OPERATOR SERVICE MANUAL

POSITECH CORPORATION
191 N RUSH LAKE ROAD
LAURENS, IA 50554
Phone Number: 800-831-6026
24 Hour Service Phone Number: 541-954-2948
Email: service@positech.com

SERIAL NO: __________
RUN NO: __________

Models Covered:
ReactionArm 1000
LodeArm 3030L
LodeArm 4500L

REV D
08-FEB-19
SECTION 1 - NAMING CONVENTION AND SERIAL TAG

A. NAMING CONVENTION

- Primary Arm
- Main Post
- Drag Brake
- Middle Joint Brake
- Adjustable Rotation Stop (Option)
- Lift Arm
- Lift Cylinder
- Middle Joint
- End Joint
- Down Shaft
- Anchor Bolt & Leveling Jacks (Option)
- Main Post Rotation Stop (Option)
- Pedestal (Option)
B. SERIAL TAG LOCATION AND NOMENCLATURE

Model Number
Capacity of Base Machine Only
Serial Number – PROVIDE FOR SERVICE SUPPORT (shown on cover)

Electrical Voltage/Hertz/Phase
Weight

Air PSI
Electrical Amps

Design Category
Air SCFM

POSITECH CORPORATION
LAURENS, IA 50554
800-831-6026
WWW.POSITECH.COM

SERIAL Tag Location
SECTION 2 - SPECIFICATIONS
See Profile Drawing for special notes.

A. MECHANICAL SPECIFICATIONS
Equipment reach and load limit specifications are identified on the Profile Drawing supplied with specific projects. The Profile Drawing will include application lift and mounting configurations identified and supplied at time of sale.

B. PNEUMATIC SPECIFICATIONS
See Profile Drawing for specification.

C. HYDRAULIC SPECIFICATIONS
See Profile Drawing for specification.

D. ELECTRICAL SPECIFICATIONS
See Profile Drawing for specification.

E. AERIAL NOISE
Aerial noise measurements are taken at the operator’s work position and based on a 50th percentile operator’s height. Hearing protection required if level of continuous acoustic pressure is greater than 80 dB (A scale)

F. ENVIRONMENTAL CONDITIONS
The equipment is designed to operate inside a protected site from outside environmental conditions. The operating environment needs be free of aggressive contaminants, acids, corrosive gases, salts, etc.

Operating Temperature
- This equipment will operate correctly in its intended ambient between 40°F – 120°F [5°C – 49°C]

Relative Humidity
- This equipment will operate correctly within an environment at 50% RH, +105°F [+40°C]. Higher RH may be allowed at lower temperatures but must be less than 95% RH
- Measures shall be taken by the Purchaser to avoid the harmful effects of occasional condensation.

Altitude
- This equipment will operate correctly up to 3280ft [1000m] above mean sea level.

Transportation and Storage
- This equipment will withstand, or has been protected against, transportation and storage temperatures of -10°F [-25°C] to 130°F [+55°C] and for short periods up to 160°F [+70°C].
- It has been packaged to prevent damage from the effects of normal humidity, vibration and shock.

G. CONVERSION FACTORS TO SI UNITS

<table>
<thead>
<tr>
<th>UNITS</th>
<th>MULTIPLY</th>
<th>BY</th>
<th>TO OBTAIN</th>
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<td>6.895</td>
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<tr>
<td>TEMPERATURE</td>
<td>F</td>
<td>SUBTRACT 32 AND MULTIPLY BY 5/9</td>
<td>C</td>
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</table>
## H. AIR LINE SIZING FOR SUPPLY AIR

Note: See profile drawing for required flow and pressure.

### SCFM

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<tr>
<th>FLOW</th>
<th>25</th>
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### SLM

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## I. SAFETY FEATURES

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>LOCATION</th>
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<tbody>
<tr>
<td>PILOT OPERATED CHECK VALVE:</td>
<td>On lift cylinder</td>
</tr>
<tr>
<td>Prevents arm movement with sudden loss of air.</td>
<td></td>
</tr>
</tbody>
</table>

*Diagram of safety feature*
J. 15” PEDESTAL MOUNTING PATTERN

K. 10” PEDESTAL MOUNTING PATTERN
L. OVERHEAD SPACER MOUNTING PATTERN
M. CONCRETE MOUNTING GUIDELINES

It is solely the customer’s responsibility to provide the proper foundation for the manipulator and if conditions are questionable or concrete does not look adequate the customer needs to consult a qualified professional to inspect and make recommendations.

