# PowerLevel™ series

# Class C Leveling Installation Instructions

## Hydraulic Leveling Systems - Ford E450 Chassis

### Contents



## Introduction

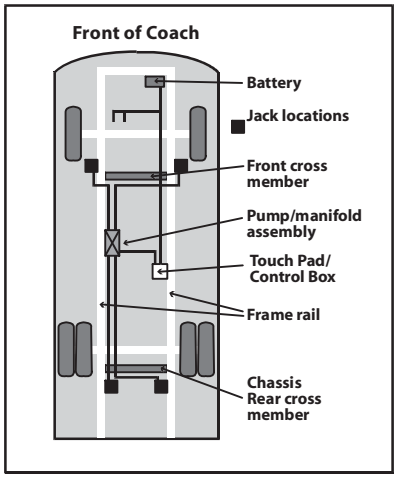
The PowerLevel leveling and stabilizing system is an electronically controlled, hyraulically operated unit that consists of a 12-volt DC powered motor/pump/manifold assembly with fluid reservoir, hydraulic hoses, four hydraulically operated jacks, and a motor control unit and switch panel. The system is designed to meet the varying requirements of Ford E450 chassis 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 PowerLevel system, please contact our Technical Service Department at 1-800-334-4712. 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:

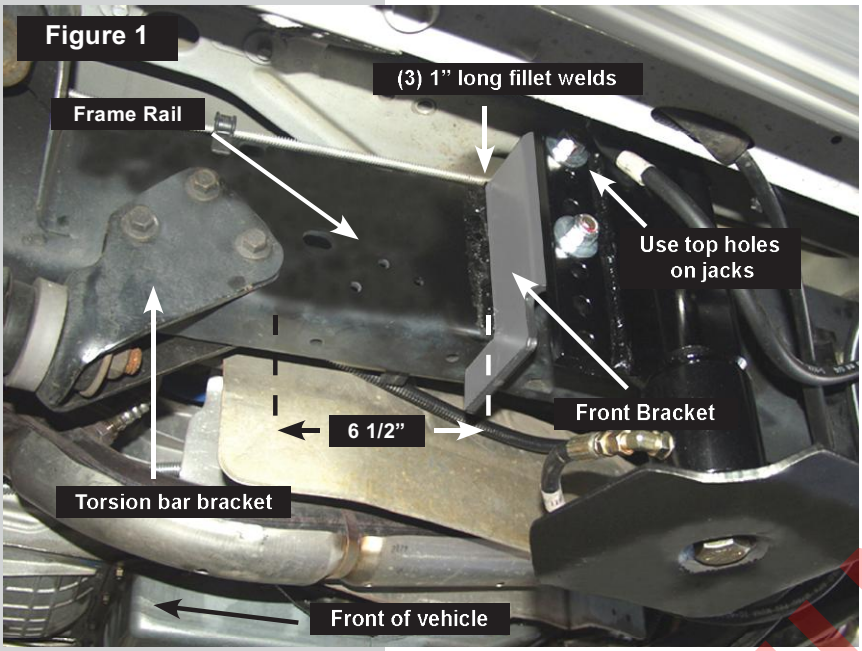
- Motor/pump/manifold assembly with splash shield
- Four hydraulic cylinders (2 right hand/passenger side/2 left hand/driver side)
- Touch Pad
- Control Box




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 the sketch above 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.

# Front Bracket Installation




The brackets used to mount the front jack cylinders are identical, but the installation process is mirrored from the driver side to the passenger side.

1. Underneath the front driver side running board, locate the front torsion bar bracket on the exterior of the frame rail.

2. Mount the Front Bracket 6-1/2" from the torsion bar bracket, placing the L-shaped flange against the underside of the frame rail (See Figure 1).

3. After preparing the area for welding, weld (3) 1-inch long evenly spaced fillet welds along the interface of each side of the vertical frame rail surface and the flanged edge of the Front Bracket (See Figure 1).

## CAUTIONS

**When welding to the chassis rail, use care to avoid damaging any of the chassis equipment. This 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.**

**Prior to welding on the chassis frame, any microprocessor controlled electronics such as engine monitoring devices and Kwikee 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.**

## Hydraulic Fittings: Front

On a workbench, install the 90° hydraulic fittings in the top and bottom openings of the jack cylinders (See Figure 2 and Figure 3). Follow the following instructions carefully.

1. Inspect components to ensure that male and female port threads and sealing surfaces are free of burrs, nicks, and scratches, or any foreign material.

2. Insert the nontapered end with the self-sealing 'O' ring into the cylinder, taking care not to nick the O-ring. Point the nipple to the best position for the hydraulic line. On the front cylinders, attach the 90° fittings on the rear facing side of the cylinder.

