OPERATIONS & MAINTENANCE MANUAL
FROG HOPPER™

7/13/2015

S&S WORLDWIDE
350 W 2500 N
LOGAN, UT 84341

Revision History

Revision	Description	Date	ECN#	Approval
0	Initial Release, 3.1 - 3.2 Installation Procedure	7/13/15	E12829	T. Snyder

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Section 1: Introduction

1.0 Scope

This manual contains information for the installation, operation, and maintenance of the Frog Hopper™ ride.

This is a reference manual only. It is not intended to cover all possible situations or to provide complete technical specifications of the ride. It is not intended to provide precise or complete engineering or mechanical information. It is to be used only for conceptualization and basic understanding.

Use this manual as a guide to support training and as a future reference.

At S&S Worldwide, Inc., our highest priorities are to:

- Ensure guest safety.
- Increase employee safety awareness.
- Reduce the risk of employee or guest injury or accidents.
- Reduce operating down time.
- Provide operation and quality control.
- Provide guest satisfaction, comfort, and security.

Safety must be the highest priority in an industry that provides fun and entertainment to nearly 300 million guests each year.

1.1 Contact Information

Contact S&S Worldwide, Inc. regarding any questions or suggestions about the safety, maintenance, operations, or any of the instruction manuals associated with the Frog Hopper™ ride.

Address: S&S Worldwide, Inc.
350 West 2500 North
Logan, UT 84341

Phone: (435) 752-1987 (7:00 – 17:00 MT)
Fax: (435) 752-1948

Website: www.engineeringexcitement.com

Section 2: Ride Description

2.0 Ride Description

The following section provides general information about the Frog Hopper™ ride including a description of the ride, ASTM specifications, and the major ride components.

2.1 Ride Motion

The Frog Hopper™ is a vertical ascent and bounced descent amusement ride. It provides seats and a restraint system in which the passengers are slowly lifted, approximately 16-18 feet (depending upon the model) vertically, and then lowered in a hopping motion. The complete cycle is repeated three to five times (as selected by the operator). The final cycle returns the passengers to the load/unload position.

2.2 Ride Information Summary

- **Cycling Capacity**
  210-280 pph (passengers per hour)
- **Labor Requirements**
  Minimum: 1 ride operator
- **Operating Statistics**
  Trip time: 1 – 1.5 minutes
  Cycle time: 2 – 3 minutes
- **Passenger Restrictions**
  - Height: 36″ (0.9 meters)
  - Medical: Expectant mothers and persons with neck or back problems, vertigo, or heart conditions are not permitted to ride.
  - All passengers must fit securely into the seat/restraint system to be permitted to ride.
- The Frog Hopper™ is designed with seating that allows individuals of various size and weight to ride as long as the requirements outlined in 2.2 are met (maximum total passenger weight: 700 lbs. [318 kg]).

2.3 ASTM Specifications

Ride Attraction Name	Frog Hopper™
Manufacturer	S&S Worldwide, Inc.
Serial Number	See ID tag located on base unit
Model Number	See ID tag located on base unit
Date of Manufacture	See ID tag located on base unit
Ride Speed	3 mph (4.8 kph)
Direction of Travel	Vertical
Passenger Capacity by Weight	0 lbs. (0 kg) to 700 lbs. (318 kg)
Passenger Capacity by Number	5 –7
Ride Duration	60 - 90 Seconds
Balancing	Within 100 lbs. (45 kg)
Environmental Restrictions	Do not operate in winds in excess of 35 mph (56.3 kph) constant or 40 mph (64.4 kph) gusts. Do not operate during electrical storms. For sustained wind exceeding 100 mph (161 kph), remove the marquee and seat, and lower the boom.
Passenger Restrictions	Height: 36" (0.9 meters) Medical: Expectant mothers and persons with neck or back problems, vertigo, or heart conditions are not permitted to ride. All passengers must fit securely into the seat/restraint system to be permitted to ride.
Power Consumption	10 Kwh
Electrical Power Requirements	208/240 V, 3 phase 30 amp/1 phase 40 amp, 50 Hz/60 Hz or 380/460 V, 3 phase, 20 amp, 50/60 Hz
Static Information Standard Model	Height: 23″ 5″ (7.1 m) Width: 10′ 3″ (3.139 meters) Weight: 2,850 lbs. (1,293 kg) empty Depth: 10′ 3″ (3.139 meters) Diameter: N/A
Dynamic Information Standard Model	Height: 23′ 5″ (7.1 meters) with top 18′ 7″ (5.66 meters) without top Width: N/A Weight: 3,550 lbs. (1,610 kg) fully loaded Depth: N/A Diameter: N/A
Static Information Short Model	Height: 21′ 5″ (6.533 meters) Width: 10′ 3″ (3.139 meters) Weight: 2,850 lbs. (1,293 kg) empty Depth: 10′ 3″ (3.139 meters) Diameter: N/A

Dynamic Information Short Model	Height: 21′ 5″ (6.553 meters) with top 16′ 7″ (5.09 meters) without top Width: N/A Weight: 3,550 lbs. (1,610 kg) fully loaded Depth: N/A Diameter: N/A
Fastener Schedule	Torque all grade 5 bolts (dry): • 3/8″ bolts not over 31-foot lbs. • 7/16″ bolts not over 50-foot lbs. • ½″ bolts not over 75-foot lbs. • ¾″ bolts not over 265-foot lbs. • 1″ bolts not over 600-foot lbs. • 1¼″ bolts not over 1120-foot lbs.
Load Distribution per Footing	NA
Elements and Structures	NA
Maximum Static Design Loads	NA
Maximum Dynamic Design Loads	NA
Interface Design Specifications	NA
Maximum Positive Acceleration	Expected ride forces: 2.0 G Design limit forces: 2.7 G

2.4 Ride Components

The Frog Hopper™ ride consists of the following components:

- **Passenger Seat**
  The passenger seat includes the restraint system, the brake system, wheels, and all other cart components.
- **Restraint System**
  The restraint system is comprised of a single bar that is lowered onto the laps of all passengers and locked into place. The ride control system monitors that the restraint is locked into place before operation of the ride can begin.
- **Cable System**
  The cable system includes sheave assemblies, cart cables, and all related items.
- **Drive System**
  The drive system includes the electric motor, pump, valves, plumbing system, and all related components.
- **Electrical System**
  The electrical system includes the control panel and light bars.

- **Boom Structure**
  The boom structure includes the boom which rises vertically above the base pad, and supports the cart.
- **Base Structure**
  The base structure includes the base, which is a rectangular structural steel cage. It envelops the drive system and supports the boom structure.
- **Queuing Area**
  The queuing area includes fencing and gates (should be provided by the owner).
- **Additional Lighting**
  Additional lighting should be provided by the owner.

Section 3: Ride Installation and Set-Up

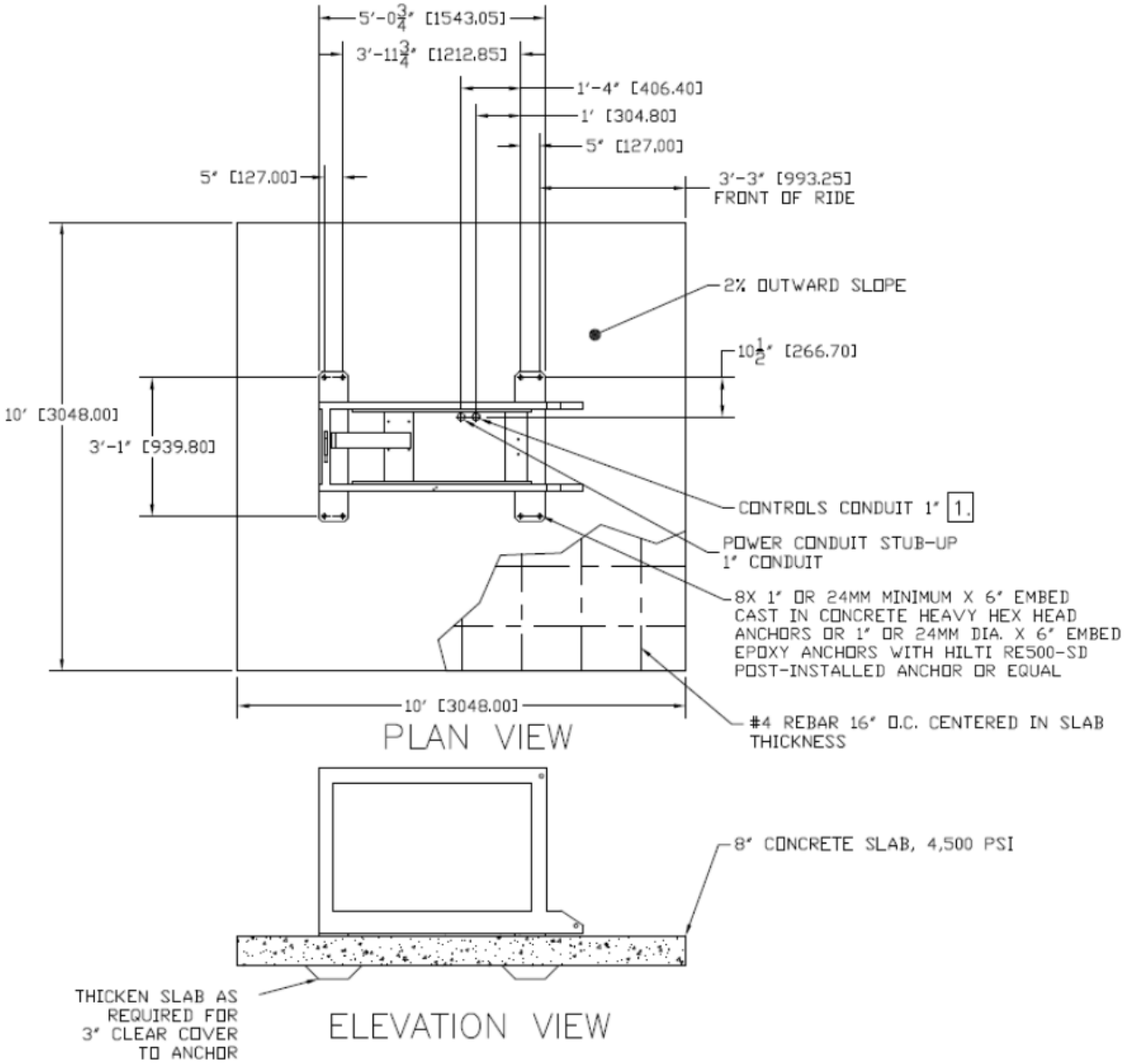
3.0 Ride Installation and Set-Up

The following section provides instruction on how to install and set-up the Frog Hopper™ ride. It includes information on the safety clearance envelope, boom and base installation procedures, and additional set-up procedures.

CAUTION
All cables and lifting equipment used for ride installation and set-up must be work rated for 4000 lbs.

3.1 Foundation Layout

This is S&S standard foundation layout. Reference S&S drawing D-FRG-FDN-1.



Any deviation from the standard S&S layout should be designed for the reaction amounts below (see also D-1058-ENGR-2 for loading conditions):

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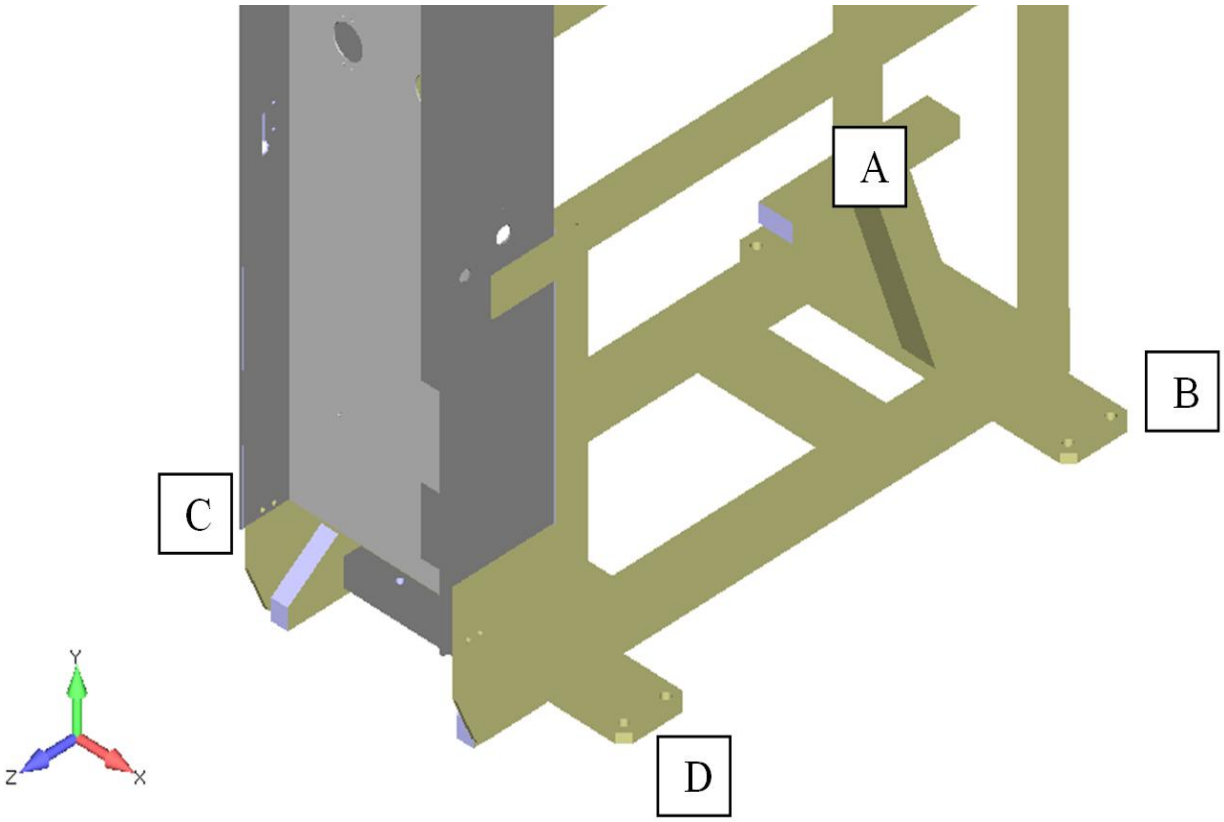
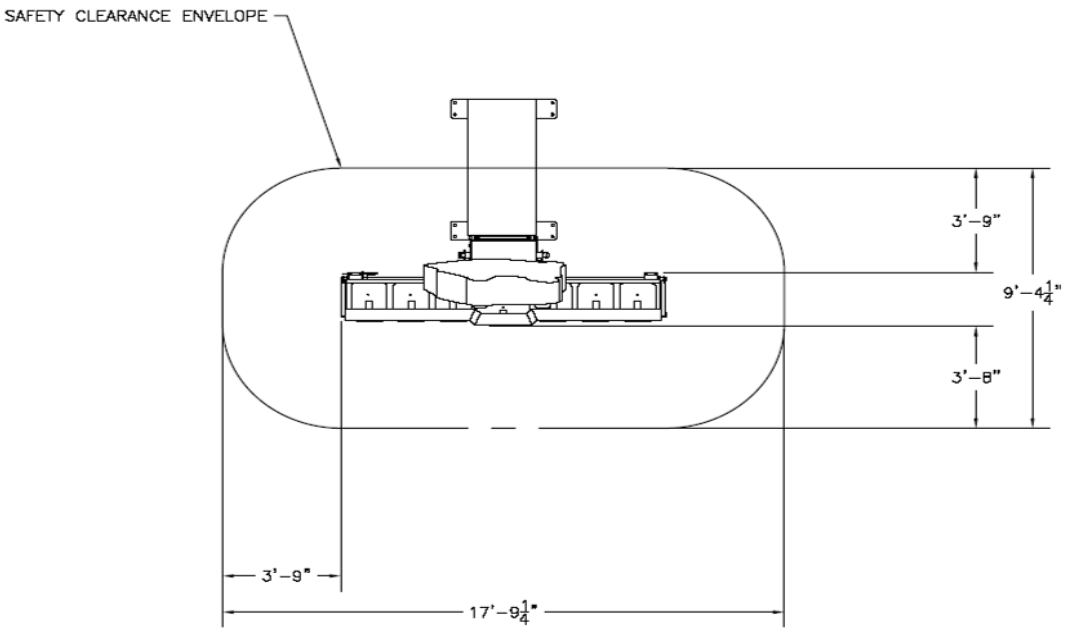


