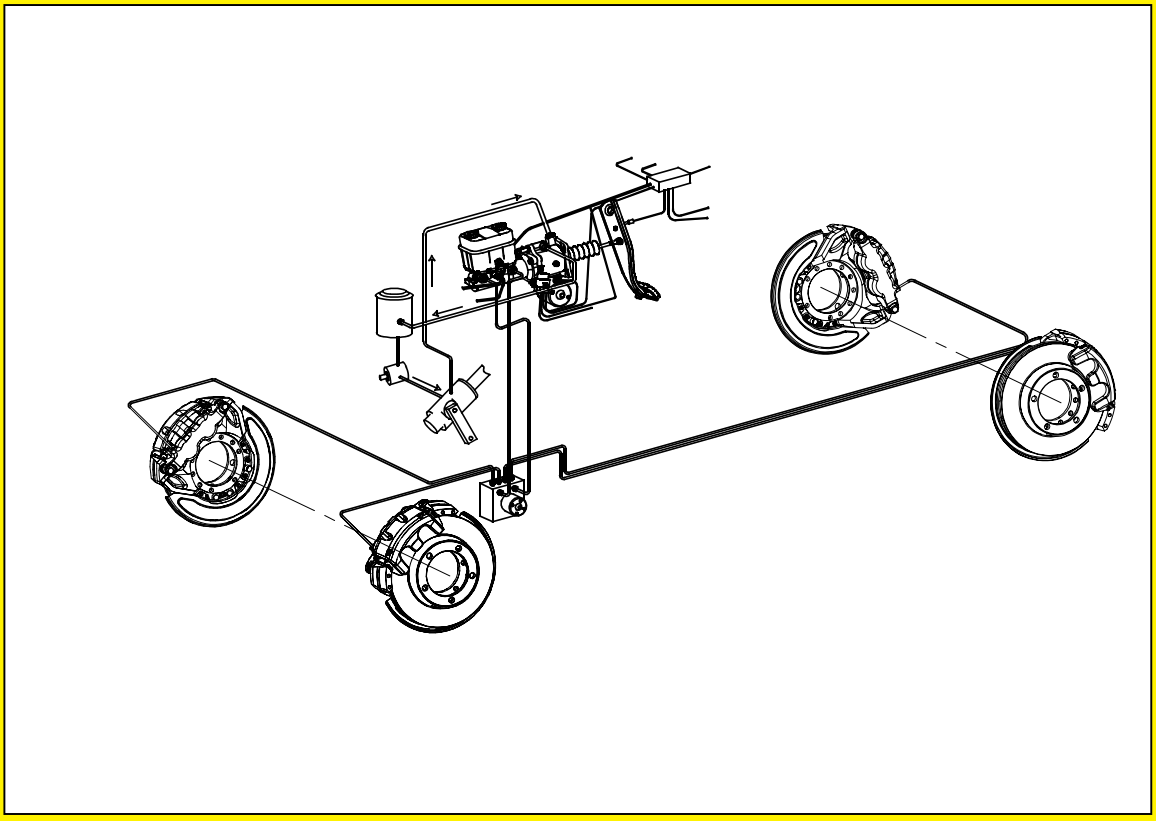
Class 5 to 7 Truck and Bus Hydraulic Brake System



Diagnostic Guide

1st Edition

BOSCH

Important Service Notes

The information in this publication was current at the time of printing. The information presented in this publication is subject to change without notice or liability.

The information contained in this publication is intended for use by properly trained and equipped professional technicians. It is NOT for the "Do It Yourselfer"

Failure to follow safety and repair procedures can result in personal injury, or damage to vehicles, components and equipment.

⚠WARNING

Failure to follow all the safety and vehicle repair procedures either contained in this manual, in the chassis and vehicle manufacturer's repair manuals or in accordance with other accepted methods can result in personal injury, death, or damage to components, vehicles, or personal property.

Correspondence concerning this manual should be addressed to:

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Contents

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Preface

Purpose Of This Diagnostic Guide

The purpose of this diagnostic guide is to assist Class 5 to 7 hydraulic brake repair technicians to more accurately and quickly diagnose the most likely causes of a customer's brake related complaint.

This diagostic guide is NOT a repair instruction, but only a guide. When the probable cause of a customer's complaint is established, the repair procedure must be done in accordance with the instructions in the vehicle manufacturer's service manual.

Using This Diagnostic Guide

The brake technician must be able to understand the customer's complaints and description of the symptoms well enough to match them to one (or more) of the categories listed in the **Table of Contents**. Most customer complaints and symptoms on the vehicle can be matched to these categories. Each category has a corresponding flow chart that will lead the brake technician to the most likely cause of the customer's complaints and vehicle symptoms. Several of the flow chart paths end with a comment box that also includes a number. Brake technicians can use this number to document why a Bosch manufactued part was replaced.

IMPORTANT REMINDER: The first step in diagnosing any customer complaint is to confirm the customer's complaint and determine which category applies.

The flow charts show which diagnostic steps need to be taken. The brake technician must have the necessary skills needed to perform each step. The flow charts are structured to guide the brake technician to take the quickest and easiest steps first. Often, these first, simple steps will be enough to determine what repair needs to be made.

⚠WARNING

After completion of all diagnostic steps, the brake technician must remember to tighten any tube nuts, fittings, bolts, screws, bleeder screws, etc., that were loosened as part of the diagnostic procedure.

In all cases, the vehicle manufacturer's service manual must be used for any repair instructions.

Brake system warning lights and buzzers are unique to the vehicle manufacturer. The **Brake Warning Light and Buzzer Do Not Shut Off** flow chart offered in this guide is generic and may not apply to all vehicles. The vehicle manufacturer's service manual must be consulted in order to determine the proper function of these warning devices.

Exclusions

The ABS portion of the hydraulic brake system is not addressed in detail in this guide since the ABS hardware and software are unique to the specific vehicle manufacturer. Any diagnosis or repair needs to be done in accordance with the vehicle manufacturer's ABS service manual.

Hydraulic Brake System Diagram

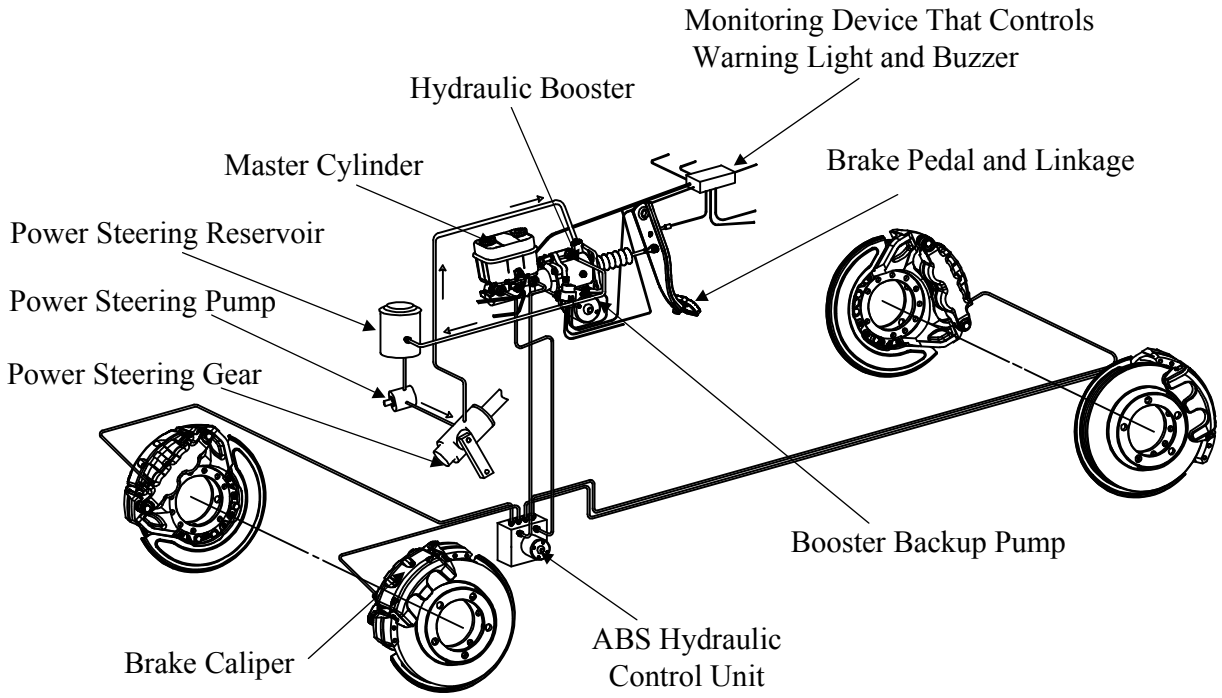


Figure 1. *Brake System Components*

NOTE: Use appropriate brake component or vehicle manufacturer's service manual for all repair work.

