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**Product Information**

This Service and Operating Manual applies to the following Bushman AvonTec machinery:

<b>Product Type:</b>	<b>Pallet Inverter</b>
<b>Model Number:</b>	<b>PI-3000</b>
<b>Rated Load Capacity:</b>	<b>3000 lbs</b>
<b>Serial #:</b>	<b>24611</b>
<b>Registered User:</b>	<b>New York Dock and Door</b>
<b>Date Shipped:</b>	<b>November 21, 2002</b>

For warranty information, service, and replacement parts information, please call your local dealer or Bushman AvonTec at (800) 558-7850. Please have the above information available when calling.

This manual should be kept with the machine at all times. In the event the machine is re-sold, or transferred to another facility, please contact the factory so that we can update our service and warranty records.

## **Introduction**

Congratulations on your purchase of a Bushman AvonTec Pallet Inverter. When correctly installed, operated, and maintained the pallet inverter is a most reliable and efficient means of turning large and heavy loads.

The Bushman AvonTec pallet inverter is designed and built to provide many years of efficient service. Like any piece of industrial equipment, there are some important safety rules to follow when installing and operating this equipment.

This manual provides instructions for correctly installing, using and maintaining this equipment. Due to the customized nature of the equipment, some information may not apply to your Inverter. If you are not the first owner of this equipment, you should consult the factory before operating to ensure that its specifications are appropriate for your application. Additionally, some service and safety information relating to specialized components such as hydraulics, gear motors, electrical components, etc. may be contained in the instruction documents provided by their manufacturers. Refer to these documents before servicing or working with these components.

## Safety Instructions

### Safety Instructions for Load Inverters:

1. Do not operate this equipment unless you have been trained and authorized to do so.
2. Before using inverter, inspect it for proper operation and condition.
3. Before using inverter, inspect all safety devices (such as limit switches) to be certain they are in place and functioning properly.
4. Do not exceed the inverter's capacity as stated on the serial number plate.
5. Center loads on the load/unload platforms. Make sure that the load to be inverted is appropriately sized and shaped. The top of the load should be parallel to the base.
6. Keep the entire load within the perimeter of the platform while the inverter is in motion.
7. Ensure that people and objects are clear of the areas beneath the platform and immediately surrounding the perimeter of the inverter while it is in motion.
8. **DANGER!** Do not work under inverter without the maintenance device(s) in position or the machine safely blocked and secure. See the maintenance section of this manual to learn about safe use of the maintenance device and how to block machine safely.

**Responsibilities of Operator****Inspection and Maintenance**

The machine shall be inspected and maintained in proper working order in accordance with the manufacturer's operating/maintenance instructions and safe operating practices.

**Removal from Service**

Any machine not in safe operating condition shall be removed from service until it is repaired to the original manufacturer's specifications.

**Repairs**

All repairs shall be made by authorized personnel in conformance to the manufacturer's instructions.

**Operators**

Only trained and authorized personnel shall be permitted to operate the machine.

1. Before using the machine, the operator shall have:
  - A. Read and/or have explained and understood the manufacturer's operating instructions and safety rules, or have been trained by a qualified person.
  - B. Inspected the machine for proper operation and condition. Any suspect item shall be carefully examined and a determination made by a qualified person as to whether it constitutes a safety hazard. All unsafe items shall be corrected before further use of the machine.
2. During operation the machine shall be used only in accordance with its intended use and within the manufacturer's limitations and safety rules.
  - A. Do not overload the machine.
  - B. Ensure that all safety devices are operational and in place.

**Modifications and Alterations**

Modifications or alterations of machinery shall only be made with the written permission of the original manufacturer. These changes shall be in conformance with all applicable standards and shall render the equipment as safe as it was before modification. These changes shall also satisfy all safety recommendations of the original equipment manufacturer for the particular application of the machine.

## **Description of Equipment**

The pallet inverter consists of a rotating mast with two sliding pallet platforms that adjust to the load size. The mast assembly is supported by two pillow block bearings and driven by a hydraulic motor with a chain and sprocket connection.

