

# SECTION 5F

## SPECIFICATIONS AND SPECIAL TOOLS

### GENERAL SPECIFICATIONS

<b>BRAKE PEDAL TRAVEL</b>	<b>Millimeters</b>	<b>Inches</b>
A Carline .....	57.00	2.244
B Carline .....	57.15	2.250
E Carline .....	57.00	2.244
C-H Carline .....	57.00	2.244
G Carline .....	57.00	2.244
J-N Carline .....	71.00	2.795

Brake pedal travel maximum with 445 N (100 lbs.) force applied to pedal with ignition **"OFF"** and vacuum or hydraulic assist depleted.

<b>BRAKE DRUMS</b>	<b>Millimeters</b>	<b>Inches</b>
<b>A-C-H Carline</b>		
Inside Diameter .....	225.12	8.860
Runout .....	0.15	0.006
Maximum Rebore Diameter .....	225.50	8.880
Discard Diameter .....	226.30	8.909
<b>J-N Carline</b>		
Inside Diameter .....	200.12	7.879
Runout .....	0.15	0.006
Maximum Rebore Diameter .....	200.64	7.899
Discard Diameter .....	201.40	7.929
<b>G Carline</b>		
Inside Diameter .....	241.00	9.500
Runout .....	0.15	0.006
Maximum Rebore Diameter .....	242.82	9.560
Discard Diameter .....	243.59	9.590
<b>B Carline</b>		
Inside Diameter .....	279.00	11.000
Runout .....	0.15	0.006
Maximum Rebore Diameter .....	280.92	11.060
Discard Diameter .....	281.69	11.090

<b>BRAKE ROTORS</b>	<b>Millimeters</b>	<b>Inches</b>
<b>A Carline (JA2-Heavy) and C-H Carline</b>		
Rotor Diameter .....	260.00	10.240
Lateral Runout .....	0.10	0.004
Thickness Variation .....	0.01	0.0005
Rotor Thickness (Max) .....	26.50	1.043
Minimum Thickness after Refinish .....	24.68	0.972
Discard Thickness .....	24.30	0.957
<b>A-J-N Carline</b>		
Rotor Diameter .....	247.00	9.720
Lateral Runout .....	0.10	0.004
Thickness Variation .....	0.01	0.0005
Rotor Thickness (Max) .....	22.48	0.885
Minimum Thickness after Refinish .....	21.08	0.830
Discard Thickness .....	20.70	0.815
<b>E Carline Front</b>		
Rotor Diameter .....	267.00	10.500
Lateral Runout .....	0.10	0.004
Thickness Variation .....	0.01	0.0005
Rotor Thickness (Max) .....	26.50	1.043
Minimum Thickness after Refinish .....	24.66	0.971
Discard Thickness .....	24.30	0.956
<b>E Carline Rear</b>		
Rotor Diameter .....	254.50	10.020
Lateral Runout .....	0.07	0.003
Thickness Variation .....	0.01	0.0005
Rotor Thickness (Max) .....	12.55	0.494
Minimum Thickness After Refinish .....	11.28	0.444

## 5F-2 SPECIFICATIONS AND SPECIAL TOOLS

Discard Thickness .....	10.90	0.429
<b>G Carline</b>		
Rotor Diameter .....	267.00	10.500
Lateral Runout .....	0.10	0.004
Thickness Variation .....	0.01	0.0005
Rotor Thickness (Max) .....	26.50	1.043
Minimum Thickness after Refinish .....	24.89	0.980
Discard Thickness .....	24.50	0.965
<b>B Carline Wagon</b>		
Rotor Diameter .....	305.00	12.000
Lateral Runout .....	0.10	0.004
Thickness Variation .....	0.01	0.0005
Rotor Thickness (Max) .....	26.50	1.043
Minimum Thickness after Refinish .....	24.89	0.980
Discard Thickness .....	24.50	0.965

All brake drums and rotors have a discard dimension cast into them. This is a wear dimension and not a refinish dimension. Any drum or rotor which does not meet the specification should be replaced.

