

by **R O A D M A S T E R**
BRAKEMASTERTM
U.S. Patent 5,915,798
9000
Series

PROPORTIONATE TOWED CAR BRAKING SYSTEM

Second Vehicle Kit

with BrakeAwayTM system – Part number 98160

Installation Instructions



Towing and Suspension Solutions
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WELCOME TO THE ROADMASTER FAMILY!

These instructions have been prepared to acquaint you with the installation of your BrakeMaster second vehicle kit, and to provide you with important safety information.

Read these instructions, as well as the owner's manual and all accompanying literature, completely (The most current version of the owner's manual is available at www.roadmasterinc.com under 'Tech Support'). Understand how to install and operate your BrakeMaster, and carefully follow the instructions and safety precautions.

Your BrakeMaster second vehicle kit has a one-year limited warranty. To qualify for your warranty, fill out and return the enclosed product registration card within 30 days of purchase.

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



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IMPORTANT NOTICE!

Safety Definitions

Statements in these instructions identified as follows are of special significance:



WARNING

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

Red type is used to emphasize warnings of particular significance.



CAUTION

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

Red type is used to emphasize cautions of particular significance.

CAUTION

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

Red type is used to emphasize cautions of particular significance.

NOTE

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

BEFORE YOU BEGIN THE INSTALLATION...



WARNING

These instructions pertain to the initial installation of the second vehicle components only. Operating instructions are contained in the owner's manual; installation instructions for the complete system are available at www.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.

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

1. ALWAYS CHECK THE ROADMASTER WEBSITE – www.roadmasterinc.com – for vehicle-specific information. Select 'Vehicle-Specific Info,' enter the vehicle make, model and year, then select 'Braking Systems' and scroll down the page.

2. If the battery must be disconnected for towing, a stop light switch must be installed. ROADMASTER manufactures stop light switch kits for a number of vehicles; to see if one is available for any specific vehicle, visit www.roadmasterinc.com and select 'Vehicle-Specific Info,' enter the vehicle make, model and year, then select 'Braking Systems' and scroll down the page.

Note: if a stop light switch kit is listed on the website for any particular vehicle, it is required.

Note: an Automatic Battery Disconnect (part number 765) is available for vehicles which must be towed with the battery disconnected. If you choose to install the Automatic Battery Disconnect, a stop light switch is still required; the Brake-Lite Relay is not required.

3. If the vehicle to be towed has an 'active' (or, 'continuous power assist') braking system, or if the vehicle is not equipped with power brakes – order the optional Brake Pressure Reducer (part number 900002) to adapt the vehicle to the BrakeMaster system.

Vehicles with 'active' braking systems include several hybrid vehicles, such as the Ford Escape hybrid and the Mercury Mariner hybrid, as well as the Hummer H3. These vehicles, and others with these systems, are designed so that even when the vehicle is set to 'tow' mode, the braking system is still active, thus requiring minimal pressure to engage the brakes.

ing system, or if the vehicle is not equipped with power brakes, install the optional Brake Pressure Reducer.

If the reducer is not installed, BrakeMaster will apply excessive force to the towed vehicle's brake pedal, causing severe tire and/or brake system damage, as well as other consequential damage.

4. If fuse(s) must be removed from the vehicle before it can be towed – verify that removing the fuse(s) will not disrupt power to BrakeMaster, or otherwise affect the installation or operation.

5. Optional seat adaptor brackets are required for some towed vehicles and simplify the installation for others. Determine if a seat adaptor bracket is required, or if one is available, for the towed vehicle – visit www.roadmasterinc.com. Select 'Vehicle-Specific Info,' enter the vehicle make, model and year, then select 'Braking Systems' and scroll down the page.

6. Check the towed vehicle's brake lights – BrakeMaster must function with the ignition key turned to the "tow" position; however, some vehicles' brake lights only operate with the key turned to the "on" position.

Check to see if this is the case: turn the ignition key to the "tow" position, apply the brakes, and check to see if the brake lights illuminate. If the brake lights do not illuminate, a two-prong stop light switch and 10-amp fuse must be installed.

ROADMASTER manufactures stop light switch kits for a number of vehicles; to see if one is available for any specific vehicle, visit www.roadmasterinc.com and select 'Vehicle-Specific Info,' enter the vehicle make, model and year, then select 'Braking Systems' and scroll down the page.

Note: check the owner's manual to see if the vehicle is equipped with an "automatic shut down" feature. If this is the case, ensure that the vehicle is not in automatic shut down mode before performing this test.

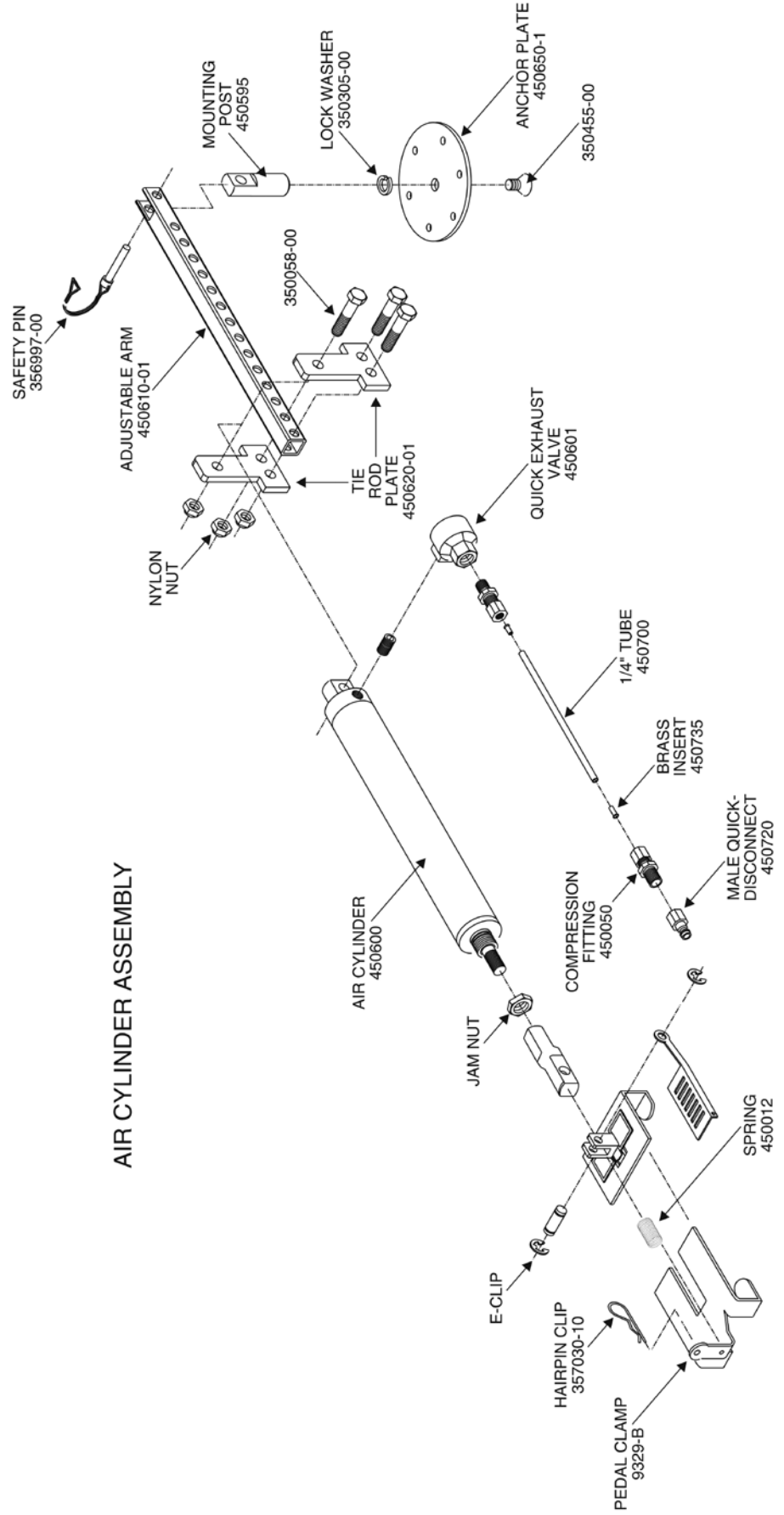
Note: if you must install a Brake-Lite Relay – see step 7, below – a stop light switch is not required.

7. An optional Brake-Lite Relay may be required. Refer to "Install the motorhome monitor wiring" for instructions on how to determine if the relay must be installed.

Note: a stop light switch (see steps 2 and 6 above) and a Brake-Lite Relay are mutually exclusive – if you use one, the other is not necessary.

CAUTION

If the vehicle to be towed has an 'active' brak-



AIR CYLINDER ASSEMBLY

INSTALL THE AIR CYLINDER ANCHOR PLATE

To determine where the anchor plate will be installed, first attach the pedal clamp to the brake pedal. Follow steps one through six below...

