



SERVICE LETTER RA-01  
ISSUED BY HUSS MASCHINENFABRIK  
DATE: 1984

MFG: HUSS-HEINER, WILHIEM,  
CO.  
NAME: RANGER  
TYPE: NON-KIDDIE

RE: Erection of the Ranger

It was brought to our attention that a problem may occur in the erection of the Ranger, specifically in the mounting of the gondola and counter-weight boom arms.

We stress that care and special attention be given to paragraphs "F" and "H2" in the Ranger manual under section V, maintenance and lubrication, to avoid any of these problems. It is essential that you adhere to the requirements of these paragraphs.

**HUSS**

SERVICE LETTER RA-02  
ISSUED BY HUSS MASCHINENFABRIK  
DECEMBER 19, 1986

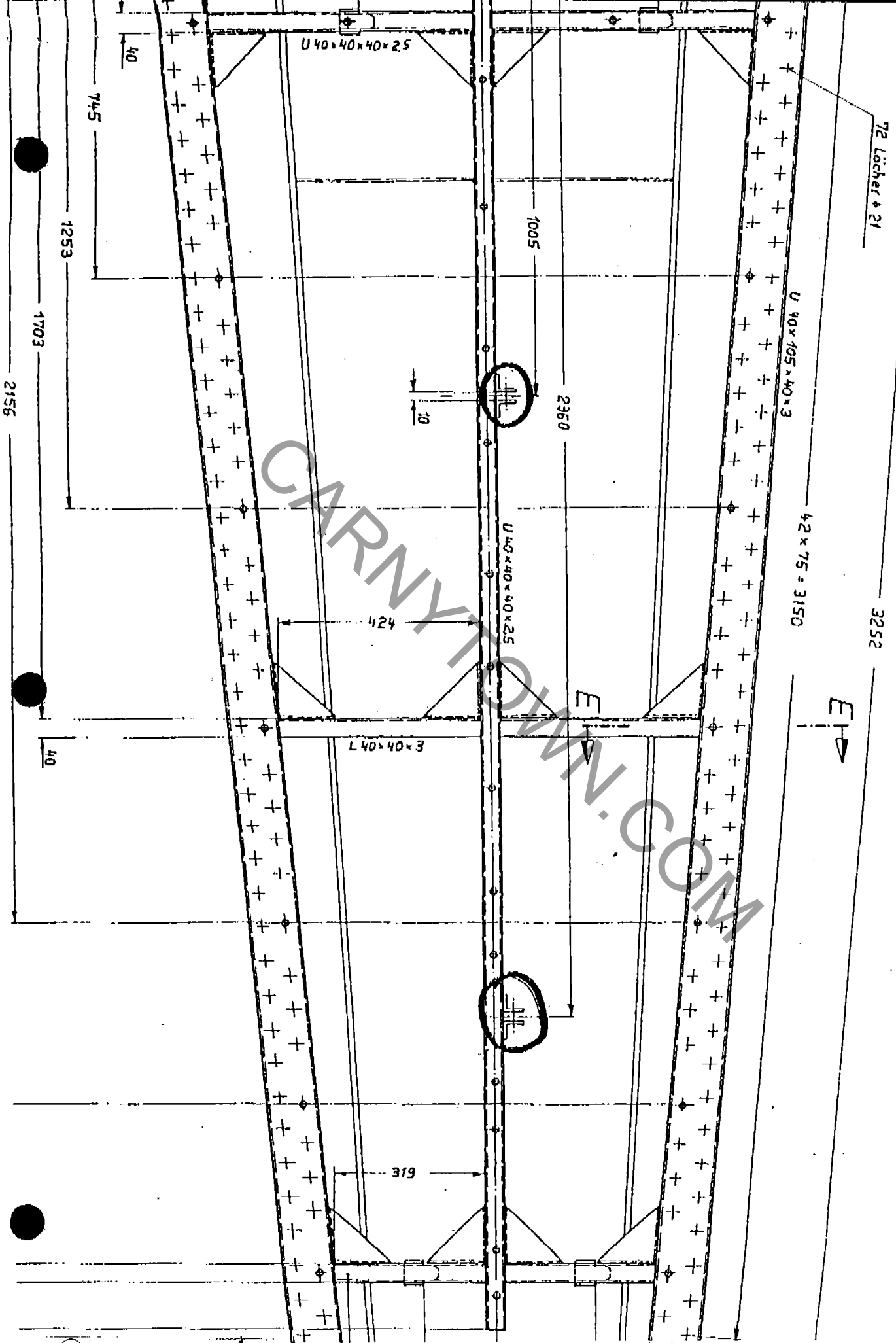
RE: Ranger decoration on the mainboom - Aluminum brackets

All customers are advised about a possible problem on the aluminum brackets which hold the decoration. Due to wear and tear, these brackets can crack or brake.

