



MFG: LARSON INTERNATIONAL
INC.
NAME: HI ROLLER
TYPE: NON-KIDDIE

P.O. Box 638, Plainview, TX 79073-0638

Phone 806-293-1353 Fax 806-293-5215

FAX TRANSMITTAL

DATE: 2-3-95 TOTAL # OF PAGES 1

TO: W. G. WADE SHOWS
ATTN: RICHARD ARMSTRONG
REGARDING HI-ROLLER # 6

FROM: JEFF NOVOTNY
LARSON INTERNATIONAL, INC.

MESSAGE: THE PURPOSE OF THE LIMIT SWITCH
UNDER THE OPERATOR HOUSE SAFETY BAR
IS TO SHUT DOWN THE HYDRAULIC TRACK
DRIVE. THE LIMIT SWITCH WILL NOT STOP
THE TRAIN ONLY THE TRACK ROTATION.

THE HI-ROLLER MAY OPERATE WITHOUT
USING THE PHOTOELECTRIC SENSORS ACROSS
THE WALKWAYS, IF THE ENTRANCE AND
EXIT ARE EACH CONTROLLED BY CARNIVAL
EMPLOYEES. THESE TWO AREAS MUST HAVE
PERSONEL 100% OF THE TIME FOR THE SAFETY
OF ALL. IF THERE ARE ANY QUESTIONS PLEASE
CALL AND WE CAN DISCUSS THEM FURTHER.

THANKS,
Beth



267

P.O. Box 638, Plainview, TX 79073-0638

Phone 806-293-1353 Fax 806-293-5216

DATE: MARCH 24, 1994

RECEIVED

MAR 24 1994

BUREAU OF
FAIR RIDES INSPECTION FAX: 904-488-9023

TO: STATE OF FLORIDA
DEPARTMENT OF AGRICULTURE
DIVISION STANDARDS/FAIR RIDE INSPECTIONS

ATTN: MR. RON SAFFORD
MR. LOWEL PARRISH

FROM: JEFF NOVOTNY
LARSON INTERNATIONAL
P.O. BOX 638
PLAINVIEW, TEXAS 79073

PHONE 806-293-1353
FAX 806-293-5215

THE HI-ROLLER AMUSEMENT RIDE MUST BE EQUIPPED WITH THE OPERATOR CONVEX MIRROR. ALL HI-ROLLER RIDES HAVE BEEN EQUIPPED WITH THIS MIRROR FOR THE SAFETY OF THE CUSTOMERS AND WITHOUT THIS MIRROR THE OPERATOR CANNOT PROPERLY SEE THE BACK OF THE RIDE. THE MIRROR MUST BE IN PLACE BEFORE THE RIDE IS ALLOWED TO OPERATE.


JEFF NOVOTNY, PRODUCTION ENGINEER
LARSON INTERNATIONAL, INC.

SAFETY FEATURES

Many safety features are incorporated on the Hi-Roller. These include

1. Operator safety gate must be closed and operator must be seated in operator seat, otherwise ride cannot be started. The ride will stop automatically should the operator leave the seat or open the safety gate.
2. An alarm will sound and ride will stop should anyone pass through photo sensing beam across outer section of loading/unloading platforms.
3. A safety net has been provided, inside of the perimeter fence, a means to prevent persons from entering the path of the rotating ring.
4. A large mirror has been installed so operator can look along back side of ride.
5. Operator has a switch to sound bell to alert personnel of intentions to start ride.
6. Passenger compartments have dual latch bars and overlapping linkage with a click pin for compound safety. Each compartment has cushions to prevent abrasions, and a restraint system for rider safety at all times.
7. Safety links are provided between the cars and power units as a back-up safety system.
8. The electrical system has 5 wires with a common and earth ground. All circuits are protected by circuit breakers sized for load conditions. There are two main disconnect panels with overload and ground fault breakers. One controls lights, second controls ride operation. Operator controls are located within normal reach. System requires a key to be inserted and turned to allow initial start up.
9. The hydraulic system consists of two systems. The 7-1/2 hp gear pump is used for erection and dismantling only. The 40 hp Sundstrand variable displacement pump provides power for forward and reverse rotation of the track. Two 10 hp motors provide power for train forward and reverse rotation.

Every effort has been made to conform to the safety codes of many states and the standards of many professional societies, such as AWS, ANSI, NEC, etc.

Field modification or lack of maintenance may alter the above conditions.

The Hi-Roller Company

INTRODUCTION

This Hi-Roller Manual has been prepared for the owner and operator of the Hi-Roller Amusement Ride. This ride has been designed and manufactured with safety as a major goal, however, accidents cannot be prevented unless the operator understands and practices all safety precautions. The Hi-Roller Company advises all operators to read this book and take special note of the many cautions listed in this manual.

Procedures for erection, dismantling, transport and operation are given, and information for inspection and maintenance is included.

The reference portion of this manual is provided for guidance of those who wish to install, repair, maintain, or test the Hi-Roller equipment covered herein. This information has been prepared with the basic viewpoint to give complete and concise data needed to perform minor adjustments as well as major overhauls.

This information is not elementary, as it is intended for operators and servicemen who are familiar with rotating machinery in general. It is not intended that it be possible in such limited space to cover every possible condition which may be encountered. Always use good, sound mechanical practices and safety precautions.

All specifications are in accordance with Engineering designs and should be adhered to in all repairs. Operation and maintenance information on equipment other than that of the Hi-Roller Company is taken in part from the various manufacturers' manuals. If the equipment manufacturers issue later instructions, or in the event of conflict, the manufacturer's information will take precedence over that given in this manual, unless specifically stated otherwise.

