



**GROUND CONTROL[®]
TT LEVELING SYSTEM
OEM INSTALLATION MANUAL**

L I P P E R T
C O M P O N E N T S[®]

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NOTE: The Ground Control® TT Leveling System is specific to travel trailer applications only.

Safety Information

NOTE: Lippert Components, Inc. (LCI) recommends that the following installation procedures should only be performed by qualified and trained personnel. Please read all Safety Information and instructions prior to starting this procedure. Lippert Components also recommends the use of appropriate Personal Protective Equipment (PPE) while performing any portion of this installation.

WARNING

Failure to follow the instructions provided in this manual may result in death, serious injury, trailer damage or voiding of the component warranty.

CAUTION

Moving parts can pinch, crush or cut. Keep clear and use caution.

Determining the Mounting Position of the Controller and Rear Sensor

NOTE: The images in this manual are designed to illustrate the installation procedure only and may not represent the exact trailer being worked on. The appearance of some components may vary from trailer to trailer.

Controller

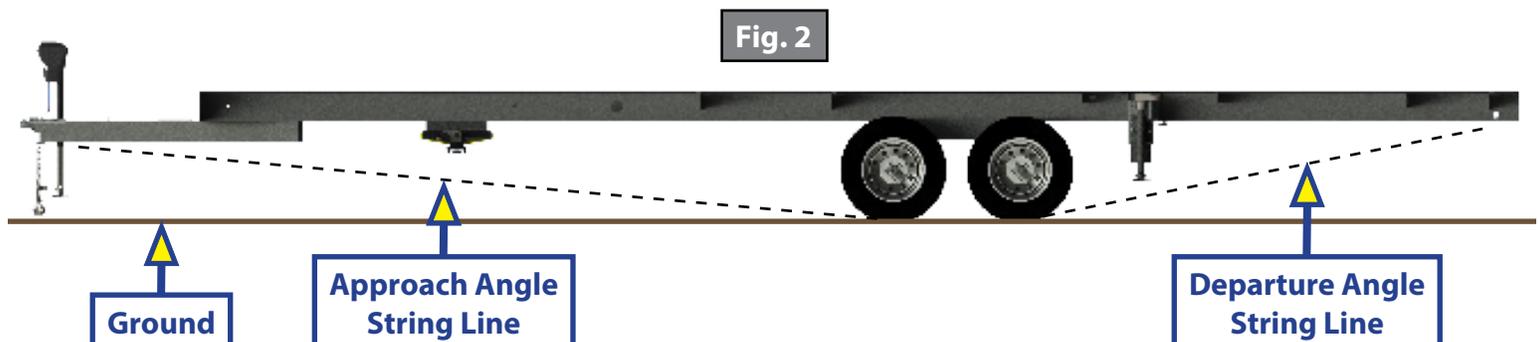
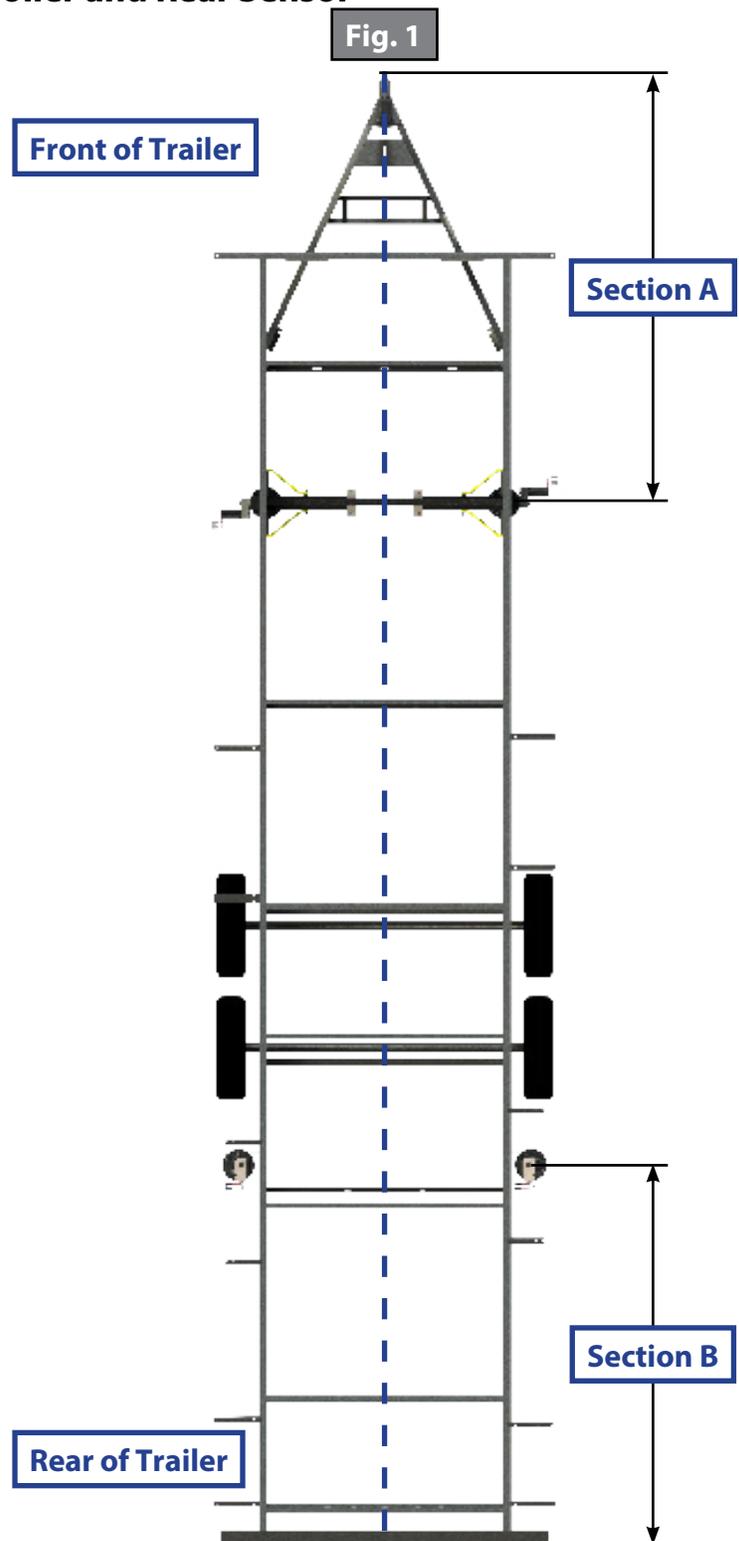
The controller can be mounted in any location that is convenient for the installer, as long as the mounting location is protected from the elements. The mounting location **MUST** also be in compliance with RVIA Gas Codes as the controller connections are not spark proof.

Leveling Sensors

The leveling sensors have a limited mounting area for proper performance. The front sensor **MUST** be in line with, or in front of, the front leveling jacks, as signified by Section A in Figure 1. The rear sensor **MUST** be in line with or behind the rear leveling jacks, as signified by Section B in Figure 1. Both the front sensor and the rear sensor **MUST** also be mounted in line with the center of the frame, as signified by the dotted blue line in Figure 1.

Measuring Departure and Approach Angle

Departure and approach angles are measured by running a string line from the meeting point of the tire and ground up at an angle to the lowest point on the front or rear of the trailer. These string lines are shown as dotted lines (Fig. 2).



Installation

NOTE: The images in this manual are designed to illustrate the installation procedure only and may not represent the exact trailer being worked on. The appearance of some components may vary from trailer to trailer.

NOTE: The Standard 5K Leveling System will include 2 C-Jacks for the front and 2 Hall Effect 5K Jacks for the rear jacks.

