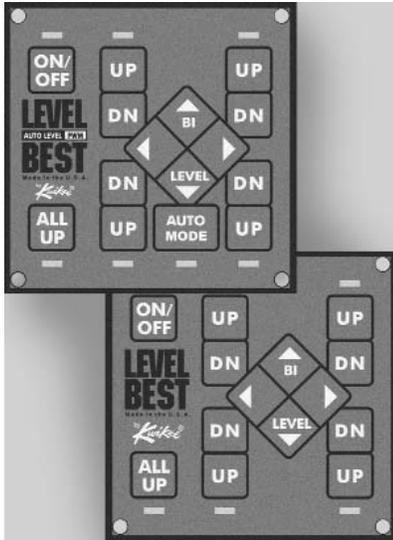




# Installation Instructions



## Installation Instructions

*Hydraulic Leveling Systems #2000, #2010, #3000, and #30130*

### Introduction

The Level Best 2000, 2010, 3000, 3010 leveling and stabilizing systems are electronically controlled, hydraulically operated units that consist of a 12-volt DC powered motor/pump/manifold assembly with fluid reservoir, hydraulic hoses, four hydraulically operated jacks, and a motor control unit and switch panel. The systems are designed to meet the varying requirements of class 'A' to class 'C' motorhomes.

The configuration of chassis and vehicular components can vary greatly from one manufacturer to another. The installation procedures outlined in this instruction sheet represent a generalized approach. Your installation application may vary. If, after reading this manual, you have questions regarding the installation of the Level Best system, please contact our Customer Service Department at 1-800-736-9961. Getting your questions answered in advance will help to ensure a smooth installation and proper operation.

### Pre-Installation Planning

Prior to beginning the actual installation, examine the vehicle and visualize the mounting position of each of the systems main components:

- Motor/pump/manifold assembly
- Four hydraulic cylinders (for LB2000 and LB2010, 2 left hand/driver side, 2 right hand/passenger side)
- Control panel

Keep the lengths of hoses and wiring, as well as the physical dimensions of each piece in mind and plan accordingly. Locate the component pieces within the range of the hose lengths. Allow adequate clearance around each component to connect wiring and hoses and provide easy access for performing routine maintenance. See **Figure 1** on Page 3 for general physical references.

**NOTE: If your vehicle does not readily lend itself to the suggested system configuration and alternatives do not appear feasible, feel free to contact the Lippert components Customer Service Department for assistance at 1-574-312-7480.**

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## Motor / Pump / Manifold Assembly

### MOTOR / PUMP / MANIFOLD ASSEMBLY LOCATION

An ideal location for mounting the motor/pump/manifold assembly is immediately forward and below the engine radiator. Be sure not to restrict ventilation to the radiator cooling surfaces. This position should provide easy access to the vehicle battery and offer an accessible area for attaching the hydraulic hoses, making wiring connections and performing routine maintenance. Close proximity to the chassis battery is preferred.

### JACK LOCATION

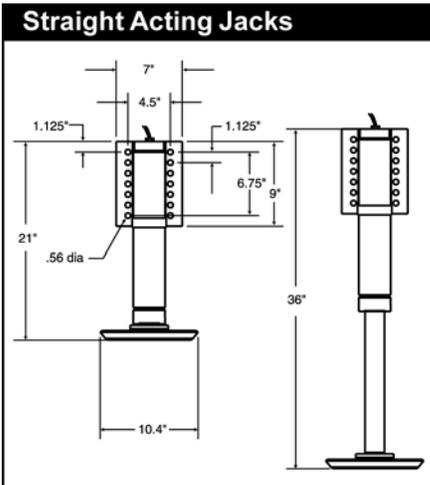
Examine the under carriage of the vehicle. You will notice that the construction of the chassis super structure includes two parallel frame rails extending almost the entire length of the vehicle. The ideal location for the rear hydraulic cylinders (or rear jacks) is along the exterior side of the frame rail and behind the rear axle, as close as possible and no more than 12" behind the rear spring hanger.

The ideal location for the front jacks is along the exterior side of the frame rail, behind the front axle.

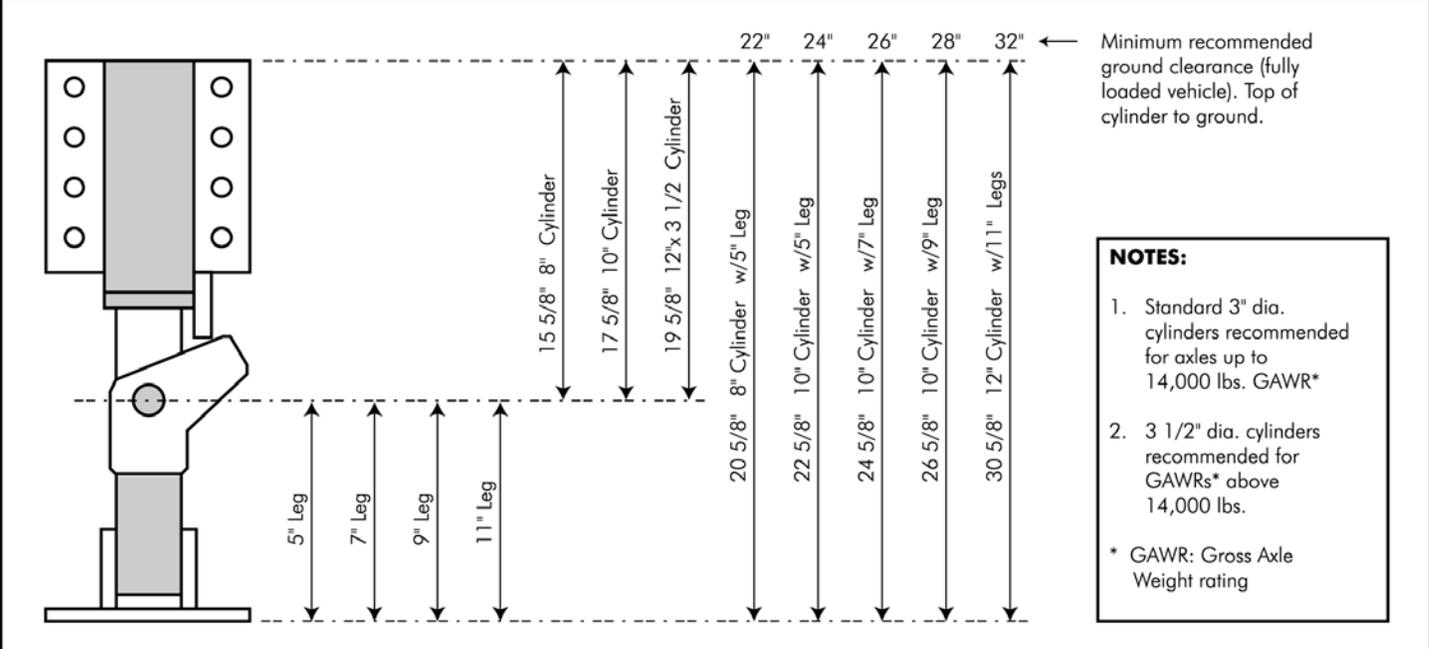
**For Knee-acting Jacks:** The pivot direction is toward the rear of the vehicle. Be certain the the jacks have adequate space to swing up and allow adequate space for the leg and footpad in the stowed position. (See **Figure 1** on Page 3.)