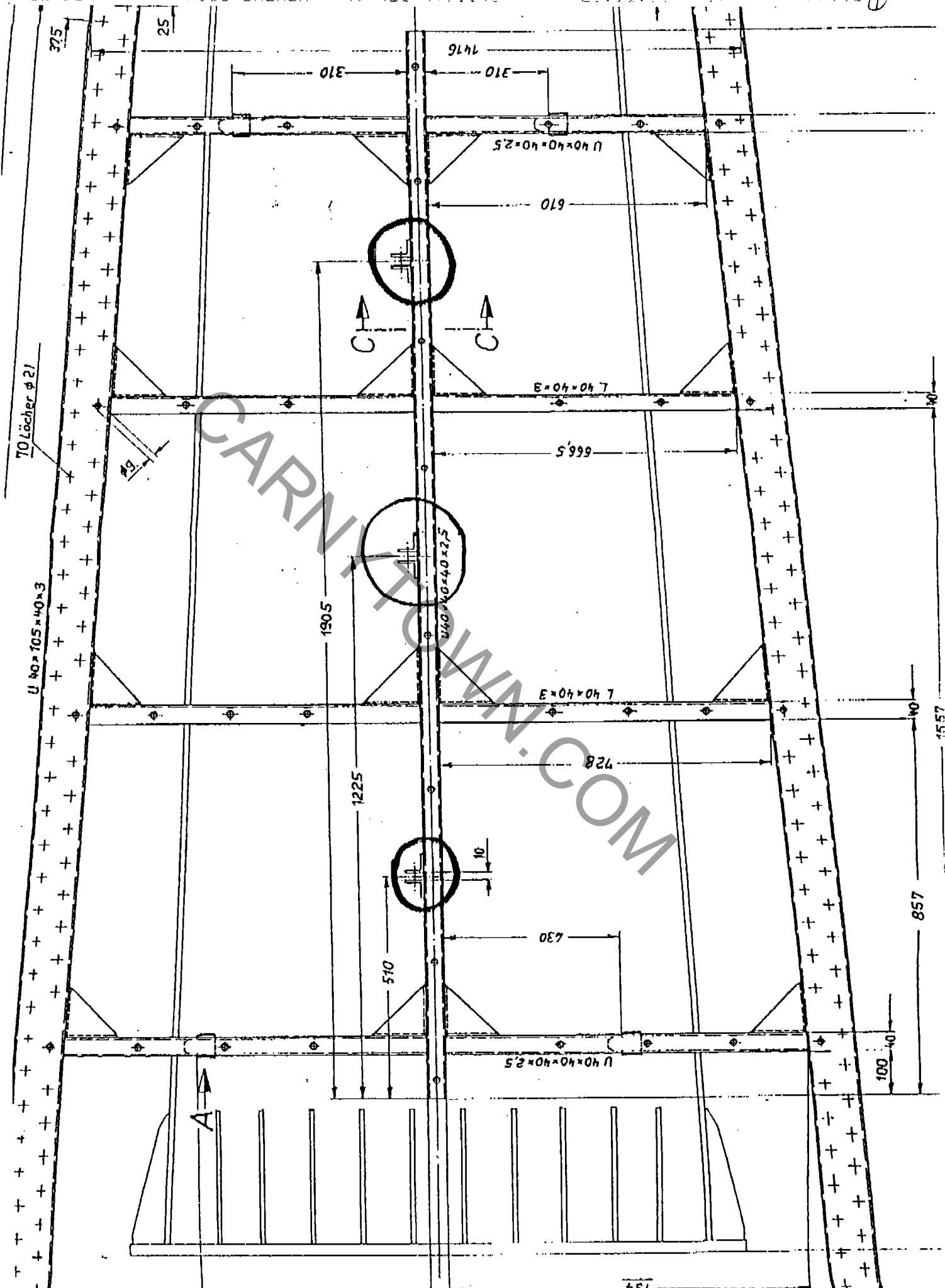
We recommend checking these brackets on a regular basis. As a permanent modification, we recommend new brackets manufactured out of Niro steel.

You also may manufacturer the brackets yourself according to the drawing which we are supplying to you with this service letter.

enc. Drawing

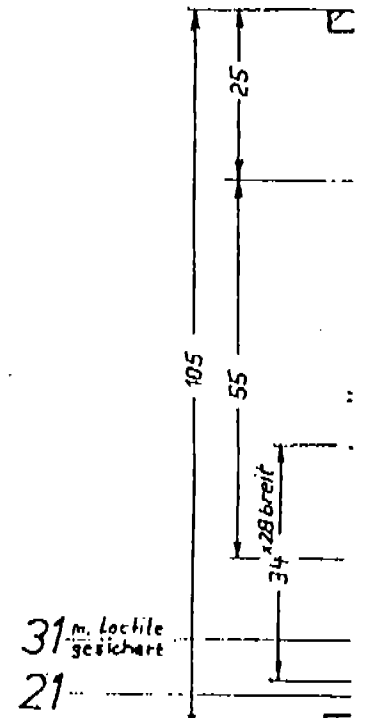
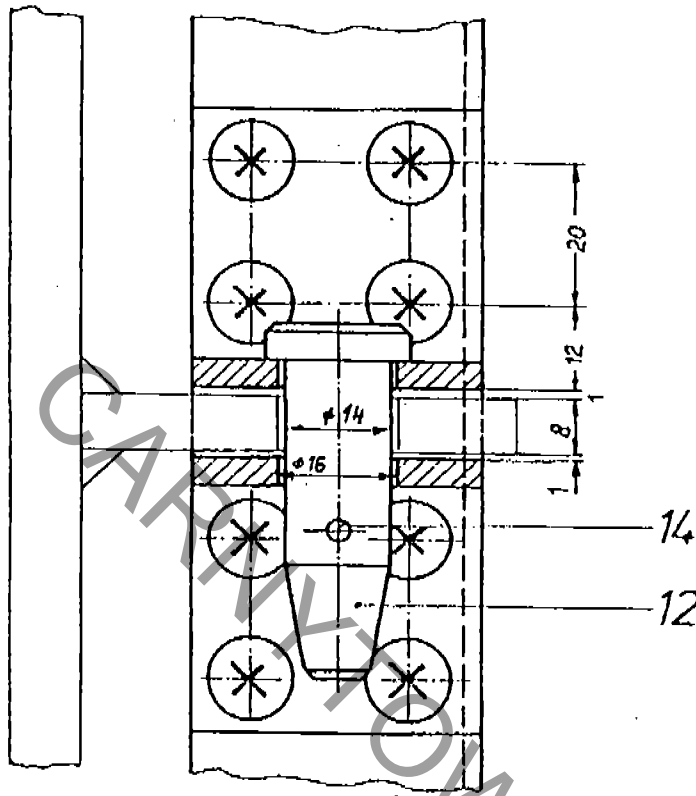