1. In the towed vehicle, slide the driver's seat back as far as it will go.
2. Verify that the pedal clamp is right side up, as shown in Figure 1 – the arrow on the sticker will point "Up" when the pedal clamp is properly positioned.
3. Pull the hairpin clip (Figure 1) out, then lift the slotted arm (Figure 1) up and out of the way.
4. Move the pedal clamp over the brake pedal. Then, hold the clevis (Figure 2) and pull back on the spring post (Figure 2), until the tabs under the pedal clamp are wide enough to clear the brake pedal.
5. Fit the pedal clamp onto the brake pedal, so that all four tabs are hooked around it (Figure 3). Then, release the spring post.

Note: on the initial installation, it may be necessary to adjust the tabs on the pedal clamp – use pliers to bend any or all of the tabs so that they hook around and under the towed vehicle's brake pedal.

Once the tabs have been adjusted to a specific brake pedal, no further adjustment to the pedal clamp is necessary for that vehicle.

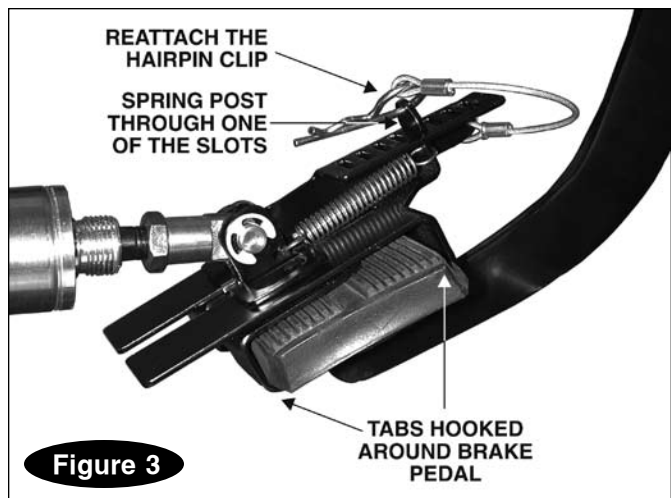
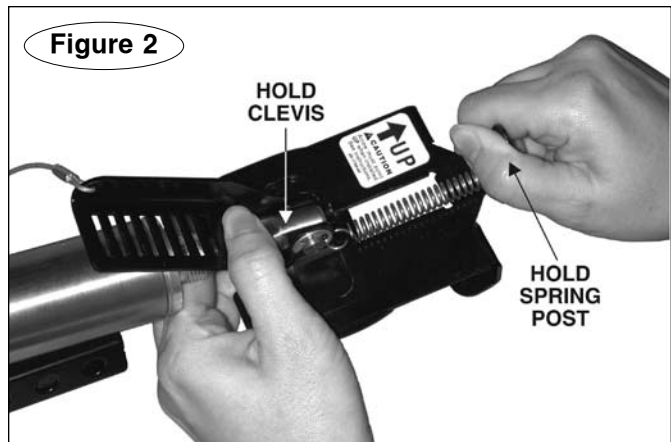
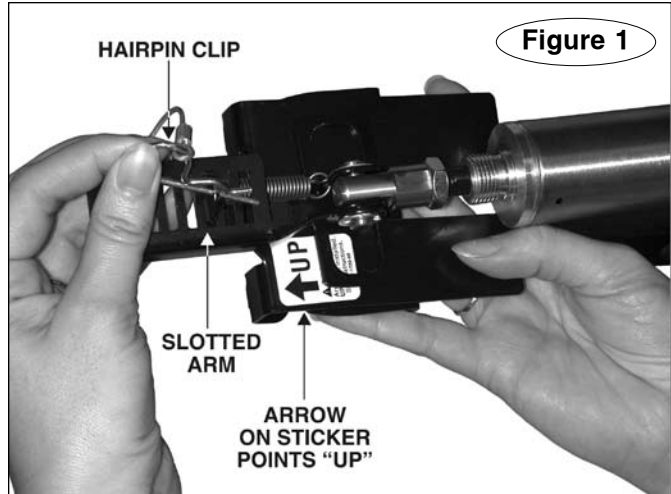
If BrakeMaster is switched between towed vehicles, always check the pedal clamp on the initial installation. Verify that all four tabs are hooked around and under the brake pedal. If necessary, bend the tabs to fit, as described above.

CAUTION

Make certain that all four tabs on the pedal clamp are securely hooked around the brake pedal (Figure 3). If the tabs are loose when the vehicle is towed, the pedal clamp can rotate out of position and hold the brake pedal down – even when BrakeMaster is not activated – which will cause tire and/or brake damage, or other consequential, non-warranty damage.

6. Swing the slotted arm back over the spring post, fit the spring post through one of the slots, and reattach the hairpin clip (Figure 3).
7. Now that the pedal clamp is in place, attach the anchor plate (Figure 4).

Note: optional seat adaptor brackets are required for some towed vehicles and simplify the installation for others. Before attaching the anchor plate, determine if a seat adaptor bracket is required – visit www.roadmasterinc.com. Select 'Vehicle-Specific Info,' enter the vehicle



make, model and year, then select 'Braking Systems' and scroll down the page.

Choose a mounting point under the driver's seat as far back as possible – ideally, the anchor plate should be concealed when the driver's seat is moved forward, and visible only when the driver's seat has been moved back as far as it will go.

BrakeMaster is shipped with the air cylinder at the
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INSTALL THE AIR CYLINDER ANCHOR PLATE

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shortest position. If necessary, lengthen the reach of the air cylinder to position the anchor plate at the point you have chosen – remove the two bolts and nylon nuts attaching the air cylinder to the adjustable arm (Figure 4). Slide the air cylinder (Figure 4) up the adjustable arm until the anchor plate is over the point you have chosen. Replace the two bolts and nylon nuts.

Note: if BrakeMaster is switched between towed vehicles, it may be necessary to lengthen or shorten the reach of the air cylinder, as described above. Two additional safety pins (part number 356997-00) are included, to replace the two bolts and nylon nuts – the pins will secure the air cylinder to the adjustable arm quickly, without having to thread and unthread the bolts.

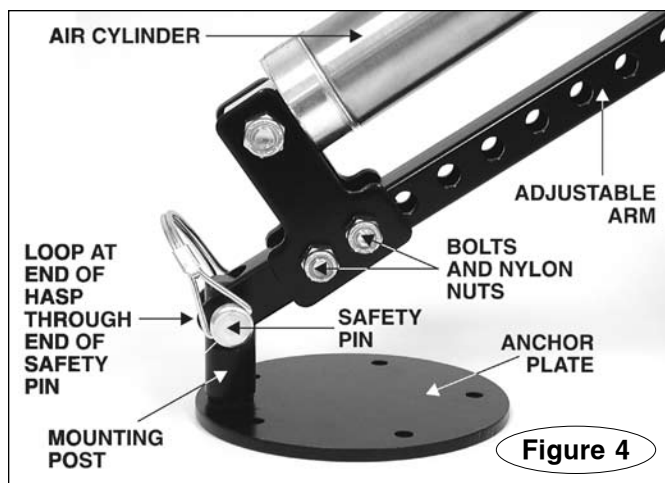
Note: if the vehicle is equipped with an automatic pedal positioning system, adjust the brake pedal to its farthest extension (as close as possible to the driver's seat) before positioning the air cylinder and the mounting post. This will eliminate the possibility of positioning the anchor plate too close to the brake pedal.

8. Next, if necessary, move the air cylinder to the left or the right, until the mounting post (Figure 4) is directly in line with the brake pedal.

CAUTION

The air cylinder must be mounted 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 when BrakeMaster is activated, which will cause severe brake system damage, as well as other consequential, non-warranty damage.

Note: the anchor plate can be rotated clockwise or counterclockwise, if necessary, to clear any obstructions – to rotate the anchor plate, remove the air cylinder and lock the plate in a vise. Use a half-inch open-end wrench to loosen the mounting post, while holding the



retaining screw (at the bottom of the plate) with an Allen wrench. Do not turn the retaining screw with the Allen wrench, as you may damage the wrench or the screw. When the mounting post is loose, rotate the anchor plate. Then, tighten the mounting post.

9. Before attaching the anchor plate, verify that the following conditions are met:

A. Make certain that the pedal clamp is not depressing the towed vehicle's brake pedal – examine the brake pedal, and also check the towed vehicle's brake lights to make certain they are not illuminated.

WARNING

Make certain that the pedal clamp is not depressing the towed vehicle's brake pedal.

If the pedal clamp is pushing the brake pedal down, the brakes will be applied continuously when BrakeMaster is connected, which will cause severe tire and/or brake system damage, as well as other consequential, non-warranty damage.

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

B. When it is connected, the air cylinder must be pulled back toward the anchor plate in order to insert the safety pin (Figure 4) through the mounting post.

CAUTION

The air cylinder must be pulled back when it is connected in order to create sufficient spring tension to keep the weight of the cylinder off the brake pedal. If the cylinder is not pulled back when it is connected, the weight of the cylinder may cause the pedal clamp to depress the towed vehicle's brakes continuously, which will cause excessive brake wear, brake system damage, or other consequential, non-warranty damage.

C. The pedal clamp must be flat against the brake pedal and properly secured with the hairpin clip (Figure 3).

D. Make certain that there is sufficient clearance between the mounting post and the bottom of the seat to allow the seat to slide properly.

10. Once the four conditions in step 9 (above) are met, attach the anchor plate. (It may be helpful to remove the driver's seat to facilitate the rest of the installation).

The anchor plate can be attached on top of the carpet, or underneath it.