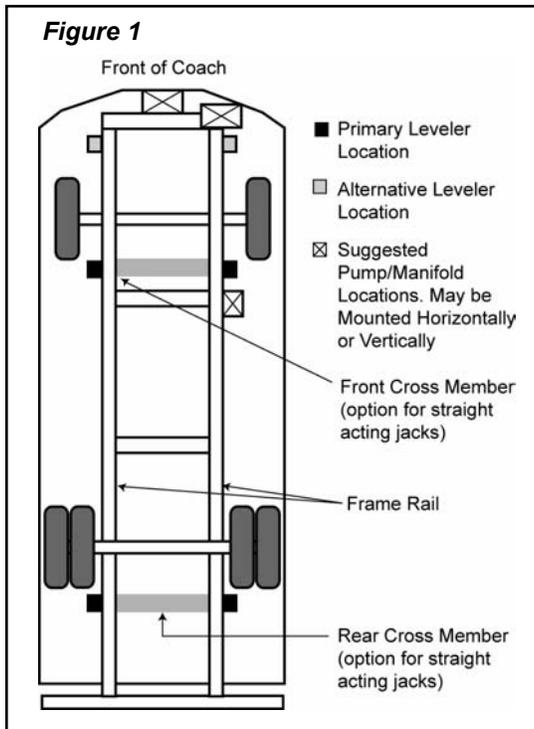
**For Straight-acting Jacks:** For lighter-duty chassis, Kwiikee recommends that jacks be positioned as close to the chassis cross member as possible (see **Figure 1** on Page 3.) If no cross member is near the selected jack location, a cross member can be attached between the frame rails to help strengthen the chassis. (Kwiikee can supply cross members for this purpose.)

**NOTE: On a gasoline-powered chassis do not mount the rear jacks more than 12" behind the rear spring hanger.**



### Application Guide: Knee Acting Jacks, LB2000 & LB2010



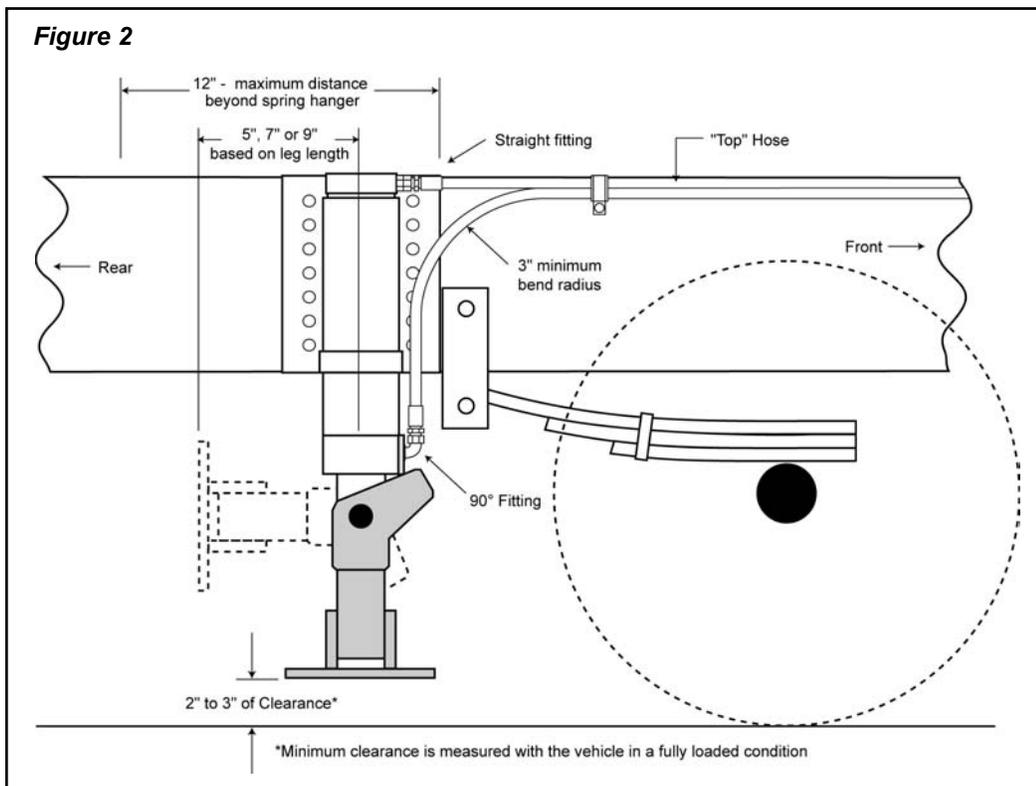


**CONTROL PANEL LOCATION**

In most applications, the control panel is situated either below or, if space is available, in the driver's instrument panel (dash board) or side panel. Access to these positions provides easy system operation and installation.

