



## INSTALLATION INSTRUCTIONS

### Brake Line Kits

#### CAUTION

- **Flexible brake hoses must allow the suspension to travel from the fully loaded position through its full possible range downward, and any potential farther travel down into a pothole and any rebounding travel upward. A damaged or broken brake hose can cause immediate loss of braking on all wheels.**
- **Ensure that all brake lines, whether steel or flexible material, are routed and secured to prevent any possibility of chafing, material fatigue in any way, or any contact with moving items. A damaged brake line or hose can burst under pressure and cause immediate braking loss on all wheels.**
- **The flexible brake hoses provided in Dexter kits are suitable for DOT-3, DOT-4, and DOT-5 approved brake fluids only. DOT-3 is the recommended fluid for all Dexter hydraulic braking systems. DO NOT USE petroleum-based hydraulic fluid in these lines or any Dexter braking system; petroleum-based fluids will cause a system failure.**
- **Wear safety glasses and gloves when handling brake fluids. If working on an existing trailer, properly drain any existing brake fluid from the system and dispose of it per state and local regulations. Never reuse brake fluid.**

**Note:** Installation, maintenance, or repair on any trailer should be performed only by qualified persons knowledgeable of the system. Also, there are numerous variations in procedures, techniques, tools, and component choices to adequately address each unique trailer design. This document cannot possibly anticipate all such variations and provide advice and caution as to each. Accordingly, anyone who undertakes to construct, install, maintain, or repair a vehicle brake system or brake system components, must first establish that they neither compromise their personal safety nor the vehicle integrity by their choice of methods, tools, or parts selected.

#### CAUTION

**Do not lift or support the trailer on any part of the axle or suspension system. Never go under any trailer unless it is securely supported on jack stands rated for the load. Improperly supported vehicles can fall unexpectedly and cause serious injury or death.**

Trailer hydraulic braking systems all include an actuator mounted at or near the front of the trailer that generates between 1,000 and 1,600 lbs. per square inch of brake fluid pressure to operate the brakes. The brake fluid distribution system consists of steel brake lines and flexible brake hoses to transfer brake fluid under pressure to each wheel's brakes. The brake line system must resist that high pressure, the effects of vibration and the elements, and provide sufficient flexibility to allow the axles or wheel ends to move up and down. Please refer to figures on the last page for brake line layout.

#### **Connecting to the trailer brake actuator:**

Actuators are designed explicitly for drum or disc brake applications. Make sure you have the correct actuator for your brake type. Severe operational problems can arise with the incorrect matching of brake type and actuator.

If you install an Electric/Hydraulic or Air/Hydraulic pump on your trailer, physically mount the pump in a protected, dry area as close to the front of the trailer as possible. Install the pump per the manufacturer's instructions with enough space around the pump to allow airflow to keep it cool. Where possible, install the pump in a location with sufficient access to visually check or add brake fluid to the pump when needed.

The hydraulic brake line system length exiting the pump is unlimited. Conversely, the tow vehicle connection's wiring length supplying the Electric/Hydraulic pump should be as short as possible. An air/hydraulic or electric/hydraulic actuator pump may have either a steel brake line or brake hose with a 3/16" inverted flare male end installed directly into the pump's outlet. A steel line should include some flexibility (usually, a "Z" shaped change of direction in the line near to the pump is sufficient) to allow the pump to be unbolted and removed for service if later needed.

If you add a surge brake actuator to your trailer, remove your coupler from the front of your trailer and bolt the brake actuator coupler in its place per the actuator manufacturer's direction.

**Note:** Short flexible brake hoses are required to connect to the actuator master cylinder on the Dexter DX8.0, DX12.5, and DX20EX (Formerly Titan models 6, 10, and 20) actuators. Their master cylinders are on spring-loaded mounts, and their master cylinder thus moves relative to the actuator outer case in operation. All other Dexter actuator models may have a steel brake line or a brake hose with a 3/16" inverted flare male end installed directly into the inverted flare output fitting of the actuator master cylinder. If a steel line, it should be routed to allow some flexibility to enable the actuator to be unbolted and removed for service if later needed. Usually, a "Z" shaped change of direction in the line near to the actuator or a pigtail coil at the far end of the line is sufficient).

If the surge brake actuator or brake system has an electric backup solenoid installed, use a wrench or other tool on the solenoid's brass end where the brake line enters to stabilize the solenoid while tightening the brake line(s) into it. The black electric solenoid coil itself is not designed to resist tightening torque and can be distorted to the point of failure if it is gripped or twisted with a wrench or a twisting force is applied to it.

