

by **ROADMASTER**
BRAKEMASTERTM
U.S. Patent 5,915,798
9100 Series

PROPORTIONATE TOWED CAR BRAKING SYSTEM

BrakeMaster 9100 and 9160
for motorhomes with air or air over hydraulic brakes
Second Motorhome Kit

Installation Instructions

Part number 98200



WELCOME TO THE ROADMASTER FAMILY!

This manual has been prepared to acquaint you with the installation, operation, care and maintenance of your BrakeMaster, and to provide you with important safety information.

Read your owner's manual cover to cover. Understand how to install and operate your BrakeMaster, and carefully follow the instructions and safety precautions.

We thank you for your patronage and greatly appreciate your discerning taste.

Table of Contents

Safety definitions	inside front cover
Before you begin the installation (installer's checklist)	inside front cover
Install the motorhome monitor	1-2
Install the air line	2-3
System test.....	4-5
Troubleshooting	back cover

All illustrations and specifications contained herein are based on the latest information available at the time of publication. ROADMASTER, Inc. reserves the right to make changes, at any time, without notice, in material, specifications and models, or to discontinue models.

Before you begin the installation...

WARNING

These instructions pertain to the initial installation of the second motorhome kit only. Operating instructions are contained in the owner's manual; the owner's manual and installation instructions for the complete system are available at roadmasterinc.com.

Read all instructions before installing or operating the BrakeMaster system. Failure to understand how to install or operate BrakeMaster could result in property damage, personal injury or even death.

1. Always check online at the ROADMASTER – roadmasterinc.com – for vehicle-specific information. Select 'Vehicle-Specific Info,' then 'Supplemental Braking Systems.' Enter the motorhome make, model and year and scroll down the page.

2. If the motorhome has a Spartan chassis – Spartan requires an air spring assist tank (commonly called a 'ping' tank, Spartan part number S-1628-001) to be installed with any supplemental braking system such as BrakeMaster. Otherwise, Spartan will void the chassis warranty.

3. An optional tee may be required to connect the BrakeMaster air line to the motorhome brake relay valve or air booster housing. Refer to "Install the air line."

A 3/8" tee (part number 450077) is provided for this purpose. An optional 1/2" tee (part number 450076) is also available.

4. If the motorhome is equipped with air over hydraulic brakes – an additional amount of air line (part number 450700) may be required.

IMPORTANT NOTICE!

Safety Definitions

These instructions contain information that is very important to know and understand. This information is provided for **safety** and to **prevent equipment problems**. To help recognize this information, observe the following symbols:

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in property damage, serious personal injury or even death.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in property damage, or minor or moderate personal injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE

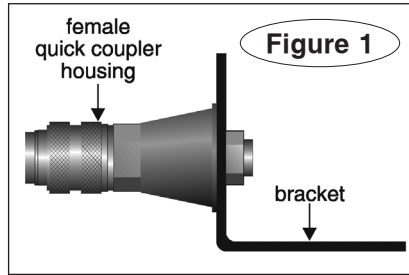
Refers to important information and is placed in italic type. It is recommended that you take special notice of these items.

INSTALL THE MOTORHOME MONITOR

Note: both the motorhome monitor and the air line (see pages 2 and 3) are installed underneath the motorhome. If the monitor system and the air lines can be attached along the same route, it may be more convenient to install them at the same time.

Note: some motorhomes are manufactured with auxiliary wires pre-strung from the rear of the motorhome to the dashboard, for aftermarket accessories such as the motorhome monitor. Call the manufacturer.

1. Find a suitable location at the rear of the motorhome, near the center, to attach the preassembled female quick coupler (Figure 1). Attach the bracket with two of the supplied 1/4" nuts and bolts, with the female quick coupler pointing away from the motorhome.



Note: the weather covers will prevent dirt or debris from entering the lines. Keep the fittings covered when the braking system is not in use.

