

TRANSLATION OF
OPERATORS MANUAL

MFG: SCHWARZKOPF
NAME: DOPPEL LOOP
TYPE: NON-KIDDIE

FOR

DOUBLE LOOP

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GENERAL REQUIREMENTS

For best performance and safety, and long life of the equipment, a reliable preventive maintenance program must be carried out based on the maintenance guidelines.

For damages caused by failure to follow these instructions or by change in the system (especially by-passing of contacts and the like), no claims can be made to the manufacturer and/or seller.

For all work which hereafter is mentioned to require a "responsible person", the management must designate a technically competent and qualified person who performs or supervises the required tasks, observing all guidelines and regulations as described.

Normal and conventional maintenance items are not listed in details here, but must be carried out to keep the ride in proper working order and as contribution to the safe operation of the whole installation.

Before start-up of operation, the ride must be checked and inspected for proper and safe functioning of every part.

Deficiencies occurring during operation must be rectified immediately. The operation must be shut down for the duration of this repair work.

Unless the whole ride area, with the exception of loading and unloading platforms, is fenced off against public entry, special protective barriers must be provided. These barriers must be installed in places where any moving parts would come within reach of visitors.

During the operation of the ride no one, not even the operators, are allowed within the ride area, with the exception of the specific work positions provided for the operators.

Electric power may be reapplied only after the persons working on the ride have completed their task, are clear of moving parts, have reinstated the ride into a safe operating condition and have personally reported the ride clear and safe for energizing.

If testing with power is required involving moving parts, the following precautions must be observed:

- a) The entire testing operation must be supervised and closely controlled by one qualified and responsible person being trained and familiar with the portion tested and its possible behavior, side effects or dangers.
- b) During live and moving tests the responsible person must be certain that everyone is out of range of the moving parts and that no one can enter this area unexpectedly.

All persons involved with such testing of equipment must be

warned that danger may exist and that parts may move or unexpectedly may start moving.

The keys for the override switches must be kept by a responsible person.

For installation of the main power supply service, utmost care must be taken that all local safety precautions are considered.

All work performed on the installation is to be ordered and supervised by the responsible person.

The following signs are to be displayed clearly visible to all riders:

- a) KEEP HANDS AND FEET INSIDE CAR AT ALL TIMES
- b) KEEP HEAD AGAINST HEADREST
- c) ANYONE UNDER THE INFLUENCE OF ALCOHOL OR DRUGS IS NOT PERMITTED ON THE RIDE

OPERATING INSTRUCTIONS

1. After daily inspections are completed the ride can be started.
 2. Turn on control voltage at control console with the key switch and turn on lighting.
 3. As soon as air pressure has reached 7 bar (100 psi) operation can begin.
 4. Turn selector switch in waiting field to "on" position.
 5. Push button "safety bar release" to open the safety bars.
 6. If hook and train are positioned correctly, hook will couple automatically.
 7. After all passengers are seated, every safety bar must be checked for:
 - a) Proper position - push lightly down on the safety bar to make sure it is snug against the passenger without applying too much pressure.
 - b) Safety bar is locked - pull up on the safety bar to make sure it is locked
- Note: Advise all Passangers to kep hands and feet inside the car at all times and to keep the head against the headrest.
8. Press horn button and a warning signal will sound.
 9. Press starting button, hold until train starts to move.
 10. Follow the train's progress on the track with the lighted control map on the console.
- If train speed is slower than allowed travel time on the

running track, or in the reducing brake, that particular ride section will blink and a warning signal will sound.

This train must be observed during following runs. If running time is again too slow, remove train and check.

11. After the train has completed it's run it will be slowed down in the reducing brake to a slower speed and transported by feeder motors to the station.
12. By pressing button "safety bar release" safety bars can be unlocked.
13. If station is occupied, following trains will be stopped in waiting fields 2 and 3. The waiting trains will automatically move forward when the station is cleared.
14. All waiting field motors as well as reducing brake can be operated from the control console.
15. When a train is transferred to the siding area use the manual buttons at the transfer area.
16. When a started train has cleared the lift, a second train can be started. At the top of the lift are 2 double magnet switches mounted for two safety blocks. When passing this switch, the control system checks if the track ahead is clear to the reducing brake. If reducing brake is occupied or signals that a switch in that section is defective, the lift will be shut off. Thus, the train stops on the lift.
After each stop on the lift the reducing brake must be checked for a closed condition. If a trains is standing in the reducing brake, it must be moved before any switch or key is touched on control console.