### MASTER CYLINDER BORE DIAMETER

	Millimeters	Inches
<b>A-J-N Carline</b> .....	22.20	0.875
A Carline (JA2-Heavy) .....	24.00	0.937
C-H Carline .....	24.00	0.937
C-H Carline (Anti-lock) .....	23.80	0.937
B Carline .....	28.60	1.125
G Carline (Powermaster).....	31.75	1.250
G Carline .....	24.00	0.937
E Carline .....	28.60	1.125

### WHEEL CYLINDER BORE DIAMETER

	Millimeters	Inches
A Carline .....	17.50	0.687
A Carline (JA2-Heavy) .....	19.00	0.750
A Carline Wagon .....	20.60	0.812
C-H Carline .....	22.20	0.937
<b>J-N Carline</b>		
Except J Wagon .....	16.00	0.625
J Wagon .....	17.50	0.687
B Carline Wagon .....	24.50	0.937
G Carline .....	19.00	0.750

## TORQUE SPECIFICATIONS

### COMPONENTS

	N · m	Lbs. Ft.
Brake Pedal to Bracket _All Carline .....	34	25
Booster to Pedal Bracket _All Carline .....	21	15
Master Cylinder to Booster _All Carline .....	27	22
Parking Brake Control Assembly to Dash		
C-H Carline .....	20	14
B-G Carline .....	10	88*
E Carline .....	17	12
A Carline .....	15	11
Parking Brake Assembly		
<b>J-N Carline</b> .....	18	13
Combination Valve Mounting – B-G Carline .....	20	14
Brake Hose to Caliper – All Carline .....	45	33
Brake Pipes – All Carline .....	24	17
Caliper Mounting Bolts – All Carline .....	51	38
Wheel Cylinder to Backing Plate		
B-G Carline .....	18	13
C-H Carline .....	12	106*
Junction Block to Axle Housing – B-G Carline .....	27	20
Backing Plate to Axle Housing		
B Carline .....	48	35
G Carline .....	58	45
Caliper Bleeder Screw – All Carline .....	13	9
Wheel Cylinder Bleeder Screw – All Carline .....	6	48*

\*LBS. IN.

## SPECIAL TOOLS

J 8049 .....	Brake Spring Pliers	J 29077-A .....	Boot Seal Installer
J 8057 .....	Brake Spring Pliers	J 29532 .....	Bleeder Ball
J 21177 .....	Drum and Shoe Gage	J 29567 .....	Bleeder Adapter
J 21472 .....	Bleeder Wrench	J 29840 .....	Brake Spring Remover & Installer
J 22647 .....	Push Rod Height Gage	J 33588 .....	Piston Locating Installer & Pilot
J 23175 .....	Control Valve Installer	J 35126 .....	Powermaster Test Gage
J 23456 .....	Tandem Diaphragm Separating Tool	J 35587 .....	Boot Seal Installer
J 23530 .....	Double Lap Flaring Tool	J 35588 .....	Caliper Piston Ring Installer
J 23709 .....	Combination Valve Depressor	J 35777 .....	Boot Seal Installer
J 23872 .....	Piston Installer/Compressor	J 35798 .....	Bleeder Adapter
J 26267 .....	Boot Seal Installer	J 35589 .....	Bleeder Adapter (Anti-lock)
J 28434 .....	Bleeder Wrench	J 35592 .....	Break Out Box (Anti-lock)
J 28458 .....	Power Piston Seal Protector	J 35604 .....	Pressure Gage (Anti-lock)
J 28662 .....	Brake Pedal Effort Gage	J 35804 .....	Pressure Switch Socket (Anti-lock)
J 28629 .....	ISO Flaring Tool		

## REPLACING PRIMARY AND SECONDARY PISTON ASSEMBLIES

Follow instructions under DEPRESSURIZE, REMOVE, and DISASSEMBLE POWERMASTER UNIT first before attempting repair described in the following steps.

