

# M&G 2.0 Brake System Operation Manual

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

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



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



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

### NOTE

Refer 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...

1. **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)(Or M&G sells a Coach Protection Kit) to be installed with any supplemental braking system such as M&G. Otherwise Spartan will void the warranty. The general information phone number for Spartan Motors is 517-543-6400.
2. **An optional tee may be required** to connect the M&G Brake System air line to the motorhome brake relay valve or air booster housing. Refer to “Install the motorhome air line”. A 3/8” and 1/2” tee are provided for this purpose.
3. **If the motorhome is equipped with air over hydraulic brakes** – an additional amount of air line or a proportioning valve may be required.
4. **If the battery must be disconnected for towing**, 12 volt power for the breakaway system must be maintained for proper operation. Breakaway power must be connected to the towed vehicle battery side of switch.
5. **If fuses are to be removed, or battery must be disconnected**, verify that removing the fuses will not remove power from the vacuum pump or breakaway system.
6. **An optional tee may be required** to connect the M&G brake air line to the motorhome brake relay valve or air booster housing. Refer to “Install the motorhome air line”.
7. **If motorhome is equipped with air over hydraulic brakes** – an additional proportioning valve (#801) and extra air line is required.

## Install the M&G 2.0 Air Brake Cylinder to towed vehicle



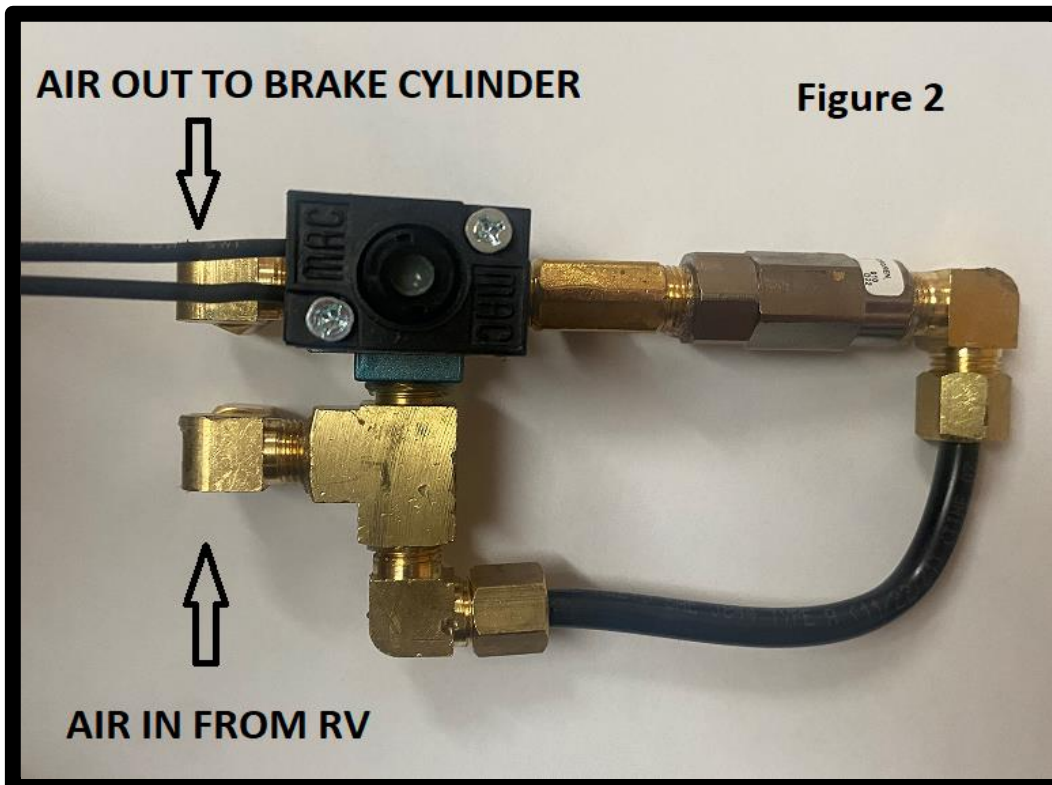
1. Mount the 2.0 cylinder to a flat strong surface under the hood or under vehicle. Keep away from heat or moving components. Mount in a location that allows conduit to reach firewall or floor behind brake pedal. Cylinder can be mounted in any position. Conduit must not make a sharp bend, (bend radius must not be more than 6" diameter). If conduit is bent too far, cable will bind causing poor brake performance and cable could not return fully causing towed vehicle brakes to drag. Towed vehicle brakes will be damaged or destroyed in this case. M&G does not warrant any damage due to incorrect installation.
2. Pull back carpet behind towed vehicle's brake pedal. Locate a flat surface to drill a 3/8" hole through firewall. Drill hole must be in line with brake pedal arm or cable must pull straight from conduit to pedal arm. If cable pulls at angle, braking force will be reduced. Start with a smaller 1/8" drill bit for pilot hole. Check opposite side of firewall for obstructions or sensitive components to clear drill bit.