17. After all obstacles have been removed the key switch "override - safety device " can be activated and a continuous warning signal will sound.
An assigned operator must depress a button on reducing brake. This button indicates that the reducing brake and the course are clear.
18. Now the ride can be restarted from console. Remove the key from the safety override prior to opening the safety bars and starting the next train.
19. To prevent the key on the reducing brake from being actuated continuously (16 b) the safety bars release does not function with this button depressed.
During power failure the reducing and waiting field brakes can be released through storage air. For this purpose a handvalve must be reversed.
20. After the train has left the lift the chain dog will stop automatically.
21. As soon as a train is in the starting area, the chain dog moves up automatically and couples. The coupling can also be done manually via a key switch on the console.
22. Should any danger or emergency condition arise, the E-stop on control console must be pressed. All motors will stop running and all brakes will activate.
23. When shutting down the ride proceed as follows:
 - a) remove passengers and run the empty train through course; stop train in waiting field before station.
 - b) start the next train, which will stop in other

waiting field

- c) move trains to storage area;
- d) do not ever store a train in reducing brake.

25. After each repair and before daily operations start, perform trial runs.

26. Repairs should only be performed by qualified personnel.

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AMUSEMENT RIDES AND DEVICES

DESCRIPTION OF ELECTRIC SYSTEM

1. Fuses and control equipment necessary for the operation of the ride are located in three control panels.
 2. Current rectifier, main contactors, entire control system as well as power connection for the power section are located in the main control panel.
 3. Fuses and contactors for the lighting are located in the lighting control panel, which requires a separate power supply.
- The ride can only be operated from the control console. Following circuit diagrams are available for the electric installation:
- | | |
|-----------------------------------|----------------|
| Main current diagram | 118/1-20-01-00 |
| Winch diagram for lift chain | 118/1-20-01-01 |
| Control current diagram I | 118/1-20-02-01 |
| Control current diagram II | 118/1-20-02-02 |
| Terminal connection diagram | 118/2-20-03-00 |
| Terminal diagram - lift | 118/1-20-03-01 |
| Control Console | 118/1-20-03-02 |
| Terminal Diagram - starting place | 118/1-20-03-03 |
| waiting field 3 | |
| Terminal diagram - reducing brake | 118/1-20-03-04 |
| waiting field 3 | |
| Lighting circuit diagram | 118/1-20-08-00 |
| Lighting plan | 118/1-20-08-01 |
| Electrical instrument arrangement | 118/1-20-05-00 |

DESCRIPTION OF CONTROL SYSTEM

The ride is a high speed coaster. Fuses and control system necessary for the operation of lights and power are located in electric panels in the power room. The ride is controlled and operated from the control console.

1. After the main disconnect of both power and lighting panels has been turned on, the control voltage can be turned on via key switch 2b4 located on control console.
2. If rotating field is incorrect, lamp h2 on lamp control plate located in power cabinet will light up. Simultaneously the phase sequence overload relay d80 will block control voltage.
3. This can be corrected by changing two phases (with power turned off !) of the main supply.
4. Now the lighting can be turned on. If contactors d6, d6.1, d45, d45.1 and d50 are in their correct dropped position, d0 will pull up.
5. All magnet switches and positioning switches receive voltage and pull up their auxiliary contactors.
6. The relay contactors of the magnet switches are delayed across the timing circuit d40 - 1 sec. This insures that no inadvertent signals can be set during switching on.
7. The compressor contactor c2 can only pull up when main power contactors c5, c6, c6.1, c19, c19.2 have dropped. When reaching 75 psi pressure control 5b15 will switch, d8 pulls up.
8. If none of the two E-stops 2b10 on console or 5b11 on

reducing brake are depressed, d6 pulls up. Now control voltage is released for the entire installation. All possible contactors, relays connected to their limit switches, can activate current rectifier signals, etc.

9. By pulling up c3, voltage is supplied by the current rectifier to the ventilator in the lift motor as well as to the regulator supply of the current rectifier. The motor field will be energized.

10. Following signals will signal from current rectifier:

- a) field acknowledgment,
- b) wind switch of ventilator on,
- c) semi conductor fuses are ok,
- d) lift motor speed $n = 0$, d13 energized
- e) no overspeed, d14 energized

11. The automatic train transport will be enabled by depressing the feeder motor keys for field 2 and 3.

12. Following items must be correct for the run of the feeder motors:

- a) The overload relays connected to the motors did not trip. Contactor d39 is off.
- b) The waiting field brake must be switched on, i.e. released.
- c) The limit switches in waiting field brake must signal an open brake.

13. The feeder motors can be operated manually by the keys located on the console, should the automatic system be interrupted or manual moving of the trains is required.

1. Relay d25 - coupling, must be energized prior to

starting up the ride, next d17, d25 drops off.

- a) d8 pulled up = air pressure is over 100 psi;
- b) c8 starting place brake contactor dropped;
off;
- c) d28 starting place brake limit switch
dropped off;
- d) d59 starting place limit switch M6.2, M6.3
contacted, d59 dropped off;
- e) d84 timer is not energized;
- f) d18 signal "coupling ok" dropped off;
- g) Item b - f are not necessary, when acc.
to key 2b 28 on console, d25 is brought
up.

