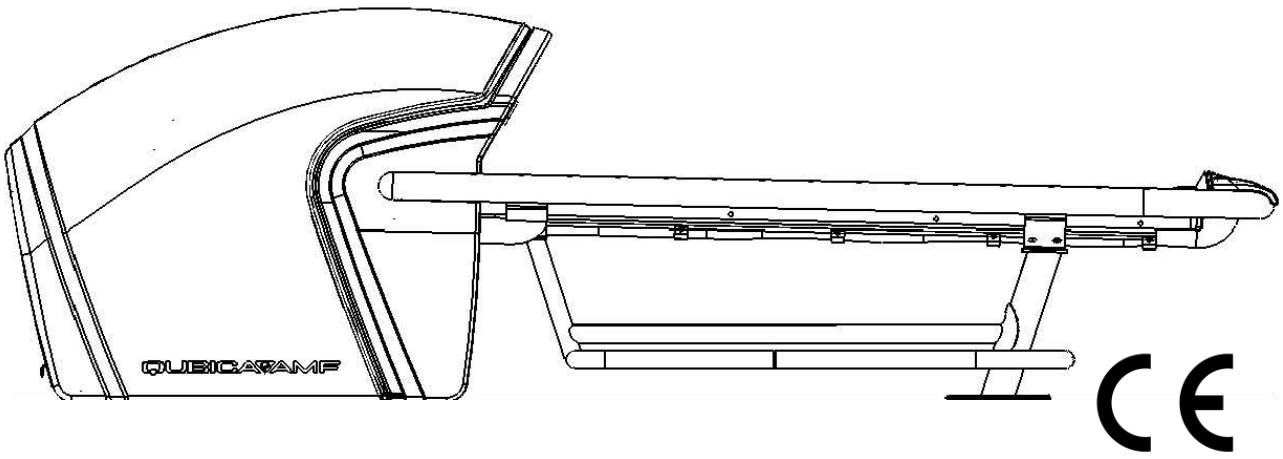
BALL RETURN

with Optional Lower Rack

Installation, Operation, Service, and Parts Manual



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DOCUMENT UPDATES

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TRADEMARK NOTICES

Document #400-254-004 Rev. D

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QubicaAMF Bowling Products, Inc.

8100 AMF Dr.

Mechanicsville, VA 23111

Harmony Ball Return with Optional Lower Rack
Installation, Operation, Service, & Parts Manual – 400-254-004 Rev. D

Summary of Changes

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List of Effective Pages

Page	Change No.	Effective Date
All	Rev. A	4/30/2014
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All	Rev. C	9/29/2014
All	Rev. D	11/11/2014

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1.0 HOW TO USE THIS MANUAL

This manual contains information needed to properly install, operate, and maintain the Harmony Ball Return. If any terms, concepts, or operations contained in this manual are not clear to you, consult an experienced professional or QubicaAMF Technical Support.

2.0 INTRODUCTION

Before you begin the installation, check your shipment against the packing list to ensure that all parts have been included. Report missing items to QubicaAMF at 866-460-QAMF (7263) between the hours of 8:30AM and 5:30PM Eastern Time. After 5:30PM, you can leave a message on the voice mail system. The 24-hour fax line is (804) 559-8650. Address all faxes to QubicaAMF Products Technical Support. You can also e-mail Technical Support at emtechsupport@qubicaamf.us.

WARNING!
Read This BEFORE Proceeding.

TO AVOID INJURY:

Read these safety precautions before attempting to install or modify any equipment.

Failure to follow these procedures may result in severe personal injury, fire, or permanent damage to property.

- **When you see this symbol  associated with an instruction, a possible hazard is indicated. Follow these instructions carefully.**
- **Before installing, removing, or replacing electrical equipment, ensure that the supply power to the unit has been turned OFF at the main circuit breaker box in accordance with your center's lock out and tag out procedures.**
- **The ball return accepts either 115 VAC or 230 VAC input power. The fuses (provided) in the control unit must be correctly sized based on the input voltage.**
- **The ball return system uses 3.8A @ 115 VAC and 1.9A @ 230 VAC. The circuit breaker must be appropriately sized according to applicable local and regional electric codes.**
- **Protect the approach and lane surfaces before you begin installation of the ball return unit.**
- **Before applying power to a ball return, be sure that all cables have been connected properly — especially the main power cables.**
- **Before operating a ball return, be sure that all GUARDS are in place.**
- **Do NOT pass anything other than 10-pin bowling balls through the unit.**
- **Do NOT place your hand or any other object into the ball lift.**
- **A bowling ball presents a pinching hazard as it exits the lift and when it comes into contact with another ball on the ball rack. Do NOT place your hand inside the ball lift exit opening, and exercise caution when removing a ball from the rack.**

- **The lift is to operate in an air-conditioned indoor environment.**
- **The control box's IP rating is 30.**

3.0 PACKING LISTS AND TOOLS

If installing part number 612-300-260, you should receive the following:

Part Number	Description	Quantity
254-001-002	Harmony Ball Lift	1
254-001-003	Harmony Hood-Rack Installation Kit	1
254-001-017	Harmony Rack Pedestal/Hardware Kit	1
254-001-010-XX	Harmony Ball Lift Hood Set*	1
610-494-444	Underlane Track Shim Package	1
612-500-032	Underlane Track Kit[1]	1
000-021-185	Underlane Track Plate Weldment[1]	1
167-003-122	Plastic Runner Assembly[1]	1
612-500-031	Underlane Track Kit[2]	1
049-006-586	Rail Track Assembly[2]	1

* "-XX" at the end of a part number denotes that color options are available.

You will receive ***either*** the items with a "1" after them ***or*** the items with a "2" after them, depending on what underlane track is installed.

If installing part number 612-300-262, you should receive the following:

Part Number	Description	Quantity
254-001-080	Lower Ball Rack	1
254-001-119	Lower Ball Rack Hardware Kit	1

Installation Tools

The following is a list of tools needed for the installation of the Harmony Ball Return. Other tools may be required depending on whether you are installing the unit on a wood or synthetic approach.

tape measure	straight edge/carpenter's square
hacksaw & blades	3/8" drive ratchet
5/16" Allen wrench or drive	12-inch, 3/8"-drive extension
pencil/marker	7/16", 1/2", & 12mm sockets
circular saw	7/16", 1/2", 9/16", 3/4", & 15/16" combination wrenches
hammer drill	#2 Phillips screwdriver
wire strippers	small flat-head screwdriver
wire cutters	3/16", 7/32", 9/32", & 7/16" drill bits
utility knife	5/16" masonry (carbide tipped) bit
crimpers	level
impact/driver	hammer
1/4" nut driver	V-wheel wrench

4.0 SAFETY

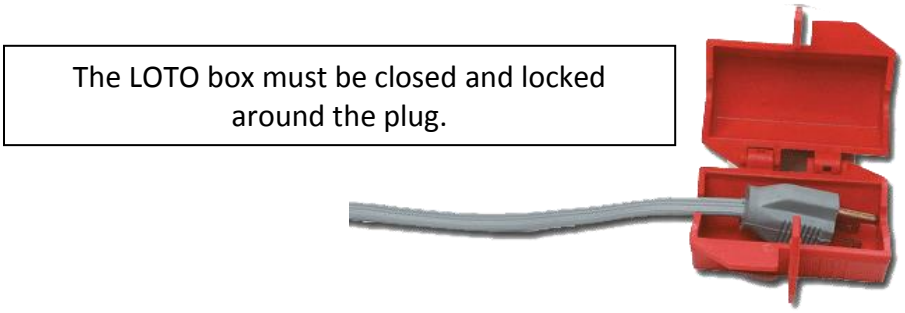
It is important to lockout-tagout (LOTO) a ball return prior to installation, maintenance, or servicing of the lift. This is a safety procedure used to ensure that the ball return is properly shut off and not started again prior to the completion of installation, maintenance, or servicing work. Hazardous power sources must be isolated and made inoperative. This can be done fairly simply, but varies slightly depending on the country/method of installation:

4.1 U.S.A.

For installations in the U.S.A., each Harmony ball lift will need to be installed with a local AC power disconnect (>10A, non-fused). The disconnect should be installed under the approach below the ball rack access cover area. In order to LOTO lifts installed this way, the puller will need to be physically pulled-out of the disconnect and then the disconnect must be locked closed with the puller removed. For non-puller types, the disconnect switched must be placed in the OFF position and then the disconnect cover must be locked shut. This will physically prevent electricity from reach the lift during installation, maintenance, or servicing.

4.2 E.U.

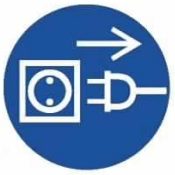
For European installations, a Schuko power outlet should be installed within 3m (10ft) of the ball lift. Then, the lift simply plugs into the outlet. Power is disconnected from this lift simply by removing the plug from the outlet. To LOTO this machine, a LOTO box must be placed around the ball lift's electrical plug and physically locked so that the plug cannot be placed in the socket. This ensures that no electricity can reach the machine during installation, maintenance, or servicing.

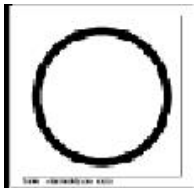


4.3 Warnings/Symbols

- READ, UNDERSTAND, and FOLLOW all of the recommended safety practices presented in this manual before using this machine.
- Only properly trained and supervised personnel should be allowed to install, adjust, or operate a Harmony ball return.
- The bowling center is a construction area during the installation of ball return(s). Required safety equipment, including safety glasses and safety shoes, must be worn during installation. Wearing loose clothing or jewelry is NOT RECOMMENDED when operating or maintaining the machinery. Refer to local safety codes for specifics.
- Follow all applicable electrical safety precautions when working around energized electrical equipment.
- Power tools such as saws, drills, nail guns, etc. present a hazard. Follow the manufacturer's safety recommendations when operating these products.
- The ball return contains motors, belts, pulleys, chains, and linkages that can present a pinching or crushing hazard during operation. Exercise caution when working around these components.
- Do NOT remove any of the safety labels and signs that are included with the ball return.
- DO NOT operate the ball return without all guards in place.

The following are some of the symbols that can be found on the machine and in accompanying documentation. Be sure to observe the applicable safety warnings and precautions.

	This symbol means STOP, DO NOT PROCEED, and is a warning that hazards could exist. It is often followed by other symbols.		This symbol means that the mechanic should read, understand, and follow the technical manual before servicing the machine.
	This symbol indicates a LOCKOUT/TAGOUT point for performing maintenance.		This symbol reminds the user to remove power from the machine prior to performing maintenance.
	This symbol indicates that eye protection is required.		This symbol denotes that an entanglement hazard associated with beltss and pulleys exists.
	This symbol indicates that the machine may start or cycle automatically without warning.		This symbol denotes that an entanglement hazard associated with chains and pulleys exists.

	This symbol warns that a falling hazard exists.		This symbol warns that a tripping hazard exists.
	This symbol warns of electrical power, circuits, enclosures, and other electrical hazards.		This symbol is used as a general warning and special attention needs to be paid.
	This is the start/on symbol. It communicates where a start/on switch or button is located.		This is the grounding symbol. It indicates wherever a safe ground connection can be made.
	This is the stop/off symbol. It communicates where a stop/off switch or button is located.		This symbol indicates a heavy object and recommends the use of two or more people for lifting.
	This is the burn hazard/hot surface symbol. It indicates an area where extreme heat is possible.		This symbol indicates STOP! NO ACCESS FOR UNAUTHORIZED PERSONS. Service should be performed by authorized, trained personnel only.
	This symbol denotes that an entanglement hazard exists.		This symbol denotes a heavy object. Extra care should be taken when lifting or moving.
	This symbol denotes a pinching hazard.		This symbol indicates a lift point.

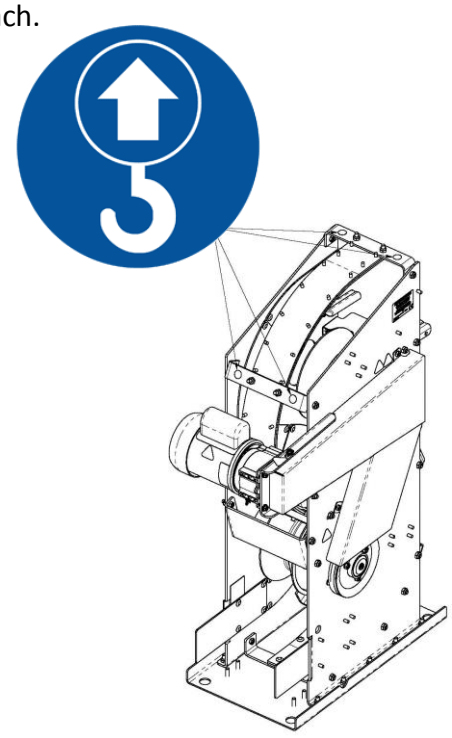
5.0 TRANSPORTATION

The Harmony ball lift is shipped physically bolted down to a small wooden pallet. This prevents the lift from shifting at all on the pallet during transport and allows for easy loading and removal from transportation vehicles. Additionally, this pallet can make moving the lift from its delivery truck to its spot on the approach easier. It is encased with a sturdy/rigid cardboard box. The box provides additional protection to the lift during transportation.

The Harmony ball lift is relatively light when compared to other/previous ball lifts. However, it is still too heavy to be lifted by one person. The lift weighs 180 lbs (82 kg) and should always be moved by two or more people. It is recommended that once the ball lift is removed from the delivery truck, that it be placed on a hand-truck and wheeled to its location on the approach. From there, two (or more) people should be able to remove it from its container and lower it into the approach cutout.

5.1 Lift Points

The ball lift is very durable and rigid. It is recommended that the ball lift be lifted by the upper guard assembly. This part is centered on the lift and connects to both side plates. This allows the lifting point to be above the center of gravity and provides for good control of the lift as it is being lowered into the approach.



6.0 HARMONY BALL LIFT INSTALLATION

The Harmony Ball Return consists of a ball lift, a hood assembly, and a ball rack. The foundation for the ball lift consists of two 2x6x18-inch boards over a concrete subfloor. While shims are provided to level and raise the ball lift to the required height, you might need to plane the boards and/or use additional materials to achieve the 14.25-inch (362mm) required distance from the **underside** of the ball lift base plate to the **top** surface of the approach. When the lift is sitting on its foundation/shims, it should not rock and should be stable even before the four screws are installed. Once the four screws are put in, the ball lift should be checked again for correct depth, levelness, and centeredness to the ball return track, then adjusted accordingly by adding/removing shims and/or shifting the lift's position to guarantee good alignment with the return track.

Depending on the length of your approach, or where you prefer to install your ball return, the ball rack may or may not overhang the end of the approach.

IMPORTANT!

The standard QubicaAMF underlane track installation results in the end of the track being 125-7/16" from the lane side of the foul line. In order for the Harmony Ball Return to sit so that the ball rack is flush with the end of the approach, the underlane track will need to be shortened. The track should be shortened (approximately 16-11/16") so that it runs flush to the ball entrance at the bottom of the ball lift. The track will need to be shortened enough to place the ball lift properly, but *be sure to place the ball lift in position BEFORE completely shortening the underlane track to prevent shortening the track too much.* This placement will result in the end of the ball rack lining up flush with the end of the approach. Measurements are shown in Figure 1. If an installation other than the standard installation is desired, the underlane track can be lengthened or shortened as needed.

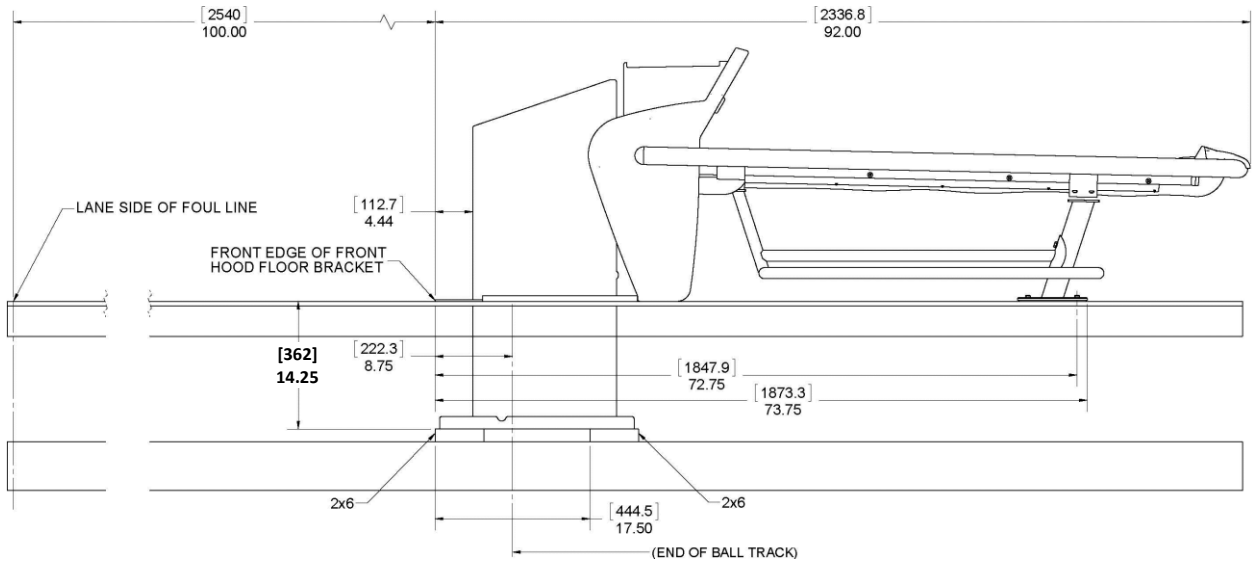


Figure 1, Standard Layout
16' (192") Approach

The dimensions specified herein are for a typical installation and assume **an approach length of 16 ft. (192")**. This typical installation will result in the ball rack ending flush with the end of the approach. If the approach is longer or shorter than 16 ft., the end of the ball rack may or may not line up with the end of the approach.

If the approach is less than 16 feet in length, or if more space is needed between the end of the ball rack and other installed equipment, then you will have to offset the installation closer to the foul line by the desired amount. **If the location of the ball lift is shifted, it may be necessary to cut and splice the underlane ball return track to accomplish the installation.**

6.1 APPROACH OPENING AND LIFT INSTALLATION

For replacing an existing installation, remove the old ball lift and fill in and/or cut out the approach opening, as necessary, to meet the specifications shown below.

1. Cut an opening in the approach floor 22.63 inches by 13.5 inches (574.5 mm x 342.9 mm) starting 101.75 inches (2584.5 mm) from the rear edge of the foul line. Cut the two trap doors and a space for the lift belt access as shown in Figure 2. Center the opening(s) over the underlane track. The front trap door is required to retrieve the ball if it is not handled properly by the ball lift.