**NOTE:** Prior to initiating any installation/mounting procedure, read and understand the following important precautions:

- Read the entire installation procedure before beginning.
- Do not connect the power source (battery) until the installation of all components is complete.
- In many of the installation procedures, the initial fastening and securing of components is temporary. Later in the installation process, the components will be securely fastened.
- When routing and securing the hydraulic hoses and wiring, be sure that they are not exposed to engine exhaust or any other high temperature component of the vehicle. Any hose or wiring should be situated a minimum of 12 inches away from any heat source. If 12 inches of separation is not possible, it will be necessary to fabricate a heat shield/baffle to protect hoses and wiring. The heat shield should be composed of an appropriate, nonflammable, heat resistant material.
- Do not mount jack assemblies on 'Mor-Ryde' suspension system components except when suspension is supplied with jack mounting plates.
- FOR KNEE-ACTING JACKS: During retraction, the pivot cam makes contact with the lifter plate which causes the leg/footpad assembly to pivot upward. Keep this area designed for stowing the jack leg clear of all obstructions.



Use only the hoses and fittings supplied by Kwiikee as part of the installation kit -- use of any other hoses and/or fittings will void the warranty.

**NOTE:** When the control panel has been installed and the wires have been routed, seal any holes you may have drilled from the interior to the exterior of the vehicle with a silicone sealant.

## Control Panel Installation

One method of installing the control panel uses the mounting bracket to install it below the driver's instrument panel. If there is enough space, flush mounting the control panel into the vehicle instrument panel is another option.

First determine where the wires are to be routed. Look for any pre-existing holes that can be used to route the control panel wiring from the pump manifold to the control panel location. If no hole can be found, drill a 1 1/2" hole through the fire wall near the selected installation site. Route the wire through the hole to the control panel location.



**Bracket mounting**

## Flush Panel Mounting Application (not shown)

Inspect the location for flush mounting the control panel and ensure that there is adequate space for the box portion of the control panel and the multi-wire cable connections. Using the template in **Appendix A**, layout and cut the opening. Route multi-wire cable through the opening in the dash and insert the connectors into the receptacles on the back of the control panel. The control panel should fit snugly into this opening. Remember, it is easier to cut the opening too small and enlarge it to fit than it is to cut it too large and have to fill the opening back in.

**NOTE: Hydraulic lines will be routed to the top of the manifold. Be sure there is adequate working space above the manifold for making the hose connections.**

**NOTE: To prevent debris from entering the hydraulic system and damaging valve seals, the hose ends have been sealed with removable soft plastic plugs. Do not remove these plugs until you are ready to attach the hydraulic lines.**

### Mounting the Motor | Pump | Manifold Assembly

The motor/pump/manifold assembly requires an area 26" long x 12" x 12" deep for installation. See **Figure 3**.

The bottom of the pump has been tapped for mounting with two 3/8"-16 x 1 bolts. The assembly can be mounted horizontally or vertically. See **Figure 4**.

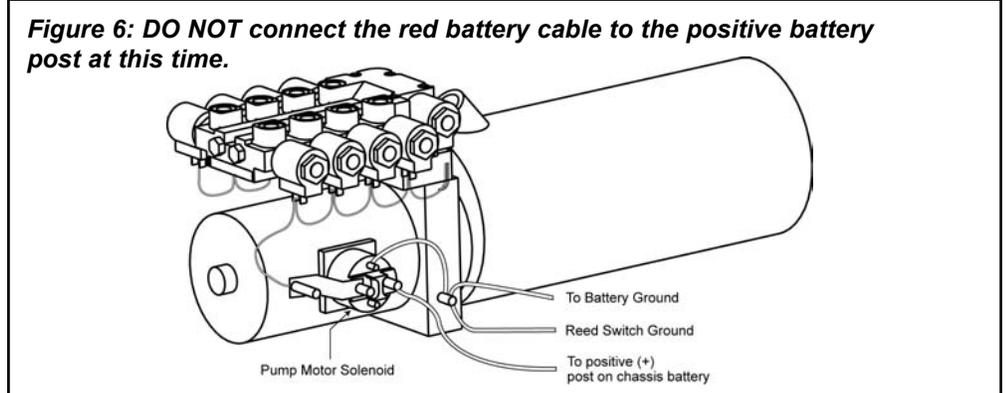
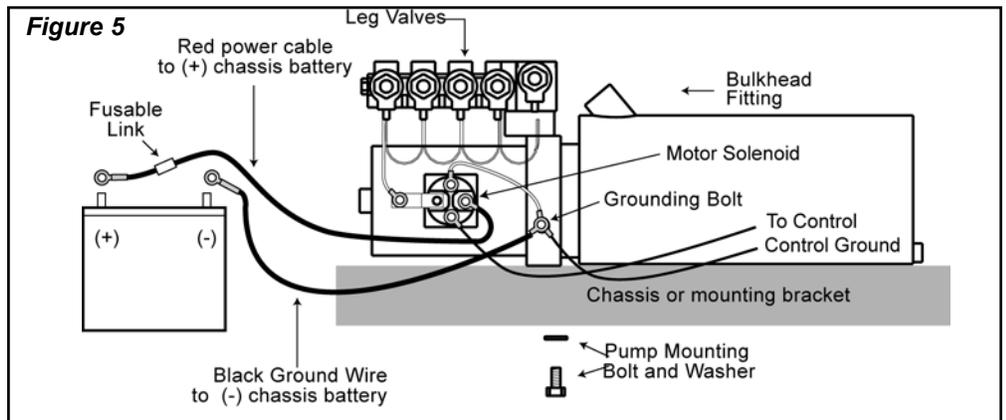
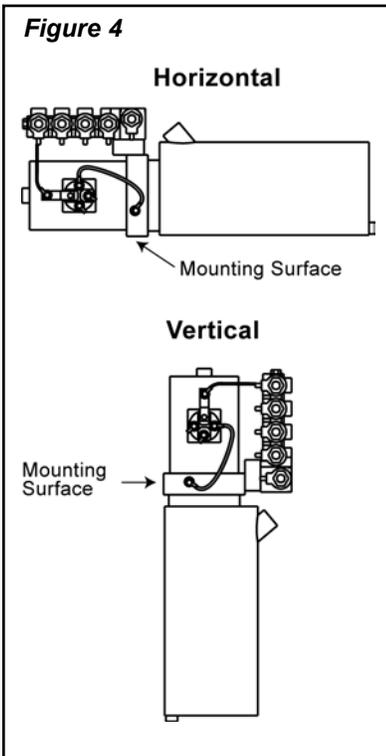
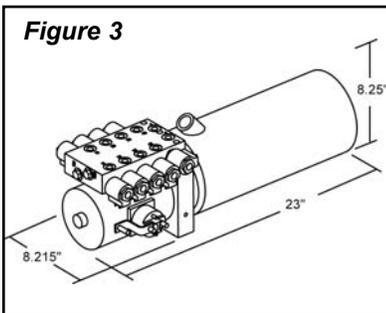
On a work bench, install the 45° hydraulic fittings into the manifold prior to mounting. Determine which direction the hoses will be routed and point the fittings in the appropriate directions.