Schematic of Typical Electrical System

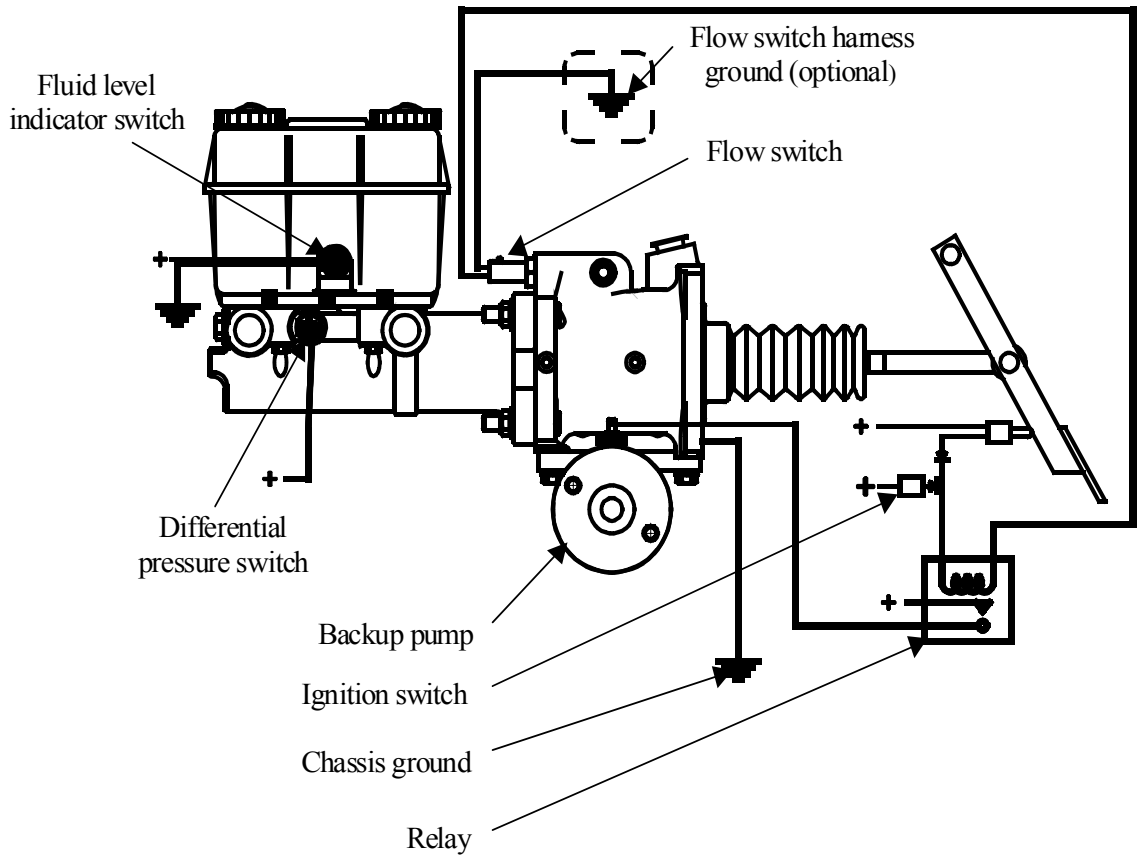


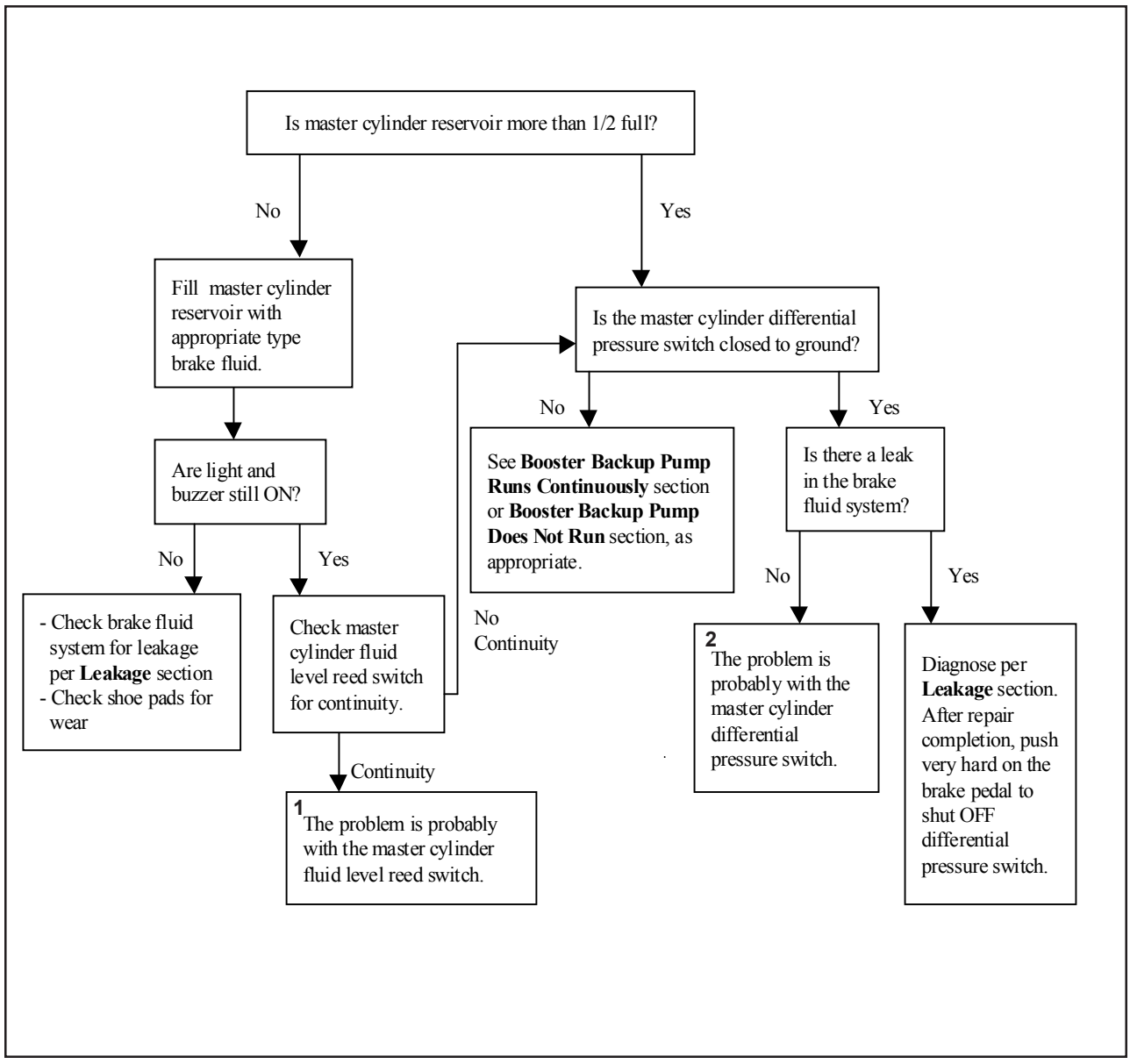
Figure 2. *Schematic of Typical Electrical System*

NOTE: Use appropriate brake component or vehicle manufacturer's service manual for all repair work.

Brake Warning Light and Buzzer Do Not Shut Off

TIP

The light and buzzer come on together, typically in response to signals from the parking brake switch, booster flow switch, master cylinder fluid level indicator switch, the master cylinder differential pressure switch or booster backup pump (*See Figure 2*).

