



Service Guide

June 2003

The **Level Best Service Guide** has been organized to facilitate quick and easy diagnostics and trouble shooting for the most common installation problems and serviceable part failures.

Each segment of the **Service Guide**, labeled 1-6, begins with a diagnostics flow chart illustrating the steps involved in the trouble shooting process. The flow charts are divided into alphabetical sections that correspond to the instructions that immediately follow the chart.

How to use the Service Guide:

1. Use the **Table of Contents** to locate a topic area that best matches the symptoms.
2. Examine the flow chart at the beginning of the segment you select.
3. Review the system checks and maintenance procedures that correspond to the problem.
4. Follow the recommended steps to repair the system.
5. If system failure continues after completing the diagnostics and recommended repairs, call 1-800-738-9961.

LEVEL BEST Service Guide



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LIMITED WARRANTY

Kwikee Products Company, Inc. ("Kwikee") warrants to the original purchaser that the Level Best® hydraulic leveling/stabilizing system is free from defects in material and workmanship for a period of 5 years from the date of purchase. Kwikee's obligation under this warranty is limited to the repair or replacement of defective parts returned to Kwikee's factory.

Kwikee will pay for the labor required to repair or replace its products on claims submitted within 2 years of the date of purchase. The warranty on repaired or replaced parts shall be limited to the unexpired duration of the original warranty.

This warranty does not apply to products or parts that, in Kwikee's opinion, have been subject to abuse, accident, alteration, improper installation/repair, inadequate maintenance or deterioration due to normal wear. This warranty does not apply to electrical wiring or hydraulic hoses. The purchaser shall pay all shipping or other transportation charges for any warranty claim.

Kwikee makes no warranty (and disclaims any implied warranty) regarding the merchantability, fitness for a particular purpose or the suitability of this product for use with other products. In no event shall Kwikee be liable for incidental, consequential or property damage arising from the purchase and/or use of this product or any claim hereunder. This warranty is in lieu of all other express and implied warranties. Kwikee neither assumes nor authorizes any other person to assume any liability for warranty claims not provided herein.

This warranty gives you specific legal rights including other rights that may vary from state to state. Some states do not allow limitations on implied warranties and exclusion or limitation of incidental or consequential damages, therefore the limitations and exclusions contained herein may not apply to you.

Any questions regarding warranty claims should be directed to your dealer or contact Kwikee Products Company. Address correspondence to: Kwikee Customer Service Representative, 230 Davidson Ave., Cottage Grove, Oregon 97424; or contact us by telephone at 1- (800) 736-9961.

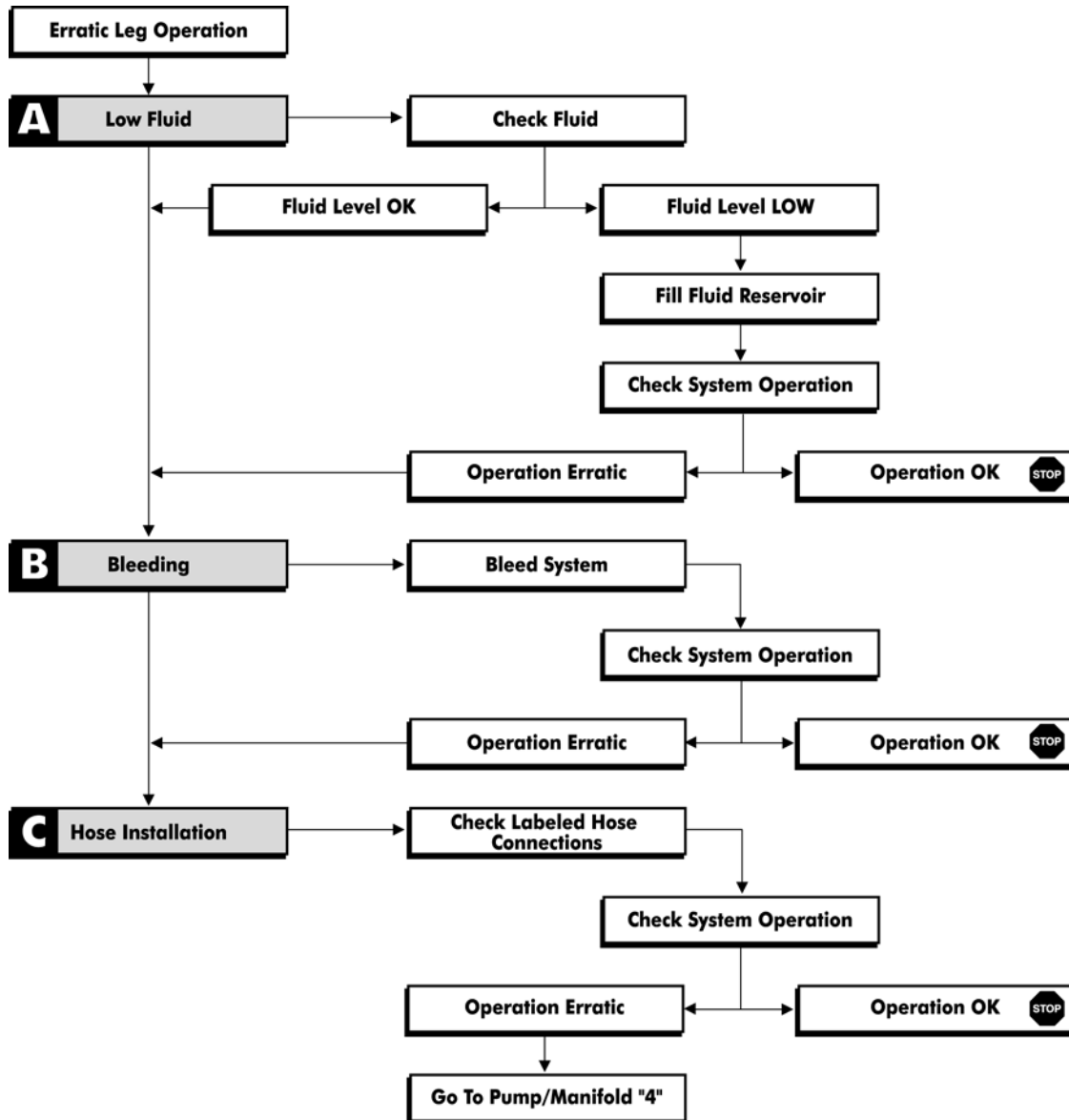
NOTE: Any parts returned for warranty service/repair with wires cut will result in voiding of the warranty.

NOTE: It is important to read and understand this manual thoroughly before initiating any installation of the jacks. Kwikee Products Company, Inc., assumes no liability for damages or injury resulting from the improper installation or operation of the Level Best® Hydraulic Leveling/Stabilizing System.

