

Sellner Manufacturing Co

P.O. Box 8
515 Fowler Street
Faribault, MN 55021-0008
USA

MFG: SELLNER MFG. CO., INC.
NAME: WIND JAMMER

Type: Non-Rideal

RECEIVED

MAY 23 1997

BUREAU OF
FAIR RIDES INSPECTION

WINDJAMMER

Amusement Ride

OPERATION AND SERVICE MANUAL



TOLL FREE 1-800-533-0390 OR CALL 1-507-334-5584
FAX 1-507-334-0503

COMPLETION INSPECTION

Before turning power on to the Windjammer for the first time perform a safety check.

- 1) All the racking is under the Windjammer trailer and does not provide a trip hazard.
- 2) There is not any foreign objects in the Windjammer fence perimeter.
- 3) The lead cord is hooked up to the main power supply.
- 4) The control cord is hooked up to the operator pedestal.
- 5) The quartz light extension cords are connected.
- 6) The sweep pins are properly installed and have hairpins.
- 7) The hydraulic pins (front and back of the cylinder) are properly installed and have hairpins or cotter pins.
- 8) The hydraulic arm pins are in good condition and secured with hairpins.
- 9) The micro-switch and lights on the sweep are plugged in the center hub.
- 10) The micro-switch on the car is plugged into the sweep.
- 11) The scenery panels are pinned together.
- 12) The car is properly pinned to the sweep and have hairpins in the car pin and the sweep stud.
- 13) The '7' bracket is properly installed and have hairpins.
- 14) The wing is properly installed on the '7' bracket with its pins and hairpins are secure.
- 15) The wing canopy is secured to the wing.
- 16) The canopy studs are secure in the their place.
- 17) The operators canopy is secured to the exit and entrance gates.
- 18) The outrigger pins are properly installed and have hairpins.
- 19) The jack handles on the outriggers are at their lowest position.
- 20) The Windjammer is level.
- 21) All the fence legs are in the fence feet.
- 22) The Windjammer ride is safely located within the fence perimeter.
- 23) The quartz lights are installed properly to the fence and fence feet.
- 24) The mats cover all the cords in the walkway of the passengers.
- 25) There is nobody within the fence perimeter before powering up.
- 26) The skirting is installed correctly.
- 27) Complete the daily inspection sheet in the back of this manual.

RIDE OPERATION CHECK

WARNING: Do not operate this ride until you have thoroughly read and understand all of this manual and have been trained in the operation of the Windjammer.

Open the control box on the operator pedestal. Turn on the power with the switch on the main disconnect box located below the control box on the operator pedestal.

Insert the key into the switch located on upper left hand corner of the control box and turn it to the 'ON' position.

Turn on the area lighting and ride lighting to make sure all the lights are working properly. If the lights are not working on the sweeps it might be that they are not plugged in.

Check again to see if any people are around or under the Windjammer.

Slide in your right foot in to the foot switch located on the lower right hand side of the operator pedestal. You should feel or hear a switch engage. Push your foot down to activate the second switch. Push the start button and check to see if the ride rotates counter-clockwise at 8 1/2 rpm. If the foot switch disengages the ride will come to a stop.

Let the ride run a full cycle and see if all the cars move up and down.

Start the ride again and stop it with the emergency stop button. This should immediately stop the ride. To reset the emergency stop turn the button clockwise until the button disengages.

Look for any problems with the Windjammer and report them immediately.

SECTION 6- TROUBLESHOOTING

TROUBLESHOOTING PROCEDURES

Prior to calling for factory help on a ride having problems, certain things should be done ahead of time to eliminate wasted time by both parties.

1. Have ride serial number and name available.
2. Have manual ready to use as reference.
3. If ride was formerly owned - by who (company records will often show changes made to the ride by previous owner).
4. Have the same person make all calls and be sure to get name of person you are speaking to at the factory. All calls should then be made to that person.
5. Have telephone number ready that you want return calls made to.
6. Have shipping instructions ready to give, such as how, when, and where to ship parts. (no post office boxes).
7. Have list of any alterations, modifications of kits that the ride may have.
8. Have a person making the call be familiar with the problem and can describe symptoms of the ride problem, such as, was the gradual or spontaneous, are any sounds occurring not normal, does the problem occur continuously or is it intermittent, etc.
9. Many times the problem that will completely stop a ride from working will be one of many simple things that are forgotten or overlooked when a person starts to look for what appears to be a major breakdown. Listed on the following chart are many of the items that may cause this, as well as items that should be checked before any calls are made to the factory. Check over this chart and determine if it could be any of them. It may save several expensive phone calls or a more expensive visit by a factory representative, as well as valuable time.