Specifications and components covered in this manual are for standard equipment current at the time this manual was approved for printing.

The Hi-Roller Company reserves the right to discontinue models at any time, or change specifications or designs of any model without notice and without incurring any obligation.

THIS IS TO CERTIFY

Hi-Roller Serial No.:

Sold To:

Date:

WHEREAS the assembly hereinafter known as the Hi-Roller, manufactured by the Hi-Roller Company of Plainview, Texas, has been manufactured in accordance with known standards as recommended by ASTM, ASM, ASME, AWS, ANSI, ISO, NFPA, NPS, and other national and state standards in effect at the time of manufacture.

Testing after manufacture includes non-destructive magnetic particle and ultrasonic tests conducted by an independent inspection company. Upon final approval, a certificate of conformance is issued for each serial number.

Load testing conforms to the standard of 170 pounds per passenger, during prolonged operation cycles.

Field modifications or changes of maintenance may alter the above conditions.

THE HI-ROLLER COMPANY

PREOPENING INSPECTION PROCEDURES

The following items are recommended to be inspected prior to approving the Hi-Roller ride for operation:

1. All outriggers and braces should be in position and properly secured. Refer to the diagram in the operator's manual.
2. Footings. Determine that all load points are acceptable as shown in the load diagram in the operator's manual.
3. Check to see that all hinge bolts are properly tightened, and all erection cylinders are stored out of the way of operation.
4. Ride should be level and plumb. It should be as near to plumb as can be determined by visual inspection.
5. All pins shall have safety devices such as snap pins or hair pins.
6. Check condition of all bolts and nuts at the track bearings.

GENERAL MACHINE STRUCTURE

1. Inspect the area of the track hinge for visible cracks.
2. Inspect the area where the pedestals are welded to the

trailer.

TRAIN INSPECTION

1. Check for worn wheels. Replace if diameter is less than 4 1/2 inches.
2. Check for worn pins or bushings in the train couplings. Replace if total movement in the coupling is more than 1/16 inch.
3. Check safety bolts in the coupling area.

PASSENGER COMPARTMENTS

1. The seats should be firmly bolted in place.
2. The head rest should be secure and have adequate cushion to prevent head injury.
3. The bolster pads should have adequate foam rubber to hold the passenger firmly in their seats.
4. Torn bolster covers are permissible if the foam rubber is still in place.
5. The door latch should latch at two places, the safety latch tie both doors together, and the safety pin should be in place.
6. Check condition of the door catches which hold the door open.

If you as an inspector have any questions concerning the ride, its operation, or possible problem areas, such as weld cracks, please call us at the factory. (806) 293-1353.

The Hi-Roller Company
P. O. Box 1968
Plainview, Texas 79072

ERECTION PROCEDURES

1. Locate the trailer on a firm level site.

Caution: Footings must be suitable for about 5000 lbs. per square foot at all landing gears and outrigger pads.

2. Place matting boards under the landing gear and lower the landing gear.
3. Remove the tractor and visually level the ride using the landing gear.
4. Extend the outriggers. Place matting boards under the shoes and lower the outrigger shoes until the outriggers have a firm footing.

DO NOT TRY TO LIFT THE RIDE WITH THE OUTRIGGERS.

5. Remove all the fencing, loading ramp and stairs, the bally cloth, and the erection poles and sheaves. Lower the loading steps.
6. Raise the sign frame. Lock in place using the turnbuckle and pin on each end of the ride. As the sign frame is being raised, be sure the sign wiring and hydraulic hoses are free to move up with the sign.
7. Assemble the track erection gin poles. The short poles are used on the entry side of the ride. Extend the cables to their full length and pin the cable ends to the clevis provided on the track. Note: it may be necessary to raise the end of the short gin pole to attach the cable to the

track. Attach the tag line on the short track to the clevis attached to the long track.

8. Take up the slack on the short track erection line and remove the transport columns located at each end on the short track section.
9. Continue to raise the short track section until the tag line to the long section becomes taut. Unfasten the long track transport lock located at each end of the long track.
10. Lower the short section until the tag line becomes loose. Remove the tag line.
11. Raise the short section until the track is almost horizontal, then raise the long section.

CAUTION: DO NOT TRY TO RAISE THE LONG SECTION FIRST AS THE SHORT SECTION WILL BE LOWERED ONTO THE TRAILER, POSSIBLY DAMAGING THE PASSENGER LOADING STEPS.

As the tracks are meeting, the dowells will align the tracks. Continue raising the long section until the flanges have met. Install the track bolts. Tighten the nuts and cotter pin.

12. Before lowering the erection poles, be sure the sign face has been erected, otherwise the fan of cards may be damaged when the track moves to the vertical position.
13. Raise the track transport stops. This will stop the

short track section so that the erection cable can be removed. Attach the tag line to the short section, raise the short section, and unlock the transport stops. Lower the short section until the track is vertical. Reset track stops.

14. Remove the erection cables and tag line, and store. The long section cable is removed by climbing the track. At this time, install the sign braces, raise the fan of cards and install braces.
15. Raise the loading steps and lower or release the track transport stops. Assemble the entry and exit ramps and stairs, and install the handrail.
16. Fold out the scenery panels and install the braces. Attach the bally cloths and set up the perimeter fence. Store as required all erection equipment.

Erection is complete.

DISMANTLING PROCEDURES

1. Remove bally cloths and fold. Remove handrail, stairs, and entry ramps. place out of the way.
2. Assemble erection gin poles, short poles on entry side. Extend erection cables to their full length.
3. Using the transport locks, lock the track in the vertical position with the train in the short section. Climb to the top of the track, remove sign supports, and attach the erection cable to

the long section.

