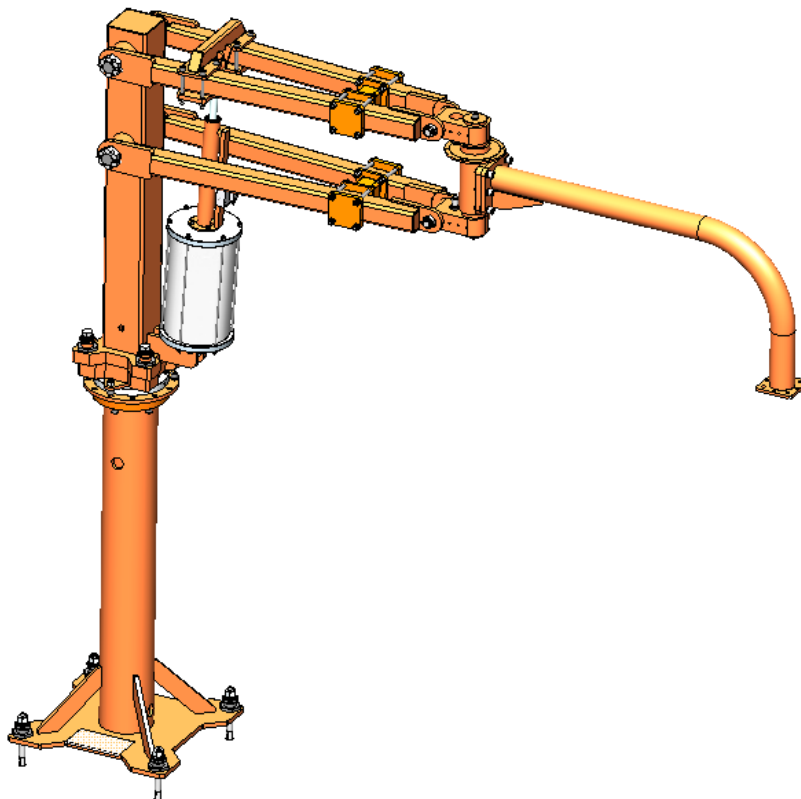


OPERATOR SERVICE MANUAL

World Manipulator



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SECTION 1 - IMPORTANT SAFETY INSTRUCTIONS



When using powered manipulators, basic safety precautions should always be followed to reduce risk of damage, and personal injury, including the following:

READ ALL INSTRUCTIONS

- **REVIEW, AND PRACTICE SAFE OPERATION OF THE MANIPULATOR.** Become familiar with, and practice safe operation of the manipulator. Observe safety warnings, and symbols that depict potentially dangerous residual risk activities, situations, or clearances.
- **KEEP WORK AREA CLEAN.** Cluttered work areas invite injuries.
- **CONSIDER WORK AREA ENVIRONMENT.** Normal working temperatures are 50F to 120F. Don't expose the manipulator to rain or wet locations. Keep work area well lit. The standard manipulator is **NOT** designed for explosive atmospheres. Special non-standard designs may be specified for use in extreme environments at time of sale. Consult the factory with questions.
- **KEEP CHILDREN AWAY.** All visitors, and personnel not familiar with the work range of the manipulator should be kept away from the area.
- **NEVER LIFT PEOPLE WITH MANIPULATOR OR TOOLING.** The manipulator is not designed as a manlift device. Although the manipulator typically has this lift capacity, lifting of personnel is **ABSOLUTELY PROHIBITED**.
- **DON'T FORCE THE MANIPULATOR, or TOOLING.** The machine will do the job better and safer at the realistic rate for which it was intended.
- **DON'T OVERREACH OR TWIST.** Keep proper footing and balance at all times. Use the vertical rotation axes provided by the bearings of the equipment to proper position your body so pushing the loaded manipulator is always possible.
- **USE RIGHT TOOL.** Use the tooling for what it was designed to handle. Don't force a small tool or attachment to do the job of a heavy-duty tool.
- **CHECK DAMAGED PARTS OR LOOSE CONNECTIONS.** Before further use of tool, or manipulator, a guard or other part that is damaged should be carefully checked to determine that it would operate properly and perform its intended function. Check for alignment of moving parts, binding of moving parts, breakage of parts, mounting, and any other conditions that may affect operation. Use the troubleshooting guide, and routine maintenance checklist for inspecting the equipment at regularly scheduled time periods. Contact the factory for service assistance, and directions.
- **USE CAUTION WHEN INSTALLING, OR PERFORMING ROUTINE MAINTENANCE.** See the specific instructions contained in this manual for lifting, and placing the manipulator. Support the lift arm structure when servicing the main lift cylinder. Have a second person assist with lift speed, and other adjustments.
- **PROPERLY STORE, AND HANDLE THE MATERIALS USED FOR MAINTAINING THE MANIPULATOR.** Material Safety Data Sheets (MSDS) are included for proper storage,

handling, and use of lubricants, and other materials used for maintaining the manipulator equipment.

SECTION 2 - SUPERIOR FEATURES OF YOUR WM AIR MANIPULATOR

Positech manufactures four Models of the series WM air operated positioners (manipulators). The WM-100 is rated at 100 Kg. of payload capacity while the WM-200 is rated at 200 Kg. the WM-300 is rated at 300 Kg and the WM-450 is rated at 450 Kg. The WM series is designed to work in low headroom areas.

Users benefit from the increased safety, versatility and efficiency, as well as the low maintenance requirements that have been designed into the machines.

FEATURES

1. DESIGN FACTOR

Positech manipulators are structurally designed to a 5:1 design factor against failure based on the ultimate tensile strength of the material used

2. LOST LOAD CONTROL DEVICE

Positech uses a separate sealed cylinder to prevent uncontrolled upward movement of the arm, if the payload is inadvertently lost during transfer. For example, if a part-supporting sling should break, the pressure in the lift cylinder would ordinarily cause the arm to move up rapidly. However, Positech's Lost Load Device provides easy adjustment for sensitivity by the user. Properly adjusted, the valve on the cylinder detects unusual vertical speeds, stops the upward travel within a few inches of load loss and allows the arms to move upward very slowly and safely. Typically, all competitive arms move fully upward in a dangerous, jumping, jerky motion.

Positech does not use oil in the main lift cylinder, as a lost load system. This eliminates objectionable, messy oil misting at various points on the machine, including at the operator's metering valve controls. Also, less operator effort is required to operate balance controlled manipulators without oil in the main lift cylinder.

3. END-OF-ARM LOADING

The WM series air operated positioners are designed with parallel linkage lift arms (which keeps the tool mount horizontal) and are capable of 2-1/2 to 7 times the side loading capability of many competitive machines. This permits users to extend the tooling and payload well beyond the end of the arm and still fully rotate it 360 degrees continuously around a vertical axis at the end of the arm. It also allows a Positech WM manipulator to reach long distances in headroom restricted work areas.

4. UNIVERSAL MOUNTING

The WM manipulators can be mounted either from a pedestal or from an overhead mount.

5. "MAGIC VALVE" (DUPLEX CONTROLS)

Positech machines have either metering valve or balance controls as standard equipment.

As an option, Positech also offers duplex controls - the automatic balancing "Magic Valve". This allows a machine to have the benefit of both metering valve and balance controls.