A. To mount the plate on **top of the carpet**, first use

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INSTALL THE AIR CYLINDER ANCHOR PLATE

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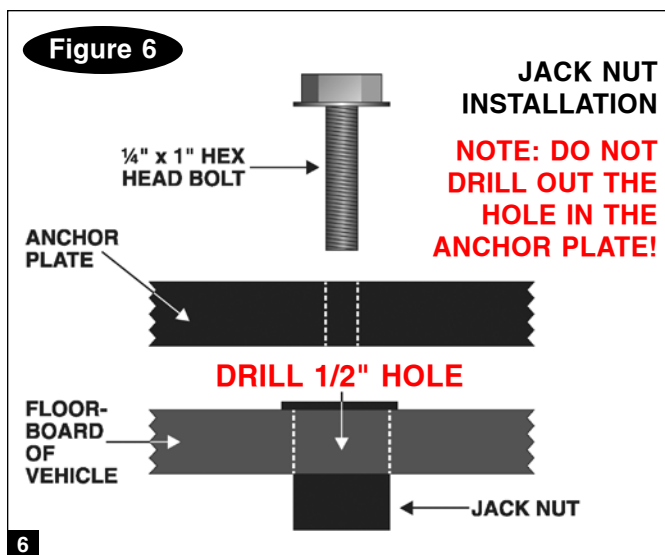
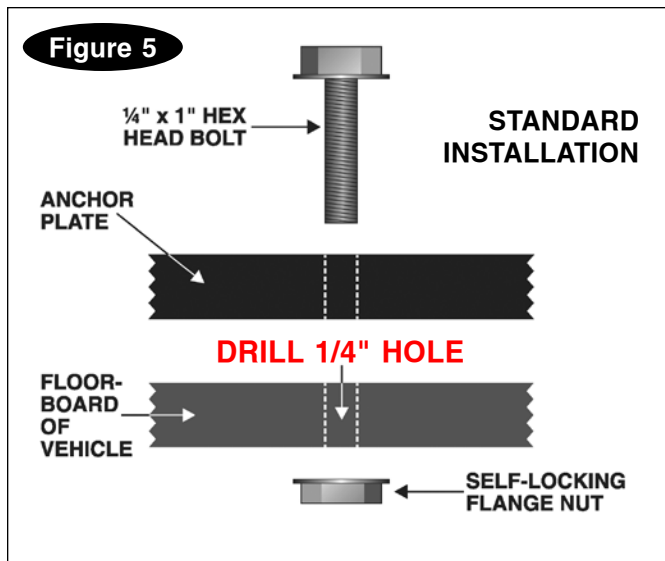
the anchor plate as a template and mark the five holes to be drilled.

Before drilling, make certain that the retaining screw (at the bottom of the mounting post) is fully tightened. (To tighten the screw, reverse the instructions in step 8, above.) Also, make certain that you will not drill through any wiring or electrical components underneath the carpeting, or damage any components on the other side of the floorboard.

WARNING

Do not drill through any wiring. The air bag sensor wire may be located under the driver's seat. Drilling into this wire may disable the air bag system, or may cause the air bags to deploy immediately, which may cause severe personal injury.

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



Next, drill five 1/4" holes at the points you marked. Drill through the carpet and the floorboard. Use caution to prevent the drill bit from catching on threads in the carpet and unraveling it.

B. If mounting the anchor plate **underneath the carpet**, cut a small flap in the carpet to allow the mounting post to protrude through it.

As described above, use the anchor plate as a template, and drill five 1/4" holes through the floorboard.

11. Next, attach the anchor plate as shown in Figure 5, using the provided 1/4" x 1" hex head bolts and self-locking flange nuts.

12. If you find that tightening the flange nut on a bolt is difficult due to a tube, channel or other obstruction under the floorboard, use one of the provided jack nuts to attach the bolt. Refer to Figure 6.

Note: if one or more jack nuts are used, the anchor plate cannot be mounted on top of the carpet.

To attach a bolt with a jack nut, drill a 1/2" hole through the floorboard at the point you marked in step 10.

Note: do not drill out the hole in the anchor plate.

Next, insert the jack nut into the hole (see Figure 6) and bolt through the anchor plate, using one of the 1/4" x 1" hex head bolts.

13. This completes the anchor plate installation. You can leave the air cylinder assembly in place – it must be attached to install an air line fitting in a later step – or you can remove it if it interferes with the installation.

WARNING

Automatic pedal positioning systems may affect the towed vehicle braking system.

Determine if the vehicle to be towed is equipped with pedal presets. Proper connection of the braking system may be affected by these presets; if the vehicle is so equipped, note the original install position and return to that position before towing the vehicle.

If the brake pedal is not at the original install position when the vehicle is towed, the pedal clamp may apply excessive braking force, which will damage the brake system and/or electrical system, and may cause brake or electrical system failure, as well as other non-warranty damage.

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

INSTALL THE BREAK AWAY SYSTEM

Step One

Install the air reservoir

1. First, choose a location for the air reservoir (Figure 7). The air reservoir is mounted in the towed vehicle, most often in the engine compartment, but it may be attached anywhere an air line can be routed from the top of the air reservoir to the front of the vehicle, and where the drain valve (Figure 7) at the bottom of the reservoir is easily accessible.

Choose a location that meets the following conditions:

- An air line will be attached to the reservoir in a later step. One end will be routed to the driver's side of the passenger compartment; the other end will be routed to the front of the vehicle. This air line cannot be closer than two feet to any heat source, such as the engine or exhaust system, which might damage the air line.
- The air reservoir must be mounted away from any moving parts, so that the air reservoir will not be damaged by, or interfere with, the proper operation of any components.
- Choose a location that will allow the bottom of the air reservoir to be mounted lower than the top, so that any accumulated water can be drained from the tank. The reservoir cylinder does not have to be perfectly straight up and down, but the drain valve must be the lowest part of the reservoir.
- The reservoir will be attached with two of the supplied $\frac{1}{4}$ " x 1" hex bolts and nuts. Choose a location that will allow you sufficient access to tighten the hex nuts from the other side.

Note: because the air reservoir will be charged with compressed air, it cannot be mounted inside the passenger compartment of the vehicle.

2. Once you have chosen a location for the air reservoir, fold the two rubber clamps (Figure 7) over the

cylinder. Press the ends of each clamp together, until the pre-drilled holes align.

Test-fit the reservoir and slide the clamps up or down the cylinder, if necessary, until the pre-drilled holes are both over a surface where the hex bolts and nuts will hold each clamp in place. Mark the center of each hole for drilling, and set the reservoir aside.

Before drilling, make certain you will not damage any components on the other side. Then, drill a $\frac{1}{4}$ " hole through the two points you have marked.

Before attaching the clamps, rotate the top of the reservoir so that the two wires at the solenoid valve (Figure 10), as well as the two brass air compression fittings (Figure 10), will be easily accessible.

Position the reservoir and clamps over the two holes, and secure the reservoir in place with one of the $\frac{1}{4}$ " x 1" hex bolts and nuts at each clamp.

Step Two

Mount the break away switch

1. Mount the break away switch (Figure 7) at the front of the vehicle, on the driver's side. Choose an area you can easily reach, with a surface of sufficient strength to hold the switch firmly in place, so that the break away pin (Figure 7) will pull freely from the switch. Mount the switch in a horizontal position, with the break away pin facing toward the motorhome.

Ensure that the break away pin can be pulled freely away from the towed vehicle without any obstructions.

WARNING

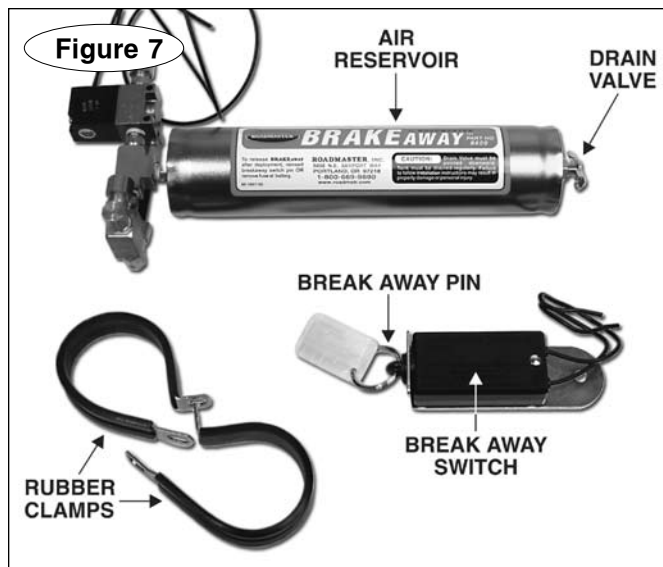
Do not attach the break away switch to the tow bar or the tow bar bracket. If the tow bar or bracket fails, the break away switch will separate with it, preventing the break away system from activating. If the towed vehicle separates, the brakes will not be applied, which may cause property damage, personal injury or even death.

Step Three

Connect the wiring

1. Using one of the blue butt connectors, attach one end of the supplied length of 14-gauge black wire to the end of either one of the two wires extending from the break away switch. (If necessary, strip $\frac{1}{4}$ " to $\frac{3}{8}$ ")

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INSTALL THE BREAK AWAY SYSTEM

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of insulation from the end of the wires before connecting them).