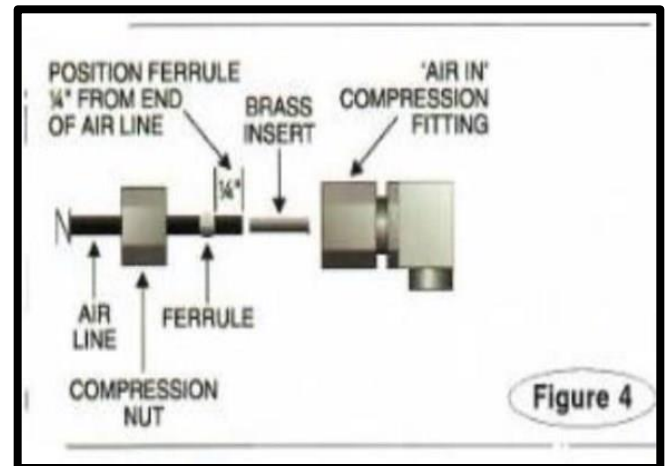
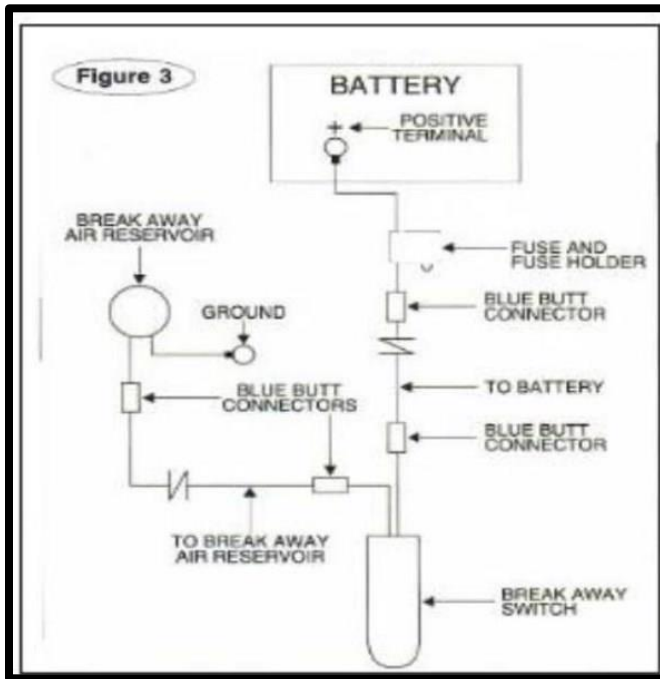


3. Route conduit to firewall, secure in place with cable ties. Keep away from heat and moving components. Fasten to firewall with supplied 5/16 nut.
4. Attach pedal clamp to brake pedal as low as possible for correct operation (8mm socket or wrench). If clamp is attached high on brake pedal arm, braking force will be reduced. Position pedal clamp straight in line with conduit. Thread cable into brass cable stop, pull slack from cable (1/4" deflection in cable is required). Tighten with a 1/8" Allen wrench and hold back up with a 7/16 wrench. Do not overtighten or cable will be damaged. Cut excess cable with side cutters.
5. Replace carpet and cut clearance for cable to move freely without obstruction. Move or trim floor mat away from moving cable.

# Install Breakaway System on towed vehicle

Breakaway is not supplied with 2.0 Brake System





## Step A

### *Install the air reservoir*

First, choose a location for the air reservoir (Figure 1). 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.