The pallet platform slide by means of four slider blocks captured in structural channel. A dual acting hydraulic cylinder moves the platform to clamp and release the load.

## **Operation of Equipment**

Pallet inverters are used to invert or “turn over” palletized materials and allow a defective pallet to be removed and replaced. The clamping mechanism allows a wide range of sizes and weights of loads to be inverted using this equipment; however, some loads may require special handling or preparation before inverting.

Normal operation consists of placing the load to be inverted into the machine. This is done either by using a forklift or other material handling trucks. If equipped with powered roller conveyors, loads may be conveyed into the machine. Care should be taken that no load or portion of the load extends outside of the machine. Severe personal injury or damage to the equipment may result if the machine is operated with part of a load extending outside of the machine.

When the load is positioned inside the machine, the “clamp” portion of the cycle is started. Hydraulic fluid is pumped from the reservoir into the double-acting hydraulic cylinders in the clamping mechanism. The clamp platform descends until it contacts the top of the load. This increases the hydraulic system pressure until the appropriate clamp pressure is attained. Once clamp pressure is attained, the inversion cycle begins.

During the inversion cycle, the hydraulic motor drives the mast assembly in a circle, until the electrical limit switches are tripped. At this point, the load is fully inverted. The clamping mechanism will then automatically retract. The pallets may then be removed from the machine and replaced. The return cycle works similar to the inversion cycle. The load is clamped by pushing and holding the clamp button until sufficient pressure is attained. Then, press invert button and the inversion cycles runs from rotation to unclamping automatically.

## **Installation**

Bushman AvonTec inverters are shipped completely assembled and ready to install. If the unit is to be pit-mounted, an appropriate size pit should be prepared before moving the unit into position. (Contact factory for instructions regarding pit size, etc.)

Careful consideration should be given to placement of the inverter within the plant. It should be placed on a level, dry floor, of suitable strength to bear the weight of the equipment and its load. There should be sufficient space to allow the unit to be loaded and unloaded using overhead hoists and or forklift-type material handling trucks. Consideration should also be given to the placement of the power supply cable and control box cord. Severe personal injury and or death can result if electrical cables are cut accidentally. Sufficient overhead clearance should be provided so that the largest potential load can rotate freely.

Inverters are supplied with lag-down holes in the base plate. It is recommended that all inverters be bolted to the floor using appropriately sized bolts. Failure to bolt unit down can result in severe injury to persons using the equipment, and possible damage to equipment or materials.

### **Voltage Requirements**

The inverter is designed to operate on a variety of power supply voltages. The Bushman AvonTec inverter uses a multi-voltage motor; however, it is shipped with overload protection heaters appropriate to the operator requirements as specified to the factory at the time of order. If the unit is connected to a power supply with a voltage different from what it was originally specified to the factory, replacement overloads should be installed before operation. Failure to install correct overloads will result in inverter failure, and can result in damage to the equipment and possible serious or fatal personal injury.

**Remote Motor Starter**

If the starter is mounted externally, it will be necessary to supply 3-phase power of the appropriate voltage to the starter, and then wire the starter to the motor in the base frame. In most cases, the motor leads will terminate in an outlet box in the base frame and the leads from the starter can be wired to this outlet box. A control circuit transformer is provided with the magnetic starter and additional wires will be required from the transformer to an outlet box in the base frame. These will pick up the limit switch and the push button that can be attached to this outlet box.

**Photo-eyes**

If the inverter is equipped with external photo-eyes, they should be positioned at the ends of the machine to detect the presence of pallet platform assembly. They will be wired to the junction box attached. Each lead from the photo-eye assembly will be labeled. Attach each numbered wire to the matching terminal in the junction box.

The photo-eyes may need to be adjusted depending on the “reflectivity” of the load. Highly reflective loads may trigger a false reading, and may not stop the conveyor drive properly. Refer to the technical documentation that is supplied with the photo-eyes for more information.

**Internal Motor Starter**

If the starter is mounted internally, it is necessary to knock out a hole in the enclosure box inside the base frame of the unit. If your inverter was ordered with J.I.C. standard enclosures, you will have to drill a hole through the enclosure and fit a gasket around the wire). A power cord should then be inserted through this hole. Attach each wire to one terminal on the motor starter, labeled L1, L2, and L3.