	A			B			C			D		
	x	y	z	x	y	z	x	y	z	x	y	z
	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
Dead	0	74	0	0	74	0	0	1070	0	0	1070	0
Live	0	-612	0	0	-612	0	0	2302	0	0	2302	0
Dead + Live	0	-538	-1	0	-538	1	0	3372	-1	0	3372	1
Dead + Live + Operational Wind Load (+z)	-1	-985	-115	-1	-985	-115	1	3523	-115	1	3524	-115
Dead + Live + Operational Wind Load (-z)	0	46	106	0	46	107	0	2494	106	0	2494	107
Dead + Live + Operational Wind Load (+x)	-31	-537	-19	-31	-537	19	-81	2467	-19	-81	2528	19
Dead + Live + Operational Wind Load (-x)	30	-411	18	30	-411	-18	81	3560	18	81	3499	-18
Dead + Non-Operational Wind Load (+z)	-2	-3255	-1006	-2	-3255	-1021	2	4397	-1006	2	4400	-1021
Dead + Non-Operational Wind Load (-z)	1	3324	1009	1	3324	1011	-1	-2177	1009	-1	-2179	1011
Dead + Non-Operational Wind Load (+x)	-283	-459	-175	-283	-459	175	-774	-4557	-175	-774	-3992	175
Dead + Non-Operational Wind Load (-x)	283	736	787	283	736	-175	137	5978	787	137	5412	-175

Contact S&S for reaction amounts when wind load on Frog is greater than a 130 mph wind (ASCE 7-05).

3.2 Safety Clearance Envelope

When installing a Frog Hopper™ ride, ensure that public access cannot breach the ride safety envelope. Requirements for the envelope are shown in the following figure.



Drawing F-FRG-DOC-2

3.3 Base Installation Procedure

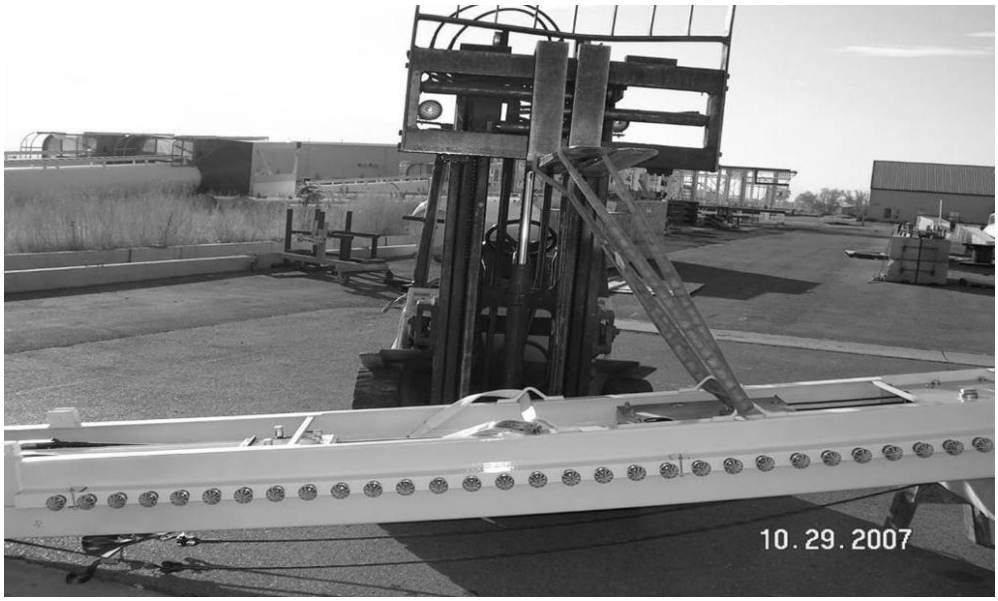
After removing all of the components from shipping containers, position the base at the prepared site. Bolt the base to the ground using 1" or 24mm heavy hex head anchors or 1” or 24mm threaded rod cut in 6” or 152 mm lengths and embed with a fast setting anchor epoxy. It is recommended that the anchor bolt holes are match drilled using the frog base. Make sure the epoxy is fully cured before installation. If using the stand-alone foot, place the foot into position first and make sure that it is level. Then, place the base on the foot and fasten the base to the foot.

3.4 Boom Installation Procedure

Match the bolt holes in the lower end of the boom with the corresponding bolt holes in the base. Place the 1″ bolts that are provided into the holes, but do not tighten the bolts until the boom is in the vertical position. The boom can be lifted into the vertical position one of two ways, either by lifting with a forklift or by using a 1½-ton come-along.

3.4.1 Installation Using a Forklift

1) Remove the pivot bar from the upper bolt holes.
2) Attach a lifting strap through the set of the lifting brackets furthest from the base.
3) Attach a come-along to this strap and to the ring at the rear of the base.
4) Attach a second lifting strap through the set of the lifting brackets closest to the base (this strap should go around the cable/chain of the come-along).
5) The strap closest to the base is used by a forklift to raise the boom part of the way. Place one fork of the forklift through the lifting strap.
6) Lift the boom so the top is about four feet off the ground and insert the marquee.
7) Continue to lift the boom with the forklift until it is at an angle of approximately 50 to 60 degrees and it would not be possible to lift it any further without the forklift damaging the boom. Be sure to take up the slack in the cable/chain of the come-along while it is being raised.
8) Carefully remove the fork from the lifting strap.
9) The come-along is used to finish lifting the boom when the forklift has raised it to the maximum height. Carefully align the upper bolt holes at the boom and base. To align the holes, it is necessary to lift the bottom of the boom slightly, one side at a time. This can be accomplished by placing a jack under the bottom edge of the boom. Be careful to lift the boom only, and not the base. Insert and tighten the bolts.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3.4.2 Installation Without a Forklift

If a forklift is not available, the boom may be raised into position by using a 1½-ton come-along. The same steps need to be followed as described in Section 3.4.1 above, except the entire weight is carried by the come-along.

1) Connect the come-along to the ring at the rear of the base.
2) Take the cable/chain of the come-along over the pivot bar (as shown in the following figure) and connect it to the lifting strap (the lifting strap is already connected in the lifting brackets that are the furthest away from the base). The Pivot bar is used until the chain no longer rests upon it: this is to protect the electrical box from being crushed.
3) Use the same method as is described in Section 3.4.1to lift the boom into position. Remember to remove the pivot bar before the boom is completely vertical.

CAUTION
Do not use the stand-alone foot for the installation of the ride.

3.5 Additional Set-Up Procedures

3.5.1 Front Panel Connections

Remove the front panel of the base and attach the two hydraulic quick disconnects, the wires for the photo sensors, and the light plug-in.

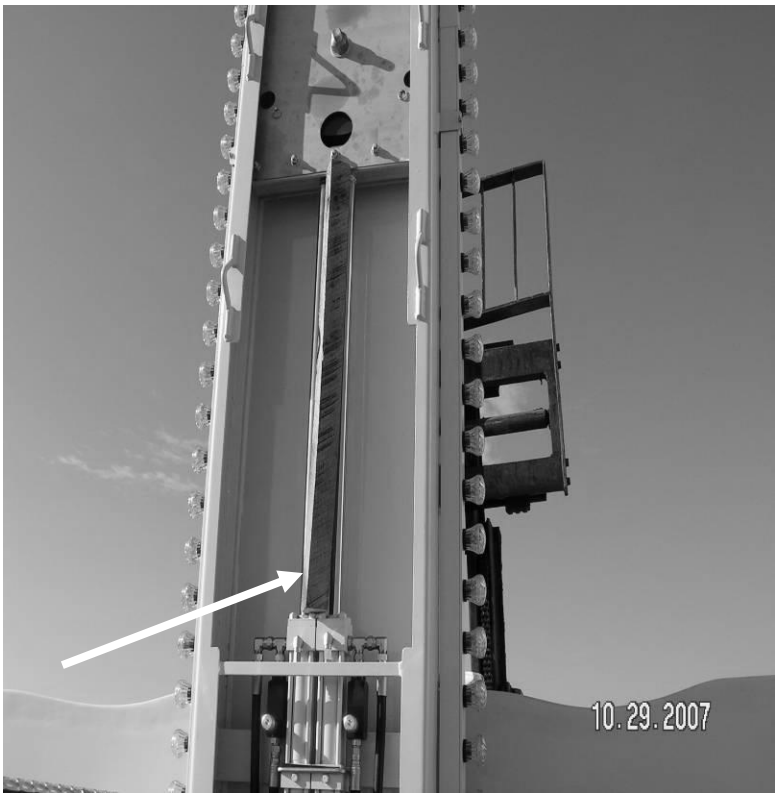
3.5.2 Hydraulic Reservoir Fill Cap

Remove the shipping plug from the hydraulic reservoir and replace with the fill cap.

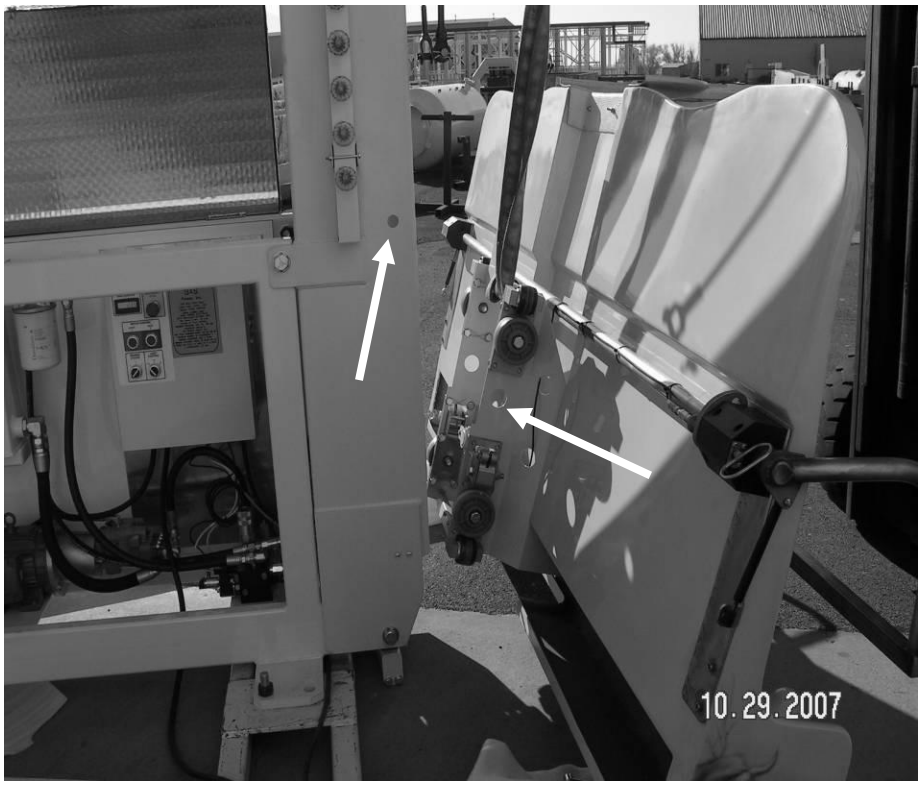
3.5.3 Attachment of Seat Assembly

1) The cables will be tied to the bottom of the boom. Before detaching the cables, loosely secure the moveable pulley assembly (located at the back of the boom and attached to the end of the hydraulic cylinder rod).
2) To secure the assembly, measure the length of the exposed rod and cut a 2″ x 4″ board to a length that is ½″ shorter than the exposed rod and place it between the two rods.
3) While one individual pulls downward on the cables, a second person will be able to remove the fastener holding the cables.
4) Once the cables are free, carefully release them until the

movement is stopped by the 2″ x 4″ board (as shown in the following figure).