Next, route the wire to the positive terminal on the towed vehicle's battery (Figure 8), avoiding moving parts, sharp edges or "hot" components such as the engine or exhaust system. Where appropriate, use one or more of the included wire ties to secure the wire in place.

2. Cut the wire and strip $\frac{1}{4}$ " to $\frac{3}{8}$ " of insulation from the end of the wire. Crimp either end of the supplied yellow 10-amp fuse onto the end of the wire. Strip $\frac{1}{4}$ " to $\frac{3}{8}$ " of insulation from one end of the remaining length of wire; crimp the other end of the fuse onto the wire.

3. If necessary, cut the wire again, leaving no more than six inches, and strip ¼" to 3/8" of insulation from the end of the wire. Crimp the larger (3/8") ring terminal onto the end of the wire, and attach the ring terminal to the positive terminal on the towed vehicle's battery.

CAUTION

In order to prevent damage from a short circuit, the 10-amp fuse must be within six inches of the positive terminal. If the 10-amp fuse is farther than six inches, a short circuit may cause significant damage to the towed vehicle's electrical system, an electrical fire, or other consequential, non-warranty damage.

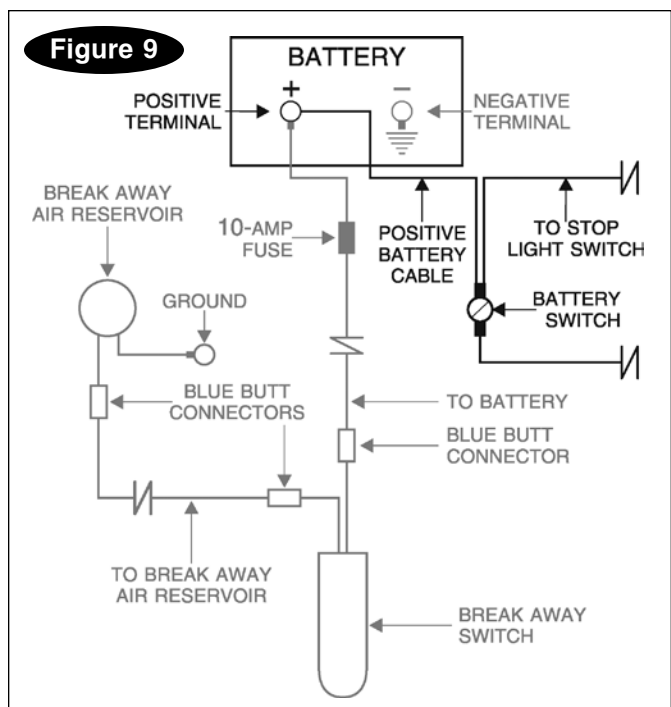
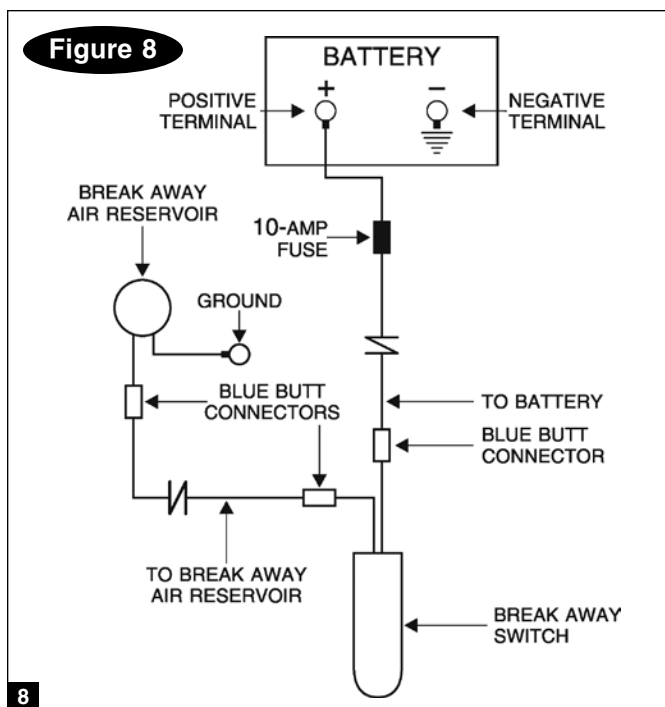
4. Now, connect the remaining wire at the break away switch to either one of the two wires extending from the top of the solenoid valve on the air reservoir (Figures

4. Now, connect the remaining wire at the break away switch to either one of the two wires extending from the top of the solenoid valve on the air reservoir (Figures 8 and 10). If necessary, use the remaining length of 14-gauge black wire to reach the top of the solenoid valve. As before, strip the ends of the wires before connecting them with the supplied blue butt connectors.

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

5. Crimp the smaller (#10) ring terminal onto the end of the remaining wire extending from the top of the solenoid valve, and attach the ring terminal to any good chassis ground. (If necessary, use another butt connector, and any remaining 14-gauge black wire, to extend the length of the ground wire).

6. If the battery must be disconnected for towing, install a battery switch to the positive battery cable, as shown in Figure 9. Connect the stop light switch wiring to the battery switch.



INSTALL THE AIR LINES

1. Find a suitable location at the front of the towed vehicle to attach the preassembled male quick coupler (Figure 10). Choose an area within easy reach, with a surface of sufficient strength to hold the mounting bracket firmly in place.



WARNING

Do not attach the female quick coupler at the front of the towed vehicle. The female quick coupler has an internal check valve to prevent air from escaping. If air pressure is not released, the Brake-Master pedal clamp will not retract when the system is activated, which will cause severe brake system damage, or a brake fire, as well as other consequential, non-warranty damage.

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

2. Attach the bracket with two of the supplied $\frac{1}{4}$ " nuts and bolts, with the male quick coupler pointing away from the towed vehicle.

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.

3. Connect one end of the air line to the male quick coupler compression fitting (Figure 10) – 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 10) 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 10) into the end of the line.

Note: if the brass inserts are omitted, the fittings 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 instal-

lation, check all the fittings for air leaks – see "Test the system."

4. Tape the open end of the air line. Then, route the air line from the male quick coupler to the break away air reservoir, avoiding 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. Where appropriate, use wire ties to secure the air line in place.

CAUTION

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.

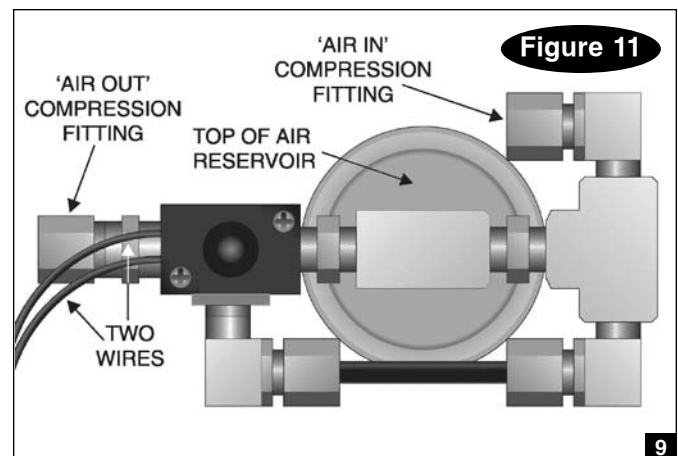
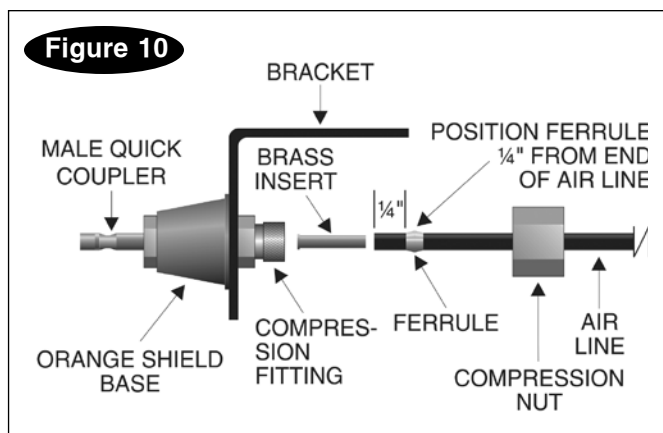
If the air pressure is reduced, the supplemental braking system will not function, or may only function intermittently.

5. At the top of the break away air reservoir (Figure 11), cut the air line to length and attach the open end to the brass "air in" compression fitting (Figure 11). Use the same method described in step 3 (above) to attach the air line.

6. Next, attach the end of another section of air line to the brass "air out" compression fitting on the top of the break away air reservoir (Figure 11). Use the same method described in step 3 (above) to attach the air line.

7. Tape the open end of the air line. Then, route the air line from the break away air reservoir through the engine compartment and to the driver's side of the fire-wall. As before, avoid moving parts, sharp edges or "hot" components such as the engine or the exhaust

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INSTALL THE AIR LINES

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

Where appropriate, use wire ties to secure the air line in place.

8. Next, look for a pre-existing hole in the firewall (or, if there is sufficient space, a pre-existing wiring grommet) on the driver's side, to route the air line through the firewall.