With Positech's duplex controls, once any load is lifted by way of the operator's metering valve control, it is immediately and automatically balanced when the operator flips a switch. No adjustments need to be made and no additional buttons need to be pushed.

6. PNEUMATIC SAFETY FEATURES AND OPTIONS

All Positech air manipulators have a lift cylinder safety blocking valve as standard equipment.

This safety feature locks the air pressure in the main list cylinder if a sudden loss of air supply pressure occurs. As a result, the arm will not drop dangerously when air supply pressure is suddenly interrupted.



Do not remove any valve parts or the valve block from the lift cylinder unless the machine is in its lowest position, because the arms will drop quickly with great risk of injury.

Other pneumatic safety and control features are also offered as optional equipment. These include:

Gripper Cylinder Safety Locking Valve

(Payloads won't immediately drop if system pressure is interrupted.)

*Standard on all gripper cylinders and pitching cylinders.

Gripper Safety Circuit

(Won't release unsupported loads.)

Vacuum Safety Check Valve

(Vacuum tooling won't immediately drop nonporous payloads due to a sudden air supply pressure interruption.)

Automatic Activation of Balance Circuit with Safety Vacuum Sensing

(Detects adequate load support vacuum before balancing the payload. Disengages the payload balance circuit before the payload is released.) *Allows single switch control for normal operation.

Automatic Activation of Balance Circuit

(Activates the balance circuit after the gripper is engaged. Disengages the gripper after the balance circuit is shifted to "no load".) *Allows single switch control for normal operation.

Gripper Pressure Regulator

(To avoid crushing the payload.)

Automatic Trolley Following Controls

(Eliminates forward/reverse controls for a trolley with an air motor drive. The trolley automatically follows the operator up and down the working range.)

7. CONSTRUCTION

Designed and built to give you a low maintenance machine with years of productive, trouble-free life, all manipulators have superior construction features. The machines have superior structural rigidity, have many sealed precision bearings and are both prime painted and overcoated with enamel. The manipulators are made to very close tolerances.

8. MADE IN THE USA

The entire Positech line of manipulators and tooling are designed and built in our factory in Laurens, Iowa. All parts and fully factory support are, therefore, easily provided. Included in the Operator's/Service Manual is a recommended list of spare parts (most of which are readily available).

8. TOOLING

Tooling can be designed and built by Positech in conjunction with the base machine, itself. Tools are machine-matched and exactly designed to satisfy your part handling needs. The machine and the tooling are operationally inspected and tested prior to shipment.

If your tooling needs should change, contact Positech for a quotation on new tooling.

Many competitors rely on subcontractors to design and build the tooling. Often, they are working on one component only and lose touch with the nuances of the complete machine.

10. HUMAN ENGINEERING

Positech designers know that the manipulators are operated by human beings. Therefore, they "walk in the customer's shoes" and design the machines to be as efficient and easy to operate as possible. This facilitates operator acceptance of the equipment.

The features and options provide productivity enhancement and operator safety features. Tooling is designed to be effective and operator's controls are placed in the most convenient position.

11. AFTER SALES SUPPORT

Positech is committed to your satisfaction through the sale of trouble-free equipment. The care taken, both during the proposal process and the design and build stages ensure superior performance.

However, if problems do arise, you are not forgotten after delivery. Positech personnel respond immediately and efficiently to calls for service.

SECTION 3 - INSTALLATION INSTRUCTIONS

A. INSTALLATION SUMMARY

(NOTE: Where provided, any checked blanks apply to your manipulator. Where blanks are not provided, this information applies to all machines.)

(Do not adjust any controls without reading the instructions.)

1. Inspect the support structure or concrete floor and verify its ability to withstand the expected loading conditions (See Page 6, Section B for loading).
2. If applicable:
 - Counterweight the mobile base.
 - Extend the mobile base corner jacks to level the base. Only the four screw jacks should be contacting the floor.

(See Page 9, Section C-2 for details.)

3. Attach the floor pedestal, overhead spacer or other machine mounting hardware to the support structure, concrete floor, mobile base or trolley (see Page 10, Section D for details).
4. Provide an adequate air supply to the manipulator's air input location at the bottom of the manipulator's main post. (See Page 12, Section E for air requirements.)
5. Lift the manipulator off the pallet carefully and locate it close to the mounting surface. Do not disconnect it from the pallet until after the machine is supported by the forklift. (See Page 12, Section F-1 for details.)
6. Connect the air supply line to the manipulator. (See Page 13, Section F-2 for details.)
7. Attach the manipulator to the pedestal, spacer or other mounting structure (See Page 13, Section F-3 for details.).
8. Attach the tooling to the end of the manipulator arm. Connect all airlines to the tooling. (See Page 14, Section G for details.)
9. Provide air pressure to the manipulator and check for leaks. **NOTE:** Balance control machines have one bleed location. (See Page 14, Section H for details.)
10. Level the manipulator (and tooling if applicable), adjust the controls (see Machine Adjustments, Page 15, Section A) and perform safety tests (see Safety Tests, Page 28, Section K).

B. **MACHINE SUPPORT LOADING**

1. **Vertical Loading**

See Profile Drawing

2. **Moment Loading**

See Profile Drawing

3. The machine's maximum static load (vertical) on one jack of the mobile base or one wheel of the trolley is 2590 kg.

4. **IMPORTANT:**

The values provided above are for static loading conditions. Positech recommends using a minimum design factor of five to one (5:1) based on the supporting structure's ultimate strength to allow for dynamic loading. Positech also recommends a maximum supporting structure deflection of 1/4 degree to maintain the machine's levelness. Concrete requirements for Positech supplied floor pedestals are provided on Page 10, Section D-1-b.

C. **MOBILE SUPPORTS**

1. **Trolley Installation:**

- a. Rails should be parallel with 1/4 inch (6.3 mm) and level within 1/4 degree along their entire length.
- b. Rails should be cross braced and rigidly supported at sufficiently close intervals to accommodate the loading described on Page 8, Section B.
- c. **NOTE:** At least 1.5 inches (38 mm) of clearance above the top of the standard S6 x 17.25 I-beam rails is required for a Model WM-100 trolley.
- d. Be careful not to damage any air lines or other fragile components of the trolley when disconnecting the equipment from the pallet and attaching the lifting device to be used. Place the trolley between the rails with the wheels between the flanges by sliding it in at one end of the rails.
- e. Be sure that safety stops are installed at each end of the rails. Positech recommends a bolted stop between the beam flanges which will contact the trolley wheel flange in line with the axle centerline.
- f. Inspect the safety catches which extend underneath the rails for loose bolts (torque to a maximum of 25 ft.-lb. or 34 N-m) and proper cam roller positions (see the trolley assembly drawing provided). The four anti-kickup rollers under the beams should be adjusted and tightened so that 1/16 inch (1.6 mm) of clearance is left between the roller and the bottom of the rail (torque both bolts to a maximum of 75 ft.-lb. or 102 N-m).
- g. Inspect the rope operated brake on a non-powered trolley for proper engagement with the bottom of the trolley rails.

2. Mobile or Portable Base Installation:

- a. If the mobile base is not counterweighted, add the required counterweights (see the mobile base assembly drawing provided).
- b. Level the base by extending the corner jacks so that only the four jack pads are contacting the floor, but no other part of the base.



The machine may upset if the corner jacks are not properly extended.



Lift the Positioning Arm and base assembly **ONLY** by the base, because the weight of the base suspended from the Positioning Arm will damage the manipulator's bearings.