5) Ensure that the brake cams are in the correct position (the flat sides should point out as shown in Section 3.5.5).
6) Locate the two cart alignment holes (approximately four feet from the bottom of the boom). Two holes in the cart will line up with the two alignment holes in the boom.
7) Carefully insert the wheel assemblies on the seat/cart assembly through the cutouts in the boom.
8) Using a forklift, raise the seat/cart assembly until the holes line up.
9) Using the lift bar from the base, slide it through the alignment holes (this secures the cart so that it can be worked on safely and is shown in the following figures).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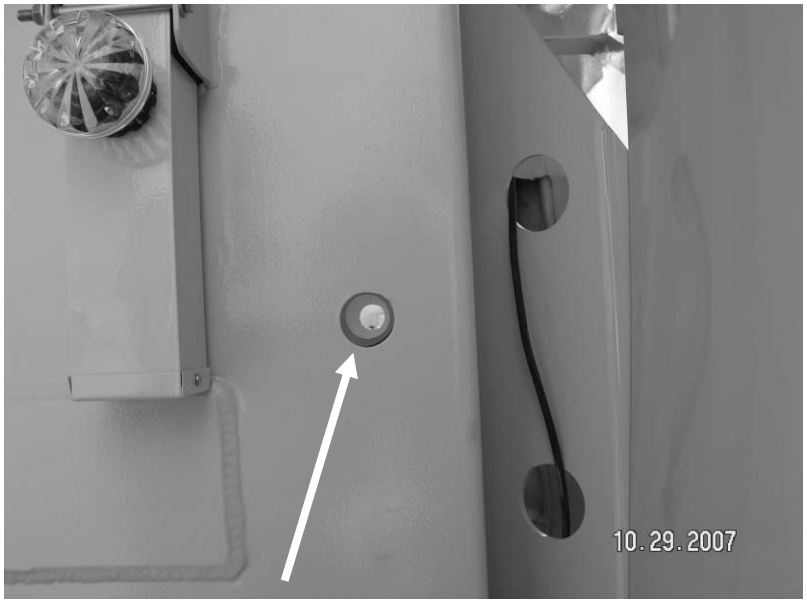
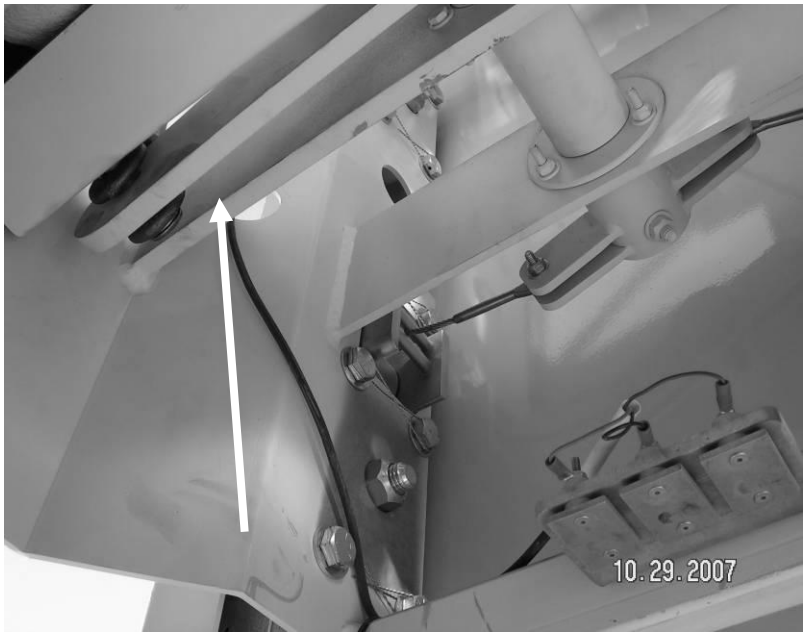


10) To attach the cables, carefully lower the cable down to the attachment bar.
11) From under the seat, pivot the attachment bar just far enough to secure the cable to it. If the attachment bar is rotated too far (past 30 degrees) the brakes may engage.
12) Repeat this process for the second cable.



3.5.4 Power Cable Connection

Connect the power cable to the lugs on the main circuit breaker inside the ride control panel.

3.5.5 Catch Shock and Up-Stop Latch Installation

While the seat assembly is still in the lifted position for cable attachment, install the catch shock assembly shown on F-FRG-FIN-A-27 using the ¾″ x 4 ¾″ hex head bolts, nuts, and washers provided with the ride.
After installing the catch shock assembly onto the base, attach the up-stop catch assembly to the boom as shown in F-FRG-FIN-A-27 Be sure to install the up-stop catch in the location shown on page 2 of the drawing and follow all notes to ensure proper alignment and operation.

3.5.6 Brake Inspection

The brakes should be visually inspected daily. Inspect the brakes on the cart to ensure they are in the operational position and will not engage accidentally during normal operation. The brakes should rotate with moderate force. If a brake rotates freely, tighten the bolt that secures the brake to the cart.

Note that in the figure, the bolt heads for the brake cams face out toward the back of the seat. This is so that they do not rub against the front side of the boom during operation. If bolts are removed, be sure that they are correctly re-installed to prevent damage to the boom.

3.5.7 Finalize Set-Up

Ensure that the E-Stop button is in the “out” position and replace the front panel.

Section 4: Ride Control System

4.0 Ride Control System

The following section provides information about the ride control system of the Frog Hopper™ ride including the function of control switches and gauges, the start-up sequence, and the fault event system.

4.1 Function of Control Switches and Gauges

4.1.1 Motor Start Buttons

- The red motor control button is located on the ride control console inside of the base assembly. This button stops the motor and pump.
- A green motor control button is located on the main control box inside of the base assembly or the ride control console. The green button starts the motor and pump.
- The E-Stop button stops the motor and removes power from the safety control power bus.

4.1.2 Control Panel Buttons

- The yellow button is the cycle start. Once power has been turned on to the ride, pressing the start button will activate the automatic ride cycle.
- The black button is the stop/down. **This may be pressed at any time to stop ride operation.** When the Stop is pressed once during the automatic ride cycle, the ride will stop and descend to the load/unload level. This button is also the fault reset button. Once the fault has been identified by maintenance (fault listing shown in Section 4.3) and properly fixed, pressing the cycle start will reset the fault and allow the ride to operate.
- The red mushroom button is the Emergency Stop (E-Stop). When this button is pressed, it stops the ride, turns off the motor, and cuts power to the safety control bus. While E-stopped, the passenger cart can be lowered to the ground by pressing and holding the Stop/Down button. The passenger cart may also be lowered manually, as described in Section 6.5.2 of this manual. The E-Stop circuit can be reset by pulling up on the E-Stop button.
- The spring return Cycle Start Interrupt key must be turned to the run position and held while also pushing the cycle start button. The ride operator must keep the key with them at all times so park guests may not operate the ride while the ride operator is away.

4.1.3 Light Switch

The light switch is a selector switch which is located on the main control box and has the following three positions:

- On
- Off
- SEQ (sequence) (SEQ allows the lights to flash randomly.)

4.1.4 Cycle Switch

The cycle switch is a selector switch which is located on the main control box. It controls the number of times the ride ascends and descends in a bouncing motion per ride cycle. The cycle switch has the following three positions:

- The ride ascends a total of four times.
- The ride ascends a total of five times.

4.1.5 Digital Pressure Switch

The digital pressure switch, located on the valve block, displays the pump output pressure in psi (pounds per square inch).

4.1.6 Contact Switch

The contact switch, which is located on the back of the seat assembly, is activated when the lap bar is down and secured. If the switch is not activated, the operator cannot start the ride.

4.1.7 Foot Switch

The foot switch is an external pedal that the operator must keep pressed down for the ride to operate. If operator leaves station and steps off foot pedal the ride cycle will stop with an emergency stop.

4.2 Start-Up Sequence

1) After the passengers are seated and secure, the operator lowers the lap restraint bar, which locks into the closed position.
2) The operator dispatches the ride by stepping on the foot switch, pressing the start button and turning the cycle start key. After the control system receives the start command, the PLC (programmable logic controller) automatically steps through the ride sequences.
3) The PLC energizes the up valve, opening the valve to retract the hydraulic cylinder on the boom. The cable pulley system attached to the cylinder and the cart-seat assembly raises the passenger cart to the top of the boom structure.
4) When the cart is detected by the top photo eye, the PLC de-energizes the up valve, stopping the cart ascent.

5) The PLC redundant down valve outputs are tested.
6) The PLC cycles the down valve open and closed in specific intervals to create the optimal bounce for the passenger weight. The drop sequence will bounce the cart three to four times before the cart passes in front of the bottom photo eye.
7) When the cart is detected by the bottom photo eye, the PLC returns to the lift sequence, de-energizing the redundant down valve outputs and energizing the up valve again.
8) The PLC repeats the cycle three to five times (the number of cycles is selected using the cycle selector switch located on the control panel).
9) At the end of the final cycle, the PLC energizes the slow letdown valve, which brings the cart back to the home position.
10) The operator steps off foot switch.
11) The operator unlocks and raises the lap restraint bar, locking it into the open position. The actual ride lasts about 1 to 1½ minutes, depending on the selected number of bounce cycles. The full cycle time, including passenger loading and unloading, is approximately two to three minutes.

4.3 Fault Event System

Fault detected by the PLC will stop the ride in progress. The boom lights will flash in rapid succession to indicate the fault detected by the PLC. The number of times the lights flash indicates the fault number.

Fault Event Listing

	Fault Description
1	Cart dropped too far while testing redundant down valves.
2	Down blocking valve output did not transfer off.
3	Down valve output did not transfer off.
4	Up valve output did not transfer off.
5	Slow letdown valve output did not transfer off.
6	Bottom photo eye N.O. (normally open) and N.C. (normally closed) contacts were both in the same state.
7	Down valves were open too long.
8	Restraint proximity switch was on at the wrong time.
9	Cart took too long to lift.
10	Operator released footswitch during the ride.
11	Spare
12	Bottom photo eye and top photo eye were seen at the same time.
13	E-Stop button is pressed.

Section 5: Ride Personnel

5.0 Ride Personnel

The Frog Hopper™ ride can run safely and continuously, but only with the assistance of a regular maintenance crew. The maintenance crew should be committed to completing detail orientated maintenance on a daily basis.

5.1 Safety Concerns

S&S Worldwide, Inc. recommends the use of daily logbooks that must be signed off by a responsible supervisor, indicating that the various inspections and checkouts have been performed each morning before the ride has been opened to the public.
It is important that unexplained events, control discrepancies, frayed cables, etc., be thoroughly investigated and their causes determined. When a problem is found, it must be resolved before permitting the ride to be opened or before continued operation. The ride must be operating properly in all respects whenever it is carrying passengers.

5.2 Personnel Requirements

5.2.1 Summary of Positions

The following is a brief summary of the operator positions at the Frog Hopper™ ride.

- **Authorized Maintenance Mechanic**
  The authorized maintenance mechanic should perform inspections, maintenance, and repairs on the Frog Hopper™ ride.
- **Ride Control Operator**
  The ride control operator is the person who operates the ride from the control panel. This person is also responsible for pre-opening duties.

5.2.2 Job Assignments

The ride operating procedures herein are not specific about the number of personnel required; however, it is important to have enough qualified operators to carry out the following instructions. Facility management is responsible to determine personnel

requirements based on local conditions and practices. The following instructions are for the minimum number of people to operate the ride safely (S&S recommends staffing the ride with additional personnel for increased efficiency).

- One person must be at the operator control panel at all times during ride operation.

WARNING
When the ride control operator is away from the ride, another responsible ride control operator must be designated to the ride. Every member of the operation must know who is in charge of the ride at all times.

- Ride control operator must give undivided attention to the controls, ride passengers, and the ride. It is imperative that the ride operator does not share in any other duties that may be a distraction.
- Ride control operator must not leave his/her position at any time during ride operation.

Section 6: Ride Operation

6.0 Ride Operation

The following section provides instruction on ride operation procedures including pre-opening, guest instructions, operating procedures, scheduled closing, planned/unplanned downtime, winterizing shut down and long-term storage.

6.1 Pre-Opening Procedures

S&S recommends completing the following procedures prior to opening the Frog Hopper™ ride.

6.1.1 Cleaning

- Sweep all floors including the stairs, ramps, and line areas.
- Clean all trash cans on and around the ride.
- Examine the seats for dirt, debris, and/or damage.
- Special cleaning projects including:
    - Scraping gum from the platform, stairs, or walls.
    - Removing any graffiti from the area.
    - Cleaning the queue line area railing.

6.1.2 Inspection

Before starting the ride each day, a daily shift change inspection routine must be completed to ensure that the ride is safe. The responsibility for this inspection must be assigned to an authorized maintenance mechanic who fully understands the system and the possible liabilities involved and who can supervise the correction of any discrepancies. By signing the Daily Shift Change Inspection Sheet, the mechanic certifies that all equipment and systems are in good and safe working order so the ride can be opened to the public (see Section 10.1 for the Daily Shift Change Inspection Sheet).

WARNING
Completion of daily inspections and certifications are extremely important to facilitate a safer ride experience and environment.

6.1.3 Authorized Maintenance Mechanic Procedures

It is the responsibility of the maintenance personnel to ensure that the ride has been inspected and is operating properly prior to releasing the ride to operating personnel.

6.1.4 Ride Control Operator Procedures

The following items must be completed by the ride control operator before opening the ride.

- Verify that the ride Daily Shift Change Inspection sheet has been signed off by maintenance department personnel.

WARNING
Do not operate the ride until inspections and inspection sign-off sheet have been completed.

- Test the restraints. The restraints must be functional before anyone is allowed to ride.
- Complete two operating cycles of the ride without passengers aboard.
  - During the test rides, be aware of all aspects of the ride operation through the ride cycle. If anything unusual is apparent, (i.e., strange noises, vibrations, etc.), follow the procedures for unplanned downtime (see Section 6.5.2).
  - Test rides during operating hours may be done, as long as no guests are permitted to ride during testing. The ride control operator is responsible for the ride at all times.

WARNING
If the ride does not operate correctly, do not begin operation for passengers. Problems must be corrected before anyone is allowed to ride.

- Ensure that scheduled cleaning has been completed.
- Inspect the queuing area.

    - In the event that all queue line areas are being used and the guest waiting line extends into pedestrian or other traffic, be prepared to set it up in an appropriate location.
    - Portable barricades should be used to organize the queue line.
    - Remove and store barricades as soon as they become unnecessary.

- Ensure that fire extinguishers are in place.
- Ensure that phone and PA systems are operating properly.
- Ensure that all signs are in place and legible.
- Ensure that all line area railings, gates, and chains are in place, hooked properly, and free of rough and jagged edges.
- Ensure that entrance and exit ramp/stairs are in good condition and clear of obstructions.
- Ensure that the ride is free of visible defects.
- Ensure that the E-Stop button is up.

(See Section 10.2 for pre-opening safety checklist.)

6.2 Guest Instructions

6.2.1 Height Restrictions

Only guests who are 36” (0.9 meters) tall are allowed to ride the Frog Hopper™. If a guest does not meet size requirements, they should not be permitted to ride.

6.2.2 Medical Restrictions

Persons with, but not limited to, the following limitations should not be permitted to ride the Frog Hopper™.

- Expectant mothers
- Persons with neck or back problems
- Persons with vertigo
- Persons with heart conditions

6.2.3 Guests with Disabilities

Guest(s) confined to a wheelchair and/or physically unable to safely or comfortably negotiate the line area may enter through the ride exit. Disabled guests, or a member of their party, should contact a ride host/hostess for instructions before attempting to enter through the exit.