N. SOIL CONDITION

The minimum soil condition that must also be achieved is 2500 lbs/sq ft [0.12 MPa].

O. FULLY REINFORCED CONCRETE FLOOR CONDITION

- 6 in [152mm] thick
- 3500 psi [24.1 MPa] compressive strength
- No cracks within 48in [1.2m] radius of pedestal

P. Poured FOUNDATION CONDITION

Foundation dimensions: 66” X 66” X 18”

Q. PLATING ON CONCRETE

Contact Positech for drawings or ordering information.
SECTION 3 - INSTALLATION INSTRUCTIONS

A. PALLET INFORMATION

Inspect manipulator for any signs of damage due to shipping. Document damage and make any claims to the carrier.

MANIPULATOR AS SHIPPED FROM POSITECH:

Do not cut manipulator banding. Refer to LIFTING WITH A FORK TRUCK for installation instructions.
B. PEDESTAL INSTALLATION

LEVEL PEDESTAL BEFORE INSTALLING MANIPULATOR ON PEDESTAL (See LEVELING THE PRIMARY ARM for leveling the manipulator if it is already installed on pedestal.)

Refer to CONCRETE MOUNTING GUIDELINES for concrete guidelines before mounting pedestal. Review profile drawing for torque requirement.

1. Set pedestal over area and drill holes using pedestal for template.

Locate pedestal so airline can be routed through air supply hole.

2. Move pedestal and clean holes with compressed air and nylon brush.

3. Add 1 flat washer between concrete and pedestal for each jack.

4. Assemble anchor with washer, lock washer, and nut below anchor bolt chamfer and drive in with hammer.

5. Torque anchor to seat anchor. Then loosen.

6. Level pedestal by adjusting the leveling jacks. Use a machinist's level to check in two directions perpendicular to each other.

7. Tighten the jam nuts on jacks against pedestal flange.

8. Torque the anchors.

FINAL NOTES:

- No grouting is required to mount this pedestal.
- Re-torque this pedestal one week after install.
- Re-torque pedestal according to suggested maintenance schedule.
C. SPACER INSTALLATION

LEVEL SPACER BEFORE INSTALLING MANIPULATOR ON SPACER: (See LEVELING THE PRIMARY ARM for leveling the manipulator if it is already installed on spacer.) Review profile drawing for torque requirement.

1. Install jack and jam nut.
2. Install flat washer and lock nuts if necessary.
3. Loosen the jam nut for leveling.
4. Loosen the bolts enough to level spacer.
5. Level spacer by adjusting the leveling jacks. Use a machinist’s level to check in two directions perpendicular to each other.
6. Tighten the bolts.
7. Tighten the jam nuts against spacer.
8. Re-check levelness of spacer to make sure it is still level.

Use a machinist’s level to check in two directions perpendicular to each other.
D. LIFTING WITH A FORK TRUCK

The manipulator is palleted to allow for easy installation with a fork truck. Raise the pallet above the pedestal and lower the manipulator onto the pedestal and install as shown in ATTACHING MANIPULATOR TO PEDESTAL.

For overhead mount, simply raise the pallet up until the manipulator mates with the mounting surface. See ATTACHING MANIPULATOR TO SPACER for installation details.
E. ATTACHING MANIPULATOR TO PEDESTAL

Lift manipulator as shown in LIFTING WITH A FORK TRUCK

Run air line through hole in pedestal and connect to nipple.

Lower manipulator until bearing housing mates to pedestal.

Torque machine mounting bolts. See profile drawing.

F. ATTACHING MANIPULATOR TO SPACER

Run air line through hole in spacer and connect to nipple.

Lift manipulator until bearing housing mates to spacer

Torque machine mounting bolts. See profile drawing.