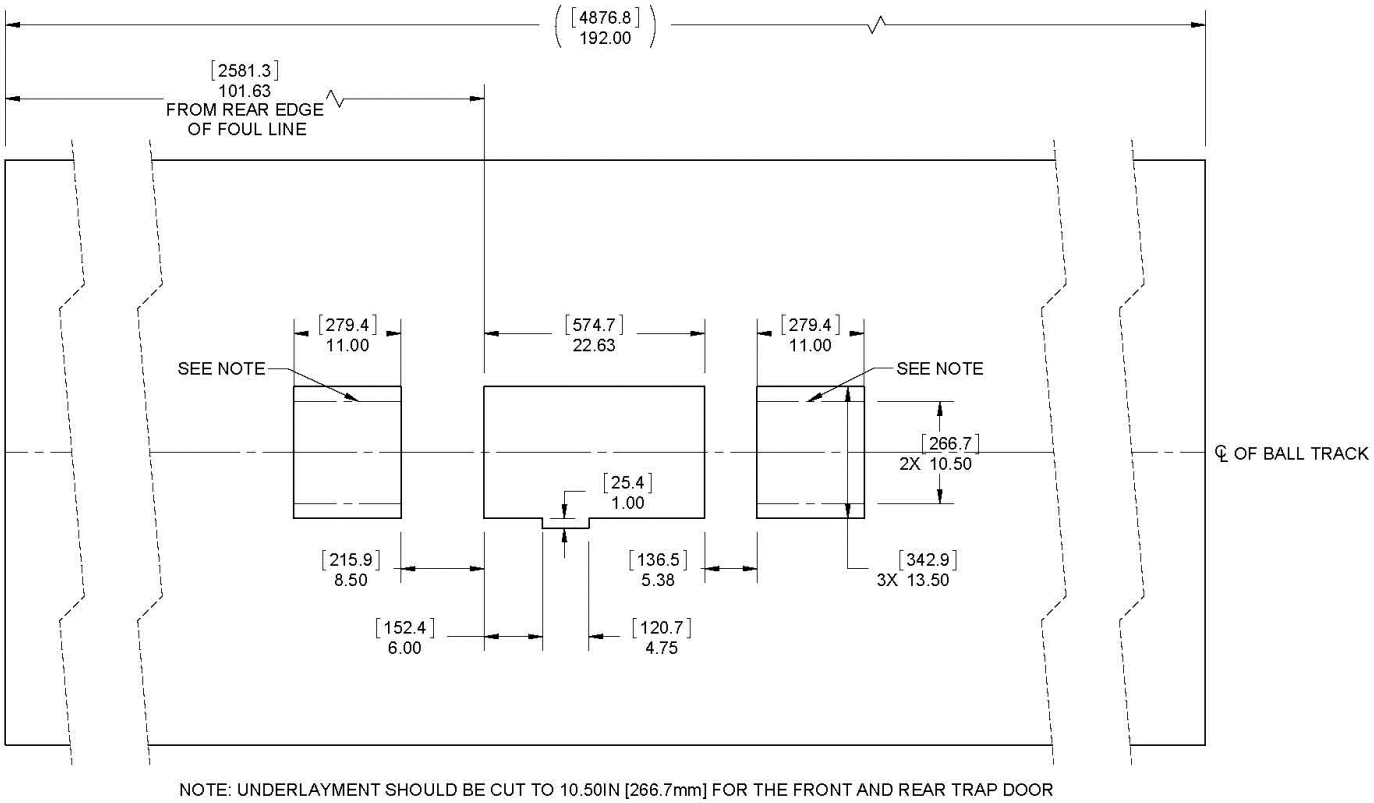


Figure 2, Approach Opening Layout – Top View

2. If not installed earlier, attach the rail adapter plate (049-006-359), which is included with the underlane track, to the end of the underlane track using two 1/4 lock washers (951-148-002) and 1/4-20 x 1/2 hex screws (809-849-085) (see Figure 5). Tighten securely.

3. Place the first 2x6x18-inch board on the subfloor so that it is positioned perpendicular to the underlane track under the rail adapter plate. Approximately 1/4" of board will stick out from under the base plate. This is just an approximate location.

4. Place the other 2x6x18-inch board on the subfloor parallel to the first board with its front edge 16.5 inches (419.1 mm) from the first board's front edge (see Figure 3). Again, approximately 1/4" of the board will stick out from underneath the base plate.

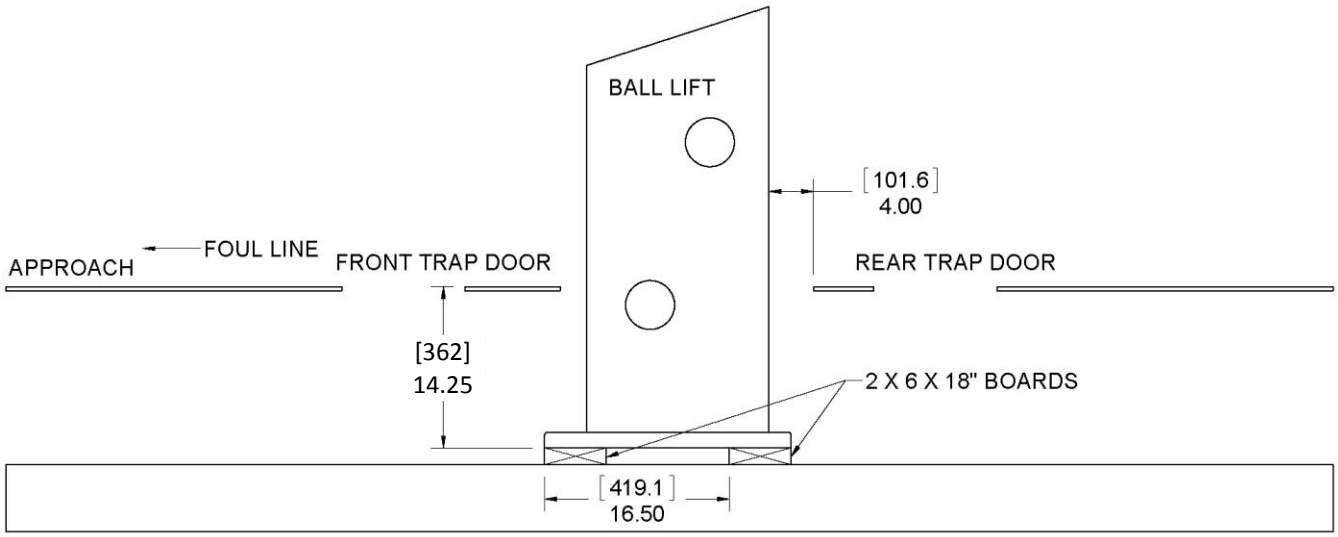


Figure 3, Ball Lift Installation – Side View

5. The ball return control unit accepts 115 VAC or 230 VAC power input. Instructions for configuring the controller and the ball rack blower motor are provided in the "Connecting the Wiring" section.

6. Lower the ball lift mechanism into the opening and onto the two 2x6"s. Position the ball lift in line with the underlane track so that the holes in the adapter plate on the end of the underlane track align with the four studs on the ball lift base plate.

7. Center the 2x6" boards under the bolt holes in the ball lift base plate and check the ball lift's levelness side-to-side and front-to-back. Use shims from the shim pack (610-494-444), as necessary.

8. Measure the distance from the underside of the ball lift base plate to the top surface of the approach. This distance should be 14.25 inches (362 mm). If necessary, add or remove shims, plane the 2x6" boards, etc. Maintain the unit's levelness side-to-side and front-to-back.

9. Drill four 7/16-inch (11-mm) clearance holes through the shims and 2x6" boards using the base plate mounting holes as a guide.

10. Drill four 5/16-inch (8-mm) holes in the concrete subfloor to a depth that is at least 5/8-inch (16-mm) deeper than the estimated screwbolt embedment using the previously drilled clearance holes as a guide. Clean out loose material from the holes.

11. Anchor the ball lift to the subfloor using four 8-mm x 100-mm screwbolts (709-013-060), 7/8-inch o.d. flat washers (948-964-142), and 1-1/2-inch o.d. flat washers (945-867-242). Apply moderate downward pressure to the screwbolts and do NOT exceed 50 ft-lbs. (68 newton-meters) torque. See Figure 4.

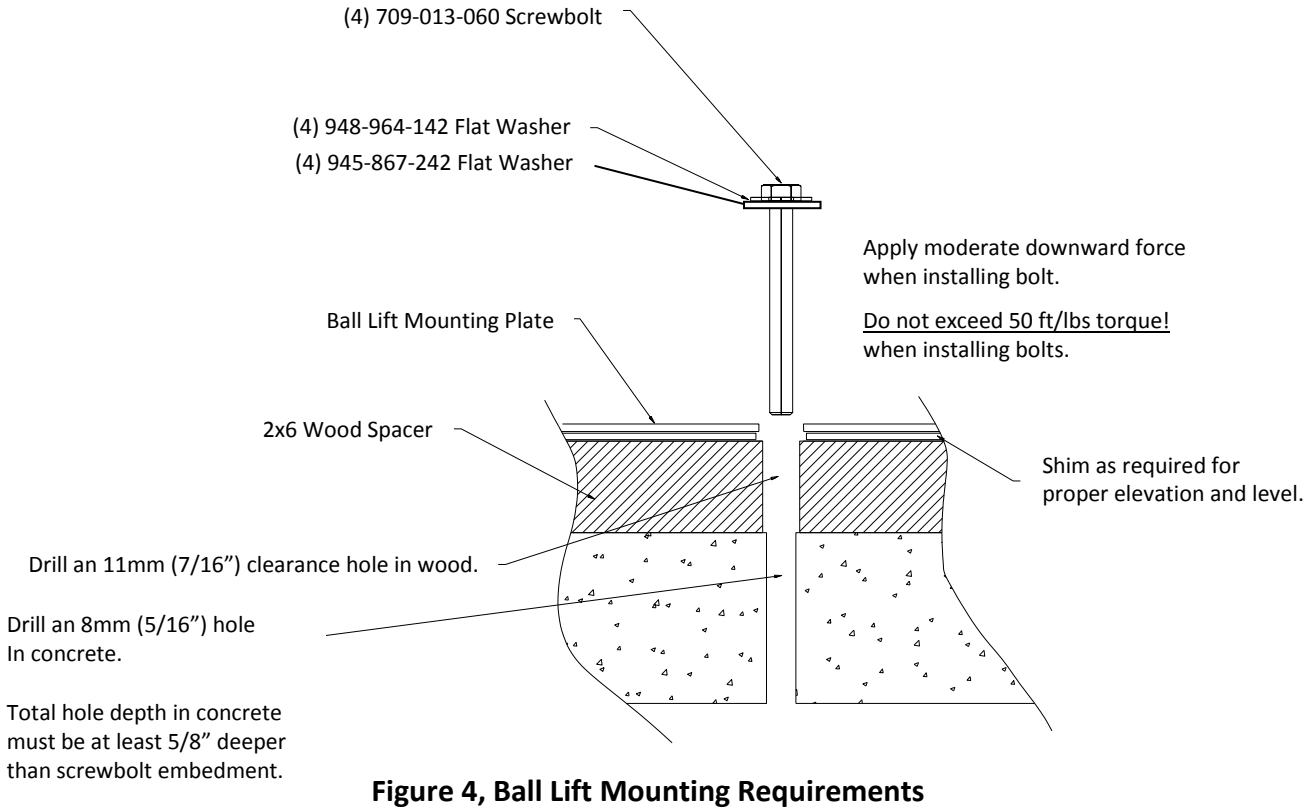


Figure 4, Ball Lift Mounting Requirements

12. Secure the adapter plate to the ball lift base plate studs using four 11/32-inch washers (948-722-111) and 5/16-18 nylon insert lock nuts (839-057-002) as shown in Figure 5. Track alignment is critical for the smooth transition of the ball to the lift. Adjust the track as necessary to ensure that the track is centered between the ball lift side plates. Shim the adapter plate as needed to obtain a smooth, level track joint.

13. If necessary, trim off any excess plastic track using a utility knife.

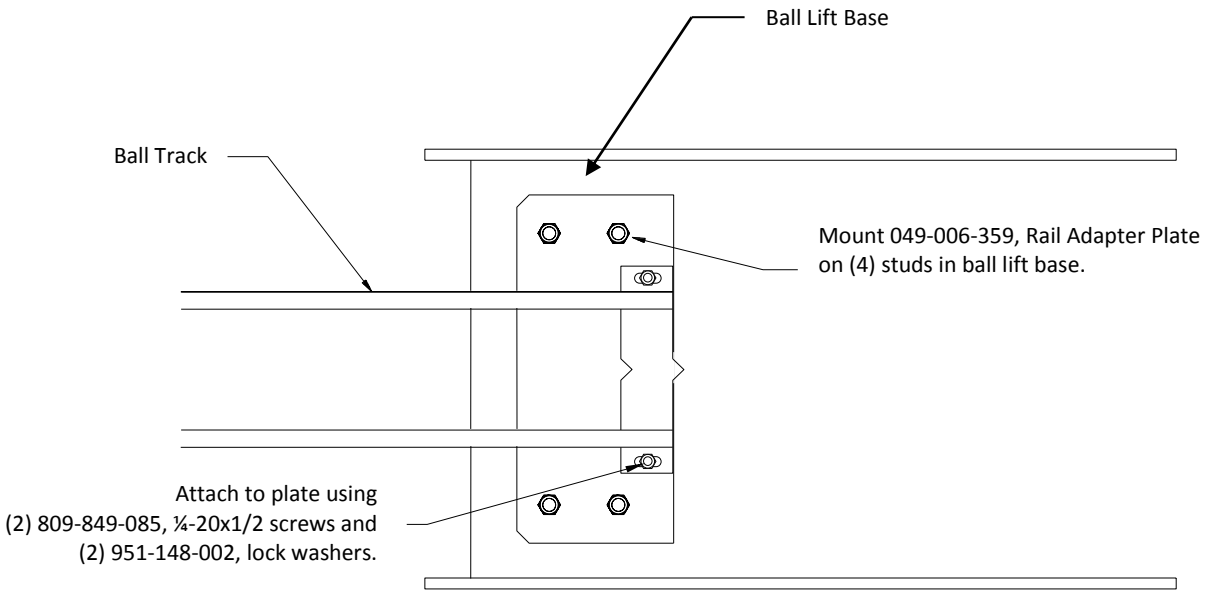
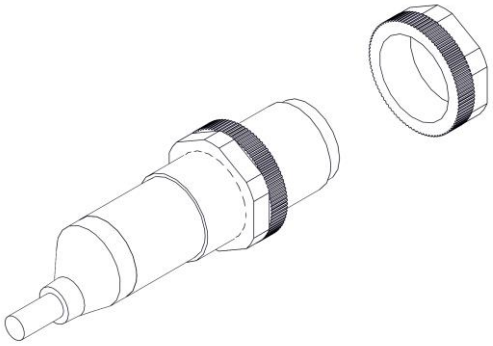


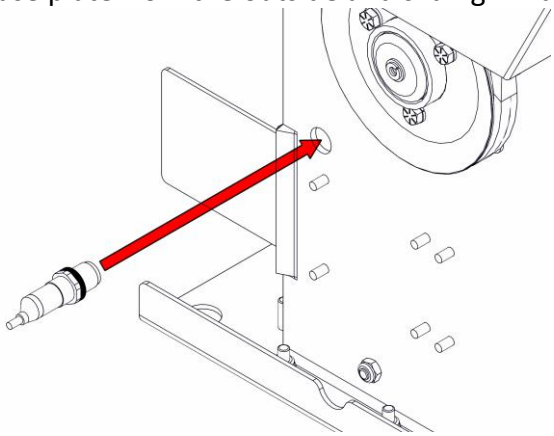
Figure 5, Track to Lift Connection

6.2 INSTALLING THE BALL ENTRY SENSOR

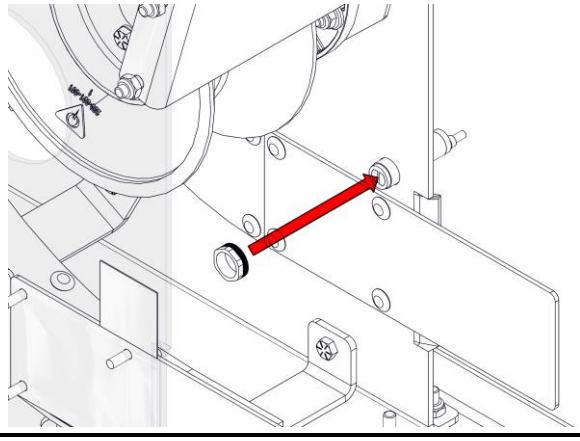
1. The Ball Entry sensor fits into a predrilled hole near the bottom of the right side plate (looking from the foul line). It comes with three screw-on tightening rings, two hex and one cone. Use the two hex rings to secure the sensor to the side plate and allow for adjustment in how far out in the interior of the lift the end of the sensor will stick out.



2. Screw one of the tightening rings midway onto the sensor. Position the sensor by sliding it into the hole in the base plate from the outside and sliding inward.



3. With the sensor in position, hand-tighten the remaining tightening ring. Adjust the rings so that the sensor does not protrude beyond the tightening ring. The sensor will need to be adjusted after it is connected to the control box and the ball lift is powered on.



BALL ENTRY SENSOR ADJUSTMENT

1. After connecting all the cables to the control box, turn the power on to the Harmony Ball Return.
2. Depress the E-Stop button on the control box.
3. Check the sensor LED indicator lights located at the cable end of the sensor. Green indicates that the sensor is on and aligned. Yellow indicates the sensor is blocked or not aligned. Both LED's can be lit at the same time.
4. While observing the LED's, rotate the sensor slowly until only the green LED is lit. Note the position.
5. Continue to rotate until the yellow LED is lit (both green and yellow will be lit). Note the position.
6. Rotate the sensor to the middle of the two noted positions in steps 4 and 5 above. Only the green LED is on.
7. Secure the tightening ring making sure the sensor does not rotate. Check that only the green LED is lit.

Note: When rotating the sensor, you may see a position when both the green and yellow LED's are not lit. This position is not acceptable. Only the green LED should be lit for optimal operation.

6.3 INSTALLING THE BALL STOP

The ball stop allows the ball to move down the track to the ball lift, but prevents the ball from moving backwards past the ball stop should the ball fail to be handled properly by the ball lift. The ball stop should be placed in alignment with the front trap door as shown in Figure 2.

1. Assemble the ball stop as shown in Figure 6. Place the tube through the hole in the plastic stop and then position the stop between the ears of the metal bracket. Secure the plastic stop using the 5/16-18 x 2 1/4-inch bolt (809-857-365) and lock nut (844-057-002). The longest side of the plastic stop must be placed against the metal bracket and should hang down as shown in Figure 6.

2. Mount the ball stop to the first leveling strip forward of the ball lift as follows:

   a) Center the plastic stop over the ball track with the centerline of the 2 1/4-inch bolt exactly 10 inches (254 mm) above the track's mounting plate.

   b) Mark the leveling strip through the holes in the ball stop bracket, and drill two 7/32-inch pilot holes for mounting the ball stop at the marks on the leveling strip.

   c) Mount the ball stop to the leveling strip using 5/16 x 1 1/2-inch lag screws (810-556-240) and flat washers (948-761-112).

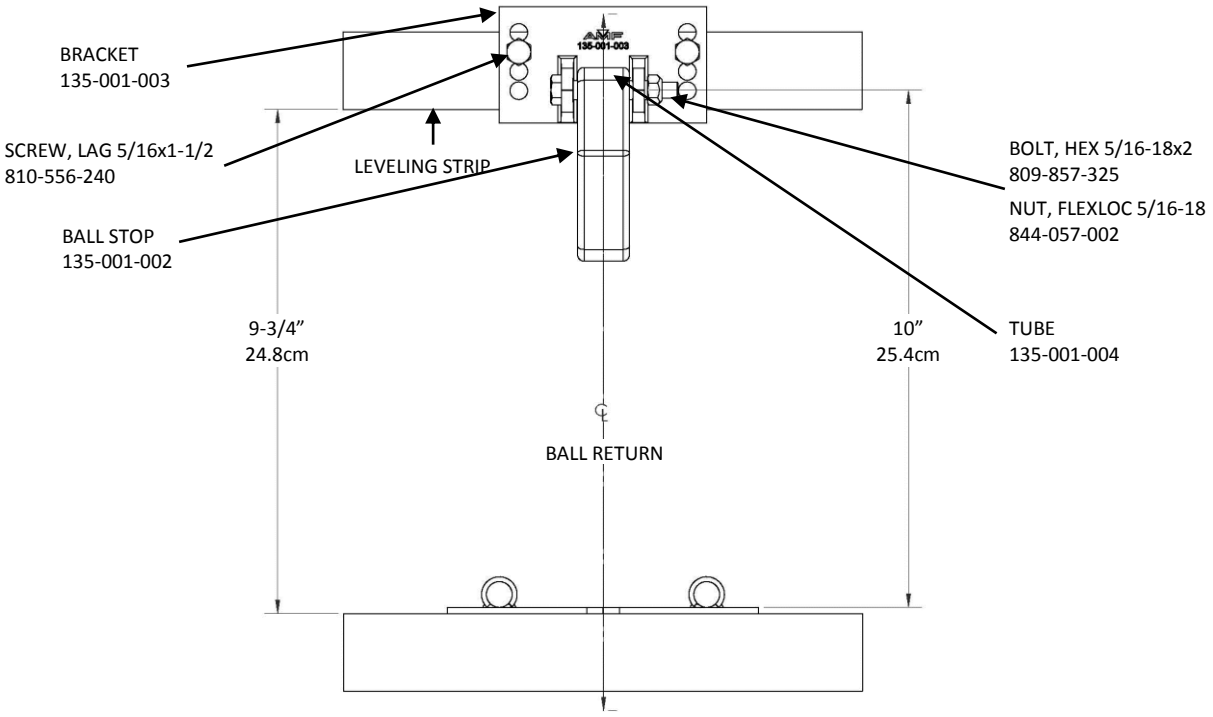


Figure 6, Ball Stop Installation

6.4 INSTALLING THE HOOD ASSEMBLY

The Harmony Hood Assembly includes an access panel, a bezel, a blower, a hood, and a rack-bezel support as shown in Figure 7.

