Note: Several situations will cause the switch LED’s to go dark. Be sure to check all scenarios listing this condition.

Quick Reference
Troubleshooting Chart
EC 400
With Powered Family Control

STATIC CAUTIONS:
1. When removing logic boxes from the shipping container and placing them on the shelving, be careful not to touch the logic board or the connectors on the ends of the cables if you are not wearing a static strap.
2. NEVER handle any logic board without a static strap which is properly grounded and functional (they wear out).
3. Always handle logic boards from the edges, being careful not to touch any component leads on the back.
4. Never put a logic board down on any surface. As soon as you remove a board from the box, place it in a static-bag.
5. Replace worn out static-bags. Any holes or tears compromise their effectiveness.
6. Treat all logic boards the same. Don't drop your guard if the board is "coming back for return and repair anyway." Most static damage is degradation, causing undetectable flaws that shorten life, not immediate failure.
7. Taking the time to be static safe will save time and money in fewer service calls.

Condition: No carriage movement possible. All control lights dark.
Check:
1.1 See the "Operation Instructions" booklet for system starting procedures. When the system is keyed on, the green LED light will be displayed.
1.2 Is the system 20 amp breaker box switch on?
1.3 Is the customers 120 V.A.C. power on at the 4 x 4 box? Check the breaker or disconnect box. Meter for incoming power.
1.4 Is the system in the optional "Night Park" mode?

Condition: No carriage movement possible. The LED is solid red. Message “R/L Aisle in Use” displayed. All other switch LED lights are dark.
Check:
2.1 The system may require that it be reset manually after each aisle selection. Press a reset button at the open aisle.

Note: if a safety is activated, this condition must be corrected before the aisle can be unlocked.

Condition: No carriage movement possible. The LED lights at all control heads are green.
Check:
3.1 Is the stop/reset button stuck or being pressed?

Condition: No carriage movement possible. The LED lights at all control heads dark. The system is equipped with safety floor.
Check:
4.1 Is the safety floor in use? Is there an object resting on the floor?
4.2 Is the condition of the safety floor electrical loop good? If the system is equipped with a safety floor monitor, check to see that there is no bad floor indication. Check the condition of the logic board in the safety floor monitor box. Near each small relay is a red and green LED A lighted green LED
indicates that the floor loop is okay. A lighted red LED indicates that a shorted condition exists in its loop. Both LED’s out indicates that an open condition exists in its loop. If the system is not equipped with a safety floor monitor, check the condition of the safety floor adder board where the floor plugs in. This board may not be present on some systems. If not, examine the override board for this information.

4.2A A green LED indicates a good floor loop. A red LED indicates a shorted floor loop. Both LED’s out indicates an open in the floor loop.

4.2B Check for material jammed between the carriage and the floor.

4.2C Check the floor adjustment. Does a plunger or spring need attention?

4.2D Check for broken switch.

4.2E Check for worn or broken wires and check for rodent gnawing on wire insulation.

4.2F Check for loose or broken connections.

4.2G Check floor loop continuity or check for voltage drop across the floor loop. (See write-up in the manual titled "Finding Safety Floor Failures.") (OP-9016, page 19.)

4.2H Check floor loop for a short circuit.

Exception: 4.2I Has a control head failed or been unplugged? Is a 2-pin jumper missing on pins 7 & 8 at positions "J29", or "J32"?

Condition: No carriage movement possible. Neither carriage at the open aisle will move to close the aisle. The LED lights at all control heads are green indicating the system is okay.

Check: 5.1 Check the condition of the limit switch(es) at the open aisle.

5.1A Switch rod not extended. Cam resting on the rear switch in the limit switch box.

5.1B The rear micro-switch in the limit switch box is broken.

5.1C Check the wire to the logic box for a good connection. At position(s) J28 and/or J16, unused positions should not be jumped.

Hint: To test carriage movement, place (2) pin jumpers across pins 1 & 2 and 3 & 4 at J16 & J28. Be prepared to stop carriage travel with the stop button.

Condition: Carriage will not move in either direction. The LED lights at all control heads are green indicating the system is okay.

Check: 6.1 Check for mechanical failure.

6.2 Is motor chain broken?

6.3 Does the gear motor need to be replaced?

6.4 Check the 90 VDC connection at the motor and at the logic box with your meter. Is 90 VDC present when a movement is called for?
Condition: Carriage moves slowly for approximately five seconds and stops. Upon stopping, all switches display a green LED indicating the system is okay.