If the actuator master cylinder has an orifice connector mounted at its exit, DO NOT remove or modify the orifice connector to install the trailer main brake line. The orifice should connect directly to the main brake line to provide proper fluid flow characteristics for the system.

If the main brake line exiting the actuator runs in a tubular trailer frame, include swivel fittings at one or both ends to ease installation and avoid installing any joints in the line inside the tube.

If the trailer has a folding tongue section, a flexible brake hose is required.

Ensure that the hose length selected will allow the tongue to be fully opened without stretching the hose but not be too long and allow the hose to pinch, kink, or get caught in the tongue mechanism when it is closed.

### **Brake lines, hoses, and connecting fittings installation:**

The brake line system should be installed considering the long-term effects of vibration, component movement, and environmental exposure.

The brake line system layout and component selection must allow for 4.5" of torsion axle arm or leaf spring suspension travel relative to the trailer frame. Flexible hoses are required anywhere in the system where components move relative to one another. Spring axles move vertically; torsion axle arms move in a radius motion.

Select the brake line lengths and route them to minimize the system's number of connections or joints. It is permissible to:

- Run the main brake line down the trailer frame on one side only and then route the lines across a trailer cross member or axle to reach the other side of the trailer, or:
- Run two main brake lines down each side of the trailer frame, and then plumb individual line drops to the axle wheel ends.

For the best braking performance, use rigid steel tubing for the majority of the system length, using flexible hose when necessary. Braking performance is best if flexible brake hoses in the system are 24" or less length each. On heavy, long trailers with three or more axles, Dexter recommends a ¼" steel main line from the actuator for the best brake response.

Dexter recommends that on trailers with concealed brake fluid distribution joints, that portion of the system be leak tested before it is hidden. The best approach is to leak test the entire system after the brakes are installed, but before the brake lines are concealed and before connecting the actuator. To leak check the system, use 50-100 pounds per square inch of dry shop air to pressurize the system. Then close a tightly sealing valve on the test air supply and use a calibrated air pressure gauge to see if the system air pressure drops, indicating a potential leak in one or more joints in the system. This initial air test gives the added benefit of pre-adjusting the disc brake calipers/pads to their operating position when the air pressure is applied.

If it is necessary to add any additional brake lines, fittings, and hoses not supplied by Dexter to complete the system, they must be rated for 3000 pounds per square inch pressure and meet FMCSA FMVSS 106 requirements. Dexter recommends 3/16" steel brazed double wall tubing per S.A.E. J527 for use with all our actuators and brake products. Use 45° double-flare tube ends for connections per S.A.E. J533.

## **CAUTION**

**NEVER CUT ANY BRAKE LINE TUBING!! Brake line tubing cannot be patched or hand flared and comply with D.O.T. approved systems. Never use any copper tubing for any part of a hydraulic brake system. Ensure connecting fittings have compatible threads/seats, incorrect combinations will leak. Do not use any thread sealant on inverted flare type brake line fittings.**

### **Routing and mounting steel brake lines**

Route brake lines within the trailer chassis in a manner that protects them from damage by road debris or low ground clearance and secure all tubing for maximum protection from pinching, vibration, corrosion, or road hazards. Secure the brake lines/hoses to the trailer frame with sufficient clips or attachment devices to support them for the application.

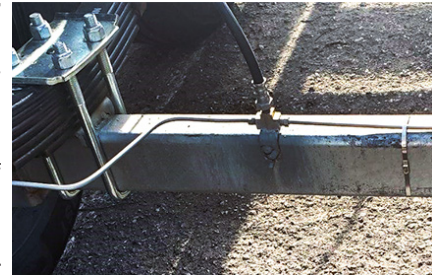
**Do not drill axle tubes to install brake line attachment fasteners.**

Brake lines that horizontally cross an axle tube or trailer chassis frame rail shall be installed on the upward or rearward facing side of the axle tube or frame rail to minimize the possibility of road impact damage.

Brake lines and hoses should never be routed on the bottom of trailer chassis frame rails where road debris or any later lifting or supporting of the trailer with a jack or jack stands can damage them.

Brake lines should be secured every 36" on a trailer frame to avoid vibration damage. If a brake line is crossing an axle tube, secure the line to the tube every 18 to 24".