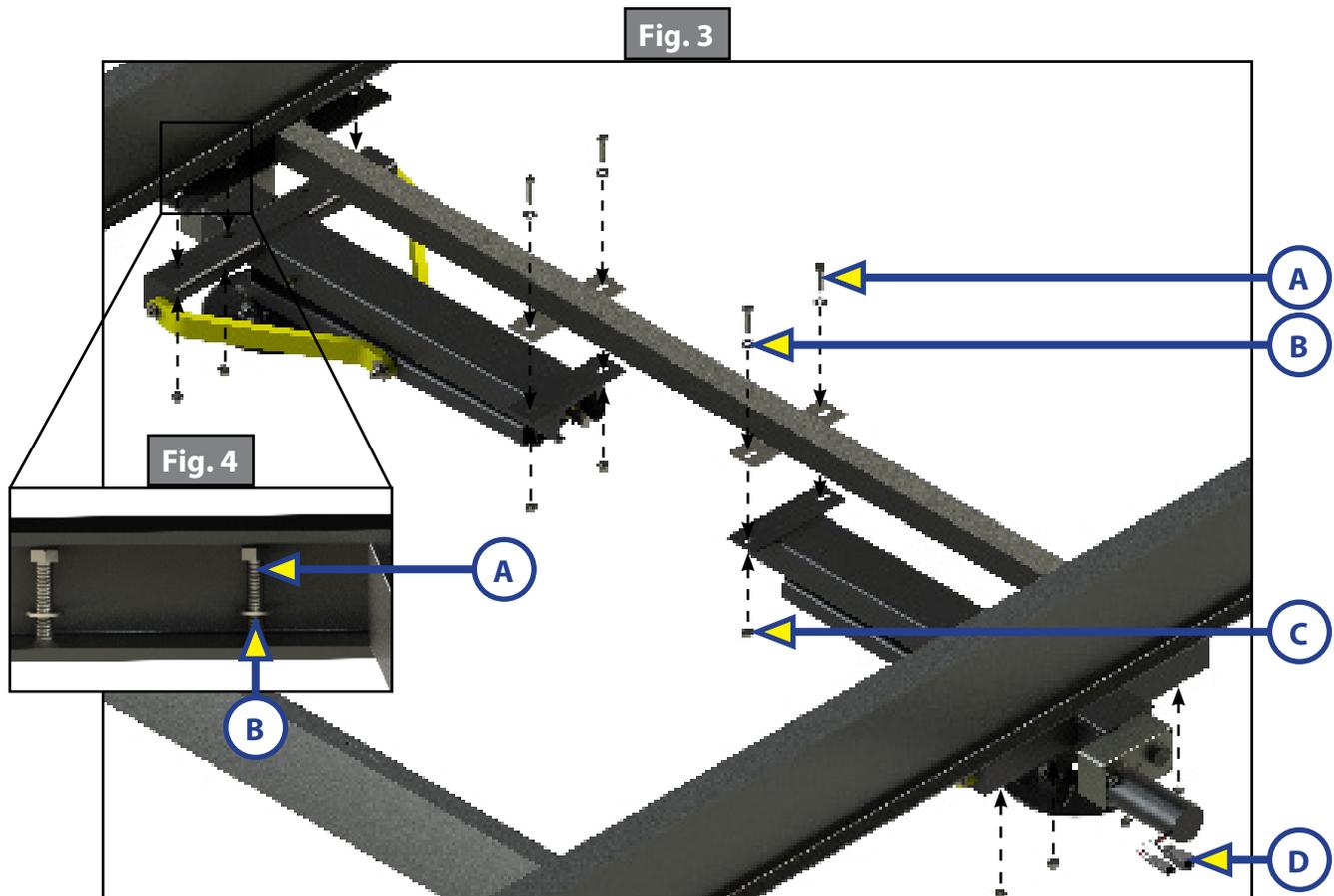
C-Jacks

1. Align the jack assembly mounting holes with the holes on the mounting bracket assembly on the main frame rail.
2. Insert six $\frac{3}{8}$ " - 16 x 1 $\frac{1}{2}$ " bolts (Fig. 3A) through each set of aligned mounting holes.
3. Secure the bolts with a $\frac{3}{8}$ " washer (Fig 3B) and a $\frac{3}{8}$ " - 16 nut (Fig 3C).

NOTE: Figure 4 illustrates the $\frac{3}{8}$ " - 16 x 1 $\frac{1}{2}$ " bolt (Fig. 4A) and $\frac{3}{8}$ " washer (Fig. 4B) configuration within the C-channel of the mounting bracket assembly.

4. Connect the wire harnesses to the C-jack motor wires (Fig. 3D) and run the harnesses to the compartment where the controller will be mounted.

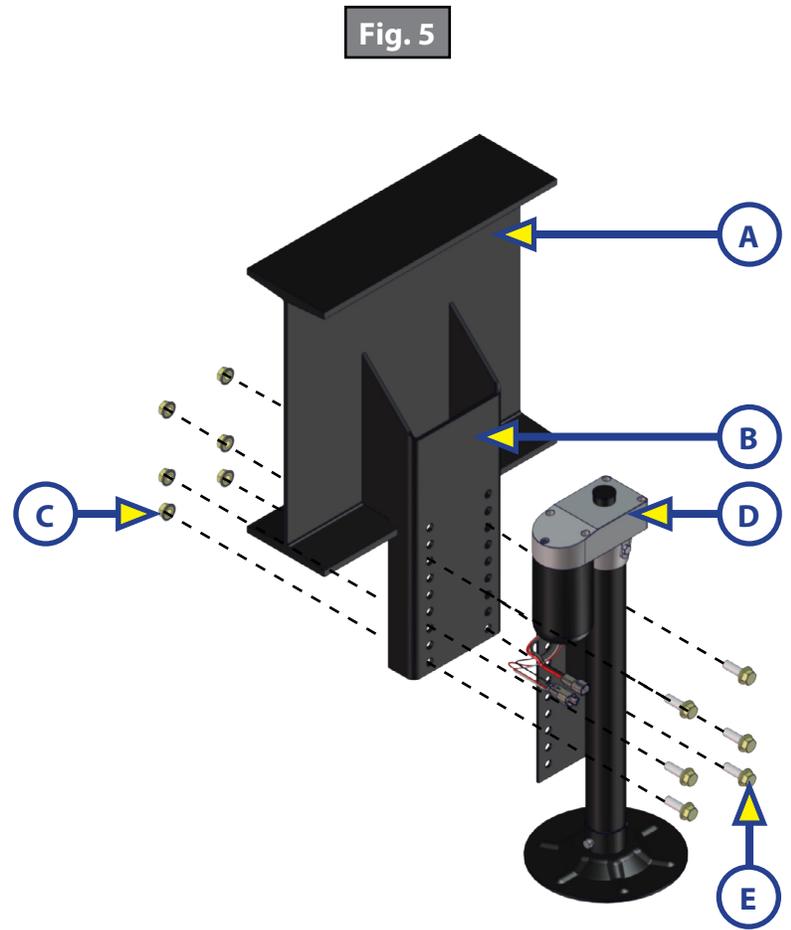
NOTE: LCI recommends zip tying the harnesses tight against the front jack motors to prevent damage to the harnesses.



Hall Effect 5K Jacks

1. Align the rear jack mounting plate holes with the holes in the rear jack mounting brackets (Fig. 5B) on the main frame rail (Fig. 5A). Set the rear jacks (Fig. 5D) at the proper height to ensure the rear jack foot pad is within the departure angle of the trailer.
2. Bolt the rear jacks (Fig. 5D) to the rear jack mounting brackets (Fig. 5B) using 6 bolts (Fig. 5E) and 6 nuts (Fig. 5C) per jack. Tighten the bolts to 90 ft-lb of torque.
3. Connect the wire harnesses to the rear jack motor wires and run the harnesses to the compartment where the controller will be mounted.

NOTE: LCI recommends zip-tying the harnesses tight against the rear jack motors to prevent damage to the harnesses.



Power Tongue Jack

1. Remove the foot pad from the Power Tongue Jack (if necessary).
 - A. Remove the hairpin cotter pin (Fig. 6D) and clevis pin (Fig. 6B) holding the foot pad (Fig. 6C) to the jack leg (Fig. 6A). Set the pins and the foot pad aside.
2. Support the trailer according to OEM instructions.
3. Carefully slide the jack leg (Fig. 7A) through the hole in the coupler (Fig. 7B) on the trailer A-frame (Fig. 7C).
4. Align the 3 holes in the Power Tongue Jack mounting plate (Fig. 8A) with the 3 holes in the coupler (Fig. 8B).
5. Secure the Power Tongue Jack to the coupler plate with three $\frac{3}{8}$ " - 16 x 1"; serrated flange grade 5 zinc coated bolts (Fig. 9).
6. Connect the red power wire from the Power Tongue Jack to a grounded 12V power supply on the trailer.

NOTE: The Power Tongue Jack **MUST** be wired through a 30 amp fused circuit.
7. Run the tongue jack harness to the compartment where the controller will be mounted.
8. Reattach the foot pad to the jack leg by sliding the foot pad back over the bottom of the jack leg. Secure it with the clevis pin and cotter pin which were previously removed.