Check: 7.1 Check the condition of the limit switch at the open aisle.

7.1A Switch cam stuck between switches, not actuating either micro-switch.

7.1B The front micro-switch in the switch box is broken.

7.1C Check the wire to the logic box for a good connection at position(s) J28 and/or J16.

7.1D Check to confirm that wires have not become tangled with the rod, thus impeding movement.

Condition: Carriage movement is fast and may stop before a full aisle is open.

Check: 8.1 Check the sensor cable from the encoder at the motor to the logic board for a good connection. The logic is not getting information from the motor. Confirm that the connector is not reversed or off a pin in orientation.

8.2 Check the sensor wheel for alignment and condition.

8.3 Replace the sensor reader.

Hint: A higher than normal D.C. voltage reading at TB2 indicates a faulty encoder.

Hint: Multiple motor carriages; with just one motor connected, check current. Low current reading indicates a failed logic board or gear motor. Check each gear motor in turn to determine source of problem. The diagnostic unit or laptop will show motor speed differential between controllers with the problem.

Condition: No carriage movement possible. The message “Aisle in Use” at the affected aisle and a steady red LED displayed. All other switch LED’s are dark.

Check: 9.1 This condition indicates that a mechanical or photo sweep, Z.F.S., or aisle entry sensor has been activated or malfunctioned while the system was at rest.

9.1A Move the carriage away from the aisle obstruction by pressing a “Move” button at the affected aisle. See the “Operations Instruction” booklet for further information (OP-0213).

9.1B If the affected aisle must be closed, the safety override on the service key must be used. See the separate sheet regarding its use (OP-0214).

9.2 Mechanical Sweep – If no obstruction is found.

9.2A Adjust the safety sweep. Release the pressure at one or more switches.

9.2B Replace any broken switches.

9.2C Push all switches solidly into their seats.

9.2D Check for loose or broken connections.

9.2E Check the condition of the steady green LED’s at D8 and D9 on the logic board. No LED indicates an open safety circuit or a short.
Hint: Mechanical sweeps can be jumped out for troubleshooting. To jump the left sweep, place a 2-pin jumper over pins 2 and 3 at “J20 – J5 or J4” on the logic board. To jump the right sweep, place a 2-pin jumper over pins 2 and 3 at “J25 – J8 or J9” on the logic board.

Hint: Identify a shorted condition by grounding one lead of your meter to the carriage while checking continuity. If continuity exists a short circuit is indicated.

9.3 Photosweep -- if no obstruction is found.

9.3A Check the condition of the steady green LED’s at D8 and D9 on the logic board. No LED indicates an open safety circuit.

9.3B (Photosweep I)
Check the conditions of the LED’s at the transmitter and receiver. Compare the reaction at the units to those at known good aisle.

9.3C (Photosweep II)
Check the condition of the LED’s at the transmitter and receiver. Compare the reaction at the units to those at known good aisle.

9.3D Calibrate as necessary. See document OP-0095 for detailed instruction.

Hint: Photosweeps can be jumped out for troubleshooting at the logic board only. To jump the left set, place a 2-pin jumper over pins 2 and 3 at “J20 – J5 or J4” on the logic board. Never jump out the components!
Photosweeps can not be jumped at the adder board except with the photosweep tester. Consult the pages in your manual titled “Using the Photosweep / Encoder Tester” for further detail. (OP-0079)

Caution: Anytime an adjustment is made, the sweep should be tested for effectiveness. Check at mid-carriage range since a check too near the transmitter or receiver unit may not be accurate.

Hint: Anytime a component is replaced a new calibration must be carried out. See OP-0095.

9.4 Aisle entry sensor – if no obstruction is found.

9.4A Check the condition of the steady green LED’s at D8 and D9 on the logic board. No LED indicates an open circuit.

9.4B Check the condition of the LED’s at the transmitters and receivers. The transmitter will display a pulsing green light if all is well or no light if power is lost. The receiver will display a steady green LED if seeing the transmitter or a steady red LED if not seeing the transmitter.

9.4C Adjust the orientation between the transmitter and receiver or replace if required.

9.4D Check the connections at either the adder board or the logic board.

Hint: Activation of aisle entry sensory routed through the adder board will not cause the Logic Board LED’s to react.

Hint: Aisle entry sensors can be jumped out for troubleshooting. To jump the left receiver, place a 2-pin jumper over pins 2 and 3 at “J4–J5–J20”
on the logic board or J1/J2 on the adder board. To jump the right receiver, place a 2-pin jumper over pins 2 and 3 at “J8-J9-J25” on the logic board or J12/J13 on the adder board. Never jump out the transmitters.