1. **RIDE WILL NOT ROTATE**

Check incoming power for proper voltage and phase.

Check to see if key in operators pedestal is on.

Check main fuse. Must be FRNR 60 amp fuse.

Check control fuses.

Trans primary- (2) 1 amp circuit breakers.

Trans secondary- 5 amp, 250 volt fuse.

NOTE: If the fuse is blown, the problem causing the fuse to blow should be corrected before introducing a new fuse to the circuit.

Check to make sure ride is not jammed.

Check belts for proper tension.

Check fluid in clutch.

Check Motor overload to see if tripped.

Check motor.

2. CARS WILL NOT MOVE UP AND DOWN

Check micro-switch under car.

Check micro-switch plug under car.

Check micro-switch plug at center hub.

Check receptacle box plug at commutator.

Check for power at PLC.

Check hydraulic fluid level.

Check to see if hydraulic pump is running.

Check for hydraulic leakage.

Check pressure gage for proper pressure.

Check to ensure solenoid is plugged in to commutator.

3. LIGHTS NOT FLASHING

Check circuit breaker (CB) 5.

Check to ensure all cords are plugged in.

Check switch at operators pedestal.

4. **PLC NOT FUNCTIONING**

Check for power.

Check for fault indication light on face of PLC. (If fault light is lit consult factory immediately). DO NOT RUN RIDE.

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BELT TROUBLESHOOTING GUIDE

This chart identifies common problems and possible solutions encountered with V-belt drives.

PROBLEM	CAUSE	SOLUTION
Short belt life- no visible reason.	Worn or damaged sheave grooves.	Replace sheaves.
	Tensile cords damaged from incorrect installation.	Replace belts with a new matched set.
	Wrong type or cross section belt.	Replace with correct belt.
Separation of cover piles. Soft, sticky swollen sidewalls.	Oil or grease.	Remove source of oil or grease and clean belts with detergent and water.
Separation of cover piles. Dry, hard sidewalls.	High temperatures.	Remove heat source and/or improve ventilation.
Cracked belt bottom.	Slippage.	Retention drive.
Broken belts.	Excessive tension. Objects hitting belts.	Reduce tension. Protect drive with guard.
Belt cut on bottom.	Belt ran off sheave. Improper installation.	Check tension and alignment.
Belt deterioration.	Belt dressing.	Never use belt dressing. Clean belt with detergent and water.
Extreme cover wear, worn corners.	Belt rubs on guard.	Align drive to give proper clearance.
	Dusty environment.	Clean belt and protect with guard.
	Sheaves rusted.	Clean rust from sheaves.
	Sheaves have sharp corners or burrs.	File down sharp corners and burrs.
Spin burns.	Slippage.	Retention drive.
	Slippage.	Retention drive.
	Water or oil.	Clean belt and protect with guard.
Belt stretch- Unequal stretch.	Misaligned drive.	Realign and retention drive.

PROBLEM	CAUSE	SOLUTION
Vibration.	Tensile cord broken from incorrect installation.	Replace belts with new matched set.
	Incorrectly placed flat idler pulley.	Align idler on slack side close to driver.
	Distance between shafts too long.	Install idler.
Belt noise.	Belt lengths uneven.	Replace with new matched set.
	Belts too loose.	Retention.
	Slippage.	Retention drive.
Belt turnover.	Vibration and shock loads cause belts to jump and whip.	Use Bando Combo.
	Debris in grooves.	Clean grooves and protect drive with guard.
Hot bearings- Over-tensioned drive.	Misaligned sheaves.	Align sheaves.
	Tensile cord broken from incorrect installation.	Replace belts with new matched set.
	Incorrectly placed flat idler pulley.	Align idler on slack side close to driver.
	Worn sheave grooves.	Replace sheaves.
	Worn sheave grooves, belts bottom out.	Replace sheaves and retention.
Under-tensioned drive- Bad bearings.	Slippage.	Retention drive.
	Poor maintenance.	Maintain correctly.