Fig. 6

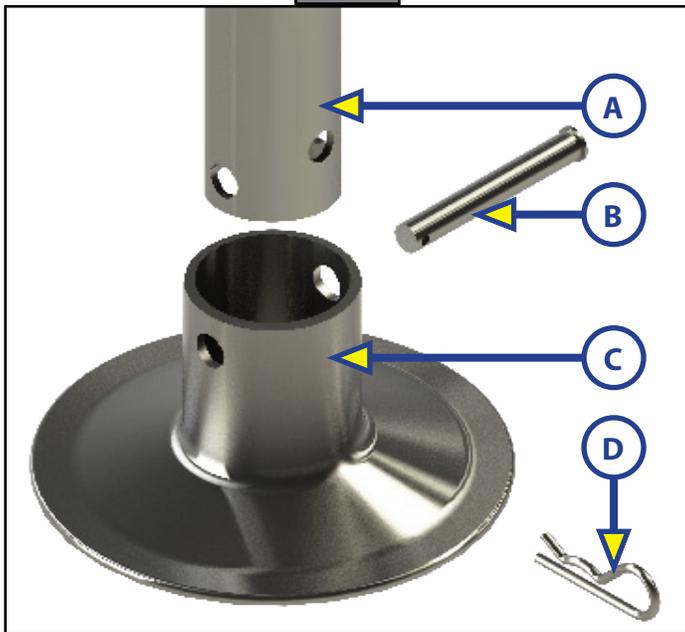


Fig. 7

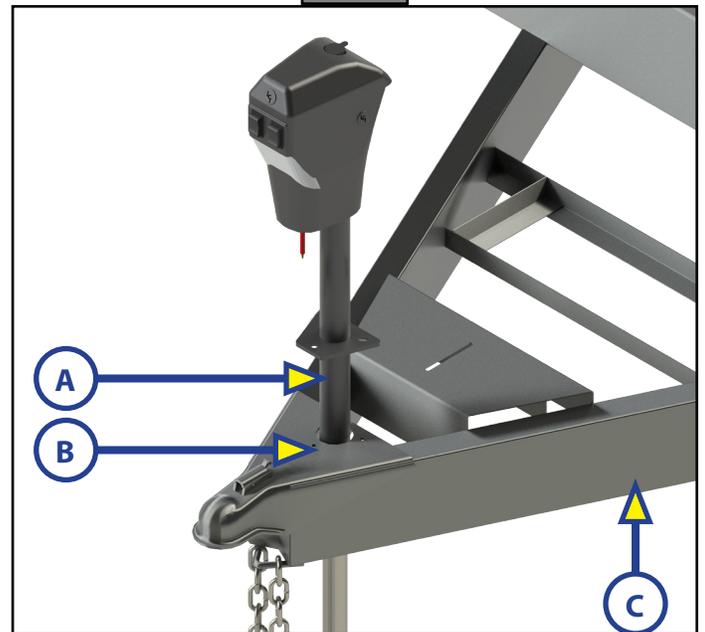


Fig. 8

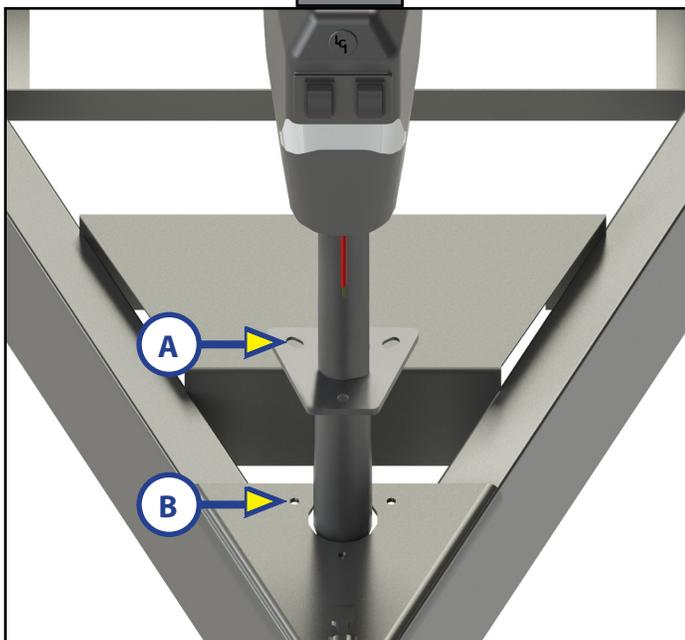
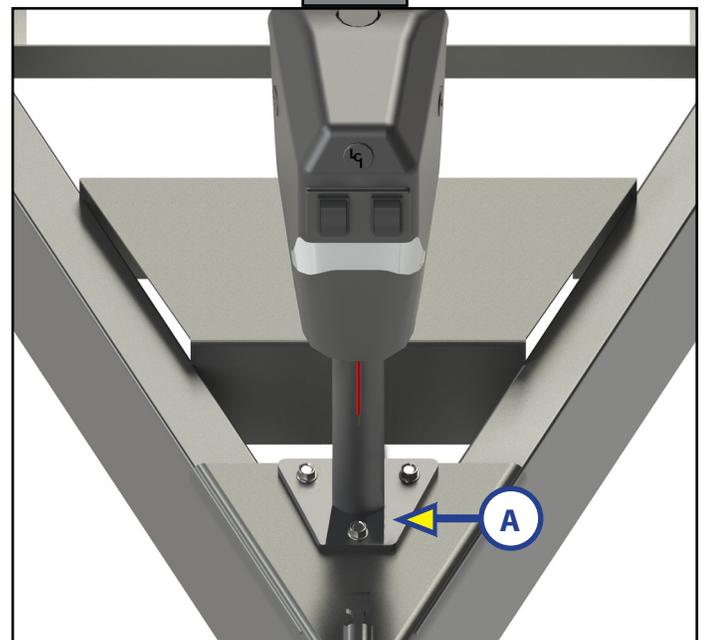
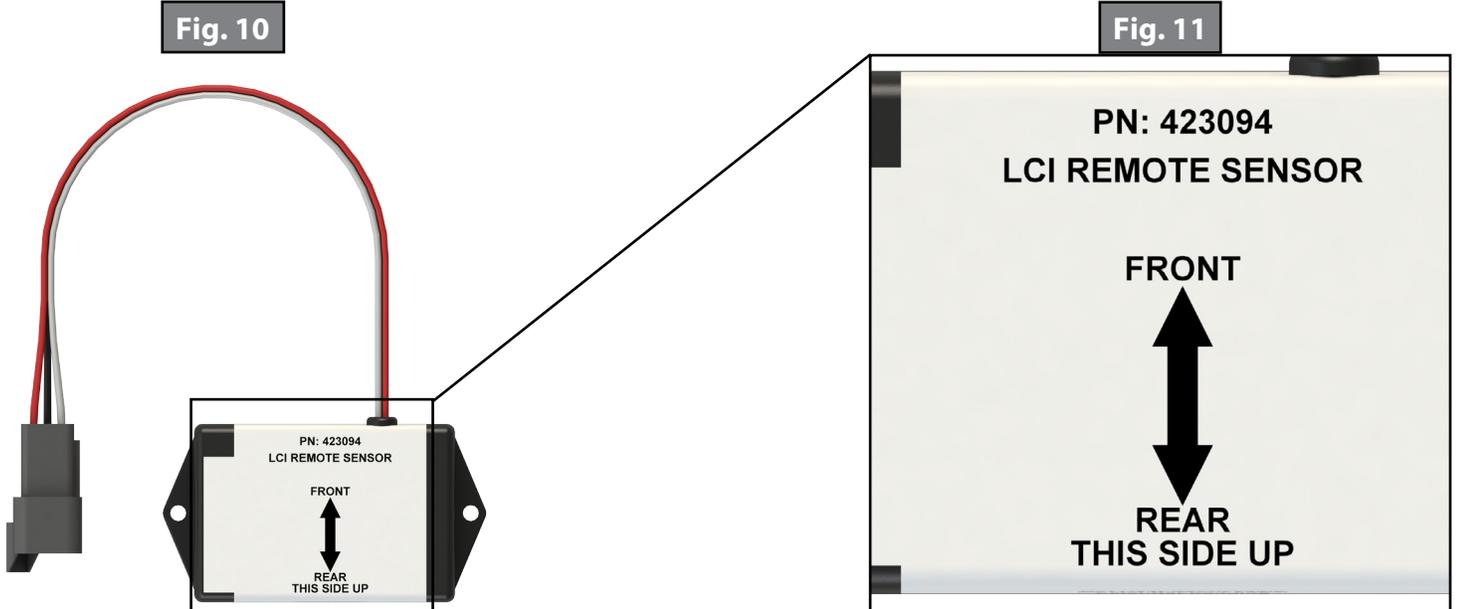


Fig. 9



Leveling Sensors

The Leveling Sensors (Fig. 10) **MUST** be installed on crossmembers in line with or behind the rear jacks, and in line with, or in front of, the front jacks, centered curbside to roadside on the trailer with the arrows on the top of the sensor pointing the correct direction (Fig. 11). See Fig. 1, Sections A and B for location clarification.



NOTE: The following process will be repeated for both sensor installations.