If there is no pre-existing hole or grommet with sufficient space, drill a $\frac{1}{2}$ " hole through the firewall.

Drill from the engine compartment or from the interior of the vehicle, whichever is more convenient. Before drilling, make certain you will not damage any components on the other side of the firewall.

9. Fit the included firewall grommet into the $\frac{1}{2}$ " hole, and push the end of the air line through.

10. The air line will be connected to the preassembled female quick coupler (Figure 12) –

Find a likely mounting point for the bracket on the driver's side – choose an area within easy reach, with a surface of sufficient strength to hold the mounting bracket firmly in place.

The bracket and quick coupler must not present an obstacle or hazard to the driver of the vehicle, or otherwise interfere with the operation of the vehicle.

Two common mounting points are: 1) under the dashboard, on the kick panel; or 2) far enough under the front of the driver's seat so that the quick coupler is accessible when the seat is slid back, but concealed when the seat is slid forward.

Or, depending on the interior design of the vehicle, there may be a more suitable mounting point.

Before attaching the bracket, first connect the BrakeMaster air cylinder assembly. Make certain that the male quick coupler at the end of the air line will reach the point you have chosen to attach the female quick coupler, without kinking either of the air lines.

Note: the quick exhaust valve on the air cylinder (see page 3) may be rotated, if this provides an easier

connection.

Before attaching the coupler, make certain you will not damage any components on the other side.

If you have chosen to attach the bracket under the driver's seat, make certain that the female quick coupler and bracket will not interfere with the normal movement of the driver's seat, or affect any adjustments to the driver's seat.

- If you have chosen to attach the bracket to the kick panel, attach it with two of the supplied $\frac{1}{4}$ " nuts and bolts, with the female quick coupler pointing toward the rear of the towed vehicle.

- If you have chosen to attach the bracket under the driver's seat, route the air line from the firewall to the front edge of the driver's seat. Remove the rocker panel or side trim (or, detach the carpeting) and conceal the air line underneath it.

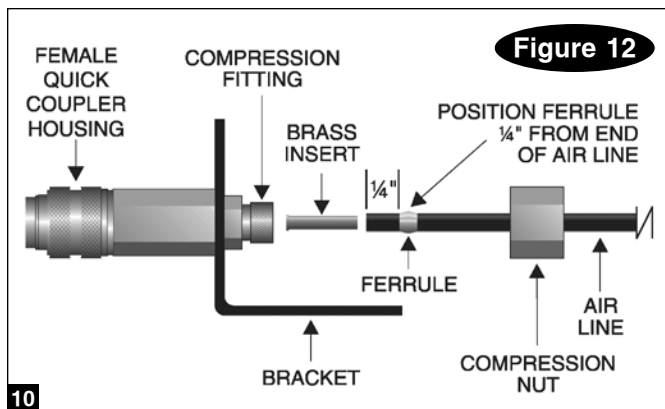
Move the driver's seat back as far as it will go.

Attach the bracket with two of the supplied $\frac{1}{4}$ " nuts and bolts, with the female quick coupler pointing toward the front of the vehicle.

11. Cut the air line to length and attach it to the compression fitting on the female quick coupler. Use the same method described in step 3 (above) to attach the air line.

12. Seal the firewall grommet with a silicone sealant. Reattach the rocker panel (or side trim or carpeting), if it was removed.

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.



INSTALL THE MOTORHOME MONITOR WIRING

1. Choose a mounting point at the front of the vehicle near the male quick coupler you attached in step 2, “Install the air lines,” for the end of the supplied length of black wire with a female bullet connector at one end. 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.

2. Once the female bullet connector is attached, route the monitor wiring harness through the engine compartment, to the driver’s side of the firewall. Use the same route as the air line, if that is convenient. As before, avoid lines, hoses, moving parts or “hot” components such as the engine or exhaust systems. Where appropriate, use wire ties to secure the wiring harness in place.

3. Route the monitor wiring harness through the same hole as the air line.

4. Before connecting the monitor wiring harness to the brake light wire, determine if the optional Brake-Lite Relay must be installed – refer to “Brake light solutions,” in this manual, for information on how to identify the type of brake and turn signals in the vehicle. Then, test the towed vehicle’s brake lights, as described in “Brake light solutions.”

Several wiring alternatives are available to you, based on the type of brake and turn signals in the vehicle and the results of the test.

CAUTION

Do not install the Brake-Lite Relay in any Ford vehicle with a ‘neutral tow’ kit. Using the Brake-Lite Relay in these vehicles may prevent disengagement of the transmission for towing, causing severe non-warranty transmission damage.

Refer to “Ford ‘neutral tow’ vehicles,” in this manual.

5. Next, locate the towed vehicle’s brake light switch and, with a test light, find the “cold” side of the brake light switch. (The “cold” side of the switch does not register voltage unless the brakes are applied). With a 12-volt meter, verify that you have found 12 VDC+.

Then, remove the vehicle’s brake light fuse, located in the vehicle’s fuse panel.

CAUTION

Failure to remove the brake light fuse from the vehicle’s fuse panel may cause the vehicle’s theft deterrent system, or other electrical system indicators, to be activated if the brake pedal is depressed during the installation. This may require non-warranty repair to the vehicle.

6. Cut the brake light wire, a few inches downstream from the “cold” side of the brake light switch.

If the Brake-Lite Relay is required...

(see step 4, above)

Install the Brake-Lite Relay now – installation instructions are included in the kit. After the relay is installed, proceed to the next section – “Test the system.”

If the Brake-Lite Relay is not required...

(see step 4, above)

7. If necessary, trim the monitor wiring harness, then attach the monitor wire to the brake light wire, using the supplied yellow butt connector.

8. Ensure that the monitor wiring harness will not present an obstacle or hazard to the driver of the vehicle, or interfere with the operation of the vehicle. Use one or more wire ties, if necessary, to secure the wiring harness out of the way.

9. Reinstall the brake light fuse, which you removed in step 5.

10. The installation is complete. Before towing, proceed to the next section – “Test the system.”

TEST THE SYSTEM

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

Note: refer to the complete installation instructions to identify the motorhome components you will connect. The most current version of the instructions is available at www.roadmasterinc.com.

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.

A. All components of the braking system must be properly connected –

- Connect and attach the tow bar to both vehicles, and shift the towed vehicle's transmission into the proper gear for towing (according to the manufacturers' instructions).

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 between the two vehicles – both the air line quick couplers and the motorhome monitor bullet connectors.

- 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 (Figure 7); clip the other end of the cable to the rear of the motorhome, close to the center.

B. For motorhomes with hydraulic brakes (Brake-

Master 9060): Turn the motorhome engine on, and leave it running. Turn the towed vehicle's ignition key to the "tow" position.

For motorhomes with air or air over hydraulic brakes (BrakeMaster 9100 and 9160): Block the motorhome wheels, then release the parking brake. Turn the motorhome engine on, and leave it running.

2. Check for leaks in the towed vehicle's air line: allow the air compressor to run until it shuts off. Then, apply the motorhome brakes and continue to hold the brake pedal down.

Cover each joint, fitting and connection in the towed vehicle's air line with a leak check solution.

CAUTION

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.

3. 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.

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

WARNING

If the LED does not illuminate, as described above, identify and correct the cause of the malfunction 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.

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

Charge the break away air reservoir – start the mo-

continued on next page

TEST THE SYSTEM

continued from preceding page

torhome and allow the air compressor to run until it shuts off. Then, apply the motorhome brakes and hold the brake pedal down.



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 breaking 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 (Figure 7) 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, briefly disconnect the quick couplers from the air line extending from the air cylinder. Then, reconnect the break away pin.

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

6. 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 motorhome turn signals; confirm that the towed vehicle's turn signals activate.

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

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 override the turn signal, you must install a non-intrusive lighting system or re-wire the towed vehicle. See "Brake light solutions."



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 an accident.

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

wire the towed vehicle according to the next section, "Brake light solutions." Then test for proper operation, as described in step 6, above.

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

BRAKE LIGHT SOLUTIONS

A supplemental braking system will affect the operation of the vehicle's tow lighting system. Use the information below to determine if optional accessories must be installed in a vehicle which has been wired for towing – or, if no lighting system has been installed, which systems are appropriate.

1. First, identify the type of brake and turn signals in the vehicle. There are two types – combined or separate. In a **combined** system (Figure 13), the brake light does the flashing for the turn signal; in a **separate** system (Figure 13), there are amber or red turn signal lights which are separate from the brake lights.

2. Next, test to see if the towed vehicle's brake lights will illuminate with the engine off – turn the ignition key to the "tow" position, press the brake pedal, and check the brake lights.

3. Based on whether or not the brake lights illuminate, and the type of brake and turn signals, there are three possibilities:

- 1) the brake lights illuminate and the towed vehicle has combined lighting;
- 2) the brake lights illuminate and the towed vehicle has separate lighting; or
- 3) the brake lights do not illuminate.

Choose from the appropriate list below to install either an optional accessory or another lighting system.

(If you choose to install a Brake-Lite Relay, a taillight wiring kit or magnetic lights, the installation instructions are included with the kits. If you choose to install a system of diodes and rewire the vehicle's turn signals, taillights and brake lights for towing, wiring diagrams are available online, at www.roadmasterinc.com.)