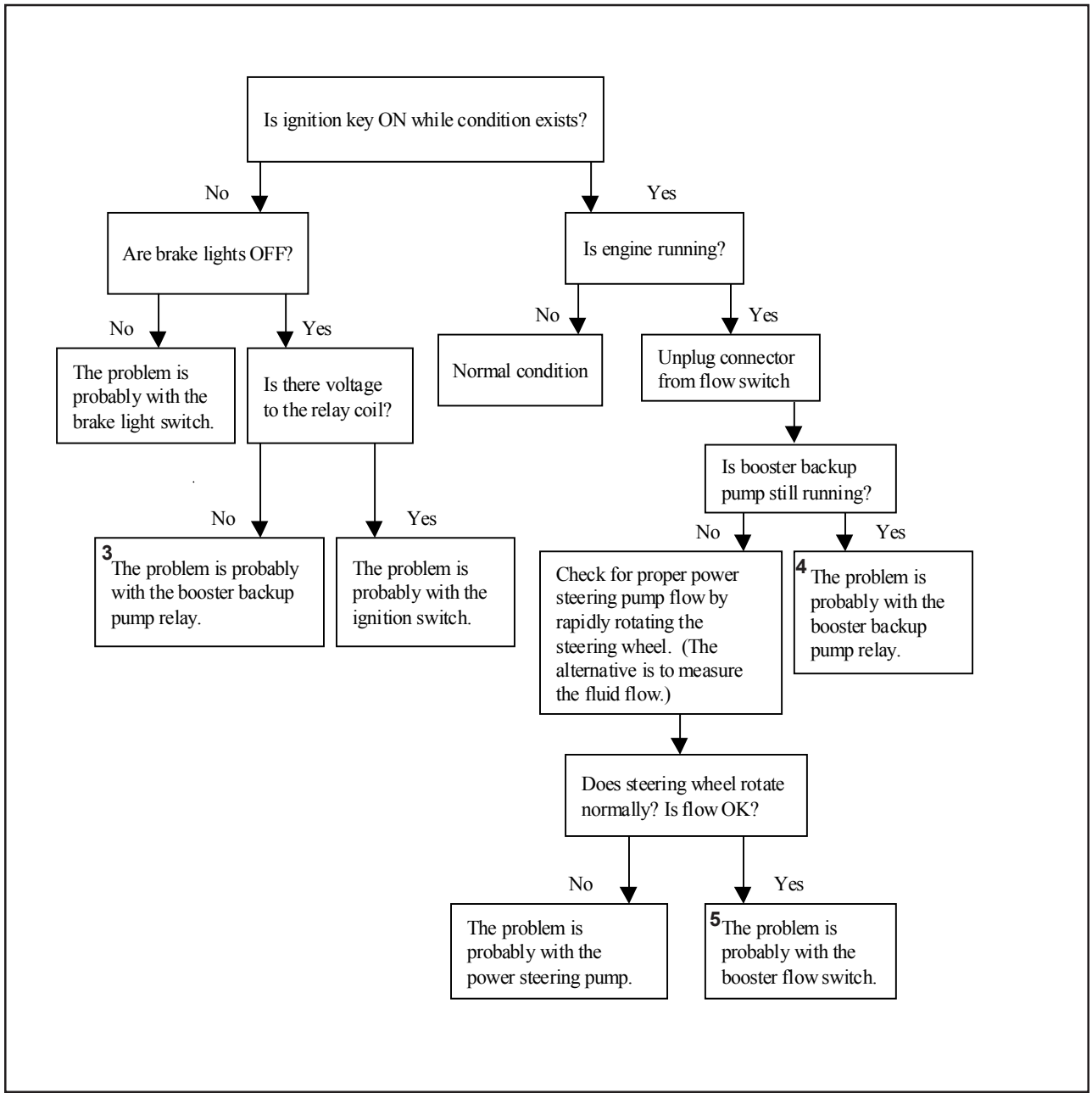


NOTE: Use appropriate brake component or vehicle manufacturer's service manual for all repair work.

Booster Backup Pump Runs Continuously

TIP

The booster backup pump can run only if the relay is closed. The relay will be closed only if:
1) the flow switch is closed and there is power to the coil, or
2) the relay is stuck closed.



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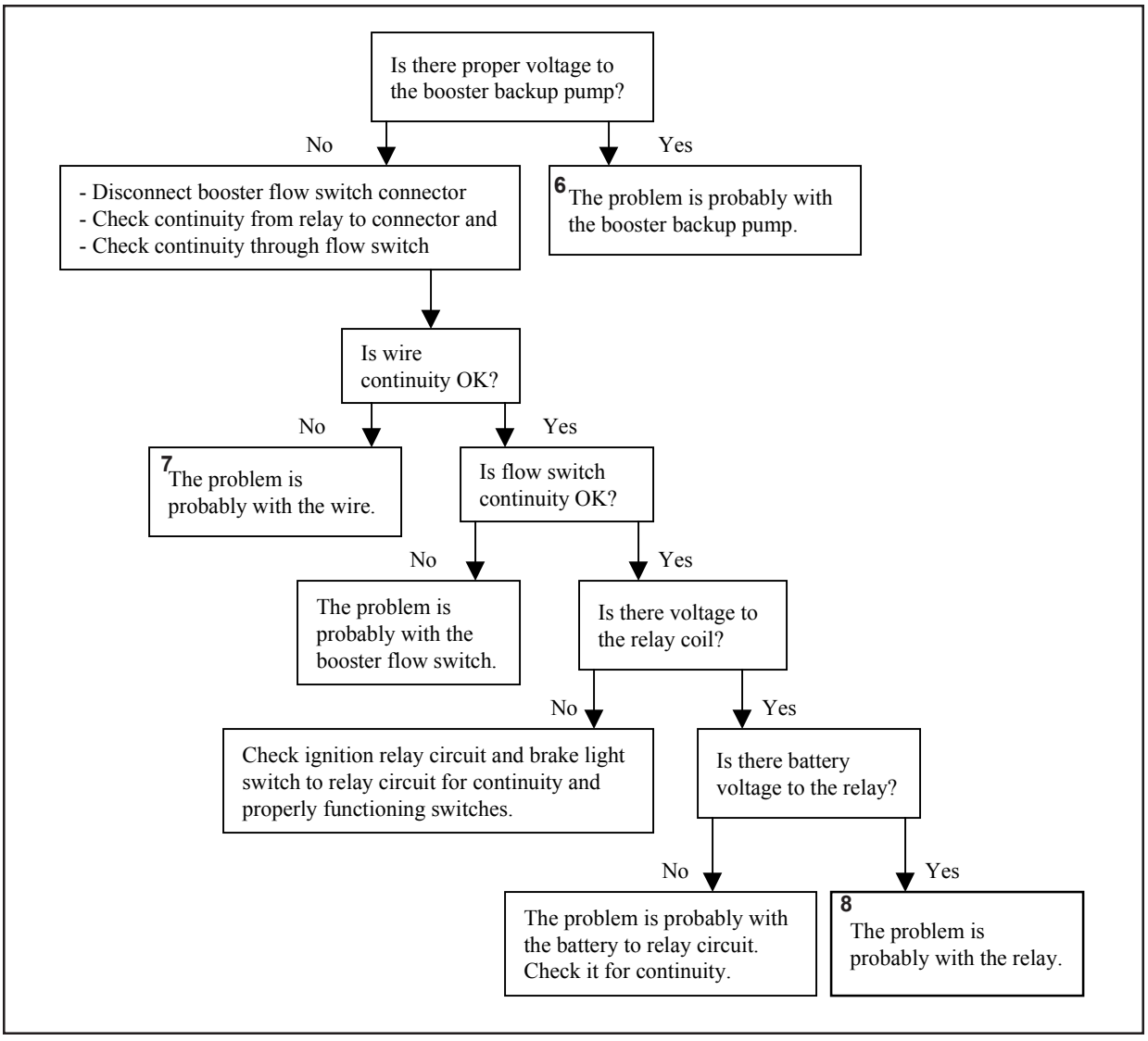
Booster Backup Pump Does Not Run

TIP

The booster backup pump will not run if there is no voltage to the motor or if the motor is damaged (e.g., burned out or jammed).

A no-voltage condition can occur because:

1) Battery is dead
2) Relay is stuck
3) Wires are broken (battery to motor circuit or ignition switch / brake light switch to booster flow switch circuit)
4) Booster flow switch is not closed to ground