SECTION 7- PARTS LIST

PART NUMBER	DESCRIPTION	QUANTITY (per ride)
CAR		
501200	Car- Full Assembly- Hot Pink	2
501210	Car- Full Assembly- Yellow	2
501220	Car- Full Assembly- Boo Berry	2
501201	Decal Set	6
501202	Seat Belt	6
501203	Seat Belt Mount	12
501204	Non-Skid Tape- Rear (on car)	6
501205	Non-Skid Tape- Front (on car)	6
501206	Plastic Cover- Seat	6
501207	Plastic Cover- Back Rest	6
501230	Control Bar- Full Assembly	6
501100	Bottom Control Bar Assembly	6
501120	Top Control Bar Assembly	6
501140	Wing Frame	6
501160	'7' Bracket	6
501170	Canopy Wing Stud	6
501175	Wing Pin	18
501180	Car Pin- Secures Car to Sweep	6
501191	Wing Canopy	6
TR10003-08	Plastic Bushing- 1/2"	12
503010	Control Bar Switch	6
CENTER HUB		
502000	Center Hub- Full Assembly	1
502004	Hydraulic Cap Gasket	1
502090	Hydraulic Tank Cap	1
503050	Arm Junction Box- Assembly	3
503060	3 hp Motor- Drives Hydraulic Pump	1
503070	Commutator Assembly	1
503500	Hydraulic Assembly	1
503530	Hydraulic Drain Assembly	1
504265	Hydraulic Cylinder Pin	12
	Sight Gage- Temperature and Fluid Level	1
	Tank Filler Assembly with Screen	1
122500	Pump- 10 gal Piston Single Stage	1
A101656-00	Spider- Universal Joint	1
G010900-00	Coupler- For Spider	2
302212-00	Spool Spacer Ring	1

PART NUMBER	DESCRIPTION	QUANTITY (per ride)
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ELECTRICAL

T907594-00	Plug- Midget Twistlock, 15A 125V	18
TR10010-94	Plug- 6 Contact w/ CBL Clamp Top	9
T950300-00	Plug PS- TL 20A 125/250V	1
T950304-00	Receptacle- 20A 125/250V	1
T907596-00	Receptacle- Flgd Mgt Twick 15A 125V	6
T907596-N	Receptacle- Twistlock, 15A 125V	6
TR10010-50	Receptacle- 6 Contact w/ Deep Brackets	9
T950206-00	Receptacle- Duplex	2
TR10010-65	Socket- 8 Pin Multiple Density	7
B120910-00	Switch, Anti-Trip Foot	1
T920001-03	Push-button, Green	1
T920052-00	Push-button, Lg Hd Red Mushroom P/PL	1
T920701-00	Switch- Key Operated w/ Key	1
T920701-01	Knob- 2 Position Black	2
T920801-10	Contact Block- 1N.O. w/ Latch	1
T920801-20	Contact Block- 2 N.O. w/ Latch	1
T922801-00	Contact, Add On INO-INC	1
T922203-00	Contact, Motor Starting A-12	2
T922207-00	Contact, 100, A-18	1
101003	Contact, Motor- A-24	1
TR10010-48	Fuse, 2A GMA	6
T930003-03	Fuse, 5A, MDL5, 250V, 1/4"	1
T930001-06	Fuse, AGC 20A 250V	4
T930010-10	Fuse- 60A, 3Ph Dual Element	3
T930030-01	Fuse Block- 1 Pole (for 1/4" Fuse)	1
T930030-04	Fuse Block- 4 Pole (for 1/4" Fuse)	1
T930030-06	Fuse Block- 6 Pole (for 1/4" Fuse)	1
T920901-01	Base- (T&B)	1
T920901-04	Connector- 24 Pin Male	1
T930301-02	Connector- 3/4" OTDR Grip	2
T920901-03	Connector- 24 Pin Female	1
T900560-C9	Connector, P&SL 60A 120/208V 3Ph	1
TR10010-37	Controller, Micrologix 1000 Programmable	1
T900560-B9	Inlet- Flanged P&SL 60A 120/208V	1
TR10010-63	Meter- 24VAC 60Hz Hour	1
B100800-00	Switch, Toggle	2
TR10010-40	Switch, 3 Pole Fusible 60A Safety	1
B100610-00	Base- Timer Universal	1
E175022-00	Block, SAK 16 Terminal	4
E175020-00	Block, SAK 2.5 Terminal	7
TR10010-53	Block, 6 Pole Dbl Row Terminal	1