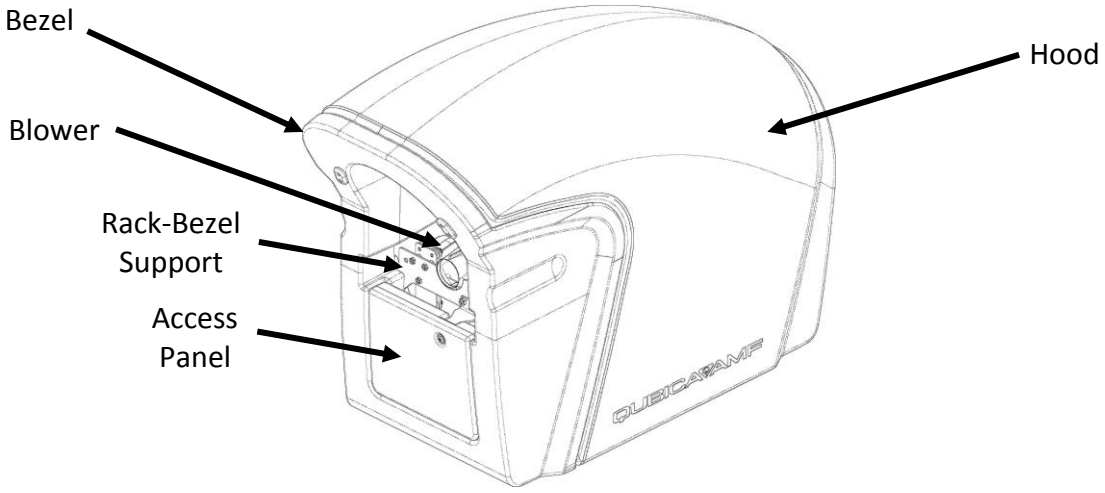


Figure 7, Harmony Hood Assembly

Installing with Floor Plate Templates

1. Ensure that the ball lift is plumb and level from all sides.
2. Stand with your back towards the foul line (facing the settee area) and place the floor plate templates on the approach around the lift so that you can read the "EVN" and "ODD" labeling. This should cause the EVN template to be on the same side of the lift as the even numbered lane. Same with the ODD template on the odd lane.
3. The plate templates fit into one another like puzzle pieces. Once fitted together, they will fit the Harmony ball lift snuggly on the foul line and settee area ends. However, the entire template will need to be centered from side-to-side.
4. Once in place, mark all 14 holes (seven in each plate template), remove the templates, and drill the holes using a 3/16" drill bit.
5. Secure the rack-bezel support using the holes on the settee side of the ball lift using four tapping screws (821-142-202).
6. Secure the odd and even floor rails to the rack-bezel support using two cap screws (809-857-100) and two nuts (844-057-002). See Figure 8. Also, install the hood locking pins (254-001-014) to the holes in the side of the rack-bezel support directly above where the side rails attach to it.

7. Position the front floor bracket so that the arrow ends of the floor rails fit snugly into the arrow cut-outs in the front floor bracket. This also ensures that each floor rail is parallel to the sides of the ball lift. See Figure 8.
8. Secure the rails and the front floor bracket to the floor using eight flat-head Phillips screws (829-642-202).

Continue to the next page.

Installing without Floor Plate Templates

1. Ensure that the ball lift is plumb and level from all sides.
2. To install the base, measure 4" [101.6 mm] from the side plate of the ball lift towards the rear edge of the approach and draw a line perpendicular to the lift's centerline.
3. Place the inside edge of the rack-bezel support on this line and ensure it is perpendicular to, and centered on the ball lift's centerline. Mark the location of the four predrilled holes and remove the support. Drill 3/16-inch pilot holes at the four locations.
4. Secure the rack-bezel support to the approach using four tapping screws (821-142-202).
5. Secure the odd and even floor rails to the rack-bezel support using two cap screws (809-857-100) and two nuts (844-057-002). See Figure 8 on the next page. Also, install the hood locking pins (254-001-014) to the holes in the side of the rack-bezel support directly above where the side rails attach to it.
6. Position the front floor bracket so that the arrow ends of the floor rails fit snugly into the arrow cut-outs in the front floor bracket. To ensure that each floor rail is parallel to the sides of the ball lift, measure the distance from the ball lift's side plate to the front and back of each floor rail. Make sure they are equidistant and parallel to the ball lift's sideplates. See Figure 8 on the next page.
7. Once both rails are parallel and fit into the front floor bracket, mark each predrilled hole (four on either side, three in each rail and two in either side of the floor bracket) on the floor for drilling. Drill 3/16-inch pilot holes at the eight locations.
8. Secure the rails and the front floor bracket to the floor using eight flat-head Phillips screws (829-642-202).

Continue to the next page.

9. Install the hood latch catch on the two studs of the front floor bracket followed by two washers (948-753-102) and two nuts (838-549-002). Orient the catch so that it is angled away from the rack-bezel support.

10. Install the access panel latch weldment and the blower motor to the top-center of the rack-bezel support by way of three cap screws (809-849-100).

11. If purchased, install the reset buttons (612-300-266) before securing the bezel to the rack-bezel support. Refer to section 6.8.7 and *Reset Button Installation Instructions* (400-254-003)

12. Install the bezel to the rack-bezel support via four cap screws (809-849-125), four lock washers (951-148-008), and four flat washers (948-753-101).

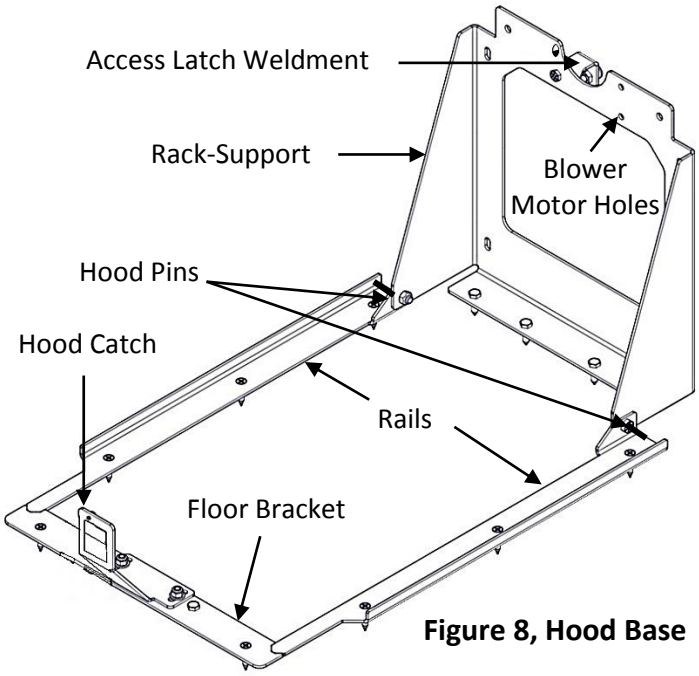


Figure 8, Hood Base

13. Wait until after the control box and ball rack are installed to complete the hood installation. The main part of the hood fits into place by sliding along the rails and fitting into tabs on either side of the bezel to prevent the hood from lifting. The latch secures the hood to the base. Also, the access panel fits into the bezel and secures to the access panel latch weldment by way of a single cap screw (808-549-160) and flat washer (948-753-101).

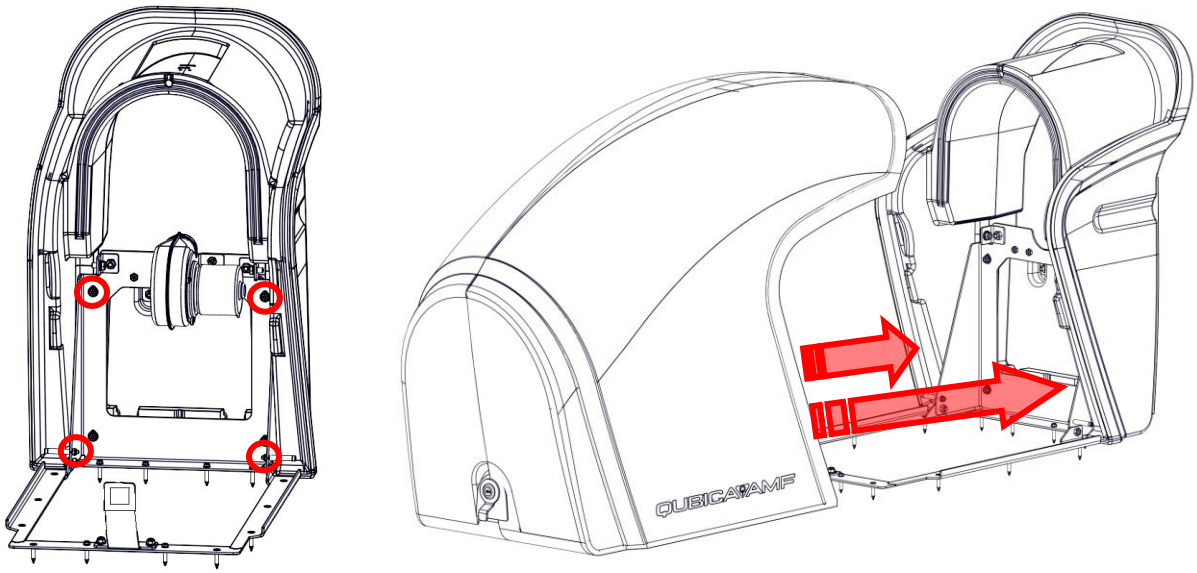


Figure 9, Hood to Base Connection

6.5 INSTALLING THE HOOD SWITCH

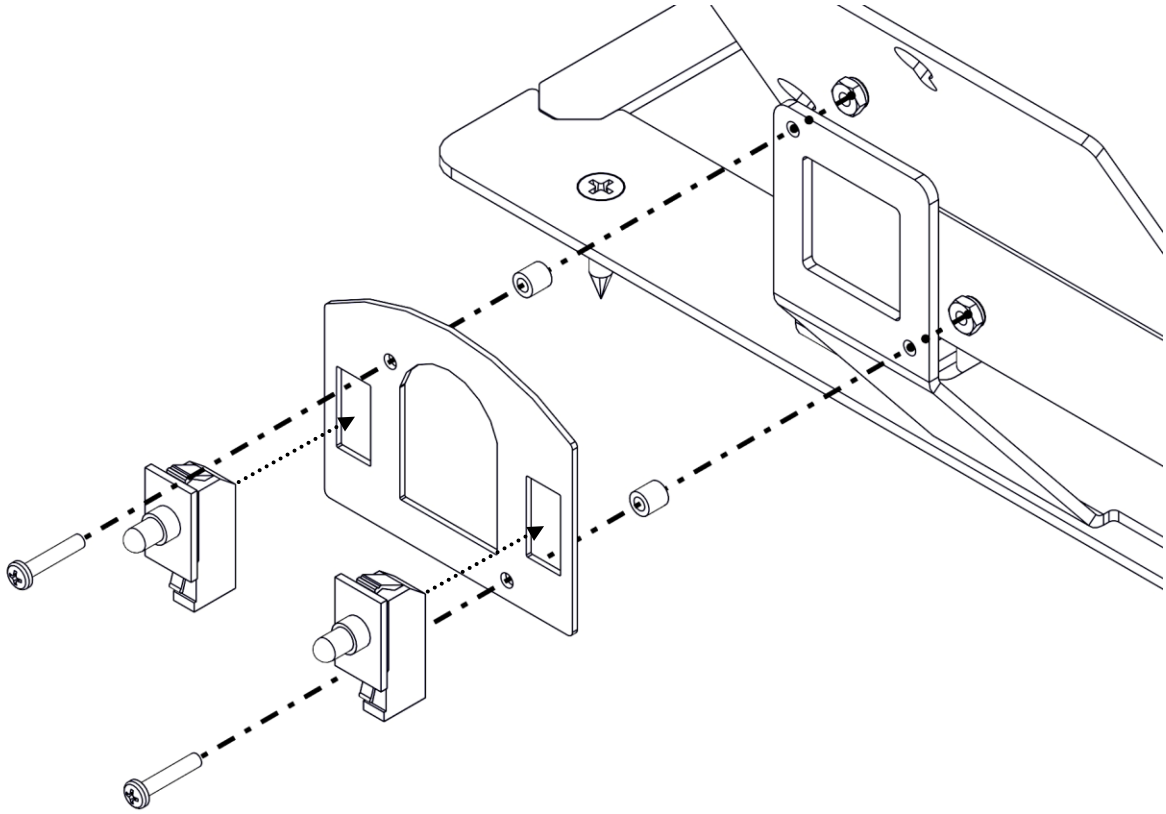


Figure 10, Hood Switch Installation

1. Position both plunger switches (759-510-030) inside the switch bracket (254-001-024). They will click into place.

2. Slide the two screws (01-002) into the front of the switch bracket.

3. Slide the spacers onto the screws on the interior side of the switch bracket.

4. Take the switch bracket with plunger switches, screws, and spacers attached, and slide the ends of the screws through the appropriate holes in the hood latch catch.

5. Secure the hood switch to the latch catch by tightening the two nuts (01-416) on the two screws.

6.6 INSTALLING THE BALL LIFT CONTROL BOX

6. Ensure that the correct fuses for the input voltage are installed in the control box.

7. Remove the cover and connect the cables to the control box. Refer to the **"Connecting the Wiring"** section of this manual. Replace the cover.

8. The control box is to be installed to the control box mount on the hood base.

9. Install three screws (818-240-082) into the pem nuts (847-640-502) that are preinstalled in the control box cover. Don't tighten the screws all the way.

10. Position the control box on the mount, as shown in Figure 11, by placing the ends of the screws through the widest part of each opening and sliding the control box down. Fasten the three screws to secure the control box.

11. Route all wires along the inside of the hood base away from any moving parts and/or the ball path and install the hood.

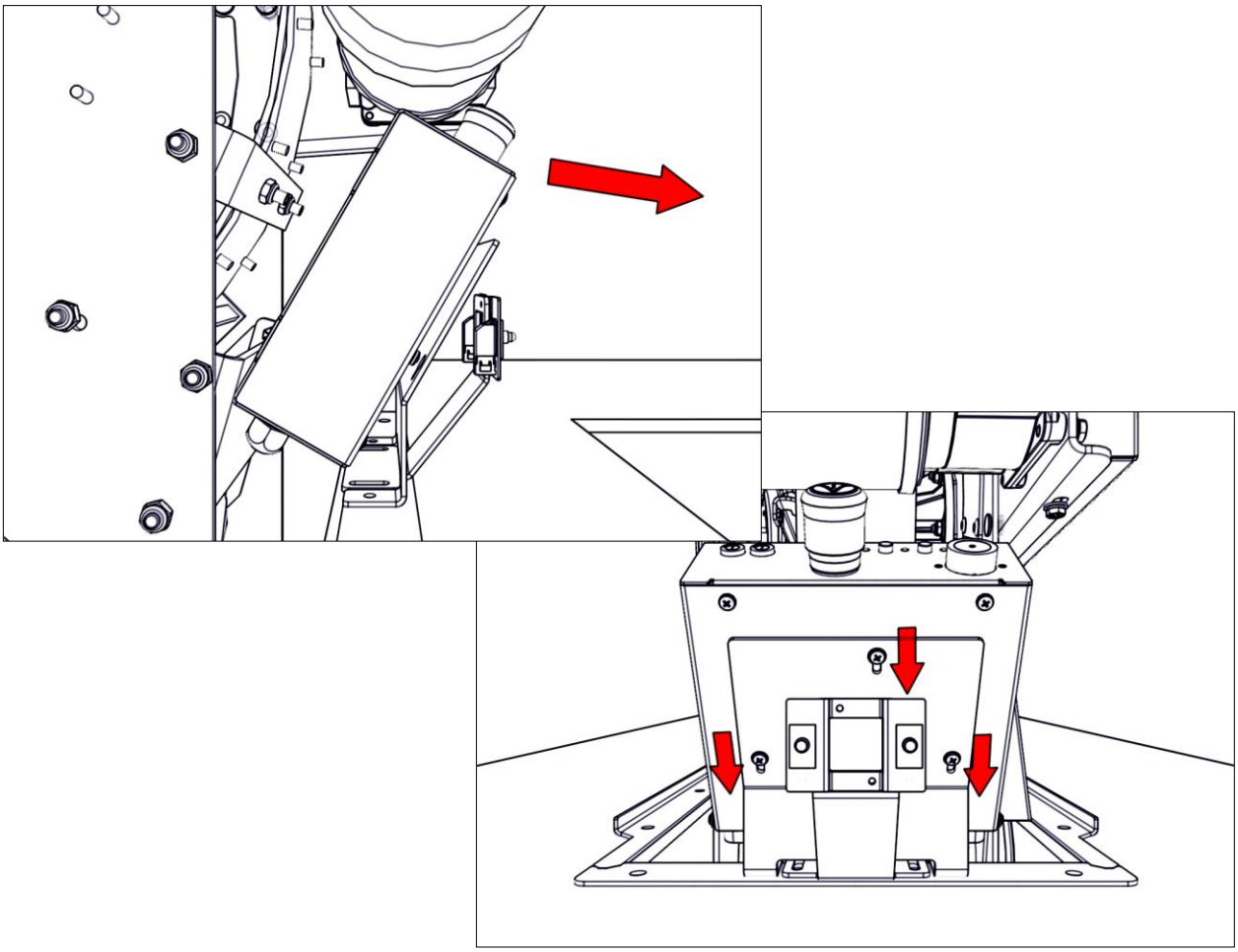


Figure 11, Control Box Installation

6.7 INSTALLING THE BALL RACK AND OPTIONAL LOWER RACK

NOTE: The ball rack and pedestal leg are shipped in separate boxes.

1. Attach the pedestal leg (254-001-090) to the underside of the center cross member using four 5/16-18 x 1-1/4 hex screws (810-257-200). See Figure 12.

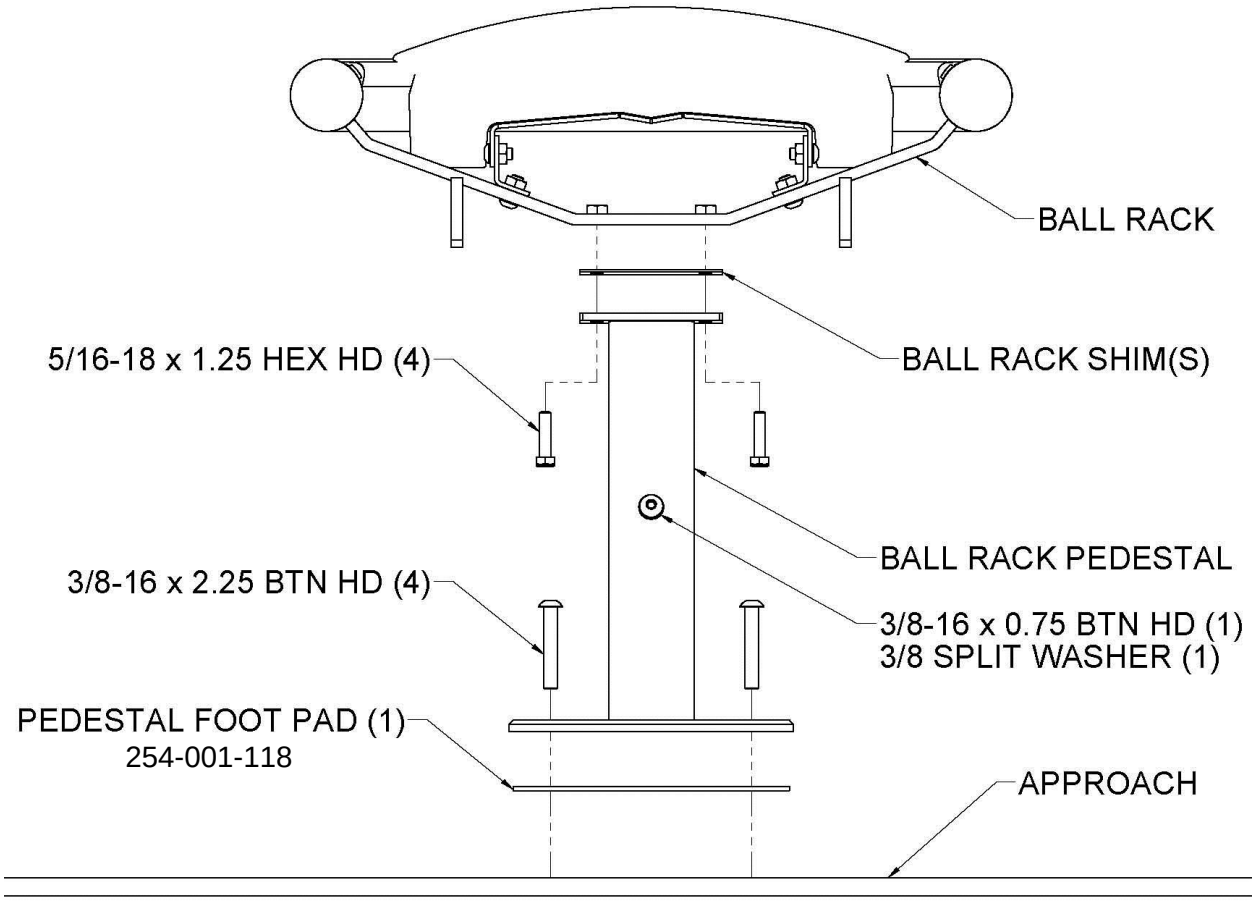


Figure 12, Leg Assembly to Rack Installation

2. Install the rack to the ball lift by completing the following steps and referring to Figure 13.

a) Install the two tie bracket weldments (254-001-089) from the hardware bag to either side of the rack-bezel support of the hood base.

b) Place the end of the ball rack on the rack-bezel support and secure each weldment connector (one on either side) to the tie bracket weldments.