3. Lubricate O-ring with light coat of system fluid or a compatible lubricant to help the O-ring slide smoothly into the port and avoid damage.

4. Back off lock nut as far as possible. Make sure back-up washer is not loose and is pushed up as far as possible.

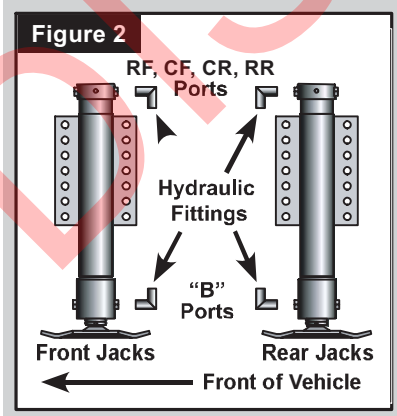
5. Screw fitting into port until the back-up washer or the retaining ring contacts face of the port. Light wrenching may be necessary. Over tightening may damage washer.

6. To align the tube end of the fitting to accept incoming tube or hose assembly, unscrew the fitting by the required amount, but not more than one full turn.

7. Using two wrenches, hold fitting in desired position and tighten locknut in a range of 170 (+/-10) in/lbs.

8. Inspect to ensure that O-ring is not pinched and that washer is seated flat on face of port.

9. Attach the Front Jack Cylinders to the Front Brackets using (4) ½"-20 x 2" Hex Bolts, (4) ½" Lock Washers, and (4) ½"-20 Nuts. Align the top pair of holes in the jack cylinder to the top pair of holes in the Front Bracket. Torque bolts to 80 - 100 lb.-ft.



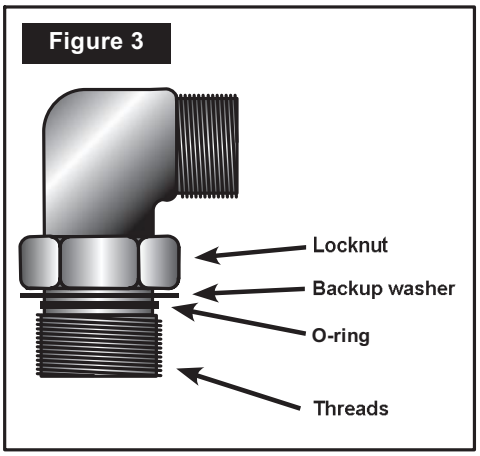



Figure 4

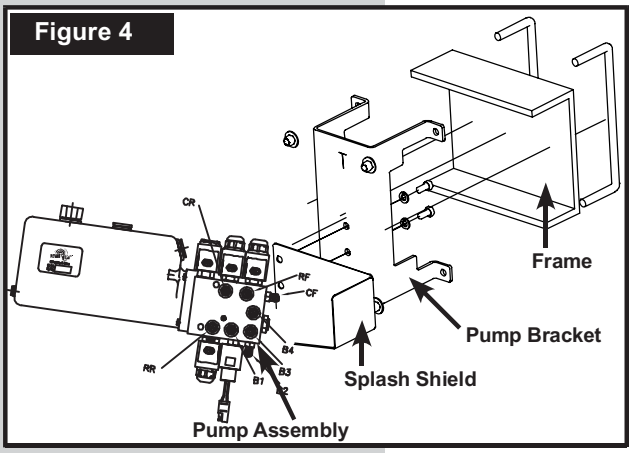
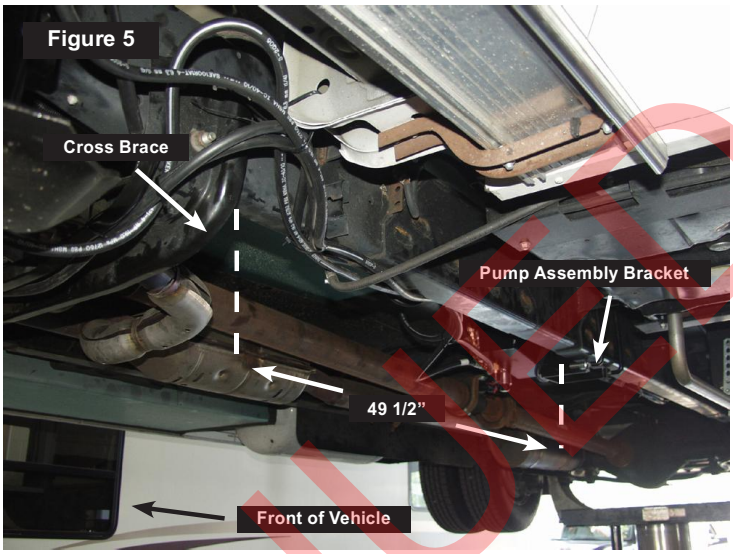



Figure 5




**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.**

Figure 6

## Pump Bracket Installation

The Pump assembly can be mounted to the Pump Bracket prior to install, but this will make the bracket heavier to lift into place.