The extent of a guest's physical limitations should be determined before they are allowed to ride. If there are any questions about the advisability of allowing a disabled guest to ride, a lead/foreman or supervisor should be called to make the decision of whether or not they should be allowed to ride.

WARNING
Persons with additional various disabilities that are beyond these generalized limitation guidelines should not be allowed to ride the Frog Hopper™ ride. The decision whether persons with additional various disabilities are allowed to ride the coaster is solely the responsibility of the owner/operator of the ride.

If it is decided that the guest can safely ride, a load/unload host/hostess should coordinate the loading process for the disabled guest and their party.

The host/hostess should assist in any way possible, except for the physically moving the disabled guest (i.e., moving crutches or wheelchair out of the way).

WARNING
Do not physically handle any disabled guest(s).

6.2.4 Guest Rules

The ride control operator should enforce the following rules for the safety of the guests.

- Guests may not enter the ride with food, beverages, cell phones, or any other loose items.
- Guests should not be allowed to sit on or lean over the gates or queue line area railings.
- Guests may not move past the gates or queue lines until their turn to ride.

6.2.5 Complaints

The ride control operator is responsible for handling general guest complaints. In the event the ride control operator is unable to resolve the complaint, a supervisor should be contacted.

6.3 Operating Procedures

The following operating procedures should be carried out by the ride control operator.

6.3.1 Start-Up Procedures

Start-up procedures should not be performed until the daily inspection has been completed and both the pre-opening safety checklist and the 24 hour/shift change inspection sheet have been filled out and signed. The following procedures should be carried out prior to loading the ride.

- Personnel and guests must be clear from the ride and in safe locations. If conditions are unsafe, the operator should wait until a safe condition exists before continuing.
- Keep the flow of guests into the loading area as constant and even as possible.
- Try to have a full load of guests lined up and ready to begin loading after each ride is completed.

6.3.2 Loading

S&S recommends the following procedures when loading passengers onto the ride.

1) When the gates open to admit guests, monitor loading to ensure that guests board correctly and safely.
2) Ensure that the weight of the passengers is distributed evenly on the ride.
3) Lead all guests to their seats, and assist them if necessary.
4) Pull the restraint lock pin (unlock) and rotate the restraint bar down until the pin locks the bar in the lower position.
5) Visually inspect all passengers for correct rider position.
6) Recheck the restraints by pushing down and then trying to pull the restraint bar back up.

WARNING
If the restraint does not function properly, do not operate the ride.

7) If a loading problem arises which requires the restraints to be unlocked during the loading process, recheck the restraints.

8) Repeat the following script: "Welcome to the Frog Hopper™. Please do not enter the ride with any loose articles. Please seat yourself quickly but carefully. When all passengers are seated and facing forward, I will lower and latch the lap bar. Here we go— enjoy your ride."
9) Respond courteously and attentively to all guest inquiries.

6.3.3 Operating

S&S recommends the following procedures when operating the ride.

1) The ride control operator must have visual contact with all of the passengers before starting the ride.
2) The ride control operator will sit or stand directly in front or slightly off to one side, of the ride seating and must be able to see the passengers at all times.
3) When conditions permit safe ride activation, the operator will initiate the automatic ride cycle.
4) While the ride is in motion, the operator must remain within the safety zone. This zone keeps distance between operator and moving seats.
5) The operator at the control stand must give undivided attention to ride operation at all times. At no time may the operator leave the control stand while the ride is running (unless another responsible ride control operator is designated to the ride and present).
6) At anytime during the ride, the stop button or the E-Stop button may be pressed to cease the ride in progress. If the E-Stop button has been pressed, or if a fault is detected, **press the Stop/Down button and hold it down to lower the passenger cart to the load/unload position.** (In case of a power outage, see Section 6.5.2 of this manual for downtime procedures.)

6.0.4 Unloading

S&S recommends the following procedures when unloading passengers from the ride.

1) Repeat the following script: "Welcome back. When the ride comes to a full and complete stop, I will unlock and raise the lap bar. Please follow the exit sign. Thank you for riding the Frog Hopper™!"
2) Upon completion of the ride cycle, lift the restraint bar and assist the passengers, if necessary, to exit safely.
3) As a ride cycle ends and the ride comes to a complete stop, the ride control operator should open the exit gate.

6.1 Scheduled Closing Procedures

When scheduled closing of the ride occurs, adhere to the following procedures:

- Accommodate all guests waiting in line at the scheduled closing time of the ride (do not let newly arriving guests enter the line).
- Check that passengers are not occupying any of the seats.
- Ensure that the ride system is turned off.
- Ensure that the restraint bar is down and latched.
- Verify that the on-ride circuit breakers are turned off.
- Verify that all electrical components are turned off.
- Ensure that all maintenance logs have been completed and signed.

6.2 Planned/Unplanned Downtime Procedures

6.5.1 Planned Downtime

Predetermined ride closure is called planned downtime. When planned downtime occurs, follow the scheduled closing procedures (see Section 6.1).

6.5.2 Unplanned Downtime

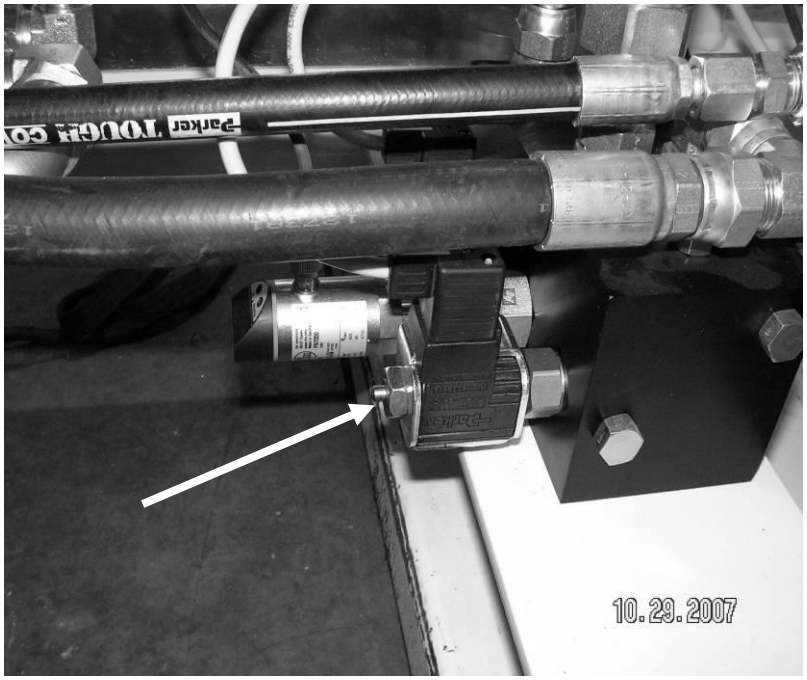
CAUTION
In the event of an electrical power failure, the ride does not retain the ability to actuate when the up or down buttons located on the control panel are pushed.

When unplanned downtime occurs, adhere to the following procedures.

1) Stop the ride operation.
2) Repeat the following scripts to the passengers:
    - In the case of short-term downtime, “Ladies and gentlemen, at this time the Frog Hopper™ has temporarily ceased operation. We will inform you of the time of restart as soon as possible. We apologize for any inconvenience. Thank you.”

- In the case of long-term downtime, “Ladies and gentlemen, we regret to inform you that the delays we are experiencing will be lengthy. Please exit the ride. A host/hostess will be near to help assist you if necessary. We apologize for any inconvenience.”

3) Notify the operations office immediately.
4) Unload the ride. If the passenger cart is not located in the load/unload position, and the stop button on the panel will not bring the cart down, the let-down valve shown in the figure below must be manually actuated to lower the seat. This operation will require two operators. Position one operator, who has direct visual contact with passengers, at the control panel. The other operator will manually operate the valve. Using a blunt object, press in the manual release button located on the valve end. This allows the passenger cart to slowly return to the load/unload position.



5) Ride operators should remain at their designated positions until directed by a supervisor.
6) Explain to guests that the ride will be reopened as soon as possible. When talking with guests, do not be specific concerning the nature of the problem unless the problem was caused by guest misbehavior.
7) Record the reason and the time of stopping the operation and record the time of restarting operations.

8) Unless maintenance personnel have confirmed that the downtime will be momentary, do not estimate the time for the ride to be back in operation.
9) Operations and maintenance personnel should decide whether the queue line area should be cleared. If a ride operation was discontinued due to mechanical reasons, the ride should not be restarted without maintenance mechanic approval.

6.6 Winterizing Shut Down and Long-Term Storage Procedures

Adhere to the following procedures for winterizing shut down and long-term storage.

1) Locate all devices supplying power to the ride, turn them off, and tag them.
2) Write an explanation on each tag stating that the ride has been shut down and winterized.
3) Write the name and phone number of whom to contact with questions regarding the ride.
4) Remove seat, cart, cables, and marquee.
5) Install a fiber-type tarp to cover the base cage and make sure it is well secured.
6) Place desiccant bags in the control boxes to protect the electronics from humidity.
7) Allow the cylinders to retract to protect the rods from corrosion.
8) Remove all proximity sensors and box them for storage.
9) List all parts needed before re-opening and order them.

CAUTION
All components removed from the ride must be stored indoors.

The extensiveness of winterization/long-term storage is somewhat site specific depending on expected weather conditions, so the previous list may need to be customized.

Contact S&S Worldwide, Inc. regarding any questions or concerns.

Section 7: Safety

7.0 Safety

Safety depends on sincere, constant, and cooperative efforts of the entire organization.

7.1 Management Safety Policy

7.1.1 Responsibility

It is the responsibility of ride personnel to be accountable for their own safety, the safety of their fellow workers, and the safety of each guest that enters the facility.

Whatever the position or job responsibilities, each individual must take the matter of accident prevention and safety seriously.

7.1.2 Safety Rules

The safety and well being of all operators and riders of the Frog Hopper™ should always be the top priority of management. In support of this commitment, facility management should make every effort to provide a safe environment by complying with the following:

- Ensure that all guest areas are clean.
- Keep working areas neat, clean, and free from actual and potential hazards.
- Keep equipment, tools, and machines in good repair and safe to use.
- Study and use safe work and operation methods.
- Log the performance of ride employees using the same precise methods.
- Immediately correct hazardous situations, which could potentially cause an accident.
- Comply with all laws regarding accident prevention and safe working conditions.
- Provide employees with all safeguards to assure safe working conditions.
- Develop safe working procedures.
- Train employees in safe working procedures.
- All employees should be authorized to shut down the ride if a potentially hazardous situation is observed.

7.1.3 Recognition of Unsafe Situations

Employees should immediately report unsafe situations. Unsafe situations include, but are not limited to, the following: the potential for a rider to trip, slip, bump, get a splinter, or get cut.

Many accidents are caused by unsafe actions of employees or guests; employees and guests should refrain from horseplay.

Housekeeping is very important to safety: ensure that everything is in its proper place. Ensure that no trash or other debris is lying around.

7.2 Emergency Unloading Procedures

Owner/operators are responsible for providing and implementing emergency unloading procedures.

7.2.1 General Procedures

S&S recommends the following procedures for evacuating guests from the ride when an emergency occurs:

1) If the ride has been activated, stop the ride using the stop button.
2) Lower the seat to the load/unload position.
3) Unload the ride as quickly and safely as possible (see Section 6.5.2 for ride downtime procedures).
4) Talk to the passengers if they cannot be immediately released. Tell them to remain calm and that they will be attended to shortly.
5) Proceed in a calm and orderly manner.
6) Escort each set of passengers to the emergency exit until all passengers have been evacuated.
7) Escort the guests to the exits, and remain with them until they are clear of the emergency situation.
8) Notify operations office.

7.2.2 Emergency Unloading Procedures When Brakes are Engaged

If a cable fails, causing the rocker arm to trip the brakes, the seat will come to a complete stop at the height of the cable failure. The cam brakes will assume full load of the seat and riders. **Depress the E-stop button immediately when a cable failure is detected.** S&S recommends the following unloading procedures when brakes are engaged.

- **Turn Power Off**
  As a safety precaution, the power must be turned off at the main power switch inside the Frog Hopper™ control panel. Having power supplied to the ride may provide a hazard to individuals working to remove the passengers and lower the seat. Electrical power will not help to lower the seat when the cable has failed and the brakes are engaged. Do not apply any additional load or force to the passenger cart; as such force exerted downward will only more fully engage the brakes.
- **Remove the Riders**
  Offer a brief explanation of the failure to passengers and spectators and assure them that the ride will not fall and they are safe. The safety concern in removing the passengers is that there is only one restraint bar for all seven seats. It will require at least three trained operators to safely unload the passengers:

  1) The first operator should open and close the restraint bar.
  2) The second operator should unload the passengers.
  3) The third operator should keep the remaining passengers seated.
  4) If the ride stops at a height above the reach of the ride operators from the ground, it is recommended that a rolling ladder or a forklift with a cage attached be used to reach the passengers. The local fire department may also be contacted for assistance in unloading the passengers.
  5) Escort each set of passengers to the emergency exit until all passengers have been evacuated.
  6) Escort guests to the exits, and remain with them until they are clear of the emergency situation.

  Notify the operations office for the assistance of trained maintenance personnel in lowering the passenger cart. Contact S&S Worldwide, Inc. if additional assistance is required to lower the passenger cart.

7.3 Emergency Procedures in Case of Injury

Owner/operators are responsible for providing and implementing ride emergency procedures in case of injury.

WARNING
In any injury situation, it is important that everyone on the crew remain calm.

7.4 Emergency Procedures in Case of Fire

Owner/operators are responsible for providing and implementing ride emergency procedures in case of fire.

7.5 Electrical System Safety

Always turn off and lock out the main electrical disconnect before performing any maintenance work on the ride to prevent the possibility of serious injury to employees.

7.6 Lock-Out Procedures

Lock-out procedures should be followed in accordance with local governmental requirements. S&S recommends the following basic lock-out procedures.

7.6.1 Purpose

The purpose of this section is to establish procedures that protect personnel in situations where an unexpected start-up or energizing of equipment would likely endanger them.

7.6.2 Responsibilities

It is the responsibility of both the maintenance and operations departments to provide each employee qualified to work on equipment with a tag, a lock, and a key. Each key must be for one specific lock and should not open any other lock. The maintenance and/or operations department should compile and retain a master list of lock/key numbers for each lock issued by the department. The maintenance department should identify each power device,

piece of equipment, or ride that could pose a hazard if unexpectedly energized. The point or points that must be locked-out, such as the main disconnect switch, lever, or valve, should then be labeled.
All employees should be trained in lock-out procedures. Each worker is responsible for knowing and following lock-out procedures.
Supervisory and/or management personnel must make periodic checks to ensure that correct procedures are followed.
Any employee who observes someone not following the correct procedures must inform that person's supervisor.