Although the Positioning Arm is leveled to the base prior to shipment, it is necessary for the user to level the base with the corner jacks prior to use at each location.

THE MACHINE MAY UPSET IF THE CORNER JACKS ARE NOT PROPERLY EXTENDED OR IF THE MACHINE IS OVERLOADED.

D. **MACHINE MOUNTING HARDWARE**

1. **Floor Pedestals**

NOTE: With the optional screw jacks, each should be screwed 1/16 inch (1.5 mm) through the bottom (or top) of the pedestal (or spacer) base at this time (final adjustment will be performed after the machine is assembled).

A. **Mobile or Portable Base Attachment:**

Install the four bolts and lockwashers provided through the pedestal base (and optional screw jacks) into the tapped holes provided in the base. Refer to the pedestal assembly drawing for proper bolt installation. See Machine Adjustments (Page 15, Section A) for proper bolt torque.

B. **Concrete Floor Attachment:**

There should be no cracks within 48 inches (1220 mm) of the pedestal centerline.

The base bolts may be installed directly into the concrete floor (using the pedestal base as a template) if the following conditions are satisfied:

The reinforced concrete is at least 6 inches (152 mm) thick and has a minimum strength of 3500 psi (246 kg/cm).

NOTE: If the minimum conditions are not met, a section of the floor will need to be removed and a pier installation will need to be made to mount the machine.

These instructions are for installation into a suitable existing floor.

- i. Position the pedestal in the desired location.
- ii. Refer to the pedestal assembly drawing for proper bolt installations.

- iii. Drill a one- (1) inch (25.4 mm) diameter hole at least five inches (125 mm) deep in the concrete. It is acceptable to drill fully through the concrete to allow the bolts to be later driven into the earth should the machine be moved in the future.
- iv. Blow the dust away from between the base and the floor. Place a flat washer between the screw jack or the pedestal base and the floor.
- v. Install a washer and nut on the base bolt with the end of the nut flush to just above the end of the bolt.
- vi. Strike sharply the bolt into the hole in the concrete until the washer and nut are tight against the optional screw jack or the bolt is a minimum of five inches (125 mm) into the concrete.

NOTE: The deeper the hole is drilled, the greater the pull out force becomes. Anchor embedment depth not to exceed 1 ½ times the anchor bolt diameter from the opposing face of concrete slab.

- vii. Torque the nut to seat the bolt into the concrete. Nut torque should be 250 ft.-lb. (339 N-m). Loosen the nut about one-half turn to allow for leveling adjustments.
- viii. Install the remaining three bolts by repeating steps iii. through vii.
- ix. After all anchor bolts are in place, see Machine Adjustments on Page 15, Section A, for proper bolt torque.

C. **Other Support Structure Attachments**

CAUTION: Bolts must be SAE grade 5 (Metric grade 8.8) minimum and one (1) inch (or 25mm min.) diameter.

- i. The support structure must be capable of safely supporting the manipulator. See Machine Support Loading (Page 5, Section B) for structural strength requirements.
- ii. The pedestal base can be used as a drilling template, or bolt center dimensions can be used from the pedestal assembly drawing provided.
- iii. Drill 1.062-inch (27.0-mm) diameter holes through the support structure if bolts and nuts are to be used (Positech recommends using locknuts or lockwashers). If threaded holes are to be used, verify a minimum of one bolt diameter thread engagement (allow for leveling shims or optional screw jack adjustments). It is better to use a longer bolt and locknut even with threaded mounting holes.
- iv. Refer to the pedestal assembly for proper optional screw jack installation.
- v. See Machine Adjustments (Page 15, Section A) for proper base bolt torque and machine leveling instructions (level the manipulator after assembly is complete).

2. **Overhead Spacers** (All overhead spacers are provided with leveling jacks.)

a. **Trolley Attachment**

(For customer supplied trolley, see fixed attachment below.)

- i. Refer to the overhead spacer drawing for proper bolt and screw jack installation.
- ii. Bolt the spacer to the mating eight WM-100 bolt pattern on the trolley mounting plate. Use the bolts and nuts provided.
- iii. See Machine Adjustments (Page 15-17) for proper base bolt torque and leveling instructions.

b. **Fixed Attachment**

(CAUTION: Bolts must be SAE grade 5 (minimum) and 5/8 inch diameter.)

- i. The support structure must be capable of safely supporting the manipulator. See Machine Support Loading (Page 5, Section B) for structural strength requirements.
- ii. The spacer base can be used as a drilling template, or bolt center dimensions can be used from the overhead spacer assembly drawing provided.
- iii. Drill 11/16 inch (17.5 mm) diameter holes through the support structure if bolts and nuts are to be used (Positech recommends using locknuts or lockwashers). If threaded holes are to be used, verify a minimum of one bolt diameter thread engagement (allow for screw jack adjustments). It is better to use a longer bolt and locknut even with threaded mounting holes.
- iv. Refer to the Overhead Spacer Assembly drawing for proper screw jack installation.
- v. See Machine Adjustments (Page 15-17) for proper base bolt torque and machine leveling instructions (level the manipulator after assembly is complete.)

3. **Customer Supplied Mounting Hardware**

- a. Refer to Figure 1 (8610324) for the required bolt pattern and necessary bearing clearance.
- b. The support structure must be capable of safely supporting the manipulator. See Machine Support Loading (Page 5, Section B) for structural strength requirements.
- c. Please proceed through the instructions before attaching the manipulator to its support.

E. AIR SUPPLY REQUIREMENTS

Your Positech Model WM-450 air manipulator requires clean, regulated compressed air at 90 psi (6.21 bar) for its rated load capacity (120 psi or 8.27 bar maximum allowed) at 60 SCFM (1699 NLM) when operating at 24 inch/sec. (61 cm/sec.) vertical rates.

The minimum supply line size is 3/8 NPT (10 mm).

NOTE: Supply line sizes may need to be larger for long lines low system pressures, vacuum tooling air requirements, etc. The manipulator will lift the payload slowly, or not at all, if the air supply requirements are not met.

Positech recommends the installation of an air line filter conveniently mounted for regular service before the manipulator connection. The air filter supplied with the manipulator can then act as a secondary filter. This will help protect the valves, cylinders and other component from damage due to air supply contaminates. Vacuum generators require a non-lubricated air supply.

F. ATTACHING THE MANIPULATOR TO ITS SUPPORT

1. Lifting the Manipulator

- a. Remove the top and sides of any crating and protective wrappings from around the manipulator. Inspect if for signs of damage due to shipping. Document damage and make any claims to the carrier.



Do not disconnect the manipulator from the pallet underneath or it could fall over!

- b. Lift the machine to a position about 6 to 12 inches (150 to 300 mm) above (or below) the mounting flange which mates to the large rotation bearing underneath (or on top of) the main post.

2. Connecting the Air Supply

IMPORTANT: Locking quick disconnects must be locked securely to avoid separation during operation of the manipulator. Twist locks must be turned approximately 90 degrees.



The air supply should be shut off at this time.

- a. If necessary, pull the air supply line provided through the hole in the side of the pedestal near the bottom. Connect the swiveling quick disconnect to its mating connection installed in the bottom of the main post.
- b. Connect your air supply line to the end of the hose or pipe provided.



The air supply should be shut off at this time.

