Power Pong

Delta





Power Pong Delta
Table Tennis Robot

User Manual

John Schmidt
Revision 1.0

Caution:

- Please read this User Manual carefully before operating the Beta robot.
- Only utilize 110/220 VAC power based on the ordered product and configuration.
- The Ball Throwing Wheels rotate at high speed. Avoid touching during operation.

IMPORTANT: This User Manual has been developed exclusively for the Power Pong Delta table tennis robot. Copying this manual or any portion of it, without explicit permission in writing from Power Pong, is strictly prohibited.

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Section 1: Getting Started with Delta Robot

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1.1 Congratulations

Congratulations on your purchase of the Power Pong Delta Table Tennis robot, the "best in its class", outstanding product, and top performing robot. The Delta robot is ideal for every type of player and every level of play. With proper care and treatment this robot will give you years of quality practice time!

1.2 Delta Table Tennis Robot Features

Below are some of the features of the Power Pong Delta robot:

- Compact, solid, functional constructed robot with integrated ball collection net – allows continuous practice without having to stop to collect balls
- Lightweight and easily transportable. The robot with included accessories weighs less than 20 lbs.
- State-of-the-art 3-wheel ball delivery technology utilizing rigid sponge wheels designed for long durability
- User-friendly, easy to understand Control Panel
- Ball delivery options include a variety of spin types, trajectory, and placement – all adjustable through the Control Panel
- Comes with 40 pre-configured Drills with different spin, speed, trajectory, and placement
- Additional 60 memory locations for your own customized Drills
- Random features include natural scattering of shots with random placement and random sequencing of Ball types
- Cluster feature allowing for up to 32 Drills to be grouped and played together
- Configurable option for more natural timing of thrown balls during Drills, on a ball by ball basis
- Adjustable height of ball delivery to simulate anything from low serves to high lobs
- Remote-Control FOB included allows starting/stopping and changing the throwing rate.
- Includes Power Pong carry bag

The Power Pong Delta tennis table robot is covered by a full 3-year Manufacturer's warranty and a 5-year guarantee of parts and service availability. See full warranty information at the end of this User Manual.

1.3 Included Parts

Robot with Net Assembly	
Power Supply (Input: 100-240V, Output: 24V DC, 3A) with cable	
Control Panel	
Power Pong Carry Bag	

Control Panel Cable	
Control Panel Mounting Bracket	
100 Power Pong Table Tennis balls	
Remote-Control FOB	
Adjustment Gauge/Tool	

Other miscellaneous parts:
2mm and 4mm Hex wrenches
Velcro strips
Flexible white replacement deflector strip
Non-Flexible, rigid white replacement deflector strip
Spare rubber bands (2)

1.4 Terminology Used in this Manual

Following is a list of terms that are used throughout this User Manual along with brief definitions.

Attributes – the individual settings applied to a ball
Ball Throw – the action of the Delta robot throwing a ball to a location on the table
Ball Throw Type - 4 primary controls affect Ball Type: Top Spin/Back Spin, Speed, Sidespin, and Trajectory
Bal Feed Tube – the path the balls follow from the base of the robot up to the throwing head.
Basic Ball - the ball that is thrown when the Control Panel is first powered on and no adjustments have been made. This ball will have no spin with medium speed and height.
Cluster – group of Drills that can be played together
Current/Active Ball - the ball that is currently selected as indicated by its flashing Ball LED.
Drill - a configurable sequence of between 2 and 8 balls of varying attributes, that upon starting, repeats until stopped
Elevation Rings — Rings painted onto the Ball Feed Tube, which are used to adjust the ball throwing height.
Existing Drill – a Drill that is currently stored in a Memory Location of the Delta robot
Placement - the location on the table where a ball lands
Rotary Dial – a dial that can be rotated to change operation of the robot
Short Button Press – a short button press is approximately 1 second or less
Long Button Press – a long press is approximately 2 seconds or more
Throwing Head Assembly – the portion of the robot that contains the 3 motors/wheels for throwing the balls

1.5 Power Pong Service / Support

For assistance or service of your Power Pong Delta Table Tennis robot, please email Power Pong support at support@powerpong.org

Please provide the following information:

1. Your full name.
2. Your phone number
3. The Model of your table tennis robot (i.e. Alpha, Beta, Delta, Omega)
4. A full description of the issue you're having with the robot.