**Operation**

After the starter and operating switches have been connected as above, and are in accordance with the attached wiring diagrams, the inverter is ready to operate. Bushman AvonTec recommends that before production use, a full range of load sizes and configurations be tested in the machine to ensure that clamp pressures and other settings are correct. During testing, it is recommended that personnel stand clear from the machine, and that an operator observes the machine. Use the “E-Stop” button to halt operation of the machine, if any unexpected condition occurs during testing.

## Using the Inverter

### **WARNING!**

Do not place loads on the inverter that overhang either platform or exceed the rated load capacity of the machine. Doing so places extreme stress on the motor, gearbox, and chain, and can cause breakage of these components and severe personal injury or death.

Once the load to be inverted is in place, you may begin the inversion cycle. The operator should ensure that the area around and underneath the machine is free from obstructions, and that persons in the area stand clear. The operator should then depress the appropriate pushbutton to begin inversion.

### **Operating Condition**

The inverter should rotate smoothly, and without any scraping or banging noises. If any of these conditions are noted, the operator should immediately discontinue use of the equipment until it has been checked by qualified maintenance personnel. Jerking motion or scraping and banging noises are indications that the unit is not operating correctly and requires maintenance. Never place any part of the body inside the Inverter while it is operating, or without blocking and securing the inversion cradle.

### **Chain Breakage**

Should the chain break during operation, do not attempt to service the machine until the load has been removed. Chain breakage is usually an indication that the platforms are not rotating freely because of damage to the frame or because of loading more than the stated capacity. Do not replace chains until the cause of the breakage has been determined and corrected. If the breakage is found to be a result of overloading, contact the factory regarding possible upgrading of your existing inverter.

In situations where you wish to invert a load that is not unitized (e.g. a pallet load of multiple cartons, etc.) make sure that the load is secured and banded before upending. Do not place any straps or chains across the rolling surfaces of the upending platform.

## Safe Operating Procedure

Ensure that all operators and maintenance personnel working with the equipment have read and/or had explained, and understand these safety instructions before operating or performing work on the equipment. Failure to heed these instructions can possibly lead to severe personal injury.

1. Keep clear of the machinery at all times, and particularly when it is operating.
2. Do not climb or ride on the machine.
3. Ensure that all safety guards and limit switches are in place and are in working order.
4. Do not enter area under the machine unless the machine has been electrically locked and tagged out, and the moving cradle has been placed and blocked in the "balanced" position.
5. Never remove the chain(s) or any other component of the drive system without first ensuring that the moving cradle is in the "balanced" position and blocking it in this position. The cradle is held in the vertical and horizontal position by the chain(s) and the drive system and is unbalanced. When the chain(s) or drive system is loosened, the cradle will move rapidly to the "balanced" position, and could cause serious injury to any person close to it.
6. Should it be necessary, for operational reasons, to be on one of the cradle platform surfaces, always use the correct ladders, safety harnesses, and other safety equipment necessary to protect persons from falling from unprotected heights.
7. Do not bump the cradle with the product being rotated or with cranes, crane hooks, or lift trucks. Shock loads may cause failure of the chain(s) or other drive system components and could cause unexpected movement of the cradle and injury to persons.
8. Never try to lubricate moving machinery. Ensure lockout and tag-out procedures are used before all lubrication and maintenance.
9. Keep rotator chain(s) correctly adjusted to prevent excess wear and stress on the drive system. See sections on chain adjustment for instructions on adjusting chain(s).
10. Use extreme caution at all times when loading and unloading the machine to ensure that the load is always in a secure mode.
11. Do not overload the machine. See the rated capacity on the serial plate.
12. Do not rotate loads that project over front edge of the cradle platform. Ensure all

loads are centrally placed and even from side to side.

## Maintaining the Inverter

A qualified person who understands all safety and operating instructions should perform all maintenance.

### Hydraulic Clamp

Refer to the appropriate manual sections for information relating to the hydraulic system.

