RAM CRYSTAL ELEVATOR
INSTALLATION MANUAL

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Revision B – June 2013
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1.1

a. Make sure the area where you are working is clean. Sweep out the pit if necessary, and clean the area where your parts are going to be placed.

b. Check installation drawing for shaft dimensions and guide rail locations.

c. Measure the shaftway along its full length at 24" intervals making sure that all four walls are parallel, square and plumb, and that the dimensions match the installation drawings.

d. Measure the distance to each landing from the bottom of the pit to the top of the finished floor, the distance from the pit floor to the finished top floor is the most critical.

e. Measure clearance from the finished top floor to the shaft ceiling, a minimum of 96" is required. If the shaft ceiling is less than 97" you will have to modify the motor position to the lowest position on the gear reducer if it is not already done.

f. Ensure that you have 83" (for standard Bi-fold door only) door height clearance from the top of the FINISHED floor to the door header. If floors are not finished, determine thickness of finished flooring and add to required door height clearance.

g. Ensure that the 2" x 3" slots are cut out at the base of each door opening for the Bi-fold door tracks.

h. Make sure that the floors at each landing are level, especially where the guide rails are going to be assembled. Guide rails may have to be shimmed with steel shims if floor is not level.
2.1 Determine which wall will support the guide rails and locate the center of the wall. Place a mark on the floor at 14 3/4" on either side if the centerline. This will be the position that you start setting up your guide rails.

Figure 1. Marking the guiderail location.
2.2
Assemble lower guide rails, guide rail base frame, lower cross brace, lower counter weight guides, and 2 wall mounting brackets (FIG. 2). Leave all bolts loose.

NOTE: Do not use washers for the bolt heads on the outside of the guide rails.

MATERIAL LIST

<table>
<thead>
<tr>
<th>PART #</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lower guide rails *NOTE</td>
</tr>
<tr>
<td>FFBUG003</td>
<td>Crossbrace support (4 hole)</td>
</tr>
<tr>
<td>FFBUG008</td>
<td>Wall mounting bracket</td>
</tr>
<tr>
<td>FFBUG001</td>
<td>Lower guide rail base frame</td>
</tr>
<tr>
<td>PGAGF014</td>
<td>7/16 N.C. x 5 bolt</td>
</tr>
<tr>
<td>PGAGF042</td>
<td>7/16 N.C. x 1 3/4 bolt</td>
</tr>
<tr>
<td>PGAGF030</td>
<td>7/16 N.C. nylon lock nut</td>
</tr>
<tr>
<td>*NOTE</td>
<td>Lower counter weight guides</td>
</tr>
</tbody>
</table>

NOTE:
Refer to the shop drawings for each job for details on these items.
2.3
Stand lower guide rail assembly against supporting wall. Measure from each guide rail to the nearest wall, the distance should be equal. If you are unable to keep the guide rails an equal distance from both walls for the entire travel distance then pick a wall (the one with the doors) and make sure the guide rails run parallel to that wall for the entire travel distance. Install ONE lag bolt into the top wall mounting bracket to stabilize the assembly (FIG. 3), leave all of the other bolts loose.

MATERIAL LIST
1. Lag bolt 1/4 x 3 long (wood wall), or concrete block lag bolt 1/4 X 2 1/4 (concrete block wall).
2. Guide rail connector section (double) Change required Conn. Section with welded lock nuts
3. Guide rail connector section (single)

PART #
PGAGF082
PGAGF083
FFBUG013
FFGUG015

NOTE:

Figure 3. Lower guide rail installation, looking from in front of the guide rails.
2.4

a.) Slide the next (upper or mid) guide rail sections in place. Insert all of the outside bolts. Remove the uppermost inner guide rail bolt (do not remove all the inner guide rail bolts or the connector tube will fall inside the guide rail).

b.) Put the 6 hole cross brace in place at an angle (Fig. 4) and insert one bolt on each side as shown. Remove the lower inside bolt, swing the cross brace into position and install the remaining bolts. Leave all bolts loose.

NOTE: Do not use washers for the bolt heads on the outside of the guide rails.