2. Attach the end of the 50-foot length of black wire with the female bullet connector to the back of the motorhome, near the female quick coupler you attached in the previous step.

Attach the connector with one or more of the included wire ties. Allow enough slack so that a male bullet connector can be plugged into and out of it.

3. Once the female bullet connector is attached, route the wire from the back of the motorhome to the underside of the dashboard.

⚠ WARNING

Route the wire to avoid moving parts, sharp edges, the fuel lines or hot components such as the engine or exhaust system.

Wiring exposed by moving parts, sharp edges or hot components may cause a short circuit, which can result in damage to the vehicle's electrical system as well as other, consequential damage.

Wiring which is attached in close proximity to

the fuel lines may ignite the fuel.

Failure to follow these instructions may cause property damage, personal injury or even death.

Use one or more of the included wire ties to secure the wire in place.

4. Choose an area on the motorhome dashboard to mount the LED (Figure 2). Look for a mounting point away from pre-existing wires or components, where the LED can be easily seen by the driver.

5. Drill a 5/16" hole through the dashboard at the point you have chosen. Before drilling, make certain you will not damage any components on the other side.

6. Center the LED decal (Figure 2) over the hole, and press it down. Or, you may choose to omit the decal, depending on your preferences.

7. From the top of the dashboard, slide the LED through the hole, wires first, until the base of the bulb (Figure 2) is flush to the top of the dash.

8. From the underside of the dash, fit both of the wires through the speed nut (Figure 2). Then push the speed nut up, against the dash, to secure the LED in place.

9. Connect to power – trim the black wire. (Save the excess; you may use it in the next step.) Then con-

continued on next page

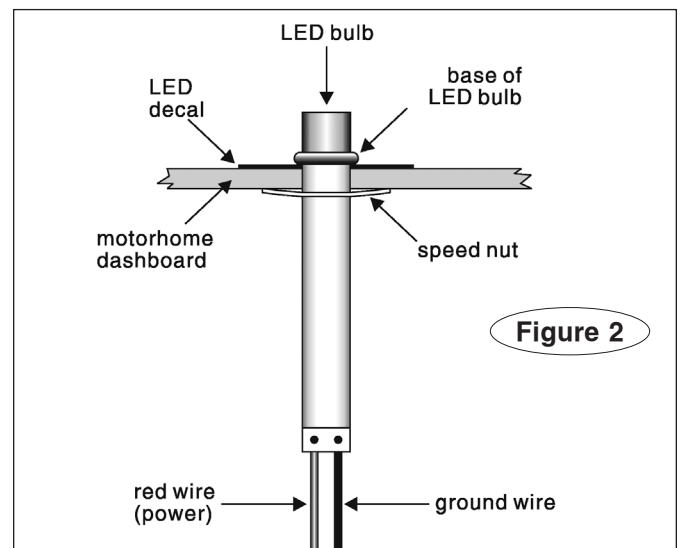
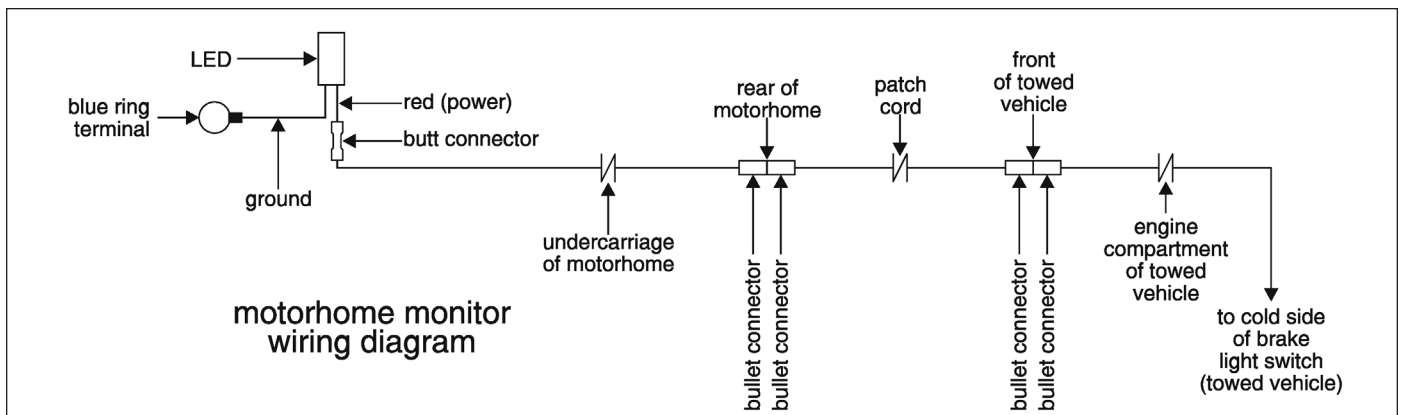