Simultaneously with d25, miniature relay d26 = compl.
nominal value will come up.

When d25 has transported hook to train, signal d18 will
be set.

- a) d25 pulled up;
- b) for a lower nominal value, signal Jx will appear
from current rectifier, d17 will be set after 2
seconds across timing relay d16;
- c) current rectifier signals shut down - d13 pulled
up.

During operation d25, d18 come up automatically.

Passenger safety bars will be released by button 2b12, c7
pulls up. If key 5b13 on reducing brake is depressed or
key 2b27 "override safety system" is on, safety bar
release will not be possible.

19. Limit switches 5b14.1 - 5b14.4 signal across d7 when switch track is moved.
20. When starting preparations are complete, push button 2b22 on console must be depressed, provided that key switch "station brake release" 2b23 is in an open position.
21. When c7 has dropped off, d7 pulled up - limit switch - bar release, depressed, signal d18 pulled up, d 16, d39 dropped off, current rectifier signals d13, d15 in base position - d13 pulled up, d 15 dropped off, d21 dropped off, signal starting control 1 ok appears, d19 pulls up.
22. d19 switches miniature relay d20, voltage to current rectifier will be supplied across d20, which is equal to tach voltage for signal overspeed.
23. Current rectifier electronic must now change signal n = over speed, d14, d14 drops off, d15 pulls up. This function checks current rectifier electronic before each running cycle for proper functioning.
4. Item 23 brings up contactor d21 which supplies contact to
 - a) wiper relay d27, d27 makes contact with station brake c8 for 20 sec.;
 - b) station brake limit switch 5b34.1 - 5b34.2 will be pressed, d28 pulls up.
5. d19, d21 signals the lift drive - d22 pulls up.
6. Across overload relay e10 - stop switch 2b26 on console, c3 pulled up, d8 pulled up, d9, d11, d12, d14 pulled up, d15 again dropps off, d22 pulled up, both monitoring blocks d45, d45.1, d50 will be pulled up, lift brake

released c6, 6.1 and the regulator of the current rectifier across miniature relay d23 released.

7. Simultaneously, d22 makes contact with higher actual value - miniature relay d24, lift motor turns on and will be raised to approx. 1.2 m/sec. across it's internal actual value integrator. Simultaneously, timing relay d95 starts up and after expiration of preprogrammed time, d95, d96 pulls up and train increases speed to 1.8 m/sec.
8. When contacting one of the monitoring signals listed in paragraph 26 or during failure of tach, the shut down of lift will be effected either across d22 or acc. to paragraph 26, the brake will activate.
9. When train reaches the lift, the first section will light up on the control console, d61 is pulled up.
0. When reaching the first double magnet switch 5M1, 5M1.1, at the end of the lift, the following will occur across the monitoring chain of d45 - block 1:
 - a) will check if block section into the reducing brake is clear, d85 dropped off;
 - b) all surface switches mounted on reducing brake, pulse generators, must be in their proper operating position, assigned contactors must be pulled up or dropped off;
 - c) reducing brake must be closed;
 - c) magnet switches in block 2, block 2 must be in their closed position.
1. If one of the signals listed in paragraph 30 is incorrect d45, d45.1 will drop off, lift will be shut off, and lift

brake will activate.

2. Simultaneously, lighting field 1 will be turned off when activating magnet switch 5M1, and lighting field 2 d-62 will turn on.
3. When proximity switch 5M2, 5M2.1 mounted at the end of lift are contacted, safety block 2 will be checked. The following must happen:
 - a) block 1 (initiated by 5M1) d44 must have pulled up;
 - b) section until after reducing brake must be clear.
 - c) d86 must have pulled up.
4. If a signal is incorrect, a lift stop will result, refer to paragraph 32.
5. To release a train on the incline, safety blocks must be bridged by key switch 2b27 on console.
5. Simultaneously, a qualified person must press lift button 5b13 mounted on reducing brake, in order to pass magnet switch 5M1, 5M2. This button should signal from the reducing brake that section is clear from end of lift until after the reducing brake.
7. A lift start up, as listed in paragraph 35/36, is only possible, when reducing brake is closed. (d36 pulled up, c19 dropped off)
8. In order for switch 5b13 not to be pushed continuously, the button must be released for each passenger bar release.

When button has been activated, bar release is not possible.