1. To assemble the Pump components, first place the Pump Bracket on a flat surface so the “T” is right side up. Hold the Splash Shield against the Pump Bracket, so the holes align and the flanged edges are on bottom (See Figure 4).

2. Attach the Pump Manifold to the Pump Bracket using (2) 3/8”-16 x 1” Hex Head Bolts and (2) 3/8” Lock Washers, sandwiching the Splash Shield between the Pump and the
Pump Bracket. Torque bolts to 13 - 15 lb.-ft. (See Figure 4).
3. Locate the front cross brace on the RV chassis, located just before the catalytic converter (See
Figure 5).

4. Mount the Pump Bracket inside the frame rails on the driver side, 49-1/2” behind the cross brace, so that the “T” is right side up. Fasten the bracket using (2) 3/8”-16 x 9-1/2” U-Bolts, (4) 3/8” Flat Washers, and (4) 3/8”-16 Nylock Nuts (See Figure 5).

5. Prior to final tightening of the Nylock nuts, ensure that the space between the frame rail and the Pump Bracket is clear.

Figure 7

## Rear Bracket Installation

1. Locate the rear chassis cross brace. Insert the Rear Bracket into the frame rail so that the long narrow cutout on the side flanges fit over the top frame rail lip.

2. Space the Rear Bracket 5-1/2” from the rivets attaching the rear cross brace to the frame rails.

3. Attach rear crossmember between the two rear jacks. Secure the cross-member to each jack using U-bolts. Secure the support braces to the cross members and the second hole from the top.

**CAUTIONS**

**Be sure that the hoses and harnesses are not exposed to high temperature vehicle components like the engine and exhaust manifold/tailpipe. Avoid 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.**

## Hydraulic Fittings: Rear

On a workbench, install the 90° hydraulic fittings in the top and bottom openings of the jack cylinders (See Figure 2 and Figure 3). Follow the instructions carefully from the **"Hydraulic Fittings: Front" section, steps 1 - 8, on page 2** of this document.

1. After preparing the area for welding, weld a 1-inch long fillet weld at each of the four interfaces between the vertical center section of the frame rail and the bracket flanges, just above and below the semi-circular cutouts (See Figure 6).

2. Attach the Rear Jack Cylinders to the Rear Brackets using (4) ½"-20 x 2" Hex Bolts, (4) ½" Lock Washers, and (4) ½"-20 Nuts. Align the second pair of holes from the top of the jack cylinder to the top pair of holes in the Rear Brackets. Torque bolts to 80 - 100 lb.-ft. (See Figure 6).

## Attaching Hydraulic Lines

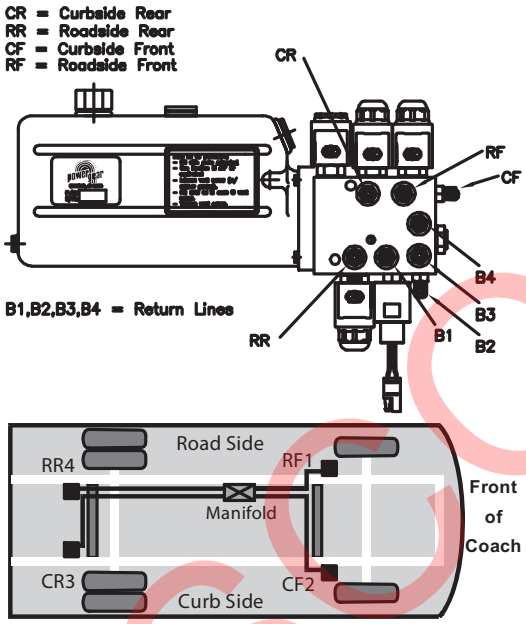
The leveling system comes with four twin line factory hydraulic hoses. Each hose is labeled on one end to correspond to a port on the manifold (See Figure 8). Starting with the hose labeled curbside rear bottom, attach the hose end to the bottom fitting on the cylinder and tighten to 220 (+/-15) in/lbs.

Attach the hose end labeled curbside rear (CR) top to the upper fitting on the cylinder and tighten to 220 (+/-15) in/lbs. (See Figure 8). Using the remaining hoses, repeat this procedure for the other cylinders.

Continue by routing and loosely securing the hydraulic lines 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 hose fittings should be connected to the manifold and tightened to 220 (+/-15) in/lbs. (See Figure 8).