You may also call Power Pong Support at: 714-280-6821.
We look forward to helping you! A Power Pong service representative will respond to you promptly.

Section 2: Setup of the Delta Robot

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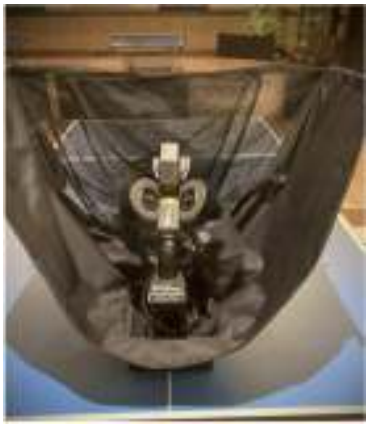
2.1 Unfolding the Robot Collection Net

1. Place the robot on top of your table tennis table. (Photo 2-1)
2. Carefully fold apart both sides of the net at the same time until the first stop. The net bars will be horizontal at this point as shown. (Photo 2-2).

Photo 2-1



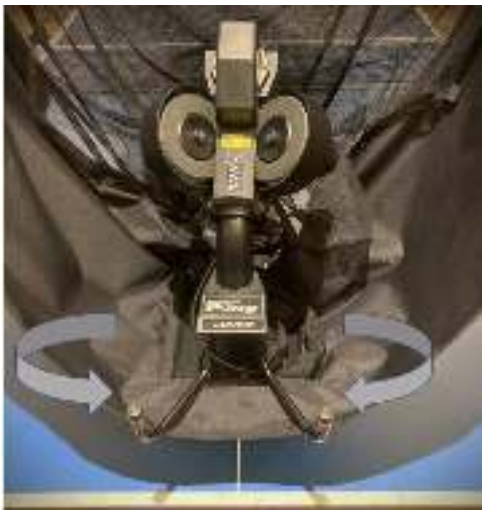
Photo 2-2



2.2 Positioning the Support Legs

1. Swing the curved tubular Support Legs **outward** toward the front of the robot into position (Photo 2-3), approximately 6-8 inches apart.

Photo 2-3



2.3 Rotating/Raising the Throwing Head into Play Position

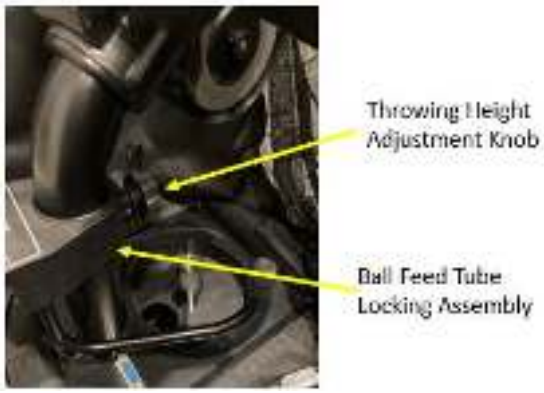
The flexibility of being able to adjust the throwing height of the Delta robot allows for a very realistic match experience. By adjusting the height (from one of four different positions) together with the ball trajectory settings, you can have the robot throw you any type of ball from a low fast serve to a high lob.

Note: If you are unpacking the unit for the first time, remove the rubber bands used on the throwing head which protect the Deflector Plates during shipment.

When adjusting throwing head height, always be sure that one of the 4 painted rings is slightly above the Ball Feed Tube Locking Assembly. Failure to adjust the height properly can lead to throwing malfunctions, including throwing two balls simultaneously.