### REMOVE PISTON ASSEMBLIES

**CAUTION:** Do not place hand in front of the Powermaster cylinder bore in an attempt to catch pistons when applying compressed air. This could result in serious injury.

Reference figure 5.

1. Remove primary piston assembly (19) and secondary piston assembly (22, 23, 24, and 25) along with spring (26) from Powermaster unit. If primary piston assembly did not come out with power piston assembly, remove it along with the secondary piston assembly components from Powermaster unit by applying low pressure compressed air into master cylinder outlet port while covering by-pass holes. Cover main bore with a shop cloth to prevent pistons from coming out too fast and possibly causing injury. Or, lightly tap Powermaster unit on work bench.

**NOTICE:** Make note of primary piston identification, stamped on side of piston, and piston length (E-11, 108.08 mm/4.255 in. or E-14, 105.28 mm/4.145 in.). This is to assist in selecting the correct replacement primary piston assembly. Failure to use the correct piston will result in defective brake operation.

2. Remove secondary seal (22), primary seal (24) and spring retainer (25) from secondary piston (23).
3. Remove reaction disc (27) from inside of power piston assembly (16).

### INSTALL PISTON ASSEMBLIES

Reference figure 5.

1. Lubricate replacement parts with new clean brake fluid.
2. Install reaction disc (27) into power piston (16).
3. Install primary seal (24), secondary seal (22) and spring retainer (25) on secondary piston (23).
4. Install spring (26) onto secondary piston assembly.
5. Slide secondary piston assembly (22, 23, 24, and 25) along with spring (26) into Powermaster unit.  
Note: Lubricate cylinder bore with new clean brake fluid to ease assembly.

**NOTICE:** There are two primary piston assemblies in the repair kit. Use the one having the same identification mark and piston length as that of the original primary piston removed in step 1 of the disassembly procedure (E-11, 108.08 mm/4.255 in. or E-14, 105.28 mm/4.145 in.). Failure to use the correct piston will result in defective brake operation. Dispose of the other replacement primary piston assembly along with the original primary piston assembly.

6. Insert primary piston assembly (19) into power piston assembly (16).
7. Reassemble power piston components along with primary piston assembly (19) as described under REASSEMBLE POWERMASTER UNIT.

### CHECK VALVE ASSEMBLY

#### IMPORTANT

The check valve assembly can be replaced with Powermaster unit on or off the vehicle. If replacement is to be done off vehicle, follow procedure described under REMOVE POWERMASTER UNIT.

### REMOVE CHECK VALVE ASSEMBLY

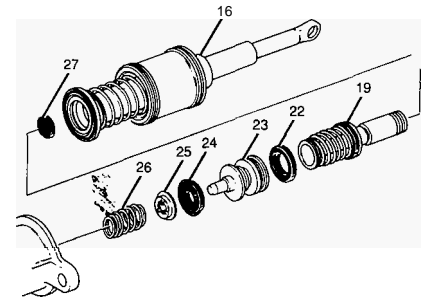
Reference figures 6 and 7.

1. Unscrew tube nut (1) from pump outlet port (5).
2. Rotate tube and nut assembly (4) out of the way.
3. Remove check valve seat assembly (2).
  - Tap "easy out" into check valve seat assembly and pull straight out.
4. Remove poppet and spring assembly (3).

### INSTALL CHECK VALVE ASSEMBLY

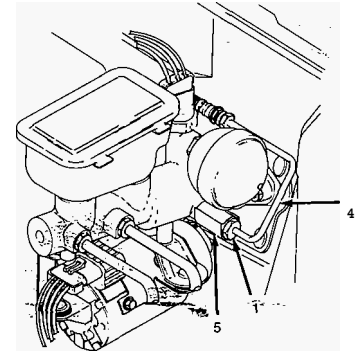
Reference figures 7 and 6.