Dexter recommends any "T" or cross fittings be secured to the trailer frame in a way that prevents vibration from loosening the brake line joints at the fitting. Most of these fittings either have an integral round hole to secure the "T" to a trailer frame or



axle tube, or the fitting may come with a separate bracket. **Do not drill axle tubes to install brake line attachment fasteners.** It is acceptable to run a screw or small bolt through the mounting holes in the "T" fitting or bracket. The "T" fittings may be secured to a cross axle tube by spot rosette welding the hole in the bracket to the axle tube or by stud welding an external fastener to the axle tube. The "T" fittings and any cross-axle brake lines can be secured using UV-resistant zip ties, stainless steel zip ties, or stainless steel hose clamps. If securing brake lines with zip ties, the maximum recommended tie spacing is 24". **Do not over tighten or crush brake lines if using hose clamps or zip ties to secure.**

Protect brake lines and hoses where they cross through frame and body members, near moving parts, etc. If a steel or rubber brake line passes through a hole without a grommet or other anti-chafing material, the line or hose must be secured so that it is centered in the hole and cannot flex enough to touch the hole's edge. Otherwise, use a rubber grommet or similar cushioning device to prevent contact between a brake line/hose and a nearby item or a surrounding hole. In that case, the grommet design should be that it remains in place permanently under the vibration conditions of the trailer, and the grommet material shall not deteriorate over time due to the elements.

Use a six-sided line wrench or crows-foot wrench where possible on hex brake line fasteners to avoid rounding them off. When tightening two lines that go into the same union or joining fitting, hold the line on the opposite side of the fitting with a second wrench to avoid twisting lines or loosening fittings downstream in the system.



Apply the tightening torque to the brake lines/fittings in a smooth and controlled motion. The tightening torque for a 3/16" inverted flare fitting is:

- If one or both fittings are brass: 60-75 in.-lbs., 5 ft.-lbs. or just snug using a 6" long line wrench.
- If both of the fittings are steel, or a steel fitting inserted into a cast iron fitting: 120 in.-lbs. or 10 ft.-lbs..
- ¼" steel inverted flare fittings tightened to 120 in.-lbs or 10 ft.-lbs.

Air bubbles will tend to rise to the highest point in the brake line; therefore, route the brake lines to run as level as possible relative to the trailer frame to avoid high spots, which may trap air and make the system harder to bleed. It is acceptable to select a rigid brake line slightly longer than needed and use up the line's excess length by installing a pigtail coil in the line. On the other hand, selecting an excessively long rigid line that requires a higher number of or large diameter shortening coils can create multiple high spots that trap air bubbles during bleeding, thus increasing overall installation time.

Do not allow any debris to enter the brake lines/hydraulic system when installing the brake lines. For example, it may be necessary to cover the brake line ends with masking tape or use temporary line end caps while sliding a line inside a trailer frame rail.

## CAUTION

**Kinked and/or damaged brake lines can cause fluid flow restriction or later fatigue cracks resulting in poor braking or no brakes at all.**

When bending steel brake line tubing, always use proper bending tools to assure sound connections and prevent kinks in the tubing. Tubing bends of radii less than 6" require the use of tools similar to those in the picture.

### Routing and mounting flexible brake hoses

A flexible brake hose is required wherever a trailer or braking component moves relative to a fixed brake line. **Do not attempt to make a flexible metal brake line section to allow repeated component motion by pigtail coiling a steel brake line.**



Brake hoses have a stripe to show if the hoses are twisted during installation. Use the hose end's swiveling feature to ensure the hose is installed and tightened with minimal twist. When installing a male/female hose, hold the hose's female end with a 5/8" line wrench to avoid twists.

If a brake hose includes an integral 90-degree bend at its male end, orient its 90-degree bend so the hose's rubber portion is pointing as directly as possible to the hose's female end before tightening the male hose end swivel fitting.

Ensure the brake hoses allow at least 4-1/2" of suspension movement, with spring axle movement being approximately vertical and torsion axle movement in a radius. The hose installation shall be such that no portion of the hose can drop below the cross-axle tube elevation to avoid snagging on-road objects or obstacles. The hose installation shall prevent the possibility of contact between the hose and a rotating tire or wheel.

Most brake hoses with one male end and one female end have a feature on the female end that allows the female end of the hose location to be secured with a bracket and C-Clip. Where a brake hose is subjected to repeated flexing, any ends of that hose that connect to a metal brake line should be secured to a non-moving portion of the trailer. Some scenarios where hoses are subjected to repeated flexing are:

- The female end of a flexible hose is attached to a bracket on the trailer frame and the male end of the hose is attached to a moving wheel end or a moving cross axle tube.
- The female end of a flexible hose is secured to a stationary torsion axle mounting bracket and the male end of the hose is connected

to a brake on the moving torsion axle end.

- If a flexible hose connects to a rigid steel brake line on either of its ends, anchor both hose ends to avoid repetitive motion in the rigid lines that could fatigue them.