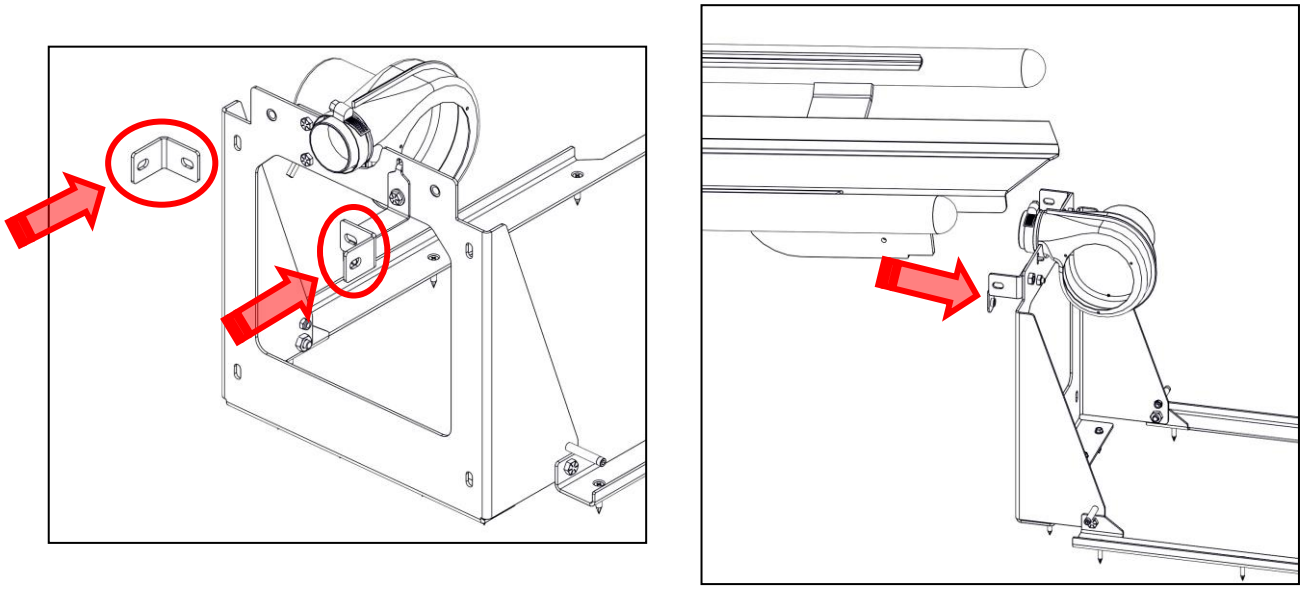
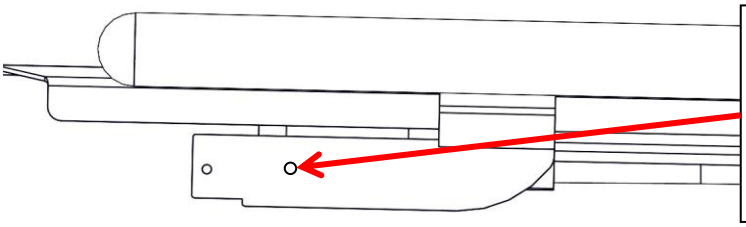


Figure 13, Rack to Ball Lift Attachment
Bezel hidden for clarity.

Note: If your ball rack has weldment connectors with two holes in each, use the hole furthest from the lift location. See the image below.



If your ball rack has two holes in each weldment connector, always secure the ball rack to the rack-bezel weldment using this hole.

3. Make sure the centerline of the rack assembly matches the centerline of the ball lift and mark the locations for drilling the four pilot holes used to secure the rack assembly to the approach. Use the holes in the base of the pedestal as a template.

4. Loosen the two screws attaching the ball rack to the rack-bezel support and slide the rack assembly aside. For maple approaches, drill four pilot holes using a 5/8" boring bit on the marks made in the previous step. For synthetic approaches tap 3/8-16 holes into the approach.

5. For maple approaches, insert and secure the 3/8-16 hex drive wood insert until it sits flush with the approach. Secure the pedestal to the floor using four 3/8-16 button head screws (813-549-367). If not installing a lower rack, the rack can be installed to the rack-bezel support now, too.

6. Verify that the rack is leveled correctly by placing a bowling ball with no initial speed onto the tray approximately mid-way along the rack. The ball should move toward the end of the rack and pick up enough speed to fall onto the side track. If low at the pedestal, add shim plates (254-001-112). Typically, two shim plates will need to be used.

7. If not involved in the initial install, the optional lower rack can be purchased and installed later. Here's how:

8. With the rack out of the way, slide the round end of the lower rack over and around the pedestal.

9. Replace the rack (with shim plate[s]), and install the lower rack (254-001-080) so that it straddles the pedestal and mounts to the underside of the lower rack brace (see Figure 14).
   a. Attach the lower rack to the pedestal leg using a 3/8-16 x 1 button screw (808-566-127), and an internal tooth lock washer (951-164-118). Don't tighten all the way.
   b. Attach the lower rack to underside of the cross member using four 5/16-18 x 1 hex screws (808-057-917) and flat washers (948-761-112).

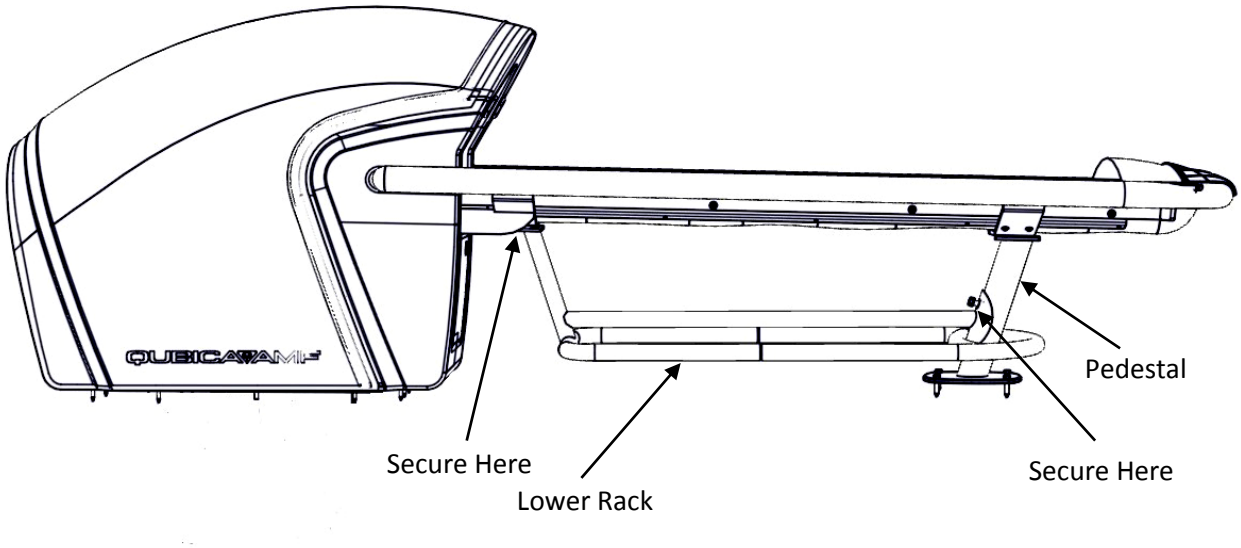


Figure 14, Assembled Ball Rack

6.8 CONNECTING THE WIRING

WARNING

Before wiring the Harmony Ball Return, all power to the unit must be locked out and tagged out at the main breaker box or serious injury could result.

CAUTION

To avoid equipment malfunction or damage, the power supply must be rated for the appropriate voltage and current.

Be sure that when any cables are inserted into their respective terminal blocks, they make connection with the bare copper wire and not the insulated part of the wire.

1. Verify that the power to the unit and the associated pinspotters is turned **OFF** at the main circuit breaker. Also, ensure that the local AC power disconnect is removed.

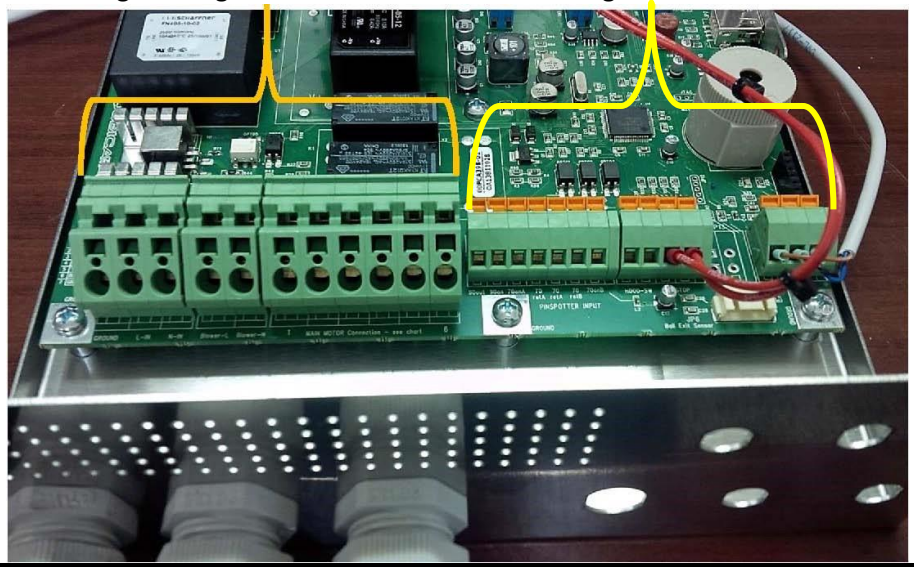
2. All ball lift assembly controllers are shipped with 230-volt operation fuses installed. If used with 115-volt operation, the fuses must be changed. 115-volt fuses are provided with the control box. Spare fuses are not provided.

3. Remove the cover from the ball lift control box.

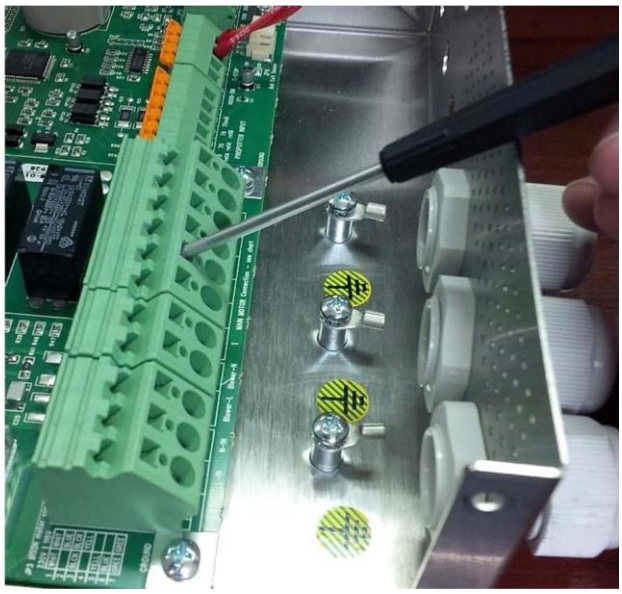
HOW TO CONNECT WIRES TO CONTROL BOX TERMINAL BLOCKS

There are two types of terminal blocks on the Control Box PCB that the various wires from the electrical components of the Harmony Ball Lift. The larger terminal blocks are for high voltage wiring while the smaller are for low voltage wiring. Both types use a clamping method to secure the wire but have slightly different releasing methods to allow insertion of the wire.

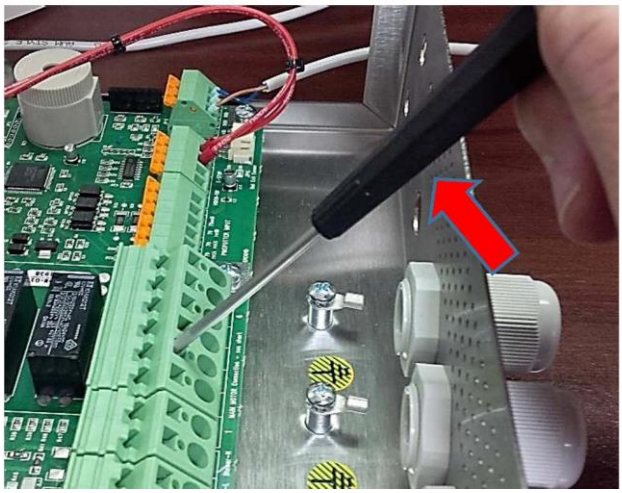
High Voltage Terminal Blocks Low Voltage Terminal Blocks

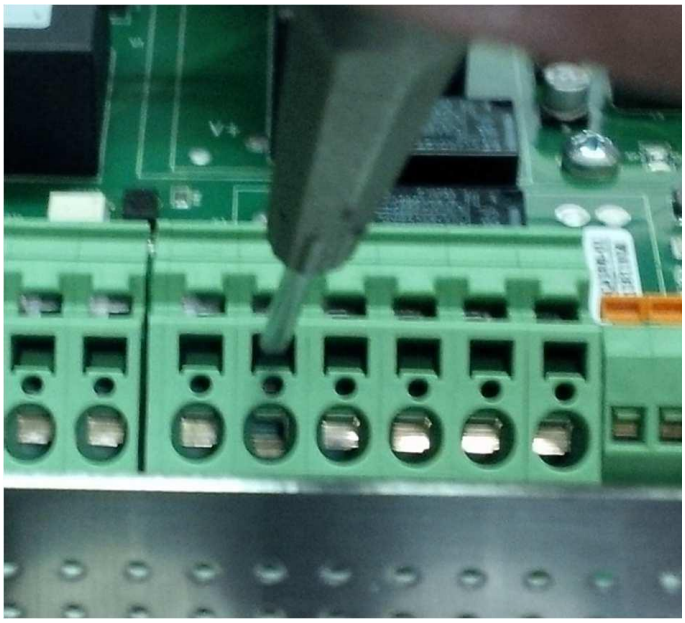


To connect a wire to the high voltage terminal, place a small flat blade screwdriver into the slot just above the hole that the wire will be inserted into.



Lift the screwdriver handle away from the edge of the control box while maintaining pressure inward.





Lifting the screwdriver opens the clamp to allow the wire or ferrule to be inserted. Remove the screwdriver to secure the wire in the clamp. Make sure the insulation of the wire is not under the clamp as this could result in intermittent or no operation of the components. It is recommended that only stranded wires be used with these terminal blocks.

6.8.1 MAIN AC POWER CONNECTIONS:

4. Route the power supply cable's flexible conduit to the "AC IN" location of the control box and secure the conduit fitting to the enclosure (see Figures 15 and 16).

5. Attach the ring terminal on the green and yellow ground wire of the power supply cable to the grounding (earthing) lug (labeled PE) inside the control box using one of the screws provided.

6. Strip approximately 3/8-inch of insulation from the ends of the AC power wires. See the table below.

7. Connect the incoming AC power conductors to **JP1** terminals L-IN (L1) and N-IN (L2). Refer to the table below and Figure 15.

Volts (VAC)	L-IN	N-IN
US 115	Black (BLK)	White (WHT)
US 208	Black (BLK)	White (WHT)
230	Brown (BRN)	Blue (BLU)

8. Depending on the specific pinspotters in your bowling center, connect the pinspotter's control wires to junction block **JP9** as shown in Figure 15.

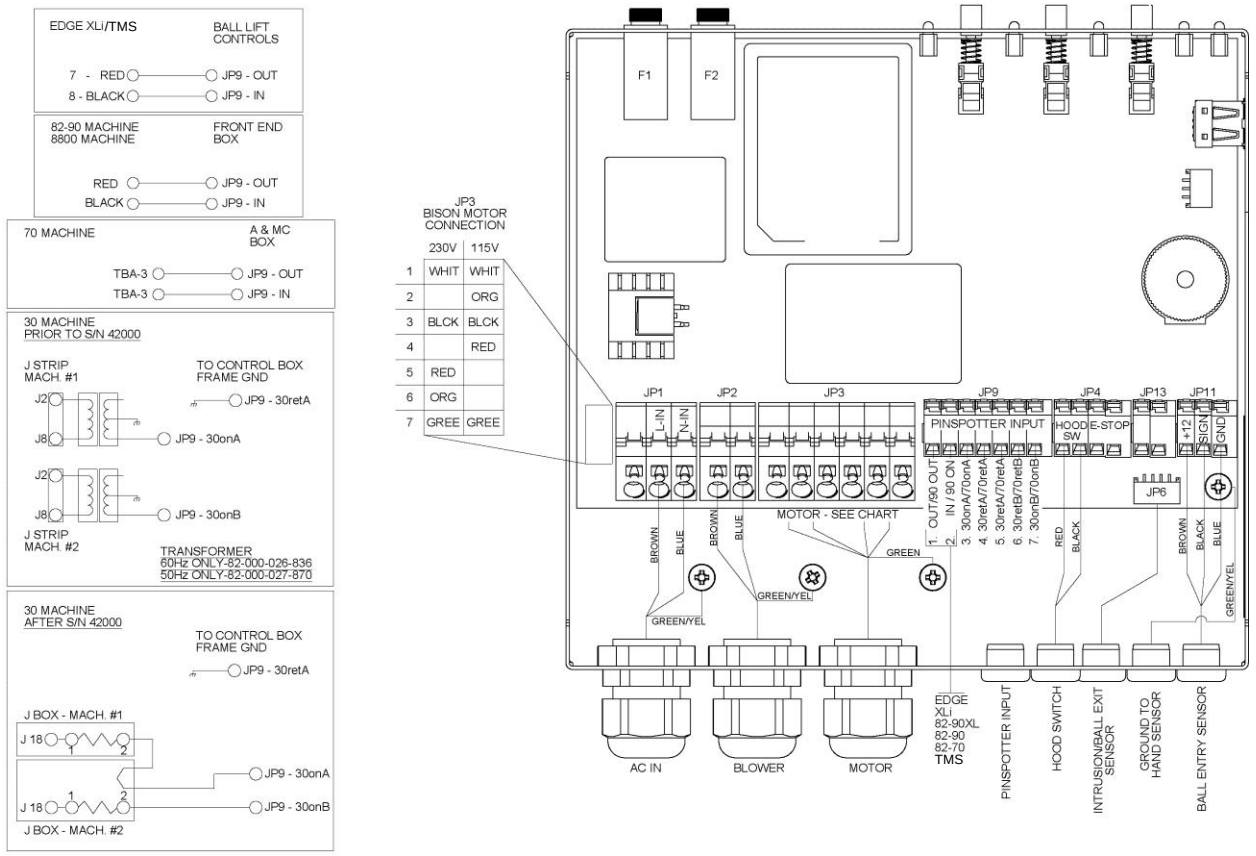
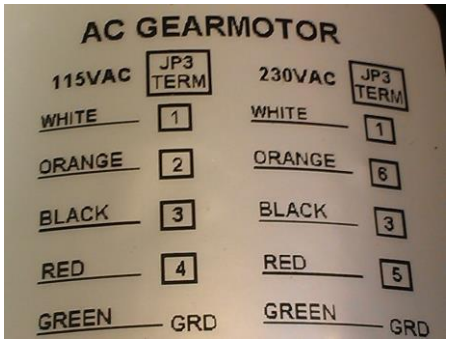


Figure 15, Electrical Connections

6.8.2 LIFT MOTOR CONNECTIONS:

9. Route the motor cable to the lift motor location on the controller enclosure. Pass the cable through the cable restraint, but do not tighten the cable restraint yet.