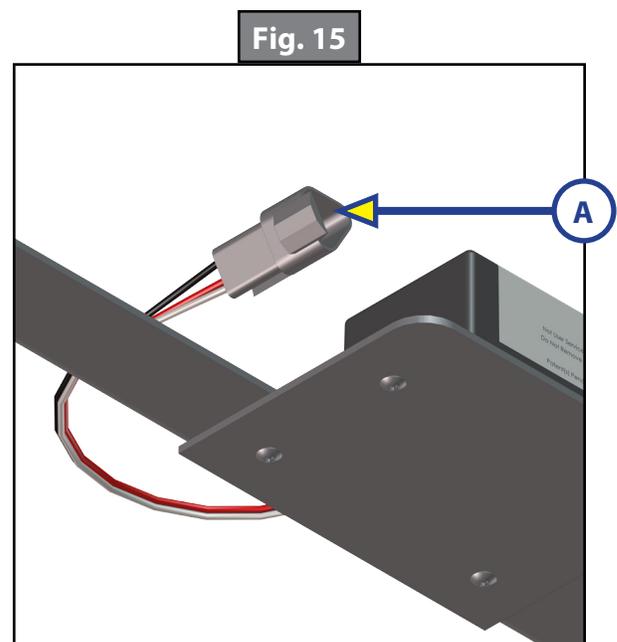
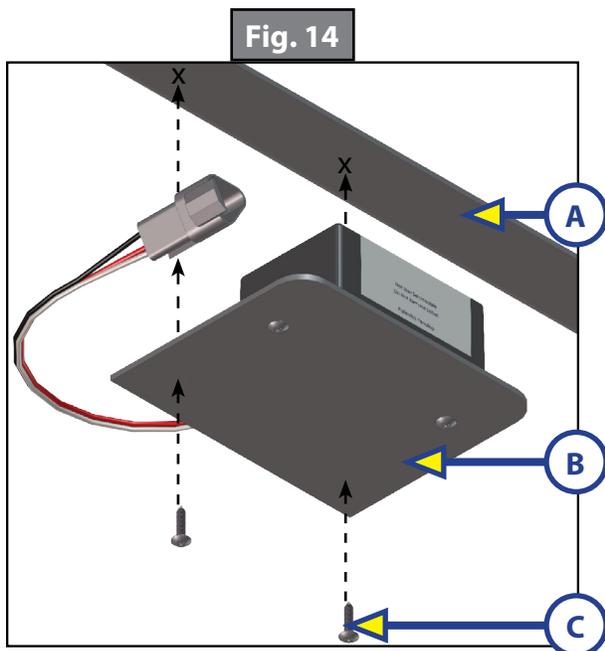
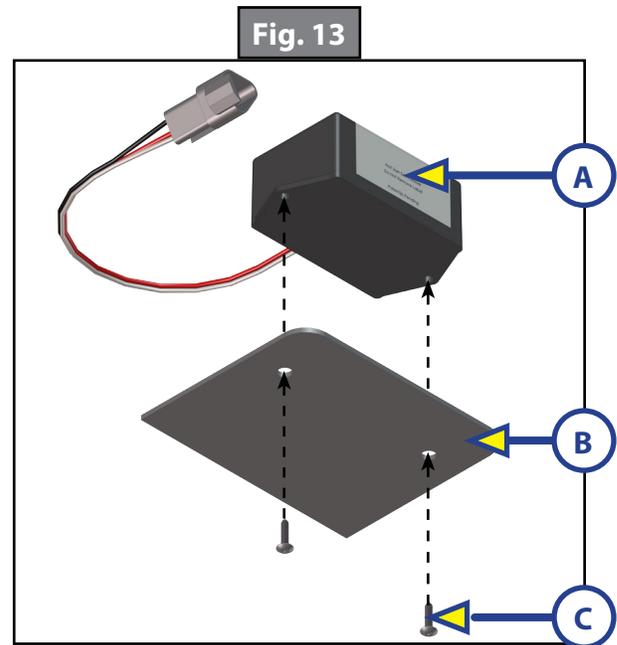
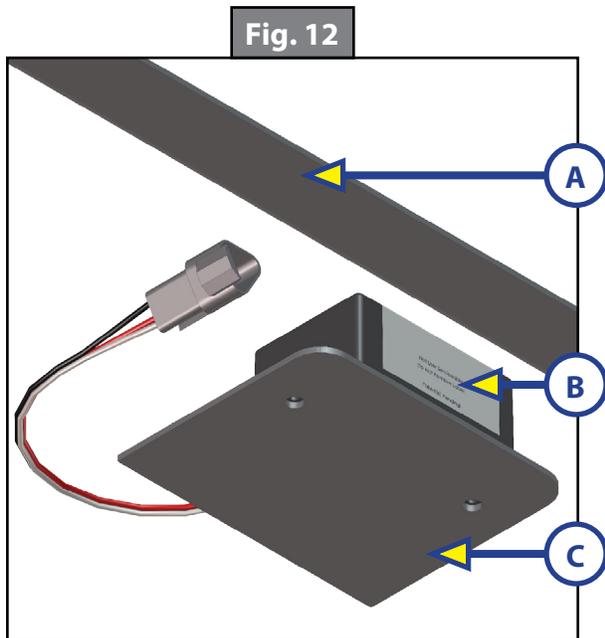
NOTE: Leveling sensor mounting plate may already be pre-installed by LCI.

1. Dry fit the mounting plate (Fig. 12C) and the leveling sensor (Fig. 12B) to the crossmember (Fig. 12A). The pre-drilled holes in the plate are for mounting the sensor to the plate. Mark on the plate where the sensor will set.

NOTE: Space between the sensor and crossmember **MUST** be left so the wire harness will not be pinched.

NOTE: The wire harness **MUST** be oriented towards the front of the trailer. Orientation is imperative for the correct operation of the leveling system.

2. Attach the sensor (Fig. 13A) to the mounting plate (Fig. 13B) using two #12 - 14 x 1" hex head self-tapping screws (Fig. 13C).
3. Attach the mounting plate and sensor assembly (Fig. 14B) to the crossmember (Fig. 14A) using two #12 - 14 x 1" hex head self-tapping screws (Fig. 14C). Ensure that the plate is centered side to side on the frame and that the sensor is oriented properly. See Fig. 1 Sections A and B for location clarification.
4. Connect the sensor harness to the connector on the sensor (Fig. 15A) and run the harness through the frame and up to the compartment where the controller will be mounted.



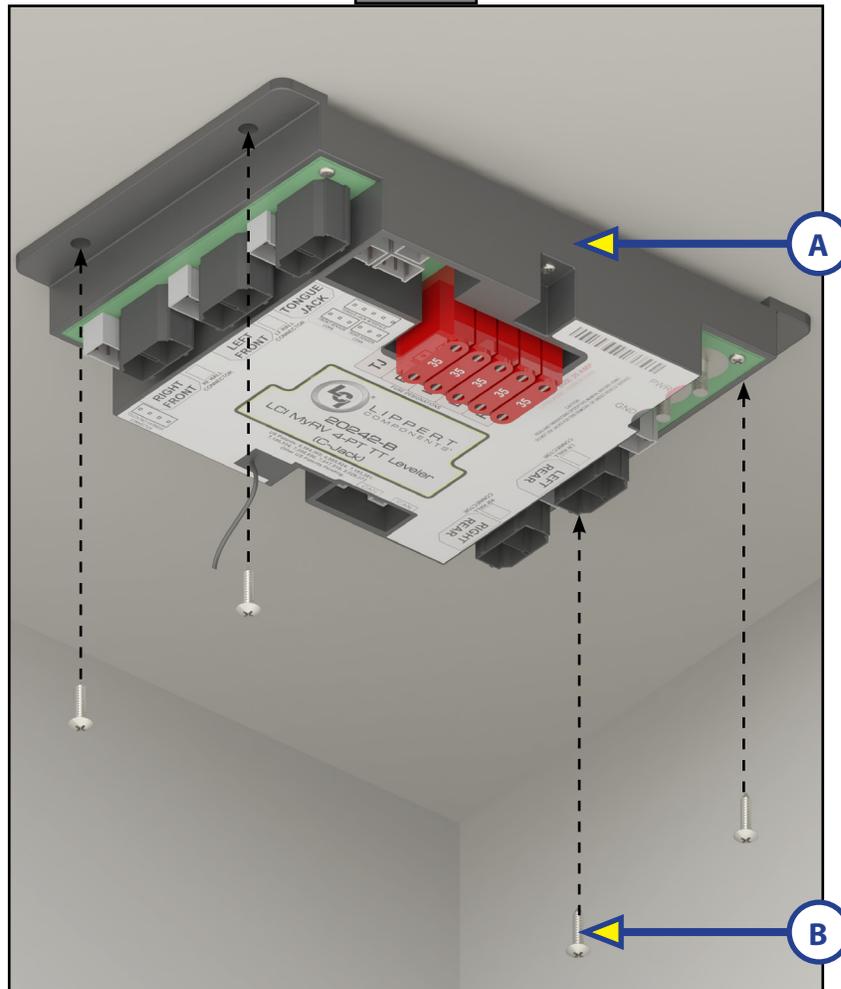
Controller

NOTE: Prior to starting this portion of the installation, double check that all of the harnesses are properly and securely connected to the leveling jacks, power tongue jack, and leveling sensors.

NOTE: The compartment where the controller will be installed **MUST** be protected from the elements and the controller **MUST** be installed in compliance with RVIA Gas Codes, as the controller connections are not spark-proof.

1. Using four #8 x 1" wood screws (Fig. 16B), attach the controller (Fig. 16A) to the compartment wall or ceiling.
2. Attach the power and ground harnesses to the corresponding posts on the controller and then connect them to the correct posts on the house battery.
3. Connect all jack harnesses to the appropriate connectors on the controller.