For some applications the pump assembly can be mounted to an existing chassis cross member in front of, below, or beside the radiator. The location of the pump assembly should not block or restrict the flow of air to the radiator. Be sure there is sufficient clearance around the assembly to connect the hoses and wiring, as well as room for checking and filling the reservoir.

Once a position satisfying these conditions has been determined, align and drill two 1/2" diameter mounting holes, centered 3 1/4" apart. Position the pump/motor assembly over the mounting holes and secure it in place using the two 3/8"-16 x 1 bolts and lock washers. Attach the ground cable using the 5/16" bolt in the side of the motor mounting block. See **Figure 5**.

Next, route the other end of the black ground cable to the chassis battery and connect it to the negative (-) battery post. Connect the 8-foot long #4 red battery cable to the stud on the pump motor solenoid and route it to the chassis battery of the RV. The end of the cable with the fusible link should end at the battery. See **Figures 5 and 6**.

**NOTE: Do not connect red battery cable to the battery post at this time.**





**CAUTION:** When welding to the chassis rail use care to avoid damaging any of the chassis equipment. This equipment includes wiring, fuel, brake, hydraulic and/or compressed air lines. Always check the opposite side of the welding surface for anything that could be damaged by the heat from the weld.



**CAUTION:** Prior to welding on the chassis frame, any microprocessor controlled electronics such as engine monitoring devices and Kwikie electric entry steps should be disconnected -- both power feed and ground connections.

Failure to disconnect any of these components can cause damage to the devices and void the warranty.

The standard bracket kit (Kwikie part #9069480) will work with Chevrolet, Freightliner, Spartan, Ford and light-duty Ford chassis.

On newer Freightliner chassis, use of the factory Freightliner bracket is recommended.

On the Oshkosh and the F53 Ford chassis with the V-10 engine, it will be necessary to use a set of mounting brackets (Kwikie part #906950000.) These brackets are required when the levelers are mounted over the leaf springs. These brackets space the levelers out from the frame rail so that during the extension of knee-acting jacks, the footpads will not contact the leaf springs when they swing down.

See **Appendix A** for additional mounting options.

## Mounting Cylinder Assembly with Weld-on Brackets

Each cylinder assembly includes a mounting flange, hydraulic cylinder, leg assembly, and lifter plate (knee-acting jacks only.)

**Knee-acting Jacks:** Position the cylinder assembly to allow adequate space for the motion of the jack leg (5", 7", or 9" from the center of the cylinder depending on the length of the leg being used.)

**For all Level Best systems:** When using the mounting bracket, the top of the bracket should be flush with the top of the chassis. Placing the bracket flush with the top of the chassis will allow for maximum ground clearance. With these conditions satisfied, clamp and weld the mounting bracket in place.

With all four mounting positions prepared on the chassis frame, the next step is to partially assemble the hydraulic cylinder components.

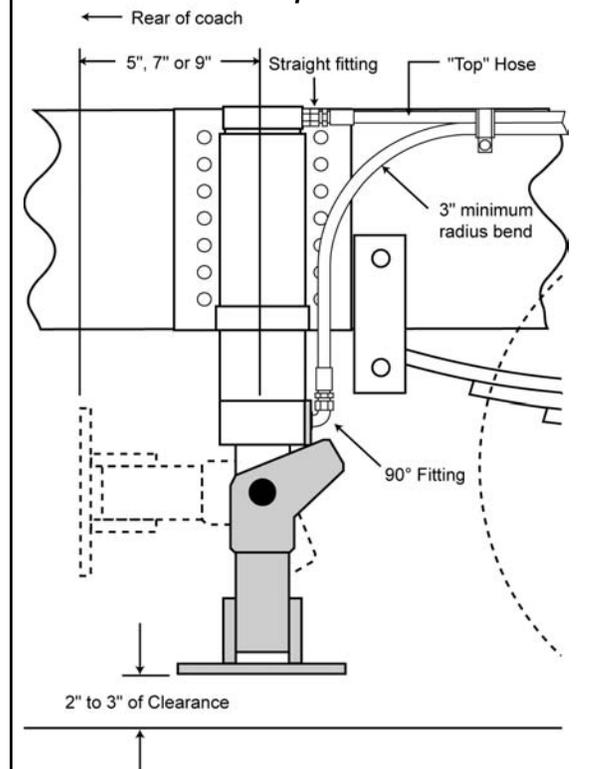
On a work bench, install the 90° hydraulic fitting into the opening closest to the bottom of the cylinder. See **Figure 7**. Insert the nontapered end with the self-sealing 'O' ring into the cylinder. With the nipple pointing up, tighten the fitting in a range of 50-150 in./lb. Install the straight hydraulic fitting in the upper threaded opening and tighten to a maximum of 150 in./lb.