Figure 2



Install the motorhome monitor

continued from preceding page

nect the black wire to the red LED wire with the included blue butt connector.

10. Connect to ground – use the included ring terminal to connect the ground wire from the LED to any good chassis ground, preferably directly to the frame.

(If necessary, use any excess wire to extend the

length of the ground wire.)

CAUTION

Failure to establish a good ground between the motorhome and towed vehicle could cause aftermarket accessories to malfunction, damage to both vehicles' electrical systems and other consequential damages.

INSTALL THE AIR LINE

There are three possible connection points for the motorhome air line –

- If the motorhome has air brakes, the line can be attached to an open port at the air brake relay valve.
- If the motorhome has air over hydraulic brakes, the line can be attached to an open port at the main brake air booster housing.
- If there is no open port, a tee must be used.

In this step, you will attach the motorhome air line at one of these three points, then route it to the rear of the motorhome.

1. Support and block the motorhome. Then release the parking brake.

⚠ WARNING

The motorhome must be safely and securely supported and blocked.

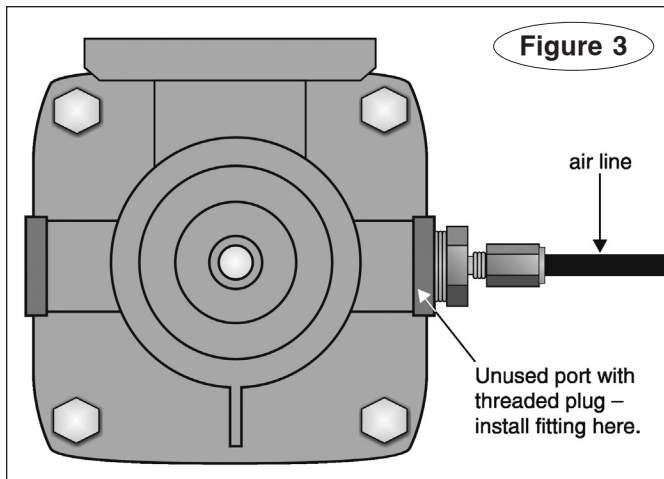
With the parking brake released, the motorhome may unexpectedly roll forward or backward, especially if it is on an incline, if it is not blocked.

If the motorhome is equipped with an air suspension system and a line to the air suspension system is inadvertently opened, or if the motorhome's air suspension system is turned off, the motorhome will lower to the ground.

Failure to follow these instructions may cause property damage, personal injury or even death.

CAUTION

The motorhome's parking brake must be released, in order to test and identify the correct port.



If an incorrect port is chosen, the motorhome brake system will be severely damaged. A brake fire or other non-warranty damage may also occur.

- If the motorhome has air brakes – find the air brake relay valve (Figure 3), which is typically located near the master cylinder. There should be one or more open ports with threaded plugs (Figure 3).

Remove the original fitting from the port and thread the appropriate-sized fitting (1/2" and 3/8" fittings are provided) into the port.