4. Attach the tag line to the short section and the short section erection cable. Unlock the track and pull the short section to one side until the locks can be reset to hold the track in this off vertical position. Disconnect the tag line from the track and attach the main short section erection line. Pull the track to the horizontal position using the short track erection line.
5. Put a strain on the long section line. Remove the flange bolts and lower the long section.
6. Lower the short section until the tag line can be attached to the long section. Attach the tag line to the long section and raise the short section pulling the long section to a point where the transport stops can be set. Lock the long section in place. Remove the tag line.
7. Lower the short section until it rests on the transport columns. Bolt the columns in place.
8. Remove the erection lines. Raise the loading steps, dismantle the erection gin poles and store.
10. Lower the sign frame and the sign. Load the bally cloths, handrails, perimeter fence and stairs. Raise the shoes on the outriggers and stow the outrigger.
11. Attach the tractor, raise the landing gear, and bind everything in preparation for transport. Check air lines and lights.

TRAIN POWER UNITS

The passenger train is powered by five power units, one in each passenger car. Each power unit has a 5 horsepower electric motor powering a 18 X 8.50-8 tire which runs on a traction plate, which is an integral part of the track. Power from each motor is transmitted to its wheel by a double reduction cog or timing belt drive. This reduction is designed to give a maximum train speed of 4 1/4 MPH or about 16 seconds for one complete trip around the track.

Each motor/wheel unit is mounted on a frame, which can be adjusted to give the desired load on the traction wheels. The traction plate is designed to keep this load constant as the train moves around the track. This load can be adjusted by loosening the bolts holding the frame and adjusting the jack screw to give the desired load. Retighten the frame bolts when the desired load is obtained.

Power for the motors is provided through a set of pick-up arms attached to a set of wheels located at each end of the train. These pick-up arms each have a sliding contact (shoe) which rides in a busway mounted in the track section. Electric power supplied to the motors is 230/208 volts, 3 phase, 60 cycle. Three additional pick-ups are provided, one equipment ground, one neutral, and one phase to be used with the neutral to give 120 volts for a lighting circuit.

One motor in each end power unit is equipped with a spring ap-

plied, magnetic released brake. When motor power is applied, brake is released, and when power is removed, brake is set. These brakes are used to insure that the train remains motionless during passenger loading. To move the train when power is not available, the belt on the motor with the brake must be removed or the tire load must be removed so that the tire will slip on the traction plate.

TRAIN

The train consists of five (5) passenger cars. Each car can seat four (4) people, two (2) in each seat. Seats are placed back to back. The passengers are retained in their seats by the car itself and a lap bolster. When the passengers are seated, the door is closed slam latch is used as the primary door latch. As the door is closed, the bolsters are brought down and pressed against the passenger(s), pushing the passenger back and down against the seat. A secondary latch attaches both doors together and pinned in place.

Each passenger car shares its main and guide wheels with its neighbor. The cars are joined together with a ball joint type of coupling allowing for some misalignment of the track as well as providing the pivot for the train when engaging the curved portion of the track. A bolted hinge joint is placed on each side of the ball joint. This hinge joint has oversized holes to provide for misalignment and acts as a safety link should the ball joint fail.

MAINTENANCE**POWER UNIT**

The power unit is reached by removing the seats in the passenger car. The seats are removed by removing the capscrews at the top and bottom of the seat. The seat must be out of the way to service the unit.

All anti-friction bearings within the motor unit are prelubricated and sealed, therefore, no lubrication of these bearings is required.

Check belts and belt tension periodically. Replace belts if frayed or worn.

Maintain tire pressure at 35 psi. Higher pressure may be required if the tire is slipping on the rim. Tire replacement is accomplished by loosening the load frame nuts, removing the load from the wheel. Remove the four lug bolts and remove the tire and wheel.

Check power collector arms for wear and spring tension. Check collector shoes for wear. Replace shoe if shoe holder is within 1/8 inch of busway. Examine electric wires for wear, cuts, abrasion, or shorts. Replace as necessary.

Couplings and wheels are covered in the train section of this manual.

TRAIN

Check the door linkage for wear. Replace if wear is such that the door does not fit properly or has too much play.

Check the main and secondary door latch for proper operation. If the latch does not operate properly or a spring is broken, repair as necessary.

Check the bolster covers for tears and cleanliness. Worn covers may be used, but torn covers which allow the foam rubber discs to come out are not permissible.

Check the couplings for wear. Replace the bushings if wear is greater than 1/16 inch.

The wheels are equipped with sealed ball bearings, which are lubricated for life. If the wheel bearings are bad or if the wheel is chipped, broken or urethane tread is bad, replace the wheel.

NOTE: It is recommended that no attempt be made to replace the bearings in a used wheel as improper assembly will result in damaged bearings.

The wheel assembly is mounted to the train with a pin/bushing arrangement which can be greased. Use a lithium base (multi-purpose) grease about once a month or more often if the bushing becomes noisy. Overgreasing does nothing but get your ride dirty.

WARNING: Train and track must be locked in such a manner that they cannot be set in motion while performing the following maintenance.

To replace a wheel or wheel assembly, pull the coupling pins and separate the cars. Pull the wheel assembly pivot pin and remove the wheel assembly. A

small jack or wedge may help to lift the car to remove this assembly. To remove the main wheels, remove the cotter pin and nut. Drive out the bolt. Two spacers, one on each side of the bearing assembly, maintain the wheel spacing. These must be used when installing a new wheel assembly. To remove a guide wheel, drive out the roll pin, then drive out the axle. Note: the threaded roller axle has a threaded hole to aid removal.