**Figure 8**




**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 are routed along the outside walls of the chassis frame rails.**

**CAUTIONS**

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

## Touch Pad Installation

1. Mount control box in storage compartment that will protect the components from the elements (see figure 9).

2. Mount to ceiling with arrows towards the front end of the motorhome.

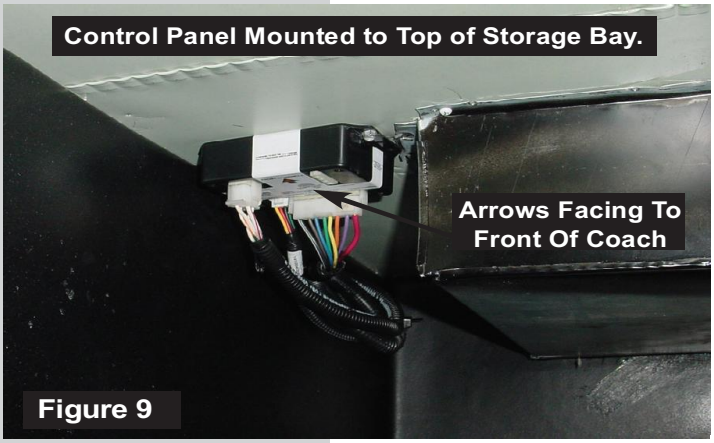
**Touch Pad**

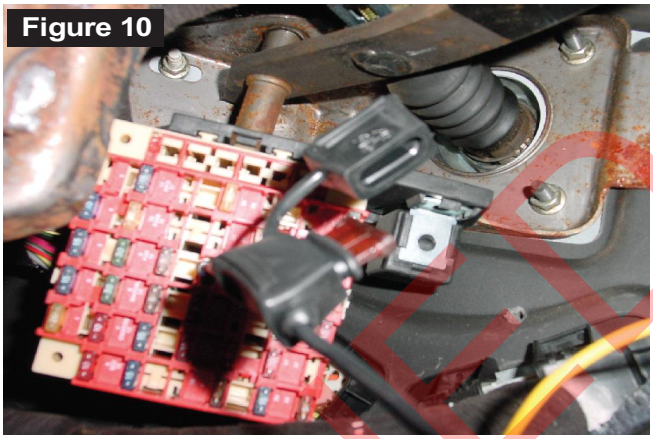

3. Route touch pad harness to where touchpad will be mounted.

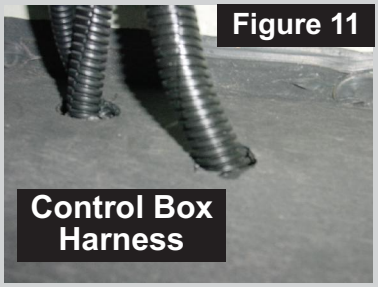
4. Route ignition harness to driver foot well. Connect red to ignition signal, blue to park brake.

5. Route the pump harness from the control box to the pump assembly.

6. Route the proper gauge wire from the pump motor solenoid to the circuit breaker and battery.




## Park Brake & Ignition Wire Harness

Route the park brake and ignition wire harness from the control panel to the driver side foot well, securing the loom with zip-ties. A 5/8" hole may need to be drilled in the firewall to accommodate the harness.

Locate the park brake switch and signal wire, usually found at the top of the park brake pedal assembly. Splice the "Blue & White" park brake wire (PKBK) to the park brake signal wire, which should be green with a red trace.

Locate the vehicle fuse box and attach the "White & Red" accessory wire (IGN) to an ignition activated circuit (circuit to be fused at a maximum of 7.5 amps). Secure the wire loom under the dash using zip-ties.

Locate the "White and Green" and "White and Orange" wires in the PowerGear harness. Cut them to 6" long and splice the ends together. Protect the splice with shrink tape or other appropriate means.

## 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 170 (+/-10) in/lbs. Also check that all the swaged hose couplers are tightened to the fittings at 220 (+/-15) in/lbs. 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, engage the parking brake, and press the ON/OFF button on the touch pad, then press and hold the manual button for four seconds. The light under the manual button will turn on. Begin extending the front cylinders then rear. 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 correctly.

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 cylinders until they reach the end of their 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 the cylinders several times to completely purge the lines of air.