Return to the undercarriage with the cylinder assemblies. Place the cylinders onto the mounting brackets. On knee-acting jacks locate the assembly so that the legs pivot to the rear of the coach. Install and tighten the top two mounting bolts just enough to hold the cylinders in place.

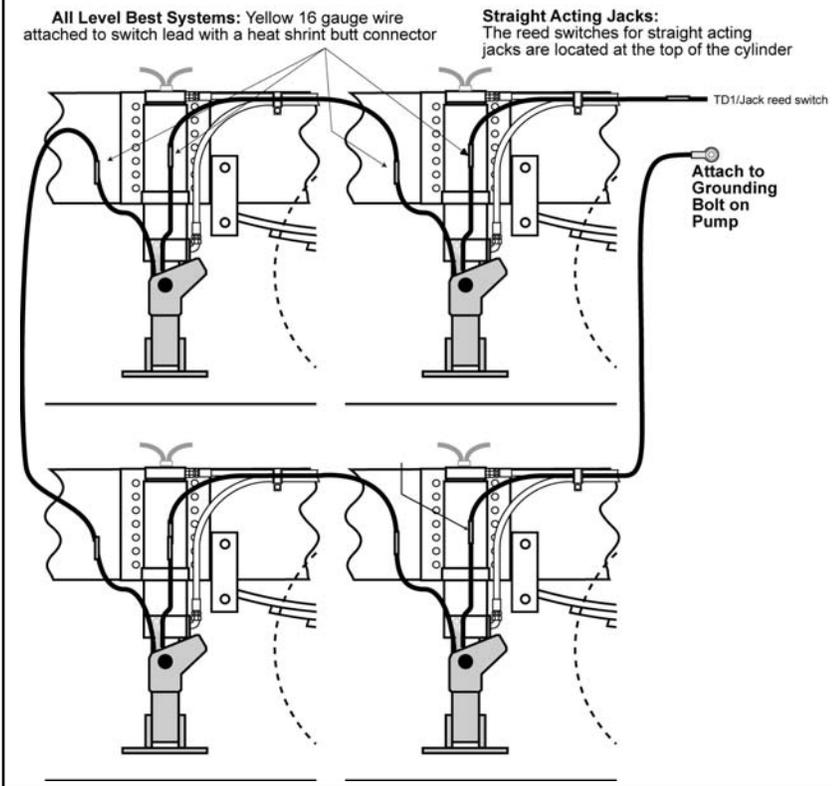
From the uppermost position on the mounting bracket, hydraulic cylinders can be adjusted downward a maximum of 3" and maintain an adequate mount. This cylinder mounting adjustment range allows for fine tuning the system. When the cylinder is in its final mounting position, secure the mounting bolts to 80 ft/lb. Now install the middle and lower sets of bolts and tighten to 80 ft./lb.

Install the jack leg position sensor wiring. The jack leg position sensors are to be wired in series. Attach the yellow 16 gauge wire to TD1/jack reed switch wire located at the pump manifold harness. Use heat shrink butt connectors when making all of these connections. Run the yellow wire to the first jack leg sensor and attach the wire to one of the two sensor wires. Attach another yellow wire to the remaining wire at the sensor and run this wire to the next jack leg and sensor. Continue this process until all four sensors are connected. At the last sensor, attach the yellow wire to the remaining sensor wire. Run the other end of the yellow wire to the grounding bolt on the pump and connect with a 5/16" ring terminal. See **Figure 8** on Page 7.

**Figure 7: Use adequate hose lengths and observe recommended radius bends (3" minimum) to avoid kinks, flattened hose, and restricted flow capabilities.**



**Figure 8**



**Attaching Hydraulic Lines**

The leveling system comes with eight factory hydraulic lines. Each hose is labeled on one end to correspond to a port on the manifold. See **Figure 10**.

**NOTE:** To prevent debris from entering the hydraulic system and damaging the valve seals, the hose ends have been sealed with removable plastic plugs. Do not remove these plugs until you are ready to attach the hydraulic lines.

Starting at the right rear cylinder, attach the RR4B hose end to the bottom fitting on the cylinder and tighten to 50-150 in./lbs.

Attach the hose end labeled RR4T to the upper fitting on the cylinder and tighten to 50-150 in./lb. See **Figure 7**. Using the remaining hoses, repeat this procedure for the other cylinders.

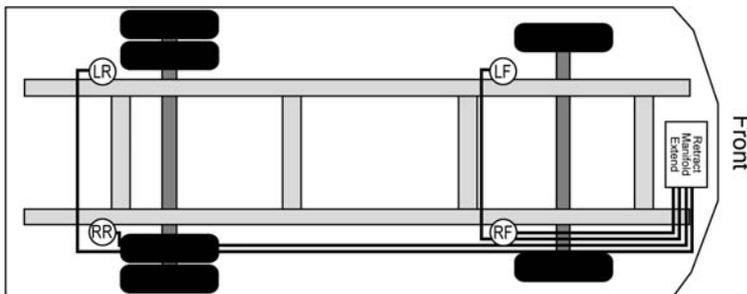
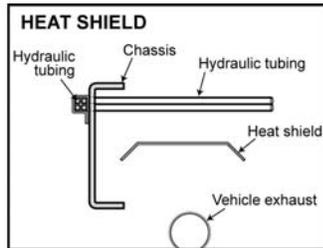
Continue by routing and loosely securing the hydraulic lines and yellow reed switch wires along the vehicle undercarriage to the pump/manifold. As you route these lines forward to the pump/manifold. Use wire ties to loosely secure them to the frame rail. Use a sufficient number of straps so that when the lines are finally secured, they will not sag or sway when the vehicle is in motion. Do not strap the hydraulic lines to any moving or heat-producing parts of the vehicle.