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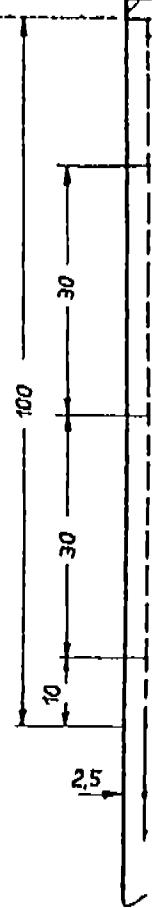
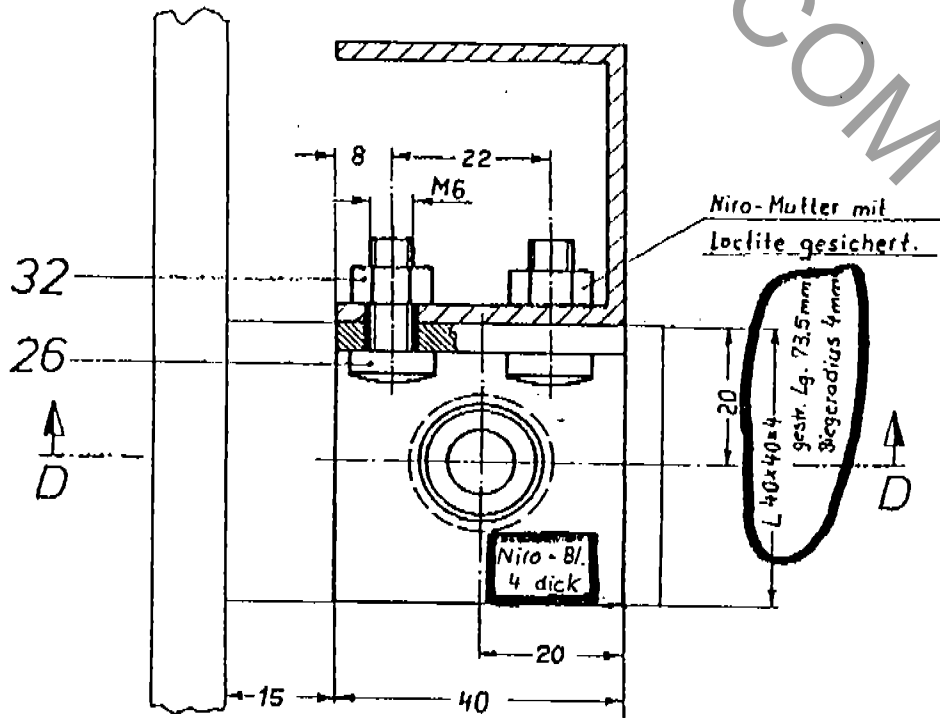


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### Schnitt D-D



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**HUSS**

SERVICE LETTER RAI-04/RA-03  
ISSUED BY HUSS MASCHINENFABRIK  
FEBRUARY 1989

RE: Ranger and Rainbow - BEARINGS IN GEARBOXES

We recommend that the bearings at the four (4) planetary gearboxes be replaced after five years of service.

This change will expand the lifetime of the gearbox.

When ordering the bearings, we will need the individual serial numbers of all four (4) gearboxes to insure proper replacement parts.



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RETURN RECEIPT  
REQUESTED

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VII. SAFETY REGULATIONS

for

Looping Swing "RANGER"

1. The ride design has not been calculated for snow loads during operation. If the ride is operated outside of the snow-free season, any snow that settles on the ride must be continuously swept off.
2. The ride must be underpinned by support blocks at the bearing points as shown in plan no. A1-10.D "Platform with supports". The given sizes of the supports are valid for a permissible ground pressure of  $p \geq 15 \text{ N/cm}^2$  (22 lb/in<sup>2</sup>).
3. Keep the supports between soil and base structure low and make sure that they are stable and immobile. Supports made of beer barrels, squared timber piles or similar must, if necessary, be secured by ground anchors or bracings. Possible washouts or floods should be taken into consideration.
4. The rear wall stanchions must be anchored for tensile forces given in plan no. A1-10.D. "Platform with supports".

In case of densely compacted sands and gravels and stiff to semi-solid soils the anchor dimensions in plan no. A1-10.D are sufficient.

5. The bracing stays of the rear wall stanchions of the facade must be anchored for the following tensile forces.
  - a) Outermost stanchions:  $Z = 9 \text{ kN}$  (2050 lbf)
  - b) Next to outermost stanchions:  $Z 0 11 \text{ kN}$  (2500 lbf)

In case of densely compacted sands and gravels and stiff to semi-solid soils the anchors stated in plan A1-10-E-1. "Rear Wall" are sufficient.

6. The M 24 bolts (grade 10.9) and M 30 (grade 10.9) at the flange connections of the booms must be pretensioned with a torque of 796 nM (587 ft lb) resp. 1842 Nm (1360 ft lb) in accordance with plan no. 1-10.00 every time the ride is erected.
7. The M 16 bolts (grade 10.9) of the tower bearing (see plan no. 1-10.13) must be pretensioned with a torque of 84 Nm (62 ft lb). The bolts must be slightly oiled.
8. The connecting surfaces of flange connections must be coated with a rub-resistant surface coating. These surfaces must not be oiled or greased. Damaged rub-resistant coating must be repaired (see instructions).
9. The ride must be erected in such a way that in every position of the trajectory of the gondola a sufficient distance (at least 0,5 m = 20 in) is maintained from houses, trees, electrical cables etc. so that the passengers are not endangered.



10. The operator's stand is to be located so that the operator can easily supervise the 0° position of the ship as well as the embarkation and debarkation of passengers and the closing and opening of the locking bars and the sliding railings.
11. For each erection, the frame of the vehicle transporting the ship and the base frame must be brought onto the same position toward each other by means of the templates (L 50 x 6 with hinges). There must be a sufficient safety distance between platform and ship. The connections of both frames with tie rods must be installed.
12. All connections must be secured against unintentional loosening. Railings must be secured against coming loose from their supports.
13. The gondola may not be loaded with more than 40 persons (calculated load = 75 kg / 165 lb per person). The gondola must be loaded as symmetrically as possible on either side of the center axis.
14. It is prohibited to lean out of the gondola to stretch out arms and legs, to smoke and to enter the gondola with animals, umbrellas, sticks or other bulky or pointed objects.
15. Drunken persons and children under 8 years of age and of a height of less than 137 cm (4,5 ft) are excluded from the ride.
16. Notices announcing the prohibitions and regulations 14 and 15 above must be prominently displayed.
17. It is prohibited to sit or stand on railings as well as to stamp or to sway rhythmically on the platform; if necessary, the music must be stopped and the motor switched off.
18. The operator must not switch on the drive power until
  - a) all passengers are properly seated in the seats,
  - b) all locking bars have been locked hydraulically,
  - c) all sliding railings have been closed and locked,
  - d) the public have left the entrance and exit platforms.
19. The locking bars and the sliding railings may only be opened after the gondola has reached a position sufficiently near to the 0° position. The exit height of the seating rows must not considerably exceed 40 cm.
20. The supervising personnel has to make sure that passengers stop on the embarkation platform only after the gondola has come to its standstill.
21. The gondola must not be stopped at its 180° position.
22. The preset electronic power regulator and the limitation of the speed of rotation to max. 11 rpm must not be changed.



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The following values may serve as guidelines:

a) when the gondola is empty, the minimum duration of one full circle should not be less than approx. 5,6 sec.

b) when all seats in the gondola are occupied, a pressure of approx. 280 bar (4060 psi) should not be exceeded when starting from the 90° position.