Replace the wheel and reverse the above process. Lightly oil the main wheel axle bolt and torque to 80 lb-ft. Insert cotter pin. Always line up roll pin holes before installing roll pin in the guide wheel.

START-UP PROCEDURE

The following start-up procedure should always be followed when starting up a new unit or when restarting an installation in which either the pump or motor had been removed from the system.

WARNING: The following procedure requires that the drive chain be removed from the track drive or the track be completely free to rotate without endangering people or property.

Prior to installing the pump and/or motor; inspect the unit(s) for damage incurred during shipping and handling. Make certain that all system components (reservoir, hoses, valves fittings, etc.) are clean prior to filling with fluid.

Fill the reservoir with the recommended hydraulic fluid which should be passed through a 10 micron filter (no bypass) prior to entering the reservoir. The use of contaminated fluid will cause damage to the components, which may result in unexpected track movement.

The inlet line leading from the reservoir to the pump must be filled prior to start up. Check the inlet line for properly tightened fittings and make sure it is free of restrictions and air leaks.

Be certain to fill the pump and/or motor housing with clean hydraulic fluid before start up. Fill the housing by pouring filtered oil into the upper drain port.

Install a 0 to 500 psi (35 BAR) pressure gauge in the charge pressure gauge port to monitor the charge pressure during start-up.

It is recommended that the connections for EDC (Electric Displacement Control) be disconnected at the pump

control until after initial start-up. This will allow the pump to remain in its neutral position.

WARNING: Do not start the electric motor unless the pump is in neutral position (0 swashplate angle). Take precautions to either prevent track movement or insure that track is free to rotate.

"Jog" the electric motor checking the rotation of the pump. Rotation should be clockwise when viewing the pump from its input shaft end. "Jog" the pump until the charge pressure starts to rise. Start the electric motor. Excess air may be bled from the high pressure lines through the high pressure gauge ports.

Once charge pressure has been established, pressure should read 320 psi (23 BAR) minimum. If charge pressure is incorrect, shut down and determine cause for improper pressure.

WARNING: Inadequate charge pressure will affect the operator's ability to control the ride.

Shut down the electric motor and connect the EDC. Start the electric motor, checking to be certain pump remains in neutral. With the motor running, slowly check for forward and reverse machine operation.

Charge pressure should remain at 320-340 psi (23-24 BAR) minimum during the forward and reverse operation. Continue to cycle slowly between forward and reverse for at least five (5) minutes.

Turn motor off, remove gauges, and plug ports. Check reservoir level and add fluid if necessary.

Transmission is now ready to operate.

MAIN HYDRAULIC SYSTEM

The Sundstrand pump will occasionally require servicing and the pump has been designed with this in mind. Many repairs or adjustments can be accomplished without the necessity of removing the pump from the ride provided the pump is accessible and can be thoroughly cleaned before beginning any procedures. Since dirt or contamination is the greatest enemy of any type of hydraulics, the greatest possible cleanliness is necessary.

The Sundstrand pump and the Charlynn motor are combined in the system providing an infinitely variable speed range between zero and maximum in both forward and reverse modes of operation. This system also provides dynamic braking, an inherent feature of this design.

The pump is a compact, high power density unit, using the parallel axial piston/slipper design in conjunction with a tiltable cradle swashplate to vary the pump's displacement. Reversing the direction of the tilt of the swashplate reverses the flow of oil from the pump and thus reverses the direction of rotation of the motor output.

The variable displacement pump is controlled by a compact, responsive hydro-mechanical, closed loop control system which is controlled by an electric input signal.

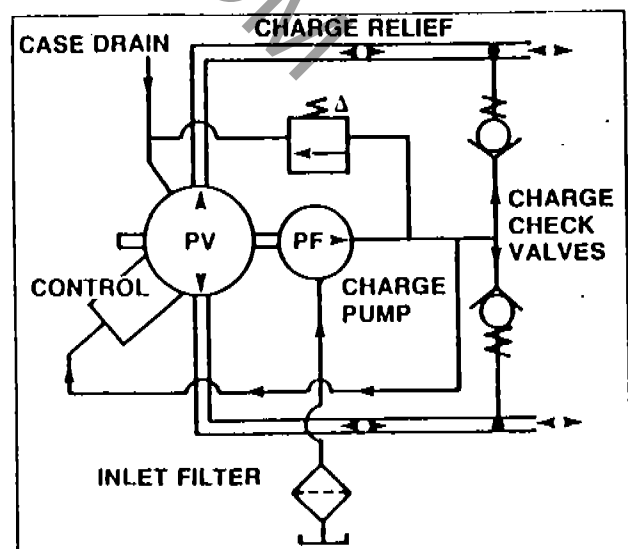
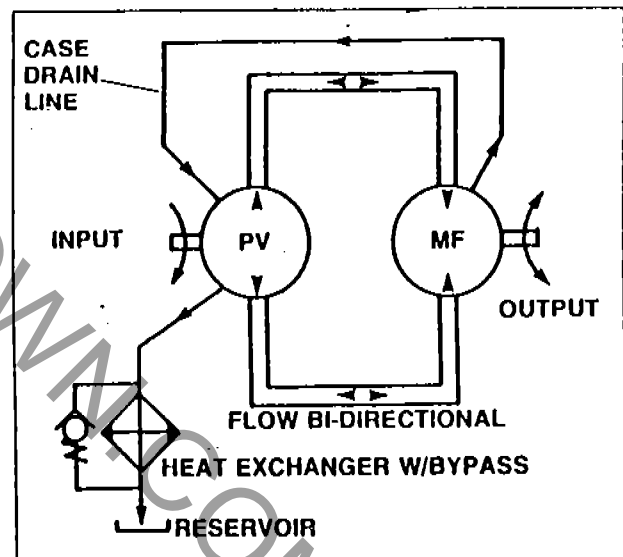
Two (2) unique multifunction valves are designed in the pump to provide the check valve, pressure limiter, high pressure relief valve, and bypass functions.

