Service Manual

25F Paper Roll Clamp
Serial Numbers 680077 through 680143

IMPORTANT: All hardware on 25F attachments is metric. All hosing and fittings are JIC.
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION, Section 1</td>
<td>1</td>
</tr>
<tr>
<td>Special Definitions</td>
<td>1</td>
</tr>
<tr>
<td>INSTALLATION INSTRUCTIONS, Section 2</td>
<td>1</td>
</tr>
<tr>
<td>Truck Requirements</td>
<td>1</td>
</tr>
<tr>
<td>Installation</td>
<td>2</td>
</tr>
<tr>
<td>Truck Preparation</td>
<td>2</td>
</tr>
<tr>
<td>Attachment Installation</td>
<td>2</td>
</tr>
<tr>
<td>Indicator Tape Group Installation</td>
<td>5</td>
</tr>
<tr>
<td>Prior to Operation</td>
<td>6</td>
</tr>
<tr>
<td>PERIODIC MAINTENANCE, Section 3</td>
<td>7</td>
</tr>
<tr>
<td>TROUBLESHOOTING, Section 4</td>
<td>8</td>
</tr>
<tr>
<td>General Procedures</td>
<td>8</td>
</tr>
<tr>
<td>Plumbing</td>
<td>10</td>
</tr>
<tr>
<td>Hosing Diagram</td>
<td>10</td>
</tr>
<tr>
<td>Circuit Schematic</td>
<td>10</td>
</tr>
<tr>
<td>Clamp Troubleshooting</td>
<td>11</td>
</tr>
<tr>
<td>Supply Circuit Test</td>
<td>11</td>
</tr>
<tr>
<td>Clamp Circuit Test</td>
<td>11</td>
</tr>
<tr>
<td>Rotator Troubleshooting</td>
<td>12</td>
</tr>
<tr>
<td>Supply Circuit Test</td>
<td>12</td>
</tr>
<tr>
<td>Rotation without a Load</td>
<td>13</td>
</tr>
<tr>
<td>Rotation with a Load</td>
<td>13</td>
</tr>
<tr>
<td>Electrical Troubleshooting - Solenoid Equipped Attachments</td>
<td>14</td>
</tr>
<tr>
<td>SERVICE, Section 5</td>
<td>15</td>
</tr>
<tr>
<td>Clamp Removal and Installation</td>
<td>15</td>
</tr>
<tr>
<td>Arm</td>
<td>16</td>
</tr>
<tr>
<td>Arm Assembly Removal and Installation</td>
<td>16</td>
</tr>
<tr>
<td>Contact Pad Removal and Installation</td>
<td>16</td>
</tr>
<tr>
<td>Drive Group</td>
<td>17</td>
</tr>
<tr>
<td>Drive Group Removal and Installation</td>
<td>17</td>
</tr>
<tr>
<td>Drive Group Disassembly and Service</td>
<td>18</td>
</tr>
<tr>
<td>Drive Group Reassembly</td>
<td>19</td>
</tr>
<tr>
<td>Drive Motor</td>
<td>21</td>
</tr>
<tr>
<td>Drive Motor Removal and installation</td>
<td>21</td>
</tr>
<tr>
<td>Drive Motor Disassembly</td>
<td>22</td>
</tr>
<tr>
<td>Drive Motor Inspection</td>
<td>23</td>
</tr>
<tr>
<td>Drive Motor Reassembly</td>
<td>24</td>
</tr>
<tr>
<td>Revolving Connection</td>
<td>25</td>
</tr>
<tr>
<td>Revolving Connection Removal and Installation</td>
<td>25</td>
</tr>
<tr>
<td>Revolving Connection</td>
<td>26</td>
</tr>
<tr>
<td>Cylinder</td>
<td>27</td>
</tr>
<tr>
<td>Servicing a Cylinder on the Clamp</td>
<td>27</td>
</tr>
<tr>
<td>Clamp Cylinder Removal</td>
<td>27</td>
</tr>
<tr>
<td>Cylinder Check Valve Service</td>
<td>28</td>
</tr>
<tr>
<td>Cylinder Bushing Service</td>
<td>28</td>
</tr>
<tr>
<td>Cylinder Service</td>
<td>29</td>
</tr>
<tr>
<td>Cylinder Disassembly</td>
<td>29</td>
</tr>
<tr>
<td>Cylinder Inspection</td>
<td>29</td>
</tr>
<tr>
<td>Cylinder Reassembly</td>
<td>30</td>
</tr>
<tr>
<td>Base Unit</td>
<td>31</td>
</tr>
<tr>
<td>Frame Bushing Service</td>
<td>31</td>
</tr>
<tr>
<td>Bearing Assembly Removal and Installation</td>
<td>32</td>
</tr>
<tr>
<td>Solenoid Valve Service</td>
<td>33</td>
</tr>
<tr>
<td>SPECIFICATIONS, Section 6</td>
<td>34</td>
</tr>
<tr>
<td>Hydraulics</td>
<td>34</td>
</tr>
<tr>
<td>Truck Carriage</td>
<td>34</td>
</tr>
<tr>
<td>Torque Values</td>
<td>35</td>
</tr>
</tbody>
</table>

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**To Order Parts call:** 513-322-1199. FAX: 513-325-9270  
681466 Rev. 0
This manual provides the installation instructions, periodic maintenance requirements, troubleshooting procedures and service guides for 25F Paper Roll Clamps. Note that all specifications are shown in US and (Metric) units where applicable.

### Section 1 Introduction

#### 1.1 Special Definitions

**WARNING**
A statement preceded by **WARNING** is information that should be acted upon to prevent bodily injury. **WARNING** is always inside a ruled box.

**CAUTION**
A statement preceded by **CAUTION** is information that should be acted upon to prevent machine damage.

**IMPORTANT**
A statement preceded by **IMPORTANT** is information that possesses special significance.

**NOTE**
A statement preceded by **NOTE** is information that is handy to know and may make your job easier.

### Section 2 Installation Instructions

**WARNING:** Rated capacity of the truck/attachment combination is a responsibility of the original truck manufacturer and may be less than that shown on the attachment nameplate. Consult the truck nameplate.