Use a liquid Teflon® sealant to seal the pipe threads (Do not use liquid Teflon on any compression fittings).

Proceed to step 2 (below).

- If the motorhome has air over hydraulic brakes – start the motorhome engine and allow the air brake system to completely charge up to operating pressure.

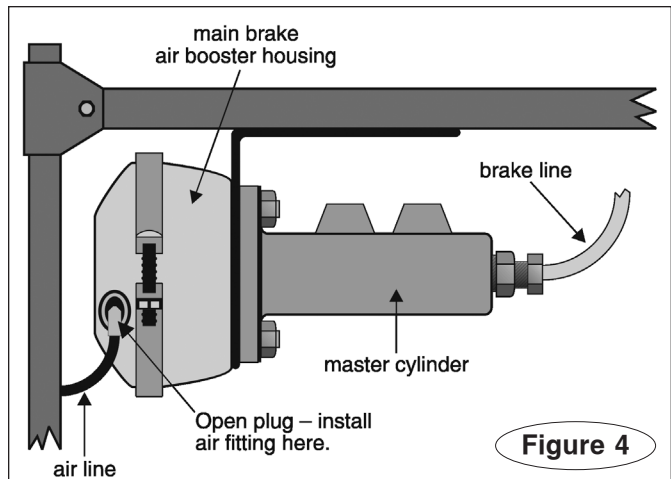
Find the main brake air booster housing (Figure 4), which is typically located near the front axle. There should be an open plug (Figure 4) threaded into the air booster housing.

Test to verify that you have located the correct port (an assistant will be necessary for this test, to press and release the motorhome brake pedal)...

⚠ WARNING

The air brake system contains pressurized air, which may cause severe eye or ear injury when it is released. Wear appropriate eye and ear protection before loosening any plugs and while attaching the

continued on next page



Install the air line

continued from preceding page

air line.

First, slowly loosen the plug – do not remove it entirely. Then instruct the assistant to depress the motorhome brake pedal several times. Pressurized air should escape from the port each time the brake pedal is depressed.

If pressurized air is only released when the brake pedal is depressed, you have located a port to attach the BrakeMaster air line.

Turn the motorhome engine off. Remove the original fitting from the port and thread the appropriate-sized fitting ($\frac{1}{2}$ " and $\frac{3}{8}$ " fittings are provided) into the port.

Use a liquid Teflon sealant to seal the pipe threads (Do not use liquid Teflon on any compression fittings).

Proceed to step 2 (below).

- **If an open port is not available** – Not all relay valves or air booster housings will have an empty port available. If this is the case, the BrakeMaster air line must be connected with a tee to the service port at the relay valve or air booster housing. A $\frac{3}{8}$ " tee (part number 450077) is provided for this purpose. An optional $\frac{1}{2}$ " tee (part number 450076) is also available. Matching compression fittings are provided in this kit.

The correct port should be identified as the "service brake" port. (If the ports are not identified, follow the steps under "If the motorhome has air over hydraulic brakes," above, to identify the service port.)

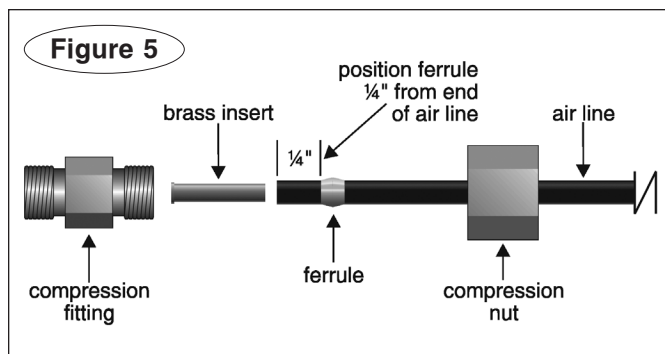
To connect the tee, first release the motorhome brakes. Then disconnect the factory air line from the service port – push down on the locking collar and then pull out.