Fig. 16



Touch Pad

1. Determine where to mount the touch pad. The touch pad should be mounted in a compartment on the side of the trailer so the operator will have a view of the coupler while using the touch pad.
2. Remove the faceplate of the touch pad (Fig. 17A) from the mounting bezel (Fig. 17B).
3. Cut a hole in the wall of the compartment $3 \frac{3}{8}$ " wide by $2 \frac{3}{4}$ " high (Fig. 18) so the top and bottom horizontal cuts are parallel to the floor of the compartment.
4. Feed the touch pad harness through this hole and run it to the compartment where the controller is mounted. Plug the harness into the appropriate connector on the controller.
5. Insert the touch pad bezel (Fig. 19A) into the cutout and attach it with four #8 x 1" wood screws (Fig. 19B) with sufficient length to thread into the compartment wall.
6. Plug the touch pad harness into the connector on the back of the touch pad faceplate and snap the faceplate into the bezel (Fig. 20).

Fig. 17

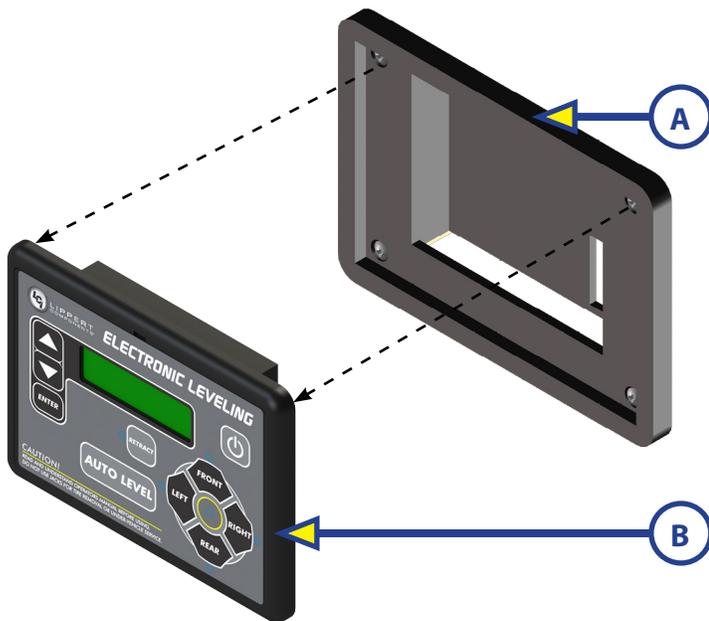


Fig. 18

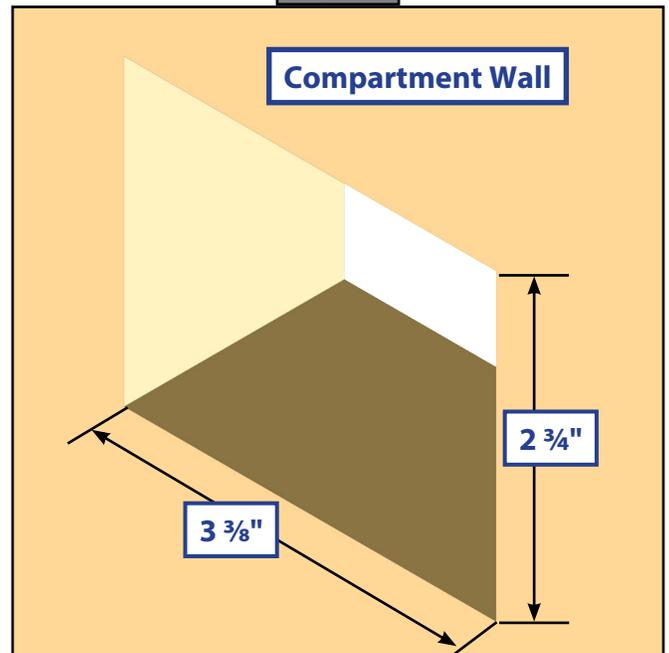


Fig. 19

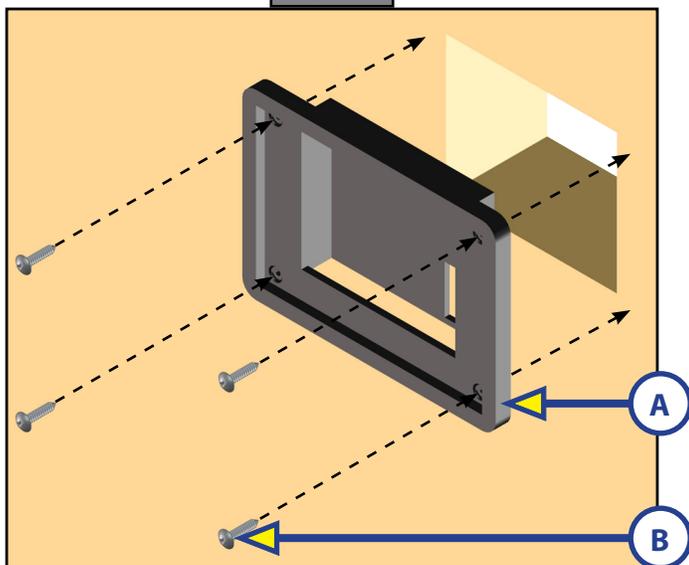
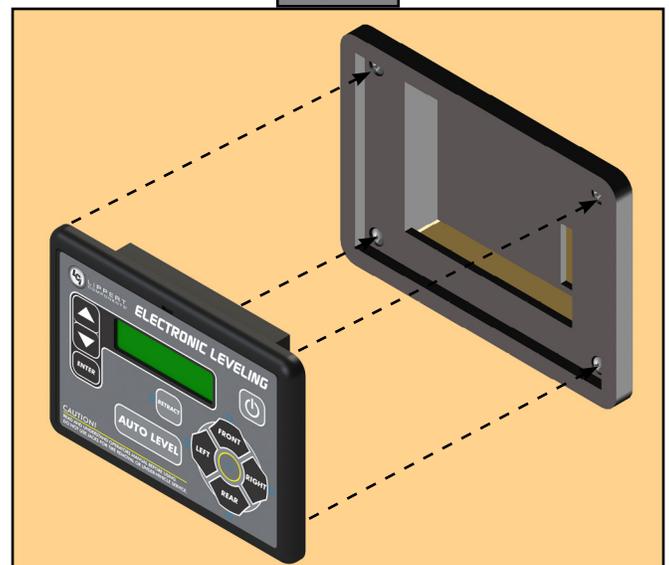
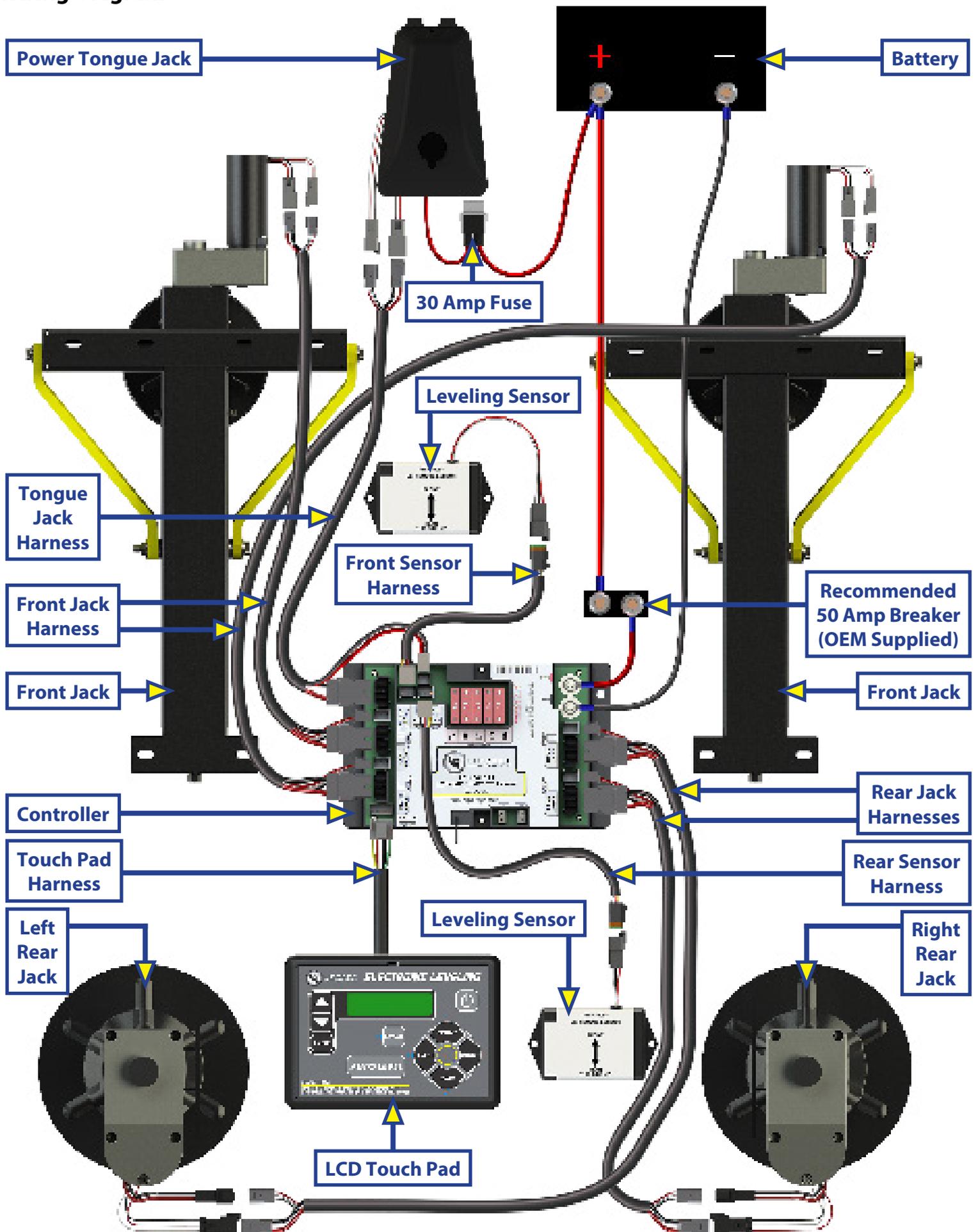