2.1 **Truck Requirements**

- Truck Relief Valve Setting:
  - 2300 psi (160 bar), maximum.
  - 2000 psi (140 bar), recommended.

- Hydraulic flow should fall within the volume range shown in the chart.

- The truck hydraulic system must supply hydraulic oil to the attachment that meets the specifications shown in the chart.

- Recommended hose and fitting size:
  - No. 6 with fitting orifices of 9/32 in. (7 mm).

- The truck carriage must conform to ISO dimensional standard 2328, equivalent to Industrial Truck Association (ITA) dimensions shown in Section 6.1-2.

- Make sure the truck carriage is clean and the notches are undamaged.

- In order to conform to industry standard practice, the hoses should be connected to the truck auxiliary valve as indicated by the chart in Section 6.1-1.

<table>
<thead>
<tr>
<th>Hydraulic Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure</strong></td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Recommended</td>
</tr>
<tr>
<td><strong>Flow</strong></td>
</tr>
<tr>
<td>Minimum*</td>
</tr>
<tr>
<td>Recommended</td>
</tr>
<tr>
<td>Maximum†</td>
</tr>
<tr>
<td><strong>Supply Hose and Fitting Size</strong></td>
</tr>
<tr>
<td>Minimum Orifice Size</td>
</tr>
</tbody>
</table>

* Flow less than minimum will result in a rotate speed less than 2 rpm.
† Flow greater than maximum can result in excessive heating, reduced system performance, and short hydraulic system life.

**Hydraulic Oil**
Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. MIL-5606 or MIl-0-2104B.

Use of synthetic or aqueous base hydraulic oil is not recommended. Contact Cascade if fire resistant hydraulic oil must be used.
2.2 Installation
2.2-1 Truck Preparation

The following preparation should be performed prior to attachment installation.

The 25F Paper Roll Clamp requires two hydraulic supply circuits over the mast. No. 6 size hosing (minimum) is required for the rotate function to maximize speed and minimum restriction. Cascade THINLINE Hose Reels provide an economical and efficient means of supplying hydraulics over the mast. Refer to Hose and Cable Reel Selection Guide Form 4099 to select the correct hose reels for the truck and mast. If the truck is equipped with mast single internal hose reeving, then a R.H 2 Port THINLINE™ Reel will be required for the rotate circuit.

2.2-2 Attachment Installation

WARNING: Make sure the overhead hoist has a rated capacity of at least 1000 lbs. (450 kg).

1. Attach overhead hoist hooks to the frame in the location shown. Lift the attachment and position upright. Remove the bolt-on lower hooks (if equipped).

2. Clamps with Quick Change Lower Hooks -
   a. Install the guide to the baseplate mounting holes with the guide hole offset in the upward position - 5/8 in. (16 mm) from top of guide to hole center. Tighten the capscrews to a torque of 105-115 ft.-lbs. (142-155 Nm).
   b. Slide the hooks over the top of the guides. Install each locking pin through the hook lower hole.

3. Remove the plastic cover from the drive assembly relief fitting. Check the oil level in the drive assembly. The oil level must be even with the end cover center plug. Fill if necessary with Cascade Gear Lube 656300 or equivalent SAE 90 wt. lube (AGMA "mild" 6EP gear oil).
2.2-2 Attachment Installation
(Continued)

4. Connect hydraulic hoses to the attachment fittings using Installation Kit 681061 OR use hoses and fittings as shown. Position the truck carriage behind the attachment to determine hose lengths required to connect hoses to the hose terminal or internal reeving fittings. Remove the hoses and cut to length as required.

CAUTION: Flush the hoses as follows to prevent damage to the attachment hydraulic components.

5. Connect the hoses to the truck hose terminal kits or internal reeving fittings. Connect the hoses together using union fittings. Start the truck and actuate the truck control valves in both directions for about 30 seconds to carry any debris left in the hoses to the truck hydraulic tank and filter.

6. Remove the union fittings and disconnect the hoses from the hose terminal fittings. Connect the hoses to the attachment fittings.

7. Center the attachment to the truck upper carriage bar. Engage the upper mounting hooks and locator tab with the center upper carriage bar notch. Lift the attachment 2 in. (5cm) off the pallet.

WARNING: The mounting hooks must be properly engaged with the upper carriage bar.

WARNING: Stop Block Kit 669344 must be installed as described in step 10.
2.2-2 Attachment Installation (Continued)

8 Engage the lower hooks with the truck lower carriage bar.

**Bolt On Hooks** - Install the hooks and capscrews. Tighten the capscrews finger tight. Tap the end of the hooks with a hammer in the direction of the adjust arrow for maximum engagement with the carriage bar. Tighten the capscrews to a torque of 105-115 ft.-lbs. (142-155 Nm).

**Quick Change Hooks** - Remove the locking pins. Slide the hooks up to engage with the carriage bar. Install the locking pins through the upper holes.

**CAUTION:** If the clearance between the carriage bar and the hooks exceeds 3/16 in. (6 mm), the guides (refer to step 2) should be inverted and installed with the hole offset downward-5/8 in. (16 mm) from bottom of guide to hole center to minimize the gap.

9 Connect the hydraulic hoses to the hose terminal fittings or internal reeving fittings. See the chart below for correct auxiliary valve and attachment function operation.

<table>
<thead>
<tr>
<th>Function, in sequence of location to the operator.</th>
<th>Attachment Movement</th>
<th>Motion of the operator's hand when actuating the truck auxiliary control handle while facing the load.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotate</td>
<td>Sideshift Right</td>
<td>Rearward or Up</td>
</tr>
<tr>
<td>Rotate</td>
<td>Sideshift Left</td>
<td>Forward or Down</td>
</tr>
<tr>
<td>Clamp</td>
<td>Clamp</td>
<td>Rearward or Up</td>
</tr>
<tr>
<td>Clamp</td>
<td>Release</td>
<td>Forward or Down</td>
</tr>
</tbody>
</table>

* If solenoid equipped depress button for CLAMP/RELEASE functions. Release button for ROTATE.

10 Install stop block kit 669344 to prevent the attachment from shifting or sliding on the truck carriage. Position each stop block on the truck upper carriage bar approximately 1/16 in. (1.5 mm) from the outward side of each upper mounting hook. If the carriage bar is not wide enough, place the stop blocks on the inward side of the hooks.