- c. Unless requested as an option with the sale, the manipulator does not come equipped with a pneumatic lock-out connection for operator access, and maintenance use. Installation by the customer may need to include access to a lockable shut-off for Lock-out protection access, and maintenance purposes.

3. Attaching the Manipulator to the Pedestal

- a. Check the torque of the bolts at the inner bolt circle of the main post rotation bearing. The twelve M18-1.5 hex head bolts should be cross torqued evenly to between 150 and 200 ft.-lb. (200 and 270 N-m).

- b. Lift (or lower) the manipulator slowly to the mounting flange. Keep the slack pulled out of any air lines running through or around the mounting hardware to avoid kinking or crushing them.
- c. Start the six M18-1.5 bolts with lockwashers provided through the floor pedestal (or overhead spacer) flange and into the threaded holes in the outer ring of the main post rotation bearing.
- d. Tighten the bolts evenly and cross torque them evenly to between 150 and 200 ft.-lb. (200 and 270 N-m).

G. ATTACHING THE TOOLING

1. Manipulator With Rotating Endjoint

- a. Tooling is typically attached to the manipulator using a "Box-frame" adaptor which is bolted to the end of the arm with four bolts.
- b. Connect any air lines required to operate the tooling to the fittings according to the matching markings. See Figure 4 (8529722) for instructions to connect (and disconnect) the press-in fittings.

NOTE: Some air lines may be more easily connected before connecting the tooling adaptor to the arm flange.

- c. Use hose clamps and plastic ties which are normally provided to secure any loose air lines on the manipulator and its accessories before operating.

H. PRESSURIZING THE AIR SYSTEM

NOTE: Balance control manipulators should have the "Load/No Load" control in the "No Load" position.

- 1. Provide air pressure to the manipulator from your air supply line. The line pressure should be 90 psi or 6.21 bar (maximum of 120 psi or 8.27 bar).
- 2. Screw in the filter/regulator/lubricator (FRL) air pressure adjustment until 90 psi registers on the gauge at that location (on the main post). See the FRL instructions provided.
- 3. Check the manipulator and its accessories for leaks.

NOTE: Balance control manipulators have one built-in adjustable bleed at the black balance valve on the main post. The bleed is a sensitivity adjustment for the balance circuit and should not need adjustment.

If any unusual leaks are detected, locate them and turn off the supply pressure. Replace any damaged air lines and reconnect at any leaking fittings. Turn the system pressure back up and re-inspect the leak locations.

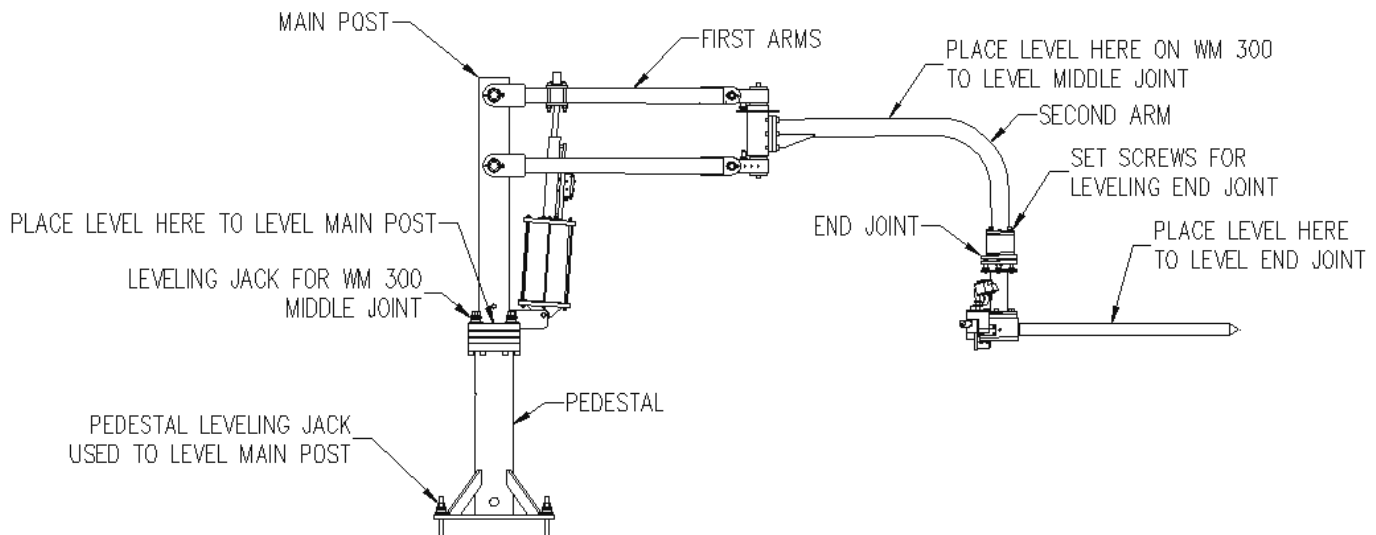
- 4. After reading the balance control adjustment instructions on Page 19 Item 7, set the no load regulator to balance the tooling. Move the arm up and down slowly to initialize the diaphragm cylinder. The movement should be smooth and without binding. **DO NOT** force the arm vertically past a bind. Instead, move it the other direction as far as possible and try again to move it gently through the bind zone. If binding persists contact Positech for a replacement cylinder.

Your Positech air manipulator is now installed and ready for final adjustment.

SECTION 4 - MACHINE ADJUSTMENTS

A. LEVELING THE MANIPULATOR

Refer to the pedestal assembly drawing provided for bolt and screw jack assembly drawings.



1. Floor Pedestal Leveling

IMPORTANT:

Torque the anchor bolt nuts to 250 ft.-lb. (339 N-m).

A. Standard Pedestal (Without Screw Jacks)

- i. Check the pedestal top flange levelness.
- ii. If the pedestal top flange is not level, loosen the anchor bolt nuts slightly. Insert shims under the base plate near the bolts until the top flange is level when the anchor bolts are tight. Recheck the top flange's levelness and readjust if necessary.

B. Pedestal With Optional Screw Jacks

- i. Be sure that all four of the anchor bolt nuts are snug but not tight.
- ii. Loosen the locking jam nut on the screw jacks.
- iii. Adjust the four screw jacks until the top flange is level.
- iv. Tighten the jam nuts and torque the anchor bolt nuts.
- v. Recheck the top flange's levelness and readjust if necessary.

2. **Leveling the Main Post:**

Note: It is easiest to level the main post by making sure the pedestal or overhead spacer is level (at the bearing interface) prior to mounting the machine. Also, when mounting overhead with a trolley, trolley wheel kickup should not exceed 1/32" or .8 mm and the rails must be leveled before leveling of the manipulator can be done.

A. If installed on a pedestal or overhead spacer rotate the manipulator so the lift arms are perpendicular to two leveling jacks on the pedestal or under one set of jacks for an overhead spacer. Position the second arm and tooling (if any) straight out from this position and make sure they are straight out when checking the other positions of the main post as well. Also, maintain the same lift arm position in all quadrants being checked.

B. Place a level on the main post base plate, parallel to the lift arms.

C. While keeping the level in the same place, check the level. Rotate the lift arms 180 degrees from this starting position and check the level. It should read the same as the starting position. If not, adjust the pedestal/spacer jacks until the level has moved halfway to the starting position level. Rotate the arms back 180 degrees to the starting position and recheck the level. It should read the same as the prior position. If not, adjust the level until both positions, 180 degrees apart, read the same on the level. The important thing is not that the level read at level but that whatever it reads be the same at both positions.