Lift manipulator as shown in LIFTING WITH A FORK TRUCK
G. PREPARING THE PRIMARY ARM FOR LEVELING

All adjustments of the primary arm will be accomplished by adjusting the leveling jacks or shimming under the primary bearing housing.

1. Position lift arm under primary arm. If lift arm will not go under primary arm position lift arm straight out from primary arm.

2. Loosen primary arm brake caliper to allow primary arm to rotate freely.
H. LEVELING THE PRIMARY ARM – DRIFT METHOD

1. Select any of the four positions shown such as position A and rotate the primary arm into that position. Release arm and step back so that any "drift" (movement to the left or the right) of the primary arm can be noted.
2. To correct for drift, loosen the anchor bolts at the base and extend the levelling jacks on the side of the pedestal base plate that the arm drifted toward.
3. Re-tighten anchor bolts and return arm back to position A and repeat steps 1 & 2, if drift still occurs.
4. When all drift has been removed from position A, rotate primary arm 180 degrees to position B and repeat steps 2 & 3.
5. When all drifts have been removed from position B, rotate primary arm 90 degrees to position C and repeat steps 2 & 3.
6. When all drift has been removed from position C, rotate primary arm 180 degrees to position D and repeat steps 2 & 3. This completes the levelling of the primary arm.
I. PREPARING THE LIFT ARM FOR LEVELING

Leveling adjustments to the lift arm do not affect the alignment of the primary arm.

1. Tighten primary caliper brake to prevent primary arm from rotating.
2. Loosen middle joint brake caliper to allow lift arms to rotate freely.
3. Rotate lift arm parallel to primary arm.

Leveling adjustments to the lift arm are performed by loosening or tightening the adjustment bolts in the adjusting collar.
J. LEVELING THE LIFT ARMS

1. Select a position such as B and rotate the lift arm into that position. Release arm and step back so that you can note any drift of the lift arm.
2. If any drift occurs, tighten the adjustment bolt or bolts, on the side that the arm drifted towards, while at the same time loosening the adjustment bolt or bolts, on the side opposite of the bolt or bolts being tightened.
3. Repeat steps 1 & 2 to check for any additional drift.
4. After all drift has been eliminated from position B, rotate lift arm 90 degrees to position C and repeat steps 1, 2 & 3.
5. After all drift has been eliminated from position C, rotate lift arm 180 degrees to position D and repeat steps 1, 2 & 3.
6. This completes the levelling of the lift arm. Re-adjust the primary arm brake (and middle joint brake, if applicable) to fit your requirements.
K. SETTING THE ROTATION STOPS

Rotation stops may be supplied for the main post and middle joint rotation axis. Set the rotation stops to allow the proper working range for the manipulator.

1. Rotate arm to stop position
2. Slide rotation stop onto brake disk with bumper located against caliper brake support
3. Tighten set screws to set stop location
4. Use 3/8 transfer punch to locate drill holes through center of the set screw
5. Drill ø0.266 holes thru brake disk
6. Tighten bolts, washers, and lock nuts
The middle joint had holes pre-drilled to allow the lift arms to rotate equally in both directions. The rotation stop can be moved to allow the lift arms to be stored under the primary arm.

If the middle joint rotation stop is moved, the lift arms may be able to contact the primary arm if the operator moves the lift arms into the contact zone.

Use caution when relocating the middle joint rotation stop to keep the hoses routed around the middle joint from being wrapped around the joint.

If two rotation stops are supplied for the middle joint, it may be useful to set one stop so the lift arm cannot rotate past center. This is useful if the lift arms are used in one quadrant of rotation.
SECTION 4 - SERVICE INSTRUCTIONS – MAINTENANCE, ADJUSTMENTS, & INSPECTIONS