1. Install new poppet and spring assembly (3) into pump outlet port (5).
  - Spring end first.
2. Install new check valve seat assembly (2) into pump outlet port (5).
  - To ease assembly, lubricate check valve seat assembly with clean brake fluid.
4. Bottom out check valve seat assembly (2) by threading tube nut (1) into pump outlet port.
5. Torque tube nut (1) to 17 N-m (13 lb-ft).
6. If unit was removed from the vehicle, reinstall following procedure described under INSTALL POWERMASTER UNIT.



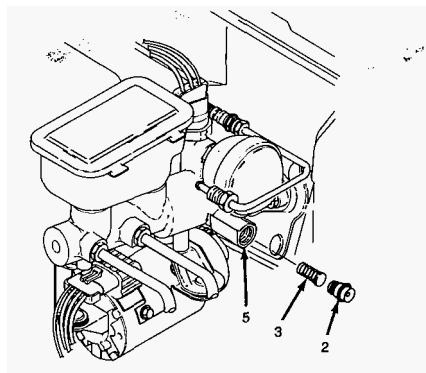
16. POWER PISTON ASSEMBLY  
19. PRIMARY PISTON ASSEMBLY  
22. SECONDARY SEAL  
23. SECONDARY PISTON  
24. PRIMARY SEAL  
25. SPRING RETAINER  
26. SPRING  
27. REACTION DISC

FIGURE 5



1. TUBE NUT  
4. TUBE AND NUT ASSEMBLY  
5. PUMP OUTLET PORT

FIGURE 6



2. CHECK VALVE SEAT ASSEMBLY  
3. POPPET AND SPRING ASSEMBLY  
5. PUMP OUTLET PORT

FIGURE 7

NOTICE: Failure to fully depressurize Powermaster unit before performing service operations could result in brake fluid being sprayed on service personnel and vehicle causing damage to painted surfaces.

**DEPRESSURIZE POWERMASTER UNIT**

1. Depressurize Powermaster before performing any service.
2. With ignition "OFF", apply approximately fifty (50) pounds force to the brake pedal and release pedal a minimum of ten (10) applies.

**REMOVE POWERMASTER UNIT**

Reference figure 1.

1. Disconnect electrical connectors (6 & 7) from Powermaster unit (10).
2. Disconnect brake pipes (8) from Powermaster unit (10).
3. Remove mounting nuts (9).
4. Remove cotter pin from brake pedal pin and slide pushrod off brake pedal pin.
5. Remove Powermaster unit from vehicle.

**DISASSEMBLE POWERMASTER UNIT**

Reference figure 1.

1. Remove reservoir cover (20) and dispose of brake fluid. Do not reuse fluid.
2. Remove boot (11).
3. Secure Powermaster unit (10) vertically in a vise.

Reference figure 2.

4. Insert wire through pushrod eyelet (17) and fasten one end to mounting hole (18).
5. Depress pushrod 1/8" - 1/4" and fasten the loose end of wire to opposite mounting hole, securing pushrod in depressed position.
6. Remove retainer (12) as shown in figure 3.
7. Remove wire

Reference figure 4.

8. Slowly pull on pushrod to remove power piston assembly (16) along with piston guide (14).
- NOTE: Primary piston assembly (19) may also come out as part of assembly.
9. Remove piston guide over pushrod eyelet.
10. Remove the small O-Ring (15) from inside piston guide (14).
11. Remove 3 large O-Rings (13) from piston guide (14) and power piston assembly (16).

**IMPORTANT**

Before reinstalling power piston assembly in Powermaster unit, follow instructions under REPLACING PRIMARY AND SECONDARY PISTON ASSEMBLIES.

**REASSEMBLE POWERMASTER UNIT**

Reference figure 4, (unit in horizontal position)

1. Lubricate replacement O-Rings (13 & 15) With new clean brake fluid.
2. Install new large O-Rings (13), one on power piston guide (14) and two on power piston (16).
3. Install new small O-Ring (15) inside power piston guide (14).
4. Slide piston guide (14) over pushrod eyelet.
5. Insert the primary piston assembly (19), if removed, into end of power piston (16).
6. Push power piston assembly (16) along with primary piston (19) and piston guide (14) into Powermaster cylinder bore.