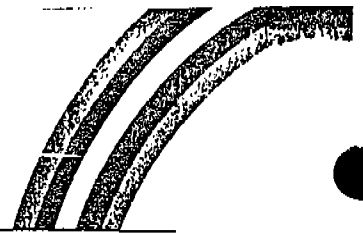
- a) When contacting magnet switch 5M8 at the end of lift, regulator of lift drive will be blocked across miniature relay d23. The lift motor will be shut off, lift brake is still open. Through this, part of the kinetic energy of the chain will be reduced.
- b) The magnet switch 5M3 mounted immediately after 5M8, drops off c6, c6.1, lift brake will fall in.
39. Also, lighting field 2 will turn off and field 3 will turn on - d63 pulls up.
10. Simultaneously, timing relay d69 starts. The running time from the lift to the reducing brake is adjusted on this timing relay. If running time is exceeded, runway lighting field on control console will light up and a warning signal will sound.
11. If running time is exceeded again, this train must be removed from operation and checked for wheel problems and/or bearing defects.
2. When entering reducing brake impulse relay 5b1, 5b2 must be passed with a higher speed than brake opening speed.
3. 5b1 relays impulses to transmitter d2, d2 switches d30 during high impulse count.
- 5b2 transmits impulses to relay d3, d3 switches d33 during increased impulse count. If impulse count falls below preprogrammed count, d2, d29 and d3, d32 will switch.
1. Transmitter 5b3 and 5b4 coordinate with relay d4 and d5. If speed of train is still higher with 5b3 and 5b5 than

preprogrammed impulse sequence, d35 and d87 will drop off. When exceeding switching points both contactors will pull up again.

5. Following conditions must be met to automatically release brake:

- a) The train must have at least contacted one of the proximity switches 5F2, 5F3 or 5F4 in the reducing brake, d64, d55 or d56 is dropped off.
- b) d2, d3 must have been adjusted to a higher impulse count than the preprogrammed one.
- c) When speed is being reduced = smaller impulse count to d2, d3 - these will revert to their base position - d29, d32 pulled up.
- d) Waiting field 3 must be clear.
- e) The switching control contactor of d2, d3 must have pulled up d31, d34.
- f) The impulse count of transmitter 5b3, 5b5 must be smaller than the preprogrammed impulse input of relays d3, d4.
- g) The three switching point limit switches 5b39.1 - 5b39.3 must be depressed and signal: switch point in drive position and locked, d36 pulled up.

During train switching the reducing brake can be operated manually. Key switch 2b23 on console must be reversed, lamp 2h47 lights up and button 2h40 must be depressed. Feeder motors will start when reducing brake is opened. When passing proximity switch 5F1 in reducing brake, leg 'section incline run' light will extinguish and reducing



- brake field will light up on console.
9. Simultaneously, timing relay d70 will receive voltage. The time in reducing brake has been programmed on d70. If time expires, lighting field on console will light up and a warning signal will sound. Should this recur, the brake must be checked.
 0. When the train leaves the reducing brake, first the proximity 5M4 will switch and block 1 is switched clear. This switch belongs to safety block 1, simultaneously it checks if safety block 2 functioned correctly, if d49 of block 2 was not energized,, the lift drive will shut off. In this way an unnoticed failure of block 2 is not possible.
 1. Proximity 5M5 will switch to clear safety block 2 d53.
 2. When approaching waiting field 3, proximity 5F5 will activate, d57 drops off, waiting field 3 lights up. Should waiting field 2 be occupied, brake in waiting field 3 will close, the train stops.
 3. When waiting field is approached and surface switch 5F6 is activated, that field will light up on console, d58 drops off. If starting place is occupied, brake in waiting field 2 will fall in and the train will stop.
 4. When one of the trains passes one of the proximity switches 5M6.1, 5M6.2, 5M6.3 in station area, the start station field will light up. The switches 5M6.2, 5M6.3 are mounted in front of station area field. When they are passed, the station brake will close.
 5. When a train departs the lift and passes over 5M8 the

motor will shut down. After passing the second proximity switch 5M3, the lift brake will close.

6. The proximity switch 5M7 has the same function if 5M3 fails.
7. When the next train stops in the station area acc. to paragraph 54, the hook positioned in the lower waiting position, as described in paragraph 14, 15, 16 and 17, will move and couple the train.
3. Lamps light up, for better control of ride and facilitate correction of any interruption and are located on main circuit board .
3. Repairs are to be made by qualified personnel only. After each repair or during daily start-up of ride several trial runs must be made, but without passengers.

INSPECTION AND MAINTENANCE

TIME INTERVAL:

Lift

- a) Check all bolted connections on the lift drive after the first 50 hours of operation, and there after yearly
- b) check oil level on gear box monthly
- c) check lift brake, located on gear box, for lining wear. weekly

The lift brake is held closed through spring pressure, and air pressure of approx. 5.0 - 5.5 bar (72-80 psi) is applied to open the brake.

The holding power of the brake should be checked frequently. weekly

To test the brake, lock the anti-roll-back dogs on the last car of a train in the up position, this prevents them from engaging in the anti-roll-back teeth on the lift. Do not have other trains on the operating track in case the brake fails and the train rolls back to the station. Dispatch the test train, close the station brake as soon as the train is at the station.