MATERIAL LIST

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1. 7/16 x 2 bolt</td>
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<td>2. 7/16 x 2 ¼ bolt</td>
</tr>
<tr>
<td>3. 7/16 Flat washer</td>
</tr>
<tr>
<td>4. 6 hole crossbrace FFBUG006</td>
</tr>
</tbody>
</table>

NOTE:
2.5
Install the remaining guide rails, cross brace, upper counter weight guides, and wall mounting brackets (FIG. 5). Leave all bolts loose.

NOTE: Do not use washers for the bolt heads on the outside of the guide rails.

MATERIAL LIST
1. Upper guide rails FFBUG011
2. Crossbrace support (4 hole) FFBUG003
3. Wall mounting bracket FFBUG008
4. 7/16 N.C. x 5 bolt PGAGF014
5. 7/16 N.C. x 2 1/4 PGAGF020
6. Upper counter weight guides FFBUG012

NOTE:
2.6 Install counter weight guide connecting angle (FIG. 6). Leave all bolts loose.

2.7 Install battery base frame (FIG. 7).

MATERIAL LIST
1. Gear Drive base frame FFCUG017
2. Upper counter weight guides FFBUG012
3. Wall mounting bracket FFBUG008
4. 7/16 N.C. x 1 bolt PGAGF006
5. 7/16 nylon lock nut PGAGF030
6. Lower counter weight guide *NOTE
7. Counter weight guide connecting angle FFBUG016

NOTE: Refer to shop drawings for each job for details of this item.

Figure 6. Installation detail of the counter weight guide connecting angle. Looking from in front of the guide rails, with part of the guide rail and cross brace cut away for clarity.

Figure 7. Gear Drive base frame and counter weight guides installation, looking from behind the guide rails.
2.8
Tighten all bolts on the guide rails, cross braces, and counter weight guide angles starting from the bottom to top in the following sequence:

a) Tighten the base frame first followed by the lower cross brace (FIG. 8) Ensure cross brace is flush with back of rail. (do not tighten the wall mounting brackets or the counter weight guides at this time).

b) Tighten the guide rail connector sections and mid-cross brace ensuring that the rails make a straight line where they connect. Tighten to about 80 ft-lbs, do NOT over tighten. **IMPORTANT**: Using a 4’ level or a set square ensure that the guide rails are in line and square in all directions (FIG. 9) (do not tighten the wall mounting brackets or the counter weight guides at this time).

c) Tighten the bolts on the upper cross brace and motor base frame.

d) Tighten the counterweight guide connecting angles (Figure 6) Ensure counterweight guide angles edges are lined up and are tight together. Grind connection smooth if necessary.

e) Move guide frame assembly back to supporting wall and anchor the wall mounting brackets to the supporting wall. Center guide rails in shaft by measuring from 4” x 4” rail to shaft walls adjacent to the support wall.

f) Tighten all of the counter weight guide angle bolts except for the ones on the lower cross brace (FIG. 8).

Figure 8. Tightening the base frame and lower cross brace, looking from in front of the guide rails.

Figure 9. Checking that the guide rails are straight and square, looking from in front of the guide rails.
2.9
Install and tighten the upper horizontal supports and wall mounting bracket (FIG. 10).

Figure 10. Installing the upper horizontal supports looking from in front of the guide rails.

MATERIAL LIST

<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td>1. Upper horizontal supports</td>
<td>*NOTE</td>
</tr>
<tr>
<td>2. Wall mounting bracket</td>
<td>FFBUG008</td>
</tr>
<tr>
<td>3. 7/16 N.C. x 1 3/4 bolt</td>
<td>PGAGF042</td>
</tr>
<tr>
<td>4. 7/16 N.C. nylon lock nut</td>
<td>PGAGF030</td>
</tr>
<tr>
<td>5. 7/16 N.C. x 1 bolt</td>
<td>PGAGF006</td>
</tr>
<tr>
<td>6. Lag bolt 1/4 x 2 1/2 long (wood wall), or</td>
<td>PGAGF082</td>
</tr>
<tr>
<td>or concrete block lag bolt 1/4 x 2 1/2 (concrete block wall).</td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>PGAGF083</td>
</tr>
</tbody>
</table>

NOTE:
Refer to shop drawings for each job for details of this item.
3.1 Hang the working platform on the bottom of the upper cross brace (FIG. 1) to install the gear reducers and motor(s).