### Daily Operator Checks

Inspect the machine to ensure that all guards and limit switches are in place.

Check to see that the platform is square and that both platforms are square and parallel to the floor. If this is not the case, something may be bent or bolts may be loose. If this is the case, **DO NOT** operate machine, and request maintenance assistance.

Before loading the machine, operate the unit unloaded through one complete cycle. Observe rotation and smoothness of operation. Report any unusual observations and/or noises, and **DO NOT** operate machine until it has been checked and repaired.

Check control power cord for wear.

During normal operation of the machine, report any unusual observations and/or noises that may suddenly occur. **DO NOT** use the machine until a qualified person has checked it.

### Quarterly Maintenance

Qualified maintenance personnel should perform the following at least quarterly:

1. Check chains and drive components (sprockets, bushings, etc.) for wear and correct adjustment. See instructions for adjusting chains.
2. Check oil level in the hydraulic reservoir. If necessary, bring oil to correct operating level.
3. Flush all bearings with grease. "Zerk" type fittings are found at all bearing locations, and are fitted with a red plastic removable cap. See attached diagram for grease point locations. Use high quality 120# multi-purpose grease.
4. Check sliders for wear.
5. Grease slider channel.
6. Check electrical cords and components for wear.

**Lubrication**

Flush all bearings with grease four times a year. Bushman AvonTec recommends using a good grade of 120# multi-purpose grease. Zerk fittings will be found at all bearing locations.

Bearings are found in all members which rotate during operation around a fixed shaft or in the rollers that support the rotating cradle assembly. Check slider channel track for grease.

**Chain Tensioning and Replacement**

Inverters are driven by a powered sprocket turning a chain that is fixed to a hydraulic motor and mast assembly shaft. It is necessary to maintain adequate tension in this chain and not to allow it to become slack. Slackness in the chain will result in excess wear and shock loads on the drive system.

**Chain Replacement**

Should it ever be necessary to replace chain, either due to wear or due to breakage, then follow the procedures above, ensuring that the chain anchor bolts are correctly adjusted when the new chain is installed.

**Limit Switches**

Bushman AvonTec inverters are equipped with two limit switches; one switch is located at each end of the 180° of travel. If the platform should begin to stop slightly short of 180° or slightly beyond 180°, the limit switch should be re-adjusted by changing the position of the operating arc of the limit switch. If this does not correct the situation, there is also a certain amount of adjustability in the cam that trips the limit switch. Contact the factory for information about replacement limit switches. Do not operate the inverter until both limit switches are operating correctly.

**Hydraulic System**

The relief valve is pre-set at the factory and requires no further adjustment.

**Hydraulic Filter**

Replace the hydraulic filter at least annually.

**Hydraulic Oil**

Check the oil level in the reservoir once a month. Add as needed. Recommended oil is Chevron Rykon Premium Oil AW ISO 32 or equivalent with anti-corrosion and anti-oxidation properties.

**Warning:** Mixing un-authorized hydraulic oils will damage components.

## Statement of Warranty

The Bushman AvonTec will replace, F.O.B. the factory, any goods that are defective in materials and workmanship within 12 months of date of shipment, provided the buyer returns the defective materials, freight and delivery prepaid, to the manufacturer, which shall be the buyer's sole remedy for defective materials.

Manufacturer shall not be liable to purchaser or any other person or entity for consequential or incidental damages. The end user is responsible for the integrity of any structure, crane or fixture to which Bushman products have been attached. This warranty does not apply to equipment and/or components, which have been altered in any way or subjected to abusive or abnormal use, inadequate maintenance or lubrication, or use beyond seller recommended capacities and specifications.

Manufacturer shall not be liable under any circumstances, for labor costs expended on such goods or consequential damages. Manufacturer shall not be liable to purchaser or any other person or entity for loss or damage directly or indirectly arising from the use of goods or from any other cause.

No employee, agent, officer or seller is authorized to make further oral or written representations or warranty of fitness or to waive any of the foregoing terms of sale, and none shall be binding on the manufacturer.

If there are any problems or questions regarding this equipment or its application, contact your local sales representative or Bushman AvonTec directly at 262 790-4207.

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