Preheat the upper carriage crossbar weld area and stop block to 400° F (200° C).

**CAUTION:** Protect all hydraulic hoses and components from excess heat and weld splatter.

Use AWS E-7018 low hydrogen rod and weld a 1/4 in. (6 mm) fillet as shown. Let the weld slow cool.

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2.3 Indicator Tape Group Installation

Installation of Indicator Tape Group 675353 provides correct, easy visual rotation alignment which reduces roll and clamp damage.

1. Select a location on the baseplate that is easy for the driver to see. Clean the baseplate then apply a tape strip.

2. Rotate the attachment to the vertical loading position. Align pad bottoms to floor. Apply a tape strip to the frame so it aligns with the baseplate tape. Rotate the attachment 180°, align pads to floor, then install another tape strip to frame.

3. Rotate attachment 90° to position the short arm down. Install remaining tape strip to frame.
2.4 Prior to Operation

1. Check for external leaks at the fittings and cylinder rod ends.

   **WARNING:** Make sure there are no people in the vicinity of the attachment when picking up a load.

2. Before picking up a load, operate the clamp through several cycles to force air from the system to the truck hydraulic tank.
   - Rotate the clamp in both directions.
   - Cycle the clamp arm in and out several times.

3. Clamp and rotate a maximum load. If the attachment is sluggish or rotates smoothly, check the plumbing.

4. The auxiliary valve must actuate the clamp functions as shown in the chart in the Requirements Section 6.1-1. If the functions are backwards from the requirements, switch the hoses at the hose reel mounting block or auxiliary valve fittings.
Section 3 Periodic Maintenance

3.1 100 Hour Maintenance

Every time the lift truck is serviced or every 100 hours of truck operation, whichever comes first, complete the following maintenance procedures:

- Check the edge of the contact plates for wear or sharp nicks that could damage or tear paper rolls. Grind the edges smooth.

- Check the pivot pins securing the contact plates and contact plate links. Replace the pins if a concentration of wear is visible or if the pins are bent. Refer to Section 5.2-2.

3.2 500 Hour Maintenance

- Tighten the faceplate/bearing assembly and baseplate/bearing assembly capscrews. Refer to Section 5.8-2.

- Lubricate the rotator bearing assembly grease fitting with bearing grease. Lube and rotate the clamp several times. Refer to Section 5.8-2 step 7.

- Tighten the mounting hook capscrews. See the torque specifications shown in Section 2.2-2, step 2.

- Check the oil level in the drive assembly. The oil level must be up to the end cover center plug. To add oil, remove the breather cap (on the 90° fitting). Fill through the 90° fitting with Cascade Gear Lube 656300 or equivalent SAE 90 wt. lube (AGMA "mild" 6 EP gear oil) until lube begins to run from the end cap center hole.

3.3 2000 Hour Maintenance

- Check the cylinder and frame pivot bushings. If the bushings are worn, refer to Sections 5.6-4 and 5.8-1.

- Check the cylinder and arm anchor pins for plating that is pitted or worn. If the pins are worn, refer to Sections 5.2-1 and 5.6-2.
Section 4 Troubleshooting

4.1 General Procedures

**WARNING:** Before servicing any hydraulic component, relieve pressure in the system. Turn the truck off and open the truck auxiliary valves several times in both directions.

After completing any service procedure, always test the function through several cycles. First test the attachment empty to bleed air trapped in the system to the truck tank. Then test the attachment with a load to be sure it operates correctly before returning it to the job.

Stay clear of the load while testing. Raise the load to the minimum height that will allow rotation of the load while testing.

4.1-1 Truck System Requirements

- The lift truck must supply sufficient hydraulic pressure to handle the heaviest load. PRESSURE MUST NOT EXCEED 2300 PSI (160 BAR).
- Hydraulic flow should fall within the volume range shown in the chart.
- The truck hydraulic system must supply hydraulic oil to the attachment that meets the specifications shown in the chart.

4.1-2 Tools Required

In addition to a normal selection of hand tools, you will need:

- A flow meter capable of measuring hydraulic flow to 20 GPM (75 L/min.). The parts shown are included in Cascade Flow Meter Kit part no. 671477.
- Two pressure gauges capable of measuring pressure to 2500 PSI (175 BAR). The parts shown are included in Cascade Pressure Gauge Kit part no. 671212. Two kits are required.
- Assorted fittings and two No. 6 hoses as shown to adapt the gauges and flow meter to the components being tested.

**Hydraulic Specifications**

<table>
<thead>
<tr>
<th></th>
<th>Pressure – Maximum</th>
<th>Recommended</th>
<th>Flow – Minimum*</th>
<th>Recommended</th>
<th>Maximum‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure – Maximum</td>
<td>2300 psi (160 bar)</td>
<td></td>
<td>5 GPM (10L/min)</td>
<td></td>
<td>10 GPM</td>
</tr>
<tr>
<td>Recommended</td>
<td>2000 psi (140 bar)</td>
<td></td>
<td>7 GPM (26L/min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply Hose and Fitting Size</td>
<td>No. 6</td>
<td>9/32 in. (7mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Flow less than minimum will result in a rotate speed less than 2 rpm.
‡ Flow greater than maximum can result in excessive heating, reduced system performance and short hydraulic system life.

Hydraulic Oil – Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. MIL-O-5606 or MIL-O-2104D. Use of synthetic or aqueous base hydraulic oil is not recommended. Contact Cascade if fire resistant hydraulic oil must be used.

FLOW METER KIT 671477

(P2 No. 8-12 JIC/O-ring Flow Meter
(P2 No. 6 JIC Reducer

PRESSURE GAUGE KIT 671212

No. 6 JIC Swivel Tee
No. 6-8 JIC Reducer
No. 4-6 Pipe/JIC

*Not included in Pressure Gauge Kit part no. 671212
4 Troubleshooting

4.1-3 Get All The Facts

It is important that you gather all the facts regarding the problem before you begin service procedures. The best way is to talk with the operator. Ask for a complete description of the problem. The following guidelines will help you decide where to begin your troubleshooting procedures.

CLAMP CIRCUIT

- Clamp drops the roll after it has been picked up.
- Clamp will not carry rolls to its rated capacity.
- Clamp arm will not function properly.