Figure 1. Hanging the working platform on the upper cross brace.

NOTE:
3.2 Mount the gear reducer on to the mounting base at the top of the guide rail assembly (FIG. 2). The sheaves should have been installed at the shop, and should be secured with a roll pin through the boss.

3.3 Ensure that the sheaves are 9 1/2” centre to centre (FIG. 3).

MATERIAL LIST
1. Gear reducer assembly
2. Traction sheave
3. 7/16 N.C. x 5 1/2 bolt

NOTE:
3.4
Install motor. (FIG. 4).

3.5
Move the working platform to the top of the second cross brace to begin installation of the counter weights.

MATERIAL LIST

<table>
<thead>
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<th>PART #</th>
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<td>1. AC motor</td>
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<td>2. Gearbox</td>
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3.6
Hang the temporary counter weight hangers on the top of the second cross brace (FIG. 5).

Refer to counterweight assembly drawing UG135 in appendix B for all counterweight assembly images.

3.7
Assemble the counterweight side channels (UG136) to the upper and lower cross plates (UG140 & UG141) as per DWG UG135 in Appendix B using the 5/16 x 1 Hex bolts. Finger tight only at this stage.

3.8
Install the specified number of counterweight plates (UG142) onto the lower cross plate ensuring that the weight stack is tight to the back of the side channel.

3.9
Install the lower & upper keeper plates using the low profile 10-32 Pan Head screws.

MATERIAL LIST

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<td>Counter weight hanger</td>
</tr>
<tr>
<td>FFBUG006</td>
<td>Crossbrace support (6 hole)</td>
</tr>
<tr>
<td>UG135</td>
<td>Counterweight Assembly</td>
</tr>
</tbody>
</table>

NOTE: The counterweight sling will be shipped assembled—it must be disassembled prior to being installed on the counterweight hangars.
SECTION 4 - CARRIAGE

4.1
Remove the four bolts that connect the lower two wall mounting brackets to the counter weight guides (FIG. 1).

4.2
Place carriage floor inside shaftway on 4 x 4 temporary support tubes (2-2x4 studs on edge screwed together will also work) (FIG. 2). Centre the carriage floor with the guide rails.

MATERIAL LIST
1. 7/16 nylon lock nut  PGAGF030
2. Lower counter weight guides  *NOTE
3. Wall mounting bracket  FFBUG008
4. 7/16 x 1 3/4 bolt  PGAGF042  *NOTE
5. Carriage floor
6. Temporary 4 x 4 support tubes

NOTE:
Refer to job specific shop drawings for details of these items.
4.3
Remove the lower side guide roller bracket assemblies and the upper rollers from the guide frame. Slide the guide frame into place and insert the lower nuts & bolts. Insert the tilt plate bolts through the back of the guide frame tilt plate and the carriage floor vertical angles. Tighten the tilt plate bolts until they just make contact but can still turn freely.

Figure 3. Setting the guide frame in place.

MATERIAL LIST
1. Carriage floor AFBUC050
2. Carriage guide frame AFCUC001
4.4 Install the upper rollers as shown in (FIG. 4). Note the 1”NC jamb nut is placed in between the two ½” thick steel plates of the guide frame. Thread the jamb nut onto the 1”x7” bolt until it has reached the end of the threads. Thread the 1”NC lock nut onto the bolt and tighten so that the jamb nut and lock nut are tight and rigid against the outside ½” steel guide frame plate. Note the upper roller should have approximately 1/4” movement along the bolt shaft when tight.