Note: Lubricate cylinder bore with new clean brake fluid to ease assembly.

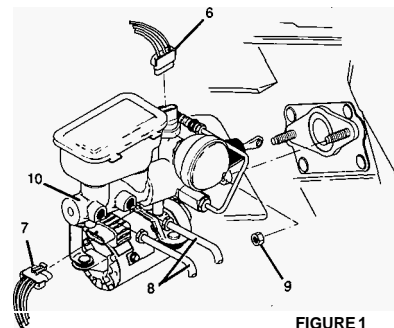
Reference figure 2, (unit in vertical position)

7. Secure pushrod in depressed position using instructions to disassemble Powermaster unit steps 4 and 5.
8. Install new retainer (12).
9. Remove wire.
10. Install boot (11) over pushrod.

**INSTALL POWERMASTER UNIT**

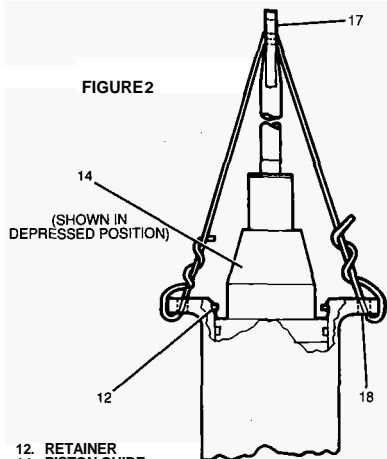
Reference figure 1.

1. Position Powermaster with pushrod through opening in mounting bracket (21).
2. Slide pushrod on brake pedal pin and push Powermaster unit onto mounting studs.
3. Install cotter pin on brake pedal pin.
4. Install mounting nuts (9).  
Torque to 21 N-m (15 lb-ft).
5. Connect brake pipes (8) to Powermaster (10).  
Torque to 17 N-m (13 lb-ft).
6. Connect electrical connectors (6 & 7) to Powermaster (10).
7. Bleed brake system per procedure in service manual.



6. ELECTRICAL CONNECTOR  
7. ELECTRICAL CONNECTOR  
8. BRAKE PIPE  
9. NUT  
10. POWERMASTER UNIT

FIGURE 1



12. RETAINER  
14. PISTON GUIDE  
17. PUSHROD EYELET  
18. CYLINDER MOUNTING HOLE

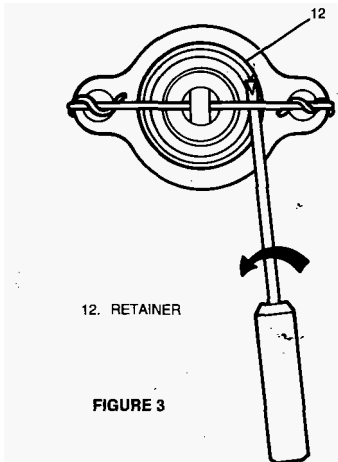
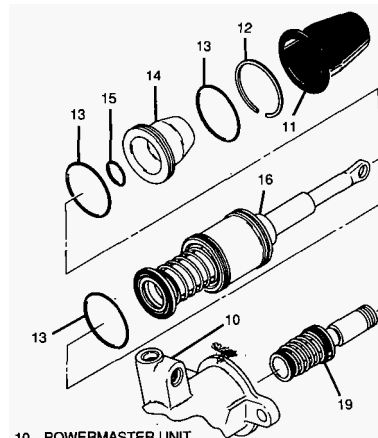


FIGURE 3



10. POWERMASTER UNIT  
11. BOOT  
12. RETAINER  
13. LARGE O-RING  
14. PISTON GUIDE  
15. SMALL O-RING  
16. POWER PISTON ASSEMBLY  
19. PRIMARY PISTON ASSEMBLY

FIGURE 4