SEGMENT

1

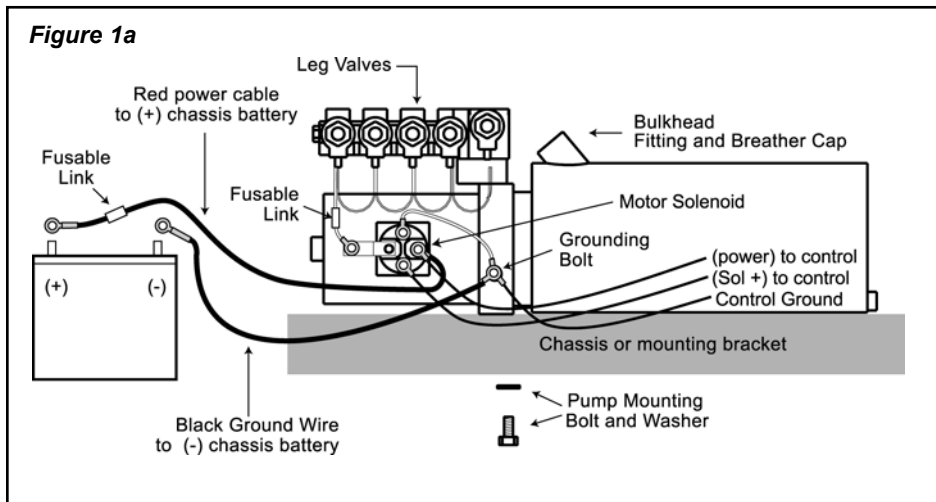
Erractic Leg Operation Diagnostics Chart



SEGMENT 1 Erractic Leg Operation

A Low Fluid

1. Check system for a low fluid level. This check should only be made when jacks are in the fully retracted position.
 - a. Check the fluid level by removing the breather cap on the reservoir tank. When full, the fluid level should be within 1" of the top of the tank at the fill opening (**Figure 1a.**)
2. Fill reservoir to within 1" of the top of the tank at the fill opening. Use transmission fluid only, we recommend the use of *Dexron III*. **Do not mix fluids.**



B Bleeding

1. Air in cylinders and hydraulic lines will cause erratic system operation.
 - a. Prior to initiating the bleeding process, verify that all the fittings on the cylinders and the manifold have been tighten to 50-150 in/lbs. Also check that all the swaged hose couplers are tighten to the fitting s at 50-150 in/lbs. The entire system must be filled with hydraulic fluid during the bleeding process. Check that the cylinders are fully retracted and fill the reservoir.



CAUTION: Never run the pump without fluid. Damage to the pump will occur.



DO NOT engage the pump for periods greater than sixty (60) seconds. Periods greater than 60 second can overheat the motor and may cause permanent damage to the pump motor.

- b. With the reservoir filled and the fittings checked, turn the system on at the control panel and begin to extend one of the cylinders furthest from the pump. When air is in the system the valves at the manifold will not seal and the cylinders will begin to extend erratically. As the hydraulic fluid begins to purge the air from the system, the manifold valves will seal and the jacks will begin to act independently.
 - c. 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 and replenish the fluid in the reservoir at this time.
 - d. Continue to extend the cylinder until it reaches the end of its stroke, then follow by retracting all of the 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 and cylinders of air.
 - e. When the system has been bled fully, retract all of the cylinders check the fluid level in the reservoir. With all cylinders retracted the fluid level should be within 1" of the top of the reservoir at the fill opening.
2. **Manually Bleeding.** 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.

- a. Completely extend the cylinder and 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 when air ceases to vent and only fluid is escaping.
- b. Operate the cylinder up and down several times to check for smooth operation.



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 thirty (60) seconds as motor damage may occur.



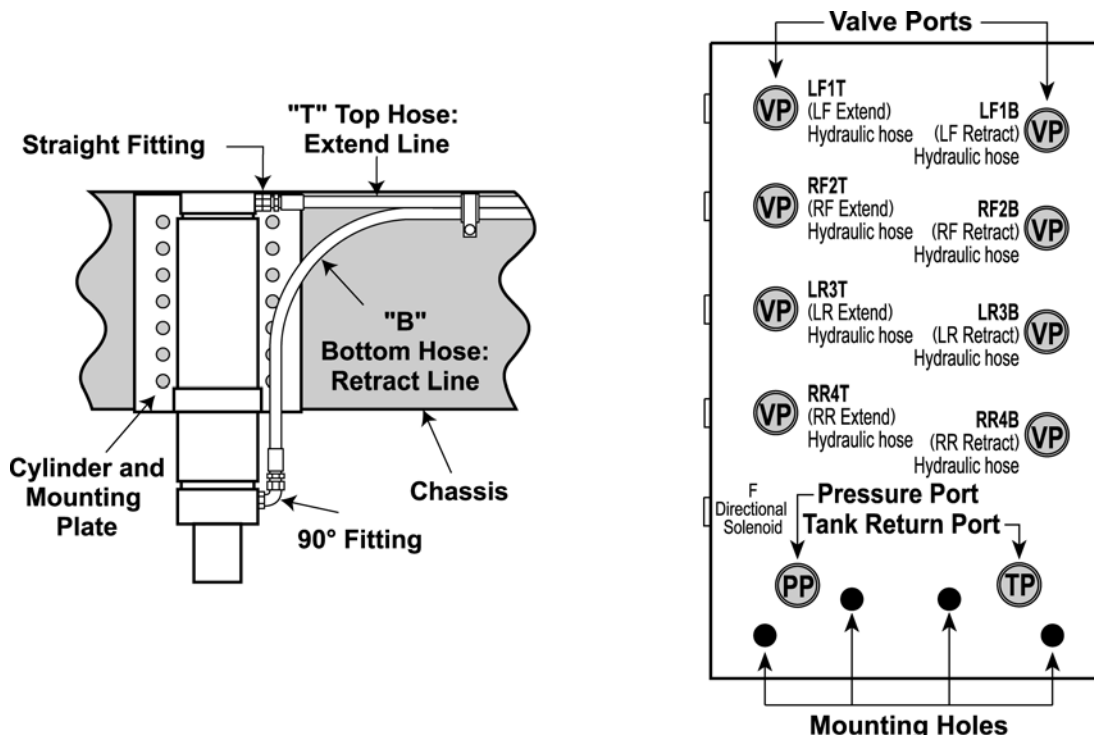
WARNING: While retracting knee acting jacks, the cam on the upper portion of the leg will make contact with lift plate and cause the leg assembly to swing upward. Failure to stay clear of the levelers when the system is being operated can result in severe injury.