If you encounter one of these problems, refer to Section 4.3.

ROTATE CIRCUIT

- Clamp will not rotate.
- Clamp will not rotate rolls up to its rated capacity.
- Clamp rotates in one direction only.

If you encounter one of these problems, refer to Section 4.4.
4.2 Plumbing

4.2-1 Hosing Diagram

ARM CLOSING
PRESSURE
RETURN
(Reverse shading for Arm Opening)

ROTATE - CLOCKWISE (CW)
PRESSURE
RETURN
(Reverse shading for CCW Rotate)

4.2-2 Circuit Schematic

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To Order Parts call: 513-352-1180. FAX: 513-325-9270
4 Troubleshooting

4.3 Clamp Troubleshooting

There are four potential areas that could affect the clamp function.

- Operator may be handling the roll incorrectly. Refer to Operator Guide 674509.
- Insufficient hydraulic pressure from the lift truck.
- External leaks.
- Worn/defective revolving connection shaft seals, cylinder seals or check valves.

4.3-1 Supply Circuit Test

1. Check the pressure delivered by the truck to the carriage hose terminal. Refer to the truck service manual. The pressure must be within 100 psi (7 bar) of specified truck pressure. TRUCK PRESSURE MUST NOT EXCEED 2300 PSI (160 bar), measured at the hose terminal.

2. Check the flow volume at the hose terminal. See Section 6.1-1 for the recommended flow volumes.

3. Check for external leaks.

4.3-2 Clamp Circuit Test

1. Check for external leaks at the cylinder and revolving connection.

2. Install a pressure gauge to the cylinder gauge port. Close the arm and hold the truck handle in the clamp position a few seconds to develop full truck system pressure. Watch gauge pressure reading.

   - If the initial gauge pressure is not within 100 psi (7 bar) of system pressure measured at the hose terminal, the revolving connection may be faulty and require service. Refer to Section 5.6-4.

   - If the gauge pressure drops more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the cylinder check valve cartridge or piston seals may be faulty. Continue troubleshooting.

   - If the gauge pressure does not drop more than 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute, the problem is not hydraulic.

3. Remove the cylinder check valve cartridge. Install a new check valve cartridge.
4.3-2 Clamp Circuit Test
(Continued)

4 Close the arm fully and hold the handle in the clamp position a few seconds to develop full truck system pressure. Watch the gauge pressure readings.

- If the gauge pressure on the cylinder continues to drop more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the cylinder piston seals are faulty. Refer to Section 5.6.

4.4 Rotator Troubleshooting

There are four potential problem areas that could affect the rotation function.

- Operator may be handling loads beyond the capacity of the attachment. Loads rotated off-center may exceed attachment capacity.
- Insufficient hydraulic pressure and flow from lift truck.
- Worn or defective motor.
- Worn or defective drive assembly or frame bearing assembly.

4.4-1 Supply Circuit Test

WARNING: Before removing the supply hoses, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

1 Check the pressure delivered by the truck to the carriage hose terminal. Refer to the truck service manual. The pressure must be within 100 psi (7 bar) of specified truck pressure. TRUCK PRESSURE MUST NOT EXCEED 2300 PSI (160 BAR), measured at the hose terminal.

2 Check the flow volume at the hose terminal. See Section 6.1-1 for the recommended flow volumes.

3 Check for external leaks.
Section 4 Troubleshooting

4.4-2 Rotation without a Load

WARNING: Before installing the gauges, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

1. Install pressure gauges to the motor fittings.
2. Start the truck and rotate the attachment without a load. While rotating, note pressure readings of both gauges.
   • If the lower gauge reading exceeds 500 psi (35 bar), there is excessive back pressure in the supply circuit. Check for restrictions such as numerous fittings and hose sizes less than No. 6, etc.

4.4-3 Rotation with Load

1. Rotate a load requiring approximately 24,000 in.-lbs. @ 2000 psi (2712 Nm @ 140 bar) torque. Note gauge readings during rotation.
   • If the higher gauge reading is substantially less than truck pressure measured at the carriage hose terminal, the motor gear set may need repair. Refer to Section 5.4.
   • If the higher gauge reading is close to truck pressure measured at the carriage hose terminal and no rotation occurs, the motor output shaft or drive box may need repair. Continue troubleshooting.
2. Remove the motor from the drive box assembly as described in Section 5.4.
3. Reinstall the hoses to the motor fittings. Actuate the rotate circuit.
   • If the motor shows rotational output, the drive box may require service. Refer to Section 5.3-2.
   • If the motor shows little or no rotational output, service the motor as described in Section 5.4-2.
4.5 Electrical Troubleshooting - Solenoid Equipped Attachments

1. Check the control knob circuit fuse. Replace if necessary.

2. Check for loose electrical connections at the truck ignition switch, control knob button, solenoid coil terminals and diode.

3. Remove the diode from the solenoid coil terminal. Test the diode with an ohmmeter for high resistance in one direction and no resistance in the other direction. If there is no resistance in both directions, replace the diode.

   NOTE: When replacing the diode, the banded end of the diode must connect to the coil and wiring as shown.

4. Disconnect the electrical leads from the solenoid coil terminals. Use a voltmeter to take a current reading at the electrical lead terminals when the button is depressed.
   - If there is no current to the solenoid, troubleshoot the electrical circuit for shorts.
   - If there is current to the solenoid, test for coil continuity.

5. Test for coil continuity by placing an ohmmeter test lead on each solenoid coil terminal. Place the ohmmeter on the R X 1 scale.
   - If there is an ohmmeter reading, the coil is good.
   - If the coil is good, but the solenoid does not "click" when the control button is depressed, the solenoid cartridge may be jammed. Refer to Section 5.9-1.
   - If there is no ohmmeter reading shown, the solenoid coil is defective and should be replaced. Refer to Section 5.9-1.
5 Service

5.1 Clamp Removal and Installation

1. Rotate the attachment to position the contact pads perpendicular to the ground. Extend the arm outside the width of the frame.

2. Remove the lower hooks.

   **Bolt On Hooks** - Remove the lower mounting hooks. For reassembly, tighten the capscrews to a torque of 105-115 ft.-lbs. (142-155 Nm)

   **Quick Change Hooks** - Pull out the locking pins, slide the hooks down and reinstall the pins in the lower holes. For reassembly, slide the hooks up and install the pins in the top holes.