**NOTE:**
Refer to shop drawings for each job for details of this item. Parts are not exactly as shown.

**MATERIAL LIST**

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<td>AFCUC001</td>
<td>Carriage guide frame</td>
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<tr>
<td>*NOTE</td>
<td>Lower guide rails</td>
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<tr>
<td>PGAGF019</td>
<td>3. 1 N.C. x 7 bolt</td>
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<tr>
<td>MMBUC040</td>
<td>4. Upper roller</td>
</tr>
<tr>
<td>PGAGF026</td>
<td>5. 1 N.C. jamb nut</td>
</tr>
<tr>
<td>PGAGF033</td>
<td>6. 1 N.C. lock nut</td>
</tr>
<tr>
<td>PGAGF017</td>
<td>7. 5/8 N.C. x 3 bolt</td>
</tr>
<tr>
<td>PGAGF032</td>
<td>8. Cable thimble</td>
</tr>
<tr>
<td></td>
<td>9. 5/8 N.C. nylon lock nut</td>
</tr>
</tbody>
</table>

Figure 4. Installing the carriage guide frame on to the guide rails. Looking from behind the guide rails.
4.5
Install the bottom side rollers on the carriage guide frame (FIG. 5) (not exactly as illustrated).

MATERIAL LIST
1. Side roller and bracket – No longer required
2. 1/4 N.C. x 2 Allen head bolt
3. 1 N.C. lock nut
4. 1 N.C. jamb nut
5. 1 N.C. x 7 bolt
6. Upper roller
7. Lower side roller frame bracket
8. 7/16 N.C. x 5 bolt
9. 7/16 N.C. nylon lock nut

PART #
FMBUC014
PGAGF002
PGAGF033
PGAGF026
PGAGF019
MMBUC040
FFBUC018
PGAGF014
PGAGF030

NOTE:
Parts may not be exactly as shown

Figure 5. Installation of the bottom side rollers. Looking from behind the guide rails.
4.6 
Install the lifting cables. Note the attachment to the carriage is assembled in the factory-inspect to ensure cable attachment bolts are fully threaded onto the locknuts. (Figure 6.)

Refer to counterweight assembly drawing UG135 in appendix B for all counterweight assembly images.

4.7 
Thread the counterweight end of the lifting cable through the gear drive base frame and over each traction sheave ensuring that each cable is set into the sheave groove. Note: you will need to loosen the cable keeper angle bolts to get the cables into the sheave groove. Tighten bolts once cables are in-place.

4.8 
Connect the rope wedge socket to the counterweight as shown in drawing UG135. Adjust the thread length after the bottom nut so that it is even on both sides and remove as much slack from the cable as possible. Jamb the nuts to secure the wedge socket in place as per UG135 and install the cotter pin in the hole below the bottom nut.

Figure 6. Carriage Lifting Cable Attachment.

NOTE:
Slack cable operated safeties shown.

4.9
Remove the temporary 4x4 support tubes underneath the carriage by lifting the carriage floor from the pit using a plank lever and blocks. The carriage should now be suspended by the lifting cables.

WARNING

DO NOT REMOVE COUNTERWEIGHT HANGARS UNTIL CARRIAGE IS FULLY ASSEMBLED
4.10
The right side rollers will have been set in the factory to achieve clearance of approximately 3/4" (FIG 7&8) spacing between the carriage guide frame and the outside of the guide rails. The left side rollers are spring loaded and you must back off the 5/16 square headed bolt to allow the spring to apply roller pressure on the guide rail. (not exactly as illustrated).

Figure 7. Upper side roller spacing. Looking from behind the guide rails.

Figure 8. Lower side roller spacing. Looking from behind the guide rails.

MATERIAL LIST
1. Carriage guide frame  AFCUC001
2. Side roller and bracket  FMBUC014
3. Lower guide rails  *NOTE
4. Lower side roller frame bracket  FFBUC018
5. 1/4 N.C. x 2 Allen head bolt  PGAGF002
4.11
Install the carriage walls and ceiling, leave the bolts loose.

MATERIAL LIST
1. Carriage wall studs  FFBUC060
2. Carriage ceiling
3. 7/16 N.C. x 2 1/4 bolt  PGAGF008
4. 7/16 Nylon lock nut  PGAGF030
5. Carriage Corner Cam Stud  FFBUC100

NOTE:
Refer to shop drawings for each job for details of these items.
4.11
To level the carriage, adjust each tilt plate bolt in sequence until the deck is level or tilted slightly up (approx. ¼”) on the side opposite the guide frame and all of the bolts have the same amount of tension. Do not adjust the bolts more than a ½ turn at a time.