A. SERVICE INSTRUCTIONS

<table>
<thead>
<tr>
<th>LOCK OUT TAG OUT</th>
<th>– Remove power from upstream power supply disconnect, apply lock and tag, then disconnect power at the machine. Apply lock and tag at machine after disconnecting power.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Follow any site-specific requirements for lock out tag out procedures.</td>
</tr>
</tbody>
</table>

| ARC FLASH WARNING | – The possibility of arc flash occurrence exists. Wear appropriate PPE. Work on circuit components in the de-energized state.                                                                                                    |

| POWER CORD PROTECTION | – The power supply cord for this product acts as the main-disconnect. It should be routed or installed in such a manner to protect it from being walked on or pinched. The unit should be powered down completely before connecting or disconnecting the power cable. The power cord should be removed before moving the unit. The power cord must be placed near an easily accessible unobstructed socket outlet. |

| CLEANING | – If it should become necessary to clean this equipment, disconnect the unit from its power source first. Do not use liquid cleaners, aerosols, abrasive pads, scouring powders or solvents, such as benzene or alcohol. Use a soft cloth lightly moistened with a mild detergent solution. Ensure the surface cleaned is fully dry before reconnecting power. |

<table>
<thead>
<tr>
<th>DAMAGE REQUIRING SERVICE</th>
<th>– Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• When the power supply cord is damaged.</td>
</tr>
<tr>
<td></td>
<td>• If liquid has been spilled into the enclosure of the unit.</td>
</tr>
<tr>
<td></td>
<td>• If the product does not function normally by following the instructions in the User’s Guide. Adjust only those controls that are covered by the operating instructions. Improper adjustment of other controls may result in damage and will often require rework by a qualified technician to restore the product to its normal operation.</td>
</tr>
<tr>
<td></td>
<td>• If the product has been damaged in any way.</td>
</tr>
<tr>
<td></td>
<td>• When the unit displays a negative and distinct change in performance.</td>
</tr>
</tbody>
</table>
### MATERIAL DISPOSAL

- **Hydraulics/Lubricants** – Must be recycled as required by local environmental law – do not dispose of by pouring down the drain.

- **Electronics** – Must be recycled as required by local environmental law – do not dispose of by adding to the Municipal waste stream.

- **Metal/Other Parts of the System** – Must be recycled as required by local environmental law.
### B. MECHANICAL ADJUSTMENTS

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DRAG BRAKE ADJUSTMENT</strong> – Tighten to increase drag, loosen to decrease drag</td>
<td><strong>POINTS OF MANIPULATOR &amp; TOOLING ROTATION</strong></td>
</tr>
<tr>
<td><strong>HYDRAULIC APPLY CALIPER BRAKE ADJUSTMENT</strong> – Loosen set screw to allow caliper to be adjusted. Use spanner wrench to tighten caliper. Confirm free rotation when brake is retracted before tightening set screw.</td>
<td><strong>MANIPULATOR &amp; TOOLING ROTATION AXIS BRAKES</strong></td>
</tr>
<tr>
<td><strong>SPRING APPLY HYDRAULIC CALIPER BRAKE ADJUSTMENT</strong> – Loosen set screw to allow caliper to be adjusted. Use spanner wrench to tighten caliper. Confirm free rotation when brake is retracted before tightening set screw.</td>
<td><strong>MANIPULATOR &amp; TOOLING ROTATION AXIS BRAKES</strong></td>
</tr>
</tbody>
</table>
C. BALANCE CONTROL ADJUSTMENTS

See the pneumatic schematic for specific information regarding the pneumatic components used.

CONNECTING THE SUPPLY AIR

Set the system pressure regulator to zero.
Connect supply air. Verify pressure and flow requirements listed on profile drawing.
Adjust system pressure regulator to requirement shown on profile drawing.

LOAD & NO LOAD BALANCE REGULATORS

If there is a bias circuit or a payload is lifted, there are two balance regulators. The regulators are labeled accordingly.

Set the “No Load” balance regulator with the empty tool.
Set the “Load” or “Bias” balance regulator with the tool and payload or with the bias switch actuated.

WARNING: The “Load” adjustment will need to be reset if the payload weight changes. The “No Load” adjustment will need to be reset if the tool weight changes.

Use the following steps to set the “Load” and “No Load” balance regulators.
Fully unscrew the “No Load” balance regulator.
With only the tool weight, carefully adjust the “No Load” regulator until the tool does not drift up or down.
Fully unscrew the “Load” balance regulator.
Make sure the “Load” or “Bias” switch is activated.
Add the payload to the tool and carefully adjust the “Load” regulator until the tool and payload does not drift up or down.