All fittings should be connected to the manifold and tightened to 50-150 in./lb. Connect the swivel fitting of each hydraulic line to its corresponding valve port fitting as labeled on the manifold. Tighten to 50-150 in./lb. See **Figure 10**.

**Figure 9**

**NOTE:** This illustration has been included as a general reference for routing the hydraulic lines and does not represent the actual routing of the lines. It is recommended that the hydraulic lines to routed along the outside of the chassis frame rails.

**CAUTION:** Be sure the hoses are not exposed to high temperature vehicle components like the engine and exhaust manifold/tailpipe. Avoid routing or stretching lines over or around any sharp surface. Do not secure the lines to any moving parts. If a 12" minimum separation is not available, use of a heat shield is required.



**Figure 10**

LABEL	VALVE PORT
LF1T	1T
LF1B	1B
RF2T	2T
RF2B	2B
LR3T	3T
LR3B	3B
RR4T	4T
RR4B	4B

**INSTALLER NOTE:** For Level Best kits sold in the aftermarket, hose labels will be supplied loose in the hose kit box. Labels should be applied to the hoses as they are routed during installation.

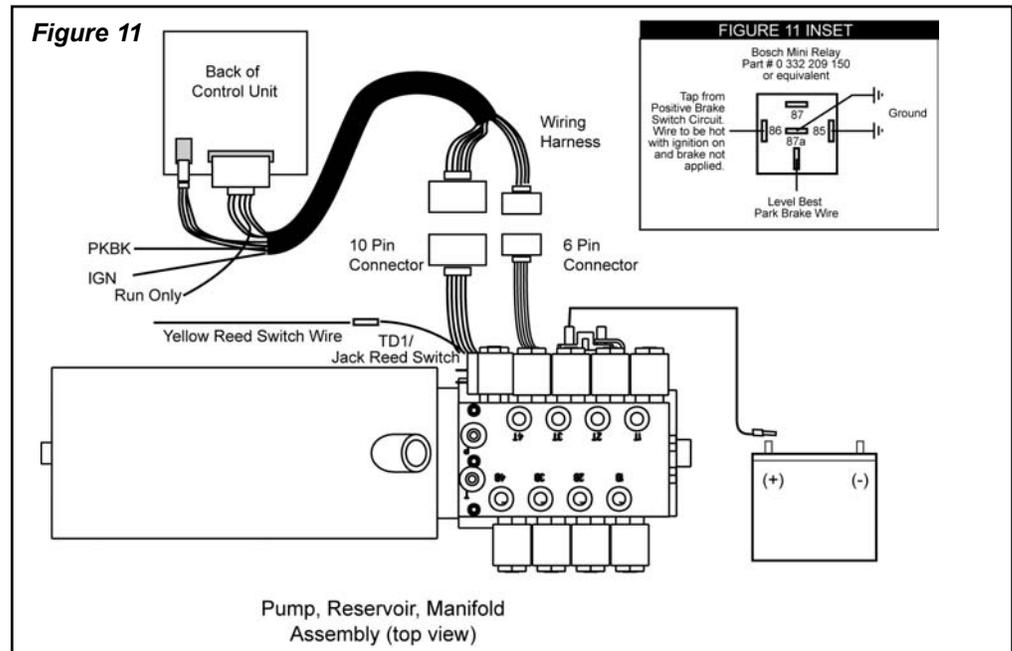
**NOTE:** Most new class 'A' motor home chassis are equipped with an automatically applied park brake system. These systems automatically apply the parking brake when the transmission is shifted into 'park.'

In the chassis wiring harness you will need to identify the park brake signal wire. This wire will carry a positive (+) 12-volt or ground signal. A signal wire can generally be found in one of the following places:

- **Steering column just below the head and rim at the upper adjustment point or at the base just above the floor line.**
- **Front bulkhead wiring connector - located on the driver side of the vehicle and accessible either under the dash or under the hood.**
- **At the slave cylinder actuator of the park brake.**
- **Possibly in the transmission wiring harness.**

Once you have located the appropriate wire, determine the type of signal by using a volt-ohm meter while engaging the park brake. If a positive signal is present, the use of a relay is required. See Figure 11 Inset. Splice a pigtail into this wire as explained in instructions.

## Completing the Wiring Connections



With the wiring from the Control Panel routed to the pump manifold, complete the wire connections. Refer to **Figure 11** for wire connection information.

1. Check that all system ground harness connections are firmly attached.
2. Use a heat shrink butt connector to attach the yellow wire from the leg position reed switches to the white wire labeled 'TD1/Jack Reed Switch' on the pump manifold wiring harness. See **Figure 12**.

Attach the ground wire from the reed switches to the ground bolt on the pump. See **Figure 6**.

3. Locate the vehicle fuse box and attach the yellow ignition sense wire (IGN) to an ignition activated circuit (circuit to be fused at a maximum of 7.5 amps.)

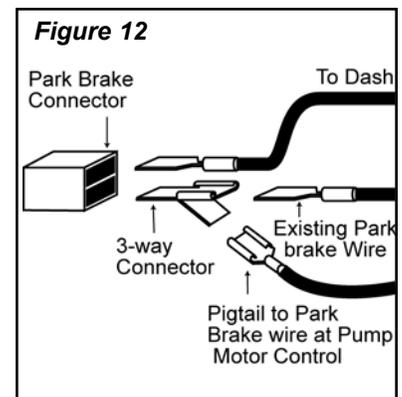
**NOTE: The positive battery cable should still be disconnected at this point.**

4. Level Best systems are equipped with a park brake interlock. The interlock is designed to allow operation of the system only when the vehicle parking brake is set.

In the chassis wiring harness, identify the park brake signal wire. The park brake switch and signal wire will usually be found on, or near the park brake pedal assembly. This wire will show ground or 12-volts positive when the park brake is applied. The type of signal will vary from one type chassis to another. Once you have located the appropriate wire, determine the type of signal by using a volt-ohm meter while engaging the park brake. If a positive signal is present the use of a relay is required. See **Figure 11 Inset**.

