply to "OFF" position; if not, replace pedal return spring. Check front and rear wheel bearing adjustment. Brakes cannot be adjusted properly when bearings are loose, as shoes will not remain centralized in the drum. Always pull at least one wheel for inspection of average condition of linings and drums. Backing plate must be tight to provide rigid support for the brakes. Loose or sprung backing plate will be evidenced by drum not being equally spaced to backing plate at all points around the drum, assuming axle shaft or spindle is not sprung, and wheel bearings are properly adjusted.

c. Inspect condition of front and rear grease retainers. Also check front wheel bearing lubricant, as an excessive amount will cause seepage through grease retainer, and make it necessary to replace lining. Inspect grease level in differential case for proper level as specified in vehicle Lubrication Guide.

d. Major adjustment should include pulling all wheels and drums. Clean drums thoroughly, using kerosene and flint paper. Clean entire brake assembly thoroughly.

e. If lining is loose, badly worn, or grease-soaked, it must be replaced. Lining is considered worn and replacement necessary when rivet heads are within $\frac{1}{32}$ inch of lining face. When assembling, lubricate all frictional contact points sparingly. Use lubricant recommended by vehicle manufacturer.

4. BRAKE PEDAL TESTS.

a. **Introduction.** If the hydraulic brake system, and the drum and brake shoe clearance are satisfactory, when brake pedal is depressed with sufficient force to set brakes firmly, the pedal will have a "solid" feel, with at least 2 inches of floorboard clearance. During the initial $\frac{1}{4}$ to $\frac{1}{2}$ inch of pedal travel, the pedal should move freely

ORDNANCE MAINTENANCE — HYDRAULIC BRAKES (WAGNER LOCKHEED)

(if pedal clearance is correctly adjusted). The subparagraphs below furnish probable remedies for various behaviors of a defective brake system, based on the behavior of the brake pedal as a symptom.

b. Pedal Has Less than 2 Inches Floorboard Clearance. Adjust clearance between brake shoes and drums.

c. Pedal Has a “Springy” Feel. This is usually evidence that the brake shoes are improperly set, or have been relined with incorrect thickness of lining. Improper shoe setting would indicate need of a major brake adjustment. Before making a decision on this type of condition, road test the vehicle (or test it on a brake machine). This will indicate a “hard” pedal and a “poor” stop, if these conditions are present. After road or machine test, pull wheels, check lining thickness, contact, drum condition, fit of shoes to drum, and anchor adjustment, to determine exact cause of difficulty.

d. Pedal Has a “Spongy” Feel. Bleed air from hydraulic system.

e. Pedal Jams or Binds. Check for mechanical interference; also check for broken piston stop wire in master cylinder. Check master cylinder mountings and linkage, and if a booster is used, check mechanical linkage between master cylinder and booster.

f. Pedal Goes to Floorboard and Can Be Built Up by Pumping. If pressure can be built up, hold down hard to see if pressure will decrease. After holding ½ minute, reduce pressure on foot without releasing pedal, and press lightly to see if pedal moves down under light pressure. This test will reveal a master cylinder cup which is thin, permitting fluid to bypass within the master cylinder without showing signs of leaking on the outside of the master cylinder.

g. Pedal Goes to Floorboard and Cannot Be Built Up by Pumping. Check fluid level in master cylinder reservoir. If insufficient fluid is present, test brake pedal action and perform operations described under new symptom. If sufficient fluid is present, continue with operations described in this subparagraph. Where accessible, feel the master cylinder boot to determine if wet with brake fluid. Squeeze boot with fingers; if fluid is expelled around or through boot, it is an indication that the master cylinder is leaking and should be removed, inspected, repaired, or replaced. If no evidence of leaks is apparent at the master cylinder, inspect all fluid lines along the frame, all hose and hose connections, the bottom edges of all brake flanges, and the inner side wall of tires for signs of brake fluid leakage. If no external signs of leaks are found, but pedal still leaks off under pressure, pull all four wheels and inspect the wheel cylinders. If no external fluid losses are found, but pedal “eases down” under constant but light foot pressure, it is a good indication that pressure is bypassing within the master cylinder; in which case, remove and repair or replace.