![Figure 10. Tightening the carriage bolts.](image)

4.12
Once the carriage floor is level proceed to tightening all of the carriage studs making sure that the factory set markings line up on each stud as this will make installing the trim panels easier.

4.13
Once the carriage studs are tight proceed to installing the carriage trim pieces using the 1/8 pop rivets provided.
4.14
Turn gear reducer manually to raise the counter weight from the hangers (FIG. 11), make sure that the counter weight is not resting on the hangers before continuing with the next step.

NOTE:
Parts may not be exactly as shown

Figure 11. Removing the counter weight hangers and bottom counter weight plate, and installation of a lock nut on the threaded shaft. Looking from behind the guide rails.
4.15
Remove the counter weight hangers and bottom counter weight plate. (FIG. 12).

4.16
Install the four bolts that connect the lower two wall mounting brackets to the counter weight guides (FIG. 1). These bolts were removed in step 4.1.

4.17
Tighten the 5/16 x 1 Hex bolts on the counterweight side channels and the counterweight lower & upper keeper plates (see section 3.7 and 3.9) by manually cranking the weights to a position where the bolts and screws can be accessed.
SECTION 5 - SAFETIES

5.1
The Wedge type safeties require onsite adjustment.
Adjust the brake adjustment bolts (see figure two) so that the brakes move 1-1/4" off the lifting bar when manually lifted and jammed between the roller and guide rail. Ensure that each brake set are tight across the face of the brake. This may need to be repeated a few times to get both brakes set equally.

Next block the counterweights and jack up the carriage 12" to cause the cables to go slack. Without moving the brake shoes make a final adjustment to ensure that both sets of brakes are engaged equally.

Release the jack quickly, both brake sets should engage equally. Repeat drop test with 125% of the rated carriage load.

Note: The above procedure is for slack cable activated safeties. When using an overspeed governor, activate the safeties by moving the linkage up by hand when moving in the down direction at contract speed with 125% of the rated load instead of jacking up the carriage to slacken the cables.

Figure 2. Location of brake adjustment bolts.
5.2
Figure 3 shows the location of the slack cable brake safety circuit switch. Adjust this switch by rotating the spline switch head and/or bending the copper tube so that the switch activates when the safeties are engaged and so the switch disengages just prior to coming to rest in the normal position when the brake linkage is fully disengaged.

**NOTE:**
Parts may not be exactly as shown
Bi-fold Doors

6.1 Install the doors and jambs so that they are flush with the inside of the shaftway. The carriage corner studs should clear the inside of the shaft by 1 1/2 inches at the end of the carriage, the side of the carriage should clear the inside of the shaft by 3 inches (FIG. 1). See Appendix A for more door details.

6.2 Install the carriage door trim as shown (FIG. 1).

Figure 1. Installing the door, jamb, and carriage door trim.

MATERIAL LIST

<table>
<thead>
<tr>
<th></th>
<th>PART #</th>
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<tbody>
<tr>
<td>1. Complete door frame assembly</td>
<td>AFCUD101</td>
</tr>
<tr>
<td>2. Bi-fold door</td>
<td>AFBUD001</td>
</tr>
<tr>
<td>3. Carriage floor</td>
<td>*NOTE</td>
</tr>
<tr>
<td>4. Carriage corner stud (L section)</td>
<td>FFBUC060</td>
</tr>
<tr>
<td>5. Floor finishing plate</td>
<td>*NOTE</td>
</tr>
<tr>
<td>6. Entrance trim - guide rail side</td>
<td>FEBUC071</td>
</tr>
<tr>
<td>7. Entrance trim - opp. guide rail side</td>
<td>FEBUC072</td>
</tr>
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</table>

NOTE:
See shop drawings for details of these items.
Bi-fold Doors

7.1
Figures 1 to 3 show the cam configurations for various shaft widths when the cam is on the guide rail side.

Figure 1. Narrow Shaft (54” to 57”)
Figure 2. Standard Shaft (58” to 65”)

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Bi-fold Doors

7.1 Continued

7.2
Figure 4 shows the cam configurations for an adjacent access Bi-fold door.

Figure 3. Wide Shaft (66” to 67”)

Figure 4. Adjacent Access Carriage.
GAL Interlocks (Swing Doors)

7.3 Figure 5 shows a typical GAL cam configuration for a shaft up to 59" wide. The extension bracket may or may not be required.