TIME INTERVAL:

Then, stop the lift when the last car is on the incline, just past the radius of the track. The brake has to hold the train. Lower the anti-roll-back dogs on the last car to their normal position before restarting the lift.

- d) Check the function of the limit switch for broken chain. daily
- e) Check the guides on the chain tension adjuster. daily
- f) Check the tension of the V-belts, if necessary tighten by moving the motor. (Must be adjusted during first days of operation). weekly
- g) Spot check the connection on the chain at two places Torque = 36 Kpm (260 ft-lbs) weekly
- h) Check the chain links, connecting links, sprockets, guides and chain for wear, replace as necessary. monthly
- i) Any change in length of the chain is taken up by the chain tension adjuster on the lift drive.



TIME INTERVAL:

- j) When checking chain links for wear with tension released, the minimum allowable diameter of the link is 18.25 mm. This allows for .75 mm wear, based on a new link diameter of 19mm. However, the chain is only case-hardened to .08mm. After the hardend surface is worn (about .003 in), the chain wear increases rapidly, as well as the friction between links.
- k) When working on the chain, the following guidelines have to be followed:
1. The welds of the chain links have to face towards each other.
 2. The lock nut of each connection link has to face towards the inside.
 3. The lift hook has to be mounted approx. 150 mm (5.9") in front of a chain guide.
 4. The chain guides are to be installed exactly 20 links apart, which is appr. every 1500 mm (5 ft). Special attention

TIME INTERVAL:

has to be paid that the chain guides pass properly over the 10 tooth double sprocket on the gearbox.

5. The two lift hooks are spaced equally on the chain, which is half the chain's length apart. That means that one lift hook has already passed the idler sprocket on top of the lift, while the other lift hook is still before the idler sprocket below the station.

- l) Clean dust filter on lift motor monthly
- m) Check brushes and commutator on lift motor for wear, blow out dust, clean commutator. yearly

Supports

- a) Check bolted connections and safety pins monthly
- b) Spot check the connection from supports to track (socket head cap screw M30) at six places for correct torque: Torq = 58 Kpm (420 ft-lbs) weekly

Should a loose connection be found, the bolts on all supports have to be checked

TIME INTERVAL:

3. Loop

- a) Check bolted connections on various places, yearly first after 50 hours of operation
Should a loose connection be found, all bolts on the loop have to be checked.

4. Track

- a) Spot check the bolted connections on the track at six places for correct torque:
torque = 58 Kpm (420 ft-lbs) weekly
Should a loose connection be found, all bolts on the track have to be checked.
- b) Also, as the bolted connections are checked, inspect the track joints for a smooth daily + transition. All irregular joints have to be yearly be sanded carefully to prevent depressions.
- c) The surface, where the wheels contact the track, should not be painted or rusted.
- d) If the ride has been out of service for a longer period of time, the contact surface on the track has to be cleaned from rust to

TIME INTERVAL:

insure that the train will run with sufficient speed.

Brakes

- a) Check all moving parts of the brakes. monthly
- b) Check the brake linings for wear. The brake linings have to be changed before the rivets start to wear. New lining, that is riveted to the brake shoe, should contact the brake shoe over the entire surface. No gap should be visible. Also, the rivets are reinforced through dowel pins to prevent them from shearing off. monthly
- c) Check opening of all switches monthly
- d) Check speed of train leaving trim brake, should be 2.5 m/sec (8.2 ft/sec) - monthly
- e) Check adjustment of trim brake as following:
Stop fully loaded train, 28 x 75 kp (28 x 165 lbs), in the trim brake by pushing the emergency stop button.

TIME INTERVAL:

The distance from the start of the trim brake to the front of the stopped train should be approx. 25.00 m +/- 5.00 m (82' +/- 16').

(Mark with color on the trim brake for daily reference).

An empty train should stop within 21.00 m +/- 5.00m (69' +/- 16').

Should the train not stop within this range, the brake has to be adjusted.

- f) If a brake has to be adjusted, make sure that the gap between all closed brake shoes is the same. A metal gauge of correct size used between the brake shoes makes the adjustment easier.

Exception: The gap between the first two sections of brake shoes in the trim brake is larger. This allows the brake fins of the cars to enter the trim brake securely.

After every brake adjustment a new brake test with a full train has to be performed. Also, the brake limiter has to be adjusted after every brake adjustment. The pin on the

TIME INTERVAL:

limiter should, with closed brake, have a gap to the radius of approx. 2-3 mm (1/16"-1/8").

- g) Check adjustment of station brake as weekly following:

An empty, as well as a fully loaded train, has to stop in the station to allow for automatic connection of the lift hook. (Mark location of train front on station, with color).

The waiting zone brakes have to be adjusted that the train contacts at least one feeder motor.