LOCK OUT PROCEDURE FOR BALANCE CONTROL

Remove payload from tool and lower tool to lowest position.
Set the system pressure regulator to zero.
Lockout per factory procedure.

WARNING: The machine is not in a zero-energy state. There may be pressure trapped in any cylinder with a lock valve due to the lock valve minimum locking pressure. If a zero-energy state is required, cylinder lock valves need to be piloted by an external air source and some air lines may need to be removed. See pneumatic schematic for more details and consult Positech with additional questions.
D. METERING CONTROL ADJUSTMENTS

See the pneumatic schematic for specific information regarding the pneumatic components used.

CONNECTING THE SUPPLY AIR

Set the system pressure regulator to zero.
Connect supply air. Verify pressure and flow requirements listed on profile drawing.
Adjust system pressure regulator to requirement shown on profile drawing.

LOCK OUT PROCEDURE FOR METERING CONTROL

Remove payload from tool and lower tool to lowest position.
Set the system pressure regulator to zero.
Lockout per factory procedure.

WARNING: The machine is not in a zero-energy state. There may be pressure trapped in any cylinder with a lock valve due to the lock valve minimum locking pressure. If a zero-energy state is required, cylinder lock valves need to be piloted by an external air source and some air lines may need to be removed. See pneumatic schematic for more details and consult Positech with additional questions.
E. ROUTINE AND PREVENTATIVE MAINTENANCE INSPECTIONS

Maintenance, adjustments, and inspections fall into three categories: every lift, frequent, and periodic and should be performed by personnel authorized and qualified to perform each task.

- **Every lift evaluations**: are visual examinations completed by operator before and during each lift.

- **Frequent evaluations**: are visual examinations completed by the operator or designated persons with records not required. The period to complete these evaluations is based on a service rating of normal (monthly), heavy (weekly), or severe (daily) as explained below.

- **Periodic evaluations**: are visual examinations completed by qualified personnel completing records of apparent external condition to provide a basis for continuing evaluation. The period to maintain these records is based on a service rating of normal (yearly), heavy (semiannually), or severe (quarterly) as explained below.

<table>
<thead>
<tr>
<th>Normal Rating</th>
<th>Heavy Rating</th>
<th>Severe Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 65% of rated load</td>
<td>65% to 100% of rated load</td>
<td>At 100% of rated load</td>
</tr>
<tr>
<td>Operate in an industrial environment free of aggressive contaminants</td>
<td>Operate in an industrial environment free of aggressive contaminants</td>
<td>Operate in abnormal environment</td>
</tr>
<tr>
<td>Life of manipulator is 2,000,000 cycles</td>
<td>Life of manipulator is 1,000,000 cycles</td>
<td>Life of manipulator is 500,000 cycles</td>
</tr>
</tbody>
</table>

For a manipulator that is outside these conditions refer to the profile drawing and/or consult the factory for specific instructions.

**EVERY LIFT EVALUATIONS**

- Remove excess debris from surface of the load.
- Verify grip pad or vacuum cup is free of contaminant. Replace if excessively worn.
- Check the condition of the operator’s controls and gauges on controls
- Verify the load is secure after actuation of tooling and before moving the manipulator.

**FREQUENT EVALUATIONS**

- Move the manipulator in and out and around each axis and check for free motion. Check bearing seals for leakage or damage. Replace any bearings that need to be replaced.
- Check friction devices, linkages, and other mechanical parts for excess wear and replace as needed. Check drag brake pucks for excessive wear.
- Check welds on structural members for cracks. Look for cracked or missing paint over a weld. If welds are torn from the base steel, cracked, or broken the manipulator should not be used until repaired or determined safe. Consult factory for solution.
- Check structural members for deformations. Consult factory for solution.
- Check pivoting points and hook points for excessive wear and replace as needed.
- Replace missing guards, fasteners, covers, stops, decals, warning labels, or nameplates.
- Check for loose fasteners, especially set screws, and retighten.
- Check for leaks. Inspect condition and routing of all external hoses. Replace any leaky components or cracked hoses.
FREQUENT EVALUATIONS cont.