### Connecting to the brakes at the trailer wheels

Follow the trailer axle/brake manufacturer's instructions for installing brake assemblies on the axle ends. Dexter recommends brakes on all trailer wheels.

## CAUTION

**When installing the brake system or any part of servicing, never let a brake caliper, drum brake assembly, or axle ever hang by its own weight on a flexible brake hose. If this happens, replace the hose with a new one.**

Install calipers or brakes with the bleeder screw on the top and the brake line inlet at the bottom.

Fixed piston style brake calipers and hydraulic drum brakes mounted on a spring axle may have rigid metal lines routed along the axle tube directly to them. If so, the rigid metal line on the axle should have a radiused "Z" bend in it near the brake to make the line flexible enough to remove the caliper or brake assembly for service. If a floating piston style caliper is in the same spring axle arrangement, the "Z" or a pigtail flexibility loop in the rigid line must additionally allow the caliper body to move outward a minimum of 1/2" as the brake pads wear.

A flexible brake hose is the required connection to all drum or disc brakes on torsion axle ends, and is recommended for all floating piston style calipers on spring axles.

Many Dexter disc brake calipers have a banjo style brake fluid inlet that may be positioned at various inlet angles to allow the brake line to enter from an optimum direction. If Dexter disc brake calipers came without fittings, the fittings can be added at brake system installation. These inlets have a hollowed-out banjo bolt that clamps a brass inlet fitting between two copper washers. In the case where an existing "banjo style" brass inlet fitting must be repositioned from its original tightened position to a new inlet angle during installation, always replace the original copper washers and then re-torque the banjo bolt to the caliper manufacturer's specification. An example single inlet fitting arrangement compatible with Dexter calipers with a 7/16-20 threaded inlet is shown on the next page.

### Initial Road Test of Trailer

After installing the actuator, brakes, and brake lines as described above, proceed immediately to the "BRAKE FLUID FILLING AND BLEEDING" instructions in the applicable brake actuator service manual.

## CAUTION

**Failure to fill the system with brake fluid and bleeding air out of the system promptly after installation may result in brake actuator or system corrosion and cause brake failure.**

Check each system joint and brake hose for leaks after the system is initially fully pressurized with fluid and after bleeding all the system's air.

Test the unit to confirm that the trailer brakes are operating correctly in a safe location before resuming regular travel. After the first few stops and the brakes have seated, check the brake fluid in the actuator reservoir and top off the fluid again to the proper level. Check for a system leak if