- h) Check air cylinders for leaks weekly

Feeder motors

- a) Check bolted connections after first 50 hours of operation and thereafter frequently. yearly
- b) Check oil level in gear boxes monthly
- c) Check air pressure in tires, approx. 5.5 - 6.0 bar (80 - 87 psi) weekly

TIME INTERVAL:

d) Check height adjustment of tires:
Contact pressure should be 5 - 8 mm monthly
(1/4" - 5/16") without lifting up the cars

e) Check function of cooling fan yearly

f) The best combination of tire air pressure and height adjustment is achieved when the full width of the tire contacts the car without lifting it up.

7. Lap bar release mechanism

The lap bar release mechanism in the station has to be checked for free movement, especially for retraction. If necessary, the tension springs have to be adjusted. daily

8. Transfer track

Check the transfer track for free movement and watch the gap between tracks, especially during high temperature periods. daily

Keep the rolling surface for the support wheels clean.



TIME INTERVAL:

Train

- a) All bolted connections, especially axles and brake fins, safety cables and switch flags are to be checked after operation daily
- b) Check the lap bars for free movement and safe locking of the ratchet. daily
- c) Check the anti-roll-back dogs on the last car for free movement. daily
- d) Check the safety cables between cars for wear, replace if wires are broken. monthly
- e) Check wheels for wear and free movement and replace as necessary. monthly

<u>Wheel type</u>	<u>New diameter</u>	<u>Minimum diameter</u>
Road wheel	265mm (10.433")	255 mm (10.039")
Guide wheel	145mm (5.708")	140 mm (5.511")

(Measure at middle of wheel)

TIME INTERVAL:

10. Pneumatic system

- a) Check air compressor according to manufacturers' specification
- b) Drain water from tank, receiver tanks and filters. daily
- c) Check pressure switch for correct operation, adjusted for 7.0 bar (100 psi) weekly
- d) Check all diaphragm cylinders for leaks weekly
- e) Check air lines, hoses and connections for leaks. monthly
- f) Check oil level on lubricators weekly

1. Electrical system

- a) After the ride is ready for operation, push the emergency stop button and check that the lift stopped and all brakes are closed. daily
- b) Actuate first magnetic switch on top of lift manually, using a piece of steel or tool, then dispatch a train. The train has to stop by that switch. (Safety block 1) daily

TIME INTERVAL:

- c) Repeat above test (point b) by actuating the other three magnetic switches on the lift respectively. The train has to stop every time on the lift. daily
- d) Place a piece of sheet metal on top of the first large proximity switch in the trim brake. The train has to stop on the lift. Repeat same test for the other three switches. weekly
- e) Check the mounting of all switches weekly
- f) Actuate all switches manually and check function on input card LED. monthly
- g) Check cooling fans for proper operation. monthly
- h) Tighten all connections, check the contacts of large contactors. yearly

12. Test runs

- a) Test runs without passengers must be performed after the daily inspection and maintenance, or after repairs have been made. daily

TIME INTERVAL:

The function of all brakes has to be checked.

b) Should the train run too slow, the corresponding section in the illuminated track diagram flashes and a buzzer is sounded. daily

c) The speed of the train has to be checked as follows: daily

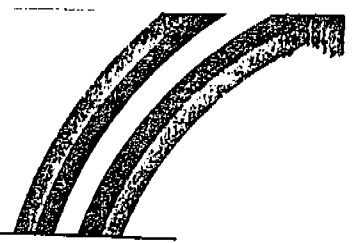
From the center of the train over support #6 (after the lift) to the center of the train over support # 10 (two supports before the trim brake) the running time for correct speed should be 29.0 sec for full, operating train, 32.0 sec for empty train.

If the measured time varies by more than 1.5 sec from the proposed time, contact the manufacturer.

13. Welds

Visually check the condition of the most important welds during each inspection

a) Car: Frame, axles, connection bar pocket yearly



TIME INTERVAL:

- b) Track: Connection from center beam to support mount, connection from track to center beam, cross members on track joint. yearly
- c) Loop: Connection from track to loop frame, connection from loop frame to base plate.
- d) Supports: Connection from cones to tubing, connection of braces.

Cracks in welds have to be repaired immediately by certified welders as follows:

- a) Grind out old weld to base material
- b) Preheat material with more than 1/2" wall thickness to 150 - 200 deg. C (300 - 400 deg f)
- c) Select proper welding material

14. Repairs

- a) All repairs are to be performed by highly qualified technicians.
- b) For all repairs the ride has to be shut down,



TIME INTERVAL:

the power turned off and locked out.

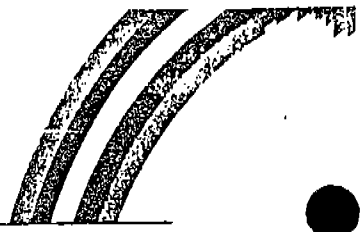
- c) Use only original replacement parts from the manufacturer.