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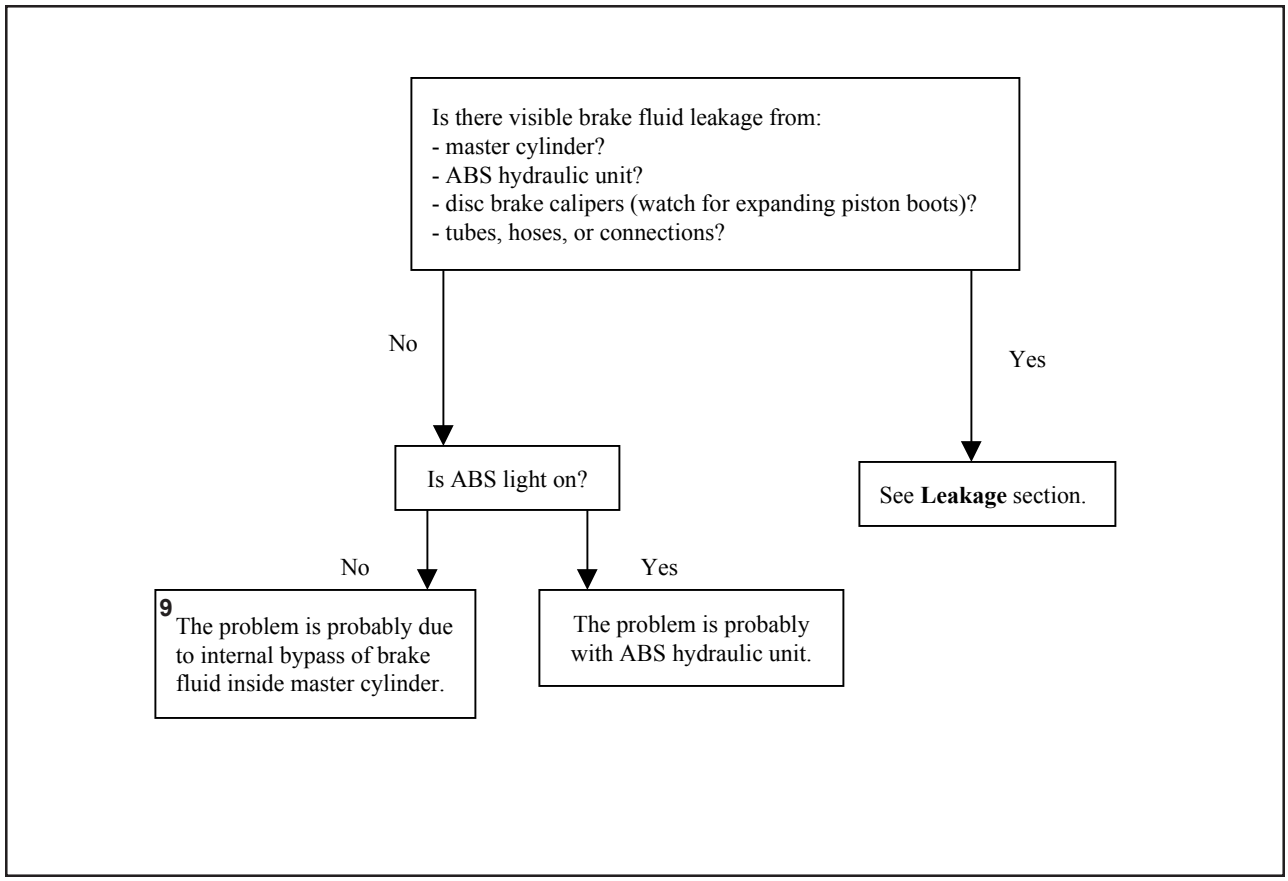
Brake Pedal Continues to Fall With Steady Foot Force



Brake Pedal Feels Spongy, Soft or Springy

TIP

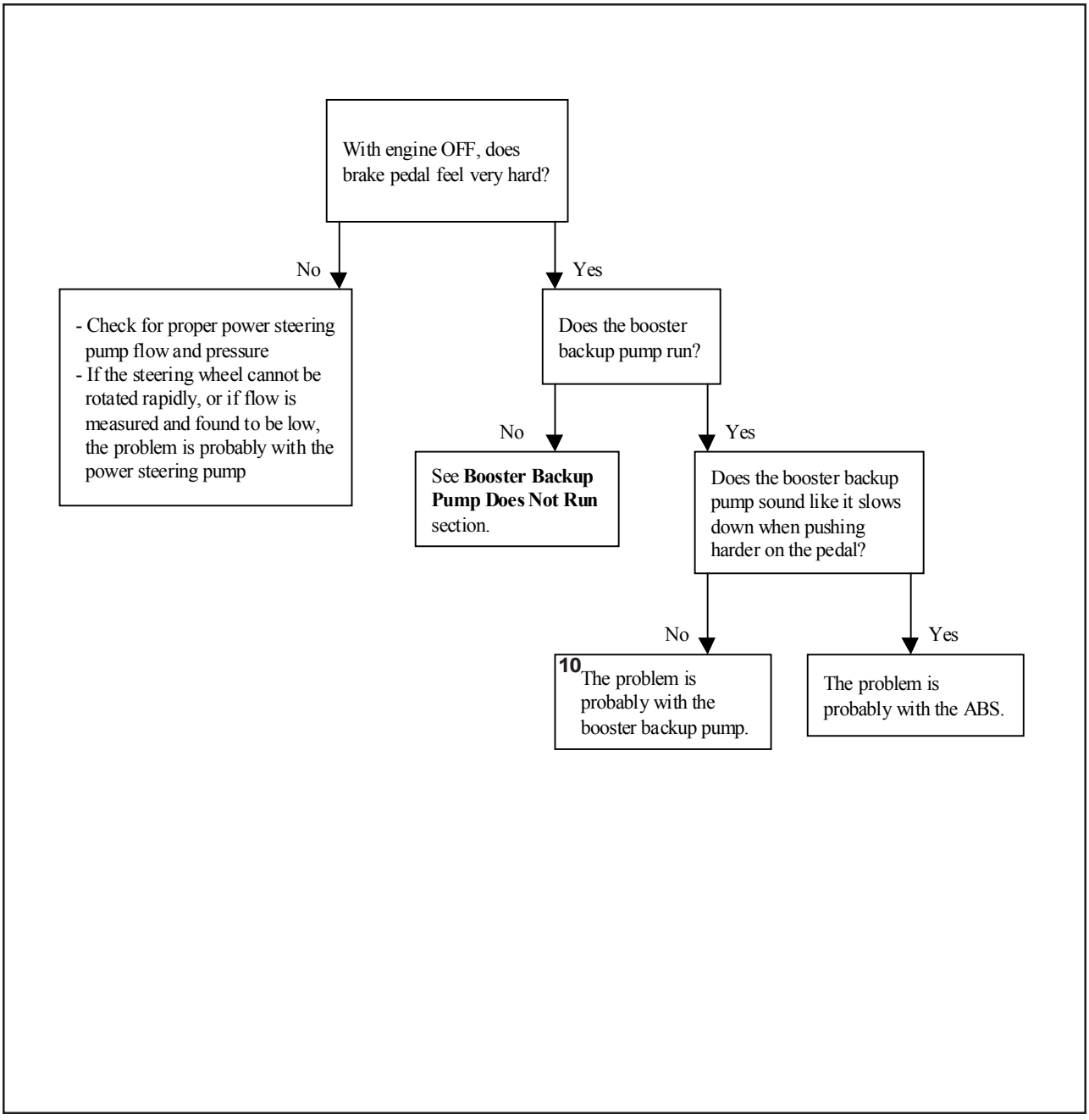
If the brake pedal does NOT fall with steady foot pressure but feels spongy, soft or springy, the problem is probably caused by air trapped in the brake fluid system. Start by bleeding the brake system at the caliper furthest from the master cylinder and work from the back to the front of the vehicle.

NOTE: Use appropriate brake component or vehicle manufacturer's service manual for all repair work.

Brake Pedal Feels Very Hard

TIP

The most common reasons for a very hard brake pedal are:
1) Insufficient flow or pressure from the power steering pump
2) The ABS hydraulic unit is blocking the flow of brake fluid to the calipers



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Potential Master Cylinder and Booster Leak Points