23. The following preset values of the overpressure valves must be left unchanged:

a) high-pressure valve 340 bar (4930 psi)

b) braking valve 150 bar (2175 psi)

c) hydraulics of the locking bars 35 bar ( 508 psi)

24. The following applies to the control of proper functioning of the ball bearing slewing rim:

For program "creeping" with an empty gondola, the pressure shall not exceed approx. 100 bar (1450 psi) when the gondola is in a 90° position (hydraulic oil at operating temperature).

25. In order to retrieve the gondola from the 180° position in the event of a catastrophe, a chain tackle or similar with suitable attachment facilities must be kept instantly available (required tensile force 15 kN = 22 lb/in<sup>2</sup>). This tackle must be attached to the Ø 76,1 mm rod at the head of the counterweight boom using a self-releasing clip.

26. Prior to starting daily operation, the ride must be checked for safe functioning. Special attention should be paid to the position of the ship towards entrance and exit platforms and a possible dropping of the supports in level.

27. During operation the ride should be subject to constant supervision, with special regard for the supports and support blocks.

28. Any faults which arise must be immediately corrected. If necessary, operation must be stopped. Repairs which could endanger passengers or operating personnel are not permitted during operation.

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RESPONSIBILITY OF MANAGERS AND OPERATORS

The following remarks should serve as a guide only and do not lay claim to completeness:

1. In all cases the manager is ultimately responsible for the safety of passengers and economic operation of the ride.
2. Selection of operators must correspond to the demands made on them regarding operation of the equipment.
3. The operator must devote his undivided attention to the operation of the ride.
4. He must be acquainted with the functioning of the equipment, its safety devices, emergency devices, operating instructions and regulations, and ensure the safety of passengers and safe running of the ride.
5. He must have complete and safe control over the unloaded equipment before he operates it with passengers.
6. If a malfunctioning occurs operation must cease immediately.
7. Malfunctioning may often be detected by a change in noise during operation. If this occurs, one should look for the cause and, if necessary, get in touch with the manufacturer.
8. The operator must insist on maintenance work being carried out. If he does not, he is obliged to cease operation.
9. Before initiation the operator has to check the ride on its perfect working condition by performing the ordered controls and the trial run.
10. The carrying parts as well as the motor driven parts are to be checked on perfect working condition before each initiation. Damaged parts are to be substituted by perfect ones. Furthermore it has to be observed that the ride is in safe upright position during erection and dismantling. After erection all parts have to be orderly connected and all connecting parts and necessary anchorages have to be mounted in a safe way.

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OPERATING INSTRUCTIONS  
FOR  
"RANGER" AMUSEMENT RIDE

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I. ERECTION

1. Drive frame with tower 1 to intended location.
2. Unfold rear stabilizer 2, attach brace 3 and fix bolts with safety pins.

Note:

Also fix all other bolts on the ride with safety pins, even if there is no special instruction to this effect.

3. Detach both tension rods 4 from the front frame stabilizer 5, see drawing no. 1-10.23.
4. Using the 3 hydraulic cylinders in the frame, 2 at the rear 6 and 1 at the front 7, raise the vehicle until the front running gear just touches the ground (control for the 3 cylinders is situated at the erection unit 8).

Caution!

The rear cylinders 6 should be driven out so that the rear axle gear rises off the ground when the frame is levelled out.

5. Using braces 9 unscrew lock nuts 10 on the front right stabilizer and detach both bolts 11 from the front stabilizer/running gear assembly, see drawing no. 1-10.23.
6. Drive the running gear away from the ride.
7. For erection the frame 1 should be supported at the rear stabilizer 2 by means of the 2 rear spacer blocks 12 and at the front underneath hinge pins of the front frame stabilizer (Point 13).

Point 13 must be the highest point on the site. The frame 1 is positioned correctly when the rail section on the frame 14 is exactly horizontal.

To ensure larger surface pressure the area underneath the stabilizers should be filled up with sand and levelled off.

8. Run in the 3 hydraulic cylinders in the frame 6 and 7.
9. Fold front stabilizer 5 to the side through 90°.
10. Drive mushroom heads 17 on the stopper blocks right in. These measures should be taken on dismantling and should not be attempted in transit. If it is not possible to push the mushroom heads in, the bypass cock should be opened and closed again afterwards 15 .
11. Using hoisting tackle, first haul the gondola boom arm 18 away from the frame 1. The boom arm must be twisted into the same angular position as the counter-flange on the rotary body 19.

The gondola boom arm is situated on the left-hand side of the frame when looking in the direction of motion. It should be fastened to the left-hand rotary body flange, also when looking in the direction of motion.

The flanges on top of one another are marked with the numbers 1/1. The area in which the numbers are to be found is marked with paint. If only 1 boom arm is fastened to the rotary body, this arm should be supported at the end and prevented from dropping, for instance, by means of a wood block.

12. Before threading the gondola boom arm into the pilots on the rotary body flange, care should be taken to ensure that the friction coating is clean, free of grease and in good condition.

Note:

If there is no longer any friction coating at the three boom arm flange points it should be properly renewed.

13. Screw on the gondola boom arm using 18 screws M 30 10.9 20. Surface-hardened washers 21 ( $\emptyset$  58 x  $\emptyset$  31 x 15) should be used. Only the head and nut contact surfaces of the screws should be lubricated lightly, without allowing grease to reach the flange surface. Fix the screws with safety pin 22.

Tightening torque 1842 Nm.

Make electrical connections.

14. Using hoisting tackle, haul counterweight boom arm 23 away from the frame 1. The boom arm must be twisted into the same angular position as the counter-flange on the rotary body 19. Looking in the direction of motion, the counterweight boom arm is situated on the right-hand side of the frame; it must be fixed to the right-hand rotary body flange.

The flanges on top of one another are marked with the numbers 2/2. The area in which the numbers are to be found is marked with paint.

15. Threading, screwing and fixing are the same as for the gondola boom arm (step 13).
16. Attach mast 24 using 4 M 16 screws 25 and fix using safety pins 26.

Tightening torque 210 Nm.

17. Attach the large ellipses 27 to the gondola boom arm 18 and make electrical connections.
18. Attach the small ellipses 28 to the counterweight boom arm 23 and make electrical connections.
19. Remove boom arm transportation fixing device on the frame.