Note: Aisle entry sensors can fail with no obvious signal. Check their operation at every opportunity.

9.4E The first and last aisle in the system may be governed by a retro-reflective aisle entry sensor. Observe the red LED on the combination transmitter and receiver unit. The unit should show a steady red LED when seeing the reflected beam or no LED if not seeing the reflected beam. Adjust or replace accordingly.

Hint: This unit can be jumped out for troubleshooting. To jump out a unit covering aisle one, place a 2-pin jumper over pins 2 and 3 at position “J4-J5-J20” on the logic board or J1/J2 on the adder board. To jump out a unit covering the last aisle, on the right place a 2-pin jumper over pins 2 and 3 at position “J8-J9-J25” on the logic board or J12/J13 on the adder board.

9.5 Photosweep adder board. If no obstruction is found.

9.5A Observe the state of the LED’s. The right one governs photosweeps on the right side of the carriage. The left one governs the photo sweep on the left side of the carriage.

Hint: Both LED’s should be on if the photo sweep units are okay. LED’s will be dark if the photo sweep units have malfunctioned or lost adjustment.

Hint: The system is equipped with a self-calibrating adder board. For further detail regarding use and set-up, consult, “Micro-Sweep Photosweep Adder Board Information”. (OP-0095)

Hint: Anytime a component is replaced a new calibration must be carried out. See OP-0095

9.6 Z.F.S. If no obstruction is found. Please turn to Section 16 for detailed Z.F.S. troubleshooting.

Condition: No carriage movement possible. The message “Aisle in Use” (and a blinking red LED), at the affected aisle, all other switch LED’s dark.

10.1 This condition indicates that a mechanical or photo safety sweep, Z.F.S., or aisle entry sensor has malfunctioned or been activated during carriage movement in a closing aisle.

10.1A Move the carriage away from an aisle obstruction by pressing a “Reset” button at the affected aisle. The blinking LED will change to solid red. Press a “Move” button at the affected aisle. See the “Operations Instruction” booklet for further information (OP-0213).

10.1B If the affected aisle must closed, the safety override on the service key must be used. See the separate sheet regarding its use (OP-0214).

10.2 Follow the steps outlined in Sections 9.2 through 9.5.
Condition: Overall Power Failure. All LED lights dark.

Check: 11.1 See the “Operations Instruction” booklet for proper use of the power override battery or rechargeable power pack (OP-0213).

Condition: No carriage movement possible. A rapidly blinking red LED displayed at all control heads.

Check: 12.1 A communication failure is indicated.

12.1A Check all communication connections between the carriages.

12.1B Refer to the write-up titled “Troubleshooting EC 400 Electrics” and follow the procedure outlined to isolate and diagnose. (OP-0078)

Exception: If communication between a control head and its logic board is broken, the failed communication signal will be displayed only at that location.

Hint: A “Failed Communications” signal can mean a problem has developed in any of several locations. The problem could be with the control head itself as mentioned above. The problem could be in the logic board driving the “Affected” control head. The problem could be in the logic board on either side of the logic board driving the “Affected” control head. The problem could be in the communication wire on either side of the logic board driving the “Affected” control head.

Use your diagnostic unit to reduce the potential problem area. Once connected to the system, the diagnostic screen will read “Communication Terminated” connected to the “X” units. The problem now, will be found in the logic board matching the “units number” or the very next board. If not in either logic board, then suspect the communication wire between them. Carry a 20-foot communication test wire in your toolbox for use in scenarios such as this.

Finally, always test communication with your diagnostic unit or laptop.

Condition: No carriage movement possible. All control head LED’s dark.

Check: 13.1 The security lock is engaged or has malfunctioned. Check the condition of the lock and its wiring. All unused security lock positions on the logic boards must be jumped at J14.

Condition: No carriages movement possible. One switch LED is dark, the other switches display the failed communication signal.

Check: 14.1 The logic board driving the switch that is dark has lost power. The most likely cause is a blown fuse.

Condition: No carriage movement possible. A safety circuit failure has caused the system to be inoperable.

Check: 15.1 Safety shut downs may be overridden using the safety override on the service key. See the separate sheet regarding its use (OP-0214).

Condition: No carriage movement possible. The message “Aisle in Use” and a steady red LED displayed at the control head. All other control head LED’s are dark.