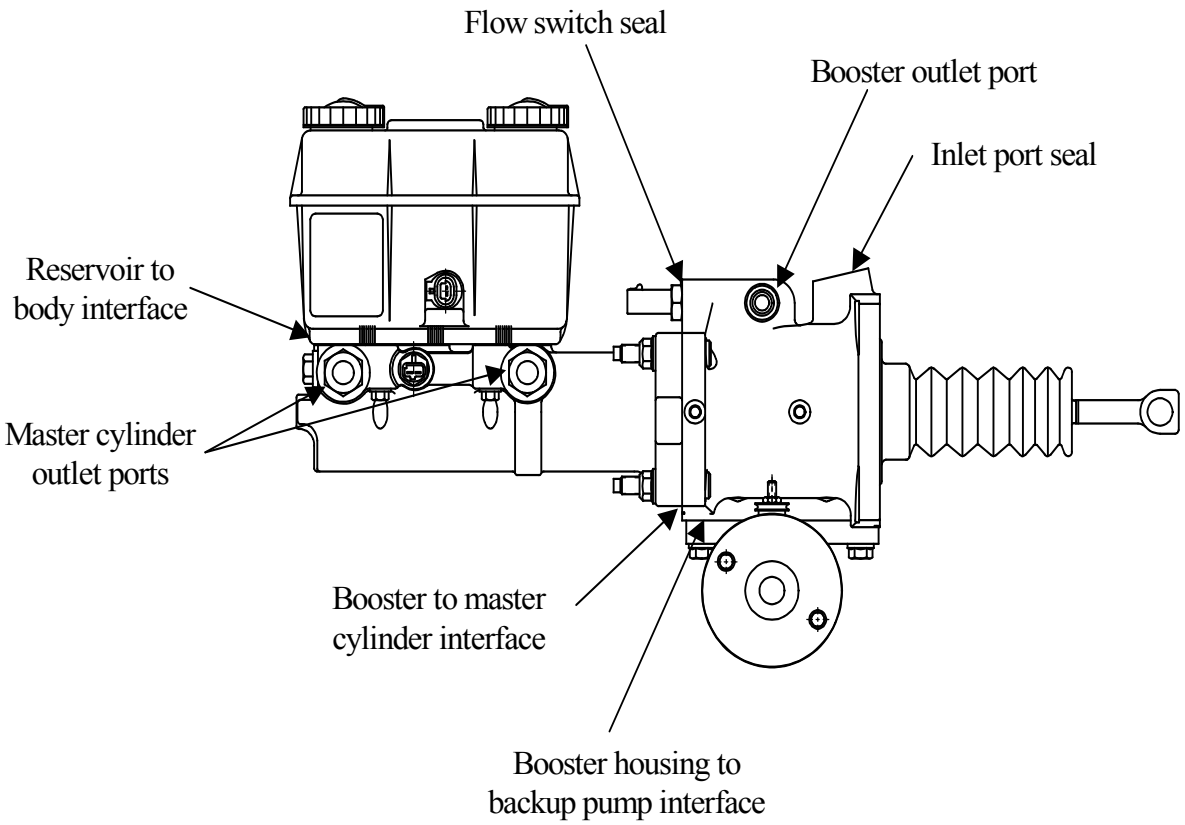


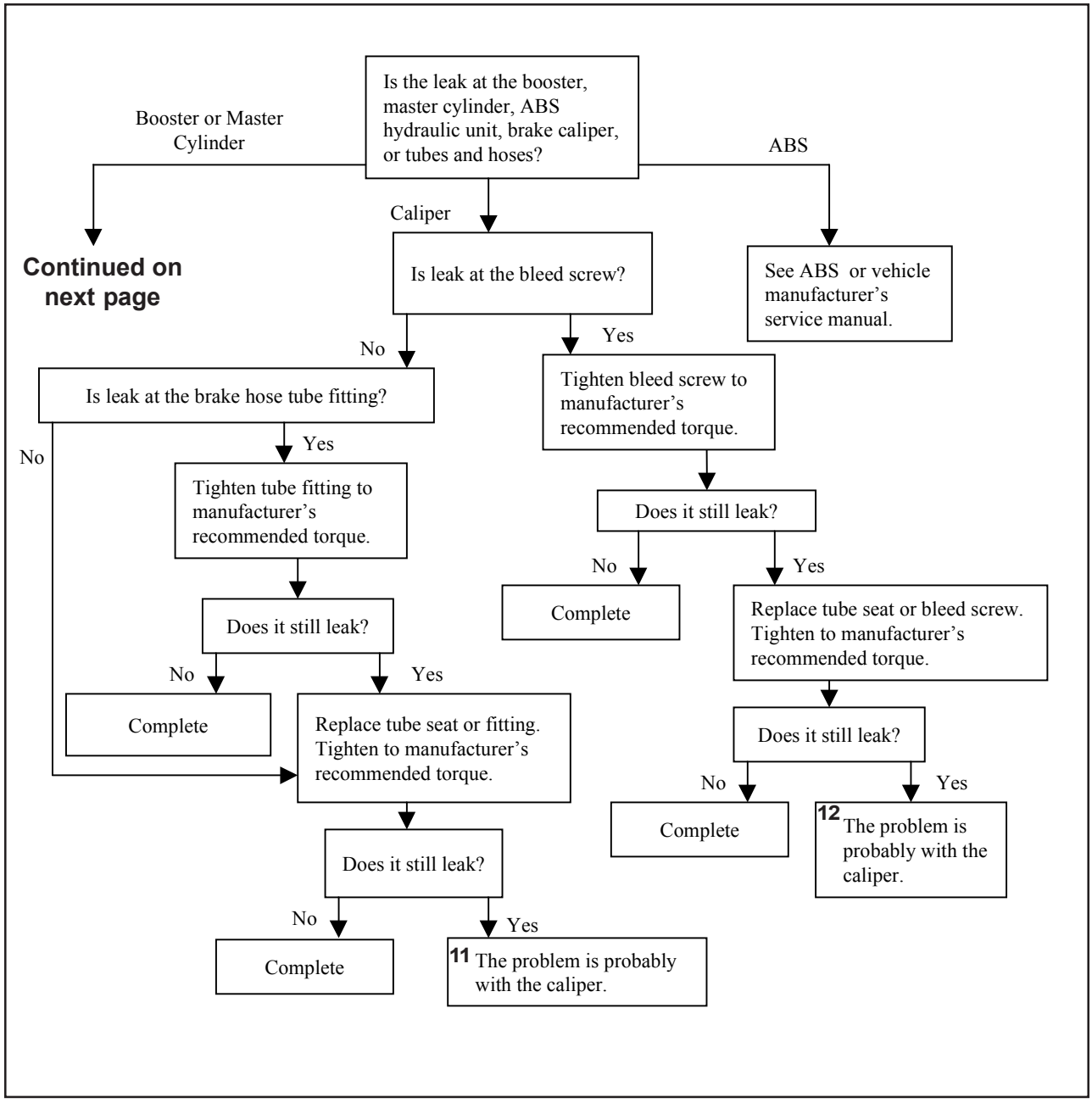
Figure 3. *Potential Master Cylinder and Booster Leak Points*

NOTE: Use appropriate brake component or vehicle manufacturer's service manual for all repair work.

Leakage

TIP

Most external leakage is easy to detect by wetness and/or appearance of fluid drops. However, slight dampness (no drops or wetness) may not indicate a leak.



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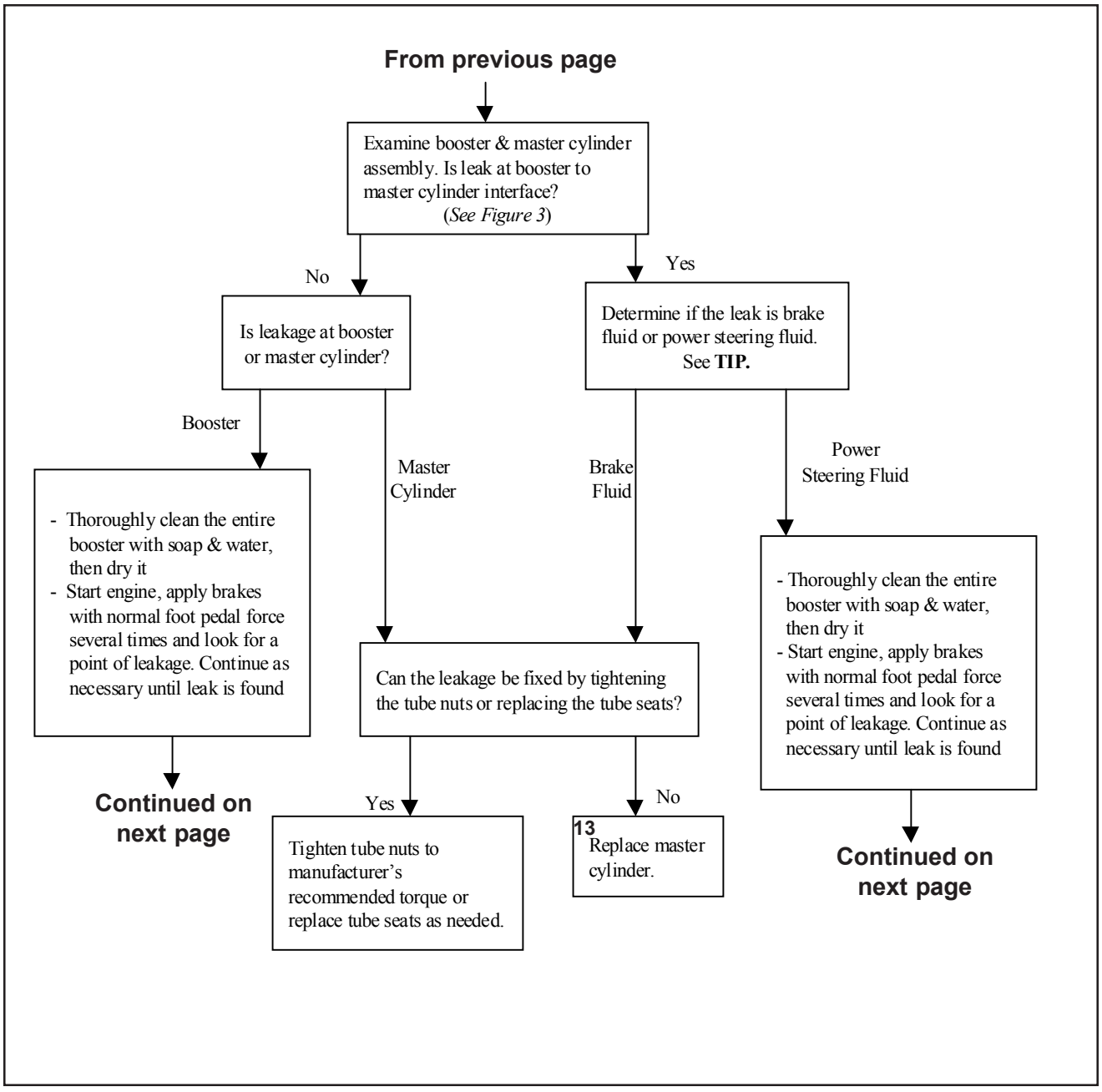
Leakage (continued)