- See LUBRICATION SCHEDULE for lubrication information.
- Wipe down cable and inspect cable jacket and ensure that the coating is smooth and free of damage.
- Inspect cable for discoloring, kinking, crushing, bird caging, corrosion, broken or cut strands, and any other obvious defects along any section of wire rope.
- Inspect the lower end of wire rope where it attaches to the handle, swivel assembly, or tooling for signs of damage or excessive wear.
- Replace cable assembly if any evidence of a potential failure is observed.
- Verify operation of all circuit breakers and E-stop functions.
- Verify all electrical connections and wires terminations are tight (check for loose screws and hardware).
- Operating the manipulator: Check that all functions are in adjustment, that all automatic mechanisms functions properly, and that no functions interfere with current operation of the work cell.

PERIODIC EVALUATIONS

- Complete the frequent evaluations along with the following evaluations.
- Check anchor bolts and re-torque. See PEDESTAL INSTALLATION for detailed views.
- Check spacer mounting bolts if overhead mounted and re-torque. SPACER INSTALLATION for detailed views.
- Check main post mounting bolts and re-torque. See ATTACHING MANIPULATOR TO PEDESTAL or ATTACHING MANIPULATOR TO SPACER for detailed views.
- Check manipulator for level both in/out and around the main post and end joint. If the manipulator is level, the manipulator will not wander or wander very little. See LEVELING THE PRIMARY ARM for leveling the manipulator to eliminate drift in all operating quadrants.
- Check for worn or cracked gears, pulleys, sheaves, sprockets, bearings, chains, or belts and replace as needed.
- Inspect all wear parts and replace as needed.
- Grease all grease fittings with grease specified on the profile.
- If cable gland seal is leaking replace entire cable assembly.
- Once cable has been inspected ensure that sealing action at cable gland is uniform. (It is recommended that "Snoop" leak detection fluid is used).
- Further inspection can be done by measuring cable diameter at varying intervals along the length of cable.
- If cable "necks down" to a smaller diameter within a short distance or is discolored these could be signs of a potential failure.
- Visually inspect all electrical components for abnormalities or signs of excessive overheating.
- Visually inspect all wiring and electrical connections for signs of excessive heating.
- Visually inspect the electric motor for damage, signs of wear, or signs of overheating.
- Visually inspect electrical enclosure to ensure it is clean and no foreign objects are present.
- Check air supply to manipulator. See profile drawing for required pressure and flow.
- Inspect lift cylinder pilot check valves. Inspect check valves on grip cylinder or vacuum check valves.
- Check GSC adjustment. Use empty tool and adjust GSC knob until an audible pop is heard. Screw in adjustment ¼ turn and tighten jam nut. Refer to pneumatic schematic for more detail. Verify adjustment using a scrap part.
The manipulator should already be adjusted for level, be fully lubricated, and the reservoir should be full of oil but all points on the machine should be checked before use. Many bearing points are Teflon lined which do not require lubrication. The following chart lists the lubrication requirements.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>AMOUNT</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDRAULIC BRAKE OIL RESERVOIR</td>
<td>EVALUATE FILL LEVEL WHEN BRAKE CALIPERS ARE RETRACTED PER PERIODIC SCHEDULE</td>
<td>AW ISO-46 HYDRAULIC OIL</td>
</tr>
<tr>
<td>GREASE ZERKS ON OPTIONAL ACCESSORIES</td>
<td>AS NEEDED</td>
<td>NLGI GRADE 2 EP LITHIUM GREASE</td>
</tr>
<tr>
<td>PIVOT PINS ON OPTIONAL ACCESSORIES</td>
<td>AS NEEDED</td>
<td>ISO 100 OIL</td>
</tr>
</tbody>
</table>

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

** With all actuators fully retracted, the oil showing in the sight gage will be even with the oil level mark on the side of the reservoir when the oil reservoir is full.
SECTION 5 - TROUBLESHOOTING

1. Machine does not move up or down
   A. Check main air supply
   B. Verify lost load cylinder isn’t locked
   C. Check main regulator
   D. If used, check lift cylinder on/off switch
   E. Check pilot to lock valve
   F. Check lock valve

2. Drifts up
   A. Check metering valve for leaks
   B. Check GSC valve for leaks
   C. If used, check 6 passage rotary manifold for leaks
   D. Check balance setting
   E. Check minimum lift setting
   F. Check tool balance adjustment setting