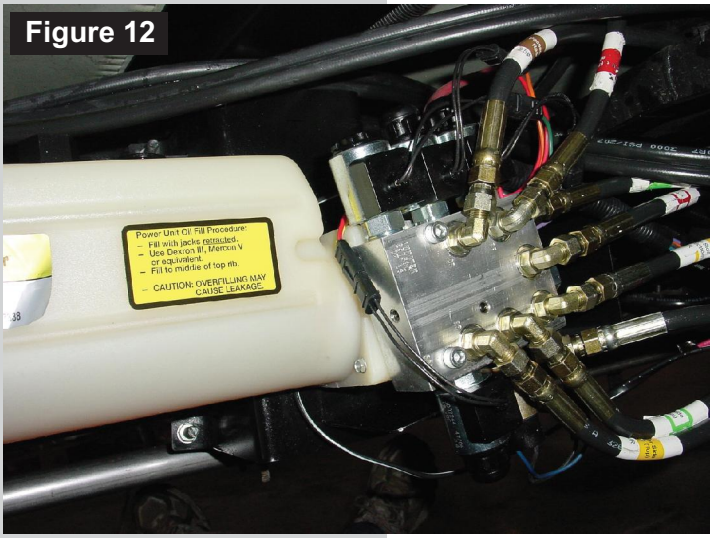
When the system has been bled, retract all cylinders and check the fluid level in the reservoir. With all cylinders fully retracted, the fluid level in the reservoir should be just visible in the filler fitting.

**CAUTIONS**

**When filling and bleeding the system, use transmission fluid only. Power Gear 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) postion.**

**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.**

Figure 12




## 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.

**WARNINGS**

**Do not use the Power Level 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.**

## Checking Hydraulics & Electronic Connections

Be sure that:

- All hydraulic fittings on the cylinders and manifold assembly have been tightened to 170 (+/-10) in./lbs.
- All hydraulic hose connections have been tightended to the fittings at 220 (+/-15) in/lbs.
- All cylinder mouting bolts have been tightend to 80 - 100 ft./lb.
- All electrical power delivery and ground connections are securely fastened.
- There are no leaks.

## Testing The System

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

***NOTE: The engine must be running and the park brake set for the Power Level system to operate.***

Operating PowerLevel is accomplished by using the buttons on the touch pad. The buttons are organized to represent the actual positions of the jacks on the coach.

Refer to wiring diagram on page 8 if needed. The control must be programmed to what is level before auto mode will function. See setting level sensor on page 7.

## Preventative Maintenance

1. Check and/or fill the reservoir with the jacks and room(s) in the fully retracted position, each month. The fluid should be one inch form the top of the reservoir.
2. Change fluid every 24 months.
3. Inspect and clean all hydraulic pump electrical connections every 12 months.
4. Remove dirt and road debris from jacks as needed.
5. If jacks are down for extended periods, it is recommended to spray exposed leveling jack chrome rods with a silicone lubricant every 5 to 7 days for protection.
6. If your coach is located in a salty environment (within 60 miles of coastal areas), it is recommended to spray the rods every 2 to 3 days with a silicone lubricant.

## Preventative Maintenance, cont'd

**Recommended Hydraulic Fluids for Your Hydraulic Pump**

•The fluids listed here are acceptable to use in your pump assebly. Contact coach manufacturer of selling dealer for information about what specific fluid was installed in your system.

•It is not recommended that hydraulic fluid and automatic transmission fluids be mixed in the reservoir.

•In most applications, Type A automatic transmission fluid (ATF, Dexron III, etc.,) will work satisfactorily. Mercon V is also recommended as an alternative fluid for Power Gear hydraulic systems.

•If operating in cold temperatures (less than -10° F) the jacks may extend and retract slowly.

•For cold weather operation, fluid specially-formulated for low temperatures may be desirable. Mobil DTE 11M, Texaco Rando HDZ-15HVI, Kendall Hyden Glacial Blu, or any Mil. Spec. H5606 hydraulic fluids are recommended for cold weather operation.

Please consult factory before using any other fluids than those specified here.

## Setting The Level Sensor

**Zero Point:** The zero point is the stored level; the orientation that the control senses as level. This can only be set when it is in calibration mode. Zero mode is indicated by all of the lights flashing on the touch pad. *If the control is in this mode, you will skip the recalibration procedure and move straight to the set-up procedure.*

**Recalibration Procedure:** *Use these steps to put the control into calibration mode.*

1. Turn the ignition on and the touch pad on.

2. Push the front button 5 consecutive times. within ten seconds, push the rear button 5 consecutive times.
   • All of the lights on the touch pad will begin flashing. This indictes that you have successfully returned the control box to calibration mode.

**Set-Up Procedure:** *Follow this procedure to reprogram a new zero point.*

1. Place a carpenter's level on the floor in the center of the coach.

2. Manually level the coach.
   • Push the front button until the front jacks contact the ground. Once they contact the ground, hold your finger on the button unitl the front jacks have lifted the front of the coach by approximately slightly.
   • Push the rear button until the jacks contact the ground. Once the rear jacks are on the ground, get the coach level from front to rear using the carpenter's level.
   • After the front to rear level is achieved, turn the the level 1/4 turn and level the coach from side to side.