PART NUMBER	DESCRIPTION	QUANTITY (per ride)
E175051-00	Section- AP End	1
E175052-00	Section- AP End	1
E175165-00	Bracket, EWK 1 End	2
G006566-00	Strap- 7" Hold Down	1
B100600-00	Timer- Blue	1
B100400-00	Transformer, 75VA, 208/480 to 24VAC	1
109539	Power Distribution Block	1
101004	Overload, SMP-1 Solid State	2
110052	Circuit Breaker, 1 Pole, 1 Amp	2
110056	Circuit Breaker, 1 Pole, 10 Amp	1
110051	Circuit Breaker, 1 Pole, 20 Amp	2
110050	Circuit Breaker, 1 Pole, 5 Amp	2
110049	Circuit Breaker, 3 Pole, 15 Amp	2
503020	Sweep Light Assembly	6
503030	Arm Switch Harness	6
503040	Arm Light Harness	6
503070	Commutator Enclosure Assembly	1
503073	Commutator Plate	1
503100	Control Pedestal	1
503130	Main Control Panel	1
503140	Main Control Box- Assembly	1
503180	Safety Switch Assembly	1
503190	Quartz Light Box	1
503200	Commutator Harness	1
503210	Directional Valve Harness	6
503230	Micro Processor Panel Assembly	1
503240	Commutator Can Cover	
T925401-03	Socket Base	
T925401-04	Socket Ring	
102006	Light Base- Yellow	
102003	Light Cap- Yellow	
102071	Light Base- Clear	
102071	Light Cap- Clear	
102060	Light Base- Magenta	
102061	Light Cap- Magenta	
T925401-01	Light Base- Purple	
T925401-02	Light Cap- Purple	
A542065-00	Light Bulb	642
G007031-0	Quart Light	4
305404-00	Cord, 25' Area Lighting Extension	3
	Cord, 35' Area Lighting Extension	1

PART NUMBER	DESCRIPTION	QUANTITY (per ride)
HYDRAULIC SYSTEM		
	Clevis- For Cylinders	6
120130	Manifold	2
TR10002-22	Relief Valve	1
121012	Solenoid Valve- 2 position 4 way Directional	6
503501	Suction Hose	1
503502	Drain Hose	1
503503	Cylinder to Tank Hose	6
503504	Manifold to Manifold Hose	2
503505	Pressure Hose	1
503506	Manifold to Cylinder Hose	6
503507	Return Hose	1
503508	Relief Hose	1
122800	Filter Assembly	1
122801	Hydraulic Oil Filter	1
121002	Check Valve	1
	Pressure Gage	1
503530	Hydraulic Drain Assembly	1
120122	Nipple- Sched 80, 1/2" x 2"	1
	Valve- Ball 1/2" Drain	1
120123	Nipple- Sched 80, 1/2" x 3"	1
120124	1/2" Pipe Cap	1
DETACHABLE		
500200	Sweep- Full Assembly	6
504000	Sweep- Main Arm Assembly	6
504020	Hydraulic Arm Assembly	6
504030	Hydraulic Arm Pin	6
504035	Main Sweep Pin	6
500210	Cylinder Travel Support Assembly	6
504060	Front Wing Rack Assembly	1
504050	Ground Stabilizer	4
504070	Rear Wing Rack Assembly	1
504100	Traveling Sweep Rest Assembly	2
504110	Right Rear Car Rack Assembly ('F' Rack)	1
504130	Front Car Rack Assembly ('F' Rack)	1
504140	Left Rear Car Rack Assembly ('F' Rack)	1
504150	Pin- Scenery Panel	6
504155	Pin- Cylinder Travel Mount	6
504180	Full Section Fence	19
J007040-00	Entrance Gate	1
J007041-00	Exit Gate	1

PART NUMBER	DESCRIPTION	QUANTITY (per ride)
504190	Operators Canopy	1
504200	Rib- Operators Canopy	5
504210	Side Rail- Operator's Canopy	2
504250	Pin- Wing Rack	2
504255	Pin- Outrigger	4
504260	Pin- Car Rack	3
504265	Pin- Hydraulic Cylinder	12
504270	Pin- '7' Bracket Travel	2
	Fence Foot- 2 Pocket	14
	Fence Foot- 3 Pocket	4
304401	Fence Cover (includes straps)	2
500220	Scenery Panel Assembly - Even (with lights)	3
500230	Scenery Panel Assembly - Odd (with lights)	3
TR10010-66	Light- Strobe Clear	6
500240	Center Cone	1
TR10010-59	Light- Micro Strobe 120V Clear Lens	3
500102	Skirt- Silver Color (set)	1
500103	Skirt- Multi-Colored (set)	1
TRAILER		
500280	Trailer Frame Assembly	1
507170	Removable Hitch Assembly	1
507200	Tongue Locking Pin	1
507210	Tongue Jack Assembly	1
507300	Motor Guard	1
132106	Tires	4
132107	Cover- 15" Silver Plastic Wheel	4
	12 Volt Battery Pack	1
MECHANICAL		
130000	Gear Box Reducer	1
TR10002-16	Sheave- 6.2 Pulley x B, SDS	1
130500	Clutch- 7.0 HDS, 0.875 Fluid	1
100003	Motor, 2hp, 1740 rpm, 3 phase	1
	Motor Base	1
131010	Sheave- 4.6 x 2B, SDS	1
120127	V-Belt (matched set)	2
302134	Hydro-Sheave Handle	1
	Motor Mount Adapter Plate	1
134000	Center Rotational Bearing	1