7.6.3 Basic Lock-Out Procedures

- Prior to starting maintenance work on ride equipment, the regular operator(s) of the equipment should be alerted that the equipment is about to be shut off.
- Any person who intends to perform maintenance work on a piece of equipment should lock that piece of equipment with his/her tag and lock before attempting to perform any work.
- The lock must be placed where indicated or labeled.
- All sources of power must be locked out.
- After a task is completed by a worker, that person will remove his/her lock and tag.
- No one should remove another person's lock, except as outlined below.
- When all maintenance work is complete, the worker will verify that all guards and safety devices are in place prior to removing the last lock.
- If it is necessary for the maintenance worker to leave the work site temporarily and the work is to be continued later by the same worker, the lock will be left on the equipment.
- If maintenance work is to be continued by another worker (such as at the end of a shift), the departing shift worker will remove his/her lock, and the oncoming shift worker will immediately lock out the equipment with his/her lock.

7.6.4 Procedure When Locks/Keys are not Removed

If a worker forgets to remove his/her lock and leaves the area, only the manager may approve cutting off the abandoned lock. The manager will cut the lock only after completing the following:

1) Attempting unsuccessfully to contact the worker.
2) Inspecting the equipment to establish that it is safe to re-start.

If a lock key is lost beyond recovery, the employee will inform his/her supervisor. The supervisor will destroy the lock and issue the person a new lock and key.

7.7 Accident Reporting

Report any accident or mishap to S&S Worldwide, Inc. by phone at (435) 752-1987 or by fax to (435) 752-1948 as soon as possible after it occurs.

7.8 Safety Hazard Review

All persons involved with any aspect of the operation or maintenance of the Frog Hopper™ ride should consider the following safety concerns and take the appropriate action(s):

7.8.1 Lock-Out Procedures

Maintenance personnel must apply lock-out procedures (lock-out procedures must be followed to ensure that no one starts the ride unaware that another individual is currently performing maintenance on the ride).

7.8.2 Loose Objects

Loose objects, including tools, must not be left anywhere on the ride during maintenance (loose objects have the potential of falling or hitting the ride, bouncing and striking someone as far away as 50 feet).

7.8.3 Path of Movement

Once the ride has been launched, it will come down at its normal operating speed. Do not stand or reach under the cart or in its pathway.

7.8.4 Visual or Verbal Contact

The ride control operator must have direct visual or verbal contact with the maintenance or operations personnel on the loading platform, the cart, and/or the tower structure.

7.8.5 Electrical or Wind Storms

The ride and most of its components are made of metal; therefore, operations or maintenance work should not be performed during electrical or wind storms.

7.8.6 Safe Distance

When the ride is, or is expected to be, in motion, operators should be located a safe distance from the ride (passenger's feet may reach as far as three feet from the passenger seat, and operators on the platform could be struck or kicked).

7.8.7 Passenger Behavior

Operators should anticipate the potential for unsafe behavior from passengers after a relatively short ride cycle is completed. Passengers will experience a major adrenaline rush, which could cause momentary drunken, hyperventilated, or other abnormal behavior.

7.8.8 Passenger Limitations

By design, the ride will not induce excessive G forces, even if malfunctions should occur. However, the designed forces may exceed the limits of some persons with disabilities or limited health conditions. Persons with such limitations should not be allowed to ride.

7.8.9 Passenger Objects

Loading platform operators must look for and remove loose objects from passengers (loose objects carried onto the ride in the hands or pockets of passengers have the potential of dropping and hitting people near the ride).

7.8.10 Normal Operations and Safety Concerns

This manual refers to normal operations and safety concerns. Maintenance mechanics should be familiar with the manual and the operation of the entire ride. Operators should also become familiar with the manual and all operations and emergency procedures. Passengers are expected to comply with posted signs and the operator instructions. All potential hazards cannot be preconceived; therefore, everyone involved with the ride should use caution and common sense in all actions to facilitate a safer ride experience and environment.

7.9 Safety Questions

Consult S&S Worldwide, Inc. with any questions regarding the safety or operation of the Frog Hopper™ (see Section 1.1).

Section 8: General Maintenance Procedures

8.0 General Maintenance Procedures

The following section provides instruction on how to maintain each of the systems and areas associated with the Frog Hopper™ ride. The following procedures should be carried out each month or every 5,000 cycles (see Section 10.3 for the 5,000 Cycles or Monthly Maintenance checklist).

8.1 Electrical Control System Maintenance

8.1.1 Electrical System Cleanliness

Inspect electrical system for cleanliness and to ensure the following:

- It is free of dust and dirt.
- It is free of moisture.

8.1.2 Wire Connections and Cables

Ensure that all wire connections and cables are secure.

8.1.3 Covers, Switches, and Bulbs

Check covers, switches, and bulbs to ensure that they are in working order. Replace any non-working bulbs (either dim or non-functional) with correct replacements.

8.1.4 Labels

Make sure all labels are present and legible.

8.1.5 Power Source

Inspect the power source, and ensure that wires, plugs, and connections are secure.

8.2 Seat/Cart Assembly Maintenance

8.2.1 Restraints

Inspect restraints to ensure the following:

- Restraints are attached securely to the seat.
- Bolts are tight.
- Lock the restraint bar and verify that it will not move forward or backward more than one inch from center of cam hole.
- Remove lap pad and cover to inspect center welds to ensure there are no cracks.

WARNING
The restraint bar tolerance is +/- 1″. If the restraint is out of tolerance, the ride must not be opened.

8.2.2 Seat Support Structures

Inspect the seat support structure for any damage.

8.2.3 Passenger Seats

Inspect the passenger seats to verify that the surface of each seat is free of cracks.

8.2.4 Passenger Cart Assembly

Inspect the cart assembly structure to verify the following:

- There is no visual damage.
- Bolts are tight and in place.
- Wheels on the cart are free of cracks and any other anomaly.
- Wheels on the cart are fastened properly.
- Wheels on the cart turn freely with no bearing noise while in operation.

8.2.5 Brake Assembly

Inspect the brake assembly to verify the following:

- Cams rotate with slight force but do not pivot freely.
- Brake cables are free of frays and kinks.
- Pivot bar can be easily rotated.

WARNING
Do not rotate pivot bar over 30 degrees each way or brakes may engage.

8.3 Wire Rope System Maintenance

8.3.1 Wire Ropes

Inspect cables to ensure the following:

- Wire ropes are free from twists, frays, and kinks.
- Connections are secure on both the passenger cart and the cylinder head end.
- Wire ropes should be replaced if any anomaly is detected.

8.3.2 Sheave Assemblies

Inspect sheave assemblies for damage or excessive wear.

8.3.3 Pulley Bearings

Inspect pulley bearings for excessive play (maximum deflection – 3/32″ or 2.38 mm measured side to side at the outside edge of the sheave).

8.3.4 Pulley Mounts

Pulley mounts should be structurally sound, properly aligned, and fastened.

8.3.5 Sheave Load Surfaces

Check for uneven or abnormal wear on all sheave load surfaces.

8.4 Queuing Area Maintenance

8.4.1 Deck and Stairs

Inspect the queuing area to verify the following:

- Deck and stairs are free of any slip, trip, and fall hazards such as debris, water, etc.
- Components of the stairs are secure.

8.4.2 Flooring

Verify that flooring is secure and does not present any hazards.

8.4.3 Rails and Gates

Check all rails and gates for proper function and verify that there are no sharp objects present.

8.4.4 Signs

Verify that all signs are posted and legible.

8.5 Boom and Base Structure Maintenance

8.5.1 Structure
Inspect the boom and base structure for visual damage to any structural member or weld.

8.5.2 Fasteners
Verify that all fasteners are properly torqued and no corrosion is visible on any fastener or weld.

8.5.3 Surfaces
All surfaces must be painted for good appearance and to protect from rust/corrosion.

8.5.4 Safety Guards and Safety Wire
All safety guards must be in place. Safety wire must be attached to cylinder rod head connection and must not be broken.

8.6 Power System Maintenance

8.6.1 Fasteners
Inspect fasteners to determine that they are properly torqued.

8.6.2 Fittings and Connections
Verify that all plumbing, fittings, connections, joints, valves, and mounts are free of leaks.

8.6.3 Fluids
Verify, by looking in the sight glass on the tank, that fluid levels are ¾ full.

8.6.4 Manual Drain Valve
Ensure that manual drain valve is not leaking.

8.6.5 Gauges
Verify that all gauges are in good working condition.

8.6.6 Safety Guards
Verify that all safety guards are in place and functioning properly.

8.6.7 Bounce Accumulator
Verify that pressure in the bounce accumulator is at a minimum of 200 psi and a maximum of 250 psi.

8.7 Parts Maintenance

8.7.1 Replacement Parts

Use only factory authorized or approved replacement parts.

8.7.2 Spare Parts List

The following spare parts list is to be used as a guide only. Actual requirements may vary due to service and environmental situations.

CAUTION
Use only factory authorized or approved replacement parts.

- **Boom Assembly**

25 ea.	LED light bulbs 230v	#B-SGN-LHT-23
4 ea.	14½" Sheave	#980737
2 ea.	18" Sheave	#SS1169
1 ea.	Upper Photoelectric Sensor	#Q45BB6DQ5
1 ea.	Lower Photoelectric Sensor	#Q45VR3DQ
6 ea.	Sheave Bearings	#B-POW-BRG-89
2 ea.	Cable assembly, 3/8" diameter	
	- Standard Frog	#990375
	- Indoor Frog	#F-FRG-CBL-A-10

- **Seat/Cart Assembly**

1 ea.	Sensor, Turck, Inductive Prox.	#BI2-M12-AP6X-H114
4 ea.	Wheel #5x2 Poly	#B-POW-WHL-17
4 ea.	Wheel #3x2	#B-POW-WHL-16
2 ea.	Gas Spring Guden	#GS-8086
1 ea.	Pin	#SS0679
1 ea	Pin Plug	#SS0905

- **Base Assembly**

2 ea.	Oil filter	#P550388
1 ea.	Gas Spring Guden	#GS-8086
1 ea.	Down Valve	#GS068200N
1 ea.	Slow Down Valve with Manual Release	#GS042110N
1 ea.	Up Valve	#GS048300N

- **Final Assembly**

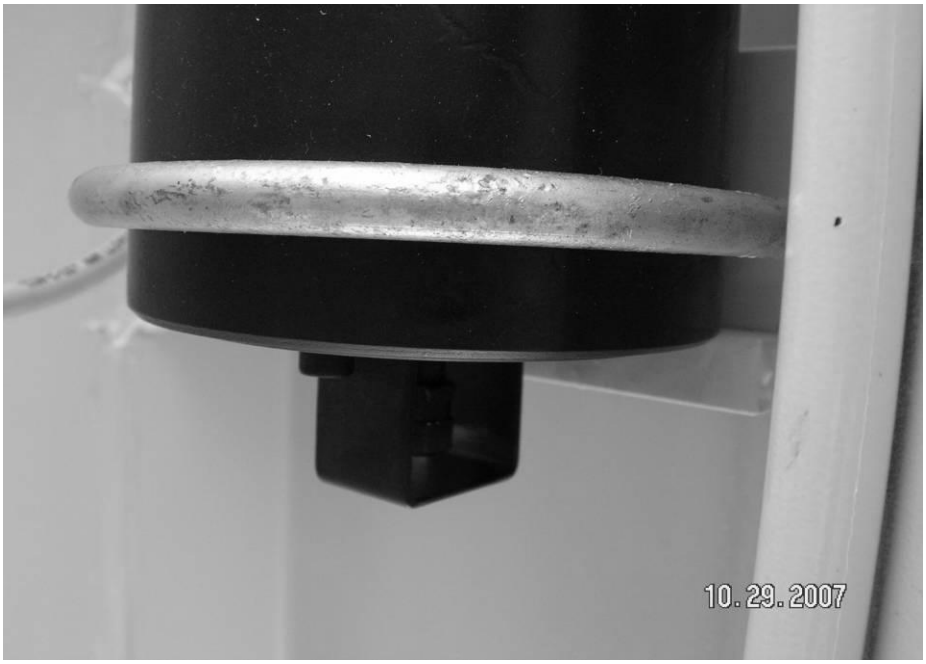
5-10 gal.	Dexron III ATF hydraulic fluid	
4 ea.	Light Control Relays	#B-CON-REL-92

8.8 Maintenance Notes

8.8.1 Accumulators

The accumulators are filled with 250 psi. of nitrogen and installed in the boom assembly. Once the ride has been started, the cart is lifted to the top of the boom and the cycle begins. The accumulators create the bounce effect for the Frog Hopper™. The cart is dropped and the hydraulic fluid is restricted from going back to the tank with the flow control valves and fills the topside of the accumulator with fluid. The nitrogen charge on the bottom side of the accumulator is compressed momentarily and then rebounds (much like a shock) and forces the hydraulic fluid to the topside of the cylinders, which moves the rods down and creates the bounce effect. This process is repeated each time the cart drops.

If the bounce seems to be rough or stiff, the accumulators may need to be rebuilt or replaced. The accumulators can be checked by removing the guard from the bottom of the accumulator, as shown in the above figure, along with the cap to the Schrader Bellows valve. Once they have been removed, quickly depress the valve stem in the center of the valve (this will cause a brief spurt of air). If only air comes out, the accumulators are ok. If a foamy pink fluid comes out of the valve, the seals are allowing the fluid to enter into the nitrogen side of the accumulator and it should be replaced.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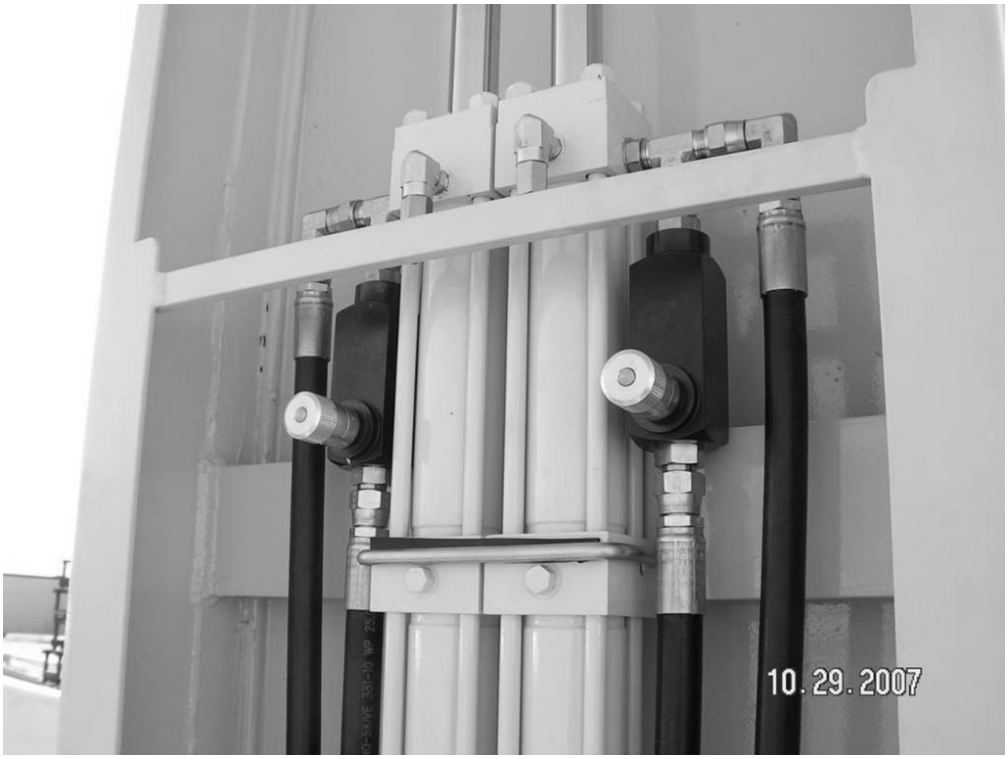
8.8.2 Flow Controls

The flow control valves adjust the amount of hydraulic fluid restricted from going back to the tank while actuating the accumulators.