   **WARNING:** Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then open the auxiliary control valve(s) several times in both directions.

3. Disconnect and plug the hydraulic hoses to the attachment. Tag the hoses for reassembly.

4. Tilt the mast forward. Remove the attachment from the lift truck and place on a pallet.

5. For installation, reverse above procedures and refer to the installation instructions, Section 2.

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681466 Rev. 0
5.2 Arm

5.2-1 Arm Assembly Removal and Installation

1. Rotate the clamp to the vertical roll handling position.
2. Remove the cylinder rod anchor pin. Retract the cylinder rod. For reassembly, tighten the anchor capscrews to a torque of 13-15 ft.-lbs. (18-20 Nm).
3. Swing the arm inward to contact the other arm. Rotate the attachment 90° to position the arm in the upper position.

**WARNING:** Make sure your overhead hoist has a rated lifting capacity of at least 1000 lbs. (450 kg).

4. Attach an overhead hoist to the arm and take up slack in the chain.
5. Remove the arm/faceplate anchor pins. Note the location of the shims. Lift away the arm assembly. For reassembly, tighten the anchor capscrews to a torque of 13-15 ft.-lbs. (18-20 Nm).
6. For reassembly, reverse the above procedures.

5.2-2 Contact Pad Removal and Installation

1. Rotate the clamp to the vertical roll handling position. Lower the clamp to position the contact pad lightly on the ground. Do not place the full weight of the attachment on the contact pad.
2. Remove the snap rings fastening the link pin to the contact pad. Remove the pin.
3. Drive out the pin in the contact pad to remove the contact pad pivot pin.
4. For reassembly, reverse the above procedures.
5.3 Drive Group

5.3-1 Drive Group Removal and Installation

1. Remove the attachment from the truck as described in Section 5.1.

2. Remove the four capscrews fastening the drive group to the baseplate. For reassembly, tighten the capscrews to a torque of 110-120 ft.-lbs. (150-165 Nm).

3. For reassembly, reverse the above procedures except as follows:
   - After the drive group has been installed, check the oil level in the drive assembly. The oil level must be up to the end cover center plug. To add oil, remove the breather cap (on the 90° fitting). Fill through the 90° fitting with Cascade Gear Lube 656300 or equivalent SAE 90 wt. lube (AGMA "mild" 6 EP Gear Oil) until lube begins to run from the end cap center hole.
Drive Group Disassembly and Service

1. Remove the drive group from the attachment as described in Section 5.3-1.
2. Lay the drive group, pinion down, on wooden blocks approx. 4 X 4 in. (100 X 100 mm) placed on both sides of the pinion.
3. Remove the cover plate from the housing.
4. Drain oil from the housing.
5. Remove the end cover from the housing.
6. Remove the drive motor as described in Section 5.4-1.
7. Remove the motor adapter from the housing.

8. Tap and rotate the worm and worm bearing out through the end cover side of the housing. Remove the worm bearing from the motor side of the housing.
9. Press the pinion, pinion bearings and worm gear out of the housing as an assembly.
10. Remove the snap ring from the pinion. Press the pinion and housing/pinion bearing from the worm gear and cover plate/pinion bearing. Remove the pinion key.
11. Press the pinion out of the housing/pinion bearing.
12. Clean and inspect all components. Remove all dried sealant residue. Replace all worn items. Remove burrs and sharp edges with emery cloth.
5.3-3 Drive Group Reassembly

1. Apply sealant 668184 to the pinion shaft seating area and shoulder for the housing/pinion bearing. Install the housing/pinion bearing. Remove excess sealant.

2. Install the key, worm gear, cover plate/pinion bearing and snap ring on the pinion.

3. Apply sealant 668184 to the housing seating area and shoulder for the housing/pinion bearing. Install the pinion assembly in the housing. Remove excess sealant.

4. Install the worm and worm bearings in the housing. The bearings must be installed using the race orientation shown below. The manufacturers stampings must be visible on the outer race.
5.3-3 Drive Group Reassembly
(Continued)

5. Apply sealant 668184 to both sides of the motor adapter shim. Install the motor drive adapter. Tighten the capscrews to a torque of 60-80 in.-lbs. (7-9 Nm).

6. Apply sealant 668184 to both sides of the end cover shim. Install the end cover. Tighten the capscrews to a torque of 60-80 in.-lbs. (7-9 Nm).

7. Install the drive motor. Make sure the drive adapter is fully engaged with the worm shaft. Tighten the capscrews to a torque of 60-80 in.-lbs. (7-9 Nm).

8. Install the cover plate. Tighten the capscrews to a torque of 60-80 in.-lbs. (7-9 Nm).

9. Remove the center plug and breather cap (on the 90° fitting) from the end cap.

10. Fill the drive group through the 90° fitting with Cascade Gear Lube 656300 or equivalent SAE 90 wt. lube (AGMA "mild" 6EP Gear Oil) until lube begins to run from the end cap center hole.

11. Install the center plug and breather cap (on the 90° fitting) to the end cap.

12. Install the drive group to the attachment baseplate as described in Section 5.3-1.
5.4 Drive Motor

5.4-1 Drive Motor Removal and Installation

**WARNING:** Before removing the supply hoses, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

1. Remove the attachment from the lift truck as described in Section 5.1.
2. Remove the drive group from the attachment as described in Section 5.3-1.
3. Remove the center plug from the end cap and drain oil from the drive group.
4. Remove the four capscrews fastening the drive motor to the motor adapter.
5. For reassembly, reverse the above procedures except as follows:
   - Apply sealant 668184 to the motor face. Install the motor and tighten the capscrews to a torque of 60-80 in.-lbs. (7-9 Nm).
   - After the drive group has been installed, check the oil level in the drive assembly. The oil level must be up to the end cover center plug. To add oil, remove the breather cap (on the 90° fitting). Fill through the 90° fitting with Cascade Gear Lube 656500 or equivalent SAE 90 wt. lube (AGMA "mild" 6 EP Gear Oil) until lube begins to run from the end cap center hole.