20. At the erection unit 8, run out the erection cylinder 29 some way so that the tower support bolts at the top of the tower (Point 30) may be detached. Fold support into the frame.
21. Run the tower up so that the lower part of the lettering platform mounting 31 is approx. 1 - 1.5 m above the ground.
22. Attach lettering platform 32, then fix covering ellipse 33 and make electrical connections.
23. Run up tower 34 until it is inclined at 60°. The erection cylinder 29 will then be approximately in the 92° position (duration of erection approx. 12 min.).
24. Several persons should now hold the pendulum support 36 using rope 35. One assistant should guide the support 36 at the side so that it does not hit the erection cylinder 29 when coming down. Detach bolts 37 at point 38 and carefully let the support down to the bottom bearing point 39. The pendulum support is then anchored at 39 using bolt  $\emptyset$  100 (37). Secure using hooked bolt 40 and safety pin 41.
25. Relieve erection cylinder 29: switch off pump 8 and move control lever briefly.
26. The ventilator 42 on the hydraulic tank 43 will normally remain open. Only during rail transport when the front axle unit is dismantled should the ventilation cock be closed. Make sure it is reopened afterwards!
27. Switch on hydraulic system and check to ensure that the mushroom heads 17 have come out; if not, pull out the mushroom heads 17 as far as possible.

28. At crawling speed turn rotary body 19 through 90° so that the counterweight boom arm 23 is situated at the bottom.
29. Switch off hydraulic system.
30. Drive mushroom heads 17 on the stopper blocks right in.
31. Carefully thread in the rear counterweight 44. The ring bolt should be pointing in the direction of the rotary body 19. Prior to assembly only fitting surface 45 should be greased lightly. The surface with the friction coating 46 must be and remain absolutely free of grease.  
  
From the inside insert 2 screws M30-10.9 (47) with surface-hardened washers  $\text{\O ext 58} \times \text{\O int 31} \times 15$  (48) - fit nut from the outside. Here as well the head and nut contact surfaces should be lubricated lightly. Secure with safety pin 49.  
  
Tightening torque 1842 Nm.
32. Switch on hydraulic system and check to see whether the mushroom heads 17 have come out; if not, pull the mushroom heads 17 right out.
33. At crawling speed turn rotary body 19 through 180° using one counterweight 44 until the gondola boom arm 18 points downwards.
34. Switch off hydraulic system.
35. Drive mushroom heads 17 on the stopper blocks right in.
36. Drive ship transporter 50 as near as possible (hand-width) to the frame 1. The side lamps on the gondola 51 must be

pointing to the front. The plastic shell of the ship has a vertical seam at the centre.

The centre of the ship is opposite the centre of the frame, i.e., in the correct position, when this seam is located in the middle of the rails on the frame.

The two sets of wheels 52 at the centre of the transporter 50 must be on a level with the rails on the frame 14. Using the 4 lift cylinders 53 raise the transporter until the sets of wheels 52 come to rest above the rails 14. The base of the lift cylinders 53 must be supported by spacer blocks beforehand.

37. The chassis of the ship transporter 50 on the side of the frame 1 should be set down onto the device 55 at the centre (Point 54), see drawing no. 1-10.24.H00.
38. The 2 lift cylinders 53 on the side of the frame 1 must be run in.
39. The front stabilizers 5 should be folded underneath the wheelsets 52. In order to compensate inaccuracies when lining up, the wheelsets 52 may be shifted to either side by approx. 100 mm.
40. Run out the lift cylinders 53 which were run in according to step 38 and at point 54 remove the device 55 erected according to step 37.
41. Using the 4 lift cylinders 53, let the ship transporter 50 down until the wheelsets 52 reach the rails on the front stabilizer 56.
42. Roll ship transporter 50 along the rails 14 and 56 until it is situated underneath the gondola boom arm 18.
43. Screw off bearing covers 57.  
Jack up the lift cylinders 53 by approx. 0.5 m and run the ship transporter 50 with gondola 51 underneath the gondola boom arm 18.

The flanges on top of one another are marked with the numbers 3/3. The area in which the numbers are to be found is marked with paint.

44. Prior to fitting the gondola 51 to the gondola boom arm 18, the flange surfaces should be checked to make sure that the friction coating is clean, free of grease and in good condition.
45. Screw on the gondola using 12 screws M 24-10.9 (58). Surface-hardened washers  $\text{\O ext 58} \times \text{\O int 25} \times 8$  (59) should be used.
46. Only the head and nut contact surfaces on the screws should be lubricated lightly without allowing oil to reach the flange surface. Secure screws with safety pin 60.  
  
Tightening torque: 796 Nm.  
  
Make electrical connections.
47. Let down ship transporter 50 using the 4 lift cylinders 53.
48. Pull retaining tubes 61 out of the gondola.
49. Switch on the hydraulic system and check to see whether the mushroom heads 17 have come out; if not, pull the mushroom heads 17 right out.
50. At crawling speed turn the rotary body 19 through  $180^\circ$  so that the counterweight boom arm 23 with the rear counterweight 44 at the bottom comes to rest above the frame.
51. Switch off hydraulic system.
52. Drive mushroom heads 17 on the stopper blocks right in.

- 10 -
53. Attach front counterweight 62 exactly as for the rear one (Section 31).
  54. Mount and fix covering star 63. Make electrical connections.
  55. Switch on the hydraulic system and check that the mushroom heads 17 have come out; if not, pull the mushroom heads 17 right out.
  56. At crawling speed turn the rotary body through  $180^\circ$  until the gondola is at the bottom.
  57. Carry out the final lining-up operation using the 3 hydraulic cylinders 6 and 7 in the frame 1. The rails 14 on the frame must be absolutely horizontal, the boom arm absolutely vertical.
  58. The spacer blocks at axle 13, at the front stabilizer 5 and on the frame 1 point 13 must be removed.
  59. Run up ship transporter using the 4 lift cylinders 53. The correct height may be attained using the foldable spacers on the frame 70.  
Fine adjustment when lining-up the ship transporter parallel and at the correct angle to the frame should be carried out using the threaded spindles 73 and 76. The threaded spindle 76 consists of 4 (see section 3) and the extension 77.
  60. As shown in drawing 1-10.00, fix the transporter using the 4 supporting stands and relieve the four hydraulic cylinders 53. The area underneath the spacer blocks should be levelled out with sand beforehand.
  61. Fold both front stabilizers 5 out at right angles to the frame 1, attach struts 65, fit with bolts and secure.

62. Push front supporting stands 66 underneath the relevant point on the stabilizer 5.  
To ensure larger surface pressure the area should be filled up with sand and levelled off.