Remove the factory fitting from the service brake port.

Clean the factory fitting. Apply a liquid Teflon sealant to the threads on the male fitting of the new tee, and thread it into the port. Use either one of the two female fittings on the new tee to reinstall the factory fitting, and then the factory air line.

Proceed to step 2 (below).

2. Attach the BrakeMaster air line and compression fitting – first, if necessary, trim the end of the air line, to make a smooth and straight cut. Then slide the compression nut and the ferrule (Figure 5) over the air line. Position the ferrule $\frac{1}{4}$ " from the end of the air line.



Next, slide one of the brass inserts (Figure 5) into the end of the line.

Note: if the brass insert is omitted, the fitting will not be airtight.

Now, push the air line into the compression fitting, as far as it can go. Then push the ferrule into the compression fitting, and tighten the compression nut onto the fitting.

Note: if the compression nut is overtightened, the fitting will not be airtight. After completing the installation, check all the fittings for leaks – see "System test."

3. Tape the open end of the air line. Then route the air line from the relay valve (or air booster housing) to the female quick coupler at the rear of the motorhome.

As before, avoid moving parts, sharp edges or hot components such as the engine or the exhaust system.

Do not kink the air line, or bend it to the extent that it crimps or creases.

WARNING

Do not position the air line closer than two feet from any heat source. The heat will soften the plastic, which will cause the air line to rupture. If the air line is ruptured, the supplemental braking system will not function.

Do not kink the air line, or bend it to the extent that it crimps or creases – air pressure will be substantially reduced, or blocked entirely, at the kink in the line. If the air pressure is reduced, the supplemental braking system will not function or may only function intermittently.

Where appropriate, use one or more of the included wire ties to secure the air line in place.

4. Connect the air line to the female quick coupler at the rear of the motorhome. Use the same method described in step 2 (above).

5. The installation is complete. Before the supplemental braking system is used for towing, proceed to the next section – "System test."

SYSTEM TEST

Note: this kit consists of the motorhome components only. In order to complete the system test, the towed vehicle components must be installed and operating correctly for BrakeMaster to function.

Refer to the complete installation instructions to identify the towed vehicle components you will connect.

CAUTION

Always deplete the stored vacuum in the towed vehicle's power brake system before towing – pump the brake pedal several times.

Depending on the make and model of the towed vehicle, it may be necessary to pump the brake pedal repeatedly to deplete the vacuum.

If the vacuum is not released, the supplemental braking system will apply excessive braking force when it is activated, which will cause severe tire and/or brake system damage to the towed vehicle.

1. The motorhome and towed vehicle must be stationary for the system test, and ready for towing...

- Connect and attach the tow bar to the motorhome and towed vehicle.
- According to the manufacturer, make all adjustments necessary to prepare the vehicle for towing. These adjustments may include: turning the ignition key to the "tow" position; pulling fuses; disconnecting the battery; and setting the transmission to a particular gear or in a particular sequence.

CAUTION

To prevent the towed vehicle from rolling, connect and attach the tow bar to both vehicles before shifting the towed vehicle's transmission into the proper gear for towing.

- Connect the patch cord (the six-foot length of air line and wiring, covered in blue plastic loom) between the two vehicles:

First, connect the male and female quick couplers at either end of the air line to the corresponding quick couplers on the motorhome and towed vehicle – push the couplers together until the housing (Figure 1) on the female coupler slides forward and 'clicks,' locking the couplers together.

(To disconnect the couplers, pull back on the housing on the female coupler until the couplers release.)

CAUTION

Never pull back on the housing to connect the couplers – this will prevent the couplers from locking. The couplers may disconnect during towing, preventing the supplemental braking system from functioning.

Next, connect the male bullet connectors at either end of the monitor wire to the female bullet connectors on the motorhome and towed vehicle monitor wiring harnesses.