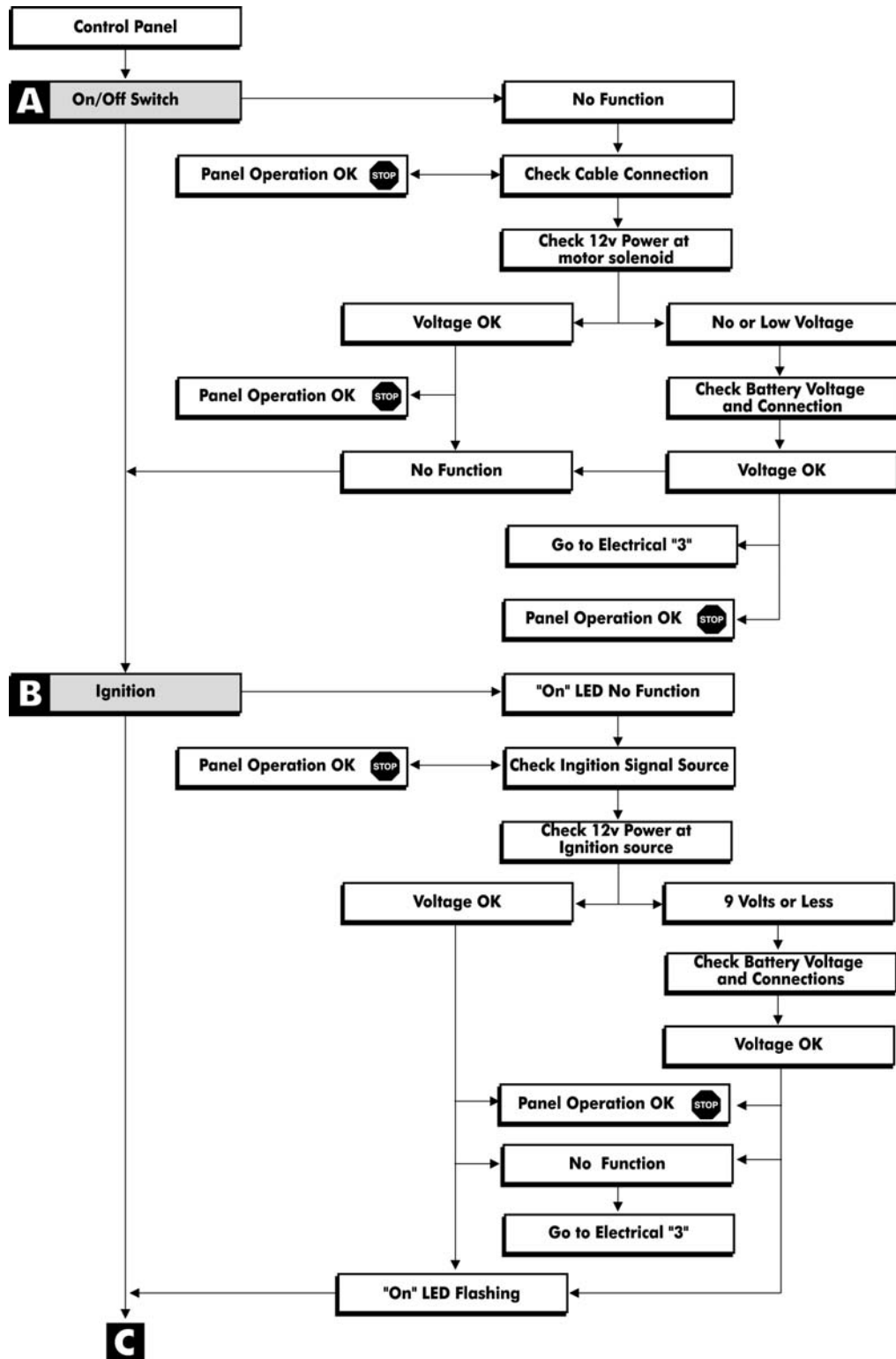
C Incorrect Hose Installation

1. Check hose routings and attachments at cylinders and manifold.
- a. Manifold connections are labeled 1T through 4T, and 1B through 4B. "T" indicates top hose at cylinder. Match the labeled hoses to the matching manifold connections. **LF1T to 1T; RF2T to 2T; etc. (Figure 1b.)**

Left Front Extend	LF1T
Right Front Extend	RF2T
Left Rear Extend	LR3T
Right Rear Extend	RR4T
Left Front Retract	LF1B
Right Front Retract	RF2B
Left Rear Retract	LR3B
Right Rear Retract	RR4B

Figure 1a

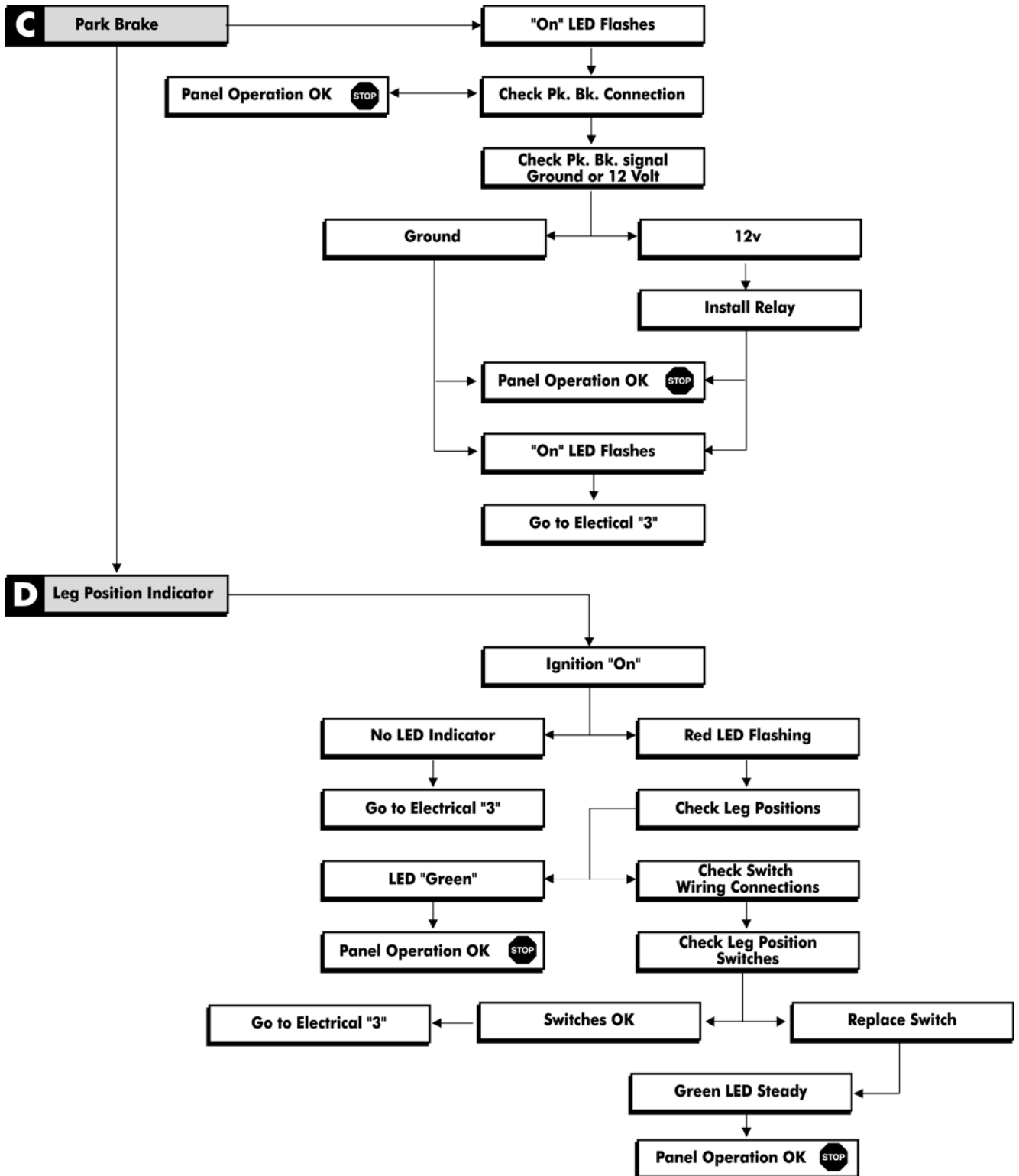




SEGMENT

2

Control Diagnostics Chart (2 of 2)



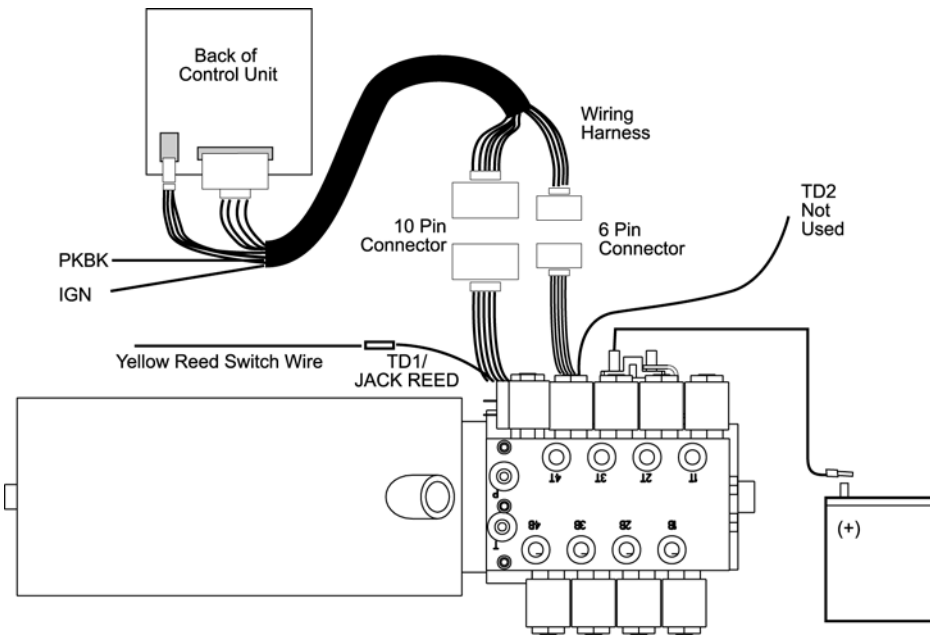
SEGMENT 2 Control

A On / Off Switch (no function)