1. If the brake lights illuminate and the towed vehicle has combined lighting...

...one of the three alternatives below is required.

A. A system of diodes (the vehicle's turn signals, tail-

lights and brake lights have been rewired for towing) **with** an optional Brake-Lite Relay.

(This method cannot be used in Ford vehicles with 'neutral tow' kits. See "Ford 'neutral tow' vehicles," in this manual, for wiring instructions.)

B. Install a "bulb and socket set" (also called a "taillight wiring kit," part number 155).

C. Install a magnetic tow light system (part number 2100 or 2120).

2. If the brake lights illuminate and the towed vehicle has separate lighting...

...one of the four alternatives below is required.

A. A system of diodes (the vehicle's turn signals, taillights and brake lights have been rewired for towing) **with** an optional Brake-Lite Relay.

(This method cannot be used in Ford vehicles with 'neutral tow' kits. See "Ford 'neutral tow' vehicles," in this manual, for wiring instructions.)

B. A system of diodes **with the diodes jumped**. This method is also used to wire Ford vehicles with 'neutral tow' kits. See Figure 15.

C. Install a "bulb and socket set" (also called a "taillight wiring kit," part number 155).

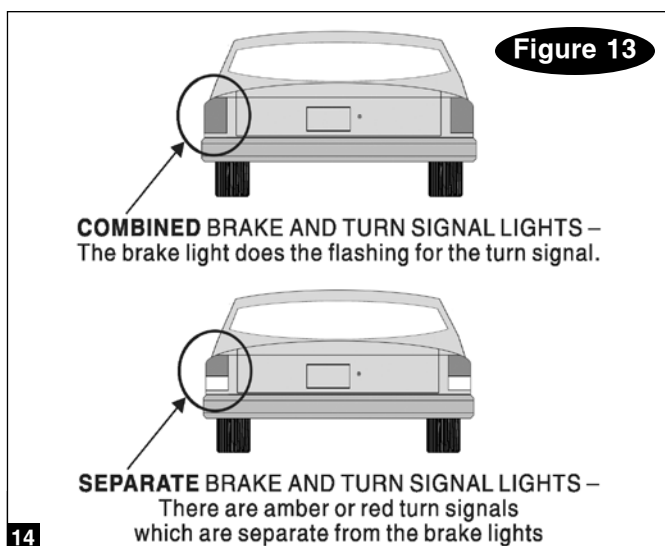
D. Install a magnetic tow light system (part number 2100 or 2120).

3. If the brake lights do not illuminate...

...an optional stop light switch **must** be installed. ROADMASTER manufactures stop light switch kits for a number of vehicles; visit www.roadmasterinc.com for the most current list of available kits.

Any one of the following tow lighting systems must also be installed with the stop light switch:

- a system of diodes (the vehicle's turn signals, taillights and brake lights have been rewired for towing)
- a "bulb and socket set" (also called a "taillight wiring kit," part number 155)
- a magnetic tow light system (part number 2100 or 2120)



FORD 'NEUTRAL TOW' VEHICLES

Some Ford vehicles, such as the Explorer, are equipped with a 'neutral tow' kit. Use the instructions below to wire these vehicles for supplemental braking, and for towing.

To wire the vehicle for supplemental braking...

CAUTION

If BrakeMaster is to be installed in any Ford vehicle with a 'neutral tow' kit, do not install a Brake-Lite Relay. Using a Brake-Lite Relay in these vehicles may prevent disengagement of the transmission for towing, causing severe damage to the transmission.

Install a diode, rather than a Brake-Lite Relay, according to the instructions below.

1. Locate the towed vehicle's brake light switch and, with a test light, find the "cold" side of the brake light switch. (The "cold" side of the switch does not register voltage unless the brakes are applied.) With a 12-volt meter, verify that you have found 12 VDC+.

Then, remove the brake light fuse, located in the vehicle's fuse panel.

CAUTION

Failure to remove the brake light fuse from the vehicle's fuse panel may activate the vehicle's theft deterrent system, or other electrical system indicators, if the brake pedal is pressed during the installation. This may require non-warranty repair to the vehicle.

2. Next, cut the brake light wire, a few inches downstream from the "cold" side of the brake light switch.

3. Install the diode in line, as shown in Figure 14.

Mount the diode under the dashboard, a few inches away from the brake light switch.

4. Reinstall the brake light fuse, which you removed in step 1.

5. Test to verify that the diode has been properly installed – the towed vehicle's brake lights will illuminate when the brake pedal is pressed.

To wire the vehicle for towing...

There are three methods available which will allow a towed vehicle's turn signals, brake lights and running lights to work in conjunction with the motorhome's: 1) install a taillight wiring kit (also called a 'bulb and socket kit,' part number 155); 2) install magnetic tow lights (part number 2100 or 2120); or 3) wire the vehicle's turn signals, taillights and brake lights for towing.

Instructions for the third method are below; instructions for the first two methods are included with the kits.

1. After you have installed a diode downstream from the brake light switch (Figure 14), wire the vehicle's turn signals, taillights and brake lights for towing by installing six diodes.

Before installing the diodes, verify that the towed vehicle has *separate* brake and turn signals – on each side, there are amber or red turn signal lights which are *separate* from the brake lights (Figure 13).

Note: if the motorhome has combined brake and turn signals, use Figure 15 to wire the towed vehicle. If the motorhome has separate brake and turn signals, visit www.roadmasterinc.com. Use the 'Separate towed vehicle to 'separate' motorhome' wiring diagram, under 'Tech Support.'

Note: if a 3-to-2 converter has been installed in a motorhome with separate brake and turn signals, wire the towed vehicle according to Figure 15.

To test for a 3-to-2 converter, use a test light to find the turn signal and brake light circuits on the motorhome electrical socket. If the same circuit energizes both the turn signals and the brake lights, a 3-to-2 converter has been installed. If the turn signal and brake lights

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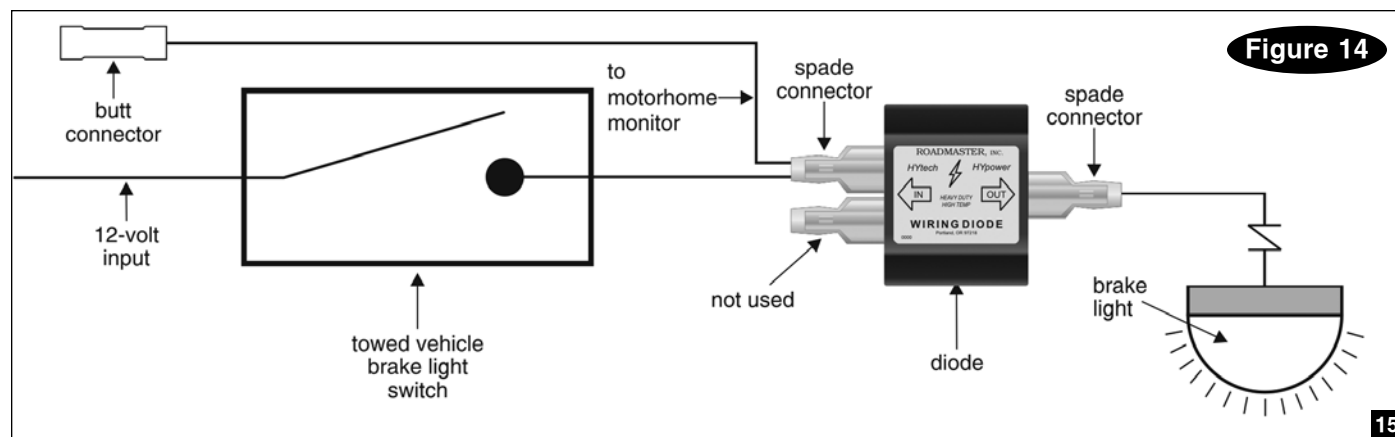


Figure 14

FORD 'NEUTRAL TOW' VEHICLES

continued from preceding page

have separate circuits, a 3-to-2 converter has not been installed.

2. First, cut the factory turn signal, taillight and brake light wires, as close to the lights as possible.

3. Next, install the six diodes in line, as close to the lights as possible, as shown in Figure 15.

CAUTION

Attach the diodes as close to the vehicle's lights as possible, to avoid interaction with other circuits which may be tied into the center brake light, the running lights, the turn signals or the brake light wires. Attaching the diodes farther away may cause the towed vehicle's lights to work improperly, and may also cause damage to other electrical components in the vehicle.

4. On each side, jump the brake and turn signal diodes, as shown in Figure 15.

CAUTION

Unless the brake and turn signal diodes are jumped, the towed vehicle's brake light circuits will 'override' the motorhome's turn signals – the towed vehicle's turn signals will not operate in conjunction with the motorhome's turn signals, as required by law.