TIP

Brake fluid mixes with water.
Power steering fluid floats on water.



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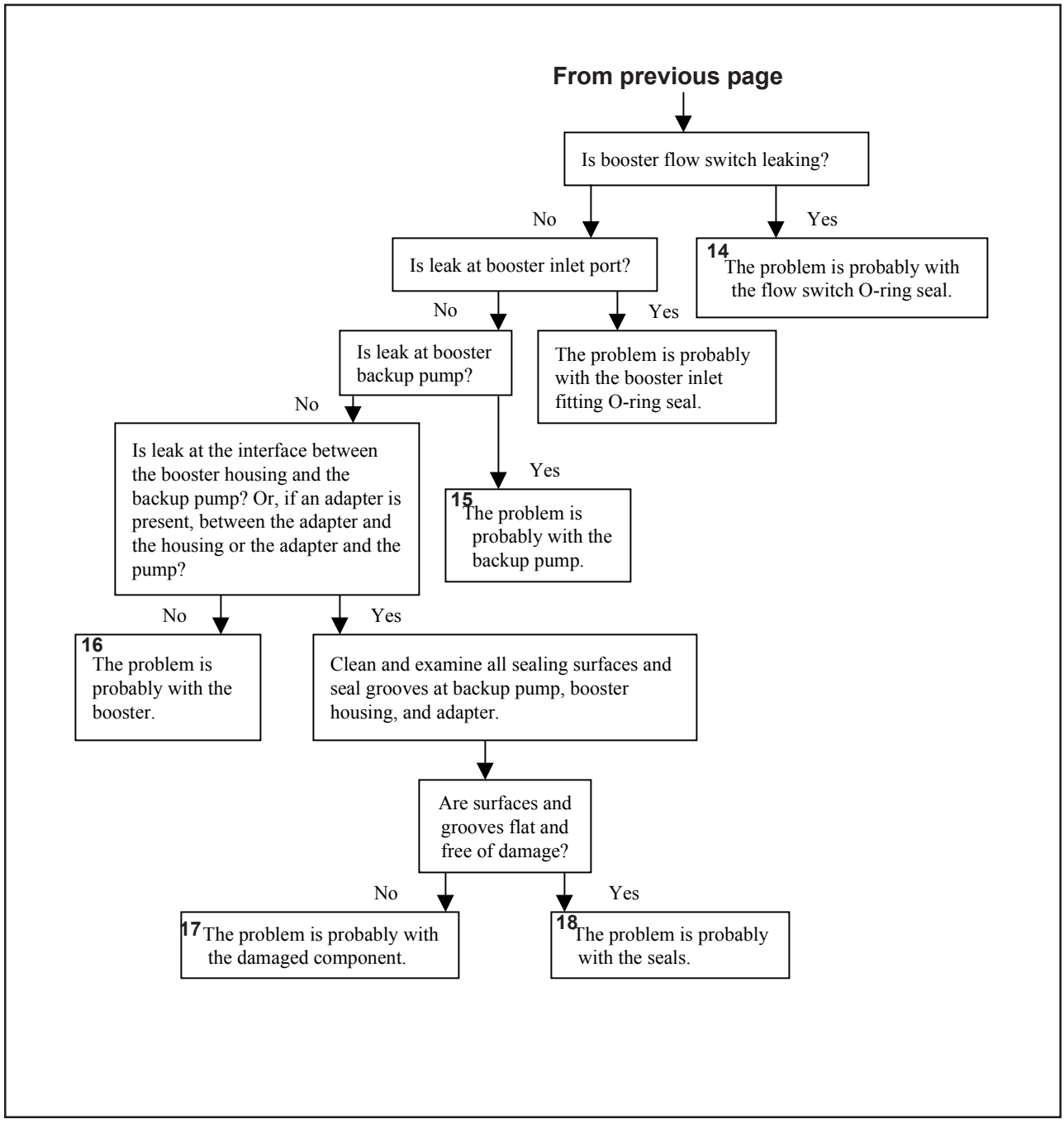
Leakage (continued)



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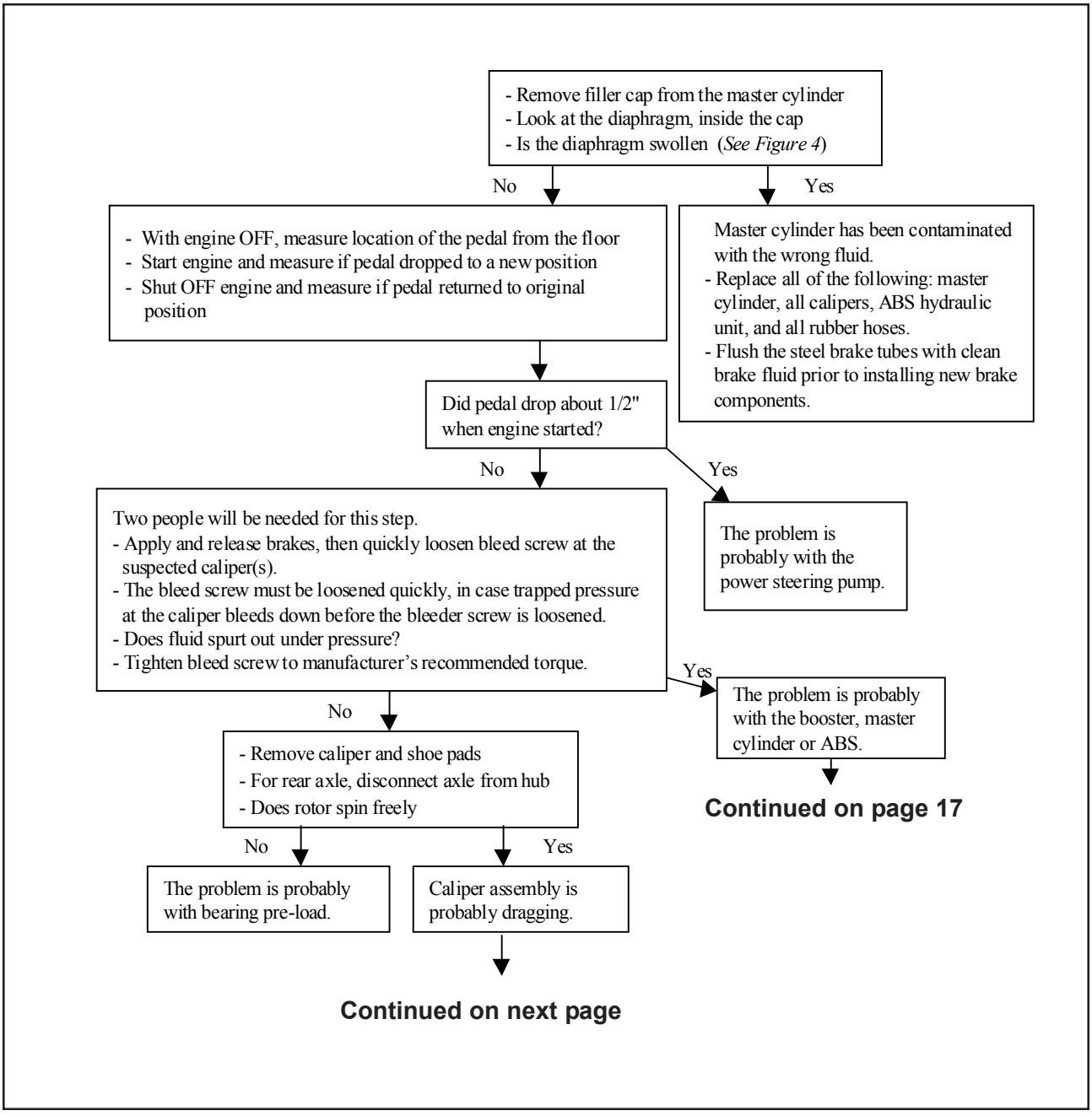
Brake Drag