1. No function indicates that the panel is not receiving power, or the vehicle ignition system is in the off position. **See 2B Ignition.** Power is transmitted to the control panel by the multi-wire cable. Check the cable connections at the panel and at the pump / manifold assembly. Verify that the cable is not damaged and is fully inserted into connectors (**Figure 2a.**)

2. Check the controls 12-volt connection that is attached to the pump motor solenoid. This connection is located on the same terminal as the battery cable from the vehicle battery. Power for the control system is derived from this connection. The Level Best control requires a minimum of 12 volts for proper operation (**Figure 2b.**)

Figure 2a: Pump, Reservoir, Manifold Assembly (top view)



B On / Off Switch (ignition)

1. Green LED will not illuminate when turning the control panel "ON". This condition indicates a lack of, or an inadequate ignition signal, or a low battery. Check the source for the ignition signal. The ignition source must be a constant signal with a minimum of 12 volts.

2. The Level Best control panel will not operate when the vehicle ignition system is in the off position.

Figure 2b

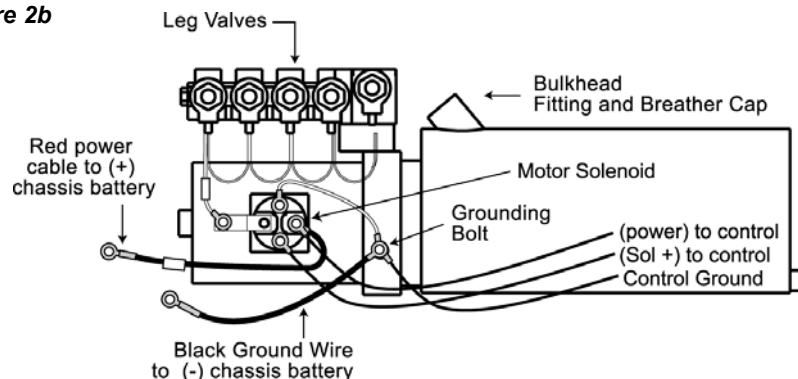
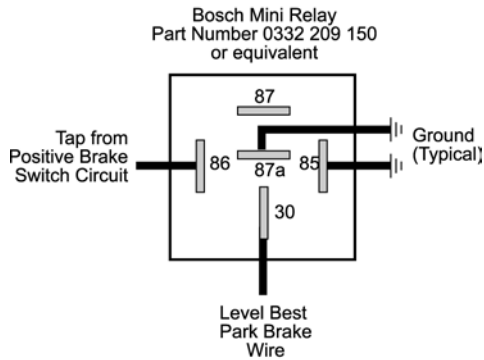
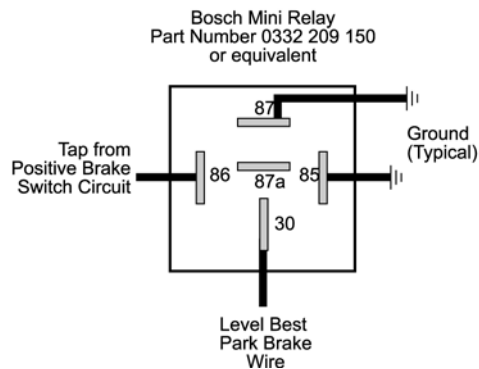


Figure 2c

Brake Circuit 12 volt Positive OFF



Brake Circuit 12 volt Positive ON



C On / Off Switch (park brake)

1. Green LED flashes when turning the control panel "ON". This condition indicates an improper, or an inadequate signal for the park brake interlock. Check the connection at the signal source. This is normally located at or near the parking brake assembly. The Level Best control is designed for a ground signal when the park brake is set. For a 12-volt signal a "mini relay" is required to transform the signal for the control panel (**Figure 2c.**)

2. Check for the type of signal, Ground, 12-volt On, or 12-volt Off.

For a 12-volt On park brake signal see **Figure 2c.**

For a 12-volt Off park brake signal see **Figure 2c.**

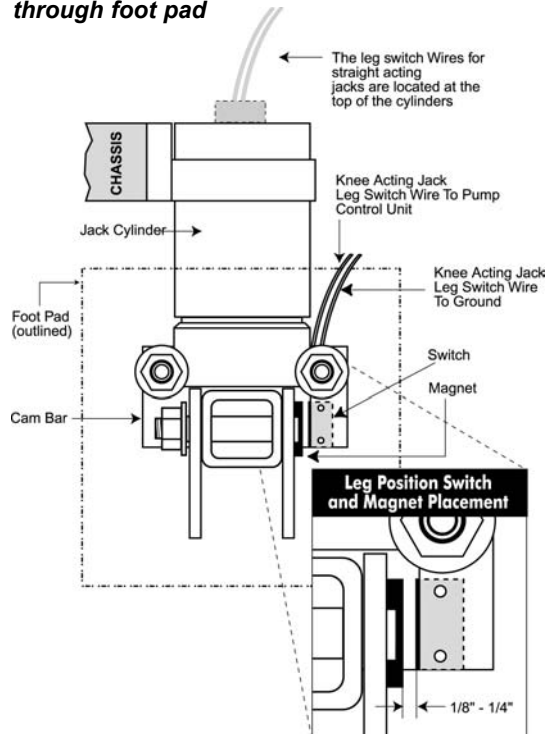
D Leg Extended Indicator

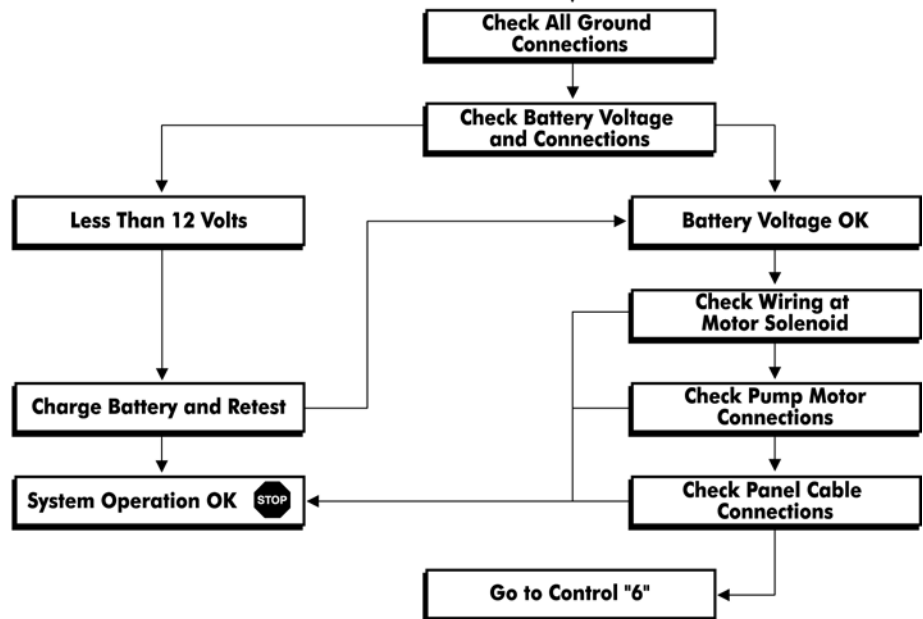
1. With the ignition on, a green LED at the All / Up button indicates that all leveling legs are in the fully retracted position. A flashing red LED indicates that one or more of the leveling legs are not in the fully retracted position.