5. Test to verify that the diodes have been properly installed...

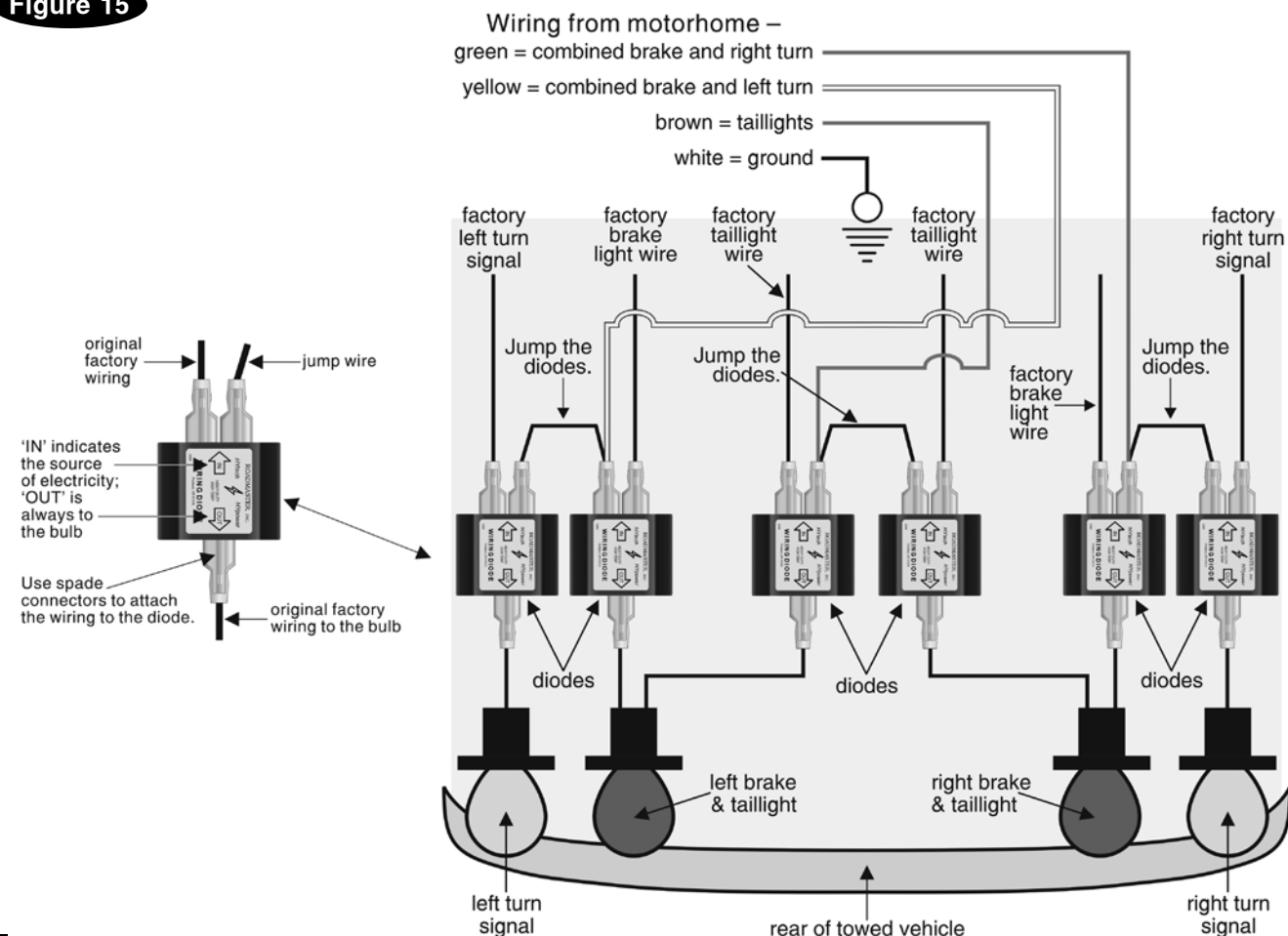
A. If the motorhome has a 'combined' lighting system...

1. The towed vehicle's turn signals and brake lights will both flash (per side) when the motorhome's turn signal is on; and

2. When the motorhome's turn signal and brake signal are both on (per side), the towed vehicle's brake lights will stay illuminated, while the turn signal flashes.

B. If the motorhome has a 'separate' lighting system, the towed vehicle's turn signals and brake lights will illuminate identically to the motorhome's.

Figure 15



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 – if the engine is off, there may be insufficient pressure to activate BrakeMaster.
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. For motorhomes with hydraulic brakes (BrakeMaster 9060) –

A. Check the wiring at the solenoid valve (on the proportioning valve). One of the black wires must be connected to a good chassis ground (Figure 16). The other black wire must be connected to the motorhome brake wire downstream from the brake light switch. Use a test light to confirm that the solenoid valve is receiving power when the motorhome brake pedal is depressed.

If the connections are good, test for proper function – with the motorhome engine running, have an assistant depress the motorhome brake pedal while you listen for a “click” at the solenoid valve. The solenoid valve should “click” every time the brake pedal is depressed.

B. Disconnect the air line from the “out” compression fitting on the solenoid valve (Figure 16). Have an assistant depress the motorhome brake pedal – the proportioning valve should release air each time the pedal is depressed.

Figure 16

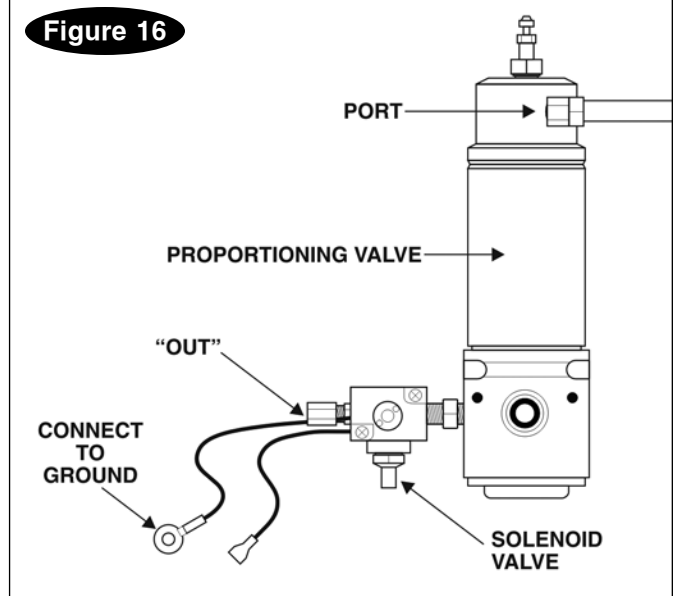
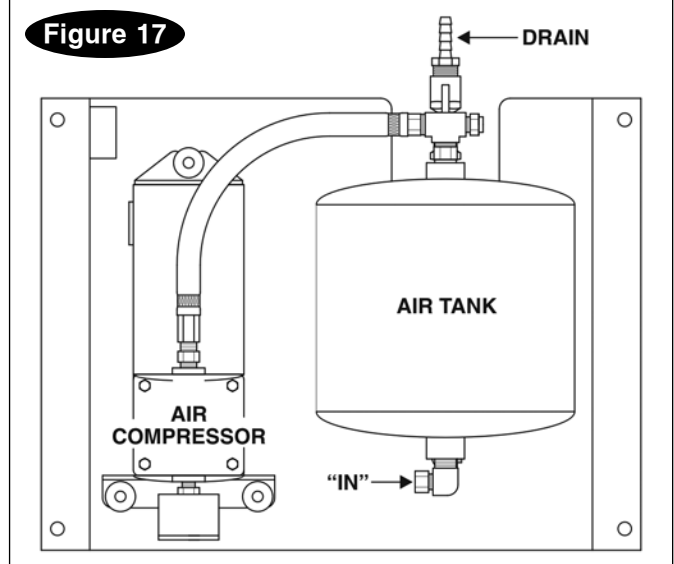


Figure 17



- If there is air at the proportioning valve – follow the air line 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.

- If there is no air at the proportioning valve – check to confirm that the air line between the air compressor and the proportioning valve is connected to the correct fitting. It should run from the “in” fitting on the air compressor (Figure 17) to the “in” fitting on the proportioning valve (Figure 18).

continued on next page

TROUBLESHOOTING

continued from preceding page

If the air line is connected to the “out” fitting on the proportioning valve, no air can pass through the valve, and the BrakeMaster system will not function.

If this is the case, reconnect the line from the air compressor to the “in” fitting on the proportioning valve.

Symptom

The compressor (for motorhomes with hydraulic brakes – BrakeMaster 9060) runs constantly, or runs much more frequently than I think it should.

Solution

1. Check for leaks in the air system.
2. Make certain that the drain valve on the air compressor air tank is closed. Refer to Figure 19.
3. Make certain that the drain valve on the BreakAway air reservoir is closed. Refer to Figure 7.
4. Make certain that a female quick coupler has been installed at the rear of the motorhome – a male quick coupler does not have a check valve to prevent air from escaping.

Symptom

It seems to require a significant amount of brake pressure in the motorhome before the BrakeMaster air cylinder activates in the towed vehicle.

Solution

1. The motorhome engine must be running – if the engine is off, there may be insufficient pressure to activate BrakeMaster.
2. Inspect the air lines 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.

3. Check for leaks in the air system: after starting the motorhome, allow the air system to fully charge. Depress and hold the motorhome brake pedal down.

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

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

4. For motorhomes with hydraulic brakes (BrakeMaster 9060) – If the towing vehicle is a Ford Class C motorhome, the proportioning valve must be teed into the front hydraulic brake line – the rear brake line does not supply sufficient hydraulic pressure.