PART NUMBER	DESCRIPTION	QUANTITY (per ride)
MISCELLANEOUS		
304402-00	Operator Control Pedestal Cover	1
304501-00	Mat- 1/8 x 24" x 12' Black Vinyl	5
206223	Wrench- 10" Crescent	2
206102	Hammer- 16 oz. Ball Pein	1
A680050-00	Level- 24" Aluminum	1
143000	Holder- Sealed Document	1
143001	Box- 16" Gray Tool	1

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SECTION 8- GENERAL

LOCKOUT/TAGOUT PROCEDURE

PURPOSE

This product establishes the minimum requirements for the Lockout or Tagout of energy isolating devices. It shall be used to ensure that the machine or equipment is isolated from all potentially hazardous energy, and Locked Out or Tagged Out employees perform any servicing or maintenance activities where the unexpected energization, start-up or release of stored energy could cause injury.

BASIC RULES FOR USING LOCKOUT OR TAGOUT SYSTEM PROCEDURE

All equipment shall be Locked Out or Tagged Out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other isolating device where it is Locked Out or Tagged Out.

RESPONSIBILITY

Appropriate employees shall be instructed in the significance of the Lock Out or Tag Out procedure. Each new or transferred affected employee and other employees whose work operations are or may be in the area shall be instructed in the purpose and use of the Lockout or Tagout procedure.

PREPARATION FOR LOCKOUT/TAGOUT

Make a survey to locate and identify all isolating devices to be certain which switch(s), Valve(s), or other energy isolating devices apply to the equipment to be Locked or Tagged Out. More than one energy source (electrical, mechanical or others) may be involved.

SEQUENCE OF LOCKOUT OR TAGOUT PROCEDURE

1. Notify all affected employees that a Lockout or Tagout system is going to be utilized and the reasons therefore. The authorized employee shall know the type and magnitude of energy that the machine or equipment utilized and shall understand the hazards thereof.
2. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch, etc.)

3. Operate the switch, valve, or other energy isolating device(s) so that the equipment is isolated from its energy source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, pneumatic systems, gas, steam, water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.
4. Lockout and/or Tagout the energy isolating devices with assigned individual Lock(s) or Tag(s).
5. After ensuring that no personnel are exposed, and as a check on having disconnected the energy source, operate the start button or other normal operating controls to make certain the equipment will not operate.

Caution: Return operating control(s) to 'neutral' or 'off' position after test.

6. The equipment is now Locked Out or Tagged Out.

RESTORING MACHINES OR EQUIPMENT TO NORMAL PRODUCTION OPERATIONS

1. After the servicing and/or maintenance is complete and the equipment is ready for normal operations, check the area around the machines or equipment to ensure that no one is exposed.
2. After all tools have been removed from the machine or equipment, all guards have been reinstalled and employees are in the clear, remove the Lockout or Tagout devices. Operate the energy isolating devices to restore energy to the machine or equipment.

PROCEDURE INVOLVING MORE THAN ONE PERSON

In the preceding steps, if more than one individual is required to Lockout or Tagout equipment, each shall place his/her own personal Lockout or Tagout device on the energy isolating device(s). When an energy isolating device cannot accept multiple Locks or tags, a multiple Lockout or Tagout device (hasp) may be used. If Lockout is used, a single lock may be used to Lockout the machine or equipment with the key being placed in a Lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his/her Lockout protection, that person will remove his/her lock from the box or cabinet.

BOLT TORQUE CHART

Foot pound torque range (see notes 1 and 2) with lock nut and hardened washer.