Fig. 20



Wiring Diagram

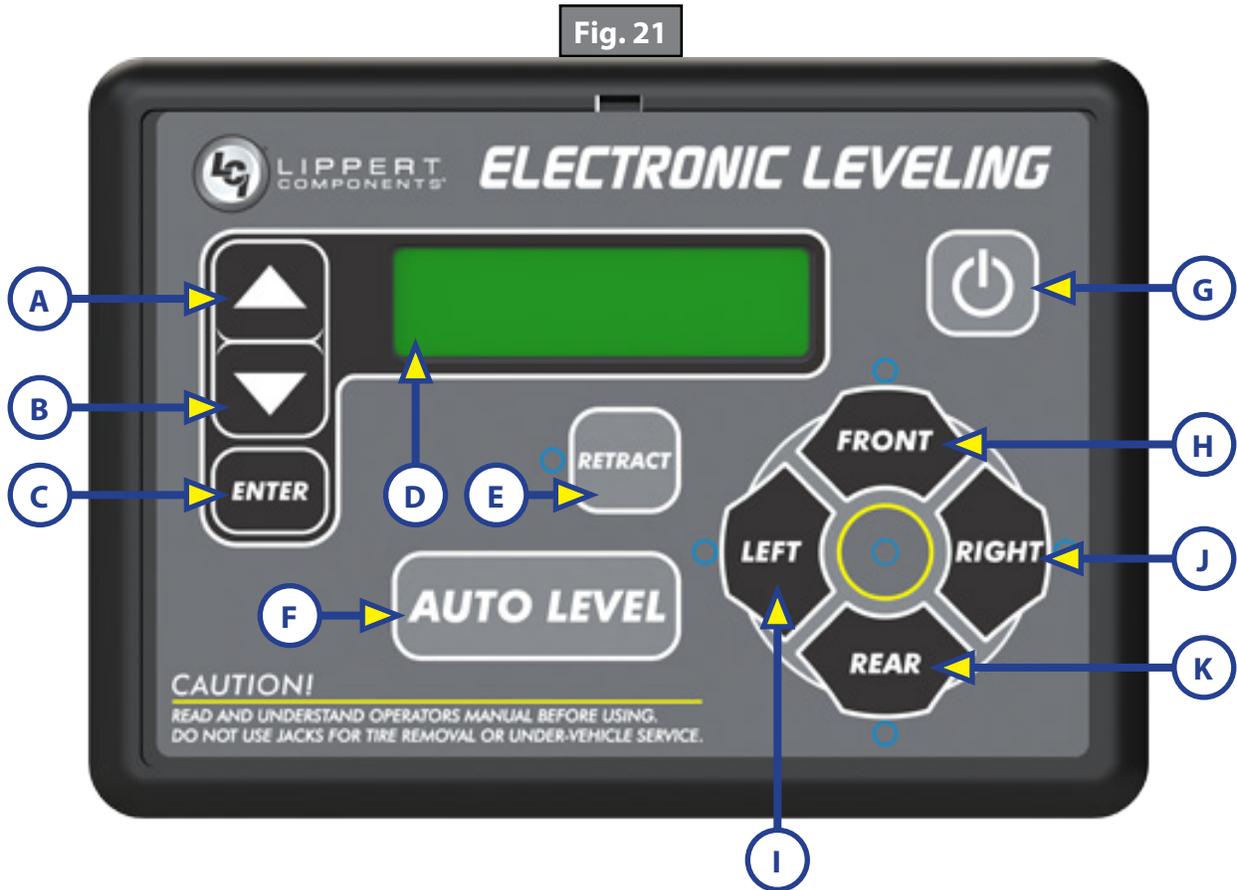


Prior to Operation

The leveling system should only be operated under the following conditions:

1. The trailer is parked on a reasonably level surface.
2. Be sure all persons, pets, and property are clear of the trailer while the leveling system is in operation.
3. Make sure battery(ies) are fully charged and test at 12+VDC under load.

Touch Pad Diagram



Callout	Description
A	Up Arrow - Scrolls up through the menu on LCD.
B	Down Arrow - Scrolls down through the menu on LCD.
C	Enter - Activates modes and procedures indicated on LCD.
D	LCD Display - Displays procedures and results.
E	Retract - Places leveling system into retract mode.
F	Auto Level - Places leveling system into auto level mode.
G	Power Button - Turns leveling system on and off.
H	Front Jack Button - Activates front jacks in manual mode.
	Front Jack Button - Activates tongue jack in standard mode.
I	Left Jack Button - Activates left jacks in manual mode.
J	Right Jack Button - Activates right jacks in manual mode.
K	Rear Jack Button - Activates rear jacks in manual mode.

Basic Jack Operation

WARNING

Be sure to park the trailer on solid and level ground. Prior to operation, clear all jack landing locations of debris and obstructions. The locations should also be free of surface depressions and moisture. When parking the trailer on extremely soft surfaces, utilize load distribution pads under each jack.

CAUTION

People and pets should be clear of the trailer while the leveling system is operated. Never lift the trailer completely off the ground. Lifting the trailer so the wheels are not touching the ground will create an unstable and unsafe condition.

NOTE: The "On" and "Off" switch (Fig. 25) controls the Power Tongue Jack's light only. If left on for an extended period of time, the light will drain the trailer's battery.

NOTE: The Power Tongue Jack is designed for vertical movement of the trailer only.

The Power Tongue Jack can be operated at any time using the buttons on the front of the tongue jack motor enclosure or by using the touch pad "FRONT" button while in standard mode.

The leveling jacks can only be extended when the touch pad is in the manual mode. Once in manual mode, pressing the "FRONT" button (Fig. 21H) will extend both front jacks at the same time. By pushing the button combination of the "FRONT" and "LEFT" (Fig. 21I), or "FRONT" and "RIGHT" (Fig. 21J) buttons, the individual front jacks can be extended. Pressing the "REAR" button (Fig. 21K) will extend both rear jacks at the same time. To extend individual rear jacks, press the button combination of "REAR" and "LEFT" (Fig. 21I), or "REAR" and "RIGHT" (Fig. 21J) buttons, depending on which jack needs to be operated.

If the touch pad is put in the retract mode, which is indicated by the orange illuminated LED next to the "RETRACT" button (Fig. 21E), both front jacks can be retracted together by pushing the "FRONT" button (Fig. 21H). Front jacks can be retracted individually by pushing the combination of the "FRONT" and "LEFT" (Fig. 21I), or "FRONT" and "RIGHT" (Fig. 21J) buttons. Similarly, the rear jacks can be retracted together by pushing the "REAR" button (Fig. 21K), or individually by pushing the combination of the "REAR" and "LEFT" (Fig. 21I) or "REAR" and "RIGHT" (Fig. 21J) buttons.

NOTE: If the leveling jacks will not operate individually using the method described above, but they operate properly when Auto Level is performed, the Twist Prevention Protection System has locked out the operation to prevent damage to the frame of the trailer.

System Settings

Homing Jacks

1. Run the system by pressing "FRONT" (Fig. 21H). A special jack error code should occur. If not, introduce the special jack error code.

NOTE: To introduce an error, disconnect 1 of the hall effect sensor wires from the controller. After attempting to operate the disconnected jack, the touch pad screen will display an error. Reconnect the hall effect sensor wire.

NOTE: In order to clear the special jack error code the jacks need to be "homed." In order to "home" jacks, each jack **MUST** be able to retract a minimum of 6".

2. Extend all jacks to reach the 6" of minimum retract needed.
 - A. Press "FRONT" (Fig. 21H) to extend the front jacks (if required).
 - B. Press "REAR" (Fig. 21K) to extend the rear jacks (if required).
 - C. Press "LEFT" and "RIGHT" (Figs 21I and Fig. 21J) simultaneously to extend the middle jacks (if equipped and required).
3. Press and hold the retract button until all of the jacks begin to retract. The jacks will retract until they reach the hard current limit.
4. The jacks are now "homed" and the special jack error code will be cleared.

NOTE: If the jacks do not retract, an error should display on the touch pad screen. This is typically caused by wiring interruption.

Zero Point Calibration

The "Zero Point" is the programmed point that the trailer will return to each time the Auto Level feature is used. The "Zero Point" **MUST** be programmed prior to using the Auto Level feature to ensure the proper operation of the system.