For Technical Assistance call: 1-800-CASCADE (227-2233) or 503-669-6300
To Order Parts call: 513-322-1199, FAX: 513-325-9270
5.4-2 Drive Motor Disassembly

1. Remove the drive motor from the drive group as described in Section 5.4-1.
   IMPORTANT: Service the drive motor in a clean work area.

2. Drain oil from the drive motor by rotating the shaft.
   Plug the ports. Wash the outside of the drive motor with solvent and blow dry.

3. Remove the key and circlip from the shaft.

4. Mark the cover, body and flange for reassembly.

5. Remove the cover bolts.

6. Remove the cover and lift off the back-up seal, bushing seals and body O-ring.

7. Remove any burrs from the shaft.

8. Tap the flange to disengage it from the locating in the body. Slide the flange squarely off the shaft.

9. Remove the internal snap ring from the mounting flange. Push the shaft oil seal squarely out of the mounting flange. Do not damage any sealing surfaces.

10. Remove the back-up seal, bushing seals and body O-ring.

11. Before removing the internal components, each of the bushings must be marked to identify its position in the body. On the surface of the bushing (which will not affect unit sealing), lightly mark:

    FD = Flange Drive Shaft Bushing
    FI = Flange Idler Gear Bushing
    CI = Cover Idler Gear Bushing
    CD = Cover Drive Shaft Bushing

12. Lay the unit on its side. Pull the drive shaft squarely out of the body with the bushings.

13. Remove the idler gear and two remaining bushings.
5.4-3 Drive Motor Inspection

1. Clean all parts with solvent and blow dry. **Do not use paper or cloth towels.**

2. Inspect the body bore where the two gears wipe into the body. The body can be reused if the "cut in" is bright and polished and the depth does not exceed .003 in. The body should be replaced if the tips of the gears have dug into the surface material.

3. Inspect the body O-ring seal areas for defects that could cause leakage.

4. Inspect the flange and cover for wear or scoring in the body O-ring, bushing seal and back-up seal areas that could cause leakage.

5. Check the shaft seal seat for scoring or damage that could cause leakage.

6. The bushing side faces that are adjacent to the gears should be perfectly flat with no signs of scoring or steps. These surfaces should be brightly polished from the side loading of the gears. This is a critical sealing surface and must be completely flat to the gear side face.

   The bushing bores should not be scored or show other signs of damage.

7. Check for scoring or a wear step on the gear side faces. If scoring or a step can be felt, replace the gear.

8. Check the gear teeth for signs of pitting or scoring.

9. The gear bearing journal surfaces should be completely free of scoring.

10. Check the area where the shaft lip seal runs on the drive shaft. If a noticeable groove can be felt, the shaft should be replaced.

**IMPORTANT:** If either of the gears are damaged, they must be replaced as a matched pair.
5.4-4 Drive Motor Reassembly

When a drive motor has been disassembled, all seals should be replaced. Make sure all components are clean prior to assembly.

1. Place the cover against the body and position the assembly so that the dowels are uppermost.
2. Install the drive shaft and idler gear into the body.
3. Install the flange drive shaft bushing FD and flange idler gear bushing FI into their original bores.
4. Install new seals and back-up seal to the bushings. The flat side of the back-up seals must be toward the flange. Install the body O-ring.
5. Install the flange (without shaft seals). Align squarely to the body dowels.
6. Turn the assembly over and remove the cover.
7. Install the cover drive shaft bushing CD and cover idler gear bushing CI into their original bores.
8. Install new seals and back-up seal to the bushings. The flat side of the back-up seal must be toward the cover. Install the body O-ring.
9. Install the cover and capscrews. Tighten the capscrews to a torque of 32-38 ft.-lbs. (43-51 Nm).
10. Pour a small amount of oil into the port and check for easy shaft rotation.
11. Lubricate the shaft seals and flange seal seat with hydraulic oil. Install the seals and hardware to the flange.
5.5 Revolving Connection

5.5-1 Revolving Connection Removal and Installation

1. Remove the attachment from the lift truck as described in Section 5.1.
2. Disconnect the hose fittings from the front of the revolving connection.
3. Disconnect the hoses from the rear of the revolving connection.
4. Remove the capscrews fastening the revolving connection to the faceplate. For reassembly, tighten the capscrews to a torque of 22-26 ft.-lbs. (30-35 Nm).
5. Remove the revolving connection from the front of the attachment.
6. For reassembly, reverse the above procedures except as follows:
   - **Clamps without Solenoid Adaption** - The shaft fittings must face to the left as viewed from the back of the attachment.
   - **Clamps with Solenoid Adaption** - The shaft fittings must face to the right as viewed from the back of the attachment.
5.5-2 Revolving Connection Service

1. Remove the revolving connection from the attachment as described in Section 5.5-1.

2. Remove the end cap from the revolving connection shaft. For reassembly, tighten the capscrew to a torque of 10-14 ft-lbs. (13-19 Nm).

CAUTION: Remove all burrs and paint from exposed shaft surface prior to removal from the body. Burrs or paint chips pulled through the bore will permanently damage the body.

3. Remove the shaft from the body.

4. Remove the block from the shaft. For reassembly, tighten the capscrews to a torque of 32-38 ft-lbs. (44-52 Nm).

5. Remove the O-rings and back-up rings from the body.

6. Clean all parts with kerosene or solvent.

7. Inspect the body bore for grooves and scratches. If the bore is worn, the body should be replaced.

For reassembly, reverse the above procedures except as follows:

- The body back-up rings and O-rings must be installed as shown.

- Lubricate the shaft with STP or petroleum jelly prior to reassembly.
5.6 Cylinder

5.6-1 Servicing a Cylinder on the Clamp

1. Rotate the clamp to the vertical roll handling position. Fully close the arm.
2. Remove the cylinder rod anchor pin. For re-assembly, tighten the anchor capscrews to a torque of 13-15 ft.-lbs. (18-20 Nm).
3. Retract the cylinder rod. Swing the cylinder outward to expose the rod and retainer.
4. Service the cylinder as described in Section 5.7.