- Attach the air cylinder to the brake pedal and mounting post (or seat bracket adaptor). Connect the male quick coupler at the end of the air line on the air cylinder to the female quick coupler at the end of the air line mounted in the passenger compartment.

- Clip one end of the steel break away cable to the break away pin; clip the other end of the cable to the rear of the motorhome, close to the center.

2. Block the motorhome's wheels, then release the parking brake. Turn the motorhome engine on, and leave it running.

3. After the air brake system is completely charged, check for leaks in the air system: have an assistant apply the motorhome brakes and continue to hold the brake pedal down.

Cover each joint, fitting and connection in the air system with a leak check solution.

WARNING

The air system now contains pressurized air, which may cause severe eye or ear injury if it is inadvertently released. Wear appropriate eye and ear protection before adjusting the air system connections and fittings.

Tighten any fittings, if necessary, and repeat until all connections are airtight.

4. Confirm the proper operation of the braking system: depress and hold the motorhome brake pedal down. At the towed vehicle, the air cylinder shaft and pedal clamp will extend. Then release the brake pedal. The air cylinder shaft and pedal clamp will retract.

5. Confirm that the motorhome monitor is functioning: the LED will illuminate after the motorhome brake pedal is depressed, and stop when the brake pedal is released.

WARNING

If the LED does not turn on and off as described above, identify and correct the cause before using the supplemental braking system. Refer to the Troubleshooting section for possible causes.

The LED is the only indication of braking activity at the motorhome. Severe damage to the towed vehicle, a loss of vehicular control or other consequential, non-warranty damage can occur if the driver of the motorhome is unaware that the supplemental braking system is not functioning properly.

Failure to follow these instructions may cause property damage, personal injury or even death.

continued on next page

System test

continued from previous page

6. Confirm the proper operation of the break away system –

First, charge the break away air reservoir – with the motorhome engine on, the air compressor completely charged and the parking brake released, depress the brake pedal for 15 seconds – apply firm pressure.

WARNING

The break away air reservoir must be charged, as described above, every time the motorhome and towed vehicle are connected.

If the air reservoir is not charged, the break away system will not apply braking pressure if the towed vehicle separates from the motorhome, which may cause property damage, personal injury or even death.

Next, remove the break away pin at the front of the break away switch. The air cylinder and pedal clamp will extend, confirming the proper operation of the break away system.

To retract the air cylinder and pedal clamp, reconnect the break away pin.

Before towing, charge the break away air reservoir, as described above.

7. Confirm the proper operation of the towed vehicle's brake lights and turn signals –

A. Depress the motorhome brake pedal; confirm that the towed vehicle's brake lights illuminate. Activate both of the motorhome turn signals; confirm that the towed vehicle's turn signals activate.

B. With one of the motorhome turn signals activated, depress the motorhome brake pedal. Confirm that the towed vehicle's brake lights and turn signal both illuminate.

If the towed vehicle's brake lights and turn signals do not operate in tandem with the motorhome's, or if the towed vehicle's brake lights override the turn signal, you must install a non-intrusive lighting system or re-wire the towed vehicle.

WARNING

By law, a towed vehicle's turn signals and brake lights must operate in tandem with the motorhome's, as described above. If they do not, drivers behind the towed vehicle will not be alerted when the motorhome stops or turns, which may cause a collision.

If the towed vehicle's brake lights and turn signals do not operate in tandem with the motorhome's, either install a non-intrusive lighting system or re-wire the towed vehicle. Then test for proper operation.

Failure to follow these instructions may cause property damage, personal injury or even death.

TROUBLESHOOTING

Symptom

The motorhome monitor LED does not illuminate, even though the brakes in the towed vehicle are being applied.