10. Connect the conductors using their marked colors to terminal strip **JP3**. A table with connection information is printed onto the exterior of the lift motor. Select the proper column by the line voltage to be used and connect the conductor colors accordingly.



11. Position the motor cable in the cable restraint so that there is no tension on the conductor's connection to **JP3** and tighten the cord restraint sufficiently.

6.8.3 BALL ENTRY SENSOR CONNECTIONS:

12. Route the sensor cable through the designated entry point.

13. Connect the conductors to **JP11**:

JP11	Sensor Cable
+12	Brown (BRN)
SIGN	Black (BLK)
GND	Blue (BLU)

14. Place a small cable restraint onto the cable and push the restraint into the enclosure hole.

6.8.4 HOOD POSITION SWITCH CONNECTIONS:

15. Route the cable through the designated entry point.

16. Connect the conductors to **JP4** HOOD-SW terminals. The RED conductor connects to the terminal position closer to JP9 and the BLACK conductor to the terminal position closer to JP13. Refer to Figure 15.

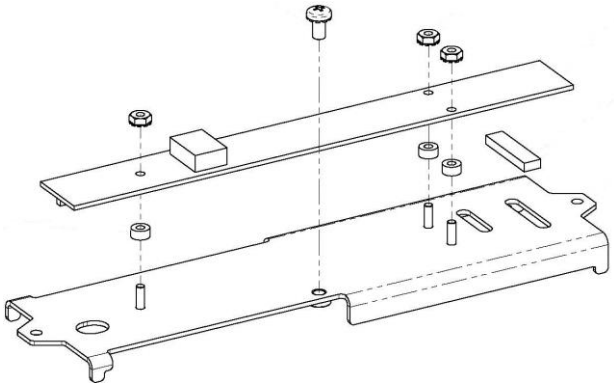
17. Place a small cable restraint onto the cable and push the restraint into the enclosure hole.

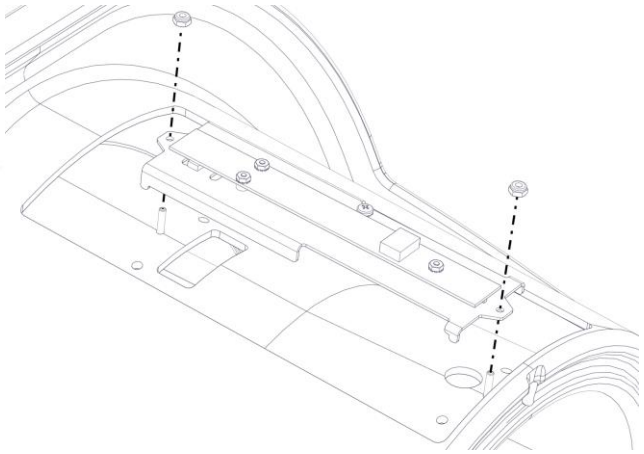
6.8.5 INTRUSION/BALL EXIT SENSOR INSTALLATION:

18. Slide the three spacers (722-503-097) over the three studs on top of the ground plate (254-001-124). Remove the backing from the foam strip (252-003-117) and attach to the plate.

19. Secure the grounding screw (818-233-052) to the ground plate but do not tighten all the way. Place the sensor board (252-003-104) over the three spacers/studs in the ground plate. Secure the sensor board to the grounding plate by tightening the three nuts (843-121-002) onto the studs and on top of the sensor board.

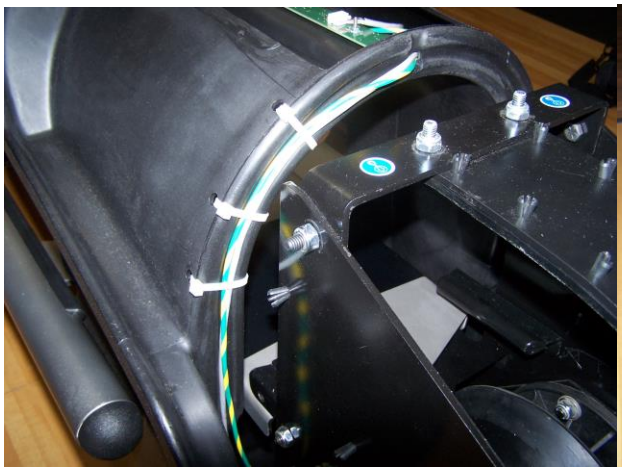
20. Insert screws so that they come up through the two holes in the top of the bezel and in the ends of the ground plate. Place lock nuts on top and tighten. Do not over tighten. Secure the ground wire to the grounding plate by way of the grounding screw.

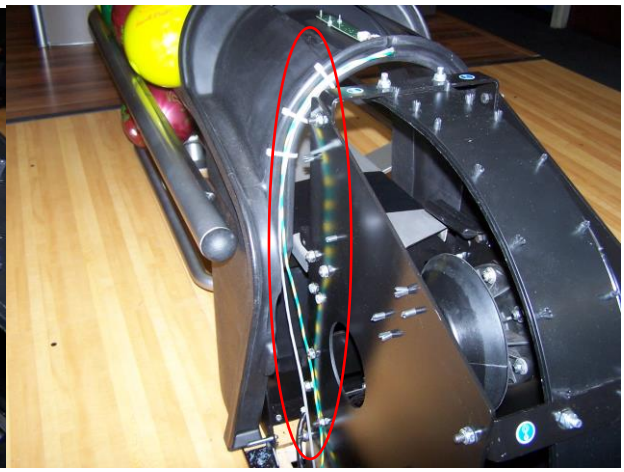




21. Connect the hand sensor cable (252-003-105) to the sensor board. Note the orientation of the cable. The end labeled with “Connect to 252-003-100” must connect to the control box, not the sensor board.

22. Route the cables from the sensor control board/grounding plate to the lift control unit through the designated entry point. Restrain the cables to the bezel with wire ties.





23. Plug the sensor board cable into **JP6** Ball Exit Sensor on the control board. Secure the ground wire on its own ground stud inside of the control box.

24. Place a small cable restraint onto the cables. Push the cable restraint into the enclosure hole.

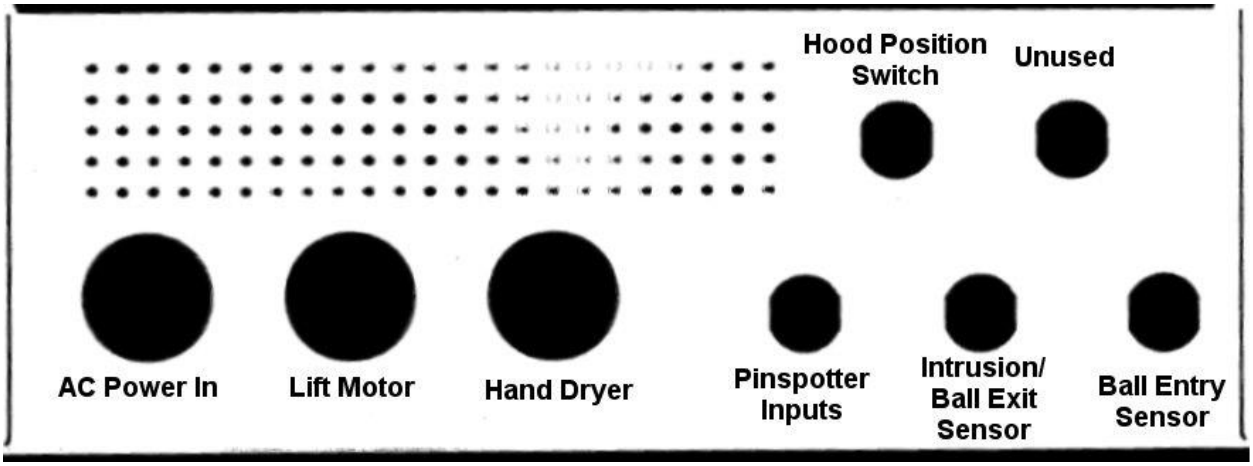


Figure 16, Suggested Cable Entry Points

6.8.6 HAND DRYER BLOWER

25. Connect the blower motor connector to the correct voltage connector on the cable (252-003-109). There are two 5-pin connectors on the wire harness leading to the blower. One connector is wired for 115-volt power and the other for 230-volt power. Check the tag by each connector and, if necessary, change the connector that is plugged into the blower to match the voltage of the power supply.

26. Connect the blower's green and yellow ground wire to a grounding (earthing) lug inside the control box. Secure it using the provided screw.

27. Secure the ground wire from the cable (252-003-109) to the ground stud on the blower bracket.

28. Mount the blower/bracket to the lift bezel frame.

29. Route the blower cable into the control box (see Figures 14 and 15). Tighten the cable clamp to secure the cable to the box.

30. Connect the blue blower wire to terminal Blower-N on junction block **JP2** and the brown blower wire to terminal Blower-L on **JP2**.

6.8.7 AVAILABLE OPTION:

10th Frame Switches

31. Install the switches per the instructions included in the switch kit (612-300-266).

32. Connect the pinspotter cycle and mechanic control wires from the Ball Lift Control & Signal Cable (088-000-016), or similar, to the cable included with the switch kit.

33. If the 10th Frame Switches are not installed, the bare wire ends of the control wires must be removed and insulated to prevent contacting each other and/or grounding out against metal. This will prevent erroneous cycling of the pinspotter. Place this cable out of the path of the ball track and Harmony Ball Return. Additionally, for TMS machines, turn off the 10th Frame option in the TMS chassis if no 10th Frame Switches are installed.

34. Install cable locks onto all cables.

Once everything has been connected, reinstall the control unit cover and secure the five screws.

6.9 ELECTRICAL RATINGS

The Harmony Ball lift controller, motor, and blower can be configured for 230 VAC or 115 VAC operation at either 50 or 60 hertz, as described elsewhere in this manual. Always configure all ball lift electrical components to match the voltage supplied to the machine. Power to the lift must be installed in accordance with local electrical codes and must be capable of meeting the following requirements. This unit is designed for indoor use only.

230 VAC operation: single phase, 50 or 60 Hertz, 1.9 Amps
115 VAC operation: single phase, 50 or 60 Hertz, 3.8 Amps

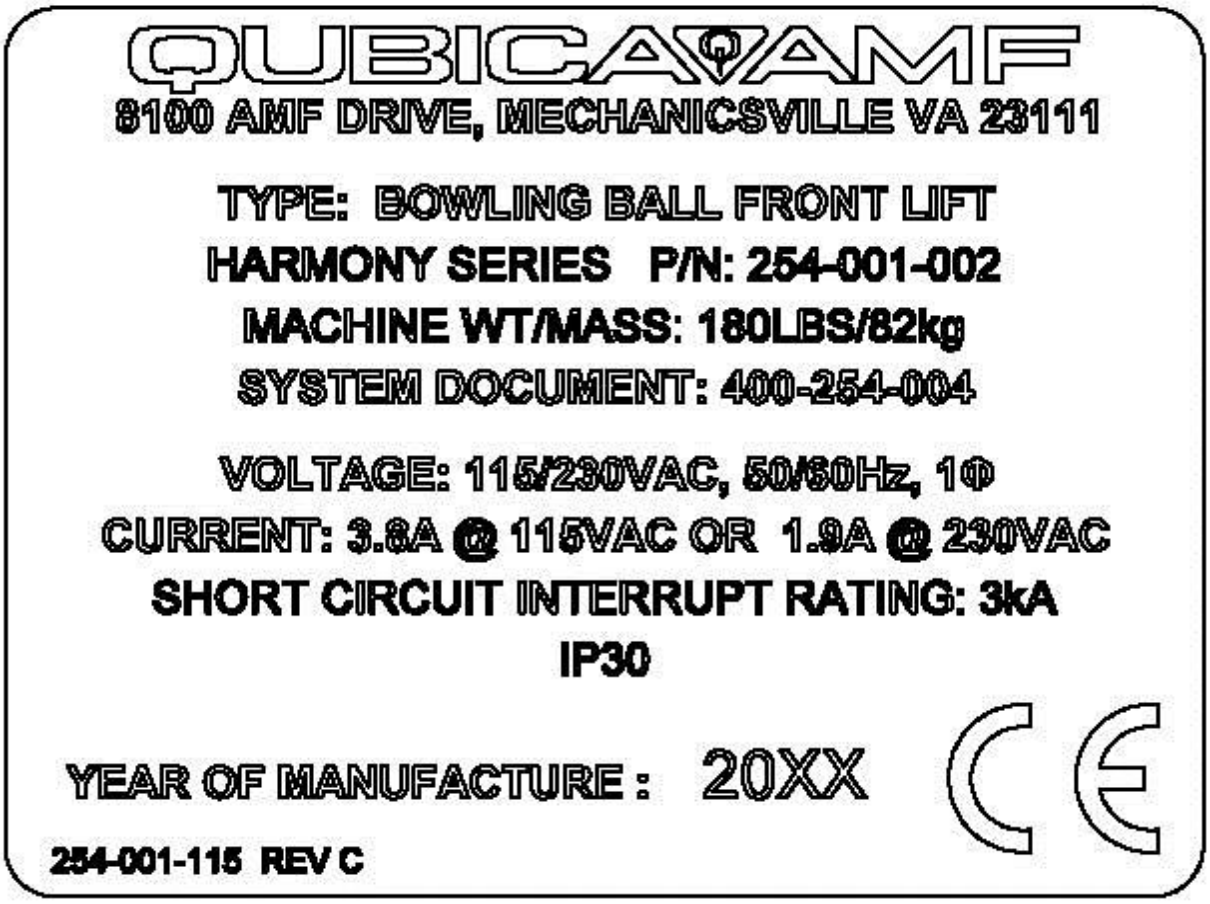


Figure 17, Nameplate Data

7.0 SETUP AND TESTING

After completing the installation, perform the following steps to ensure proper operation.

1. Make sure the service disconnect is connected or in the "ON" position. Turn on power at the main circuit breaker. Turn on one of the associated pinspotters, and verify that the alarm on the ball lift control box emits a one-second alarm before the ball lift starts. Verify that the lift is in Advanced mode (see the Operation section of this manual).

CAUTION

The ball lift contains belts, pulleys, and other moving parts that can present a grabbing and pinching hazard. Keep hands, loose clothing, and jewelry away from moving parts.

2. Check the operation of the ball lift's Intrusion sensor by carefully placing an object (**NOT your hand**) into the ball return opening. The ball lift motor should immediately stop**. Note:** The lift must be in Advanced mode to complete this step. The Intrusion sensor is inactive when the lift is in Continuous or Energy Saving mode.

3. Keep an object in the ball return opening for five or more seconds. This should sound an audible alarm and signal to the pinspotter to stop returning balls (XL*i* and TMS only). This alarm will continue to sound until the intrusion is removed.

4. Remove the intrusion. After the intrusion has been removed, the lift controller will re-enable the lift motor to run and finish transporting a ball out of the lift if needed. Also, the pinspotter will be signaled to allow the returning of balls to the lift.

5. Remove the hood. This will cause a Hood Failure and turn off the ball lift even though one (or both) of the associated pinspotter(s) is (are) operating. The ball lift should stop without delay.

6. To clear this error, press the MODE SELECT button on the ball lift control box. Return the ball lift to normal operation by sliding the hood back into place and locking it. The ball lift's alarm should emit a sound and the motor should restart.

7. Turn off the pinspotters and wait for the ball lift to turn off. **There is a built-in time delay of 30 seconds between the time the pinspotter back ends turn off and the ball lift turns off. This allows any bowling balls in the system to return through the ball lift to the ball rack.**

8. Though the pinspotters and ball lift are turned off, the sensors' operation can still be checked and the motor/v-wheels can still be run. Simply interrupt each sensor and check to see if the corresponding light turns green on the control box. To operate the motor, use the start and stop buttons on the control box.

9. Turn on the pinspotters and return a few balls through the ball lift. Adjust the transition brackets, as needed, to obtain a smooth transfer of the ball to the ball rack. This is best done by hammering the brackets with a rubber mallet. Balls that wobble along the tray may indicate a misalignment of the tray to the ball lift. The ball rack can be adjusted left or right by loosening the brackets that attach the rack to the bezel bracket.

   Note: Be sure to test using a variety of bowling balls as not all bowling balls interact with the lift the same way. It's recommended that at the minimum both slick/oiled house balls and reactive resin balls be tested.

10. Verify that the blower is functioning properly.

11. If not done previously, install the hood assembly. When these tests are satisfactory, the ball lift may be placed into service.

8.0 OPERATION

The operation of the Harmony ball lift is very simple. The ball lift starts when you start either of the two associated pinspotters, and will continue to run for 30 seconds after both pinspotters are turned off to allow any bowling balls in transit to pass through the lift and return to the ball rack. The lift is to operate in an air-conditioned indoor environment.

8.1 OPERATIONAL SAFETY

There is an Intrusion sensor and a V-wheel guard built into the ball return to protect against someone placing a hand inside the lift and having it grabbed by the V-wheel and pulled further into the machinery. The switch is actuated by an optical sensor that, when it detects your hand entering the lift, will actuate the safety switch stopping the ball lift. This sensor is only operational while the lift is in the Advanced operation mode. **EVEN THOUGH THIS SAFETY SWITCH IS DESIGNED TO PREVENT INJURY, NEVER PLACE A HAND INSIDE THE MECHANISM WHILE IT IS IN OPERATION.**

A moving bowling ball contains a considerable amount of energy and can appear at the outlet opening of the ball lift with little or no warning. Keep hands away from the exit opening to prevent injury.

Though the ball exits the Harmony lift slowly because the motor drives the v-wheels slowly, a slick, oil coated, heavy bowling ball may have significant momentum after exiting the ball lift. For this reason, **a pinching hazard can exist when two bowling balls come together on the rack. KEEP HANDS CLEAR OF THE BALL RACK UNTIL THE RETURNING BALL COMES TO REST.**

8.2 BALL LIFT CONTROLS

Ball lift operation is normally controlled by the operation of its associated pinspotters. Whenever either pinspotter is in operation, the ball lift is in operation. When both pinspotters are off, the ball lift turns off after a 30-second time delay, which allows any bowling balls that have been played to return to the ball rack. On pinspotters equipped with the horizontal ball return (HBR), the HBR motor will switch off whenever the ball lift switches off. On XL*i* and TMS pinspotters, the back end motors will switch off. All these will restart when the ball lift restarts.

The ball lift's operating modes can be controlled manually through the operation of the MODE SELECT pushbutton on the lift's control box. The lift's operating mode can be changed at any time, while in any other operating mode. By pressing the MODE SELECT button, the STATUS LED will show the last set mode:

- Advanced: solid green
- Energy Saving: alternating red and green
- Continuous: solid red
- Manual: quickly blinking green

***Note**: The ball lift always starts in the mode it was in when last shut off.

Holding the MODE SELECT button for more than five seconds will cycle the STATUS LED through the various operating modes. Simply release the button at the desired mode and the new setting will be accepted. Replace the hood and then the ball lift will beep once and restart. The ball lift has several different modes of operation: **ADVANCED**, **ENERGY SAVING**, **CONTINUOUS**, and **MANUAL**. They are described below.

ADVANCED

This is the normal operation mode. It provides power savings, but also responds to the intrusion and ball exit sensors. As soon as the lift starts, it will run for five seconds to eject any balls that may be in the lift. It will then stop and enter a "ready-to-run" state.

The Intrusion sensor detects if there is an intrusion (of a hand) into the lift. If this sensor detects an intrusion, the lift immediately stops. If the intrusion is not removed within five seconds, an alarm sounds and a signal is sent to the pinspotter so it will stop returning balls (XL*i* and TMS only). This will continue as long as the intrusion is present. After removing the hand (or any intrusion), the ball lift's operation will reset and the pinspotter will resume sending balls.

When a ball enters the lift, it activates the Ball Entry sensor. This starts the lift motor for up to 12 seconds. The Ball Exit sensor ensures that any ball that has entered the lift actually exits. If the Ball Exit sensor does not detect a ball exiting the lift within eight seconds of its entry, an error (Ball Stuck) takes place. Once the Ball Exit sensor sees the ball, the Intrusion sensor is masked for two seconds to allow the ball to exit the lift without falsely seeing an intrusion.

ENERGY SAVING

Operation is very similar to ADVANCED except the Intrusion and Ball Exit sensors are ignored. This allows continued energy saving should the exit sensors stop operating correctly.