63. Floor

64. If applicable, fold up centre scenery struts 68 and bolt them in position. Height adjustment should be carried out when the platform, scenery struts and braces have been erected and lined up.

65. As shown in the drawing, place spacer blocks under the floor trusses and chassis, bolt them in position and secure.  
Swing ship transporter draw-bar 69 to the side through 90° beforehand.

66. Fit and secure floor covering, steps and hand rails.

67. Scenery

68. Mount scenery struts and braces according to drawing and bolt in position. Make sure that scenery strut 68 is at the correct level.

69. Drive tension rod according to drawing 1-10. E 1.

70. Attach front sheets and finally fit illuminated border.

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III. Starting and Shutdown

A) The daily starting procedure is as follows:

1. Check the oil level, i.e. the oil level indicator on the oil tank must be filled with oil up to the centre.
2. Switch on the master switch for the electrical system and press the electrical control and cooler buttons on the right-hand side of the switchboard.
3. Switch on the hydraulic system at the control panel and prior to starting any manoeuvres let the pumps run with no load for a reasonable length of time:  
At normal outdoor temperatures: approx. 10 min.  
" low " : approx. 1 hour
4. Carry out at least 3 complete rides with the ship empty and using all the various control possibilities. During these rides the spacer blocks should also be checked.
5. When the trial-run has been properly carried out, the ride may commence operation.
6. The cooler is activated by operating the pushbutton switch on the switchboard.  
Depending on the oil temperature, the cooler is then switched on or off by means of a thermostatic switch in the oil circulation system:  
Switch off: below approx. 50° C  
Switch on: above approx. 50° C  
Signal: above approx. 90° C

For shutdown the master switch should be turned off.

WARNING:

When making electrical connections make sure that the phase sequence is correct and that the electric motors rotate in the correct direction! Watch signal lamps!

During operation no persons should be allowed to stand directly next to the ship on the podium.

When the passengers are embarking, the operator should ensure that they are all sitting up properly in the centre of the seats before the safety bars are let down. When these have been let down, one should also check that all the passengers are properly pressed in their seats. If necessary, press the safety bar switch button "Close" again. Care should be taken to ensure that the passengers do not push the safety bars away from themselves during closing thus removing the intended pressure.

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IV. Exceptional Operating Conditions

A) Power failure

If there is a power failure, the ship will swing and finally come to rest at the bottom.

B) Safety bars in the ship will not open

Use the hand pump on the hydraulic unit to raise the safety bars. Insert plug-in hand jack through slit in plastic covering.

C) Hydraulic hose for the safety bars leaks

In the foot area unscrew the short-circuit screws on the safety bar hydraulic cylinders and open safety bars manually.

D) Ship remains in the 180° position

In this case the flagpole will be at the bottom within easy reach.

If the ship is already slightly inclined to one side, several persons should pull or push the flagpole until the ship moves.

If the persons are not capable of moving the ship, attach the chain hoist supplied to the flagpole, thus obtaining the necessary force.

**Warning!**

As soon as the ship is set in motion, the area underneath the ship transporter should be cleared immediately in order to prevent accidents caused by the ship swinging down!

Prohibited

V. Maintenance and Lubrication

A) Ropes and hoisting tackle

The hoisting tackle for transporting the boom arms should be checked prior to use. If necessary, faulty ropes should be replaced by new ones of the same quality and absolutely identical length because the boom arms must be in a particular position during transport and flanging.

Grease ropes at reasonable intervals.

Check nylon cord  $\emptyset$  10 prior to letting down the pendulum support and replace if necessary. Minimum tensile force 2600 N.

B) 90 kW electric motor

If the motor is subjected to dust, it should be blown free at reasonable intervals using dry air in order to remove accumulated dust from the inside and from the vents. The 2 lubricating nipples should always be kept clean. Regreasing should be carried out every 2000 operating hours using ESSO multi-purpose grease "BEACON 2".

C) Reducing gear (4sets)

For the reducing gear ESSO gear lubricant oil GP 90 HYPOID (SAE 90 EP) should be used. Refilling requires approx. 6 l. The first oil change should be carried out after approx. 50 operating hours, then every 1500 operating hours. The filling and outlet screws are marked accordingly.

D) Toothed ring

The tothing of the ring should be lubricated with MOLYKOTE 165 BR toothed-gear grease approx. every day or as soon as bare patches can be observed on the tooth profiles.

The ball-bearing track of the toothed ring should be lubricated with ESSO "BEACON 2" multi-purpose grease every day, or at least after every 30 hours of operation. For this there are 6 grease nipples provided. Turn bearings when lubricating.

The fastening screws M 20 on the toothed ring must be checked at reasonable intervals to ensure that they are firmly in place. For this the torque spanner supplied should be used. The individual screws should first of all be undone and then tightened again at 580 Nm.

The toothed ring should be replaced at least every 5000 operating hours.

If a new toothed ring is being fitted, the screw contact surfaces on the structure must be coated with Loctite no. 0586 (type AVX) (Loctite 275).

E) Bearing Points

The 90 kW motor has 2 greasing points. These bearing points should be regreased at reasonable intervals using ESSO multi-purpose "BEACON 2".

Prior to each erection or lowering of the tower, grease tower bearing at grease nipples using ESSO multi-purpose "BEACON 2".

The bottom bolt 37 should be slightly greased before it is inserted into the pendulum support.

F) Flange Points

The screws at all flange points must be checked at reasonable intervals to ensure that they are securely in place. For this the torque spanner should be used. The individual screws should first of all be undone and then tightened again.

For tightening torque see H 2.

Not to be used  
Prohibited

G) Hydraulic System

The chief requirement for smooth operation is a clean hydraulic system.

Dirt which has entered the hydraulic system brings about a relatively rapid drop in performance of the pumps and the life of all the components is reduced. Dirt can also cause the control processes to be blocked.

One should always ensure that there is sufficient oil (up to centre of the oil level indicator). After relatively long shutdown periods (2 months max.) or after an oil change any air-locks in the system must be removed. For this there are various vents fitted.

G1) Axial Piston - Variable Displacement Pump

Renew paper filter each year. When changing oil clean the magnetic screw at the lowest point on the pump housing as well as the gauze on the distributor block.

G2) Axial Piston Motor (4)

No special maintenance necessary.