3. Drifts down
   A. Check metering valve
   B. If used, check 6 passage rotary manifold for leaks
   C. Check for leaky lift cylinder seal, blocking valve connection
   D. Check white poly lines for leaks

4. Main post rotation difficult
   A. Check for main post bearing wear
   B. If used, check drag brake adjustment
   C. Check rails on trolley systems

5. Grip release without being supported
   A. Check GSC setting
   B. If used, check 6 passage rotary manifold for leaks
   C. Verify proper hose connections
   D. Check bleed down speed

6. Oil discovered on machine
   A. Check lost load cylinder for leaks
   B. Check hydraulic lines to brakes
   C. Verify FRL lubricator is not set too high
   D. Check FRL

7. Up/Down movement difficult
   A. Check balance regulator adjustment
   B. Verify horizontal arms are not rubbing on lift housing
   C. Check lift cylinder and muffler
   D. Check lost load cylinder
   E. Check vertical cam eccentrics
   F. Verify supply pressure and sufficient flow

8. Rotation drift at tooling
   A. Check main post level
   B. Check anchor bolts on main post
   C. Check middle joint leveling
SECTION 6 - OPERATOR INSTRUCTIONS

The manipulator is used for manipulating and moving parts through the work cell. Manual and powered functions are available to allow the movements necessary to perform the tasks.

Refer to safety warnings, precautions, and Dos and Don'ts for general manipulator safety and use.

<table>
<thead>
<tr>
<th>![Warning Symbol]</th>
<th>Do not use this equipment for any purpose not described in this manual.</th>
</tr>
</thead>
<tbody>
<tr>
<td>![No Operation Symbol]</td>
<td>Do not operate this equipment without all guards and covers in place.</td>
</tr>
<tr>
<td>![Warning Symbol]</td>
<td>Do not operate this equipment from any power source that does not match the voltage rating stamped on the equipment. Refer to the serial tag for operational requirements.</td>
</tr>
<tr>
<td>![Hearing Protection Symbol]</td>
<td>Hearing protection required if level of continuous acoustic pressure is greater than 80 dB (A scale).</td>
</tr>
</tbody>
</table>

SEE PROFILE DRAWING FOR DETAILED PICTURE AND LABELS OF CONTROLS
A. MANIPULATOR MOVEMENT

The manipulator movement is manually controlled. Speed of movement should be maintained at a controllable and safe level by the operator to allow for ease of stopping and positioning.

Manipulators with longer arms and heavier lift capacities usually have greater mass and take more operator forces to control and position. Therefore, consideration needs to be given when reviewing work cell layout and cycle rates for these larger and heavier manipulators.

Use of excess speed can result in momentum that can be difficult to control and dangerous for the operator. The mass of the machine moving at a fast speed can create forces that are dangerous for the operator to control and expose the operator to physical injury when trying to stop due to loss of control. Part and customer equipment damage may also result.

Drag brakes can be used to control arm movement. Small amounts of drag brake force can help control arm movements and reduce drift due to operator use and arm deflection.

B. END OF ARM LIFTING

End of arm lift assist tooling varies to customer application. When lifting equipment is added to the end of arm, the weight of the lifting equipment must be factored into the moment loading and lift capacity of the equipment.

When a fixed lifting device is included, it may serve as a location to mount an operator controls station for movement of the manipulator and for actuation of the functions.

Lifting devices may require electric, hydraulic, or pneumatic connections for motion. See requirements identified on Profile Drawing, schematics, and component literature for equipment supplied by Positech for requirements. Lifting controls will vary depending on the style and options selected at the time of sale.

C. TOOLING

End of lift or end of arm tooling varies per customer application requirements. Positech supplies tooling options that are reflected in the tool drawings and equipment supplied. Weight of the tooling must be factored into the lift capacity of the manipulator.

Tool function and control needs to be factored into safe operation of the manipulator movements. Part security, working clearances, and controllable operator speeds are all factors in the machine operation.
APPENDIX A: MACHINE OPERATION PROCEDURE
APPENDIX B:
DRAWINGS, SPARE
PARTS LIST