5. For motorhomes with hydraulic brakes (BrakeMaster 9060) – Not all of the air was bled from the brakes after installing the proportioning valve. Re-bleed the proportioning valve, as well as all brakes (and any components connected to the braking system) downstream from the brake tee. Refer to the complete BrakeMaster installation instructions (at www.roadmasterinc.com) for instructions on bleeding the valve and the brakes.

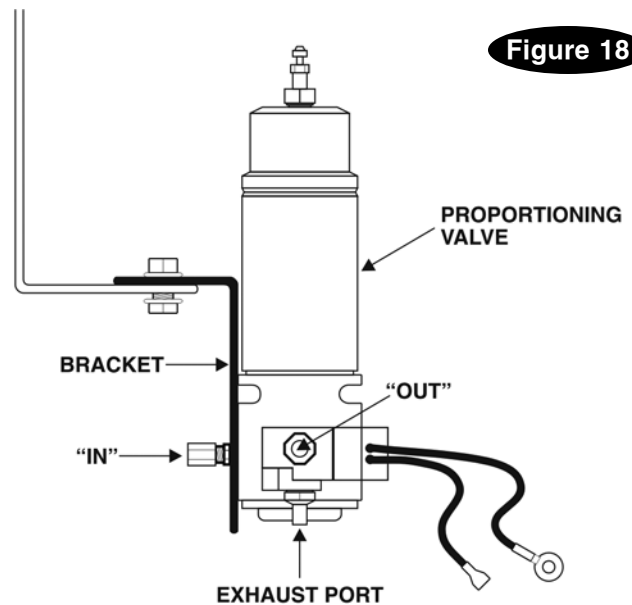


Figure 18

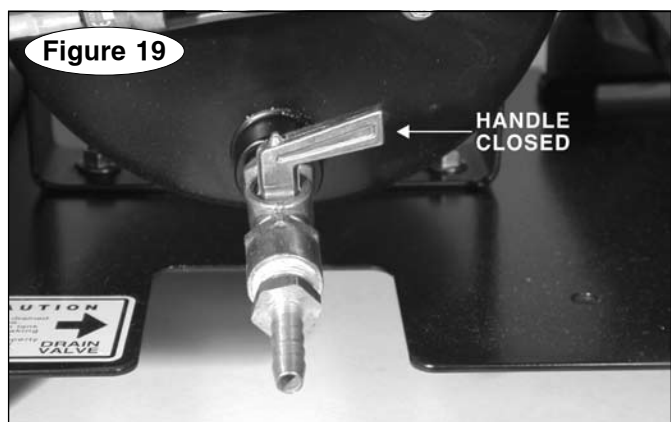


Figure 19

Symptom

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

Solution

1. 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.

2. 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 (see page three) 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.

3. If a system of diodes was used to wire the towed vehicle's lights for towing, make certain that a diode is installed at every point where the motorhome brake light wire connects to the towed vehicle's brake light wire (refer to Figure 15).

When the air cylinder shaft extends and the pedal

continued on next page

TROUBLESHOOTING

continued from preceding page

clamp depresses the towed vehicle's brake pedal, it energizes the towed vehicle's brake light wire. If diodes are not installed in the circuit, current will travel back to the motorhome and activate the BrakeMaster solenoid.

As long as the solenoid is activated, it will not allow air to vent from the air cylinder – the air cylinder shaft will remain extended.

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 12.

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 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.

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A 'Wow!' difference in RV control...

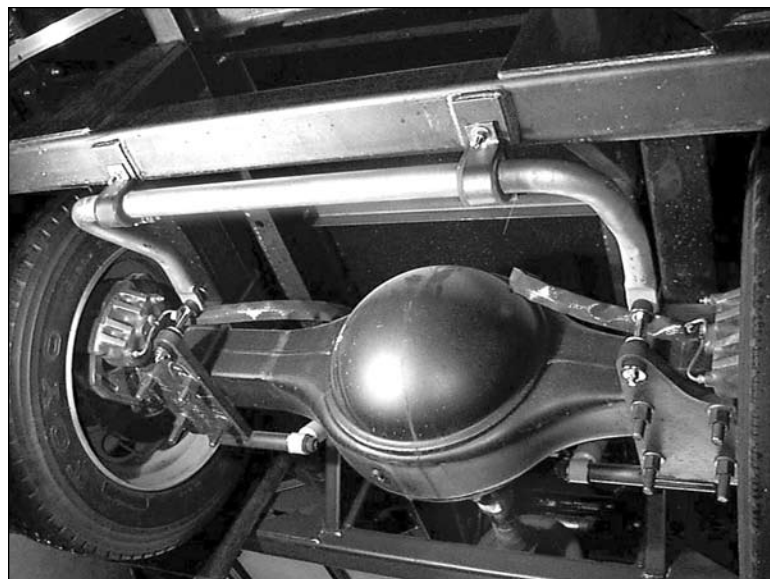
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RSS



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A CADMIUM-PLATED RSS ANTI-SWAY BAR bolted in place. Most installations take about the same amount of time as shock absorbers.

When tracking is an issue...

Davis Tru Trac™ bars, manufactured by Roadmaster Suspension Solutions, are designed to eliminate "wander" and reduce "rut tracking" by controlling excessive axle side play. The result is crisper handling, and more positive control.

Davis Tru Trac bars are available for Ford F53 chassis (V8 and V10), and all Workhorse motorhome chassis (W16, W18, W20, W22 and W24), Freightliner front engine diesel chassis (FRED), as well as Kodiak 45/5500 chassis.



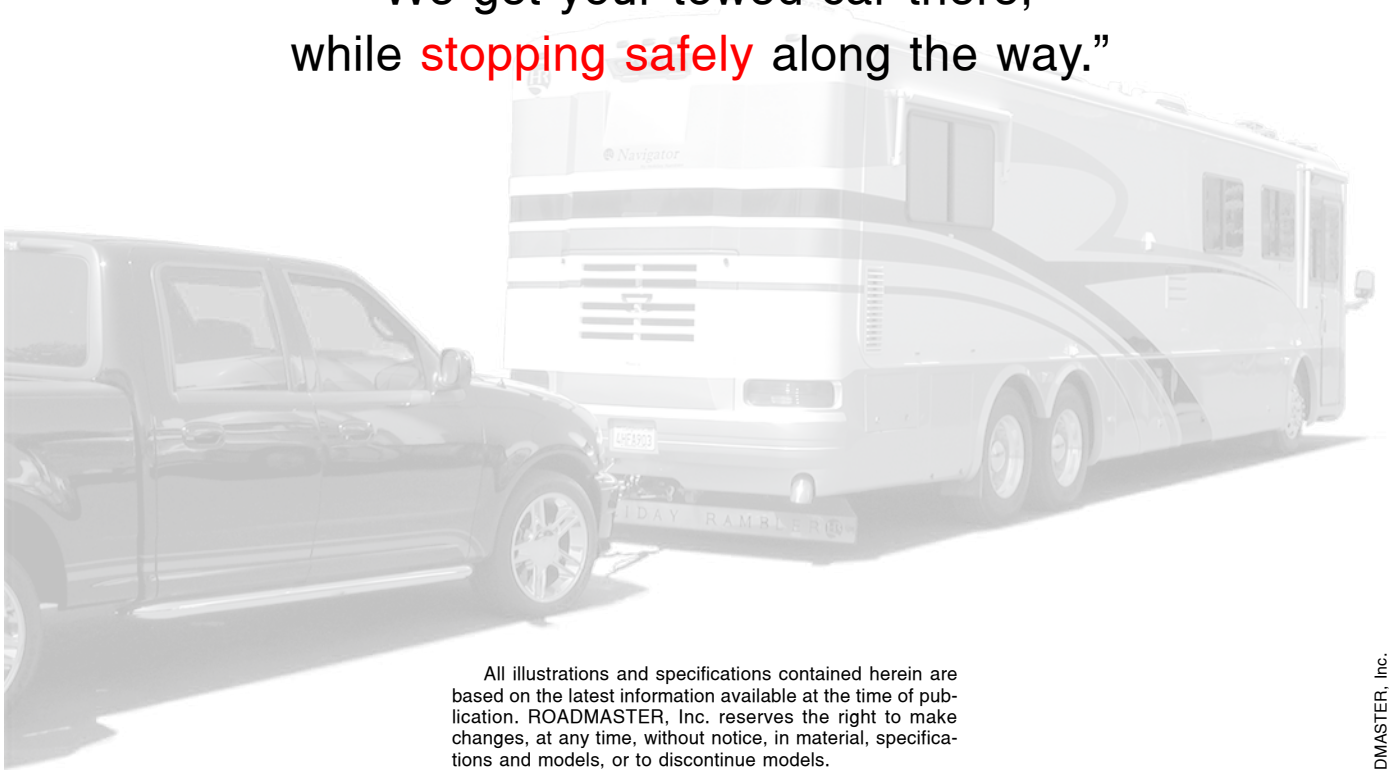
A HIGH-GRADE ALLOY AND A BETTER PIVOT POINT – The stock anti-sway bar (on the right) has a small diameter, 1020 grade spring steel, and a rubber bushing. The RSS anti-sway bar (to the left) has a large diameter, 4140 chromoly steel, and a polyurethane bushing, making it many times more resistant to sway.



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