1. Loosen the Throwing Height Adjustment Knob found on the rear of the Ball Feed Tube Locking Assembly typically one-half to one turn. (Photo 2-4)

Photo 2-4



2. Grasp the curved Ball Feed Tube and rotate approximately 180° so that the ball head / exit route is pointing toward you and/or the front of the robot. You may have to pull up slightly on the Ball Feed Tube to rotate. See Photo 2-5 (before) and Photo 2-6 (after).

Photo 2-5



Photo 2-6



3. Pull the head upwards on the Ball Feed Tube until the second ring on the tube is just visible (Photo 2-7). **SLIGHTLY** tighten the Throwing Height Adjustment Knob to hold the throwing head in place - just enough to prevent it from dropping.

Caution: Overtightening can damage the Ball Tube!

Photo 2-7



The height of the throwing head can be adjusted to one of four possible heights as shown in photos 2-8 thru 2-11. Before tightening the Throwing Height Adjustment Knob, it is important that one of the Ball Feed Tube rings be located just above the Ball Feed Tube Locking Assembly.

Never operate the robot with the height beyond the 4th red ring.

Photo 2-8



1 Ring Exposed

Photo 2-9



2 Rings Exposed

Photo 2-10



3 Rings Exposed

Photo 2-11



4 Rings Exposed
(Maximum Height)

2.4 Connecting the Throwing Head Communication Cable

1. Connect the Communication Cable coming from the Throwing Head Assembly to the 15-pin connector found on top of the robot base (Photos 2-12, 2-13 and 2-14).

Photo 2-12



Photo 2-13



Photo 2-14



2. Tighten (snug) the two thumb screws on the cable connector. **Note:** This cable **MUST** be disconnected anytime you swing the table support legs back into their transport position to prevent damage to the cable.

2.5 Fully Opening the Collection Net

1. Standing behind the robot, grip the top points of the net and completely fold the net down on both sides until the net fully opens (Photo 2-15).

Photo 2-15



2.6 Mounting the Robot on the Table

1. From behind, grasp the robot with both hands on the bottom of the base. Pick up the robot, angle the Support Legs downward, and slip them under the end of your table. (Photo 2-16)
2. Gently push the robot onto the end of the table with the Power Pong logo aligned with the center line of the table. (Photo 2-17)
3. Carefully let go of the robot base and it will hang securely by its own weight.
4. Lower the Corner Brackets of the net around the corners of your table.
5. With a newer robot, the corners of the net may not stay completely down at this point – this is okay and as the material loosens up the corners will stay in place.

Note: If the table to which you are attaching the robot to, is the table that you will always use, you can secure the mounting by using the included longest Velcro strip to secure the robot to the end of the table. You may also use supplied Velcro on the corners of the table.

Photo 2-16



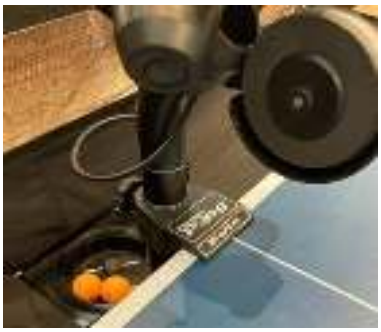


Photo 2-17

2.7 Adjusting the Support Legs (Rubber Tips)

The Delta robot is designed with adjustable Support Legs allowing it to fit onto tables with a variety of thicknesses, up to 1 inch. There are adjustable rubber tips on the end of the Support Legs that can be turned clockwise or counterclockwise, as needed for your table, **so that the Throwing Head Assembly is positioned straight up and NOT tilting either forward or backward**. Failure to adjust the legs properly will cause ball placement to be inaccurate.