5.6-2 Clamp Cylinder Removal

1. Rotate the clamp to the vertical roll handling position. Fully close the long arm.
2. Remove the cylinder rod anchor pin. For re-assembly, tighten the anchor capscrews to a torque of 13-15 ft.-lbs. (18-20 Nm).
3. Retract the cylinder rod.
4. WARNING: Before removing hoses, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.
5. Place a drip pan under the cylinder. Disconnect the hoses from the cylinder ports. Plug the hose ends and tag for reassembly.
6. Remove the cylinder base anchor pin. Note the locations of the shims. For reassembly, tighten the anchor capscrews to a torque of 13-15 ft.-lbs. (18-20 Nm).
7. Service the cylinder as described in Section 5.7.
Section 5 Service

5.6-3 Cylinder Check Valve Service

1 Rotate the clamp to the vertical roll handling position. Fully close the arm.

**WARNING:** Before removing the check valve cartridge, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

2 Remove the check valve cartridge from the cylinder port.

3 Remove the O-rings and back-up rings. Clean the check valve cartridge with kerosene or solvent.

4 Install the new O-rings and back-up rings as shown.

5 Lubricate the check valve cartridge with petroleum jelly prior to reassembly.

5.6-4 Cylinder Bushing Service

1 Remove the cylinder from the clamp as described in Section 5.6-2.

2 Remove the bushings from the cylinder using a bushing driver.
   - The bushing driver (part no. 678588) can be ordered from the Cascade Parts Depot (see phone and address below) or can be fabricated using the dimensions shown.

   Cascade Parts Depot
   2501 Sheridan Ave.
   Springfield, Ohio 45505
   Telephone: (513) 322-1199
   Telex: 279563
   FAX: (513) 325-9270

3 For reassembly, reverse the above procedures except as follows:
   - Install the new bushings and spacer using the bushing driver.

   **CAUTION:** The bushings may be damaged if installed without a bushing driver.
5.7 Cylinder Service

5.7-1 Cylinder Disassembly

1. Clamp the cylinder in a soft-jawed vise. Clamp at the extreme base end only.
2. Remove the retainer by using a pin type spanner wrench.
3. Remove the rod and retainer assembly from the cylinder.
4. Clamp the rod assembly across the rod end. Never clamp directly on the rod sealing surface.
5. Remove the nut fastening the piston to the rod.
6. Place the piston and retainer in a soft-jawed vise to remove the seals. Pry the seals up with a blunt screwdriver. Cut the seal to remove.

CAUTION: Do not scratch the seal grooves.

5.7-2 Cylinder Inspection

- Inspect the rod, piston and retainer for nicks or burrs. Minor nicks and burrs can be removed with emery cloth. If they cannot be moved with emery cloth, replace the part.
- Inspect the cylinder shell bore and remove any minor nicks or burrs with a butterfly hone. If they cannot be removed with the butterfly hone, the shell must be replaced.
- Inspect the outside of the shell for any defects that could weaken its performance when under pressure. Replace if necessary.
5.7-3 Cylinder Reassembly

1. Lubricate all new seals and rings with petroleum jelly.
2. Note the direction of the U-cup seals. If installed backwards the seals will not work properly. See illustration below.
3. Polish the piston and retainer chamfer angle with emery cloth. The seals will slide over the chamfer easier.
4. Install new seals on the piston and retainer. Hook one side of the seal in the groove and push it over the piston or retainer as shown.
5. Install the retainer and piston on the rod. Tighten the piston retaining nut to a torque of 400-450 ft.-lbs. (545-610 Nm).
6. Place the piston loader in the cylinder shell. The loader must cover all of the threads but not contact the thread relief chamfer. Trim the stop fins with a sharp knife if more engagement is needed. The piston will not enter the shell if the loader contacts the thread relief chamfer.
7. Apply a thick film of petroleum jelly to the inside of the cylinder shell, piston loader and piston seals.
8. Insert the rod/piston assembly through the loader into the cylinder shell. If resistance is encountered, tap the rod end with a rubber mallet.
9. Cut the loader down one side with a knife and remove.
10. Apply a thick film of petroleum jelly to the inside of the cylinder shell and retainer seals.
11. Screw the retainer into the shell. Tighten the retainer to a torque of 400-450 ft.-lbs. (545-610 Nm).
5 Service

5.8 Base Unit

5.8-1 Frame Bushing Service

1. Remove the arm from the faceplate as described in Section 5.2-1.

2. Remove the bushings from the frame using a bushing driver (part no. 078587).

3. Install the new bushings to the frame using the bushing driver. The bushings must be flush with the outer surfaces of the frame.

   CAUTION: The bushings may be damaged if installed without a bushing driver.

4. For reassembly, reverse the above procedures.

Bushing Driver

- The bushing driver can be ordered from the Cascade Parts Depot (see address below) or can be fabricated using the dimensions shown.

Cascade Parts Depot
2501 Sheridan Ave.
Springfield, Ohio 45505
Telephone: (513) 322-1199
Telex: 279563
FAX: (513) 325-9270

- For Technical Assistance call: 1-800-CAS-CADE (227-2233) or 503-669-6300
- To Order Parts call: 513-322-1199, FAX: 513-325-9270
### 5.8-2 Bearing Assembly Removal and Installation

1. Remove the attachment from the lift truck as described in Section 5.1.
2. Remove the drive group as described in Section 5.3-1.
3. Attach an overhead hoist to the baseplate. Remove the capscrews fastening the baseplate to the bearing assembly. For reassembly, tighten the capscrews to a torque of 110-120 ft.-lbs. (150-165 Nm).