TIP Possible Causes of Brake Drag:

1) Booster does not return
2) Brake pedal does not return
3) Brake hoses and tubes collapsed or kinked
4) Master cylinder does not return
5) ABS traps pressure
6) Brake caliper does not release



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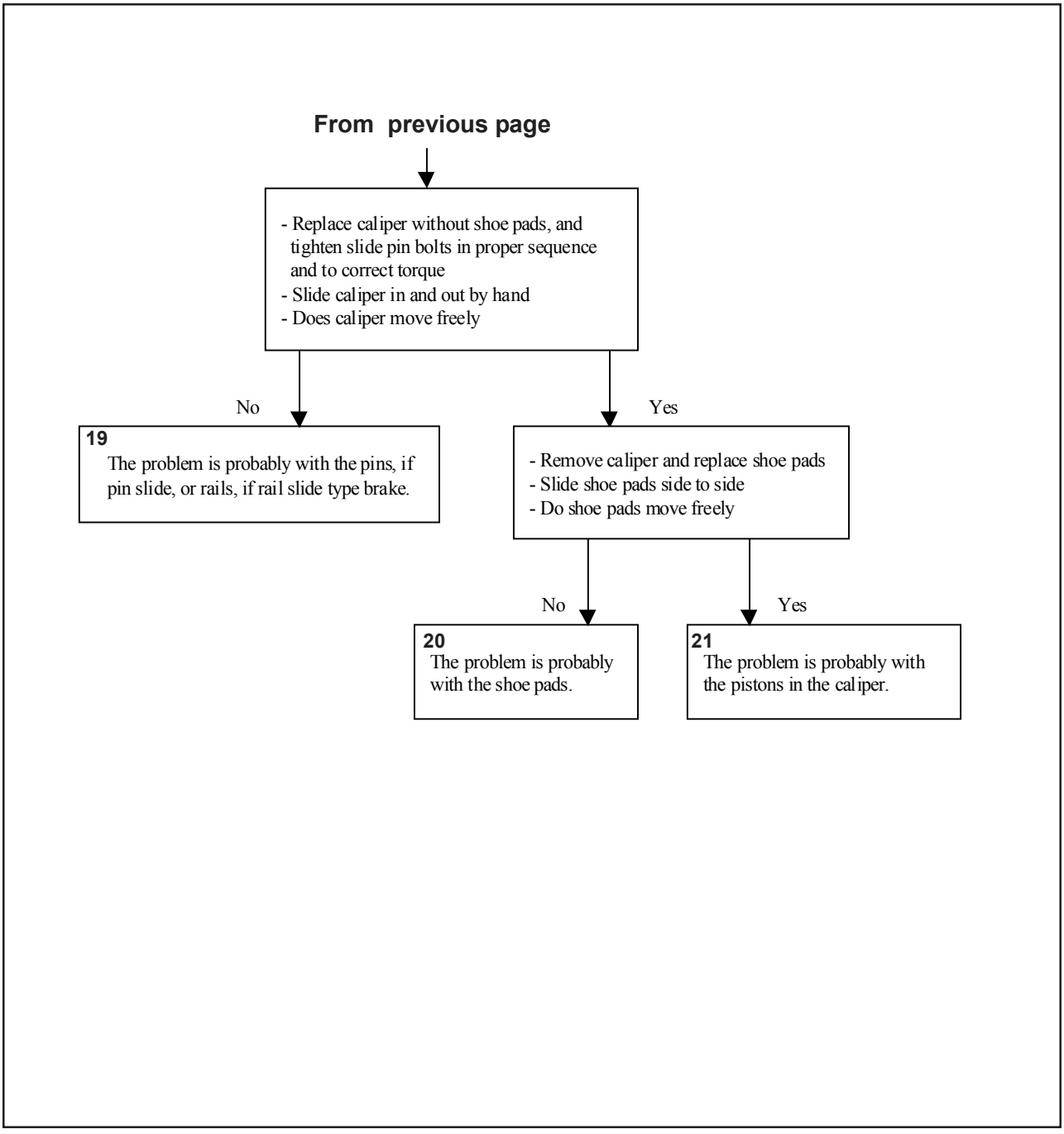
Brake Drag (continued)



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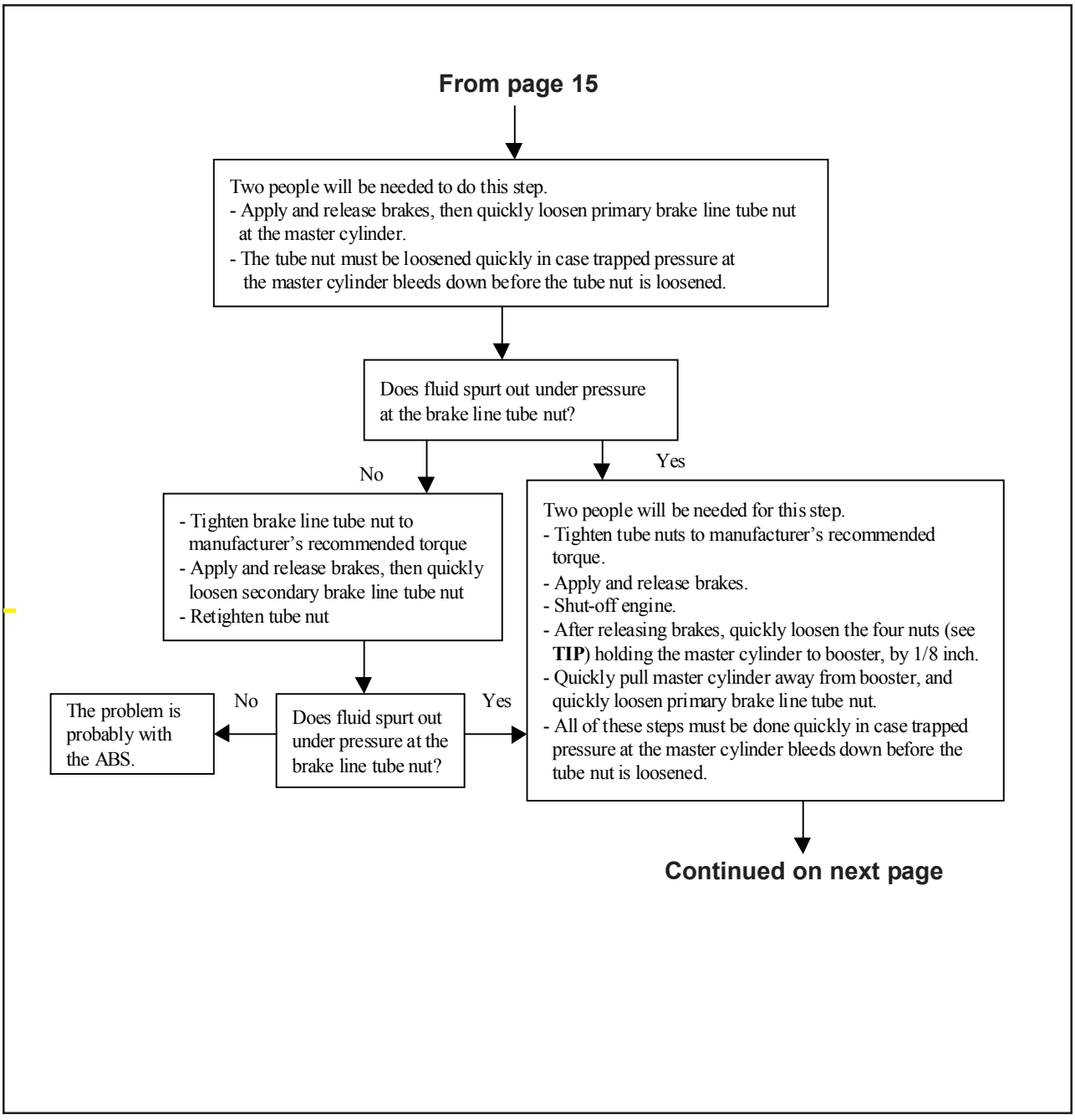
Brake Drag (continued)

TIP

Prior to moving master cylinder 1/8 inch away from booster, loosen two diagonally opposed nuts that hold the master cylinder to the booster, by 1/8 inch. Have a power tool ready to loosen the remaining two nuts after the brakes have been applied and released.