Figure 1: Tandem Axle Brake Line using T fittings

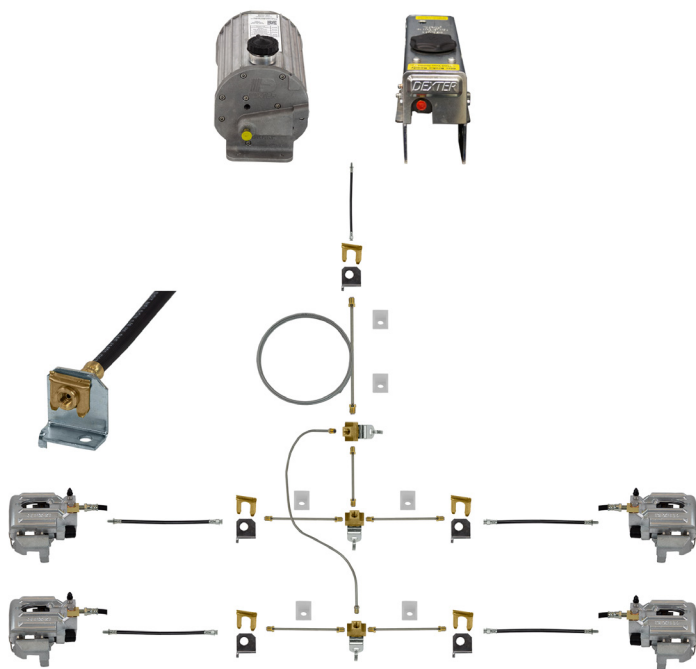


Figure 2: Triple Axle Brake Line using T fittings

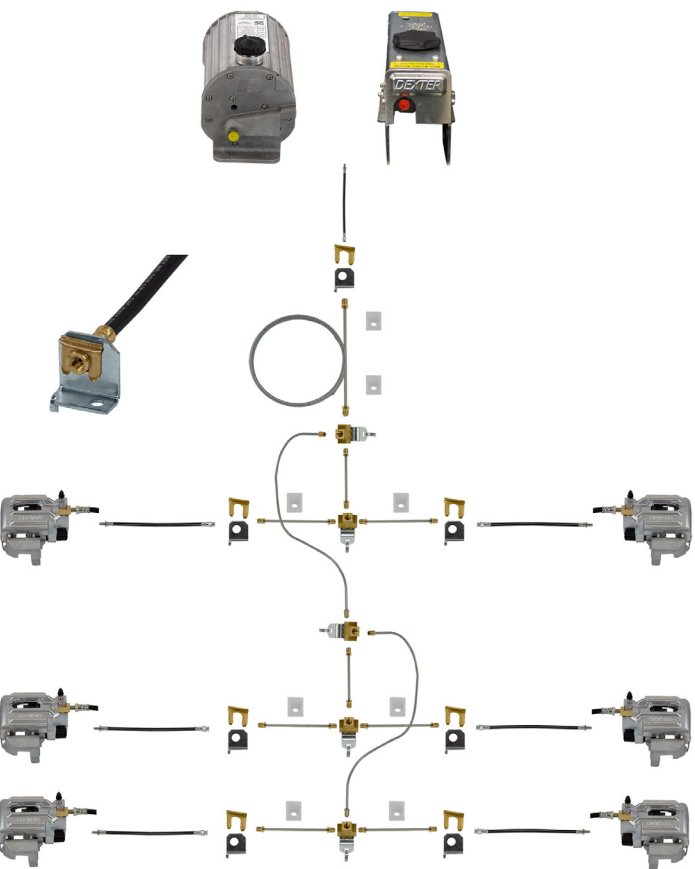


Figure 3: Tandem Axle Brake Line using cross fittings

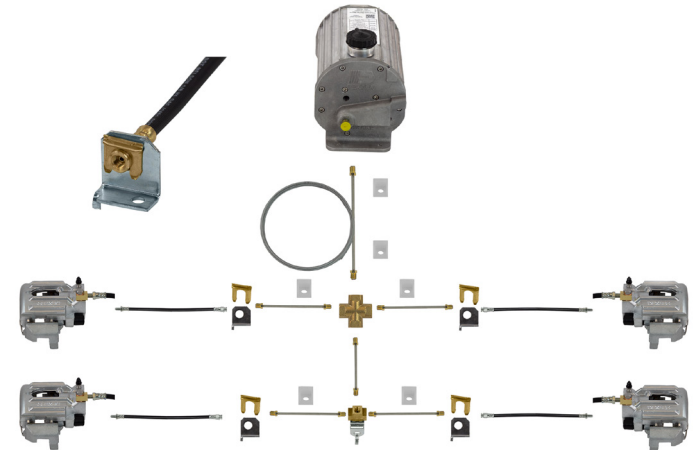
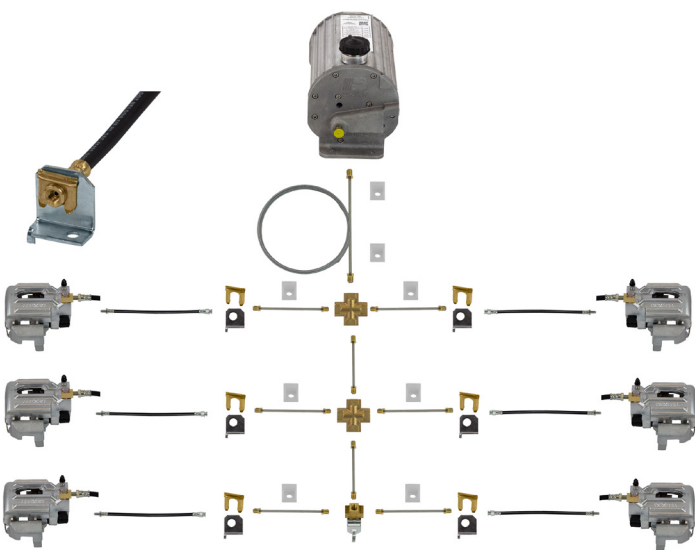
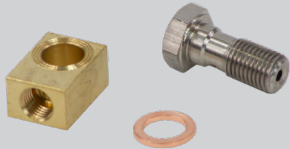


Figure 4: Triple Axle Brake Line using cross fittings



**AP Numbers (if required)**

Fitting:	Bolt:
034-323-00	007-307-00



Washer: 005-169-00

**Note:** Typical torsion axle trailer diagram shown. The diagram for a leaf spring axle is similar except that any brake line exiting a trailer frame leading to a leaf spring axle tube or brake shall be a flexible hose.