Size Diameter- Threads/inch	SAE J429 Grade 5 ASTM A325	SAE J429 Grade 8 ASTM A490
1/4 - 20	5 - 6	7 - 8
1/4 - 28	6 - 7	8 - 10
5/16 - 18	11 - 13	15 - 18
5/16 - 24	12 - 15	17 - 21
3/8 - 16	19 - 24	27 - 33
3/8 - 24	22 - 27	31 - 38
7/16 - 14	30 - 35	45 - 55
7/16 - 20	35 - 40	50 - 60
1/2 - 13	50 - 60	65 - 80
1/2 - 20	55 - 65	75 - 90
5/8 - 11	95 - 115	130 - 160
5/8 - 18	105 - 130	150 - 180
3/4 - 10	165 - 200	235 - 285
3/4 - 16	185 - 225	260 - 320
7/8 - 9	270 - 325	380 - 460
7/8 - 14	295 - 360	415 - 505
1 - 8	400 - 490	565 - 690
1 - 12	440 - 535	620 - 755
1 1/8 - 7	495 - 600	800 - 975
1 1/8 - 12	555 - 675	900 - 1095
1 1/4 - 7	700 - 850	1135 - 1380
1 1/4 - 12	775 - 940	1255 - 1525
1 1/2 - 6	1215 - 1480	1975 - 2395
1 1/2 - 12	1370 - 1660	2220 - 2700

CAUTION: Torque values are given for steel bolts in steel threaded holes only. Be certain threaded parts are not aluminum, brass, or other soft alloy.

1. Use hardened washer under nut.
2. Use hardened washer under head and nut.
3. Lubricate with Anti-Seize or Penetrating oil.

REPLACEMENT OF BOLTS

During normal maintenance practices, it is usually necessary to replace some bolts. They work loose because they have not been checked periodically, or they become lost when they are removed to repair some component. The point we wish to stress is the following:

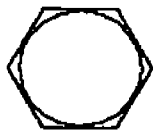
Sellner Manufacturing Company uses only Grade 5 or better bolts. Bolts are identified by the markings on the bolt head. Bolts without markings are generally Grade 2 or 3 (common hardware store variety) and are not strong enough to be used on amusement rides.

When replacing any bolt, always use an equivalent or stronger bolt. Higher number equals stronger bolt.

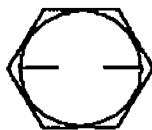
NOTE: There are some bolts available above a Grade 8, however, these bolts are not used for general purposes. They are extremely brittle, and are designed for special applications.

If trouble is encountered with bolts working loose, check the tightness according to the torque chart.

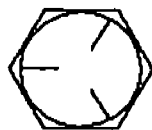
If certain bolts continue to work loose, remove the bolts and inspect the threaded holes. If threads are in good condition, clean out with a non-oil based solvent. Blow dry and apply 'Green Loctite' to threads. Install new lock washer to bolt and torque per chart.



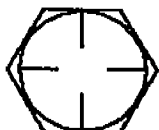
Grade 0 - 3
No markings



Grade 4
2 raised marks



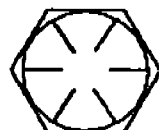
Grade 5
3 raised marks



Grade 6
4 raised marks



Grade 7
5 raised marks



Grade 8
6 raised marks

TORQUE METHOD (NO TORQUE WRENCH)

LEVERAGE METHOD

The average 200 - 225 lb. mechanic, while standing on his feet, can apply a steady pull with his good arm (right arm if right handed, etc.) of between 100 and 110 pounds. This pull is obtained without bracing his feet or free hand against any solid object such as a work bench or machinery being worked on. If a torque of any given value is desired, it becomes a simple matter of leverage. If the mechanic in question is tightening a 7/8" UNC thread bolt which recommends 520 ft. lbs. of torque, this value can be reached by using a heavy duty socket wrench and slipping a 5 ft. length of pipe over the handle of the wrench.

Thus, if the mechanic can exert a 100 lb. pull, 5 ft. times 100 lbs. would equal 500 ft. lbs. If he exerted a 110 lb. pull, it would result in 5 times 110 or 550 ft. lbs. Any other desired torques can be reached by simply dividing the desired torque value by approximately 110 to determine the length of pipe or 'cheater bar' that is needed.

TURN OF THE NUT METHOD

This method applies only to bolts with UNC threads. If the bolt is shorter than eight times its diameter, tighten the nut until the pieces being joined are snugged up. Put a reference mark on the nut or the socket wrench being used and tighten the nut, while preventing the bolt from turning, until the nut has been turned an additional one-half of a turn. If the bolt is longer than eight times its diameter, proceed as before but tighten the nut an additional two-thirds of a turn. This will apply a preload to the bolt that will be very close to the same value that would be achieved if a torque wrench has been used.