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 brake actuator, the other end will be routed to the front of the vehicle. This air line cannot be closer than two feet from 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.
- The reservoir will be attached with two supplied self-drilling screws.



**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:

Test-fit the reservoir and check for clearance. Using a drill and driver secure air reservoir assembly.

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

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

**Step B****Mount the break away switch**

1. Mount the break away switch (Figure 1) 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 1) 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. In the unlikely event that the tow bar should separate, the break away switch will separate with it, preventing the break away system from activating. The towed vehicle's brakes will not be applied, which may cause property damage, personal injury, or even death.**

**Step C****Connect the wiring**

1. Using one of the red butt connectors, attach one end of the supplied length of black wire to the end of either one of the two wires extending from the break away switch. (If necessary, strip ¼" to 3/8" 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 2), 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 brown 5-amp fuse onto the end of the wire. Strip the 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  $\frac{1}{4}$ " to  $\frac{3}{8}$ " of insulation from the end of the wire. Crimp the larger ( $\frac{3}{8}$ " ) 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 5-amp fuse must be within six inches of the positive terminal. If the 5-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 2 and 5). If necessary, use the remaining length of black wire to reach the top of the solenoid valve. As before, strip the ends of the wires before connecting them with the supplied red butt connectors.
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 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 3.



### WARNING

**If the battery must be disconnected for towing, a battery switch must be connected as shown in Figure 3. If it is not, the break away system will not function if the towed vehicle separates, which may cause property damage, personal injury, or even death.**



## Install air lines in the towed vehicle

1. Find a suitable location at the front of the towed vehicle to attach the male quick coupler (Figure 4). Choose an

area within easy reach, with a surface of sufficient strength to hold the mounting bracket firmly in place.



### WARNING

**Do not attach a female quick coupler at the front of the towed vehicle. The female quick couplers have an internal check valve to prevent air from escaping. If air pressure is not released, the M&G brake system will not retract fully 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 self-drill screws, with the male quick coupler pointing away from the towed vehicle.
  - a. *Note: the 90 degree spark plug boot 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 – first, if necessary, trim the end of the air line to make a smooth and straight cut. Then slide the compression nut and the compression sleeve over the air line. Next, slide one of the brass inserts onto the end of the line.
  - a. *Note: if the brass inserts are omitted, the fittings will not be airtight*

4. Push the air line into the compression fitting, as far as it can go. Tighten the compression nut onto the fitting
  - a. *Note: if the compression nut is overtightened, the fitting will not be airtight. After completing the installation, check all the fittings for air leaks – see “System test.”*

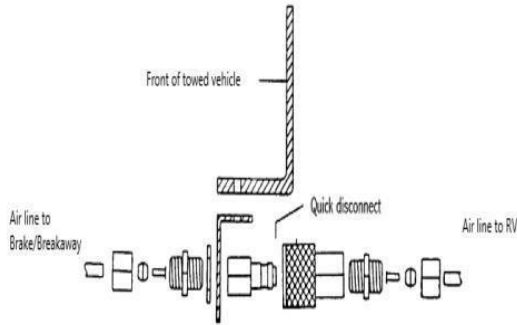
5. Tape the open end of the air line. Then, route the air line from the male quick coupler to the break away air reservoir, avoiding moving parts, sharp edges or “hot” components such as the engine or the exhaust system. Do not kink the air line, or bend it to the extent that it crimps or creases.
 

*(cont. next page)*

- a. *Note: if the break away system was not installed, route the air line through the engine compartment.*

### 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.**



- b. Where appropriate, use wire ties to secure the air line in place.
6. At the top of the break away air reservoir, cut the air line to length and attach the open end to the brass ‘air in’ compression. Use the same method described in step 3 to attach the air line.

7. 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. Use the same method described in step 3 to attach the air line.
8. Tape the open end of the air line. Then, route the air line from the break away air reservoir through the engine compartment. As before, avoid 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 lines.