The pump includes the charge pump and associated valving to provide the necessary flow for makeup oil, to operate the control system and provide cooling for the system. It also has an auxiliary mounting pad

on which an auxiliary hydraulic pump is mounted, which is used for operating the passenger loading platform.

BASIC CLOSED CIRCUIT

The main ports of the pump are connected by hydraulic lines to the main ports of the motor. Fluid flows, in either direction, from the pump to the motor then back to the pump in this closed circuit. Either of the hydraulic lines can be under high pressure. The position of the pump swashplate determines which line is high pressure as well as the direction of fluid flow.



MAINTENANCE

To insure optimum service life on the hydraulic power unit, regular maintenance of the fluid and filters must be performed.

Check the reservoir daily for proper fluid level, the presence of water (noted by a cloudy to milky appearance, or free water at the bottom of the reservoir), and rancid fluid odor (indicating excessive heat).

It is recommended that the filters be changed every 500 hours and the fluid changed every 2000 hours. It may be necessary to change the fluid more frequently if the fluid becomes contaminated with foreign matter (dirt, water, grease, etc.) or if the fluid has been subjected to temperature levels greater than the maximum recommended. Never reuse fluid.

The filter should be changed whenever the fluid is changed or whenever the filter indicator shows that it is necessary to change the filter.

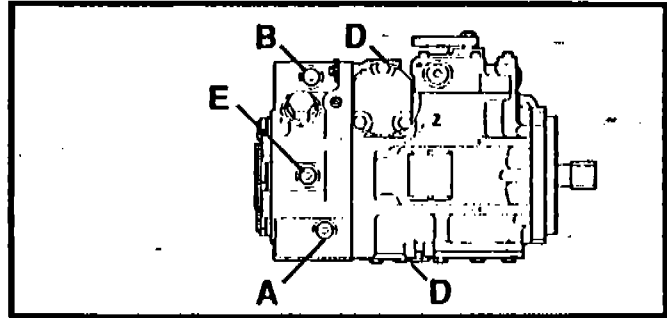
GAUGE INSTALLATION

Various pressure and vacuum gauge readings can be a great asset in troubleshooting problems in this system.

It will be necessary to install a high pressure gauge into the system pressure gauge ports to check the high pressure setting of the multi-function valves.

Measuring the charge pump inlet vacuum will help locate restrictions in the inlet lines, filter, etc.

Case pressure readings can help locate restrictions in the return lines, the oil cooler, and the return filter.



Gauge Information		
A	System Pressure Port "A"	10,000 PSI (690 BAR) - Gauge 9/16 - 18 O-Ring Fitting
B	System Pressure Port "B"	10,000 PSI (690 BAR) - Gauge 9/16 - 18 O-Ring Fitting
C	Charge Pressure	500 PSI (35 BAR) - Gauge 9/16 - 18 O-Ring Fitting or Tee into Charge Pressure Filter Outlet Line
D	Case Pressure	500 PSI (35 BAR) - Gauge 1-1/16 - 12 O-Ring Fitting
E	Charge Pump Inlet Vacuum	Vacuum Gauge 9/16 - 18 O-Ring Fitting or Tee into Charge Pump Inlet Line

ELECTRIC DISPLACEMENT CONTROL (EDC)

The electric displacement control inputs a 12 volt DC signal to a pressure control pilot (PCP) valve. The PCP valve converts the electric input signal to a hydraulic signal to operate a spring centered 4-way servo valve which ports hydraulic pressure to either side of a double acting piston. The servo piston rotates the cradle swashplate through an angular rotation of +/- 17 degrees, thus varying the pump's displacement from full displacement in one direction to full displacement in the opposite direction.

AUXILIARY MOUNTING PAD

The auxiliary mounting pad is used for mounting a gear pump which supplies the hydraulic power for operating the passenger loading platform.

CASE DRAIN AND HEAT EXCHANGER

The pump and motor require case drain lines to remove hot fluid from the system or to prevent excess pressure on the motor shaft seal. The motor should be drained from its topmost drain port to insure the case remains full of fluid. The motor case drain is connected to the lower drain port on the pump housing and out the topmost port.

A heat exchanger (radiator) is provided to cool the case drain fluid before it returns to the reservoir.

Caution: Continuous case pressure should not exceed 40 psi (3 BAR).

CHARGE SYSTEM and INLET FILTER

A fixed displacement (gerotor type) charge pump is installed in the variable displacement pump and driven off the main pump shaft. The charge pump supplies cool fluid to the system, keeps the system charged and supplies fluid to operate the control system. Charge pressure, with the pump in neutral (0 flow), is limited by a relief valve, which is normally factory set at 330-370 psi (23-26 BAR) above case pressure at 1800 RPM.

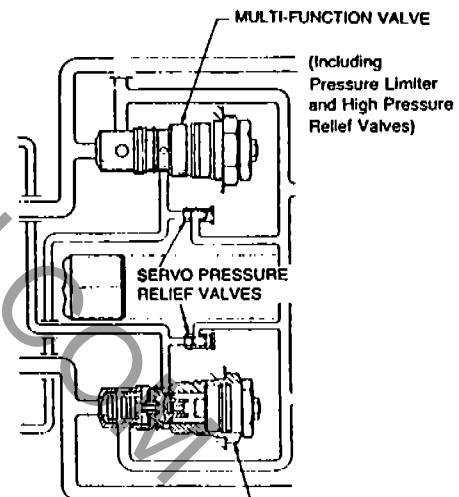
Since either of the main hydraulic lines can be high pressure, two (2) charge check valves are used to direct the charge supply into the low pressure lines. The check valves are contained in the multi-function valves located in the pump end cap.