7.4 Figure 6 shows a typical GAL cam configuration for shaft 60" wide or larger.

Figure 5. GAL cam configuration (carriage up to 59" wide).

Figure 6. GAL cam configuration (carriage 60" or wider).
GAL Interlocks (Swing Doors)

7.5
Figure 7 shows a typical GAL cam configuration for an adjacent shaft.

Figure 7. GAL cam configuration (adjacent carriage).
8.1
Figure 1 shows the basic configuration of the over speed governor. The over speed governor is always on the left side of the guide rails.

MATERIAL LIST

<table>
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<tr>
<th>PART #</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>FMBUG050</td>
<td>Over speed governor bracket</td>
</tr>
<tr>
<td>AMBUG057</td>
<td>OSG counter weight assembly</td>
</tr>
<tr>
<td>FMBUG055</td>
<td>OSG counter weight guide</td>
</tr>
<tr>
<td></td>
<td>¼” dia. OSG pulley cable</td>
</tr>
</tbody>
</table>

NOTE:
Not all installations require an over speed governor.
8.2
Figure 2 shows how to connect the over speed governor cable to the brake system.

8.3
Figure 3 shows the location of the over speed governor safety circuit switch.

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Figure 2. Connecting the over speed governor cables to the slack cable brake linkage.

Figure 3. Location of the over speed governor safety circuit switch.
• APPENDIX A – INSTRUCTIONAL DRAWINGS
  - UG089 – LIMIT SWITCH OPERATOR BRACKET LOCATIONS
  - LimSwLocation – LIMIT SWITCH LOCATION
  - CONTROLLAYOUT (1-5) – ON-BOARD CONTROLLER LOCATION AND LAYOUT
  - CLEARANCES – CARRIAGE AND MOTOR CLEARANCES
**NOTE:** Magnets near upper & lower terminal switches must be positioned such that the switch releases before the sensor sees the magnet when leaving the floor.

- **Front of Guide Rails**
- **Upper Floor Terminal Switch**
- **Upper Landing**
  - 7/8" x 1/4" Flexible Magnet x 3" LG
  - UG087 (9" Long)
- **Mid Landing(s)**
- **Lower Floor Terminal Switch**
- **Lower Landing**
  - UG085 (6" Long)
  - UG088 (6" Long)
- **Bypass & Final Limit**

4 to 5 in
For a left hand door, see opposite page.

The door shown is a right hand door. All details are in R.E.

Scale: 1/4" = 1'-

View A,

NOTE
• APPENDIX B - MISCELLANEOUS SHOP DRAWINGS
  • AMBUG101 – MANUAL CRANK ASSEMBLY
  • AMBUG135 - COUNTER WEIGHT ASSEMBLY
  • AFCUG035 - GEAR BOX AND UPPER HORIZONTAL SUPPORT
  • AFCUD101 - DOOR FRAME ASSEMBLY
### PARTS LIST

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<td>1/16 NC UNI</td>
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<td>SCREW #2 X 10</td>
<td>SCREW #2 X 10</td>
</tr>
<tr>
<td>15</td>
<td>SCREW #2 X 10</td>
<td>SCREW #2 X 10</td>
</tr>
<tr>
<td>16</td>
<td>SCREW #2 X 10</td>
<td>SCREW #2 X 10</td>
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</tbody>
</table>

**NOTES:**
- Max weight for 14/14 in one box.
- Max weight for 12/12 in one box.
- Max weight for 18/20 in one box.
- Add longer length for 1400 lb elevator.
- 1/2" O.D. x 1-1/2" HEX HEAD BOLT.
- 1/2" HEX HEAD BOLT.
- WC 75812.
- Guide Shoe.
- Counter Weight Plate.
- Lower Cross Plate.
- Upper Cross Plate.
- Upper Keeper Plate.
- Lower Keeper Plate.
- Side Channels Weldment.
- Plug Weld Uniaxial To C.
**RAM MANUFACTURING LTD.**

**DESCRIPTION**

- **Scale:** 1/4 size

**Note:**

1. The door shown is a “right hand” door. All details in the drawing are for a “right hand” door. Also to reduce door 1/4”, make gap to 1/4” max.