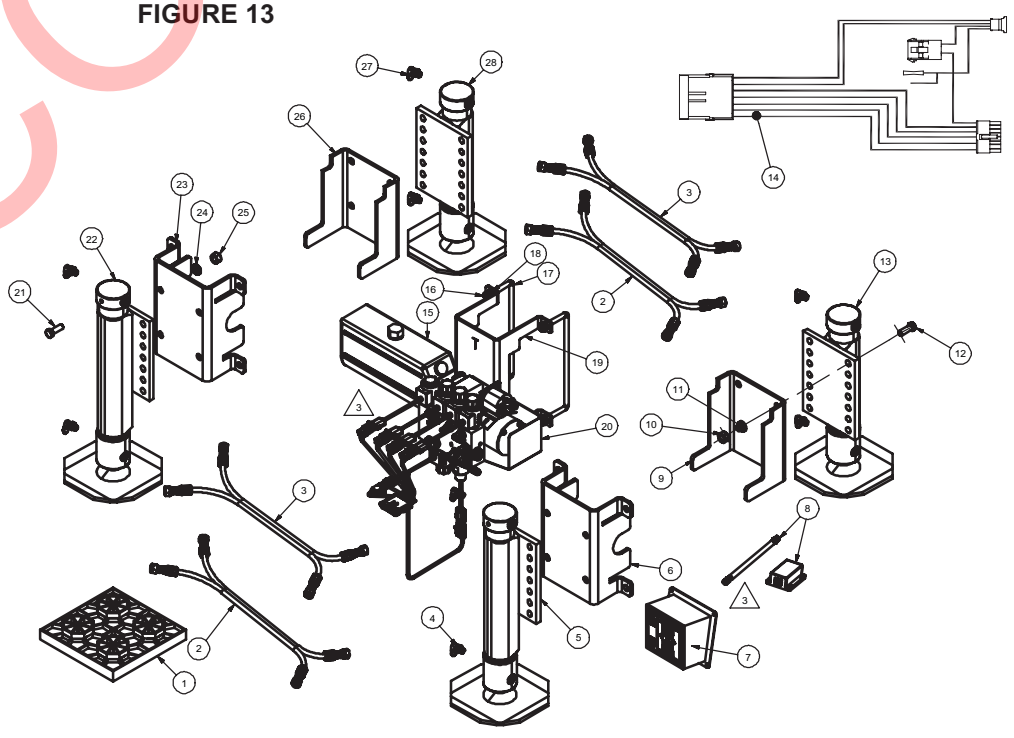
3. To store the zero point into the leveling controls, do the following:
   • Push the retract button three consecutive times to store the zero point.
   • After the retract button has been pushed 3 times, all of the lights on the touchpad will stop flashing except for the ON/OFF light. The ON/OFF light will flash for 20 seconds, then shut off. *DO NOT touch any buttons during these 20 seconds.*