Do not adjust the flow control valves unless instructed by an S&S service technician. Valves are set at the factory for proper ride function. Make sure the valves are tight and that they have not come loose during shipping or installation.



8.8.3 Catch Shock

The catch shock should be stroked twice a month to prevent the seals from drying out. The catch shock should be inspected daily for fluid leaks. Pay particular attention to fluid leakage on the piston rod or around the seals. If there is leakage, the shock must be replaced or repaired prior to ride operation. Replace if a fall from mid-height or above occurs.

Park Notes:

Section 9: Preventative Maintenance Procedures

9.0 Preventative Maintenance Procedures

Item	Required Action
Wire Rope Replacement	Required Every 40,000 cycles Every 3 years Recommended Annually
Oil Filter Replacement	First 50 hour interval and Every 250 hours thereafter
Hydraulic Hose Replacement	Every 3 years
Catch Shock Replacement	Every 250,000 cycles

Item	Suggested Action
Sheave Bearing Replacement	Replace at time of Wire Rope replacement
Down Valve Replacement	Every 3 years
Hydraulic Cylinder Rebuild or Replace	Every 50,000 cycles
Hydraulic Accumulators Rebuild or Replace	Annually or 30,000 cycles
Cart Wheels	Annually
Oil Change	Annually

9.1 Preventative Maintenance/NDT Schedule

Perform NDT of the welds noted on the drawings for the following components:

MT Boom Weldment	Every 3 years
MT Base Weldment	Every 3 years
MT Sheave Attachment Weldment	Every 3 years
MT Cart Weldment	Every 3 years
MT Cam Trigger Weldment	Every 3 years

(Pre 2004 models require visual inspection, and magnetic-particle inspection (MT) is recommended. Post 2004 models require MT inspection per AWS D1.1 requirements.)

Refer to the following drawings:

Base Weldment	002125
Boom Weldment (Standard Frog)	F-FRG-BOO-W-2
Boom Weldment (Indoor Frog)	F-FRG-BOO-W-11
Sheave Attachment Weldment	002189
Cart Weldment	002268
Cam Trigger Weldment	002281

(Please contact S&S to obtain the latest revision of the drawings listed)

9.2 Wire Rope Replacement Procedure (F-Style)

S&S recommends that owners/operators of the Frog Hopper™ ride change the wire ropes on an annual basis.

9.2.1 Wire Rope Removal Procedure

1) Remove the cap from the top of the boom.
2) Place a 2” x 4” block between the traveling sheave head and the top of the cylinder bodies.
3) Raise the passenger cart.
4) Disconnect the wire ropes from the passenger cart.
5) Remove the pins from the traveling sheave head.
6) Lift the clevis end of the wire ropes up and off of the upper sheaves.
7) Remove one wire rope one at a time, by threading the eye end of the wire rope around the traveling sheave head and around the stationary sheave.

9.2.2 Wire Rope Installation Procedure

1) Place the clevis end of the wire rope over the upper sheave.
2) Thread the eye end of the wire rope on the cylinder side of the boom and thread it down through the stationary sheave head assembly.
3) Thread it through the traveling sheave head assembly, back up and around the stationary sheave assembly and back down to the traveling head assembly.
4) Attach the wire rope to the traveling sheave assembly.
5) Reinstall the pull pins on the traveling head assembly and stationary sheave assembly.
6) Install the clevis end of the wire rope to the passenger cart.
7) Lower the cart and remove the 2” x 4” block.
8) Ensure all bolts are tight and wire ropes are routed correctly.

CAUTION
Failure to route wire ropes properly could cause damage to the Frog Hopper™ ride.

If further assistance or instruction is necessary, contact the S&S Service Department at (435) 752-1987.

9.3 Hydraulic Oil Replacement

Replace hydraulic oil annually. S&S recommends replacing it with Dexron III transmission fluid (see spare parts list in Section 8.7 for amount).

9.3.1 Procedure

1) Remove plug from the drain valve (located on the bottom of the oil tank).
2) Install hose on the valve or place a bucket under the valve. (Ensure oil is captured for proper disposal.)
3) Open the valve.
4) Allow oil to drain completely.
5) Re-install the plug in the valve.
6) Change the oil filter (see Section 9.4).
7) Remove cap from the oil tank.
8) Fill tank with new oil.
9) Cycle the ride.
10) Dispose of the oil in accordance with local environmental laws.

9.4 Oil Filter Replacement

It is recommended that owners/operators of the Frog Hopper™ replace the oil filter after the first 50 hours of operation and every 250 hours of operation thereafter. Oil filter replacement procedure should be as follows:

CAUTION

Cleanliness during filter replacement is essential. Foreign objects will compromise the hydraulic system and could cause ride failure.

1) Shut off power to ride.
2) Relieve all pressure from the ride.
3) Locate the filter (located on the upper left hand corner of the oil tank).
4) Remove the oil filter (use caution while removing the oil filter as there may be some pressure still on the filter).
5) Ensure the seal on the new filter is laying flat against the filter housing.
6) Install the new filter.
7) Apply power to the ride.
8) Operate the ride.
9) Verify that there are no leaks in the hydraulic system.

For further assistance or instruction, contact the S&S Service Department at (435) 752-1987.

9.5 Sheave Bearing Replacement Procedure (F-Style)

S&S recommends that owners/operators of the Frog Hopper™ ride change the sheave bearings (B-POW-BRG-89) annually. Sheave bearing replacement procedure is as follows:

1) Remove wire ropes from the ride (see Section 9.2.1).
2) Remove upper sheave assemblies.
3) Remove stationary sheave assemblies.
4) Remove traveling sheave assemblies.
5) Remove the screws holding the capture plates in place and use the screws in the threaded secondary holes to press the capture plates apart.
6) Remove the bearing out of the sheave.
7) Inspect the bearing plates for wear (replace if bearing plates show signs of wear).
8) Press new bearings into the bearing plates.
9) Reinstall the capture plates.
10) Install sheave assemblies.
11) Install new wire ropes.
12) Inspect the ride.
13) Perform daily maintenance check before opening ride to the public.

For further assistance or instruction, contact the S&S Service Department at (435) 752-1987.

Section 10: Post Installation/Daily Inspection Forms

10.1 Daily Shift Change Inspection Sheet

Inspect and perform necessary maintenance on the following and, when complete, initial the appropriate line by each item (see Section 6.1.2 for inspection details).

Power System

_____ Verify electric motor and pump operation.
_____ Verify hydraulic cylinders. Pushrods should be clean and free of scars.
_____ Inspect hydraulic system for leaks.
_____ Inspect system gauges and verification of operating pressure.
_____ Check fluid levels.
_____ Inspect main power box.
_____ Inspect catch shock for leaks.

Passenger Cart/Seat Restraint

_____ Verify restraints function properly (+/- 1″ deflection).
_____ Inspect cart structure.
_____ Check wheels on cart.
_____ Check condition of seats.

Electrical Control System

_____ Check all switches and labels.
_____ Check all decorative lights.

Wire Rope System

_____ Inspect wire ropes for any fraying or kinks.
_____ Inspect connections.
_____ Inspect sheave pulleys. All wire ropes should be in the sheaves/grooves.
_____ Inspect traveling pulley head and safety wire.

Brake System

_____ Verify cam tension.
_____ Verify brake cable integrity.

Platform/Line Areas

_____ Check condition of ride entry and platform.
_____ Check line areas and fencing.

Previous inspection performed by: _____ (Date/Time) _____

This inspection performed by: _____ (Date/Time) _____

Signatures: _____
Maintenance Personnel Ride Operator

10.2 Pre-Opening Safety Checklist

The following items must be checked “yes” before ride can be opened (see Section 6.1.2 for inspection details).

Yes	No	
_____	_____	Has the authorized maintenance person signed the Daily Shift Change Inspection Sheet?
_____	_____	Are the fire extinguishers in place?
_____	_____	If the ride area has a phone, does it operate properly, and is the PA system operational?
_____	_____	Are all signs in place and legible?
_____	_____	Are all line area railings, gates, and chains in place, free of rough, jagged edges, and the chains hooked properly for opening?
_____	_____	Are the entrance and exit ramp/stairs in good condition and Clear of obstructions?
_____	_____	Are the rides free of visible defects?
_____	_____	Is the E-Stop button up?
_____	_____	Did the ride run smoothly during the test ride?

Authorized Personnel: _____

Date: _____ Time: _____

10.3 5,000 Cycles or Monthly Maintenance Checklist

Inspect and perform necessary maintenance on the following and, when complete, initial the appropriate line by each item. Refer to Section 8 and 9 for details.

_____ Electrical Components
_____ Lights
_____ Passenger Cart
_____ Seats/Restraints
_____ Wire Ropes
_____ Sheave Assemblies
_____ Sheave Head
_____ Loading Area
_____ Boom Structure
_____ Base Structure
_____ Power System
_____ Fluid Levels
_____ Hydraulic System
_____ Oil Filter
_____ Catch Shock