D. Rotate the lift arms 90 degrees from the starting position while maintaining the same position on the level. Read the level. It should be the same as the first two positions checked. If not, adjust the pedestal/spacer jacks until it does. You can check the position 180 degrees from to make sure as well but it shouldn't be required if you have 3 positions, 90 degrees apart, reading the same on the level.

E. The main post should be leveled. You can check different positions to make sure it is and if not, use the procedure above to level it.

Note: If the structure the manipulator is mounted to is not the same stiffness in all quadrants, it may not be possible to have the manipulator be the same level in all quadrants. In this case, it may make sense to set the main post level so it doesn't drift in the quadrants being used while recognizing it will drift in the others.

3. **Leveling the Middle Joint (WM 300 only):**

A. Place a level on the second arm and parallel to it. Check the level at both 90 degree positions relative to the lift arms. The tooling (if any) should be straight out each time the middle joint level is checked. The level should be the same in both positions. If not, adjust the middle joint leveling jacks in the main post mounting plate until they read the same. This can be done on one side if they are different by adjusting the middle joint leveling jacks until the level reading has moved halfway to the reading from the opposite side (180 degrees from position being adjusted). Again, the idea is to have the level read the same on both sides and not that the level must read true level.

B. Place the second arm straight out and check the level. It should read the same as the two positions 90 degrees to the lift arms. If not, adjust the middle joint leveling jacks until it does.

C. Check to make sure the level reads the same in all three quadrants and if not adjust accordingly using the above procedure.

Note: It may be necessary to use the second arm at angles less than 90 degrees to the lift arms (inward positions). There may be some drift out from these positions when using the middle joint leveling procedure listed above. One can compensate for this by adjust the full out position to slightly higher than the two 90 degree positions and then adding a small amount of drag at the middle joint drag brake to keep it from drifting.

4. **Leveling the endjoint:**

D. With the tooling straight out, place a level on it with the level parallel to the tool (pointing out and parallel to the second arm when in this position). Check the level. Rotate the tooling 180 degrees, while maintaining the level's position, and check the level. If different than the starting position, adjust the set screw jacks at the end of the second arm until they read the same.

E. With the tooling 90 degrees to the second arm, check the level. Rotate 180 degrees and recheck. If different adjust the set screw jacks until they read the same.

Note: If the endjoint does not rotate 360 degrees (limited rotation) you will need to find two positions 180 degrees apart and level these the same. If less than this you can just adjust until drifting has been minimized.

5. **The manipulator and tooling should now be properly leveled.**

Note: In some cases it is not possible to eliminate all drift. In most of these cases you can adjust the level of the manipulator and tooling to make it easier to work in the desired quadrant while allowing it to drift in the quadrant / quadrants that are not typically used.

6. **Re-leveling**

IMPORTANT:

The manipulator will probably require re-leveling after one or two weeks of use. This is due to the final setting of the concrete anchor bolts or settling of the support structure.

The manipulator may require re-leveling every few months, particularly after seasonal temperature changes. The support structure may settle and will likely be affected by thermal expansion and contraction.

B. **DRAG ADJUSTMENTS**

1. **Middle Joint Drag Brake**

A drag brake is provided to restrict side to side swinging of the second arm with respect to the lift arms (first arms). If the second arm moves too freely for your needs, just tighten the drag brake-adjusting plug for the desired amount of drag. This adjustment is sometimes used to overcome drift when a manipulator has been installed slightly out of level.

NOTE:

The manipulator is usually shipped with no middle joint drag adjusted in.

2. **Optional Main Post Rotation Drag Brake**

An operator can choose the amount of friction he wants on the main post rotation by selectively tightening or loosening the adjusting plug at the main post rotation bearing.

C. LOST LOAD SAFETY CYLINDER ADJUSTMENT

NOTE:

To "unlock" the lost load cylinder, lower the arm slightly and wait a few seconds. The lost load cylinder allows the arm to move slowly upward when it is "locked". The lost load cylinder is factory adjusted and will probably not require adjustment at installation. See Safety Tests on Page 28, Section K-2, to confirm proper operation.

The sensitivity of the lost load cylinder can be easily adjusted (see Figure 7, 8610702). The lost load cylinder is too "sensitive" if it "locks" the upward movement of the arms during normal operation.

To reduce the sensitivity of the locking valve, loosen the chrome jam nut and back out (counterclockwise) the adjusting screw 1/8 turn. Without re-tightening the jam nut, check the upward travel again for over-sensitivity. If necessary, back out the adjust screw 1/8 turn again and re-check until the upward travel does not lock at normal operating speeds. Re-tighten the jam nut and recheck when satisfactorily adjusted. To increase sensitivity follow the same procedures by turning the adjusting screw in (clockwise) 1/8 turn at a time.

D. AIR SYSTEM ADJUSTMENTS

NOTE:

Refer to the air schematic provided for the specific adjustments, which apply to your manipulator. The schematic indicates air system adjustment locations, effects, settings, valve types, airline sizes, etc. The following instructions describe how to adjust the various "types" of valves in the manipulator's air system.

See Figure 9 (8610701) for a list of symbols to identify the adjustable valves on the air schematic.

1. **Pressure Regulators**

- a. Filter/regulator/lubricator (FRL) pressure adjustment: See FRL instructions provided.
- b. Other small, control air regulators: Pull the adjusting cap out gently to unlock it. Screw the cap in (clockwise) to increase the pressure. Unscrew the cap (counterclockwise) to reduce the pressure. Push in the adjusting cap to lock it in place.

NOTE:

The cap should not unscrew all the way out of the thread and fall off.

2. **Needle Valves**

Loosen the jam nut on the adjusting screw. Turn the screw in (clockwise) to restrict flow. Back the screw out (counterclockwise) to enlarge the flow path.

NOTE:

Needle valves are often used as a "delay" or "speed" control.

3. **Ball Check Flow Controls**

These are simply needle valves with a ball check by-pass to control flow in one direction and allow full flow in the opposite direction. Their adjustment and use are identical to those of needle valves.

4. Adjustable Exhausts

These perform the same function as a needle valve and are located at vents. Adjustment is similar to needle valves.

5. Pressure Sequence Valve

These valves are somewhat confusing. They go **NORMAL** (as shown on schematic) when the higher **PRESSURE** is sensed.

This valve "breaks" (normally open) or "completes" (normally closed) a flow path through the valve when pilot pressure exceeds the adjusted and set pressure. To adjust the sequencing pressure level: Loosen the bronze jam nut. Turn the adjusting screw in (clockwise) to increase the sequencing pressure. Back



the screw out (counterclockwise) to decrease the sequencing pressure. Tighten the jam nut after adjusting.

Do not unscrew the adjusting screw too far or it will come out followed by a spring and disk.

Pressure sequence valves may be used to operate a "high flow" valve on machines with metering valve controls. Also, they are used to control the sensitivity of gripper safety circuits.

6. Vacuum Sequence Valve

These valves are somewhat confusing. They go **NORMAL** (as shown on schematic) when the higher **VACUUM** is sensed.