HAIRPINS

Hairpins must be inserted and removed from the pin by hand only. If the hairpin cannot be inserted by hand correct the misalignment condition.

Don not use a hammer to insert or remove hairpins. Using a hammer may cause the hairpin to turn to one side and be forced over the pin in a position where the material thickness is greater than the hairpin is designed for. This can cause the hairpin to be sprung beyond its unusable dimensions.

All hairpins are expendable items and will become sprung after repeated use. A hairpin that is easily inserted and removed must NOT be used. Replace the defective hairpin with a new one of the same size.

If the hairpin is worn or defective, has a crack or part of it is broken off, replace the hairpin with a new one of the same size.

SECTION 9- INSPECTION

WINDJAMMER HOLE TOLERANCE

Many parts on the Windjammer are pinned together and after time the holes become enlarged or 'egged' shaped. This is due to the force exerted between the pin and the hole wall creating friction and eventually causing material loss in the area. Proper lubrication will reduce, but not eliminate, the amount of friction produced and will give the parts longer life.

Listed below is a chart of holes that should be checked at least twice a year. When measuring the diameter of the hole: start at the point of greatest wear, through the center, to the opposite side of the hole. If the hole is greater than 1/16" larger than its original diameter the part should be replaced.

Hole Description	Location	Original Diameter	Tolerance not to Exceed
Main Sweep Pin	End of sweep	1.21875"	1.28125"
Hyd. Arm Clevis	Main Sweep	1.03125"	1.09375"
Hyd. Arm Ear	Both ends of hydraulic arm	1.03125"	1.09375"
Hydraulic Cylinder-Clevis	Hyd. Cylinder- Rod	1.0015"	1.03275"
Hydraulic Cylinder-Cap Clevis	Hyd. Cylinder- Cap	1.0015"	1.03275"
Sweep Clevis	Center hub- Base	1.21875"	1.28125"
Hydraulic Ear	Center hub- Top	1.03125"	1.09375"

Other holes than what is listed above should also be checked on an annual basis. The same tolerance holds for all holes on the Windjammer Amusement ride.

WINDJAMMER DAILY INSPECTION SHEET

FENCE AND GATES

- () 1. Inspect all fence sections.
- () 2. Inspect that fence legs are in fence feet.
- () 3. Inspect that fence is correct distance away from ride.
- () 4. Inspect exit and entrance gate for proper functioning.
- () 5. Inspect operators canopy and canopy frame.
- () 6. Inspect surrounding area for debris.
- () 7. Inspect vinyl mats covering electrical cords.
- () 8. Inspect all signage.

CARS

- () 1. Inspect cars.
- () 2. Inspect car pins.
- () 3. Inspect hairpins on sweep studs.
- () 4. Inspect micro-switch plugs.
- () 5. Inspect lap belts and lap belt mounts.
- () 6. Inspect control bars.
- () 7. Inspect wing pins.
- () 8. Inspect '7' brackets.
- () 9. Inspect wing frames.
- () 10. Inspect wing canopies.
- () 11. Inspect wing canopy stud.

SWEEPS

- () 1. Inspect sweeps for structural integrity, i.e. welds, cracks, deformation, etc.
- () 2. Inspect main sweep pins and their hairpins.
- () 3. Inspect hydraulic arm pins and cotter pins (connects main arm to hydraulic arm).
- () 4. Inspect hydraulic cylinder pins and their hairpins (both front and back of the cylinder).
- () 5. Inspect sweep lighting structure (mounting screws, light caps, etc.).
- () 6. Inspect micro-switch and sweep light plugs at center hub.

BLOCKING

- () 1. Inspect blocking and leveling.
- () 2. Inspect outrigger pins.
- () 3. Inspect that the cranks on the outrigger jacks are down.

HYDRAULIC SYSTEM

- () 1. Inspect hydraulic cylinders.
- () 2. Inspect hydraulic hoses; valves, manifolds and fittings for damage or leaks.
- () 3. Inspect hydraulic pump.
- () 4. Inspect hydraulic pump motor.
- () 5. Inspect hydraulic fluid level.
- () 6. Inspect that all set screws on the hydraulic rod clevis are secure.