2. Flashing red LED. Visually check to verify leveling leg positions. If legs are fully retracted, check the leg position wiring and switches (**Figure 2d.**)

3. Retest panel, if the LED continues to flash red, check leg position switch function. Separate the wiring connector at the switch. Using an ohm meter check the wires leading to each of the leg switches. These wires should show continuity when the legs are fully retracted. If the wires do not show continuity replace the defective leg switch (**Figure 2d.**)

Figure 2d: Rear view of retracted jack as seen through foot pad

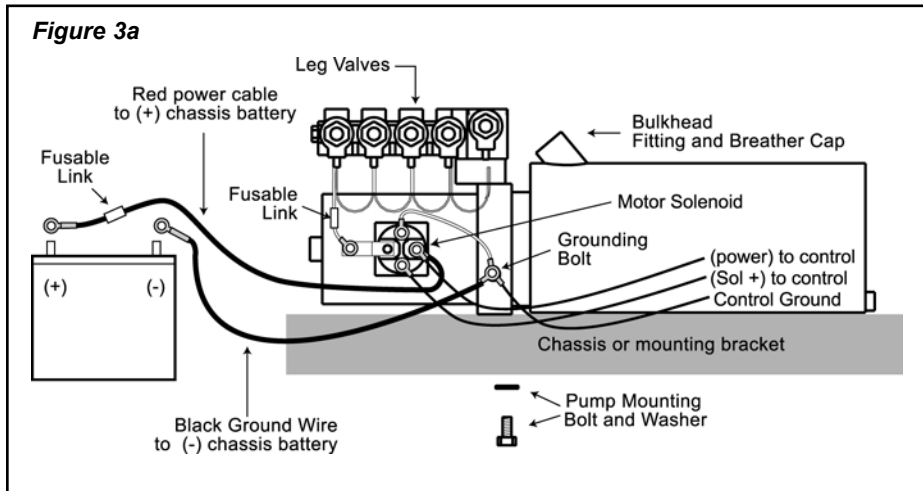


SEGMENT**3*****Electrical Wiring/Connections Diagnostics Chart*****A****Electrical**

SEGMENT 3 Electrical Wiring / Connections

A Function

Power for the Level Best leveling system is derived from the battery cable connection at the pump motor solenoid. The power lead for the control module also originates from this connection (**Figure 3a.**)



1. Check all ground connections. These connections are critical for the proper operation of the control system. Check the battery to chassis ground. The pump motor ground cable to the chassis battery and the control ground wire to the pump ground connection. Incorrect or inadequate grounds can lead to damage of the electronic control unit (**Figure 3a.**)

2. Check battery voltage and connections. A battery in good condition and properly charged will have a no load voltage of approximately 12.6 volts. Check the voltage at the battery and at the cable connection to the motor solenoid (**Figure 3a.**) Insure

that all battery, and motor connections are tightened properly. Recharge or replace the battery as necessary and retest system for proper operation.

3. Check the wire connection at the motor solenoid to control. Check that all wiring terminals are properly installed and that the fusible link is in good condition. This wire provides the electrical power required for the Level Best electronic control system (**Figure 3a.**)

4. Check the cable connections between the control panel and the pump / manifold harness, refer to **Segment 2: Control.**

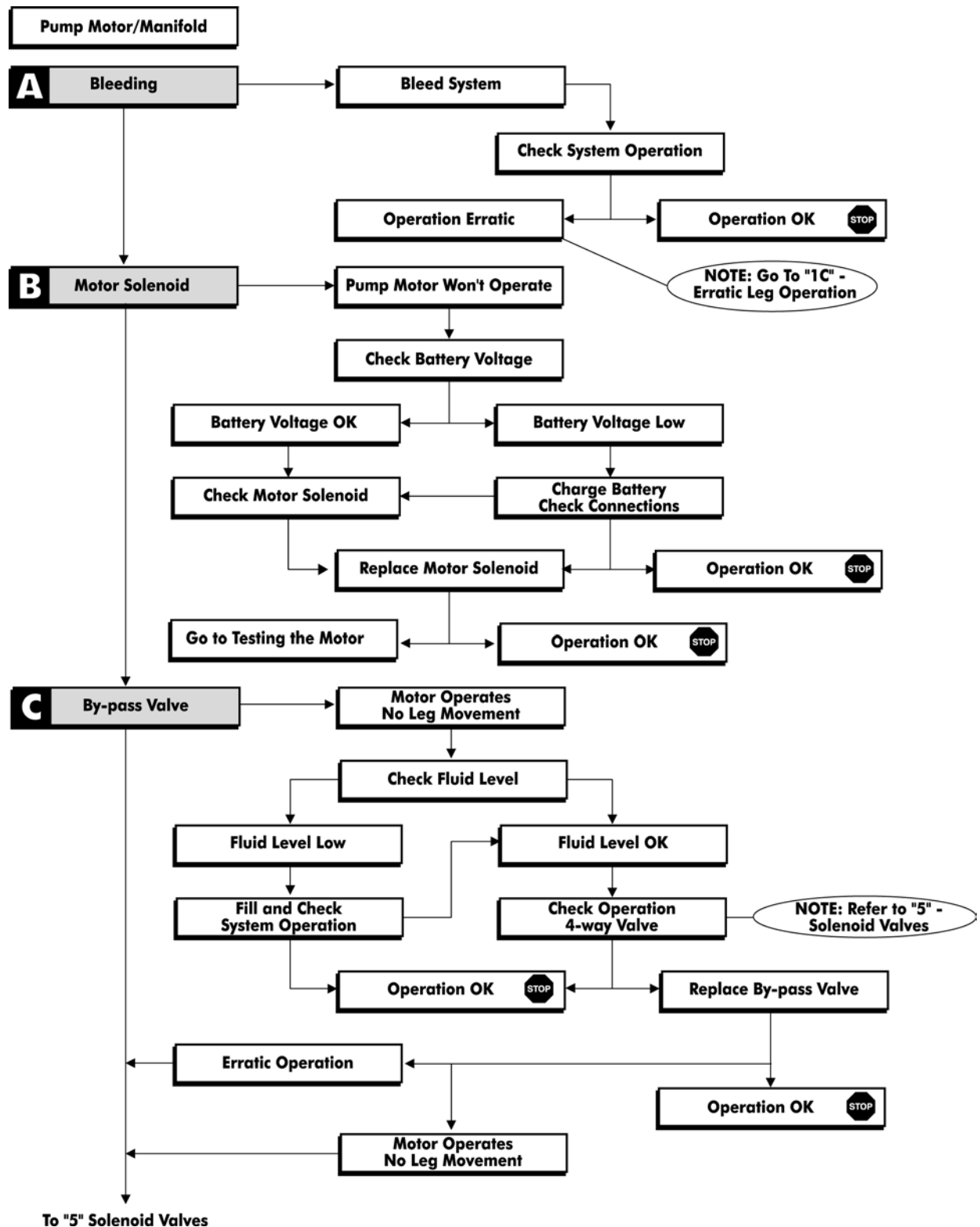
5. Check that all wiring has been properly routed and protected and that all connections are secure and complete.