Solution

1. The monitor LED will not illuminate during very light braking.
2. Make certain that the monitor patch cord is securely connected between the two vehicles.
3. The towed vehicle-to-motorhome electrical cord must also be connected – the monitor system uses it for the ground wire.
4. The monitor LED is connected to the towed vehicle's brake light circuit. If the fuse in the circuit is blown, the LED will not illuminate. Check the towed vehicle's brake lights – if they illuminate when the brake pedal is depressed, the fuse is good.
5. Did you install the optional Brake-Lite Relay? If so, make certain that the monitor wire is connected to the towed vehicle's brake light wire **after** the brake light switch, but **before** the Brake-Lite Relay – connecting the wire anywhere else will prevent the monitor LED from functioning.

Symptom

Nothing happens after proper installation.

Solution

1. The motorhome engine must be running, and the parking brake must be released. If the engine is off, there may be insufficient air pressure to activate BrakeMaster. If the parking brake is on, pressurized air is prevented from entering the BrakeMaster air lines.
2. Check the air line connections. Remove the weather covers from the quick couplers at both vehicles, and gently tug on the air line to verify that the quick couplers are connected.
Check to make certain that the air cylinder quick coupler is connected to the air line in the passenger compartment.
3. Follow the air lines from the motorhome back to the air cylinder in the towed vehicle. Inspect the entire line for deformities caused by excessive heat, and/or kinks in the line, which would restrict the air flow – replace the entire section of air line if any are found.
Disconnect the quick couplers to confirm that they are allowing air to flow through them.

Symptom

The BrakeMaster air cylinder will extend and depress the towed vehicle's brake pedal. However, it will not retract when the motorhome brake pedal is released.

Solution

1. One of the air lines may be damaged or kinked. Follow the air lines from the motorhome back to the air cylinder in the towed vehicle. Inspect the entire line for deformities caused by excessive heat, and/or kinks in the line, which would restrict the air flow – replace the

entire section of air line if any are found.

2. Make certain that the air cylinder has been installed directly in line with the brake pedal. If it is mounted at an angle to the brake pedal (to one side or the other), the air cylinder may jam in the extended position.

3. Dirt or debris can enter the air lines if the weather covers are not used over the quick couplers. It may accumulate at the quick exhaust valve on the air cylinder, preventing the valve from venting air out of the air cylinder. Disassemble the quick exhaust valve and make certain it is not jammed.

Symptom

The towed vehicle brakes abruptly the first time BrakeMaster is activated, 'flat-spotting' the tires. Also, after towing, there may be excessive brake dust on the wheels of the towed vehicle, and/or an unusual odor near the towed vehicle's brakes.

Solution

1. The stored vacuum in the towed vehicle's power brake system **must** be depleted before towing – pump the brake pedal several times. Depending on the make and model of the towed vehicle, it may be necessary to pump the brake pedal repeatedly.

Deplete the vacuum in the power brakes every time the towed vehicle's engine has been started – typically, when the vehicle is connected for towing.

The engines in some vehicles, such as the Saturn Vue, must be started periodically during towing. If the towed vehicle's engine must be started periodically, always deplete the vacuum in the vehicle's power brake system **before** you resume towing.

Refer to the caution statement on page 4.

2. If the towed vehicle has an 'active' (or, 'continuous power assist') braking system, order the optional Brake Pressure Reducer (part number 900002) to adapt the vehicle to the BrakeMaster system.

Vehicles with 'active' brake systems include several hybrid vehicles, such as some models of the Ford Escape hybrid and the Mercury Mariner hybrid, as well as the H3 Hummer. These vehicles, and others with 'active' braking systems, are designed so that even when the ignition is turned to the 'tow' position, the braking system is still active.

If the Brake Pressure Reducer is not installed, BrakeMaster will apply excessive force to the towed vehicle's brake pedal.

3. If the towed vehicle does not have power brakes, order the optional Brake Pressure Reducer (part number 900002) to adapt the vehicle to the BrakeMaster system.

BrakeMaster is designed to work with vehicles that have a power brake system (even though the power brakes are not activated while towing).

If the reducer is not installed, BrakeMaster will apply excessive force to the towed vehicle's brake pedal.