**WARNING:** Make sure your hoist has a rated capacity of 1000 lbs. (450 kg).

4. Lift away the baseplate.
5. Attach two eyebolts to the bearing assembly. Attach an overhead hoist.
6. Remove the capscrews fastening the bearing assembly to the faceplate. For reassembly, tighten the capscrews to a torque of 110-120 ft.-lbs. (150-165 Nm). Lift away the bearing assembly.
7. For reassembly, reverse the above procedures except as follows:
   - Align the bearing assembly inner race grease fitting with the access hole in the faceplate.
   - Tighten the capscrews to half torque value 55 ft.-lbs. (75 Nm) using the pattern shown. Tighten to full torque value - 110-120 ft.-lbs. (150-165 Nm).
   - Apply NLGI No. 0 grease to the teeth of the bearing assembly gear teeth.
   - After remounting the attachment on the lift truck, apply chassis grease to the bearing assembly grease fitting. The fitting access hole is in the faceplate near the cylinder base. If the fitting is not visible, rotate the clamp 180°. Lube then rotate the clamp to distribute the grease. Apply grease and rotate several times.
5 Service

5.9-1 Solenoid Valve Service

1. Disconnect the wiring from the coil. Loosen the end cover cap screws. Remove the end cover and coil.

2. Install the new coil and end cover making sure the terminals are positioned correctly.

3. For reassembly, reverse the above procedures except as follows:
   - See the electrical schematic for correct wire and diode installation.
6 Specifications

6.1-1 Hydraulics

<table>
<thead>
<tr>
<th>Hydraulic Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure – Maximum</strong></td>
</tr>
<tr>
<td><strong>Recommended</strong></td>
</tr>
<tr>
<td><strong>Flow – Minimum</strong></td>
</tr>
<tr>
<td><strong>Recommended</strong></td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
</tr>
<tr>
<td><strong>Supply Hose and Fitting Size</strong></td>
</tr>
<tr>
<td><strong>Minimum Orifice Size</strong></td>
</tr>
</tbody>
</table>

* Flow less than minimum will result in a rotate speed less than 2 rpm.
↓ Flow greater than maximum can result in excessive heating, reduced system performance and short hydraulic system life.

Hydraulic Oil - Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. MIL-0-5606 or MIL-0-2104B.

Use of synthetic or aqueous base hydraulic oil is not recommended. Contact Cascade if fire resistant hydraulic oil must be used.

In order to conform to industry standard practice, the hoses should be connected to the truck as indicated by the chart.

<table>
<thead>
<tr>
<th>Function, in sequence of location to the operator.</th>
<th>Attachment Movement</th>
<th>Motion of the operator’s hand when actuating the truck auxiliary control handle while facing the load.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotate</td>
<td>Sideshift Right</td>
<td>Rearward or Up</td>
</tr>
<tr>
<td></td>
<td>Sideshift Left</td>
<td>Forward or Down</td>
</tr>
<tr>
<td>Clamp*</td>
<td>Clamps</td>
<td>Rearward or Up</td>
</tr>
<tr>
<td></td>
<td>Release</td>
<td>Forward or Down</td>
</tr>
</tbody>
</table>

* If solenoid equipped depress button for CLAMP/RELEASE functions. Release button for ROTATE.

6.1-2 Truck Carriage

Truck carriage must conform to ISO dimensional standard 2328, equivalent to Industrial Truck Association (ITA) dimensions shown.

Make sure the truck carriage is clean and the notches are undamaged.

<table>
<thead>
<tr>
<th>Mounting</th>
<th>Dimension A – ITA (ISO)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Class II</td>
<td>14.94 in. (380.0mm)</td>
</tr>
</tbody>
</table>
### 6.1.3 Torque Values

Note that all specifications are shown in US and (Metric) units where applicable.

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Fastener Thread Size</th>
<th>Torque Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ft.-lbs.</td>
</tr>
<tr>
<td>1</td>
<td>M16</td>
<td>110-120</td>
</tr>
<tr>
<td>2</td>
<td>M8</td>
<td>6-8</td>
</tr>
<tr>
<td>3</td>
<td>M12</td>
<td>43-48</td>
</tr>
<tr>
<td>4</td>
<td>M9</td>
<td>12-15</td>
</tr>
<tr>
<td>5</td>
<td>M10</td>
<td>22-26</td>
</tr>
</tbody>
</table>

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503-669-6300

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To Order Parts call: 513-322-1199, FAX: 513-325-9270

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Do you have questions you need answered right now? Call your nearest Cascade Service Department.

**AMERICAS**
Cascade Corporation
U.S. Headquarters
2201 NE 201st
Fairview, OR 97024-9718
Tel: 800-CASCADE (227-2233)
Fax: 888-329-8207

Cascade Canada Inc.
5570 Timberlea Blvd.
Mississauga, Ontario
Canada L4W-4M6
Tel: 905-629-7777
Fax: 906-629-7785

Cascade do Brasil
Rua João Guerra, 134
Macuco, Santos - SP
Brasil 11015-130
Tel: 55-13-2105-8800
Fax: 55-13-2105-8899

**EUROPE-AFRICA**
Cascade Italia S.R.L.
European Headquarters
Via Dell’Artigianato 1
37030 Vago di Lavagno (VR)
Italy
Tel: 39-045-8989111
Fax: 39-045-8989160

Cascade (Africa) Pty. Ltd.
PO Box 625, Isando 1600
60A Steel Road
Sparton, Kempton Park
South Africa
Tel: 27-11-975-9240
Fax: 27-11-394-1147

**ASIA-PACIFIC**
Cascade Australia Pty. Ltd.
1445 Ipswich Road
Rocklea, QLD 4107
Australia
Tel: 1-800-227-223
Fax: +61 7 3373-7333

Cascade Japan Ltd.
2-23, 2-Chome,
Kukuchi Nishimachi
Amagasaki, Hyogo
Japan, 661-0978
Tel: 81-6-6420-9771
Fax: 81-6-6420-9777

Cascade Korea
121B 9L Namdong Ind.
Complex, 691-8 Gojan-Dong
Namdong-Ku
Inchon, Korea
Tel: +82-32-821-2051
Fax: +82-32-821-2055

Cascade New Zealand
15 Ra Ora Drive
East Tamaki, Auckland
New Zealand
Tel: +64-9-273-9136
Fax: +64-9-273-9137

Cascade-Xiamen
No. 668 Yangguang Rd.
Xinyang Industrial Zone
Haicang, Xiamen City
Fujian Province
P.R. China 361026
Tel: 86-592-651-2500
Fax: 86-592-651-2571

Sunstream Industries
Pte. Ltd.
18 Tuas South Street 5
Singapore 637796
Tel: +65-6795-7555
Fax: +65-6863-1368

Cascade India Material Handling Private Limited
No 34, Global Trade Centre
1/1 Rambaugh Colony
Lal Bahadur Shastri Road,
Navi Peth, Pune 411 030
(Maharashtra) India
Phone: +91 020 2432 5490
Fax: +91 020 2433 0881