**CAUTIONS**

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

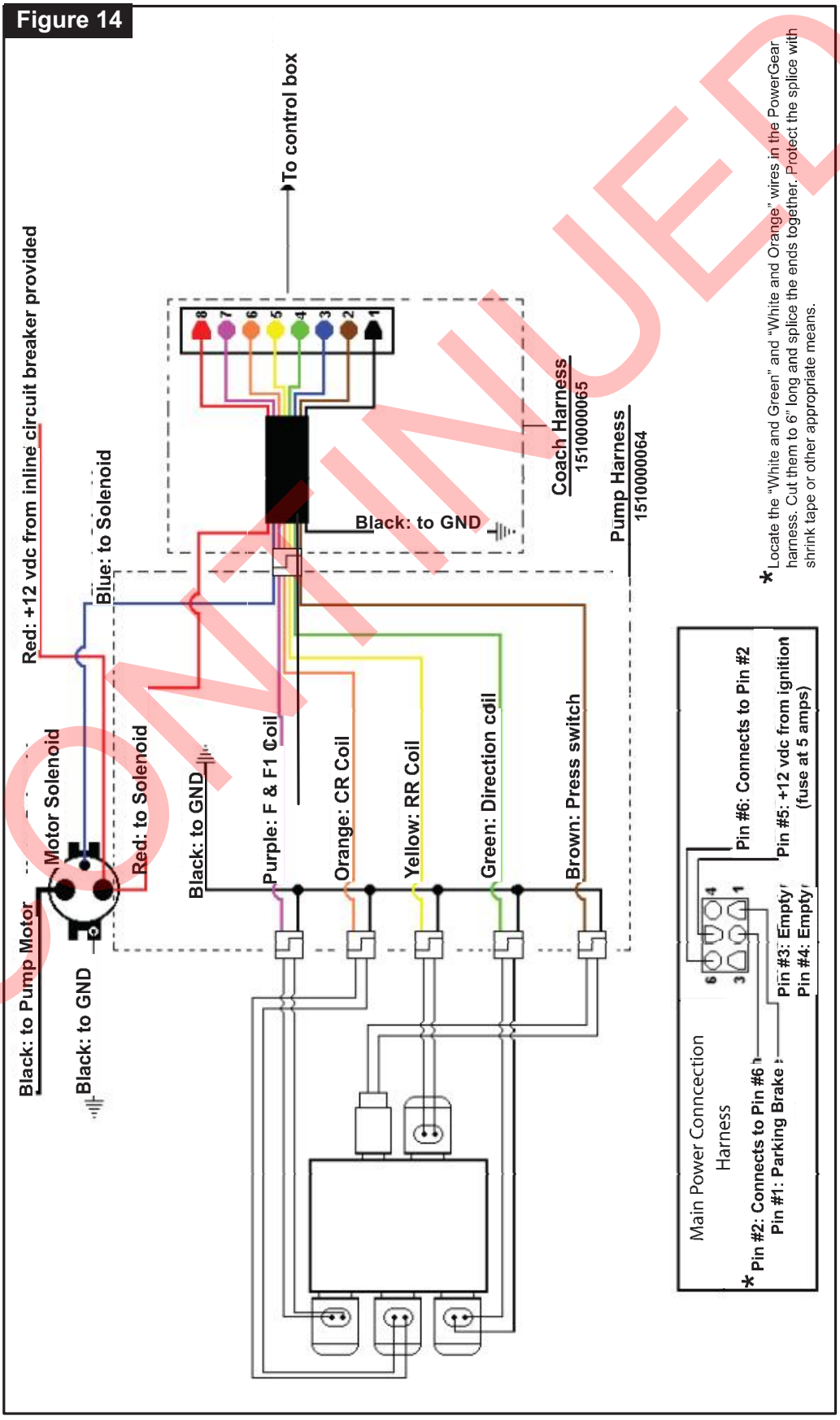
**Do not use the levelers on icy or slick surfaces on which the footpads may slip.**

**FIGURE 13**



## Wiring Diagram

**Figure 14**



## Troubleshooting Tips

### Trouble Shooting Tips

The following chart contains troubleshooting tips if your system is not operating properly, and the touch pad *is not* giving you a trouble code

| Description | Probable Cause | Corrective Action |
|---|---|---|
| Touch Pad will not turn ON | Coach ignition not in run position. | Turn on the ignition and start the coach. The engine must be running for the jacks to operate. |
| | Blown fuse or tripped circuit breaker | Replace fuse or reset breaker |
| | Auto Shut Off has | Push On/Off button to turn the control back ON. |
| Jacks will not extend. Pump *is not* running | Blown fuse or tripped circuit breaker | Replace fuse or reset breaker |
| | Batteries are weak. | Turn on the ignition and start the coach. Wait a few minutes to allow the batteries some time to charge. The engine must be running for the jacks to operate. |
| Jacks will not extend (or are extending slowly), pump *is* running | Fluid level low. | Fill tank to proper level with automatic transmission fluid, see tip sheet 140. |
| | Batteries are weak. | Turn on the ignition and start the coach. Wait a few minutes to allow the batteries some time to charge. The engine must be running for the jacks to operate. |
| Jacks will not retract fully | Air in the system | Check for coils in hose. Remove the coil if present then extend all jacks to full extension, then retract fully. Repeat 4 cycles waiting a few minutes between cycles, check fluid level in between cycles. |

## Troubleshooting Tips, cont'd

### Normal Operation: Description of Flashing Lights

The following chart contains information about different sets of flashing lights you will see during normal operation

| Flashing Lights | Mode | Description of operation | Reason |
|---|---|---|---|
| *Wait* | Wait | Will not allow operation while the wait light is flashing | The system is busy. The wait light will go out within one minute. At that time operation can be resumed. |
| *Power Gear Logo* | Already Level | The *Power Gear Logo* is flashing indefinitely | The coach is already level as it sits. However leveling can still be executed as normal (to stabilize the coach) |
| Any two of: *Front, Right, Rear & Left* | Not Level | These two lights could be ON solid or Flashing | This is normal anytime the coach is not already level. The arrows indicate the side of the coach that would need to be raised to reach level, if manual mode is used. |
| *Left, Right, Front, Rear & the Power Gear Logo* | Diagnostic Check | For approximately 5 seconds, the *Front, Right, Rear & Left* lights flash in a clockwise pattern, along with the *Power Gear Logo* | This is a normal diagnostic check anytime the ignition is turned ON. The control will either turn back OFF after this diagnostic check, or a trouble code will start to flash. |
| All lights are flashing | Emergency Retract | All of the lights are flashing, *and the jacks are retracting.* A buzzer sounds for the first 10 seconds of retract | While the jacks were extended, either the parking brake was released or the transmission was put into gear. This is normal behavior as a safety feature. This is to prevent damage to the coach or leveling system due to driving away with your jacks down. |
| All lights are flashing | Program Mode | All of the lights are flashing indefinitely. No buzzer is sounding. | This mode was intentionally entered, and cannot be entered by accident. See TIP Sheet # 153 for a description of operation in program mode. |