6. Retest system, if system is not operating or operating incorrectly please refer to **Segment 6: Control Touchpad.**

SEGMENT

4

Pump Motor/Manifold Assembly Diagnostics Chart



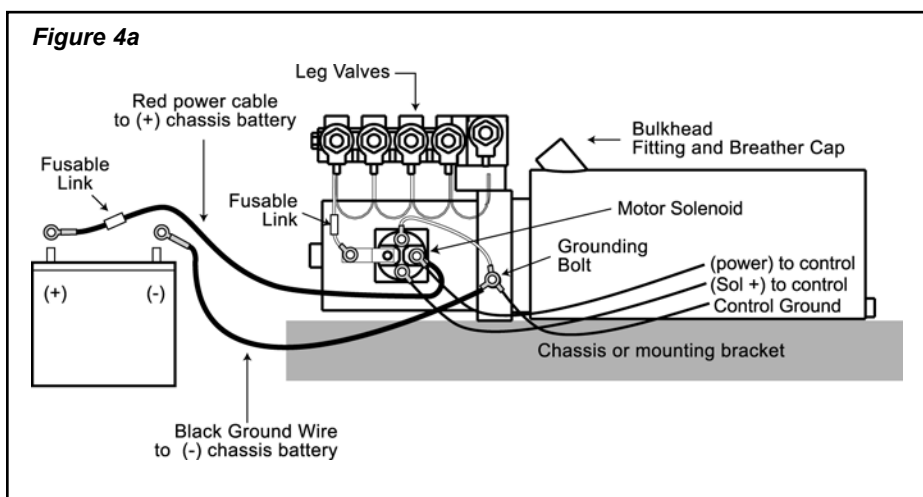
SEGMENT 4 *Pump Motor / Manifold Assembly*

A Bleeding

Please refer to Section "1 B" for bleeding procedures.

B Motor Solenoid

1. The pump motor solenoid is located on the side of the motor at the pump manifold assembly. This solenoid controls the electrical power to the pump motor. The solenoid has four terminals, two large and two small. The two large terminals are for the connection of the battery power cables; one to the pump motor and one from the vehicle battery. The two small terminals are for the connection of the control circuits; one for ground and one for power (**Figure 4a.**)



2. Pump motor will not operate. Check battery voltage and connections, voltage at the battery to solenoid cable connection should be approximately 12.6 volts. Reference **Segment 3: Electrical**, for battery and connection information.

3. Check motor solenoid operation. Solenoid should engage each time that a leg button on the control panel is activated. Using a volt meter check for voltage at the solenoid to motor connection. If voltage is detected when a leg button on the control panel is pressed, this indicates that the motor solenoid is operating correctly. If voltage is present at this connection

when a leg button on the control panel is pressed and the pump motor does not operate, replacement of the pump motor will be necessary (**Figure 4a.**)

4. If no voltage is detected at the solenoid to motor connection check the solenoid power wire from the control module. **Note: Caution should be exercised when testing any of the control wires, use only a quality volt meter. Do not ground or spark wires. This will permanently damage the motor control module.** When the control panel leg buttons are activated power should be detected at the wire that is connected to one of the small terminals on the motor solenoid. If power is detected and the solenoid does not operate replace the solenoid (**Figure 4a.**)

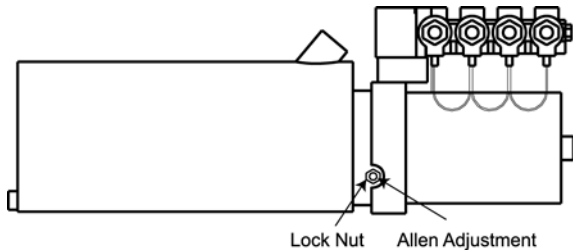
5. When no voltage is detected at the solenoid control terminal the control module will require replacement. Refer to **Segment 6: Control**.



CAUTION should be exercised when testing any of the control wires. Use only a quality volt meter. Do not ground or spark wires. This will permanently damage the motor control module.

C**By-Pass Valve**

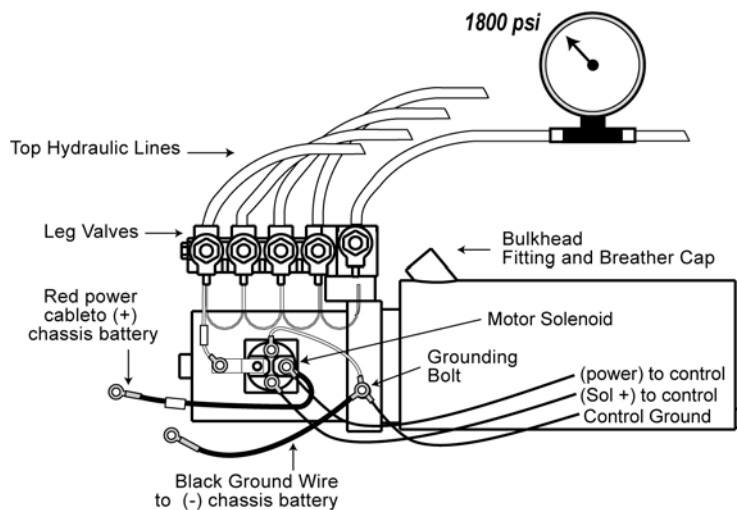
1. The By-pass valve controls the pressure at which the leveling system operates. The Level Best system operates at a pressure of 1500 to 1800 pounds per square inch. The By-pass valve is located on the side of the pump motor mounting block (**Figure 4b.**)

Figure 4b

2. Pump motor runs but leveling legs do not operate. Check the reservoir fluid level, refer to **Segment 1A: Fluid Level.**

3. Legs will retract but not extend. Check 4-Way valve operation refer to **Segment 5: Solenoid Valves.**

4. Check the system pressure by installing a gauge in the 'P' Port on the manifold. The gauge will read the by-pass pressure when the jack is at full extension/retraction. Adjust the bypass valve if inadequate pressure is recorded (**Figure 4c.**)

Figure 4c

SEGMENT

5

Solenoid Valves Diagnostics Chart

A Solenoid Valves

B Sticking Valve

One Leg Erratic Operation
One Direction

All Legs Erratic Operation
One Direction

Check Fluid Level

Check System Operation

Leg(s) Operation OK **STOP**

Check "Leg" Valve

Check 4-way Valve

Operation Erratic

Leg(s) Operation OK **STOP**

Replace Valve

Leg(s) Operation OK **STOP**

Operation Erratic

C Shorted Coil

One Leg "No" Operation
"One" Direction

All Legs "No" Operation
"One" Direction

Check Fluid Level

Check System Operation

Leg(s) Operation OK **STOP**

Check Leg Solenoid Coils

Check 4-way Solenoid Coil

Leg(s) Operation OK **STOP**

Operation Erratic

Go to Control "6"

SEGMENT 5 Solenoid Valves



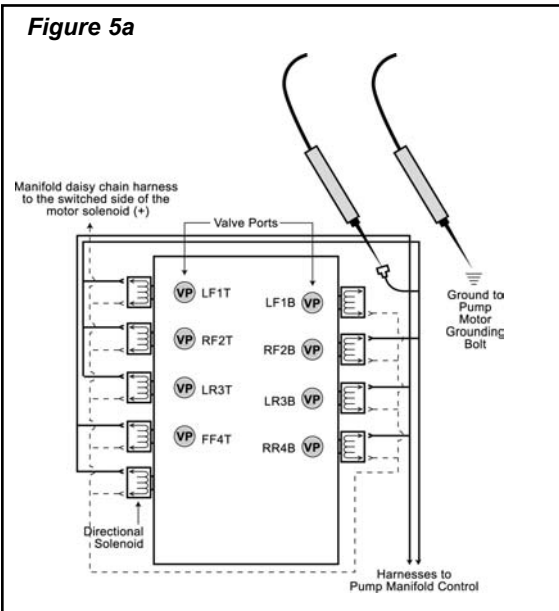
CAUTION should be exercised when testing any of the motor control wires. Use only a quality volt/ohm meter. Do not ground or spark wires. This will permanently damage the motor control module.