Next, splice the blue park brake wire (PKBK) from the control unit into the signal wire.

5. The 'Run Only' wire (**Figure 11**) at the control is used for special applications and should be ignored.
6. The final connection is the 8 ft. red #4 cable from the pump motor solenoid to the positive (+) terminal of the chassis battery.



**NOTE:** When filling and bleeding the system, use transmission fluid only. Kwikee recommends using Dextron III. Do not mix fluids. When checking the fluid level in the reservoir, all levelers must be in the retracted (ALL UP) position.



**CAUTION:** Do not run the pump without fluid as damage to the pump may occur. Do not engage the pump motor for periods greater than 30 seconds as motor damage may occur.



**WARNING:** During the retracting of the jacks, the cam on the upper portion of the leg will make contact with lift plate and cause the leg assembly to swing upward; failure to stay clear of the levelers when the system is being operated can result in severe injury.

## Bleeding the Hydraulic System

Prior to initiating the bleeding process, verify that all the fittings on the cylinders and the manifold have been tightened to 50-150 in./lb. Also check that all the swaged hose couplers are tightened to the fittings at 50-150 in./lb. The entire system must be filled with hydraulic fluid during the bleeding process. It is recommended that the reservoir be filled with 1 1/4 gallons of fluid to start the process. The hoses and cylinders hold approximately 2-2.5 gallons of fluid, therefore it will be necessary to refill the reservoir several times during the bleeding process.

With the reservoir filled and the fittings checked, turn the system on by starting the coach and pressing the power button on the control panel. Begin extending one of the rear cylinders. Initially, the system contains mostly air, which prevents the manifold valves from sealing and causes all cylinders to extend erratically. As the hydraulic fluid begins to fill the lines and cylinders, the manifold valves will seal and each cylinder will begin to act independently.

When the reservoir begins to run low on fluid, the resistance of the fluid within the pump lessens and the sound of the pump increases in pitch. Retract the legs completely and replenish the fluid in the reservoir.

Continue to extend the cylinder until it reaches the end of its stroke, then retract all cylinders. With air in the lines, the cylinders will emit squeaking and humming noises and move in a jumpy manner. As air is purged from the system, the cylinders will move in a smoother, quieter manner. It may be necessary to extend and retract each cylinder several times to completely purge the lines of air.

When the system has been bled, retract all levelers and check the fluid level in the reservoir. With all cylinders fully retracted, the fluid level in the reservoir should be just visible in the filler fitting.

## Manually Bleeding the Cylinders

Most cylinders will bleed themselves. However, if you have difficulty with a particular cylinder during the bleeding process, it is possible to manually bleed a cylinder. Extend the cylinder until it touches the ground.



**CAUTION:** Do not lift the coach.

Loosen the top hose fitting on the cylinder. You will hear air escaping. Do not remove the fitting from the cylinder to vent this air. Tighten the fitting again when air ceases to vent and only fluid is escaping. Operate the cylinder in and out several times to check for smooth operation. Repeat manual bleeding process as necessary.

## Hydraulic System and Electrical Connections

Be sure that:

- All hydraulic fittings on the cylinders and manifold assembly have been tightened to 50-150 in./lb.
- All hydraulic hose connections have been tightened to the fittings at 50-150 in./lb.
- All cylinder mounting bolts have been tightened to 80 ft./lb.
- All electrical power delivery and ground connections are securely fastened.
- There are no leaks.

**NOTE:** Be sure that any holes from interior to exterior of vehicle made during the installation process have been completely sealed with a silicone sealant.

**WARNINGS:** Do not use the Level Best systems as a lift for changing tires or working under the vehicle.

Never check for hydraulic fluid leaks using your hands and/or any other body part. The leaking fluid is under pressure and is capable of cutting and penetrating your skin, resulting in severe injury.

When extending the rear stabilizers, do not lift the wheels beyond ground contact. This overrides the braking effect of both the transmission park and the parking brake and makes it possible for the vehicle to roll unexpectedly forward or backward off the jacks. This could cause severe injury or even death.

Holding a control panel button switch in the 'UP' or 'DN' position for a time period longer than necessary to fully extend or retract the hydraulic cylinders, can cause overheating and damage to the pump motor as well as the electrical components.

Do not use the levelers as an emergency brake. They are not designed for any type of vehicle braking purpose.

Do not use the levelers on icy or slick surfaces on which the footpads may slip.

## Testing the System

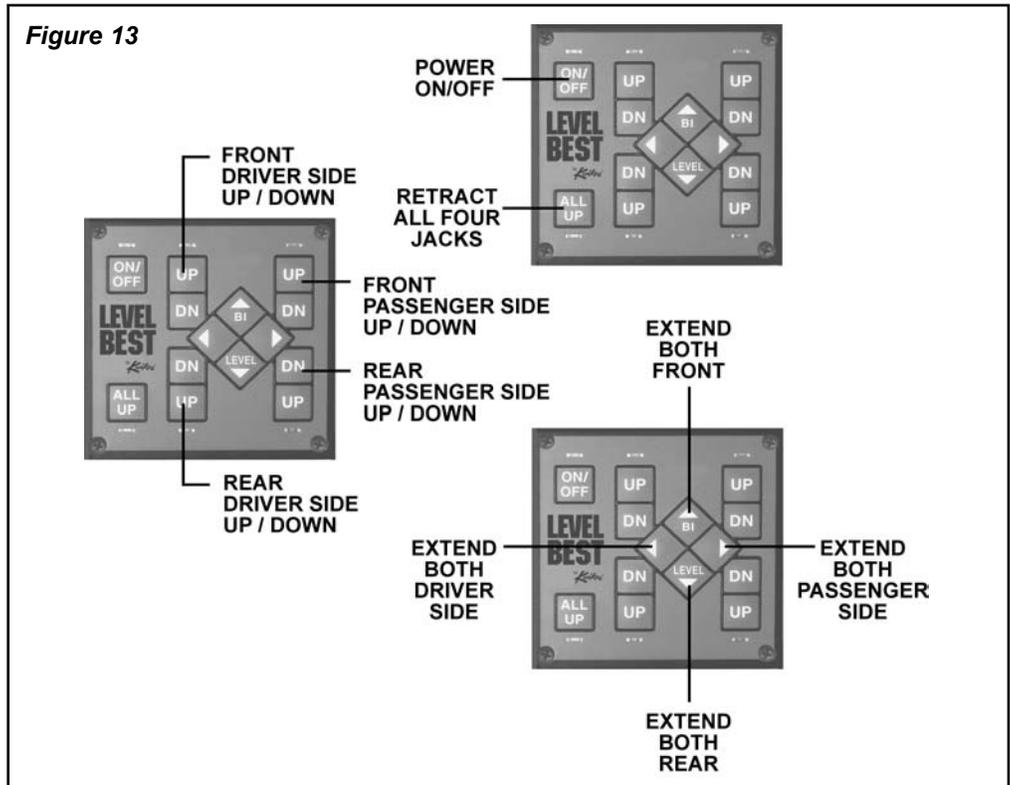
**NOTE:** The park brake must be set and the ignition on for the Level Best System to operate.