NOTE: Prior to starting this procedure, double check all connections on the controller, jacks, and touch pad.

5. In manual mode run the jacks to level the trailer. This is best achieved by placing a level in the center of the trailer and leveling it both front to back and then side to side. (See "Basic Jack Operation" for instructions on how to manually operate the system).
6. Once the trailer is level, turn off the touch pad.
7. With the touch pad off, press and release the "FRONT" button (Fig. 21H) 5 times and then press and release the "REAR" button (Fig. 1K) 5 times.
8. The touch pad will flash and beep and the display will read "ZERO POINT CALIBRATION ENTER to set, Power to Exit" (Fig. 22).
9. To set the current position as the zero point, press the "ENTER" button (Fig. 21C).
10. LCD display will read "Zero point stability check" (Fig. 23).
11. LCD display will read "Zero point set successfully" once process is complete (Fig. 24).
12. The system will set this point as its level state and the touch pad will turn off.

Fig. 22



Fig. 23

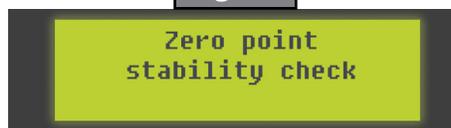
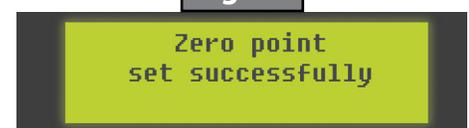


Fig. 24



Operation

Unhitching from Tow Vehicle

1. Be sure the ground surface under the Power Tongue Jack is firm and level.
2. Be sure the footpad of the Power Tongue Jack is pinned securely in place with the clevis pin and hairpin cotter pin.
3. Chock all tires of the trailer.
4. Disconnect any wires, chains, or sway control that may be equipped between the tow vehicle and the trailer. Unlatch the trailer coupler.
5. Press and hold the "EXT" button (Fig. 25A) on the Power Tongue Jack or press the "FRONT" button (Fig 21H) on the touch pad in standard mode to extend the Power Tongue Jack until the footpad touches the ground and the coupler clears the hitch ball.
6. Once the coupler is clear of the hitch ball, move the tow vehicle a safe distance away from the trailer.

Fig. 25



Auto Level

NOTE: Once the automatic leveling cycle has been started, it is important that there is no movement in the trailer until the trailer has completed the leveling process. Failure to remain still during the leveling cycle could have an effect on the performance of the leveling system.

1. After unhitching from the tow vehicle and parking the vehicle at a safe distance away from the trailer, locate the leveling touch pad on the unit (Fig. 26). It will usually be in a side compartment near the front of the trailer.
2. Press the "ON/OFF" button (Fig. 26A) and then press "AUTO LEVEL" (Fig. 26B).

Auto Level Sequence

NOTE: Sequence may vary slightly based on the height of the trailer coupler prior to leveling.

3. When the Auto Level Sequence begins, the front of the trailer will seek a position near a level state using a combination of the tongue jack and front jacks. During this sequence the tongue jack will partially retract.
4. The rear jacks will then extend and complete a rear leveling sequence.
5. When the rear leveling sequence has been completed, the trailer will adjust front to back and side-to-side.
6. Each jack will perform a final grounding touch.
7. Once this has been completed the LCD screen will read "AUTO LEVEL SUCCESS."
8. The LED screen will then read "READY" followed by the current battery voltage. The green LED in the center of the four leveling jack buttons will be illuminated (Fig. 27A).

NOTE: If the "AUTO LEVEL" sequence does not perform as described above, place the system in manual mode and test that the jacks operate correctly by pushing their coordinating buttons on the touch pad; i.e. "FRONT" button operates only the front jacks, etc. If the jack functions are incorrect, check that the correct jack wiring harnesses are plugged into the correct ports on the controller.

Fig. 26



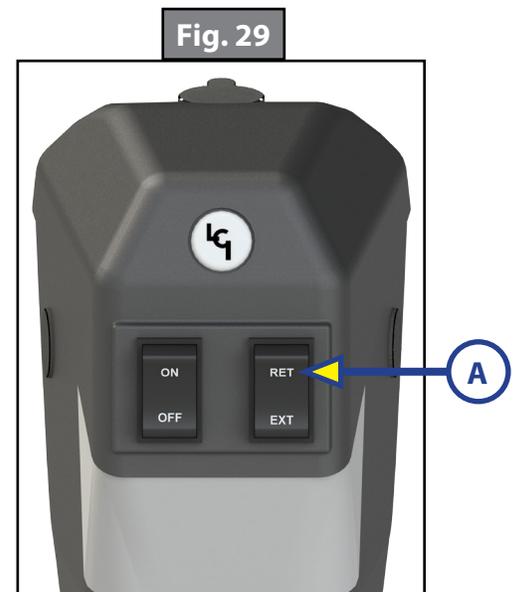
Fig. 27



Reconnecting To Tow Vehicle

1. Press the "ON/OFF" button to turn panel on (Fig. 28B).
2. Press the "UP ARROW" (Fig. 28A) button on the touch pad until "AUTO HITCH HGT, ENTER TO BEGIN" is displayed on the LCD. Press the "ENTER" button (Fig. 28C).
3. The rear leveling jacks will retract, followed by the tongue jack extending to the ground, then followed by the front leveling jacks retracting. The tongue jack will then adjust the height of the front of the trailer coupler to the point at which the "AUTO LEVEL" button was most recently pressed.
4. Press the "ON/OFF" button to turn system off (Fig. 28B).
5. Back the tow vehicle into position to align the tow vehicle hitch and trailer coupler with each other.
6. Press and hold "RET" on the tongue jack to retract the tongue jack (Fig. 29A) until the coupler sets into position on top of the tow vehicle hitch.
7. Latch the tow vehicle hitch and connect any wires, chains or sway control that may be equipped between the tow vehicle and trailer.
8. Press the "RET" button (Fig. 29A) twice and then press and hold the "RET" button for 3-5 seconds to engage the tongue jack's auto retract feature.

NOTE: The "RET" button (Fig. 29A) can also be pressed and held until the jack is fully retracted.



Troubleshooting

Touch Pad Error Codes

NOTE: To clear an error from the touch pad, repair or otherwise correct the issue, then press "ENTER." If the error is still present, the message will be displayed again.

Touch Pad Error Codes		
LCD Message	What's Happening?	What Should Be Done?
****ERROR**** Excess Angle	Excessive angle reached during auto operation.	Relocate the trailer.
****ERROR**** Excessive Angle	Excessive angle reached during manual operation.	Stop manual operation and reset jacks to a more level state. The code will self clear, there is no need to hit "ENTER."
****ERROR**** Feature Disabled	Hitch recognition requested but no hitch height set.	Perform "AUTO LEVEL" sequence to establish hitch height.
	Zero point not set.	Set zero point.
****ERROR**** Low Voltage	Battery voltage dropped below 9.5V.	Check wiring - repair or replace.
		Test battery voltage under load - charge or replace.
****ERROR**** Out Of Stroke	Jack has reached maximum stroke length and is unable to lift.	Check disposition of jacks. Relocate the trailer.
	Unexpected high amp current stall.	Check jacks in manual mode or perform manual override procedure. Repair or replace as needed.
		Check for bent or damaged jacks. Repair or replace as needed.
****ERROR**** External Sensor	Bad connection or wiring from the controller to the leveling sensor.	Replace or repair connection to leveling sensor.
****ERROR**** Jack Timeout	Time limit exceeded for the requested auto operation.	Check disposition of jacks.
****ERROR**** Auto Level Fail	Unable to auto level due to uneven ground.	Check disposition of jacks. Relocate the trailer.
	Unable to auto level due to zero point being set incorrectly.	Reset zero point.
****ERROR**** Comm Error	Communication between controller and touch pad has been lost.	Check harness for proper connections or damage. Replace if necessary.
****ERROR**** Bad Calibration	Sensor calibration values are out of range.	Replace controller.
ABORT Function Aborted	The user pressed a button on the touch pad during an automatic operation.	Restart automatic operation and then refrain from pressing any buttons on the touch pad.
****ERROR**** Hall Power Short	Short circuit detected in one of the hall effect power wires.	Test for short and repair or replace.

Special Jack Error Codes

To clear one of the error codes listed below:

1. Correct or otherwise repair the issue (see the table below).

NOTE: In order to clear the special jack error code the jacks need to be "homed." In order to "home" jacks, each jack MUST be able to retract a minimum of 6".

2. Extend all jacks to reach the 6" of minimum retract needed.
 - A. Press "FRONT" (Fig. 21G) to extend the front jacks (if required).
 - B. Press "REAR" (Fig. 21J) to extend the rear jacks (if required).
3. Press and hold the retract button until all of the jacks begin to retract. The jacks will retract until they reach the hard current limit.
4. The jacks are now "homed" and the special jack error code will be cleared.

NOTE: If the jacks do not retract, an error should display on the touch pad screen. This is typically caused by wiring interruption.