CONTINUOUS

While in this mode, the pinspotter activates the ball lift motor. The motor will start and run continuously until the pinspotter deactivates the lift. This mode ignores the Ball Entry, Intrusion, and Ball Exit sensors and allows for continued use of the lift should the Ball Entry sensor stop operating correctly.

MANUAL

Mode is activated in one of two ways: either turning on the ball lift with the hood already open or by opening the hood with the lift already powered on. If the hood is opened while the lift is powered on, the lift will go into a "Hood Error" state. During that error, press the MODE SELECT button to enter MANUAL mode. When entering MANUAL mode, the alarm will NOT sound.

In MANUAL mode (hood open), with no errors, the ball lift is powered on, but not running. To activate the lift, simply use the START and STOP buttons. In this mode, the STATUS LED blinks green. Closing the hood will force the device to restart in the last set operating mode (ADVANCED, ENERGY SAVING, or CONTINUOUS).

8.3 OTHER FEATURES

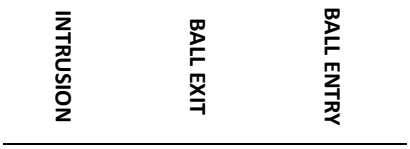
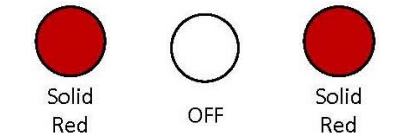
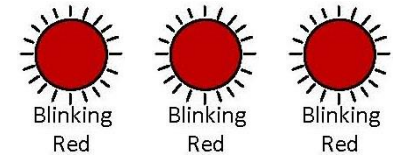
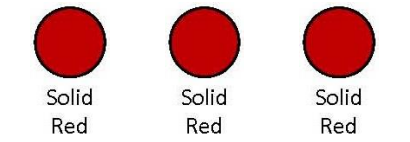
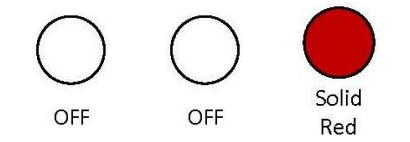
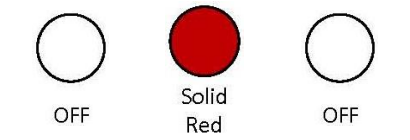
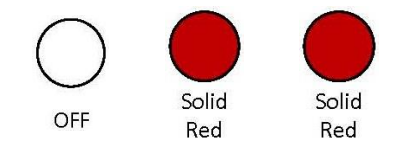
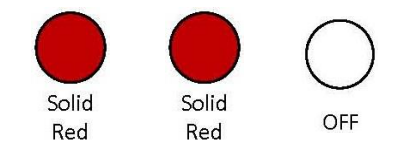
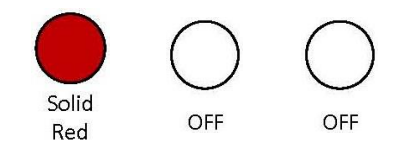
The ball rack is designed to stagger the balls as they return, first to the left, or odd lane and then to the right, or even lane. This arrangement allows more bowling balls to be accommodated on the rack when compared to a single, straight-line design while still allowing easy access from either side of the rack. This is accomplished by having the ball exit the ball lift on the center of the ball rack and then deflecting the ball to the left set of rails when it touches the ball rack end stop. Subsequent balls are deflected to the opposite side of the rack when they contact an existing ball since contact is made "off center" due to the position of the existing ball. The rack has a slight downward slope to help maintain the momentum of the ball and assure adequate deflection energy. There is an optional storage rack below the main ball rack for the storage of additional bowling balls. The blower operates continuously when the ball lift is in operation.

8.4 ERRORS

There are a set of errors that can occur during operation of the ball lift. Various ON/OFF combinations of the LED's on the control box indicate which error has occurred. The control box display with the location and labeling of the various LEDs and buttons can be seen below.

Figure 18, Control Box Display

When an error occurs, the STATUS LED will rapidly blink red. Press the MODE SELECT button to clear an error and enter MANUAL mode. The various errors are listed in the table below. The "LEDs" column shows which LEDs will be lit in conjunction with the associated error.

Error	*Description/Troubleshooting*	*LEDs*
		
Lift Control Overheat	The control box's thermal protection has been activated. Internal temperature has exceeded 203°F (95°C).	
E-STOP	User pressed the E-STOP button. Reset the E-STOP button and then clear the error.	
Hood Opened	User opened the hood while the lift was powered on.	
Ball Entry Failure	Ball Entry sensor has been activated for 10+ seconds. Could be caused by sensor failure, a ball between the sensor and reflector, or the reflecting mirror shifted out of position.	
Ball Exit Failure	Ball Exit sensor has been activated for 10+ seconds. Could be caused by sensor failure, a ball below the sensor, the bezel view port is blocked, or the circuit board moved out of position.	
Stuck Ball Failure	The ball did not pass through the lift within eight seconds.	
Sensor Board Calibration Failure	The sensor board failed to calibrate properly. Check sensor board cable.	
Sensor Board Failure	Communication between the lift controller and the sensor circuit board has failed. Check sensor board cable.	
Internal Error	This could be any problem that is different from the others listed.	

8.4.1 INTRUSION SENSOR

If the Intrusion sensor detects a foreign object, the lift immediately stops. If the object is not removed within five seconds, the alarm will sound and the pinspotter will be signaled so as to not return any balls (XL*i* and TMS only). This will continue until the object is removed.

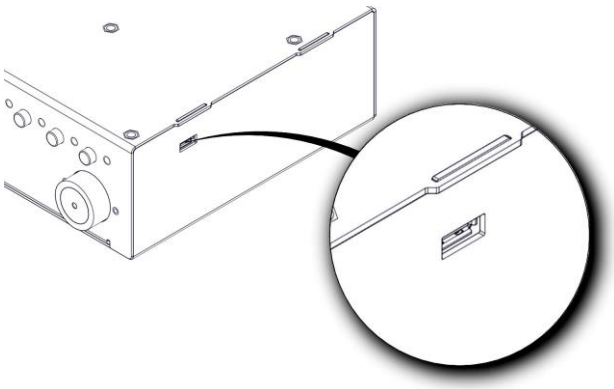
Five seconds after the object is removed, the lift will restart and continue transporting balls out of the lift. The alarm will also stop.

This can also occur if a ball crosses the Intrusion sensor area without being seen by the Ball Exit sensor. As soon as the object is removed, the ball lift will resume its action of returning the ball.

When in ADVANCED mode, the intrusion sensor must be active for five seconds before the alarm sounds. In MANUAL mode, the alarm will sound immediately once the Intrusion sensor is activated (as this helps a technician test the device). The Intrusion sensor is inactive while the ball lift is in ENERGY SAVING or CONTINUOUS modes.

8.5 SOFTWARE

Occasionally, QubicaAMF will develop new and improved software for the Harmony Ball Return to improve particular features and enhance the overall functionality of the lift. It's recommended that each ball return have the latest available software installed. If there is ever an issue with the way a ball lift is operating, the best place to start in resolving that issue is to ensure that the latest software is loaded. Here is the procedure for how to load software:



1. Be sure the latest software version is loaded onto a thumb drive. The software (UPD) file must be at the root directory (not in any folders on the drive).
2. Insert the thumb drive into the control box.
3. Press the MODE SELECT button.
4. As soon as red flashes across the four LEDs, the software is loaded.
5. Remove the thumb drive.
6. Restart the control unit. This can be done in one of two ways:
   - Press the MODE SELECT button.
   - Simply close the hood.
7. The control box will recalibrate and then be functional with the loaded software.
8. To see the software version, press the MODE SELECT button. Green will flash to signify that the control box is calibrating. After the green has stopped flashing, the software version will be displayed by red blinks first on the Ball Exit and then on the Intrusion LEDs. To determine the software version number, simply count the blinks. For instance, three blinks of the Ball Exit LED followed by two blinks of the Intrusion LED signifies software version 3.2.

9.0 CLEANING AND CARE

9.1 BALL RETURN TRAY

The Harmony Ball Return Tray is made from stainless steel. This is the best material possible for its purpose as it is excellent at resisting wear and has superior strength. On top of the steel there is a brushed finish that enables the tray to further resist wear and marking.

However, the ball return tray will still get dirty and show some wear marks over time. Some very basic cleaning and care should be done to alleviate these issues.

For Dirt:

1. Dust/wipe the tray with a clean cloth.
2. Spray water on top of the tray.
3. Wipe down with another clean cloth.
4. **Optional:** Rub a scouring/Scotch-Brite™ pad all along the top of the tray to restore the brushed finish of the tray as it dulls.

For Wear Marks:

1. Dust/wipe the tray with a clean cloth.
2. Spray stainless steel liquid cleaner on top of the tray.
3. Wide down with another clean cloth.
4. **Optional:** Rub a scouring/Scotch-Brite™ pad all along the top of the tray to restore the brushed finish of the tray as it dulls.

9.2 BALL RETURN HOOD

Occasionally, the Harmony Ball Return Hood may get dirty or stained. Children with crayons or markers, shoe scuffs, condiments, drinks, pens/pencils, dirt/grease, etc. can all come into contact with the hood and will need to be removed. The hood is made of an easy to clean material that outperforms previous ball return hoods. The material is resilient and difficult to harm using most cleaning agents.

General Cleaning:

For general cleaning of the ball return hood, simply wipe off with a dry clean cloth to remove any dust and debris. Then, wipe down with a clean wet cloth using clean warm water.

Minor Stains:

For minor stains such as condiments or drinks, use an all-purpose cleaner and a clean cloth. For best results, use an all-purpose cleaner that contains butyl cellosolve (aka 2-Butoxyethanol). Additionally, a soft brush can be used in conjunction with the cleaner to get rid of more difficult stains.

Major Stains:

For more serious stains such as shoe scuffs, pens/pencils, and grease, use either acetone or bleach with a clean cloth.

10.0 SERVICE

Whenever ball lift repair or maintenance is needed, check for any applicable Service Bulletins at www.qubicaamf.com. Click on the *Support* tab, and then select the *Tech Support Customer Portal* window.

The ball lift requires very little maintenance. All of the ball bearings on the lift and in the motor are sealed and lubricated for life. There are several wear items described below that should be monitored periodically and replaced as necessary. The most critical factor in assuring long and trouble-free operation is the transition between the underlane track and the ball lift. The better the alignment of these components, the smoother the handoff is. Whenever banging is heard as a ball enters a lift, it is a sign that the alignment is out of adjustment and should be corrected.

The ball lift mounting hardware can become loose either where the track joins the lift or where the lift is secured to the subfloor. If the screwbolts that mount the lift to the subfloor are loose, tighten them, but do not exceed 50 ft-lbs. of torque. It is a good idea to inspect these attachments periodically especially for the first few months following lift installation. When the alignment is correct, the ball lift will be centered along a continuation of the centerline of the underlane track, and when a bowling ball is placed on the track where it joins the lift, there will be equal clearance between the ball and side plates.

WEEKLY

- Observe the operation of each of the lifts. Wipe down the hood, ball rack, tray, and end stop to remove oil and handprints. Make any necessary adjustments.
- If equipped, press the 10th frame pushbuttons and verify proper response from the pinspotters. The two pushbuttons can be replaced individually.
- With the ball lift running, verify that the blower is operating. If not, check for a blown fuse in the control box, a damaged cable, a faulty blower, or even a detached blower hose underneath the tray.

MONTHLY

- Inspect the belt. Some cracks may appear after moderate use. If the cracks are very deep or the belt starts to split/delaminate, replace the belt. You should develop a belt replacement schedule based on lineage rather than on the calendar. This maximizes useful belt life while minimizing inconvenience to the bowler due to belt failure during play.
- With the ball lift OFF, check the belt tension. During operation the belt should not slip/flap.

QUARTERLY

- Inspect the ball lift's upper and lower guide strips as well as the left and right side wear strips for excessive wear, especially where the ball enters the lift and where the ball transitions onto the upper guide strip. These are very long-wearing components, but occasionally one may need to be replaced. Also, replace any missing plastic rivets (938-101-005) and tighten any loose hardware.
- Inspect the upper and lower V-wheels. These items are very tough and should provide a very long life, but will wear out after years of use. To replace a V-wheel, remove the three bolts that secure it to the upper or lower shaft assembly and install a new wheel in its place. Tighten the three bolts securely.
- Check the operation of the Intrusion sensor. When actuated in ADVANCED mode, the ball lift should immediately turn off and after five seconds, should sound an audible alarm. When actuated in MANUAL mode, the alarm will sound immediately.
- Wipe up or vacuum out any accumulated debris. Inspect the track rail brackets for damage and check for the smooth operation of the pulleys, bearings, etc.

  For replacement part numbers, refer to the Drawings and Part Numbers section at the back of this manual.

ANNUALLY

- Lock out and tag out each ball lift, remove the control box cover, and ensure that all wire clamping screws are tight using a small flat-blade precision screwdriver.
- Grease the drive chain.

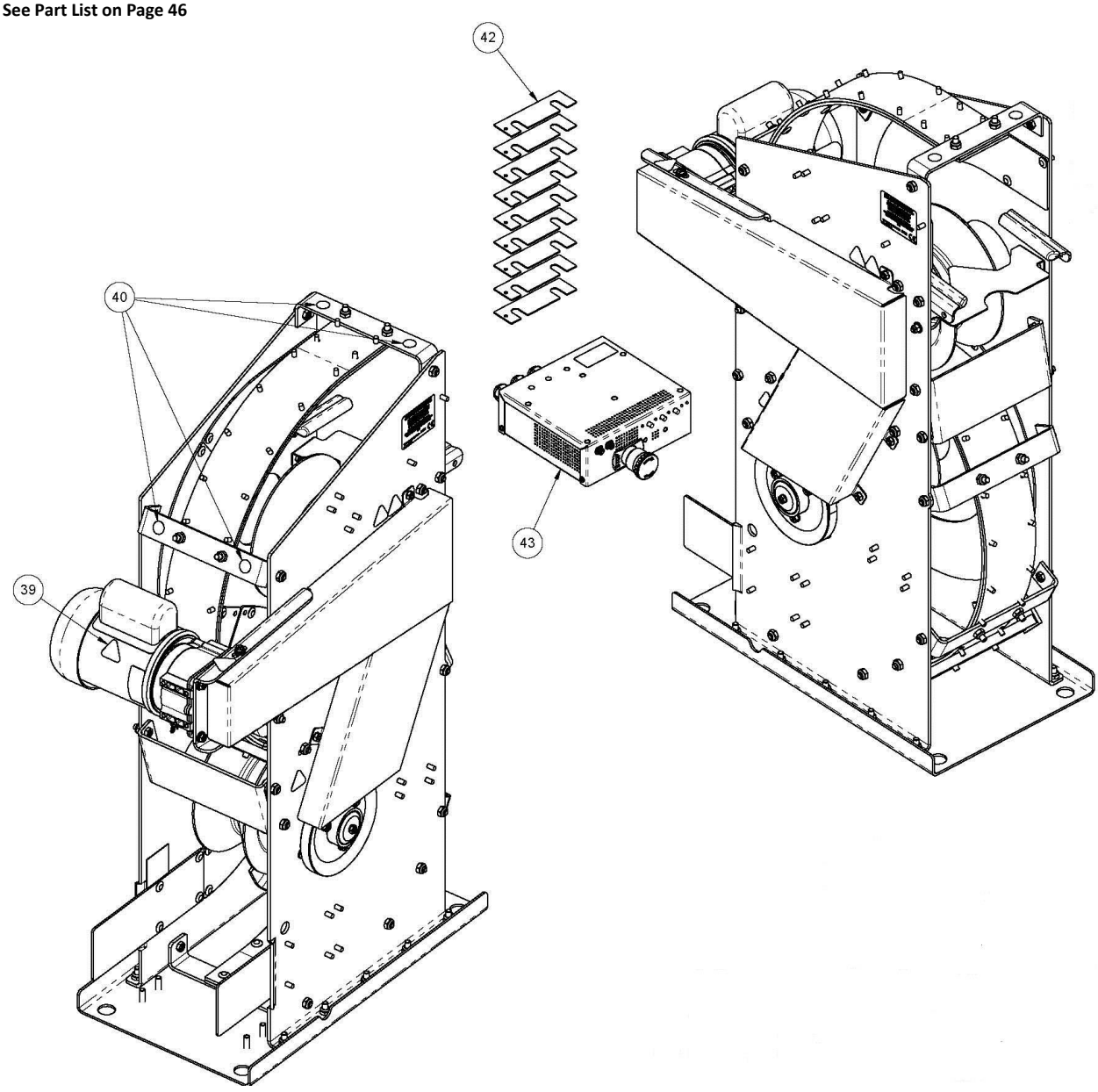
Harmony Ball lift

Drawings & Parts Lists

A bold item in a parts list indicates an exploded view drawing for that item is included.