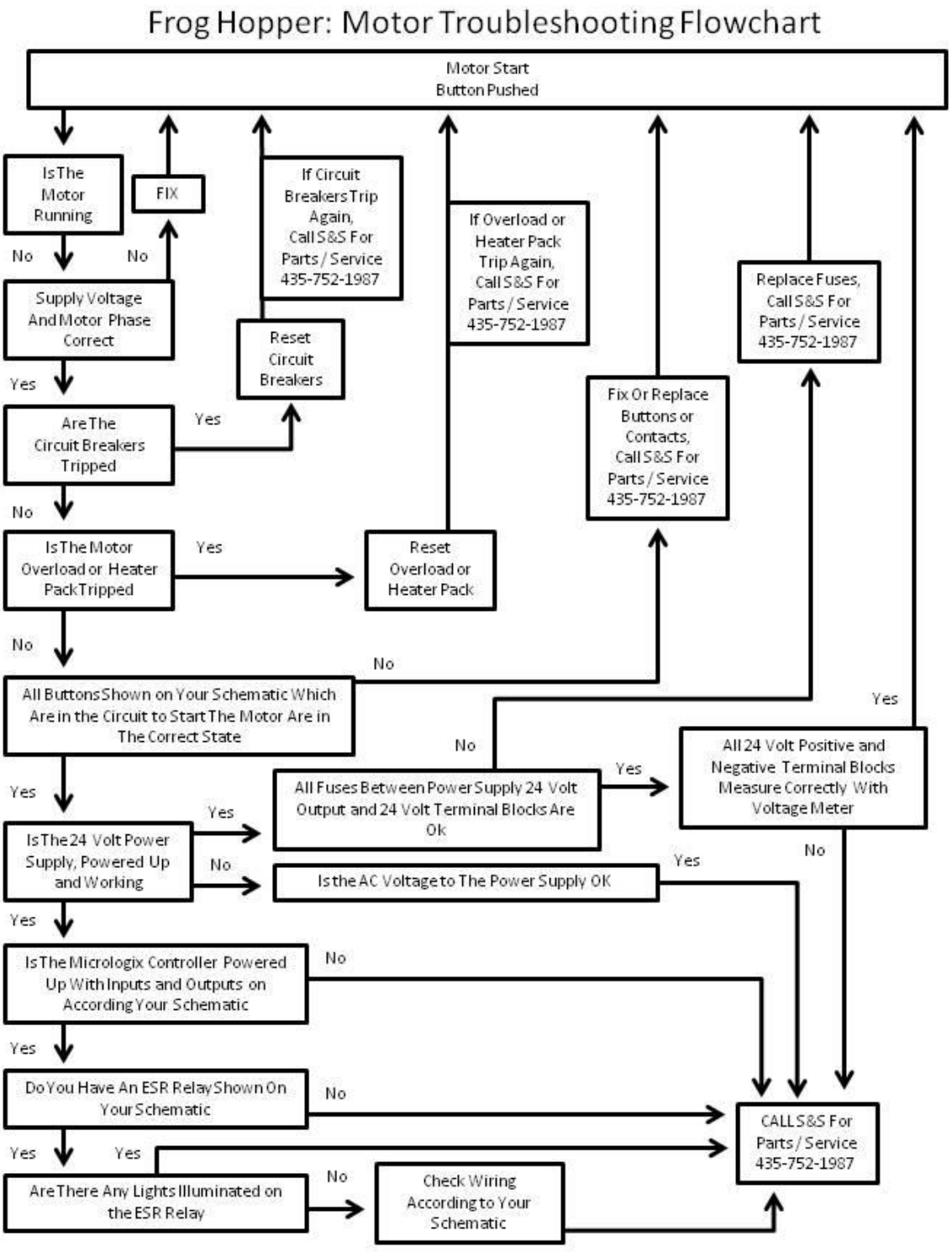
Date: _____ Number of Cycles: _____

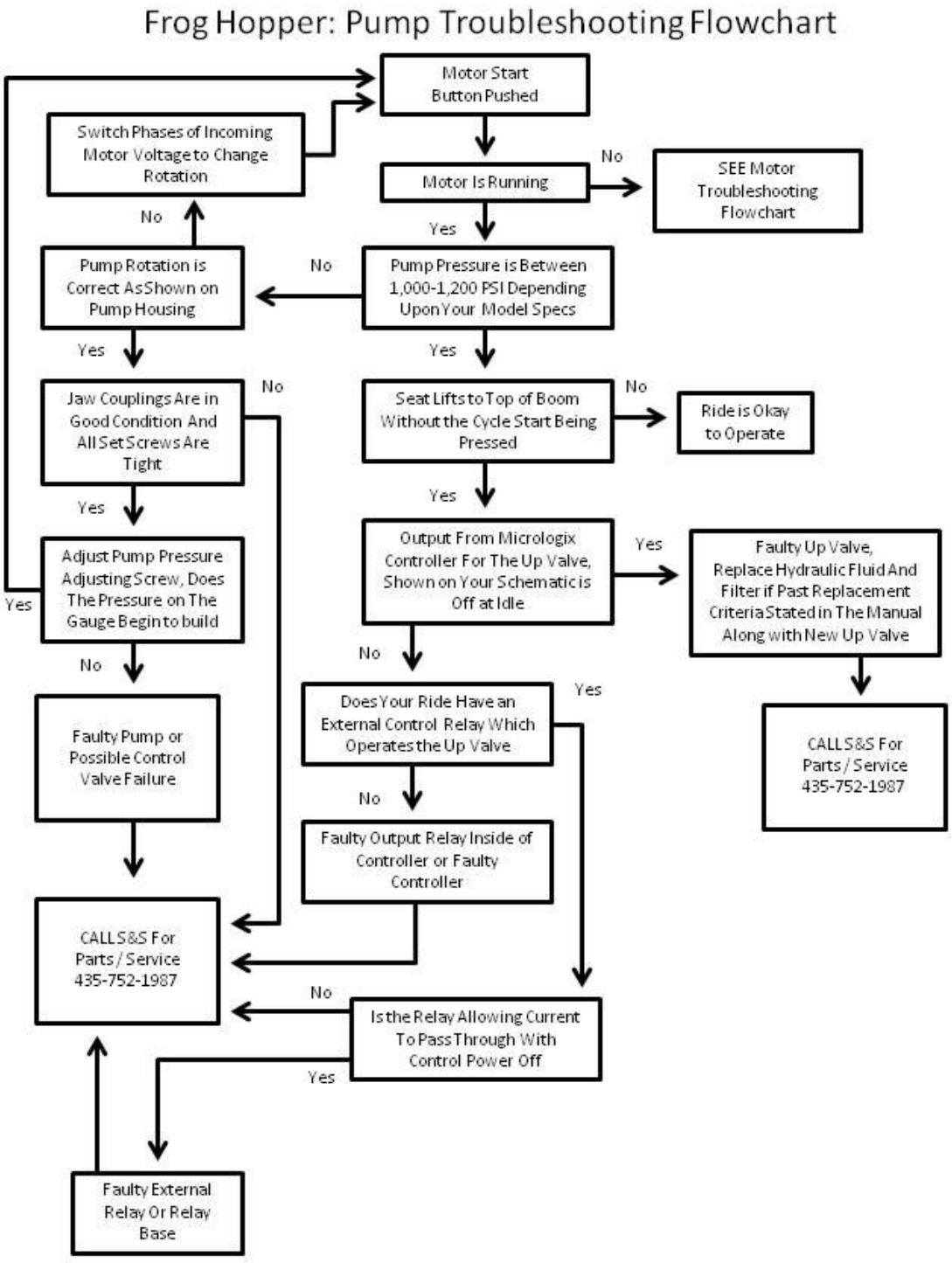
Authorized Maintenance Person who performed the inspection:

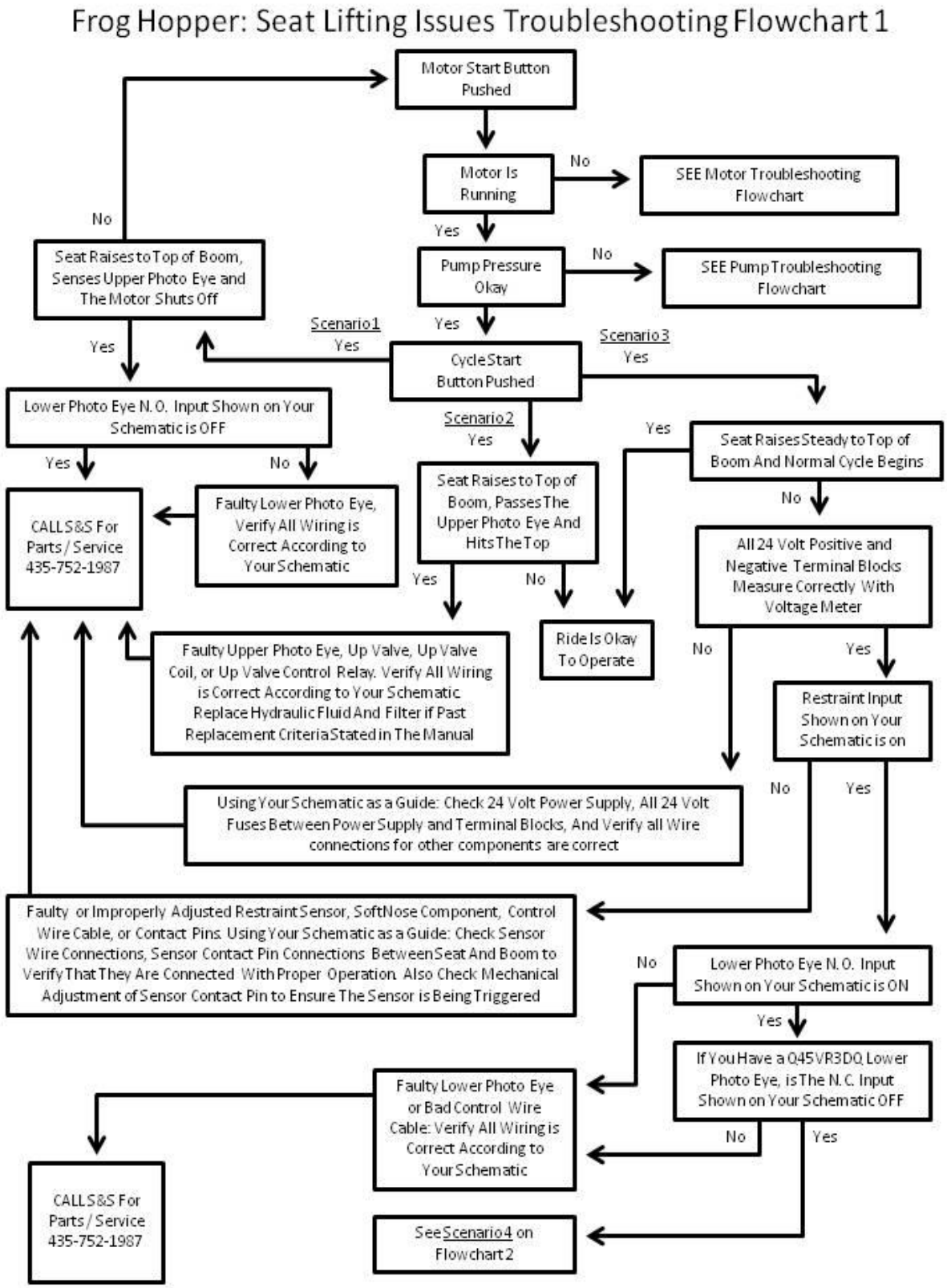
By: _____
(Print Name)

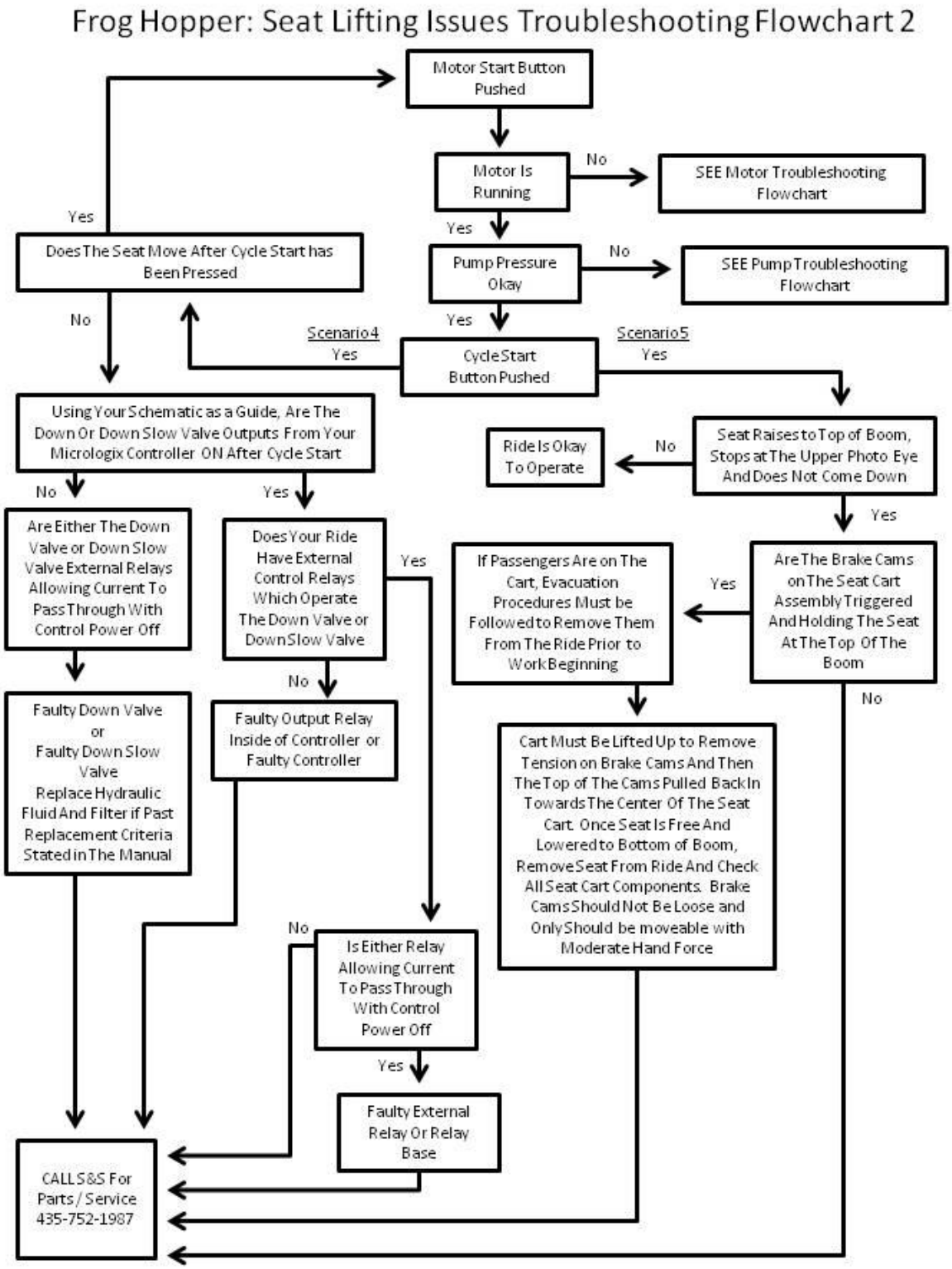
_____
(Signature of Authorized Maintenance Personnel)