TESTS AND ADJUSTMENTS

5. BRAKE PEDAL ADJUSTMENT.

a. Purpose. Proper pedal adjustment is important; otherwise, the compensating features of the master cylinder cannot function. Fluid cannot return from the lines. Brakes will drag after several applications if master cylinder bypass port is blocked. It is imperative that master cylinder piston be against its stop, and that pedal link rod be adjusted for clearance where it seats in master cylinder piston. There should be at least $\frac{1}{4}$ - to $\frac{1}{2}$ -inch free play in pedal pad before the pressure stroke starts. Greater free play reduces the effective travel of master cylinder piston, which in turn reduces brake effectiveness. **NOTE:** *Some vehicles have a pedal stop adjustment.*

b. Method. Adjustment is made by loosening the lock nut, and removing clevis pin at pedal. Hold piston push rod link from turning, with wrench on large hexagonal surface, to avoid damage to boot. Adjust pedal rod to obtain desired setting. Tighten lock nut, and reconnect pedal by inserting clevis pin. Pedal adjustment is made as follows:

(1) Remove clevis pin from clevis on pedal rod at master cylinder end.

(2) Locate lever on outside of cylinder so that it crosses an imaginary vertical line at $\frac{2}{3}$ of its actual stroke.

(3) Adjust pedal stop screw to provide $\frac{1}{2}$ -inch free play at pedal pad.

(4) Loosen lock nut at cylinder end of pedal connecting rod.

(5) Adjust length of rod so that the clevis connected to lever, pedal pad will have $\frac{1}{2}$ -inch free travel before pressure stroke starts.

NOTE: *This provides the best pedal adjustment.*

6. BLEEDING THE SYSTEM.

a. Description. Since the proper operation of the hydraulic brake system requires a solid column of fluid (without air bubbles) at all points in the pressure system, it becomes necessary under certain conditions to bleed fluid from the system in order to expel air bubbles which have become mixed with the fluid. The necessity of bleeding is indicated by a soft or spongy pedal.

b. Reasons for Bleeding.

(1) When a wheel cylinder, master cylinder, hose, pipe line, or any part of the system has been broken or disconnected, allowing air to enter.

(2) When air has been drawn into some part of the system through neglect or misadjustment, such as: Air drawn into master cylinder around a worn master cylinder secondary cup; air drawn into rear wheel cylinders by emergency brake linkage being misadjusted; or, improper fluid level in master cylinder.

(3) When brakes have been adjusted too tight, or emergency

TM 9-1827C**6****ORDNANCE MAINTENANCE — HYDRAULIC BRAKES (WAGNER LOCKHEED)**

brake has been left on, causing overheating and boiling or gassing of the brake fluid.

(4) When, after proper mechanical adjustment of all brake shoes, the brake pedal feels spongy, indicating presence of air in the system.

(5) When it becomes necessary to replace fluid.

c. Bleeding Brakes.

(1) Remove cap screw from bleeder connection, and thread bleeder drain hose into this opening. Allow bleeder hose to hang in a clean container.

(2) Care must be taken not to drain the master cylinder reservoir during this operation; otherwise, air will enter and make rebleeding necessary. Reservoir must be full during the bleeding operation.

(3) Loosen bleeder screw one full turn, and depress the brake pedal slowly; then, allow pedal to return to the "OFF" position. Repeat this operation approximately 10 times, to provide a pumping action to force fluid through the line, and expel all air. This operation must be repeated at all four wheels to bleed the entire system.

(4) Watch flow from bleeder hose, keeping hose submerged in fluid in container. When air bubbles cease to appear, or when the stream is a clean, solid mass, close bleeder connection. **CAUTION:** *Fluid withdrawn during the bleeding operation should not be used again.*

d. Bleeding Equipment. Pressure bleeding equipment materially reduces the time required for the bleeding operation. Such equipment may also be used for cleaning and flushing the system. This unit connects to the master cylinder; fluid under pressure is introduced at this point. The mechanic then bleeds system at each wheel. Constant pressure is maintained, no fluid is lost or spilled, and the job is completed in minimum time.