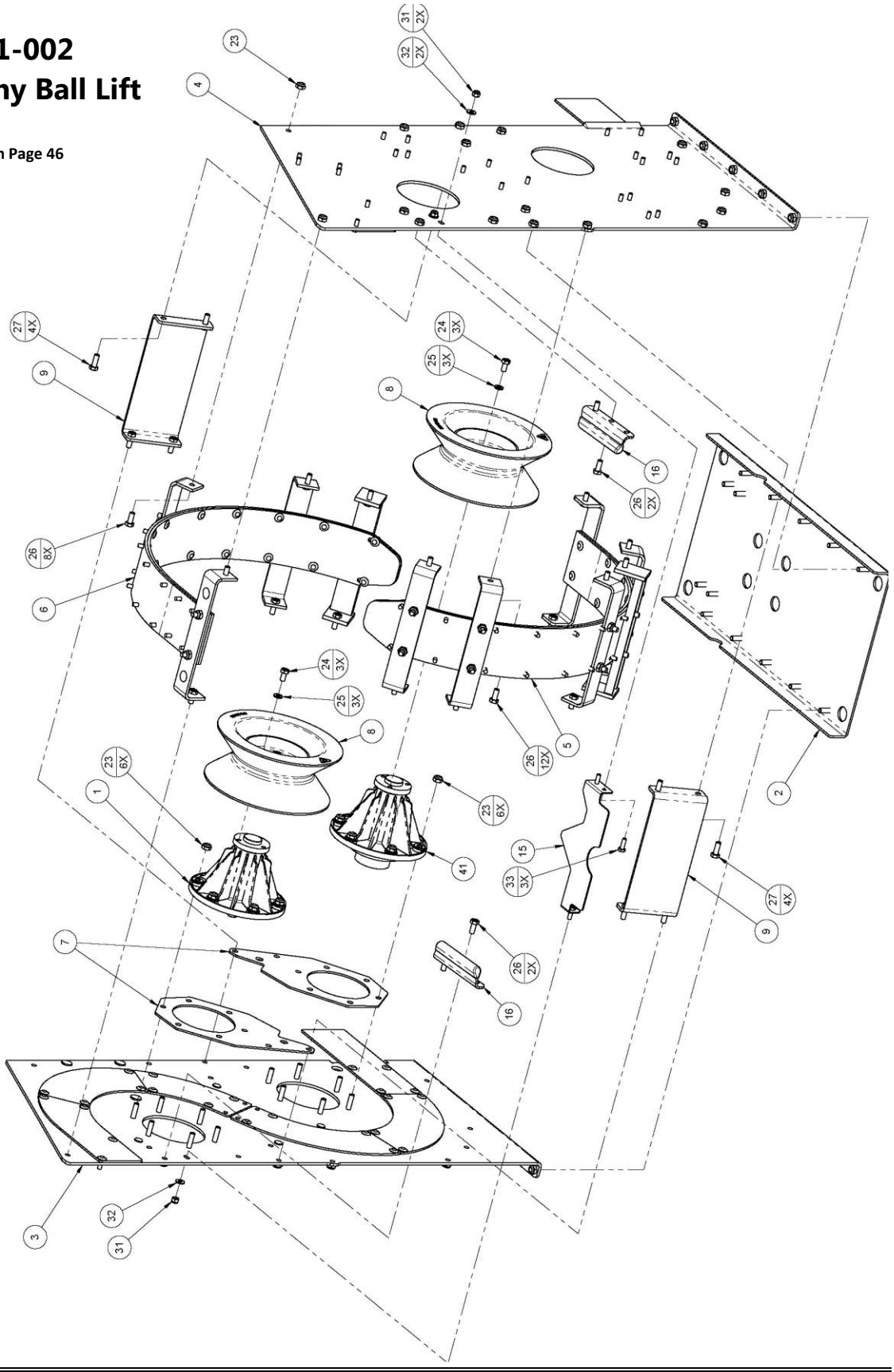
254-001-002
Harmony Ball Lift
View-1

See Part List on Page 46



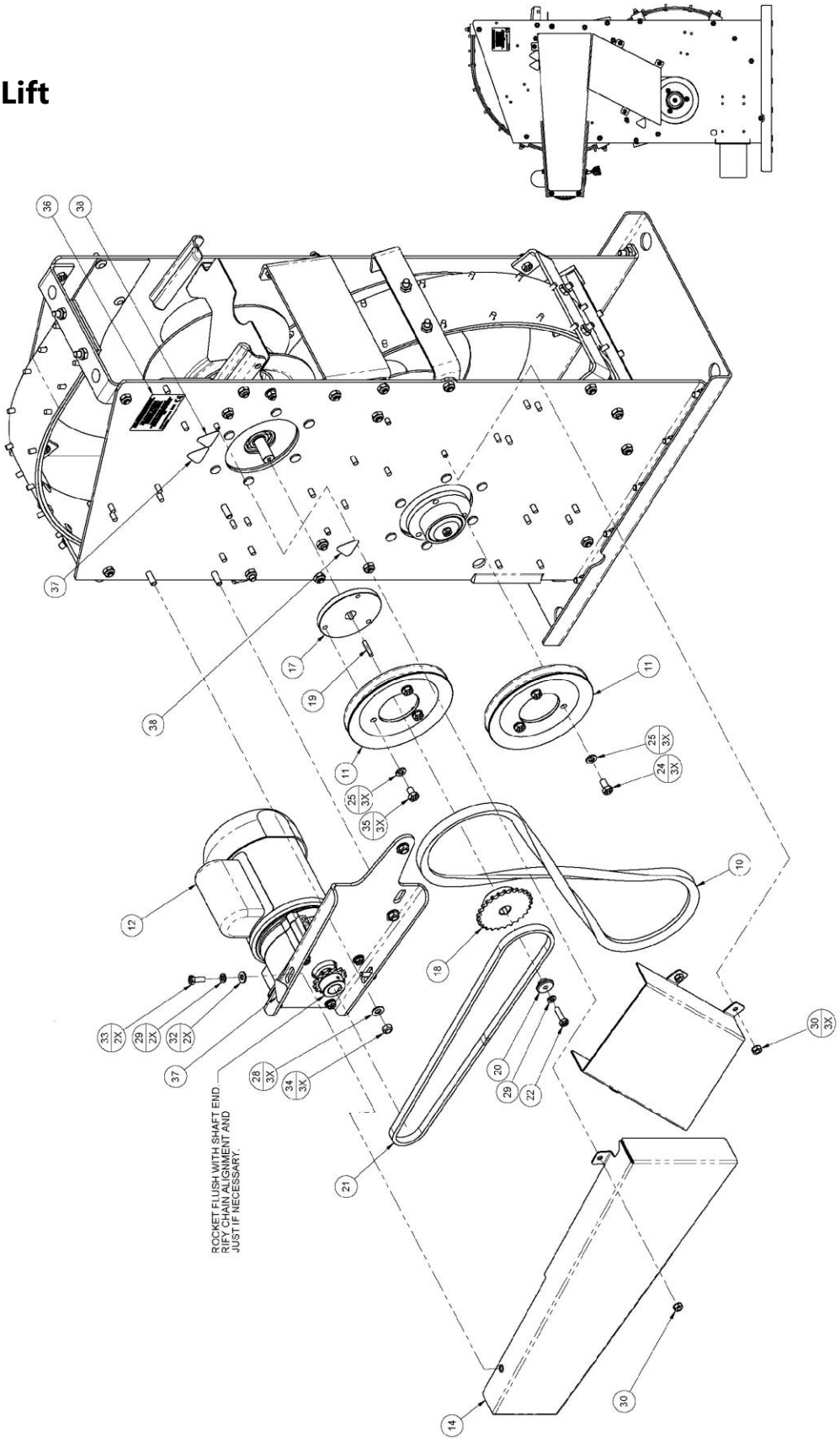
254-001-002
Harmony Ball Lift
View-2

See Part List on Page 46



254-001-002
Harmony Ball Lift
View-3

See Part List on Page 46

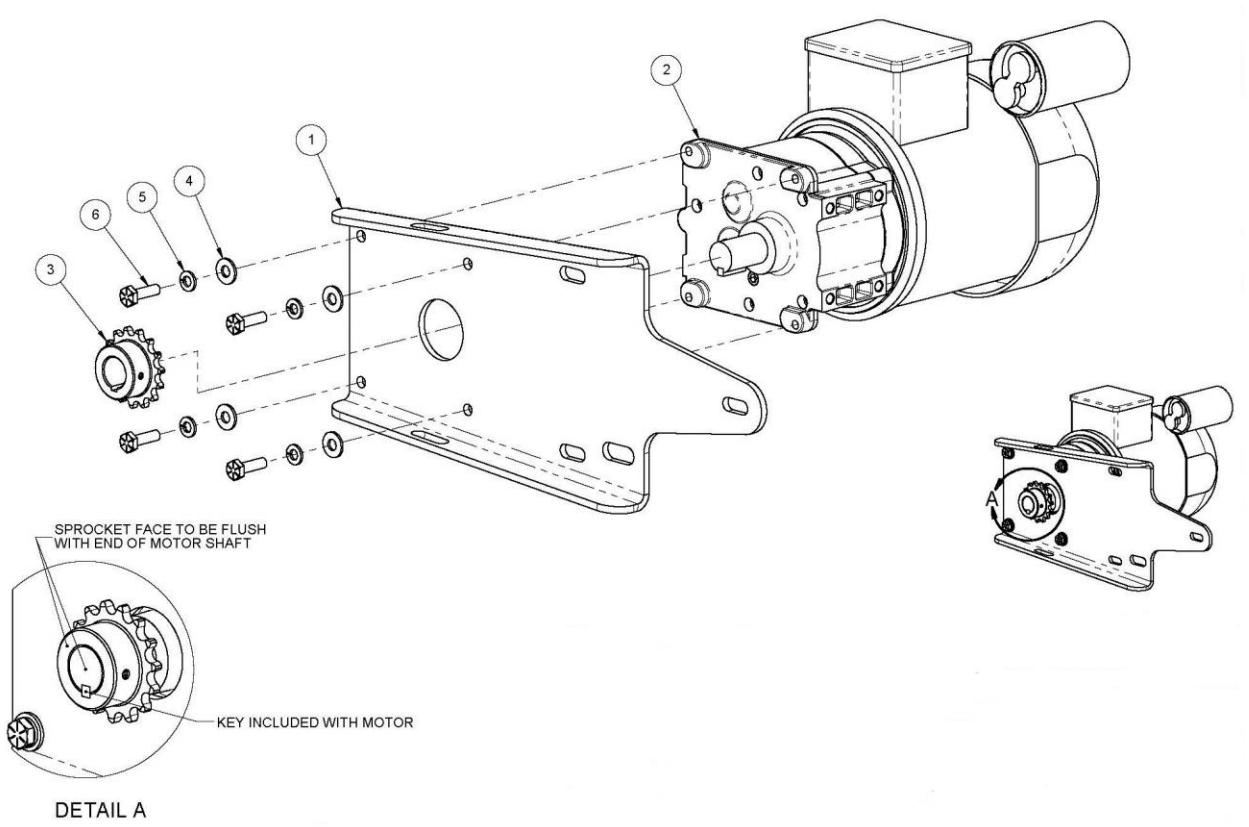


254-001-002
Harmony Ball Lift

Item	Part No.	Description	Qty
1	250-001-128	Plastic Bell Housing	1
2	254-001-054	Base Plate Assembly	1
3	254-001-055	Odd Side Plate Assembly	1
4	254-001-056	Even Side Plate Assembly	1
5	254-001-062	Lower Guide Assembly	1
6	254-001-066	Upper Guide Assembly	1
7	254-001-067	Stiffener Plate	2
8	250-001-163	Thick Profile V-Wheel	2
9	254-001-068	Side Plate Brace	2
10	254-001-095	A51 V Belt	1
11	254-001-070	Pulley	2
12	**254-001-099**	**Motor and Bracket Assembly**	**1**
13	254-001-102	Belt Guard	1
14	254-001-101	Chain Guard Weldment	1
15	254-001-071	V-Wheel Guard	1
16	254-001-072	Transition Rail	2
17	254-001-103	Upper Hub	1
18	254-001-104	26T #35 Sprocket	1
19	250-001-233	KEY SQ 0.19 X 1.00 Q	1
20	250-001-226	Pulley Washer	1
21	254-001-106	Drive Chain	1
22	809-849-165	HHCS 1/4-20 X 1.00 GR8 BO	1
23	839-057-002	HLN 5/16-18 ZN NTU	56
24	809-857-100	HHCS 5/16-18 X 0.63 GR8 BO	9
25	951-156-002	SWM 5/16 ANSI BO	12
26	809-857-125	HHCS 5/16-18 X 0.75 GR8 PB	18
27	809-857-145	HHCS 5/16-18 X 0.88 GR8 BO	14
28	948-761-112	FW 5/16 SAE NS	3
29	951-148-008	SWM 1/4 ANSI BO	3
30	843-149-002	KN 1/4-20 ZN	4
31	7036-002520-000	HLN 1/4-20 ZN NE	3
32	948-753-101	FW 1/4 SAE BO	5
33	809-849-125	HHCS 1/4-20 X 0.75 GR8 BO	5
34	844-057-002	HLN 5/16-18 CAD STV	3
35	809-857-080	HHCS 5/16-18 X 0.50 GR8 BO	3
36	254-001-115	Harmony Lift ID Label	1
37	294-115-245	Hand Entanglement-Chain Decal	2
38	294-115-246	Hand Entanglement Decal	2
39	294-115-238	Hot Surface Decal	1
40	254-001-147	Lift Point Decal	4
41	**254-001-152**	**Lower Shaft Assembly**	**1**
42	250-004-062	Ball Lift Shim	9
43	252-003-100	Harmony Ball Return Control Box	1

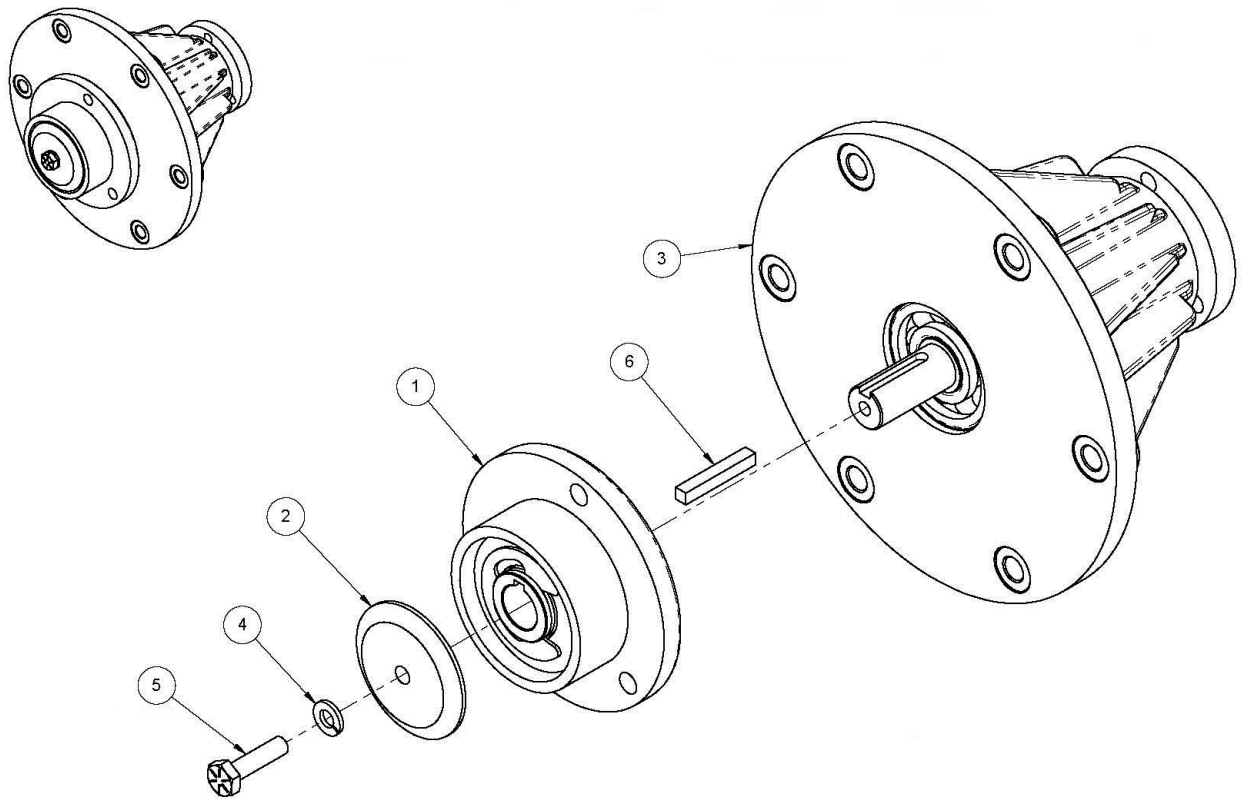
NOT SHOWN

Item	Part No.	Description	Qty
44	254-001-069	Ball Entry Sensor Assembly	1
45	610-900-038	Ball Lift Installation Hardware	1
46	611-353-105	Ball Stop Latch	1
47	610-252-000	Hand Intrusion Sensor Kit	1
48	610-252-001	Hood Switch Kit	1
49	252-003-114	Control Box Mount	1



254-001-099, Motor & Bracket Assembly

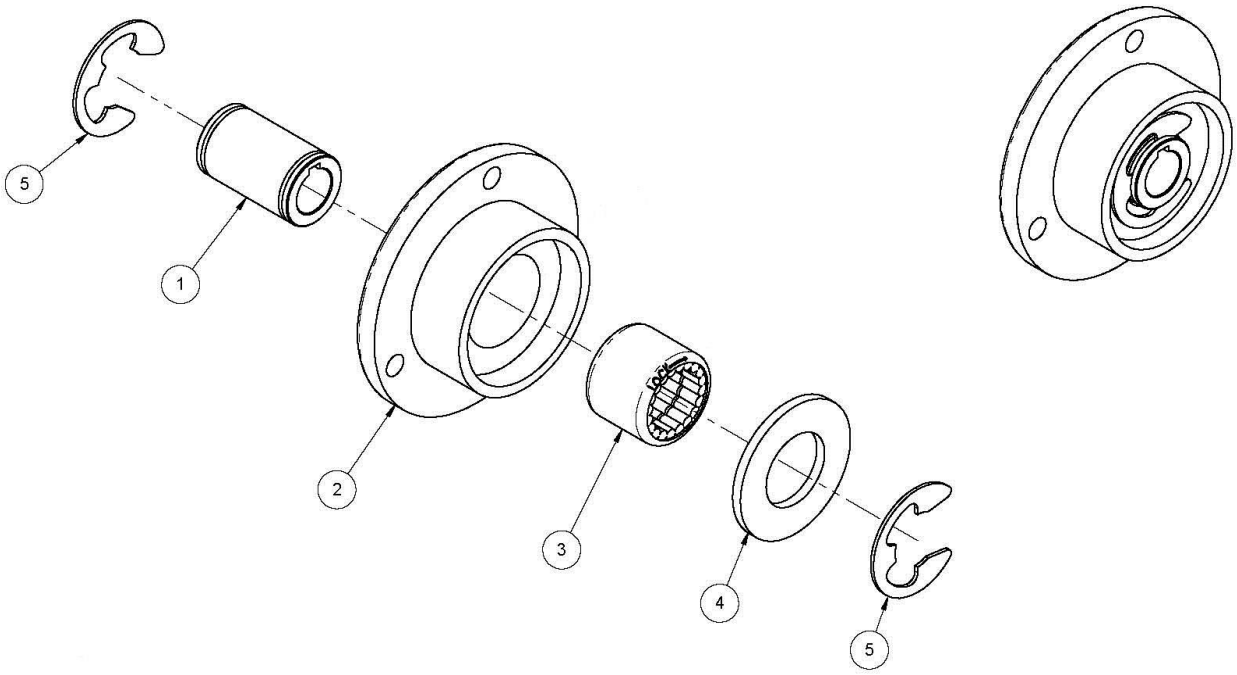
	Part No.	Description	Qty
1	254-001-097	Motor Bracket	1
2	254-001-096	Motor Assembly	1
3	254-001-098	15T #35 Sprocket	1
4	948-753-101	FW 1/4 SAE BO	4
5	951-148-008	SWM 1/4 ANSI BO	4
6	809-250-141	HHCS 1/4-28 X 0.88 GR8 BO	4



*** Apply thread locker (700-107-010) to threads of screw, tighten to 150 in-lbs. Thread locker must not get between clutch sleeve and shaft.**

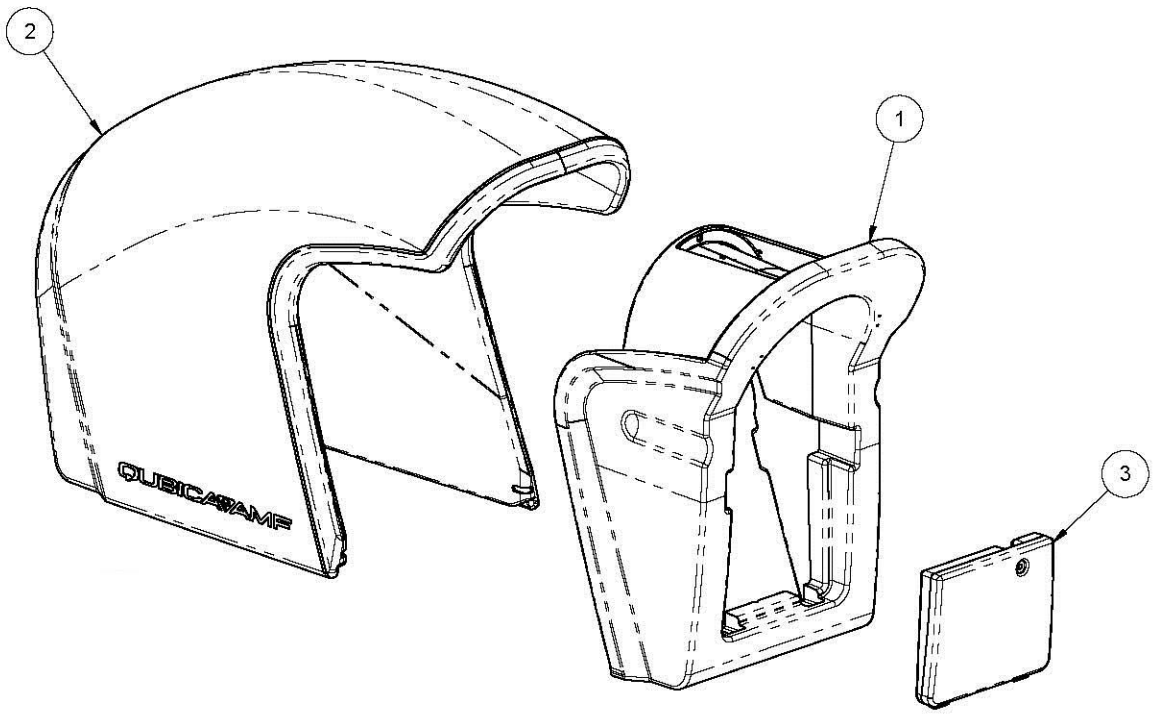
254-001-152, Lower Shaft Assembly

	Part No.	Description	Qty
1	**254-001-150**	**Harmony Clutch Assembly**	**1**
2	250-001-231	Clutch Cover	1
3	250-001-128	Plastic Bell Housing	1
4	951-148-008	SWM 1/4 ANSI BO	1
5	809-849-165	HHCS 1/4-20 X 1.00 GR8 BO	1
6	250-001-233	KEY SQ 0.19 X 1.28 Q	1