## Trouble Codes: Description of Flashing Lights

The following chart contains troubleshooting tips if your system is not operating properly, but the touch pad *is* giving you a trouble code

| Flashing Lights | Fault Code | Description of operation | Probable Cause | Corrective Action |
|---|---|---|---|---|
| *Low Voltage* | Low Voltage | Low Voltage light is ON solid or flashing. May or may not allow operation | Batteries are weak. | Turn on the ignition and start the coach. Wait a few minutes to allow the batteries some time to charge. The engine must be running for the jacks to operate. |
| *On/Off and Wait* | Transmission | Will not allow operation | Transmission is in gear | Place the transmission in Park (or Neutral for diesel coaches). |
| *Park Brake* | Park Brake | Will not allow operation | Parking Brake is not engaged | Engage the parking brake |
| *Left, Right, Front, Rear & the Power Gear Logo* | Excessive Slope | The lights are flashing indefinitely, but leveling is possible | 1) Too steep/uneven terrain<br>2) The control was improperly programmed | 1) Move coach to ground that is more level<br>2) See TIP Sheet # 153 to reprogram control |
| *Jacks Down & Wait* | Pressure Loss | Will not allow operation | The leveling system has a pressure leak and needs service | Take your coach to an authorized service center for repair. Note: The electronics are fine and do not need service. Only the hydraulic portion of the system needs service. |
| *On/Off , Jacks Down & Park Brake* | Communication Error | Will not allow operation | Faulty wiring, poor connections, or faulty component | Check to make sure that all connections are tight and properly connected. Cycle the ignition power to reset. If that does not work, try replacing components individually, in the following order:<br>a) Harness (between the touch pad and control)<br>b) the touch pad<br>c) the control |
| *All of the Lights are on Solid, indefinitely* | Internal Error | Will not allow operation | This is an internal error | A new control box is needed. However, a touch pad *is not* needed. |
| *Left, Right & the Power Gear Logo* | Timeout Error | Leveling operation was aborted. There are several internal timers that could have tripped. These timers are built-in to protect the hydraulic pump or the coach from being damaged.<br><br>The most common are<br>a) Jacks took too long to retract or<br>b) Jacks took too long to finish auto leveling | Batteries are weak. | Turn on the ignition and start the coach. Wait a few minutes to allow the batteries some time to charge. The engine must be running for the jacks to operate. |
| | | | Too steep/uneven terrain | Move the coach to ground that is more level |
| | | | Thick hydraulic fluid caused by cold weather | See Page 4 for recommended cold weather hydraulic fluid |
| | | | Air in the Leveling System | Check for coils in hose. Remove the coil if present then extend all jacks |

**ZERO POINT: The zero point is the stored level position — the orientation the control sees as level. This can only be set when you are in calibration mode. This mode is indicated by all of the lights flashing. *If the control is in this mode already, you can skip the recalibration procedure and move straight to the set-up procedure.***

## *Recalibration Procedure*

### RECALIBRATION PROCEDURE

Use these steps to put the control into calibration mode.
1. Turn the ignition on and the touch pad on.
2. Push the front button 5 consecutive times. Within ten seconds, push the rear button 5 consecutive times. All of the lights on the touch pad will begin flashing. This indicates that you have successfully returned the control box to calibration mode.

### SET-UP PROCEDURE

Follow this procedure to reprogram a new zero point.
1. Place a carpenter's level on the floor in the center of the coach.
2. Manually level the coach.
   - Push the front button until the front jacks touch the ground.
   - Push the rear button until the jacks contact the ground. Once the rear jacks are on the ground, get the coach level from front to rear using the level.
   - After front to rear level is achieved, turn level 90° & level coach from side to side.
3. To store the zero point into the leveling controls.
   - Push the retract button three consecutive times to store the zero point.
   - After the retract button has been pushed 3 times, all of the lights on the touch pad will stop flashing except the ON/OFF light. The ON/OFF light will flash for 20 seconds. Do not push any buttons during the 20 seconds.

## *Warranty*

**This document has been modified from the original Power Gear Rev. 0E SEP08 release. All former references to the Power Gear warranty and contact information were removed.**

**For all concerns or questions, please contact Lippert Components, Inc.**
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