This valve "breaks" (normally open) or "completes" (normally closed) a flow path through the valve when the pilot vacuum exceeds the adjusted and set sequencing vacuum. To adjust the sequencing vacuum level: Loosen the bronze jam nut. Turn the adjusting screw in (clockwise) to increase the sequence vacuum. Back the adjusting screw out (counterclockwise) to decrease the sequencing vacuum. Tighten the jam nut after adjusting.



Do not unscrew the adjusting screw too far or it will come out followed by a spring and disk.

Vacuum sequence valves are used to control the sensitivity of vacuum safety circuits and vacuum sensed auto activation of balance circuits when using vacuum tooling.

7. Balance Control Adjustments

To balance the tooling only: Switch the "Load/No Load" control to the "No Load" position. Carefully adjust the "No Load Pressure Regulator" until the lift cylinder pressure balances the tool and does not drift up or down. Lock the adjusting cap.

NOTE:

The No Load pressure should not have to be readjusted and you may wish to tape the adjusting cap in position.

To balance the tooling with the payload: Unscrew the "Load pressure Regulator" out all the way. (The adjusting cap should not fall off.) Attach the tooling to the payload as in normal operation. Switch the "Load/No Load" control to the "Load" position. Carefully turn the "Load Pressure Regulator" in for a higher lift cylinder pressure until the tool with its payload begins to drift slowly upward. Back off the "Load Pressure Regulator" a little so that the tool and payload are balanced (there should be no tendency to drift up or down after vertical movements). Lock the adjusting cap. **CAUTION:**

This regulator must be readjusted each time the payload weight changes.

NOTE:

Either balance setting can be adjusted to have an upward or downward bias depending upon operator preference.

8. Duplex Control Adjustments

The duplex controls only have a "No-Load" pressure adjustment unless other special circuits are purchased.

The "No Load" adjustment is provided to balance the tooling any time the "Balance" mode is selected and no payload is being supported by the manipulator. To set the "No Load" adjustment:

- a. Back out the "No Load" adjustment knob (counterclockwise) all the way while in the "Metering" mode (gently pull out the knob's cap to unlock it). The adjusting knob should not fall off.
- b. Set the tooling down firmly (without any payload) on a support.
- c. Select the "Balance" mode.
- d. Turn in the "Balance Adjustment" knob slowly (clockwise), until the tooling can be floated off the support and does not drift up or down.

NOTE:

If the tool drifts upward back out the adjusting knob slightly, selecting the "Metering" mode, set the tooling down firmly on the support, repeat steps c and d above.

- e. Press in the cap on the adjusting knob to lock it in place.

Refer to the air schematic provided for other "Duplex Control" adjustments.

9. Metering Valve Controls Adjustments

Refer to the air schematic provided for adjustments.

E. TOOL PITCHING LIMIT ADJUSTMENTS

Refer to the Pitching Endjoint Assembly provided for adjustment locations.

F. LEVELING THE TOOLING

You may wish to trim the tooling levelness to compensate for any deflection which occurs when the endjoint is side loaded. Positech manipulators are built very rigidly. However, all materials deflect to some extent when loaded and you may wish to compensate for this.

If you decide to adjust the tooling, make adjustments with no payload and then attach the most common payload and check for satisfactory levelness. Readjust as necessary but remove the payload while making adjustments.

Refer to the rotating endjoint assembly drawing provided.

NOTE:

Use only three of the screw jacks (every other one) to trim the tooling level. Then turn the other three screw jacks down snug and tighten their bolts.

1. Loosen the six socket head bolts around the edge of the endjoint using the access hole through the "Box-frame" adaptor. (For rotating endjoints with air passages, back out the set screw under the rotary manifold spool.)

2. Adjust three of the screw jacks and re-tighten the bolts through them evenly. As the jacks are adjusted the socket head bolts may need to be tightened or loosened to provide adjustment clearance.

IMPORTANT:

Torque the socket head bolts to 10 ft.-lb. (15 N-m) maximum.

3. Check the tool level and readjust the three jacks if necessary.

4. Turn the other three screw jacks down snug and torque all six bolts to a maximum of 40 ft.-lb. (54 N-m). Make a final check of the tool level. For rotating air endjoints, turn in the setscrew until it is snug under the spool.

IMPORTANT:

Do not disassemble the endjoint. The ball bearings may fall out and be lost.

SECTION 5 - SAFE OPERATION INSTRUCTION

Important to read and understand before operating the equipment

The following are instructions for safe operation of the manipulator. A few minutes spent reading these rules can make an operator aware of his/her own safety and the safety of others. Frequent examinations and periodic inspections of the equipment and conscientious observance of safety rules will help prevent injuries, lost production time and money.



To avoid injury practice the following:

- **DO** read the operation instructions in this manual.
- **DO** become familiar with the operating controls, procedures and warnings.
- **DO** make sure that if the manipulator is mounted on a portable base, the support surface is flat and that the leveling jacks touch the floor.
- **DO** maintain firm footing while operating the manipulator.
- **DO** operate the manipulator arms by pushing and pulling directly in front of the body.
- **DO** make sure that the load is free to move and will clear all obstructions.
- **DO** make sure that all persons stay clear of the suspended load.
- **DO** warn personnel of an approaching load.
- **DO** promptly report any malfunction, unusual, performance, or damage to the manipulator.
- **DO** inspect the manipulator regularly, replace any damaged or worn parts, and keep appropriate records of maintenance.
- **DO** use Positech parts when repairing the manipulator.



To avoid injury, avoid doing the following:

- **DO NOT** raise more than the rated load.
- **DO NOT** use a damaged unit or a unit that is not working correctly.
- **DO NOT** allow your attention to be diverted while operating the manipulator.
- **DO NOT** operate the manipulator arms by pushing and pulling that requires twisting of the back.
- **DO NOT** use the manipulator to lift, support, or transfer people.
- **DO NOT** lift loads over people.
- **DO NOT** allow unauthorized personnel within the working area of the manipulator.
- **DO NOT** leave a suspended load unattended unless safety precautions have been taken.
- **DO NOT** remove or obscure any warning labels on the manipulator.
- **DO NOT** adjust or repair the manipulator unless qualified to perform such maintenance or repair.

SECTION 6 - OPERATING INSTRUCTIONS

Allowable temperature range: +50°F to +120°F (+10°C to +50°C). Consult factory for temperatures outside this range.

All of the manipulator's operating controls are clearly labeled at the factory. Metering valve controls or balance controls are standard equipment.

Tooling controls vary in complexity. They are typically operated by manual pushbuttons and clearly labeled at the factory. Functional operations are referred to on the operator control, the tooling assembly, and/or the schematic drawings.

A. METERING VALVE CONTROLS

A variable speed, powered up/down control. Simply operate the labeled up or down control as needed. Refer to the air schematic provided for adjustments.

B. BALANCE CONTROLS

A "Load/No Load" control switch and two adjustable regulators are provided. The "No Load" setting allows the operator to float the tooling into the desired location. After the tooling has been connected to the payload, switch the control to the "Load" position in order to float the payload to the desired location.



The "Load Adjustment" will need to be reset if the payload weight changes. The "No Load Adjustment" will need to be reset if the tooling weight changes. Read the Balance Control Adjustments on Page 17, Section E-7 before adjusting the controls and operating.

NOTE:

Machines with "Auto Activation of the Balance Circuit" must be switched to "Load" for the "Load Balance Circuit" to be automatically engaged after the payload is gripped.