G3) Oil Tank 43

There are approx. 200 litres of hydraulic oil ESSO NUTO H 68 (SAE 20) in the entire hydraulic system. The condition of the oil should first be checked after 50 operating hours. Filter the oil and change it if necessary. Further oil changes should be carried out every 1500 operating hours.

New oil should always be filled at the oil tank through a clean filter using a filter size of at least  $\mu = 40$ .

The magnetic needle 71 should be checked at reasonable intervals. During the initial operating period it should be cleaned at least once a week.

G 4) High-Pressure Filter 72

If the red button on the differential indicator trips (approx. 4 mm) during normal operation and will not remain in the original position when pushed in, the filter element must be changed.

When the system is cold the differential indicator may respond but when the operating temperature rises the indicator will switch back again.

G 5) Hose Pipes

All the hose pipes are marked with item numbers which should always be quoted when ordering replacements.

According to the recommendations of the manufacturer the hoses should be renewed every 5000 operating hours.

When changing or reconnecting a pressure hose always ensure that it is in the correct position (bending only on one plane) !

G 6) Erection Cylinder

The erection cylinder is fitted with a pipe-break safety device which cuts off the cylinder if the feed hose bursts. After erection the cylinder should be fitted with a protective bellwto prevent the piston rod from being damaged. The extended piston rod should always be well lubricated.

G 7) Hydraulics for Handrail Locking

The hydraulic unit 74 with oil tank is mounted on the ship. There are approx. 90 l of hydraulic oil ESSO NUTO H 68 (SAE 20) in the entire system.

Filling the Oil Tank:

Open filler cap. Using a clean container, fill up with hydraulic oil ESSO NUTO H 68 (SAE 20) until the oil tank is full to the brim. Switch on the motor and operate the magnetic valve manually to bring up the locking device.

Remove air from the cylinders. Push on the valve repeatedly until the air is out of the pipe. Now insert test keys into the grooves on the compensating pots. In this position fill the tank up to the brim again. Close filler cap.

Then remove the test keys and insert in their mountings. When operating the cylinders via the magneting valve, the tappets on the compensating pots are moved. Even when drawn in, the tappet heads should still have a clearance of approx. 10 mm. If they come into contact during operation, the filling procedure should be repeated.

G 8) Hydraulics for Assembly

The hydraulic unit 8 with oil tank is fitted to the frame 1. There are approx. 140 l of hydraulic oil ESSO NUTO H 68 (SAE 20) in the entire system.

G 9) Hydraulics for Ship Transporter

The hydraulic unit 75 with oil tank is fitted at the end of the transporter. There are approx. 90 l of hydraulic oil ESSO NUTO H 68 (SAE 20) in the entire system.

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H 2) Tightening Torque for Screw Connections  
Which have to Transfer Loads:

Boom arm/hub:	M 30;	Ma = 1842	Nm
		= 185	mkg
Boat/boom arm:	M 24;	Ma = 796	Nm
		= 80	mkg
Counterweight/boom arm:	M 30;	Ma = 1842	Nm
		= 185	mkg
Flagmast/boom arm:	M 16;	Ma = 210	Nm
		= 21	mkg
Toothed ring	M 20;	Ma = 400	Nm
		= 40	mkg

The threads should be oiled lightly and not greased, because with grease the tightening torque values cannot be maintained.

The contact surfaces of flange connections should be provided with a friction coating.

Under no circumstances may these surfaces be oiled or greased.

Damaged non-slide coating must be touched up (see treatment specification).

All the screw connections should be checked at reasonable intervals to ensure that they are secure.

For this the torque spanners supplied should be used.

Checking tightening torque:

1. Undo screws
2. Retighten screws.

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H 3 Weights and Loads

For assembly the following individual weights have to be moved:

Gondola boom arm	2300 kg
Counterweight boom arm	2600 kg
Counterweight per disk	2200 kg
Weight of the ship	5100 kg

Ground loads for touring rides: see drawing 4 - 20119  
park rides: see special foundation plan

H 4 Driving the equipment prior to installation of the ship, i.e. during assembly or dismantling:

Operate maintenance switch on the right-hand side of the switch cabinet. Press "Crawl" button on transportable control panel.

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H 5) Treatment Specification for Adhesive Coating between  
Flange Connections

Manufacturer: Dr. Schumacher & Co.  
DESCO Lacquer Chemistry  
Kronbachstr. 100  
4600 Dortmund

Type of paint:  
"DESCOSIL"

When using zinc silicate the surface must be dry, dust-free and sandblasted in accordance with RoSt 2.213.

For at least half an hour the paint applied must be protected from spray water and dripping water.

When sandblasting one should ensure that the entire cross-section is covered uniformly in layers so that when any remaining parts are being reblasted coating which has already been applied will not be blasted again.

It is advisable to apply the coating as soon as possible after the sandblasting, 2 to 4 hours later but certainly on the same day before a film of rust is allowed to form.

Mixing the zinc powder into the medium should be done as evenly as possible, finishing off using a mixer, so that the paint is free of lumps.

The paint must be deep and should be applied using new brushes; for large areas it is advisable to use new lamb's wool rollers for application. The required layer thickness of approx. 80  $\mu$  is attained when there are deep, filled, continuous brush lines or when there is a coarse orange peel effect. Dripping time will be 3 hours at the most. The paint is still workable after this time but it will no longer bind because of chemical reactions. For this reason, tools should also be thoroughly washed in water

and shaken out after 3 hours. Initial brush strokes should, if possible, be applied whilst wet because dry overlaps and increased layer thicknesses lead to flaking. For this reason, touching up should also be carried out as soon and as localized as possible (if possible using a relatively small radiator paint brush filled with only a small amount of paint).

The paint can best be applied at a surface temperature of between +5° and 25° C. having prepared the surface properly beforehand. At higher surface temperatures where the drying process would be accelerated too much, the paint should be diluted with a small amount of pure water (approx. 0.3-0.7% depending on temperature). So for a mix of 5 kg this would be 15-35 ccm. (1-2 brandy glasses). If the paint is not diluted accurately enough, sometimes only 5-10% of the required layer thickness is obtained.

If paint is applied to warm surfaces undiluted, the layers become too thick and flake off.

It is advisable to determine the necessary degree of dilution by carrying out tests beforehand. The dry layer thickness can be measured after approx. 20 minutes.

Owing to the alkalinity of the silicate, any splashes on the eyes should be washed out immediately using plenty of water. Splashes on the skin should also be washed off immediately using water. To protect the skin, normal work clothing will suffice but it is recommended that gloves be worn while working. When applying paint above one's head, we recommend that safety goggles be worn.