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LUBRICATION

1. General

- a) The listing of lubricants in the following table is in alphabetical order. Other brands of the same quality may be substituted, but the mixture of different brands should be avoided.
- b) Perform lubrication at listed time intervals.
- c) If the ride is out of service for a longer period of time (as winter time), the lubrication of all moving parts is necessary.
- d) If parts are cleaned, as bearings or gear boxes, make sure that the cleaning solvent is completely removed before assembly.
- e) Bearings should be cleaned only in white gasoline or kerosene.
- f) After cleaning, lubricate bearings with grease according to table A. Fill bearings approx. 1/3 up to max. 1/2 of available space with grease.



2. Lubricants

Table A: Bearings

<u>Brand</u>	<u>Type</u>
Calypsol	H 443
Esso	Beacon 2
FAG	Arcano L 78
Shell	Alvania 2

Table B: Gear boxes

<u>Brand</u>	<u>Type</u>	<u>Remarks</u>
BP	Gear lubricant 140	For worm gears
Shell	Gear lubricant 140	For worm gears
BP	Gear lubricant 90	For bevel & spur gears
Shell	Gear lubricant 90	For bevel & spur gears
BP	SGR - XP 220	FOR V5/V6 Gear boxes
Shell	Marfak 00	For V5/V6 Gear boxes

Table C: Chain

<u>Brand</u>	<u>Type</u>
Molykote	1221 / 1231
Optimol	KL 300

3. Lift

- a) Chain: acc. to Table C
Lubricate the link chain carefully twice a week.
- b) Chain guide: acc. to Table C
Lubricate the track for the chain guides daily.
- c) Lift drive motor: acc. to manufacturers' recommendations
- d) Gearbox: acc. to Table B and Table A
The gear box SEW R 160 is filled with 21.50 Ltr. (5.67 gal) of gear lubricant oil. Check the oil level once an month and add oil if necessary. The oil should be changed once a year and the bearings lubricated.
- e) Chain tension adjuster: acc. to Table A
About once a month clean the guide on the chain tension adjuster and lubricate on 4 places.

f) Chain sprockets: acc. to Table A
After one year of operation lubricate the bearings.
Each sprocket has one grease nipple each on the left
and on right side.
Every two years the bearings should be taken apart
and inspected for wear, cleaned and re-lubricated.

g) Lift hook: acc. to Table A
Once a month lubricate the rear pin on the lift hook
(one grease fitting).
Every two years the lift hook should be taken apart
and inspected for wear, cleaned and re-lubricated.

4. Trim brake

- a) Brake shoe mounting: acc. to Table A
All bolts and pins on the brake shoes should be
lubricated once a month.
- b) The clevises on the air cylinder should be oiled
frequently, at least monthly.

5. Transfer track

Grease all moving parts once a month.

6. Feeder motors

- a) Gear box: acc. to Table B and Table A

The gearbox is filled with 2.10 ltr. (2 1/4 qt.) of oil.

Check the oil level once a month and add oil if necessary. The oil should be changed once a year and the bearings lubricated.

- b) Motor: acc. to Table A

The bearings of the motors should be cleaned and relubricated after approx. 4000 hours of operations.

- c) Feeder motor with freewheel clutch:

The feeder motors in the trim brake have a free-wheeling clutch added on the drive shaft. The clutch should be lubricated every time the tire is changed. The freewheel clutch should be cleaned and relubricated at least every 1500 hours of operation.

Use Esso Beacon 2 or equivalent.

7. Lap bar release mechanism

All sliding areas of the release mechanism in the station should be oiled or lubricated monthly.

8. Train cars

- a) Axles: acc to Table A
Lubricate each axle joint once a week. (Three grease fittings)..
- b) Support rollers: acc. to Table A
Lubricate each support roller once a week.
- c) Lap bars and ratchets: acc. to Table A
Lubricate the fittings on the lap bars and the ratchet housing once a month, if necessary more frequently.
- d) Anti-rollback dog: acc. to Table A
The anti rollback dogs on the last car should be lubricated monthly, three grease fittings.
- e) Road wheels and guide wheels: acc. to Table A
At least once a year, or every time the wheels are changed, the bearings have to be inspected, cleaned and re-lubricated.

9. Pneumatic system

a) Air compressor

Service the air compressor according to the manufacturers' recommendations. It is important to check the oil frequently and to change the oil after the specified periods.

b) Air line lubricators:

Fill lubricators as necessary with oil, type BP Energol HLP 22 or equivalent (10 SAE).

TORQUE CHART

Torque values for lightly oiled screws with metric thread as per
DIN, 912, 931, 933, 934, 6914, 6915.