Once all the system components have been installed a system check is recommended to verify all Level Best functions are operational.

Operating Level Best is accomplished by using the buttons on the control panel. See **Figure 13**. The buttons are organized to represent the actual positions of the jacks on the coach.

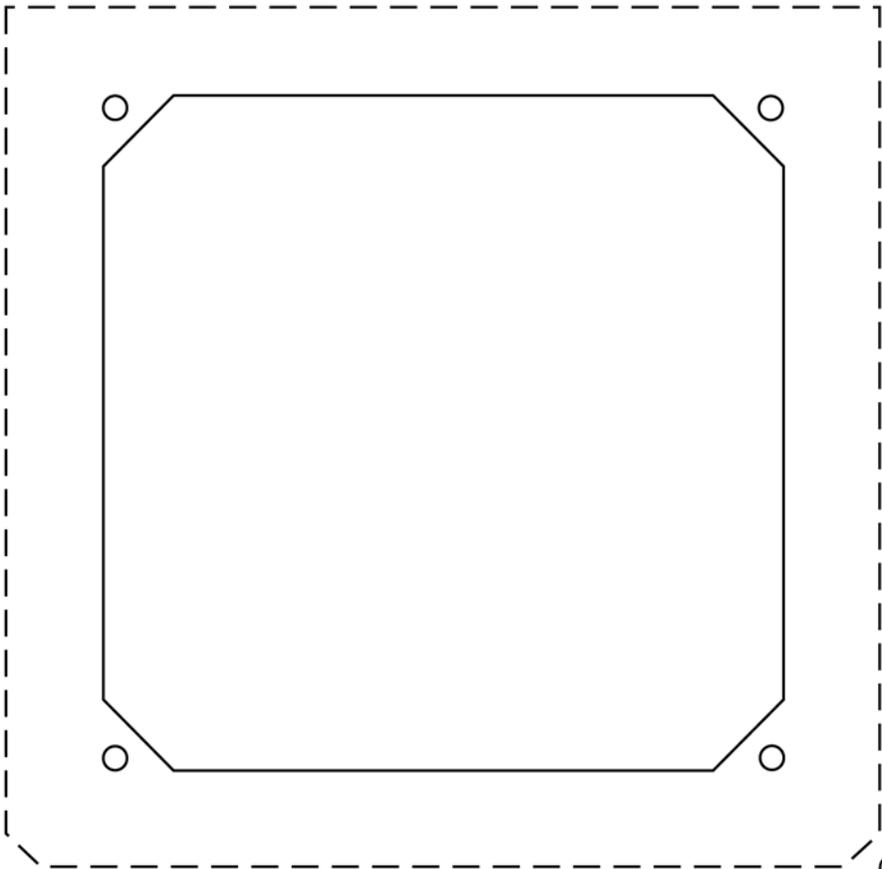
- Using the four individual 'UP' / 'DN' (down) buttons, verify that each jack can be extended and retracted separately and that the associated yellow LED indicator lights during operation.
- The 'Bi-Level' buttons, marked with triangles and arranged in a diamond pattern, operate pairs of jacks simultaneously. Press each of the buttons and verify that the appropriate pair of jacks can be extended together and that the associated pair of LED indicators light during operation.
- After placing all jacks in the extended position, press the 'All Up' button and verify that all four jacks retract together into the travel position and that all four yellow LED indicators light during operation. The LED light under the 'All Up' should turn green and the pump will shut off automatically 2-5 seconds after all the jacks are fully retracted.

Figure 13



**NOTE:** If system is equipped with automatic leveling, see "Level Best Operation Guide" for information about 'AUTO MODE' operations.

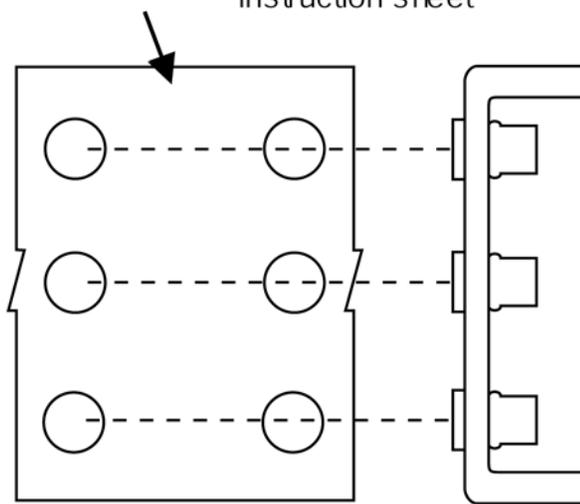
**TEMPLATE FOR TOUCHPAD**



**TYPICAL INSERT APPLICATION**

For insert installation see accompanying instruction sheet

Chassis



**CHEVY P30 REAR**

*\*Use long inserts at these locations.*

For insert installation see accompanying instruction sheet

Chassis