Special Leveling Jack Error Codes		
LCD Message	What's Happening?	What Should Be Done?
ERROR LF Jack RF Jack LR Jack RR Jack Tongue Jack	Error at a specific jack (left front, right front, left rear, right rear, tongue jack). <ul style="list-style-type: none">• Hall signal issue (open, short, malfunction or loss of communication)• Open or short circuit between controller and motor.	Check harness connections at controller and at jack. Check harness for damage. Check fuses at controller. Repair or replace as necessary.

⚠ CAUTION

Moving parts can pinch, crush or cut. Keep clear and use caution.

Manual Override

NOTE: For ease of manual override it is recommended to unplug the power harness to the motor prior to performing the manual override procedure.

NOTE: Use of a 12-18 volt cordless screw gun or pneumatic screw gun is acceptable to manually override the jacks. Do not use an impact screw gun to perform any of the override procedures, as this may damage the motor. If manual override is necessary there are two options for each style of jack.

Front Jack-Jack Motor Override:

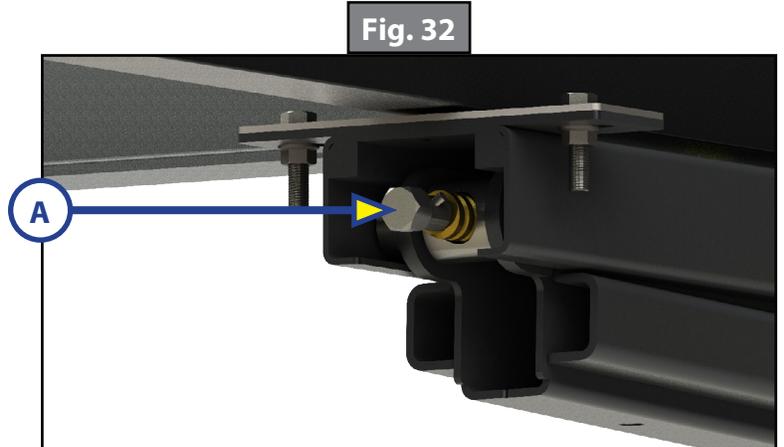
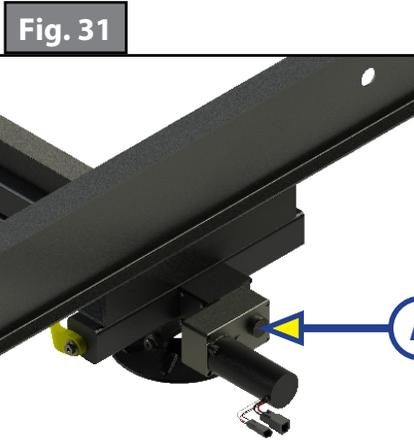
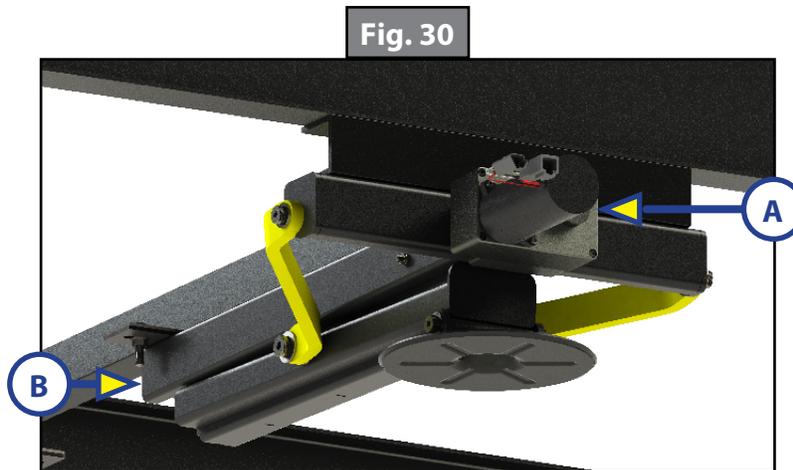
Tools needed: $\frac{3}{8}$ " drive ratchet and extension (no socket)

1. Find the port on the top of the jack motor (Fig. 30A).
2. Remove the rubber plug (Fig. 31A).
3. Insert the $\frac{3}{8}$ " drive into the port.
4. Turn the override until the jack extends or retracts to desired position.

Front Jack-Jack Manual Override Nut:

Tools needed: $\frac{3}{4}$ " socket wrench

1. Locate the manual override nut (Fig 30B).
2. Place $\frac{3}{4}$ " socket wrench over the manual override nut (Fig. 32A) and turn the override nut until the jack extends or retracts to desired position.



Rear Jack - Top of Jack Motor Override:

Tools needed: $\frac{3}{8}$ " drive ratchet and extension (no socket)

1. Find the port on the top of the jack motor (Fig. 33A).
2. Remove the rubber plug (Fig.34).
3. Insert the $\frac{3}{8}$ " drive ratchet into the port (Fig. 35).
4. Turn the override until the jack extends or retracts to desired position.

Rear Jack - Bottom of Jack Motor Override:

Tools needed: $\frac{3}{8}$ " drive ratchet and extension, $\frac{5}{16}$ " socket

5. Find the port on the bottom of the jack motor (Fig. 33B).
6. Remove the rubber plug (Fig. 36A).
7. Insert the $\frac{5}{16}$ " socket into the port (Fig. 37).
8. Turn the override until the jack extends or retracts to desired position.

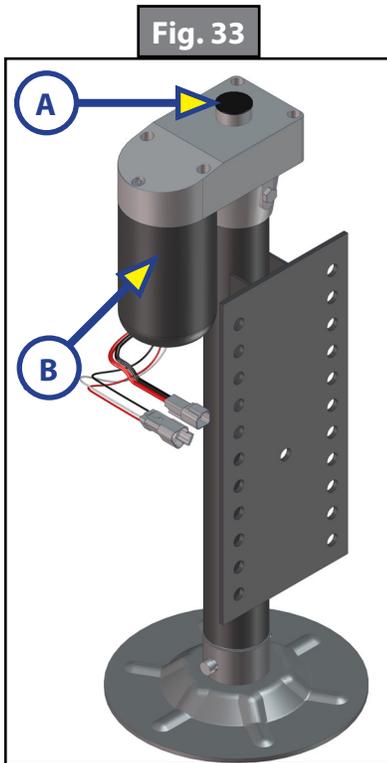


Fig. 33

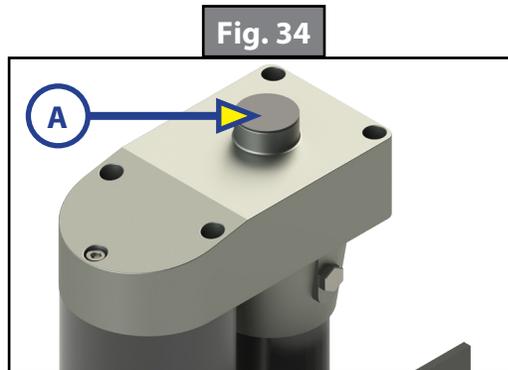


Fig. 34

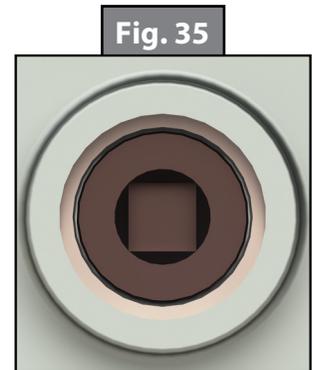


Fig. 35

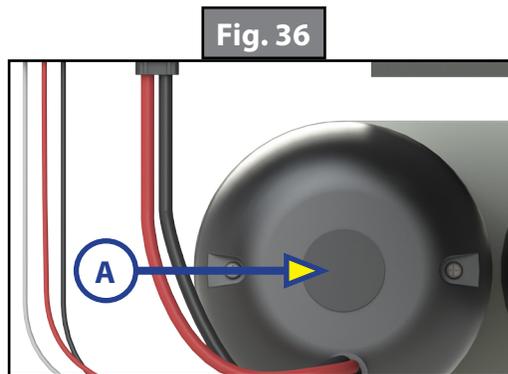


Fig. 36

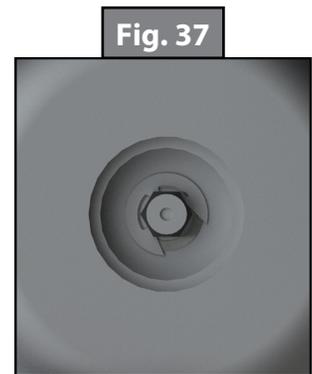


Fig. 37

Preventive Maintenance

1. For optimum performance, the system requires full battery current and voltage. The battery **MUST** be maintained at full capacity.
2. Check the terminals and other connections at the battery, the controller, and the jacks for corrosion, and loose or damaged connections.
3. Remove dirt and road debris from jacks as needed.
4. If jacks are down for extended periods, it is recommended to spray exposed leveling jack rods with a silicone lubricant every three months for protection. If the coach is located in a salty environment, it is recommended to spray the rods every 4 to 6 weeks.



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