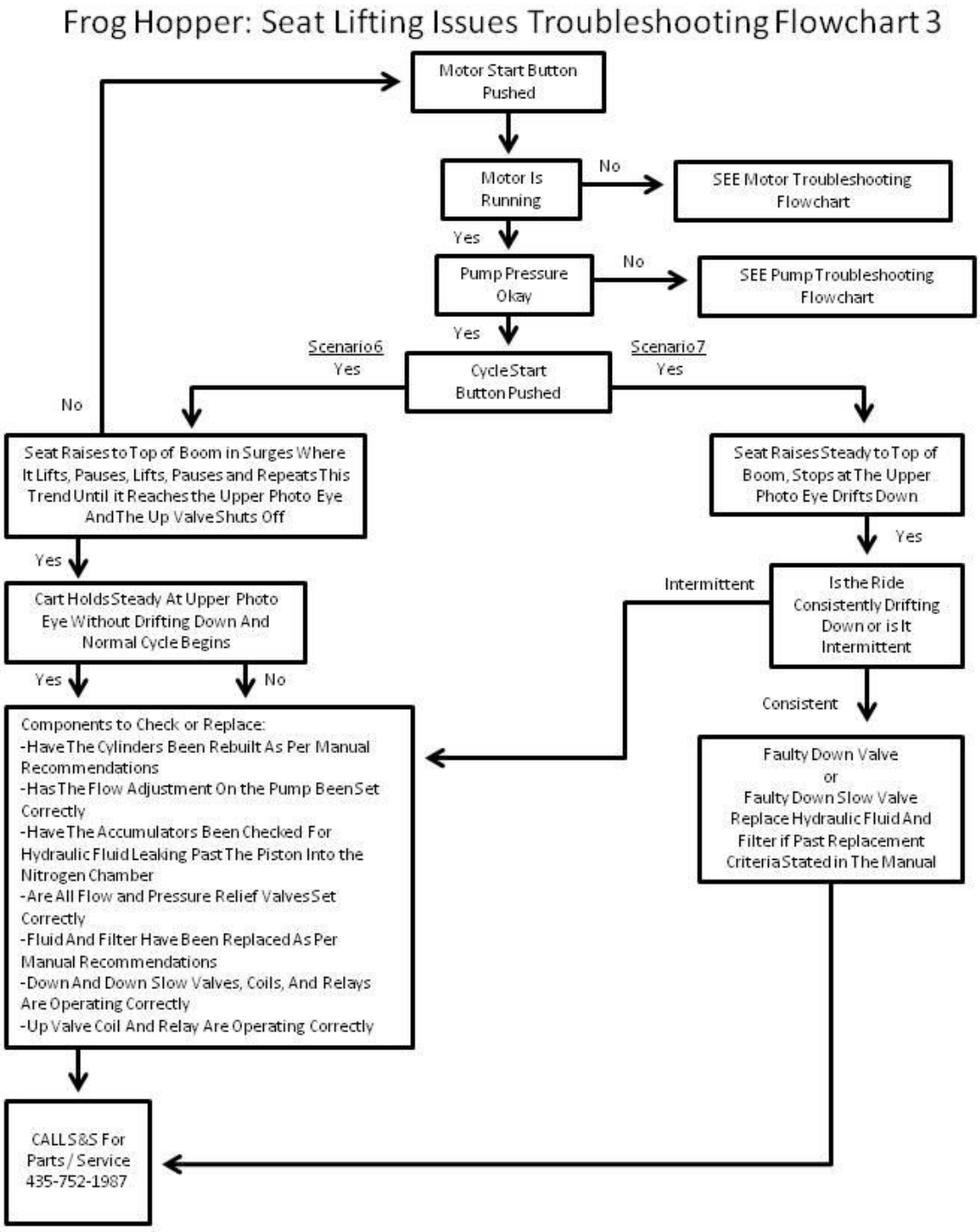
ADDENDUM – FROG HOPPER MOTOR TROUBLE SHOOTING GUIDE

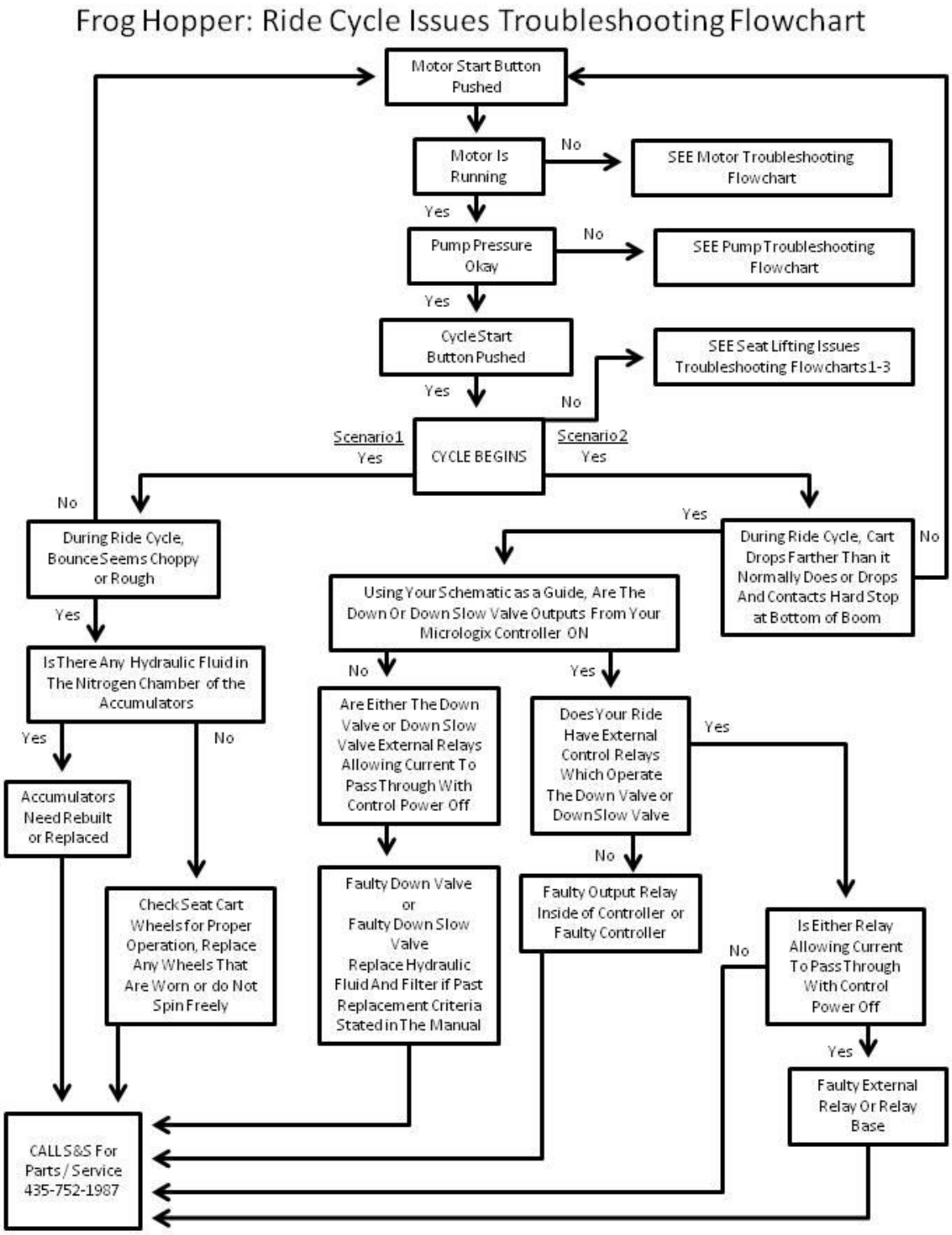

Frog Hopper: Motor Troubleshooting Flowchart
Motor Start Button Pushed
Is The Motor Running
FIX
If Circuit Breakers Trip Again, Call S&S For Parts / Service 435-752-1987
If Overload or Heater Pack Trip Again, Call S&S For Parts / Service 435-752-1987
Replace Fuses, Call S&S For Parts / Service 435-752-1987
No
No
Supply Voltage And Motor Phase Correct
Reset Circuit Breakers
Yes
Are The Circuit Breakers Tripped
Yes
Fix Or Replace Buttons or Contacts, Call S&S For Parts / Service 435-752-1987
No
Is The Motor Overload or Heater Pack Tripped
Yes
Reset Overload or Heater Pack
No
No
All Buttons Shown on Your Schematic Which Are in the Circuit to Start The Motor Are in The Correct State
Yes
No
All 24 Volt Positive and Negative Terminal Blocks Measure Correctly With Voltage Meter
Yes
All Fuses Between Power Supply 24 Volt Output and 24 Volt Terminal Blocks Are Ok
Yes
Yes
Is The 24 Volt Power Supply, Powered Up and Working
No
Is the AC Voltage to The Power Supply OK
Yes
No
Yes
Is The Micrologix Controller Powered Up With Inputs and Outputs on According Your Schematic
No
Yes
Do You Have An ESR Relay Shown On Your Schematic
No
CALL S&S For Parts / Service 435-752-1987
Yes
Yes
Yes
Are There Any Lights Illuminated on the ESR Relay
No
Check Wiring According to Your Schematic


Frog Hopper: Pump Troubleshooting Flowchart
Motor Start Button Pushed
Switch Phases of Incoming Motor Voltage to Change Rotation
Motor Is Running
No
SEE Motor Troubleshooting Flowchart
Yes
No
Pump Rotation is Correct As Shown on Pump Housing
No
Pump Pressure is Between 1,000-1,200 PSI Depending Upon Your Model Specs
Yes
Yes
Jaw Couplings Are in Good Condition And All Set Screws Are Tight
No
Seat Lifts to Top of Boom Without the Cycle Start Being Pressed
No
Ride is Okay to Operate
Yes
Yes
Adjust Pump Pressure Adjusting Screw, Does The Pressure on The Gauge Begin to build
Yes
Output From Micrologix Controller For The Up Valve, Shown on Your Schematic is Off at Idle
Yes
Faulty Up Valve, Replace Hydraulic Fluid And Filter if Past Replacement Criteria Stated in The Manual Along with New Up Valve
No
No
Faulty Pump or Possible Control Valve Failure
Does Your Ride Have an External Control Relay Which Operates the Up Valve
Yes
CALL S&S For Parts / Service 435-752-1987
No
Faulty Output Relay Inside of Controller or Faulty Controller
CALL S&S For Parts / Service 435-752-1987
No
Is the Relay Allowing Current To Pass Through With Control Power Off
Yes
Faulty External Relay Or Relay Base


Frog Hopper: Seat Lifting Issues Troubleshooting Flowchart 1
Motor Start Button Pushed
Motor Is Running
No
SEE Motor Troubleshooting Flowchart
Yes
Pump Pressure Okay
No
SEE Pump Troubleshooting Flowchart
Yes
Cycle Start Button Pushed
Scenario1
Yes
Scenario2
Yes
Scenario3
Yes
Seat Raises to Top of Boom, Senses Upper Photo Eye and The Motor Shuts Off
No
Yes
Lower Photo Eye N.O. Input Shown on Your Schematic is OFF
Yes
No
CALL S&S For Parts / Service 435-752-1987
Faulty Lower Photo Eye, Verify All Wiring is Correct According to Your Schematic
Seat Raises to Top of Boom, Passes The Upper Photo Eye And Hits The Top
Yes
No
Faulty Upper Photo Eye, Up Valve, Up Valve Coil, or Up Valve Control Relay. Verify All Wiring is Correct According to Your Schematic Replace Hydraulic Fluid And Filter if Past Replacement Criteria Stated in The Manual
Ride Is Okay To Operate
Yes
Seat Raises Steady to Top of Boom And Normal Cycle Begins
No
All 24 Volt Positive and Negative Terminal Blocks Measure Correctly With Voltage Meter
No
Yes
Restraint Input Shown on Your Schematic is on
No
Yes
Using Your Schematic as a Guide: Check 24 Volt Power Supply, All 24 Volt Fuses Between Power Supply and Terminal Blocks, And Verify all Wire connections for other components are correct
Faulty or Improperly Adjusted Restraint Sensor, SoftNose Component, Control Wire Cable, or Contact Pins. Using Your Schematic as a Guide: Check Sensor Wire Connections, Sensor Contact Pin Connections Between Seat And Boom to Verify That They Are Connected With Proper Operation. Also Check Mechanical Adjustment of Sensor Contact Pin to Ensure The Sensor is Being Triggered
No
Lower Photo Eye N.O. Input Shown on Your Schematic is ON
Yes
If You Have a Q45VR3DQ Lower Photo Eye, is The N.C. Input Shown on Your Schematic OFF
No
Yes
Faulty Lower Photo Eye or Bad Control Wire Cable: Verify All Wiring is Correct According to Your Schematic
CALL S&S For Parts / Service 435-752-1987
See Scenario4 on Flowchart 2


Frog Hopper: Seat Lifting Issues Troubleshooting Flowchart 2
Motor Start Button Pushed
Motor Is Running
No
SEE Motor Troubleshooting Flowchart
Yes
Pump Pressure Okay
No
SEE Pump Troubleshooting Flowchart
Yes
Does The Seat Move After Cycle Start has Been Pressed
Yes
No
Scenario4
Yes
Cycle Start Button Pushed
Scenario5
Yes
Using Your Schematic as a Guide, Are The Down Or Down Slow Valve Outputs From Your Micrologix Controller ON After Cycle Start
Ride Is Okay To Operate
No
Seat Raises to Top of Boom, Stops at The Upper Photo Eye And Does Not Come Down
No
Yes
Are Either The Down Valve or Down Slow Valve External Relays Allowing Current To Pass Through With Control Power Off
Does Your Ride Have External Control Relays Which Operate The Down Valve or DownSlow Valve
Yes
If Passengers Are on The Cart, Evacuation Procedures Must be Followed to Remove Them From The Ride Prior to Work Beginning
Yes
Are The Brake Cams on The Seat Cart Assembly Triggered And Holding The Seat At The Top Of The Boom
No
No
Faulty Down Valve or Faulty Down Slow Valve Replace Hydraulic Fluid And Filter if Past Replacement Criteria Stated in The Manual
Faulty Output Relay Inside of Controller or Faulty Controller
Cart Must Be Lifted Up to Remove Tension on Brake Cams And Then The Top of The Cams Pulled Back In Towards The Center Of The Seat Cart. Once Seat Is Free And Lowered to Bottom of Boom, Remove Seat From Ride And Check All Seat Cart Components. Brake Cams Should Not Be Loose and Only Should be moveable with Moderate Hand Force
No
Is Either Relay Allowing Current To Pass Through With Control Power Off
Yes
Faulty External Relay Or Relay Base
CALL S&S For Parts / Service 435-752-1987


Frog Hopper: Seat Lifting Issues Troubleshooting Flowchart 3
Motor Start Button Pushed
Motor Is Running
No
SEE Motor Troubleshooting Flowchart
Yes
Pump Pressure Okay
No
SEE Pump Troubleshooting Flowchart
Yes
Scenario6
Yes
Cycle Start Button Pushed
Scenario7
Yes
No
Seat Raises to Top of Boom in Surges Where It Lifts, Pauses, Lifts, Pauses and Repeats This Trend Until it Reaches the Upper Photo Eye And The Up Valve Shuts Off
Seat Raises Steady to Top of Boom, Stops at The Upper Photo Eye Drifts Down
Yes
Intermittent
Is the Ride Consistently Drifting Down or is It Intermittent
Yes
Cart Holds Steady At Upper Photo Eye Without Drifting Down And Normal Cycle Begins
Yes
No
Consistent
Components to Check or Replace:
-Have The Cylinders Been Rebuilt As Per Manual Recommendations
-Has The Flow Adjustment On the Pump Been Set Correctly
-Have The Accumulators Been Checked For Hydraulic Fluid Leaking Past The Piston Into the Nitrogen Chamber
-Are All Flow and Pressure Relief Valves Set Correctly
-Fluid And Filter Have Been Replaced As Per Manual Recommendations
-Down And Down Slow Valves, Coils, And Relays Are Operating Correctly
-Up Valve Coil And Relay Are Operating Correctly
Faulty Down Valve
or
Faulty Down Slow Valve
Replace Hydraulic Fluid And Filter if Past Replacement Criteria Stated in The Manual
CALL S&S For Parts / Service 435-752-1987


Frog Hopper: Ride Cycle Issues Troubleshooting Flowchart
Motor Start Button Pushed
Motor Is Running
No
SEE Motor Troubleshooting Flowchart
Yes
Pump Pressure Okay
No
SEE Pump Troubleshooting Flowchart
Yes
Cycle Start Button Pushed
SEE Seat Lifting Issues Troubleshooting Flowcharts 1-3
Yes
No
Scenario 1
Yes
CYCLE BEGINS
Scenario 2
Yes
No
During Ride Cycle, Bounce Seems Choppy or Rough
Yes
Is There Any Hydraulic Fluid in The Nitrogen Chamber of the Accumulators
Yes
No
Accumulators Need Rebuilt or Replaced
Check Seat Cart Wheels for Proper Operation, Replace Any Wheels That Are Worn or do Not Spin Freely
Yes
During Ride Cycle, Cart Drops Farther Than it Normally Does or Drops And Contacts Hard Stop at Bottom of Boom
No
Using Your Schematic as a Guide, Are The Down Or Down Slow Valve Outputs From Your Micrologix Controller ON
No
Yes
Are Either The Down Valve or Down Slow Valve External Relays Allowing Current To Pass Through With Control Power Off
Faulty Down Valve or Faulty Down Slow Valve Replace Hydraulic Fluid And Filter if Past Replacement Criteria Stated in The Manual
Does Your Ride Have External Control Relays Which Operate The Down Valve or Down Slow Valve
Yes
No
Faulty Output Relay Inside of Controller or Faulty Controller
Is Either Relay Allowing Current To Pass Through With Control Power Off
No
Yes
Faulty External Relay Or Relay Base
CALL S&S For Parts / Service 435-752-1987