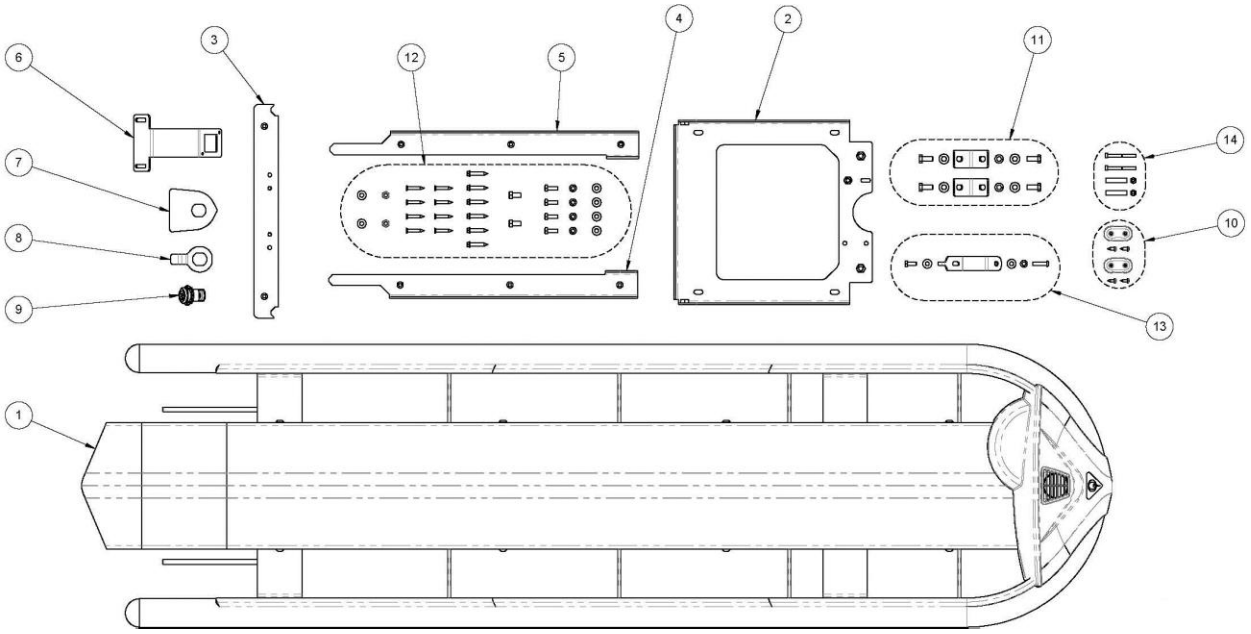
254-001-150
Harmony Clutch Assembly

	Part No.	Description	Qty
1	250-001-234	Clutch Sleeve	1
2	254-001-151	Clutch Housing	1
3	070-007-291	Clutch Bearing	1
4	941-092-320	FW 1 SAE ZN	1
5	919-010-900	RNG E 1.000 X 0.050 NS	2
6	700-112-830	RTV Silicone gasket (not shown)	A/R



254-001-010, Hood Set

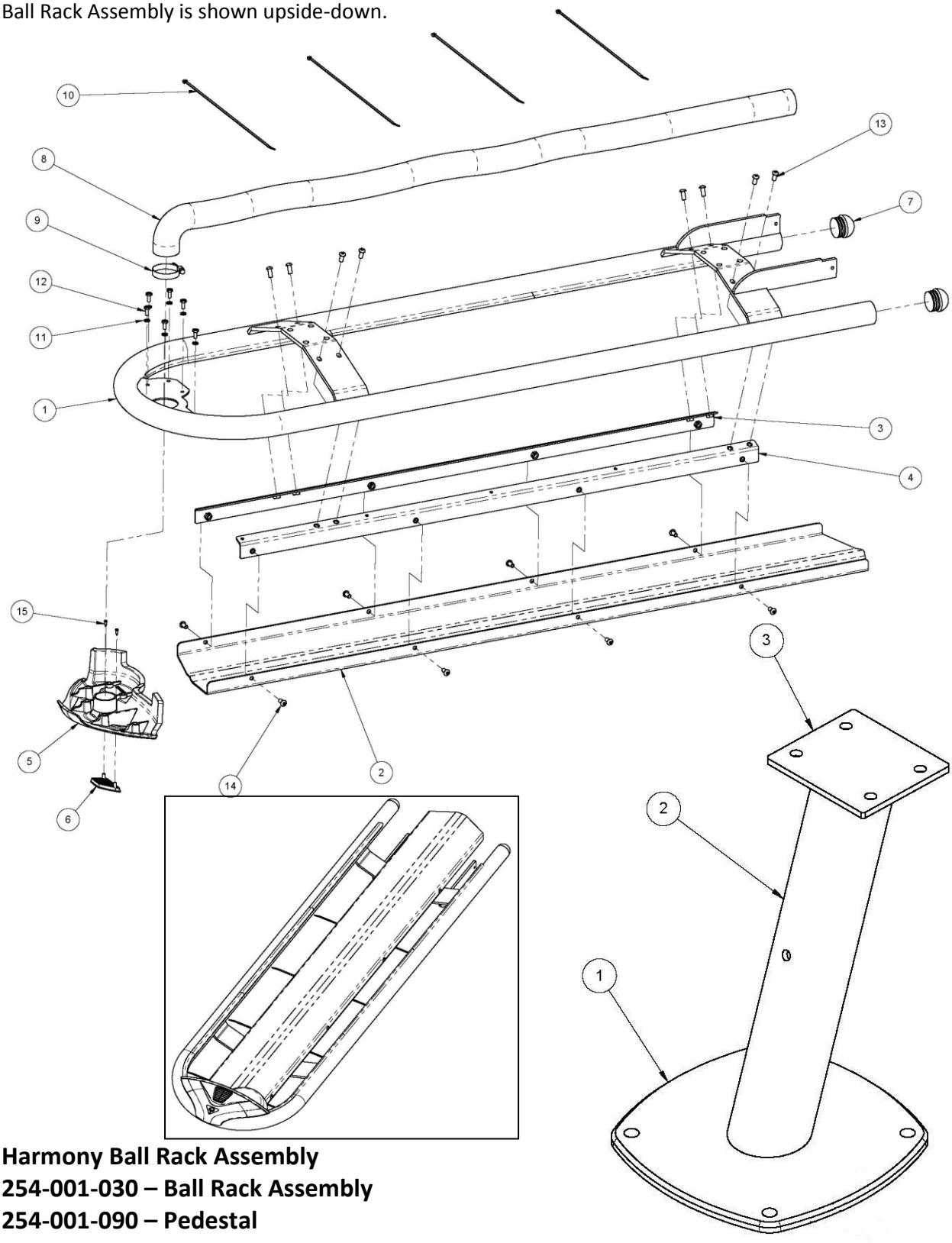
	Part No.	Description	Qty
1	254-001-012	Bezel	1
2	254-001-011-XX	Hood	1
3	254-001-013	Access Panel	1



254-001-003, Hood-Rack Install Kit

	Part No.	Description	Qty
1	**254-001-030**	**Ball Rack Assembly**	**1**
2	254-001-057	Rack-Bezel Support Assembly	1
3	254-001-016	Front Floor Bracket	1
4	254-001-022	Even Hood Floor Rail	1
5	254-001-021	Odd Hood Floor Rail	1
6	254-001-023	Hood Latch Catch	1
7	254-001-094	Latch Backer Plate	1
8	254-001-029	Hood Latch Pull	1
9	254-001-028	Hood Latch	1
10	254-001-019	Bezel Ball Stop Kit	1
11	254-001-045	Rack-Support Mount Kit	1
12	254-001-046	Hood Mount Hardware	1
13	254-001-047	Bezel/Door Mount Hardware	1
14	254-001-014	Hood Lock Pin Kit	1

Ball Rack Assembly is shown upside-down.



Harmony Ball Rack Assembly
254-001-030 – Ball Rack Assembly
254-001-090 – Pedestal

254-001-030, Ball Rack Assembly

	Part No.	Description	Qty
1	254-001-049	Upper Rack Weldment Assembly	1
2	254-001-040	Tray	1
3	254-001-108	Tray Leg Right-Hand Weldment	1
4	254-001-107	Tray Leg Left-Hand Weldment	1
5	254-001-037	End Stop	1
6	254-001-038	End Stop Grill	1
7	254-001-043	Tube Plug	2
8	254-001-042	Blower Hose	1
9	744-102-007	Clamp, WD, 1.56 – 2.5 X .50 SS	1
10	770-011-011	CBT 17.0 X 5.0 X 50 NAT	4
11	951-148-008	SWM 1/4 ANSI BO	6
12	809-849-100	HHCS 1/4-20 X 0.63 GR8 BO	6
13	808-557-120	BHSCS 5/16-18 X 0.75 BO	8
14	808-557-108	BHSCS 5/16-18 X 0.625 SS	8
15	822-626-081	PHPTS 6 X 0.50 BO TYA	2

254-001-090, Pedestal

	Part No.	Description	Qty
1	254-001-091	Foot	1
2	254-001-092	Tube	1
3	254-001-093	Flange	1

Ball Rack-Pedestal Hardware (Not Shown)

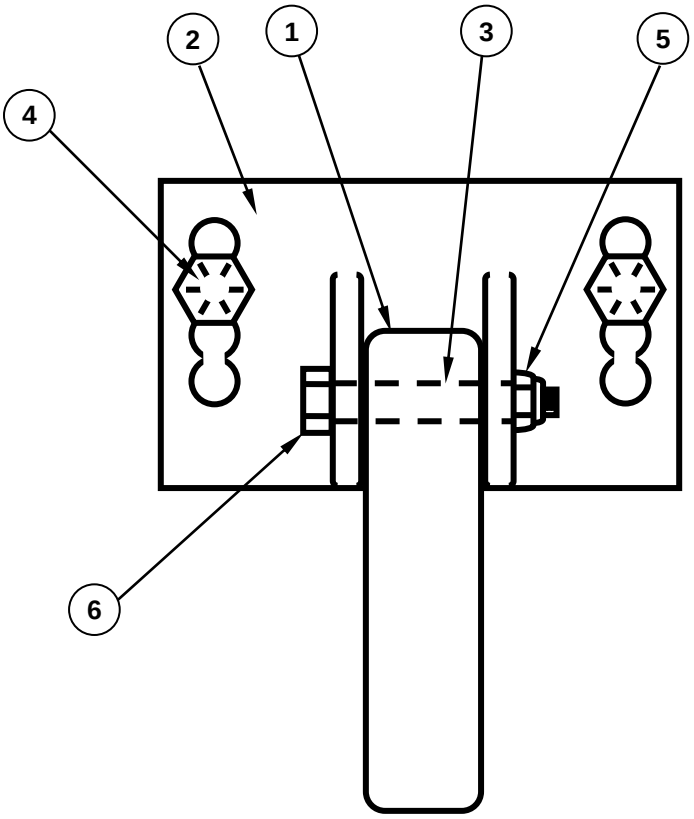
Part No.	Description	Qty
810-257-200	SHCS 5/16-18 x 1.25	4

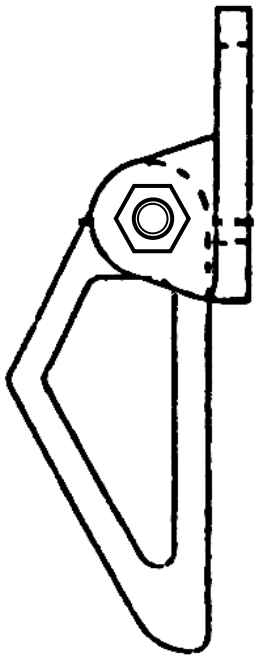
Ball Rack-Lower Rack Hardware (Not Shown)

Part No.	Description	Qty
808-057-917	SHCS 5/16-18 x 1	4
948-761-112	5/16 Plain Washer	4

Ball Rack-Lower Rack (Not Shown)

Part No.	Description	Qty
254-001-080	Lower Ball Rack	1

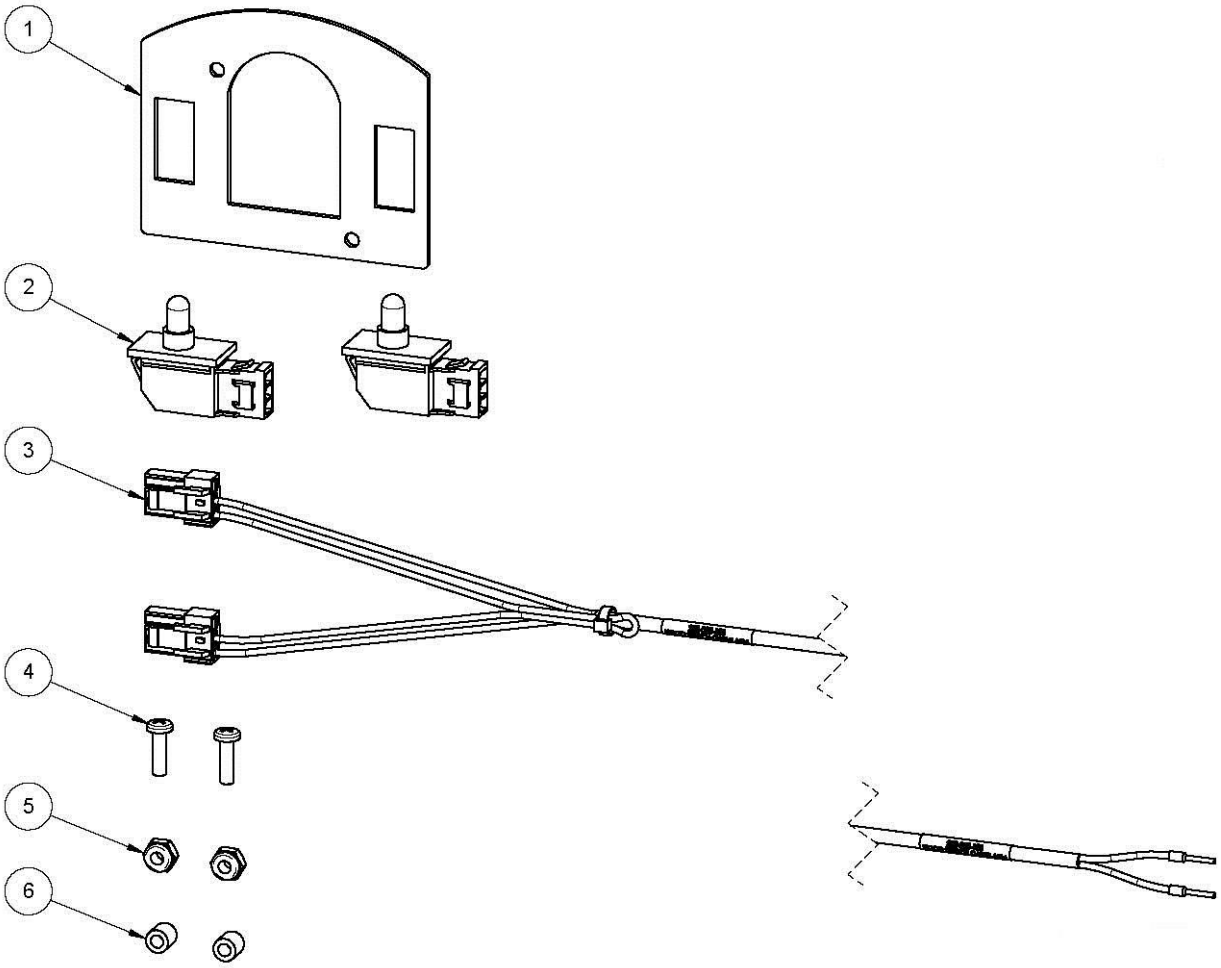




Side View

611-353-105
Underlane Return Ball Stop

	Part No.	Description	Qty
1	135-001-002	Ball stop	1
2	135-001-003	Ball stop bracket	1
3	135-001-004	Tube	1
4	810-556-240	5/16 x 1-1/2 lag screw	2
5	844-057-002	5/16-18 stover lock nut	1
6	809-857-365	5/16-18 x 2-1/4 hex screw	1

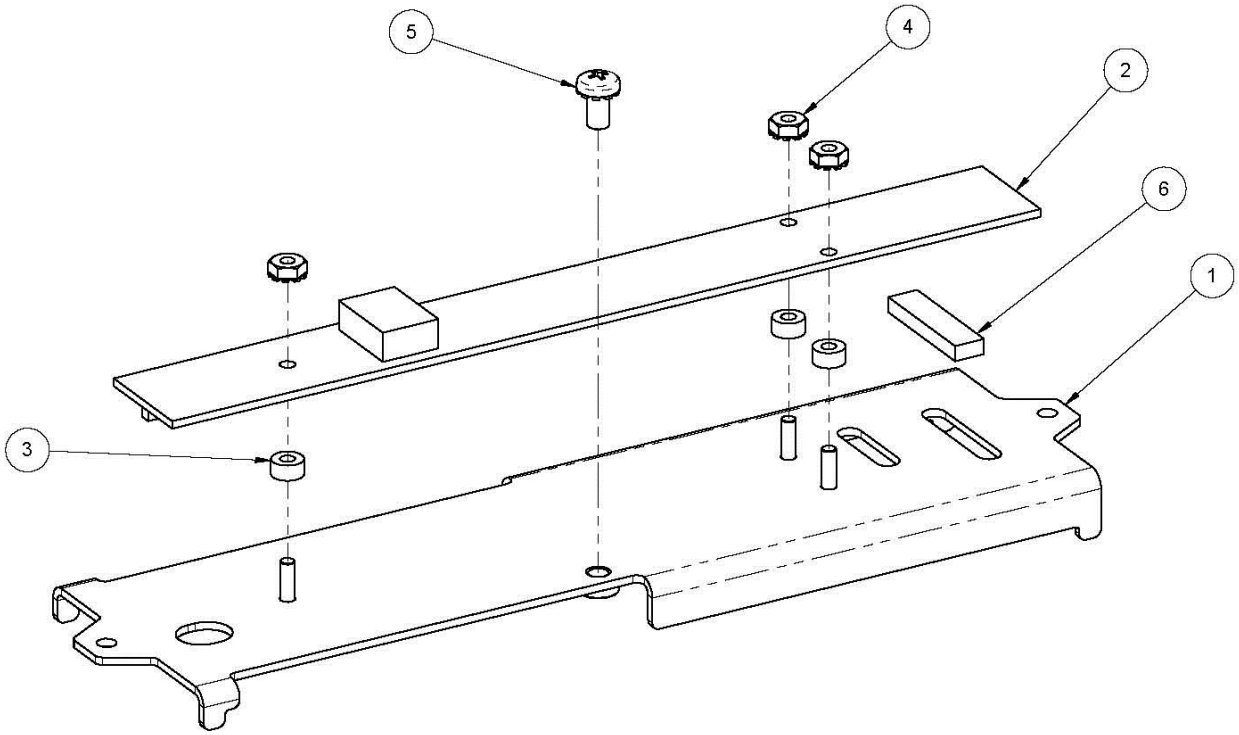


610-252-001

Hood Switch Kit

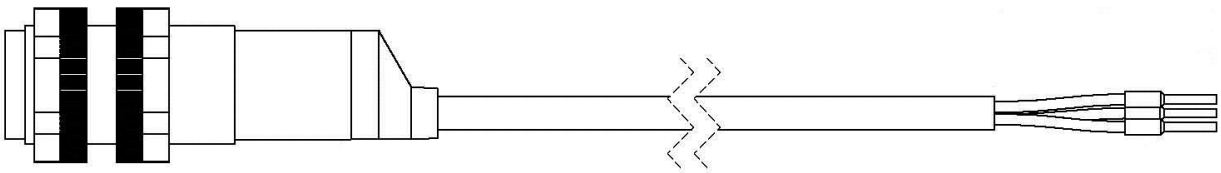
	Part No.	Description	Qty
1	254-001-024	Hood Latch Switch Bracket	1
2	759-510-030	SPST 12V 2AMP Plunger Switch	2
3	252-003-108	Hood Switch Cable Assembly	1
4	01-002	PHPMS 6-32 X 0.50 ZN	2
5	01-416	HLN 6-32 ZN NM	2
6	722-503-091	SFR 0.14 X 0.25 X 0.25 NY	2

Sensors



252-003-115
Hand Intrusion Sensor Assembly

	Part No.	Description	Qty
1	254-001-124	Harmony H.I.S. Ground Plate Assembly	1
2	252-003-104	Intrusion & Ball Exit Sensor Board Assembly	1
3	722-503-097	SFR 0.12 X 0.25 X 0.13 ZN	3
4	843-121-002	KN 4-40 ZN	3
5	818-233-052	PHPMS 8-32 X 0.31 ZN SEMS	1
6	252-003-117	1/4 X 1/8 X 1 Self-Adhesive Foam	1



254-001-069
Ball Entry Sensor Assembly
Ball Entry Sensor Tape (not shown) – 254-001-105