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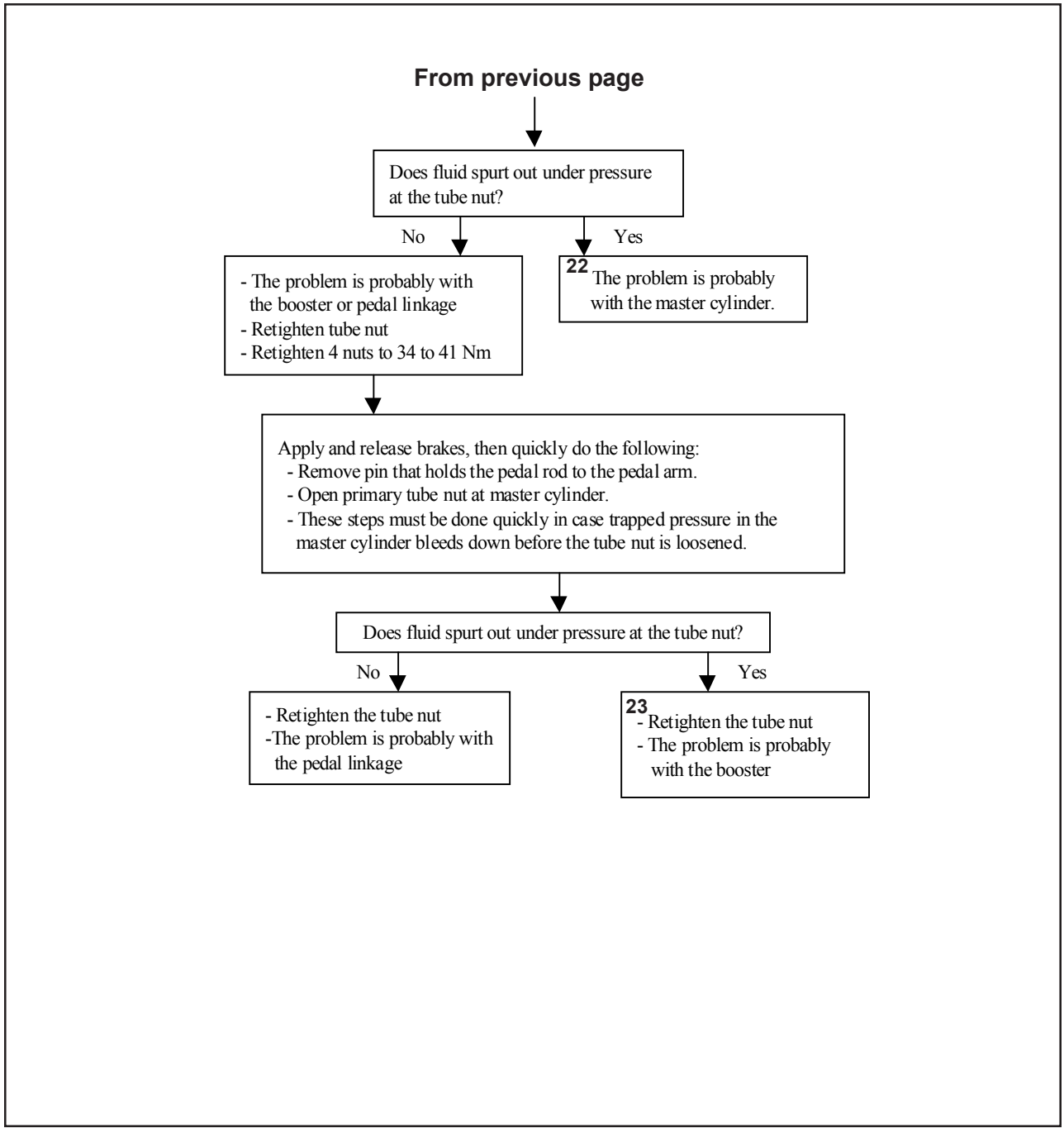
Brake Drag (continued)



NOTE: Use appropriate brake component or vehicle manufacturer's service manual for all repair work.

Master Cylinder Cap Diaphragms

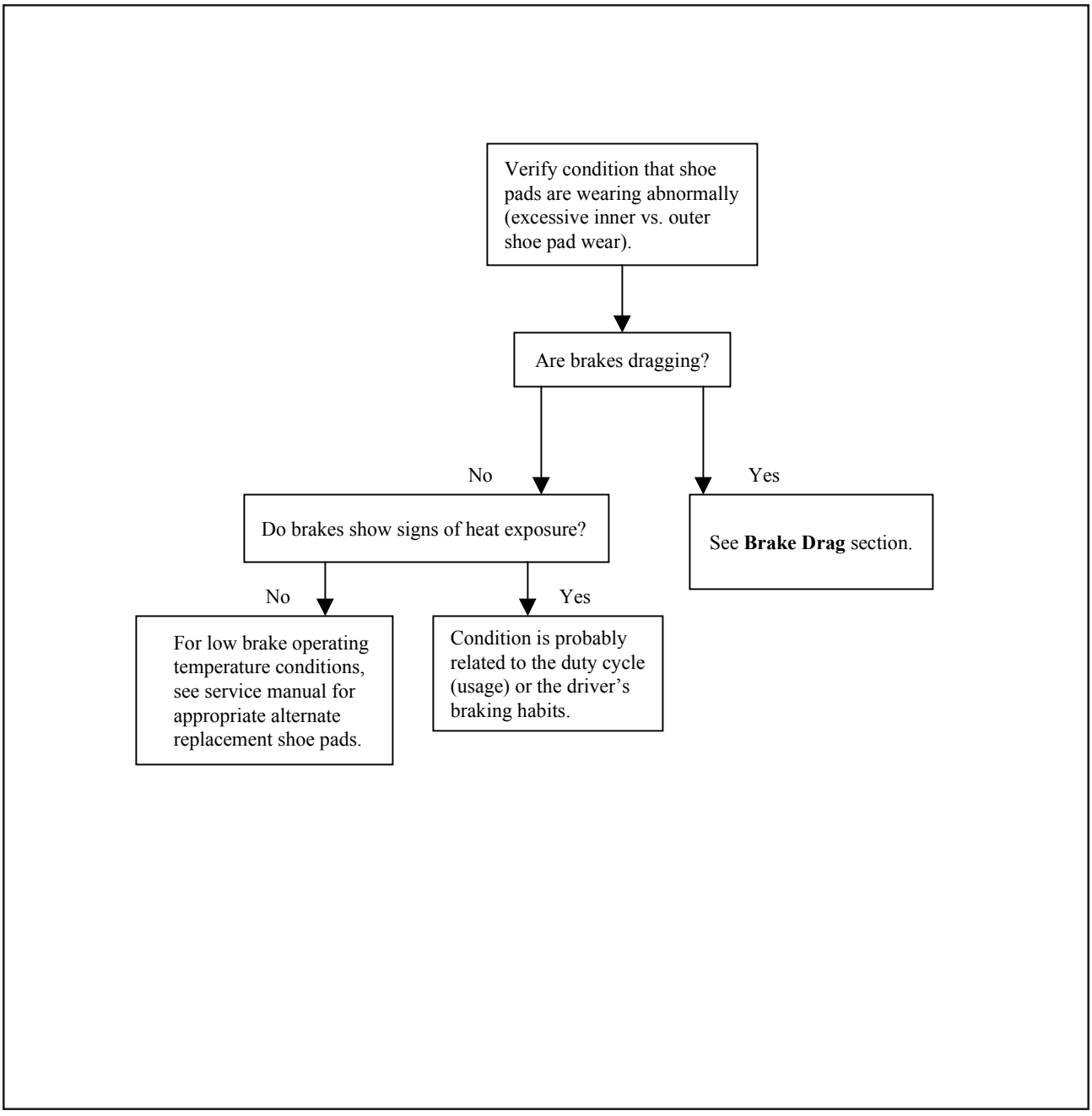
Figure 4. *Comparison: Swollen vs. Normal Diaphragm*

NOTE: Use appropriate brake component or vehicle manufacturer's service manual for all repair work.

Low Shoe Pad Life or Uneven Shoe Pad Wear

TIP

Shoe pad life can vary greatly due to many factors including vehicle type, vocation (e.g., rollback tow truck, box truck, bus, etc.), terrain, urban vs. rural use, and driver style. Therefore, no guidelines can be provided for the mileage that should be obtained.



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