# Install the motorhome air line

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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.**

## 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.**

2. Start the motorhome engine and allow the air brake system to completely charge up to operating pressure.
3. **If the motorhome has air brakes** – find the air brake relay valve. **If the motorhome has air over hydraulic brakes** – find the main brake air booster housing, which is typically located near the front axle. There should be an open plug threaded into the air booster housing.
4. Test to verify that you have located the correct port (an assistant will be necessary for this text, 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 air line.**

5. 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 then the brake pedal is depressed, you have located a port to attach the air line.

6. 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 8.
7. **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 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 is provided for this purpose. An optional  $\frac{1}{2}$ " tee is also available. Matching compression fittings are provided in the kit. The correct port should be identified as the "service brake" port. (If the ports are not identified, follow steps 4 and 5 to identify the service port.) Fits, with the motorhome brakes released, disconnect the factory air line from the service port – push down on the locking collar and then pull out. Next, 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. Use the compression fitting provided with the tee to attach the air line to the remaining female fitting. Use the same method described in step 3 under "Install air lines in the towed vehicle" to attach the air line. Proceed to step 9.

#### **To finish the installation...**

8. Now that the fitting is in place, connect one end of the remaining length of air line to the fitting. Use the same method described in step 3 under "Install air lines in the towed vehicle."
9. Tape the open the remaining length of 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 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.

#### **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.**

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

10. Connect the air line to the female quick coupler at the rear of the motorhome. Use the same method described in step 3 under "Install air lines in the towed vehicle."
11. The installation is complete. Before the supplemental braking system is operated for towing, proceed to the next section – "System test."

## SYSTEM TEST

1. The motorhome and towed vehicle must be stationary for the system test, and ready for towing...
2. Connect and attach tow bar to the motorhome and towed vehicle.
3. According to the manufacturer, make all adjustments necessary to prepare the vehicle for towing.

### 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 proper gear for towing.**

4. Connect the coil hose or air hose between the two vehicles.
5. Clip one end of the steel breakaway cable to the breakaway pin; clip the other end of the cable to the rear of the motorhome, close to the center.
6. Block the motorhomes wheels, and then release the parking brake. Turn the motorhome engine on, and leave it running.
7. 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 pedal down fully. Cover each joint, fitting, and connections with a leak check solution.

### Caution

**The air system is 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.**

8. Tighten any fittings, if necessary, and repeat until all connections are airtight.
9. Confirm the proper operation of the braking system: depress and hold the motorhome brake pedal down. At the towed vehicle, the air cylinder will retract and the pedal will depress. Then release the brake pedal. The air cylinder will extend and the pedal will return.
10. Confirm the proper operation of breakaway system – First charge the breakaway reservoir – with motorhome engine on, the air compressor completely charged and the parking brake released, depress the brake pedal fully for 10 seconds and release.
11. Next, remove the breakaway pin at the front of the breakaway switch. The air cylinder and brake pedal will actuate, confirming the proper operation of the breakaway system. To release brake system, reconnect the breakaway pin. Before towing, charge the breakaway air reservoir, as described above.

# Troubleshooting

## **Nothing happens after proper installation.**

Check air flow from RV. RV must be running or air pressure at maximum capacity. Check for any kinks or restrictions in air line. Open seal on quick disconnect at rear of RV, step on RV brake pedal, controlled air should be present. Connect air line between RV and towed vehicle, step on RV brake again, M&G 2.0 air cylinder should move and pull cable which pulls towed vehicle's brake pedal.

## **Brakes apply fully on towed vehicle when RV parking brake is released.**

Air line is connected to wrong port on RV. The air line is connected to the Parking brake system on RV. Connect air line to Service relay port. See "Install Motorhome Air Line".

## **Brakes drag on towed vehicle.**

Cable is too tight, release at cable clamp on brake pedal, must have ¼" deflection or slack. Cable is restricted inside conduit—conduit is bent too far or too tight. Conduit is melted or too close to heat. Cable is frayed and needs replacing. Air fitting on front of towed vehicle is sealed, capped, or plugged by foreign material. Fitting must be able to breathe. Pedals have been adjusted on towed vehicle or moved.

## **Breakaway does not work**

Check 5 amp fuse. Check for air pressure in reservoir. If air is not present, check valve could be stuck open – remove, clean, and lubricate.

Trip switch can be corroded – remove pin and clean contacts.