A Functions

The solenoid valves control the operation of the leveling systems cylinders and legs. There are eight cylinder / leg valves and one directional valve (4-way). The leg valves allow for the operation of the individual legs while the 4-way controls the direction of all the legs.

1. The four leg valves located at manifold ports "1B" through "4B" open as required to allow the return of fluid during the extend sequence, and ports "1T" through "4T" open during the retract sequence. The 4-way valve is shifted (energized) only during the extend cycle.
2. 12-volts should be present on one of the valve coil terminals at each valve coil during pump motor operation.

Figure 5a



B Sticking Valve

1. A leg will not operate or will only go in one direction. Check the reservoir fluid level, refer to **Segment 1: Erractic Leg Operation; A. Low Fluid.**
2. Check leg valve operation.
 - a. Check that the valve coil is receiving a ground signal from the control module. If no signal is present at the valve coil refer to **Segment 6: Control Touchpad (Figure 5a.)**
 - b. Remove valve from manifold; use caution as fluid in the manifold may be under pressure. Test valve actuation on the workbench using a 12-volt battery or a regulated 12-volt power supply.
 - i. Check for bent valve assembly.
 - ii. Check the valve orifices for any obstructions or contaminates.
 - c. Replace valve.
3. All legs move only in one direction.
 - a. Check that 4-way valve coil is receiving ground signal from the control module. If no signal is present at the valve coil refer to **Segment 6: Control Touchpad (Figure 5a.)**
 - b. Remove 4-way valve from manifold; use caution as fluid in the manifold may be under pressure. Test valve actuation on the workbench using a battery or a regulated 12-volt power supply.
 - i. Check for bent valve assembly.
 - ii. Check the valve orifices for any obstructions or contaminates.
 - c. Replace valve.

Figure 5b

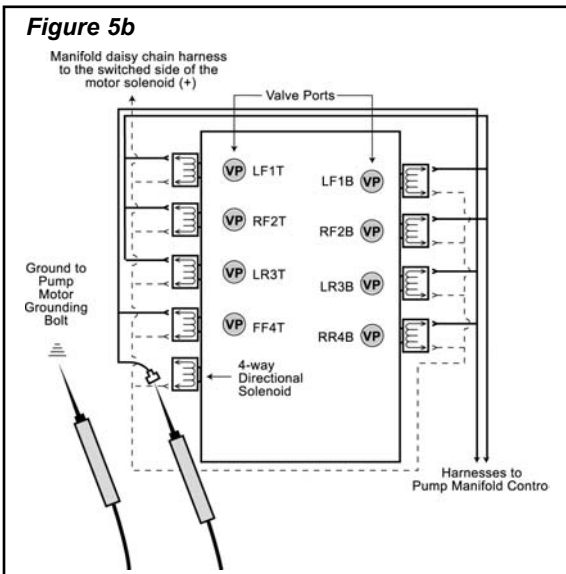
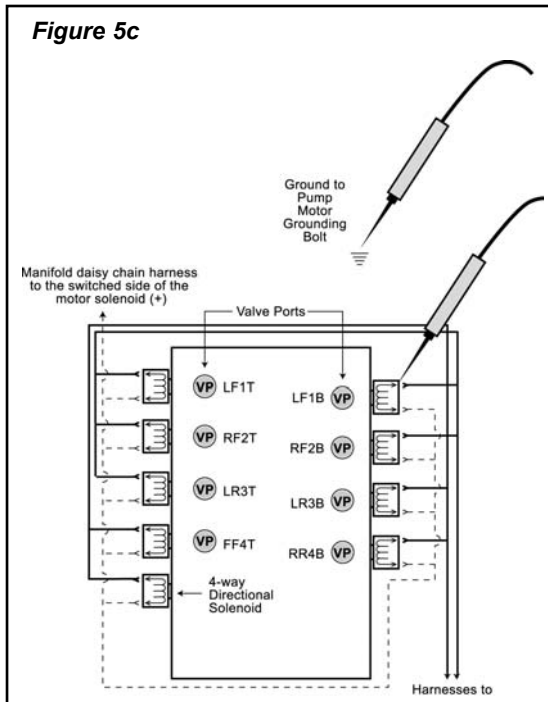


Figure 5c



C Shorted Coil

1. A leg will not operate or will only operate in one direction. Check the reservoir fluid level, if low refer to **Segment 1: Erractic Leg Operation; A. Low Fluid.**

2. Check leg valves for shorted coils. **Note:** CAUTION should be exercised when testing any of the Control wires. Use only a quality volt / ohmmeter. DO NOT GROUND OR SPARK WIRES. This will permanently damage the control module.

Unplug both wires to the coil, then, using an ohmmeter place one probe on the pump motor grounding bolt and the other probe on one of the coils terminals, if the meter shows continuity the coil must be replaced (**Figure 5c.**)

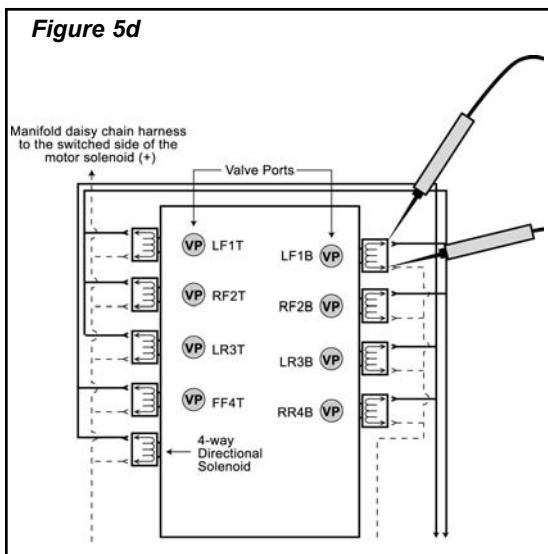
Next test between the two coil terminals, the meter should read between 8.5 and 10 ohms, if not replace coil (**Figure 5d.**) If after replacing the coil the problem still persists refer to **Segment 6: Control Touchpad.**

3. All legs move only in one direction. Check 4-way valve for shorted coil. **Note:** CAUTION should be exercised when testing any of the Control wires. Use only a quality volt / ohmmeter. DO NOT GROUND OR SPARK WIRES. This will permanently damage the control module.

Unplug both wires to the coil, then, using an ohmmeter place one probe on the manifold and the other probe on one of the coils terminals, if the meter shows continuity the coil must be replaced.