The charge pump draws the fluid from the reservoir. An inlet filter is provided to insure that only clean fluid enters the system.

Caution: The inlet vacuum, measured at the charge pump inlet should not exceed 10 inches (254 mm) Hg except during cold starts.

PRESSURE LIMITER AND HIGH PRESSURE RELIEF VALVE

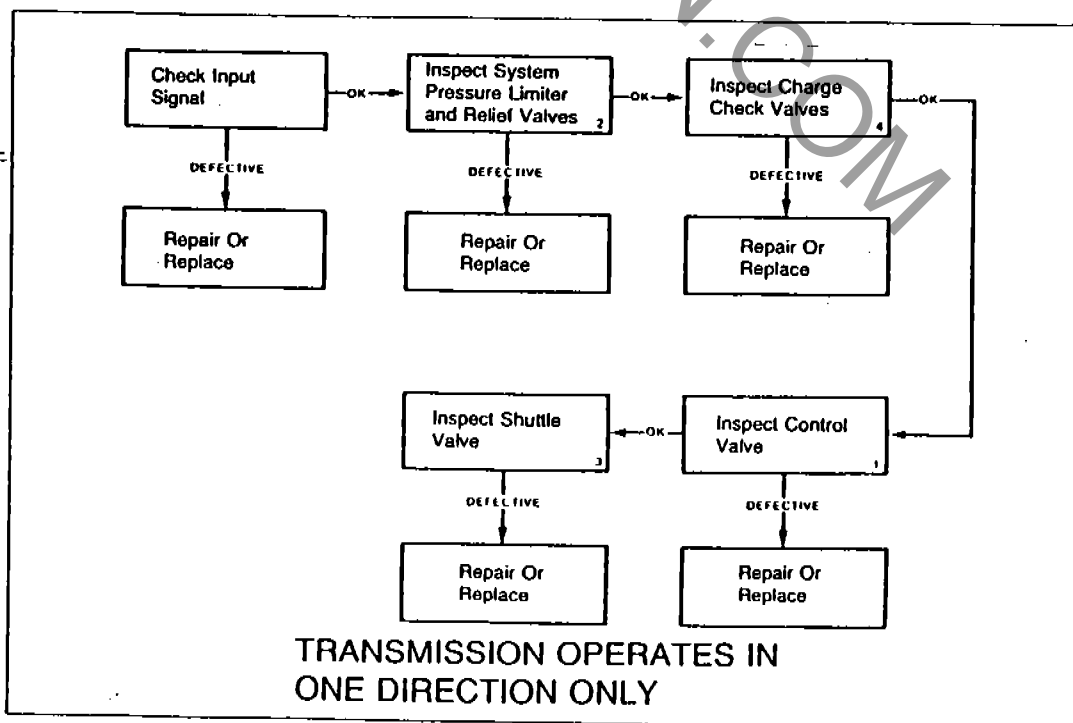
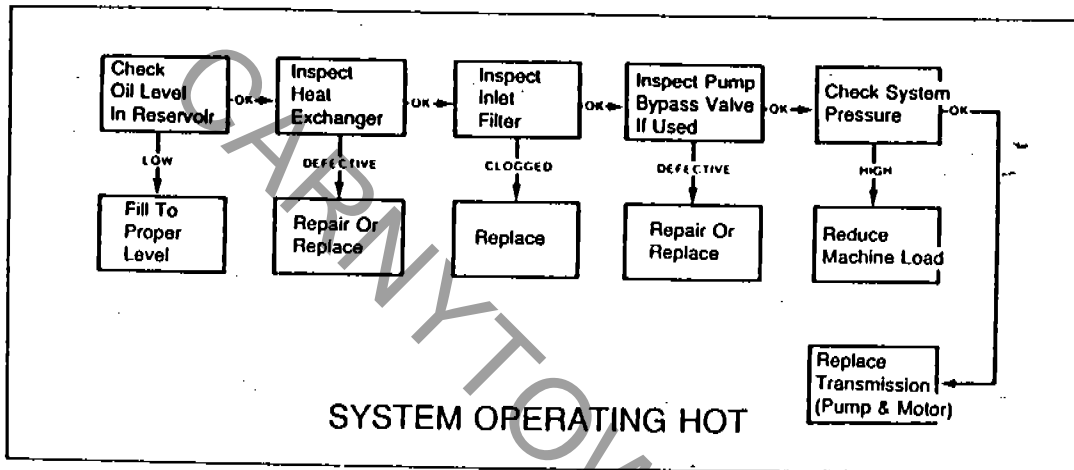
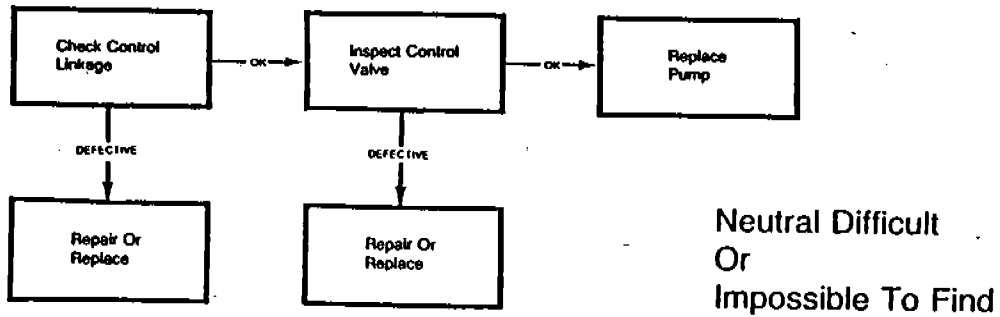
The Sundstrand pump is designed with a pressure limiter system and sequenced system relief valves. When the preset pressure is reached in the main loop, the pump will destroke to limit the the system pressure. For unusually rapid load applications, the relief valve is available to also limit pressure. The pressure limiter sensing poppets also act as pilot valves for the relief valve spools, such that the relief valves are sequenced to operate at pressures above the pressure limiter destroke pressure level. Both the pressure limiter sensing valves and relief valves are built into the multi-function valves in the pump end cap.