C. DUPLEX CONTROLS

This optional feature combines "Metering Valve Controls" with "Balance Controls". For "Metering Valve Control" operation, switch the "Metering/Balance" selector to the "Metering" position. Operate the controls as described for "Metering Valve Controls" in Section A above.

For "Balance Control" operation, switch the "Metering/Balance" selector to the "Balance" position while the tooling and any payload is stationary and supported by the "Metering Controls". When the switch is placed in the "Balance" position the proper balance pressure is automatically set. The tooling and any payload may now be floated to the desired location.

Read the Duplex Control Adjustments on Page 20, Section E-8, before adjusting the controls and operating.

SECTION 7 - MAINTENANCE INSTRUCTIONS

A. AIR SUPPLY

Your Positech air manipulator has an air supply filter/regulator/lubricator (FRL) located near the top of the main post. Refer to the FRL instructions provided for proper maintenance, cleaning and adjustment. Use Marvel tool oil in the lubricator (refer to Material Safety Data Sheets for specifications). Service intervals will vary with the quality and volume of the air supplied. Adjust the lubricator for one drop in each ten minutes of machine control operation.

The manipulator & control circuit utilizes pressurized air for machine lifting, and tooling function. To remove pressure from the machine lift cylinder, see page 27. Pressure to the tooling can be controlled with the pressure regulator that normally is mounted to the Main post of the unit. Depending on the installation, the pressure regulator for the unit maybe in another location.

B. LIFTING THE MANIPULATOR

IMPORTANT:

If the manipulator is being moved, or removed for bearing tightening, inspection, or replacement.

- Position the first arms to horizontal level.
- Secure first arms to forklift with blocks & clamps. Position one fork near main post, the second fork near the middle joint pivot location.
- Remove & disconnect air pressure to the unit.
- Support & disconnect the tooling mechanical & pneumatic connections.
- Fold the second arm back towards the main post.
- Bleed air pressure from lift cylinder.
- To reinstall, reverse process. Pressurize lift cylinder before detaching forks.
- Contact Positech Service for instructions if uncertain how to bleed, or pressurize lift cylinder.

NOTE:

The manipulator requires clean, regulated air. Positech recommends an upstream filter and regulator in the air supply. This allows the manipulator's filter and regulator to act as secondary units. This will help protect the valves, cylinders, and other components from damage. Manipulators with vacuum generators require a "non-lubricated" air supply.

C. MAIN POST ROTATION BEARING

IMPORTANT:

Inspect the bearing every 1000 hours of machine use and after each machine overload of more than 10% for any signs of bearing looseness or bolt looseness. If the bearing shows any sign of out-of-limit looseness, replace the bearing immediately. **DO NOT** operate the manipulator if the main post bearing shows any sign of bearing wear or bolt looseness.

1. To check for bearing wear:
 - a. Measure the bearing's overall thickness all around the bearing. There should be no more than .015 inch (.381 mm) of variation between the manipulator's base plate and outer bearing ring. If more variation is observed, replace the bearing immediately.



If the bearing is observed to be pulling away from the main post (allowing a gap between the manipulator and the bearing), tighten the inner bolt circle immediately. See Page 25, Section B-2 for instructions.

- b. Rotate the manipulator slowly around the main post. Watch and listen to the bearing very closely. If any signs of bearing roughness are detected, replace the bearing immediately.



Do not operate the manipulator with a worn main post rotation bearing or loose bearing bolts. To do so may result in the manipulator breaking away from its support and causing serious damage to equipment and personnel.

1. Make sure the bearing is well greased every year. Two grease zerks are provided in the side of the bearing.

Use any "all purpose bearing grease".
2. Check the torque of the bolts in the outer bolt ring around the bearing every 1000 hours of machine use. The bolts should be evenly cross torqued to between 150 and 200 ft.-lb. (200 to 270 N-m).
3. Every 1000 hours of machine operation inspect the bolts at the inner bolt circle which hold the bearing to the manipulator post plate. Check for looseness as follows:
 - a. Check for any gaps between the bearing and the manipulator post plate with the arm at rest. If a gap is observed, refer to Section 5 below for bolt tightening instructions.
 - b. With the downarm in the vertical position, use it to shake the main post from side to side. If any gap is observed between the bearing and the manipulator post plate, refer to Section 5 below for bolt tightening instructions.

- c. Raise the arm end quickly to the top of its vertical working range. If any gap is observed between the bearing and the manipulator post plate when the arm comes to a sudden stop, refer to Section 5 below for bolt tightening instructions.
4. Every year, or if any gaps between the bearing and the manipulator have been observed, tighten the inner bolt ring through the bearing and into the manipulator as follows:



DO NOT operate the manipulator with loose main bearing bolts.

- a. Support the manipulator with a forklift and strap as required to safely secure it.
- b. Remove the outer circle of bolts which are through the manipulator's support and into the bearing.
- c. Lift the manipulator a few inches away from the support (to get access to the inner circle of bolts which attach the bearing to the manipulator post plate). Be sure to feed any air lines through the support so they aren't pulled from their fittings.
- d. Evenly cross torque all twelve inner bearing bolts to between 150 and 200 ft.-lb. (200 to 270 N-m).
- e. Lower the manipulator back against its support. Pull any air hoses through the support so they aren't crushed or twisted.
- f. Evenly cross torque all six bolts in the outer circle (through the support and into the bearing) to between 150 and 200 ft.-lb. (200 to 270 N-m).
- g. Remove the forklift, reconnect the air supply and re-inspect the bearing for wear.

D. MACHINE LEVELING

Refer to Page 15-16 of the Machine Adjustments for Leveling & Page 30 for service interval and instructions.

E. BALL, ROLLER AND NEEDLE BEARINGS

These are packed with grease and sealed at the factory. The ball, roller and needle bearings shouldn't require lubrication and are, therefore, virtually maintenance free. Manufacturer's part numbers for many of these items are provided in the parts list for your convenience.

F. VALVES

All air valves are replacement items if they should become defective. Manufacturer's part numbers for many of these items are provided in the parts lists. Refer to the air schematic and its parts list provided for proper valve identification.

G. VACUUM FILTERS

Refer to the vacuum tooling assembly drawing provided for vacuum filter locations. Most filters may be cleaned if necessary. The service interval will vary depending upon the particular tooling application. Refer to the tooling drawings and parts lists for identification.

H. H. TOOLING BEARINGS

Refer to the tooling assembly drawing(s) provided for any tooling bearing locations and descriptions. Grease zerks are provided if necessary. Service intervals will vary according to the type and usage of the tooling. Manufacturer's part numbers for many of these items are provided in the parts lists.

I. LIFT CYLINDER

The lift cylinder requires no maintenance. If the lift cylinder develops a leak past the seals, it will need to be repaired or replaced. For a replacement cylinder, contact Positech Corporation. Refer to the Recommended Spare Parts List for seal kit information.

1. Lift Cylinder Removal:

- a. Place a block under the lifting assembly to firmly support it with the arm in the fully down position.



Releasing air pressure to the lift cylinder when the machine is not full down, or other wise supported will allow sudden lowering movement of the machine arms, and tooling. This situation can be dangerous, and should be avoided.

- b. Depressurize the lift cylinder as follows:

- i. For metering valve controls and duplex controls: Operate the down control until the air flow out of the cylinder stops.
- ii. For balance controls: Select the "No Load" balance circuit lower the arm and back out (counterclockwise) the "No Load Adjustment" all the way (it should not fall off).