2. Install smoke seal on jambs for length of door edge.

3. Pan a left hand door are opposite details shown.

**PARTS LIST**

<table>
<thead>
<tr>
<th>PART</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>2 - P-1601</td>
</tr>
<tr>
<td>9</td>
<td>1/16 NC x 15 bolt</td>
</tr>
<tr>
<td>8</td>
<td>1/4 reference</td>
</tr>
<tr>
<td>7</td>
<td>3/4 reference</td>
</tr>
<tr>
<td>6</td>
<td>1/4 NC x 15 bolt</td>
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<tr>
<td>5</td>
<td>1/4 NC x 15 bolt</td>
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<tr>
<td>4</td>
<td>1/4 NC x 15 bolt</td>
</tr>
<tr>
<td>3</td>
<td>1/4 NC x 15 bolt</td>
</tr>
<tr>
<td>2</td>
<td>1/4 NC x 15 bolt</td>
</tr>
<tr>
<td>1</td>
<td>1/4 NC x 15 bolt</td>
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</table>

**DRAWING:**

- **Size:** 1/4 size

**VIEW:**

- A. Front view

**SCALE:** 1/4 size
REQUIRED TOOLS FOR INSTALLATION

- ½” Drive Electric Drill
- 1” AUGER Bit LONG 12 – 18”
- 1 1/2” & 1 7/16” Combination Wrench
- 24” Combination Punch-Pry Bar
- Concrete Chisel
- 48” Level
- Broom & Dustpan
- 90 Ft. 12Ga. extension Cord w/tri-plug adapter
- Extension Ladder
- 72” Step Ladder
- Working Platform - shipping with elevator (1st install only)
- 24” Hydraulic Bottle Jack
- Counterweight Hangars - shipping with elevator (1st install only)
- Trouble Light
- Concrete Drill with 3/8 concrete bit
LIST OF STANDARD TOOLS THAT SHOULD BE INCLUDED
IN THE INSTALLERS TOOL BOX

- 3/8" Drive Electric Drill
- 4-1/2" Electric Grinder
- 10-12" Hacksaw
- Torpedo Magnetic Level
- Utility Knife
- 25'x1" Measuring Tape
- 12" Combination Square
- Drywall Saw
- Multi-meter
- Pop Rivet Gun
- 16 oz. Ball Peen Hammer
- Tapered Hole Punch
- Center Punch
- Cold Chisel
- 1/2" Wood Chisel
- 10" Vise Grip (x2)
- 7" Quick Clamp
- Round & Flat File
- 1/16"-3/8" Allen Wrenches
- 3/8,7/16,1/2,9/16,5/8,11/16,3/4
  Combination Wrenches
- 5/16,3/8,7/16,1/2,9/16,5/8,11/16,3/4&5/8
  Deep 3/8" Dr. Sockets
- 3/8" Drive Ratchet w/6" Extension
- 3/8" Drive. Bit Driver
- Combination Screwdriver
- #2 Stubby Robertson Screwdriver
- #2 Stubby Phillips Screwdriver
- Terminal Block Screw Driver (1/8" Tipped Flathead)
- Combination Wire Stripper/Crimper
- 7" Wire Cutters
- 8" Linesman Pliers
- Needle Nose Pliers
- 10" Channel Lock Pliers
- 7/8", 1 1/8", 1 1/16", 1 1/4" Hole Saws w/arbor
- Drill Bits (1/8,5/32,13/64,1/4) X2 & 1/2" w/3/8 shaft
- Taps (10-24 & 1/4-20 NC.) X2
- Large Flat Head Screw Driver
- Needle Nose Vise Grips