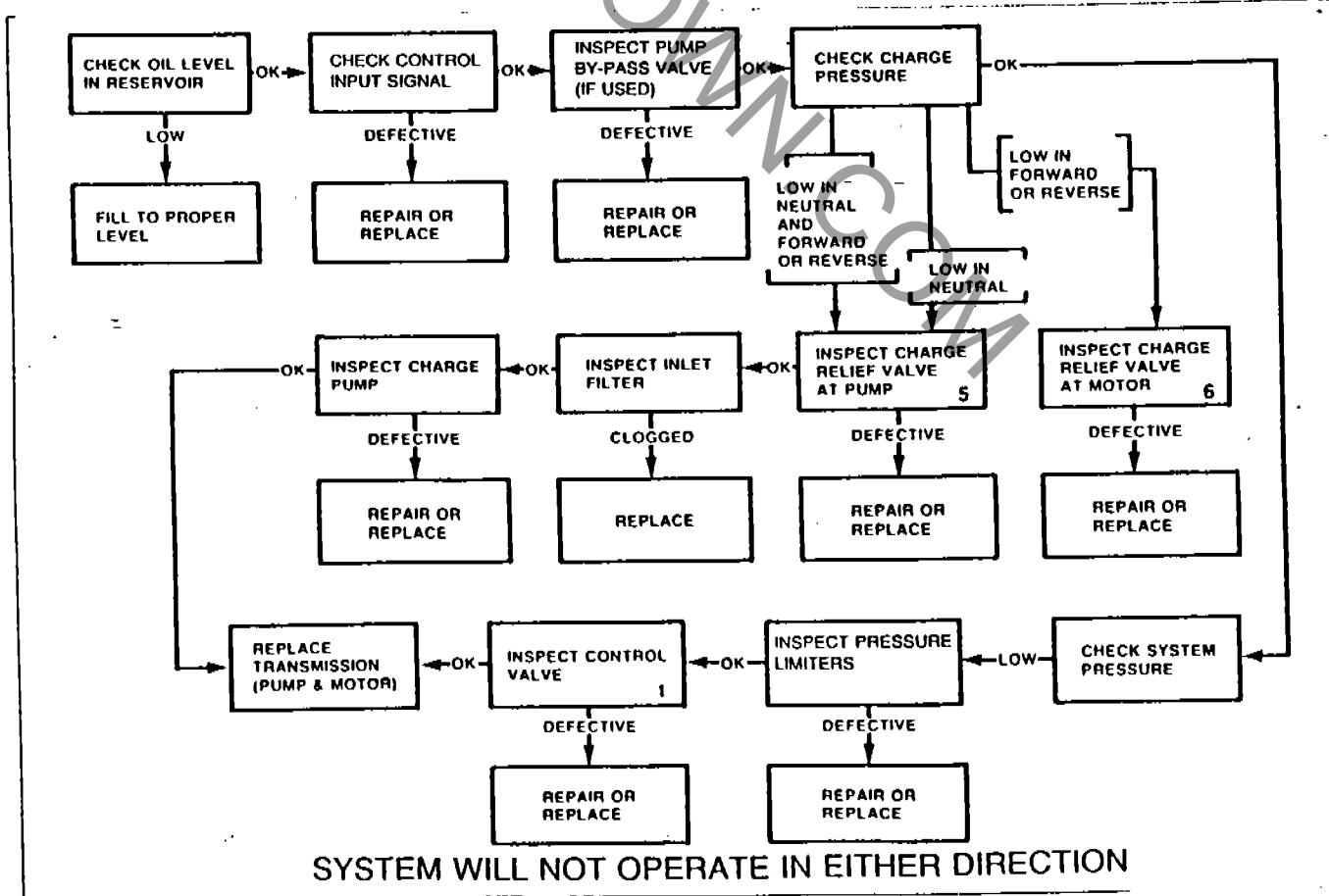
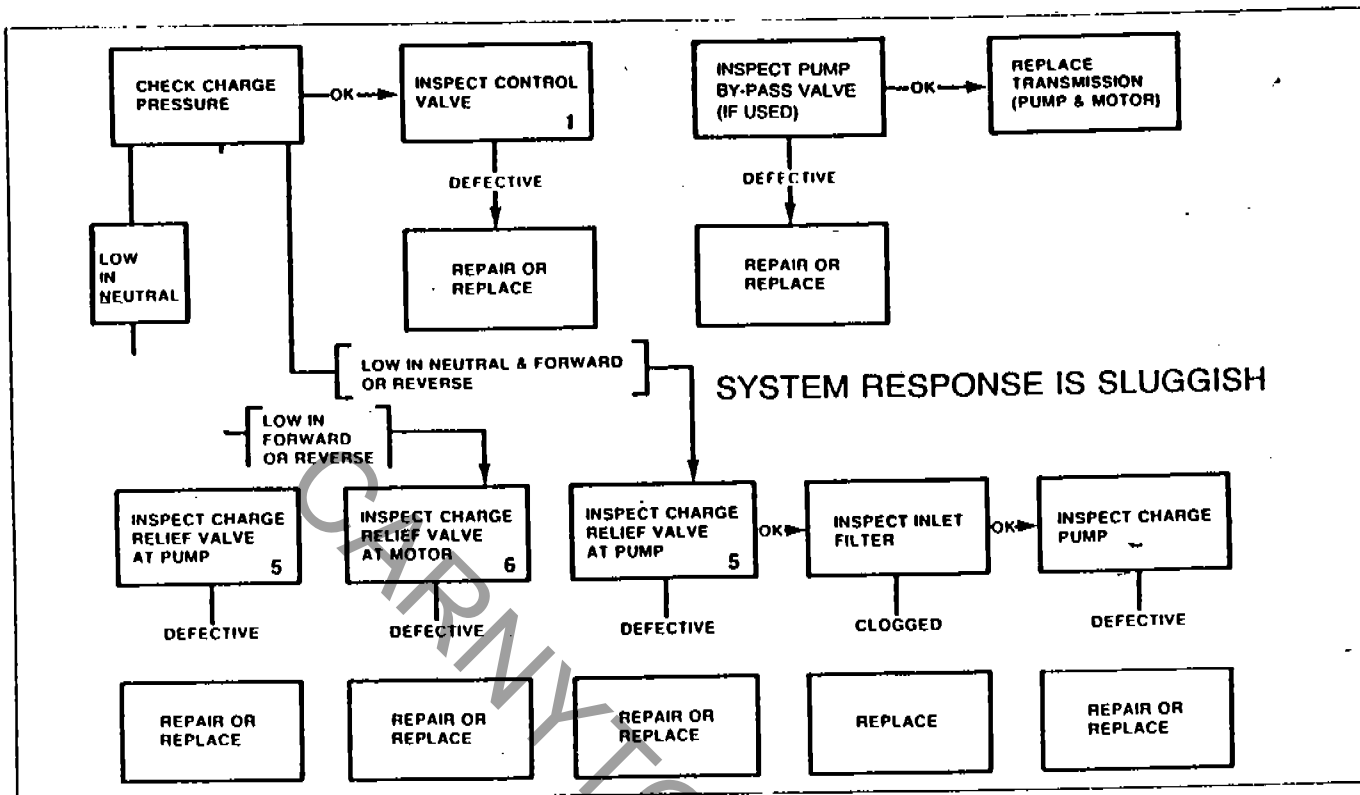