NOTE:

The arms should now be completely supported by the block under the lift assembly.

- c. Disconnect the air supply.
- d. Disconnect the valves mounted to the side of the cylinder. Be careful not to lose the O-ring seals around the port holes.
- e. Carefully remove the connectors at either end of the lift cylinder.



The cylinder will extend or retract when the first bolt is removed, due to gravity. **DO NOT** manually extend or retract diaphragm cylinders.

2. Lift Cylinder Installation:

Reverse the procedures for removal as described above.

J. J. LOST LOAD SAFETY CYLINDER

The lost load cylinder should not use or leak a noticeable amount of its hydraulic fluid. The cylinder should be kept full of Case IH transdraulic fluid (refer to Material Safety Data Sheets for specifications). Use the pipe plug near the top of the cylinder to check the fluid level every 3 months and keep it full. Fluid will run out if it is full. Bleeding is not required.

NOTE:

Be sure to always seal, replace and tighten the pipe plug after inspection.

If the lost load cylinder begins to leak a noticeable amount of hydraulic fluid, it will need to be repaired or replaced.

For a replacement cylinder contact Positech Corporation. Refer to the Recommended Spare Parts List for seal kit information. Refer to the Lost Load Cylinder Assembly drawing for details.

NOTE:

Replacement cylinders do not include the lost load cylinder locking valve which is bolted to the side of the lost load cylinder.

K. K. SAFETY TESTS

1. Lift Cylinder Safety Locking Valve

Instantaneously remove the air supply to the manipulator. For example: Break a fitting loose or disconnect a quick disconnect in the air supply line to the machine so the manipulator system pressure drops instantly to atmospheric pressure. The arm end should not drop more than a few inches. The air pressure in the cylinder should be "blocked-in" restricting the vertical arm end movement. If the cylinder pressure is not blocked, the blocking valve will need replacement.

NOTE:

Slowly turning down the system pressure (with a regulator, for example) will not seat the blocking valve and the arm will drift down.

2. Lost Load Safety Cylinder

Test the cylinder as follows:



Stand clear of the tooling so it won't hit you if it moves quickly upward.

- a. Balance Control Test: Switch to the "Load" balance circuit with no payload on the arm end. The arm should only travel quickly upward a few inches before locking and then it should move slowly upward.
- b. Duplex Control Test: Select the "Metering" control circuit. Turn in the "No Load Adjustment" one or two full turns (clockwise). Switch to the "Balance" control circuit with no payload on the arm. The arm should only travel quickly upward a few inches before locking and then it should move slowly upward.

- c. Metering Control Test: Adjust the maximum "up speed" so the machine can travel upward with no payload at a very fast rate. Quickly operate the up control at maximum speed. The arm should only travel quickly upward a few inches before locking and then it should move slowly upward.

NOTE:

If the lost load safety cylinder does not operate properly refer to the Adjustment Instructions on Page 18, Section C for the Lost Load Safety Locking Valve. Also check the cylinder oil level (see Page 28, Section J.)

CAUTION:

Be sure to properly adjust the balance, duplex, or metering controls before operating the manipulator. If the locking valve adjustments do not correct any improper operation of the lost load safety cylinder, replace the locking valve immediately.

3. **Gripper Safety Circuit (GSC)**



GRIPPER SAFETY CIRCUIT (GSC) WARNINGS!

THE PAYLOAD WILL BE RELEASED BEFORE IT IS SAFELY SUPPORTED WHEN THE RELEASE BUTTON IS PUSHED IF ANY OF THE FOLLOWING OCCUR:

1. The lift arms are in the full down position!
2. The lost load device is activated (causing the lift arms to be supported)!
3. The arms or tooling are supported, for whatever reason, before the payload is safely supported!



Do not perform this test while gripping the payload. Test weights should be hung from the tooling.

NOTE:

The GSC is factory adjusted and may not require further adjustment. All adjustable valves are labeled. See the air schematic provided for valve locations and other information.

- a. Lift a 22 lb. (10 Kg.) test weight using the Metering or Balance Controls.
- b. Press the gripper control button.

NOTE:

The gripper should not open or close. If the gripper operates, unscrew the GSC adjuster screw until the gripper will not operate.

- c. Slowly set down the payload using the Metering or Balance Controls. The gripper should now operate.

NOTE:

If the gripper does not operate, turn in the GSC adjuster screw until the gripper will operate. Repeat steps a. and b.

SECTION 8 - SERVICE

The POSITIONING ARM should already be adjusted for level and parallelism, be fully lubricated. But, you should check all points on the machine before use. Many bearing points are teflon lined, never requiring lubrication. The following chart lists the lubrication requirements.

ITEM	LOCATION AND PLACES	DESCRIPTION	FREQUENCY AND AMOUNT	RECOMMENDED LUBRICATION
1	2	Grease zerks at the middle joint	1 shot each 12 months*	Lubriplate #630 grease or equivalent
2	1	Grease zerk at the endjoint	1 shot each 12 months*	Lubriplate #630 grease or equivalent
3	2	Grease zerks at the top and bottom of the main case	2 shots once a year	Lubriplate #630 grease or equivalent
4	3	Grease zerks for the lift cylinder	1 shot every 3 months	Lubriplate #630 grease or equivalent
5	Several	Grease zerks on optional accessories	As needed	Lubriplate #630 grease or equivalent
6	Several	Pivot pins on the optional accessories	As needed	#30 Weight oil

* Excessive grease in the drag brakes will reduce brake effectiveness.

Although few mechanical items need attention, occasionally check all bolts and nuts for tightness and the main post for level (See **Leveling** in Section IV).

See the Service Checklist on the following page for items typically inspected on a monthly, or routine basis. Use this form for establishing specifications for preventative maintenance service on this unit.

SERVICE CHECKLIST FOR POSITECH PNEUMATIC MANIPULATORS

SER-012, REV. IR

Company _____ Date _____ Model _____

-

Asset Number _____

Location _____

Serial # _____

OK	Corrective Action Required	Corrective Action Completed	Inspection Items All items in which the corrective action was not completed must have an action plan to correct the problem!
----	----------------------------------	-----------------------------------	---

-
Check with operator about any possible concerns with unit. Operate the unit to verify any operator complaints and check for the following. List any item that is not to Positech's OEM specifications.

- | | | | |
|--------------------------|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Inspect structure for cracked welds. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Inspect for loose or missing fasteners on machine & tooling. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check the level of the manipulator. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check all bearings on the manipulator for proper operation. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check adjustment of Drag Brakes. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check air supply to manipulator. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check oil level in lubricator <input type="checkbox"/> Setting <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Test for proper operation of Lost Load Cylinder <input type="checkbox"/> Leaks <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Inspect condition and routing of all external hoses. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check Rotary Air Joint for leaking between passages. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Inspect all cylinders for external leakage. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check the Safety Lock Valves to ensure they are operating to specifications. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check all pneumatic connections for leaks. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Test that air circuitry operates according to schematic. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Check Gripper Safety Circuit (GSC) for proper operation. |

Description of items repaired or still in need of repair and plan of action to complete repairs. Also any additional items requiring repair not listed above.

Parts Supplied by Positech for repair of unit.

Service Technician _____

Date _____