## INSTRUCTIONS

for

### "RANGER SOMERSAULT"

#### A) Erection of the equipment

The equipment is not designed for operation under the weight of snow. If it is used during the snowy season, any snow which has fallen should be cleared continually.

2. The equipment should be fitted with spacer blocks at the supporting points according to details in Plan No. 1-10 D "Podium with spacer blocks". The sizes of blocks stated are for a permissible foundation pressure of  $p \geq 15 \text{ N/cm}^2$ .
3. Anchor the scenery struts for the tensile forces stated in Plan No. 1-10 D "Podium with spacer blocks". For tightly packed sand and gravel and on hard to semi-solid cohesive soils the anchor dimensions stated in Plan No. 1-10 D will be sufficient. Anchor the respective braces of the same size (see Plan No. 1-10 E.1 "Scenery").
4. For every erection the screws M 24 quality 10.9 and M 30 quality 10.9 at the joints of the brackets should be prestressed according to details in Plan No. 1-10.00 with a torque of 796 Nm and 1842 Nm respectively.
5. The screws M 16 quality 8.8 at the tower bearing (see Plan No. 1-10.13) should be prestressed with a torque of 84 Nm. For this the screws must be lightly lubricated.
6. At every place of erection the operators should be given special instructions on:
  - operating regulations,
  - action in case of power failure, fire, panic or other disturbances,
  - operation of the safety lights or auxiliary lights,
  - the location of the nearest fire alarm or the nearest telephone from which the fire brigade may be called.

The unabridged operating regulations must be available to the operators at any time.

7. With respect to the stability of the equipment and easy access the site should be levelled out as much as is necessary.
8. The bearing members as well as the mechanical parts should be checked prior to erection to ensure that they are in perfect condition. Damaged parts should be replaced by flawless ones without delay. Furthermore, care should be taken to ensure that the equipment is also stable during erection and dismantling. When erection has been completed, all the parts must be properly connected and fastenings and any anchorage must be fixed firmly in place.

The manager of the ride or his agent should instruct the employees concerned about handling the individual parts with care during erection, dismantling, loading, unloading and carrying passengers, supervise them while the work is being carried out and, if necessary, give them directions.

9. The spacers (blocks) between the ground and the floor structure should be kept low and be placed in such a way that they are immovable and offer a firm base. Spacers made out of beer barrels, piles of beams or the like should, if necessary, be secured by ground anchors or braces; precautionary measures should be considered to prevent water or floods from washing them away.

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## B) Operation of the Equipment

1. The operational safety of carrousel, show and amusement stands must be checked daily before starting operation. The main connections, moving and mechanical components must also be observed during operation; any faults which arise must be immediately corrected. If necessary, operation must be stopped. Repairs which could endanger passengers or operating personnel are not permissible during operation.
2. The equipment must be erected so that a sufficient distance is maintained away from houses, trees, electrical cables etc. (min. 0.5 m) in all positions of the swing so that passengers are not endangered.
3. The control stand should be installed so that the vertical position of the ship, embarkation and disembarkation of the passengers as well as opening and closing of the safety bars and sliding gratings may easily be observed.
4. Every time the equipment is erected the vehicle frame for conveying the ship as well as the base frame should be brought together in the same position with the aid of the welded rulers. In this way sufficient safety clearance should be guaranteed between ship and podium. The pieces provided for joining the two frames (rectangular pipe 60 x 40 mm) should be fitted.
5. All connections must be secured against accidental opening. Hand rails should be prevented from coming loose.
6. The swing is designed for a maximum load of 40 passengers (calculated at 75 kg per person). As far as possible the ship should be loaded symmetrically with respect to the center axis.
7. Leaning out of the ship, smoking and taking animals, umbrellas, sticks or other unwieldy or sharp objects onto the ship is prohibited.
8. Children under 8 years of age are not allowed to use the ride. Drunken persons must not be allowed onto the ride.
9. The conditions as under 7 and 8 must be clearly displayed on notice boards.
10. It is prohibited to sit or stand on hand rails as well as to sway or stamp rhythmically on podiums; if necessary, the music should be stopped and the motor switched off.

- 11. The operator may switch on the drive mechanism only when
  - a) all the passengers are seated,
  - b) all the safety bars have closed hydraulically,
  - c) the sliding gratings have closed and locked and
  - d) the embarkation and disembarkation podiums are cleared of passengers.
- 12. The safety bars and sliding gratings may be opened only when the ship has been brought into the 0° position with a sufficient degree of accuracy. In no row of seats should the disembarkation level be much in excess of 40 cm.
- 13. The supervisory personnel should take care to ensure that passengers walk onto the embarkation podium only when the ship has come to a standstill.
- 14. The ship must not be stopped in the 180° position.
- 15. The set electronic output regulator as well as the device limiting speed to a maximum of 11 r.p.m. should not be adjusted.

The following values may serve as a guide:

- a) When the ship is empty, the minimum time for one revolution should not be under approx. 5.6 s.
  - b) When the ship is full and starting up in the 90° position, pressure should not be in excess of approx. 290 bars.
16. The following set values for the overpressure valves should be maintained:
- |   |          |
|---|----------|
| a) High-pressure valve  | 340 bars |
| b) Brake valve<br>(when the ride is empty, a maximum of 170 bars were measured) | 210 bars |
| c) Safety bar hydraulic system  | 35 bars  |

- 17. To check the perfect functioning of the ball bearing slewing rim observe the following:  
When the ship is empty and switched to "crawl", pressure in the 90° position should not exceed approx. 90 bars (hydraulic oil sufficiently warm for operation).

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18. Every day before operation commences, each part of the equipment should be checked to ensure that everything is in good working order. In particular the location of the ship with regard to the embarkation and disembarkation podiums should be examined and one should check to see whether the supporting stands or individual blocks have dropped in level.
19. During operation the equipment should be subject to constant supervision, with particular regard for the supporting stands and blocks; any faults should be eliminated without delay.
20. The manager (licensee) or one of his deputies who has sufficient expertise must organize supervision during operation and ensure that regulations are complied with:
21. Employees should be provided with the following:

- Seats, also for standing employees during breaks,
- weatherproof clothing in the case of places of work which are not under cover,
- places to hang clothes where they will be protected from dust, damp and theft.

In addition, employees must also have facilities (protected from bad weather) to change clothes, wash, warm themselves and take their meals.

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