FLUIDS

Hydraulic fluids used in this system should be carefully selected with assistance from a reputable supplier, following the guidelines presented in the Sundstrand Sauer "Fluid Quality Requirements" bulletin, BLN-9887.

Fault Logic Diagrams







LIMITED WARRANTY

The Hi-Roller Company warrants to owners of new products manufactured by The Hi-Roller Company that The Hi-Roller Company will make any repairs on any part of the equipment, except trailer wheels and tires, made necessary because of defects in material or workmanship for a period of 120 days from the first day the new product is in service for pay. Warranty repairs will be performed without charge to the owner by The Hi-Roller Company at The Hi-Roller Company factory at Plainview, Texas, within a reasonable time after delivery of the new product to The Hi-Roller Company factory.

All parts to be considered for warranty must be returned to the factory at Plainview, Texas, freight prepaid. The warranty department of The Hi-Roller Company will inspect and evaluate said parts, and it shall be at the option of The Hi-Roller Company to repair, replace or credit owner's account should the matter be covered by the warranty.

NOT COVERED BY THIS WARRANTY are repairs or replacement of parts required because of misuse, negligence, alteration, accident, or a lack of normal maintenance. **ALSO NOT COVERED BY THIS WARRANTY** are the repair or replacement of items such as filters, brake lining pads, wheels, tires or other similar items required in normal maintenance.

NOT COVERED BY THIS WARRANTY are loss of time, inconvenience, loss of the use of the product or other matters not specifically included herein.

The Hi-Roller Company does not authorize any person to create for it any other obligation or liability in connection with this product.

THIS WARRANTY IS GIVEN EXPRESSLY AND IN PLACE OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE AND THIS WARRANTY IS THE ONLY WARRANTY OF ANY KIND MADE BY THE HI-ROLLER COMPANY. THE HI-ROLLER COMPANY SHALL NOT BE LIABLE FOR CONSEQUENTIAL COMMERCIAL DAMAGES RESULTING FROM BREACH OF WARRANTY.

WARRANTY OF ALL PARTS OF THE PRODUCT NOT MANUFACTURED BY THE HI-ROLLER COMPANY SHALL BE COVERED ONLY BY THE WARRANTY, WHETHER EXPRESS OR IMPLIED, OF THE MANUFACTURER OF SAID PARTS AND ARE NOT COVERED BY THIS HI-ROLLER COMPANY WARRANTY.

ALL SALES OF PRODUCTS BY THE HI-ROLLER COMPANY ARE MADE AT THE FACTORY IN PLAINVIEW, TEXAS, AND ALL CONTRACTS RELATING THERETO, AND THIS WARRANTY, SHALL BE DETERMINED AND CONSTRUED UNDER THE LAWS OF THE STATE OF TEXAS.

HRC89

Manufacturers of
The Hi-Roller • Super Loops • Whirlwind • Paratower

THE HI-ROLLER CO.

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