MECHANICAL AND MISCELLANEOUS

- () 1. Inspect rotational bearing.
- () 2. Inspect gear box.
- () 3. Inspect bolts on rotational bearing and gear box.
- () 4. Inspect rotational motor.
- () 5. Inspect drive belts.
- () 6. Inspect all guards and safety devices.
- () 7. Inspect center hub
- () 8. Inspect operators pedestal.
- () 9. Inspect structure for cracks, bad welds, etc.
- () 10. Inspect structure for worn or defective parts.
- () 11. Inspect center cone.
- () 12. Inspect scenery panels.
- () 13. Inspect trailer skirting.
- () 14. Inspect trailer.
- () 15. Inspect all pins and fasteners.
- () 16. Inspect that all hairpins are not worn or defective.

ELECTRICAL

- () 1. Inspect all electrical plugs and hook-ups
- () 2. Inspect all electrical cords.
- () 3. Inspect quartz lights.
- () 4. Inspect ride lighting.
- () 5. Inspect main power switch.
- () 6. Inspect proper operating cycle. (rpm [8.5], rotation, motion, etc.)
- () 7. Inspect ride for excessive vibration.
- () 8. Inspect Emergency stop button.

LUBRICATION CHART

RIDE COMPONENT	FREQUENCY	LUBRICANT
1) DRIVE COMPONENTS		
Electric Motors	(Instructions on separate page)	
Fluid Clutch	(Instructions on separate page)	
Rotational gear bearing	(Instructions on separate page)	
Gear Box	Quarterly	140 weight oil
Pinion Gear	Every 100 hours	EP Grease
2) SWEEP		
Main Sweep Pin	Every 100 hours	Clean Petroleum Jelly
Hydraulic Arm Pin	Every 100 hours	Clean Petroleum Jelly
Hydraulic Cylinder Pins	Every 100 hours	Clean Petroleum Jelly
3) RACKING COMPONENTS		
Seat Racks	Quarterly	Clean Petroleum Jelly
4) TRAILER COMPONENTS		
Wheel Hubs	Every 30,000 miles	
5) HYDRAULIC SYSTEM		
Reservoir	(Instructions on separate page)	A W32
Oil Filter	(Instructions on separate page)	

WINDJAMMER FASTENER SCHEDULE

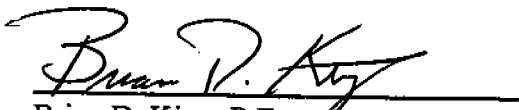
Pin or Fastener	Part Number	Location	Recommended Replacement
5/8-11 UNC x 2 Gr. 8 Hex Hd Cap	150074	Rotational Bearing	See Notes 2,3,4
5/8-11 UNC x 2 Gr. 8 Hex Hd Cap	150074	Gear Box	See Notes 2,3,4
5/8-11 UNC x 2 Gr. 5 Hex Hd Cap		Trailer Hitch Bolts	Every 4th Set-up See Notes 2,3,4
Main Sweep Pins	504035	Sweep	See Notes 1,2,3
Hydraulic Arm Pins	504030	Sweep	See Notes 1,2,3
Hydraulic Cylinder Pins	504270	Hydraulic Cylinder	See Notes 1,2,3
Outrigger Pins	504255	Outrigger	See Notes 1,2,3
Car Rack Pins	504260	Trailer	See Notes 1,2,3
Car Pins	501203	Car	See Notes 1,2,3
Wing Rack Pins	504250	Trailer	See Notes 1,2,3
Wing Pins	501175	Wing and Car	See Notes 1,2,3
Scenery Panel Pins	504150	Scenery Panel	See Notes 1,2,3
Tongue Locking Pin	507200	Trailer	See Notes 1,2,3

Notes:

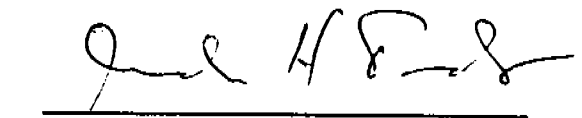
1. Replace the part if the diameter is 1/16" smaller than its original size at the point of maximum wear.
2. Replace the part if grooves or cracks appear in the shank.
3. Replace the part if it looks worn or defective.
4. See bolt torque chart for proper torque.

SELLNER
WINDJAMMER
STRESS
ANALYSIS

Prepared by:


Brian D. King, P.E.
President/Mechanical Engineer
Triodyne Recreation Engineering, Inc.




Andrew H. Tudor, P.E.
Senior Mechanical Engineer
Triodyne, Inc.