Next test between the two coil terminals, the meter should read between 8.5 and 10 ohms, if not replace coil. If after replacing the coil the problem still persists refer to **Segment 6: Control Touchpad.**

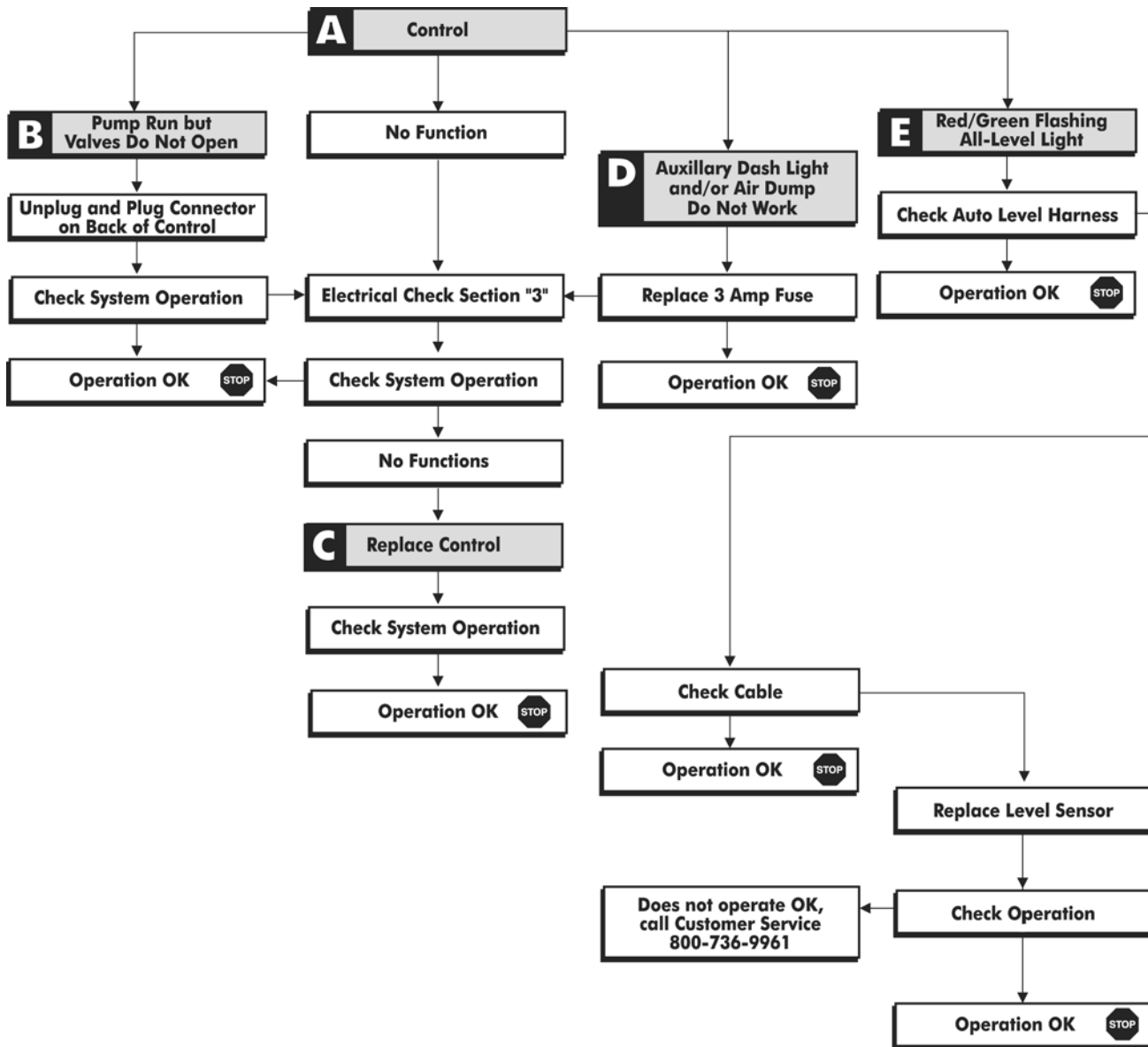
Figure 5d



SEGMENT

6

Control Touchpad Diagnostics Chart



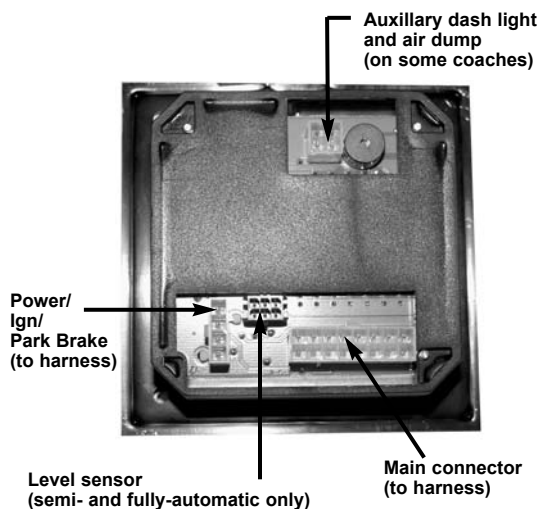
SEGMENT 6 Control Touchpad

A Function

The Control is the heart of the Level Best electronic control system. **Note:** *Extreme care should be exercised when working with this device.* Disconnect batteries, as any short circuit or inadvertent grounding will damage the control. The Control microprocessor handles all of the Level Best switching functions, including the motor solenoid, 4-way valve, and cylinder / leg valves.

All of the leveling systems electrical requirements, 12-volt power and ground, as well as all of the necessary leveling system information is processed through the control microprocessor. This information includes, leg position switches, ignition and park brake signals, leveling sensor and fluid pressure sensor.

Figure 6a



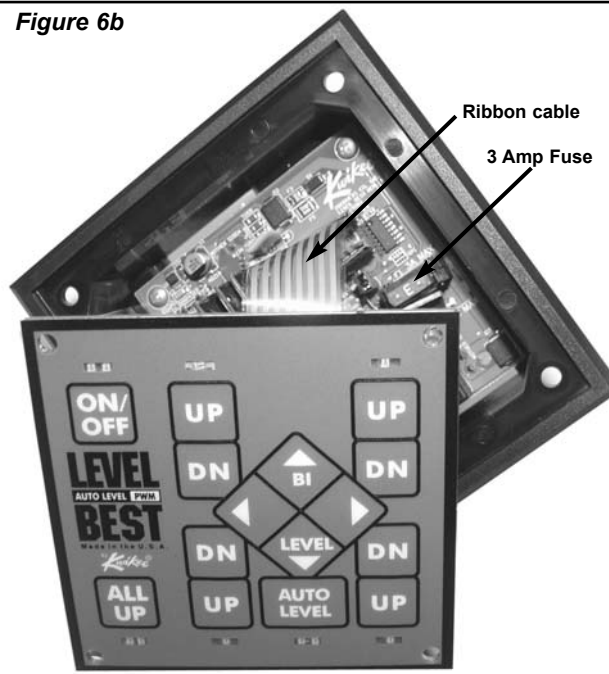
B Pump Runs / Valves Do Not Open

1. Unplug and plug back in the Power/Ign connector (**Figure 6a.**)
2. Check system operation.

C Replace Control

1. Disconnect Battery Power connections.
2. Disconnect Battery Ground connections.
3. Remove control cable connections.
4. Remove control assembly.
5. Replace control assembly.
6. Reinstall cable connections.
7. Reconnect battery Ground.
8. Reconnect battery Power connections.

Figure 6b



D**Auxiliary Dash Light and/or
Air Dump Does Not Work**

1. On some coaches the 4 pin rectangular connector will be connected to an electric air dump valve and / or an auxiliary jack warning light.
2. If the coach is so equipped and the dash light and or air dump control valve is not functioning check the fuse behind the touchpad.
3. Check the function again.

E**Auto Level Flashing Red / Green alternating**

1. The flashing red / green indicates a failure to communicate with the level sensor.
2. Check to see that the auto level harness is plugged in to both ends to the control and plugged in to the auto level sensor.
3. Check function of the unit. If it still does not function go to step 4.
4. Check that the harness does not have a break in the cable. Check for continuity between the pins on both ends of the cable. With your meter set on the continuity setting, check that there is continuity between Pin 1 on one end and Pin 1 on the other end. Check the same for Pin 2, Pin 3, etc. If there is not continuity between the pins, the cable is bad. Replace the cable.
5. Check function again. If the unit still does not work replace the level sensor module.
6. Check function. If the unit does not function, call **Kwikee Customer Service at 800-736-9961.**



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