Caution: Never make or break any connections with the system powered up!
Check:  16.1  This condition may indicate that a Z.F.S. transmitter and receiver pair or quadrature are detecting a presence or an obstruction in the open aisle. Is the aisle occupied or is there an object blocking the beams?

16.2  Try to clear the locked aisle condition by pressing the reset button. The system may be programmed for supervisory reset. If so, refer to the operations instructions describing the use of the managerial key (OP-0214).

16.3  Has a quadrature failed? Has a transmitter or receiver failed? Has a ribbon connector between housing loosened? Plug your hand held Z.F.S. troubleshooting unit into the Z.F.S. logic board. Position the toggle switch for right or left aisle. The unit will indicate the location of the failure. Go to the location of the failure and check the transmitter with your infra-red sensor card. If the transmitter is not sending, replace the board. If the transmitter is sending, replace the receiver board across the aisle.

Hint 1:  As you enter the aisle and block a web light all transmitters beyond that point will go dark. While using the infra-red card, back into the aisle to assure that the transmitter being checked is allowed to light unless it has failed.

Hint 2:  It is possible that the receiver just before or after the indicated trouble location has failed and has interrupted the sequence before reaching the pair of web lights indicated. Try a new receiver board at these locations.

Hint 3:  If your hand held Z.F.S. troubleshooting unit is acting erratically, a shorted condition in a transmitter or receiver board may exist. Find this short by breaking the connection between housing, in order, down the aisle starting from the front. The hand held unit will count correctly until the housing with the shorted board is added. At this point, one board at a time can be added until the bad one is located. The hand held will display a number one higher than the actual number of web lights. This is normal during this procedure.

Hint 4:  A shorted condition may also cause the current limited Z.F.S. board to shut down. This shut down may take some time to occur and will recover once the short is corrected. Touch the thermal protector on the Z.F.S. logic board at position VRI. Be careful, it may be hot! If hot to the touch, suspect a thermal shutdown. Remove all connections until board recovery takes place. Replace connections one at a time while watching the power LED The component that knocks out the power LED has the problem. At his point, you will have identified the circuit with the short. Troubleshoot this circuit as you did in “Hint 3”.

Note:  Typical operation of the carriage is not possible when the hand held Z.F.S. troubleshooting unit is being used. The small button on the side of the unit will, when depressed, remove the influence of the unit and restore typical operation without unplugging it from the Z.F.S. logic board.

Note:  Before attempting to troubleshoot and diagnose a Z.F.S. problem, read Section 7 found in OP-9660.

Condition:  A new logic board has just been installed and the system is displaying symptoms of poor communication between carriages. The symptoms don’t seem to fit into any category previously described.

Check:  17.1  This condition could indicate incompatibility of EPROM revisions levels. Remove the EPROM from the bad board and install it in the new board.
**CAUTION:** Never attempt an EPROM change without first powering down the 120 V.A.C. supply!

**Hint:** It may be more convenient to disable the low voltage supply to the logic board by removing the two (2) pin jumper at JP4 during EPROM changes.

**Hint:** For systems with multiple gearmotors remember that each board must have the jumpers at “JP2” and “JP3” configured properly. Also, each control board must be assigned front, middle, or rear status with the diagnostic unit.

**Condition:** No carriage movement possible or erratic system behavior.

When problems occur that seem to have no reasonable symptoms or solutions, please feel free to contact our service department:

Spacesaver Corporation – A division of KI  
1450 Janesville Avenue  
Fort Atkinson, WI 53538  
(920) 563-0533  
(920) 563-0554  
(800) 457-5463 (Help Line)  
(920) 723-7022 (Extended Hours Cell)

**POWERED FAMILY CONTROL SIGNALS:**
1. All LED lights steady green: system is ready for use.
2. One red LED blink per second: A safety fault has taken place during carriage movement. A press of the safety override button will cause light to go dark.
3. Steady red LED: The system is programmed for manual reset.
4. Steady red LED: A safety fault has taken place while the carriage is at rest.
5. Rapid blinking red LED (3 per second): The system has lost communication.
6. All LED’s Dark: The system is security locked.
7. All LED’s Dark: The system has lost power.
8. All LED’s Dark: A stop circuit is active. (Safety floor or stop button.)
9. Back Light “Stationary”: Carriage has been set as a temporary stationary unit.
10. Back Light “Aisle in Use”: Each carriage side has its own light. This is lit during: aisle locked, a mechanical or photosweep activation, a Z.F.S. activation, an aisle entry activation.