Size	Grade 6.8		Grade 8.8		Grade 10.9	
	kpm	ft-lbs	kpm	ft-lbs	kpm	ft-lbs
M 8	2.1	15	2.5	18	3.5	25
M 10	4.1	30	4.9	35	6.9	50
M 12	7.2	52	8.6	62	12.0	87
M 14 x 1.5	12.5	90	15.0	108	21.0	152
M 16	18.0	130	21.0	152	29.5	213
M 20	34.5	250	41.0	297	58.0	420
M 24	60.0	434	71.0	513	100.0	723
M 30	120.0	868	145.0	1050	200.0	1446



TROUBLE SHOOTING CHART

1. Trouble: No control voltage

Probable cause:

Corrective action:

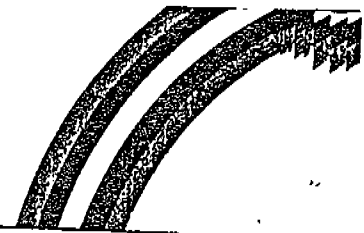
- | | |
|---------------------------------------|---------------------------------|
| a) Phase sequence from line is wrong. | a) Change phase sequence |
| b) fuse for control circuit defective | b) Replace fuse |
| c) The main disconnect is off | c) Turn on the main disconnect. |

2. Trouble: The lift hook can not be engaged manually

Probable cause:

Corrective action:

- | | |
|---|--|
| a) Fuse in motor or brake circuit defect | a) Replace fuse, check current if fuse blows again |
| b) The air pressure is below 7 bar (100 psi), control lamp d8 is off. | b) Turn on compressor |
| c) Hand valve on trim brake is in manual position | c) Turn hand valve to automatic position |
| d) The limit switch "Broken Chain" is actuated | d) Check chain and function of limit switch |
| e) The lift motor is overheated | e) Check motor temperature, if hot let motor cool down, then check brushes and |



current.

f) Rectifier - thyristor unit
not working

f) See point 5

g) Safety block set up

g) See point 7

Trouble: The lift hook does not engage automatically.

Probable cause:

Corrective action:

a) See point 2, a through e
b) Limit switches from station
brake are not functioning
correctly.

a) See point 2, a through e

b) Check and adjust limit
switches, should not be
actuated by closed brake

Magnetic switches in station
not actuated.

c) One of the magnet switches
in the station has to be
actuated.

Trouble: The train won't start

Probable cause:

Corrective action:

Lap bar release not
retracted, limit switch
not actuated.

a) Check release mechanism
and limit switch, must be
actuated.

The signal "Lift hook
engaged" is missing.

b) See point 2, a through e

One of the overload relays
from the transfer motors
is tripped.

c) Check overload relays,
reset

The signal $n=0$ or $n= \max$

d) Corresponding contactor

from thyristor unit not correct.

should be picked up.

The magnet switch or proximity switch for chain operation is actuated or defective.

e) Check switches, replace if necessary.

See point 2

Problem: Rectifier - thyristor unit not working

Probable cause:

Corrective action:

No lift motor field or defective current relay.

a) Check field current, should be within manufacturers' rating.

Cooling fan not working or wind flag switch defective.

b) Check fuse and overload relay, reset, check wind flag switch.

The fuse control is tripped, defective rectifier fuse.

c) Replace with rectifier fuse, do not replace with a common fuse, if fuse blows again, consult the manufacturer.

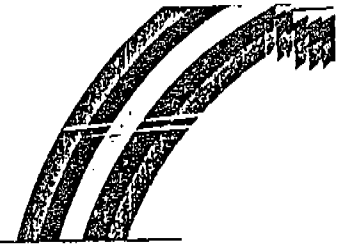
Lift motor stopped shortly after start, tach generator defective.

d) Check tach generator brushes, check voltage

Attention: Do not remove rotor from tach generator.



INC.



AMUSEMENT RIDES AND DEVICES

Trouble: The trim brake is not working properly.

Probable cause:

Corrective action:

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a) One of the proximity switches is defective or not actuating.

b) One of the impulse relays is defective.

c) One of the three limit switches on the transfer track is not actuated or is defective.

a) With no train in trim brake the corresponding contacts should be picked up. An incoming train has to reach at least the second switch.

b) Check that incoming train actuates the first two impulse relays with a higher speed than the preset level.

c) All three limit switches have to be actuated.

Trouble: A safety block was set up, the train stopped.

Probable cause:

a) One of the proximity switches in the trim brake is actuated or defective.

b) One of the impulse relays is

Corrective action:

a) Check function of proximity switch with a piece of steel same size as the switch, the steel should actuate the switch from a distance of 25 - 30 mm (1" - 1 1/4").

b) Check function of impulse

defective.

relays on LED's with a train passing, adjust carefully, if necessary.

- c) One of the trim brake limit switches is not actuated or is defective.
- d) One of the proximity switches of safety block 1 or 2 is defective.
- e) One of the contactors in the safety block control circuit is defective
- c) Adjust limit switches, these have to be actuated by a closed brake.
- d) Check proximity switches, replace if defective.
- e) Check if contactors are picked up or dropped out according to the circuit design, replace if defective

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