1. Turn the **adjustable rubber tips** on the ends of the Support Legs as needed so that the Ball Feed Tube is straight up, not tilting forward/backward. (Photo 2-18, Figures 2-1, 2-2)

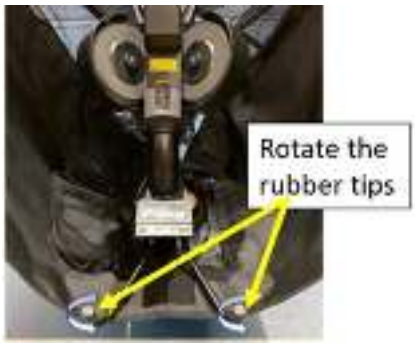
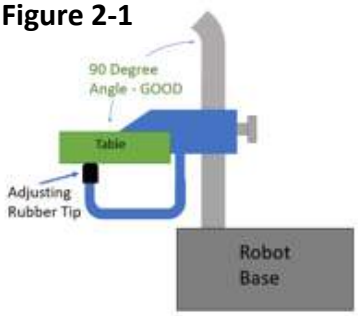


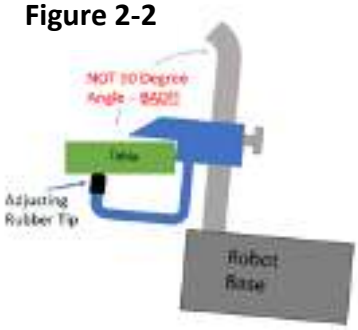
Photo 2-18

Figure 2-1



CORRECTLY Adjusted Rubber Tips

Figure 2-2



INCORRECTLY Adjusted Rubber Tips

2.8 Securing the Side Nets

1. Pull one of the Side Nets along the side of the table and secure to the net post hardware (Photos 2-19 and 2-20), by looping the rubber band **over the top** of the net support and then down around the clamp screw that holds the net support onto the table.
2. Repeat with the other Side Net.

Photo 2-19



Photo 2-20



2.9 Connecting the Control Panel Cable

1. Connect either end of the Control Panel Cable into the jack (looks like a headphone jack) on the side of the Robot Base Assembly (Photo 2-21). Be sure to fully seat/insert this cable.



Photo 2-21

2. Extend the other end of the Control Panel Cable to the opposite side of the table and connect to the Control Panel (see Photo 2-22 and 2-23). Be sure to fully seat/insert this cable.



Photo 2-22



Photo 2-23

2.10 Mounting the Control Panel to the Table

The Control Panel Bracket and Control Panel can be mounted on either side of the table.

1. Attach the Control Panel Bracket onto the side of the table, near the end so that you can easily reach/operate it. (Photo 2-24)

Photo 2-24



2. Attach the Control Panel to the mounting tabs on the Control Panel Bracket. You may use a Velcro strip to help secure the bracket onto the side of the table if you will always be using the same table. (Photo 2-25)

Photo 2-25



2.11 Connecting the Delta Robot to a Power Source

1. Insert the power connector from the power adapter into the power jack on the side of the Robot Base Assembly. (Photo 2-26)



Photo 2-26

2. Plug the power adapter into the wall power (110VAC) as shown in Photo 2-27. When you do this, you will hear the Delta robot begin its startup process consisting of several clicking noises followed by the ball throw motors spinning for 1-2 seconds.

Photo 2-27



2.12 Load the Delta Robot with Table Tennis Balls.

1. Fill the collection net assembly with the supplied table tennis balls. (Photo 2-28)

Photo 2-28



2.13 Congratulations – Setup is Complete

Setup of your Delta robot is complete, and the unit is ready for use!

Section 3: Delta Control Panel

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3.1 Control Panel Introduction (Photo 3-1)

The Delta Control Panel is used to control all aspects of how the balls are thrown/delivered to you. This includes:

- placement of the ball on the table
- speed, spin, and trajectory of the balls
- starting/stopping and the rate of ball delivery
- programming Drills and Clusters
- the use of random placement/ball type features



Photo 3-1

This section of the User Manual focuses on the function of the individual buttons, dials, and LEDs that are part of the control panel. References to Drills (which are grouped sequences of balls) and Clusters are used in this Section, however those functions will be covered in greater deal, in Section 4.

3.2 Controls Affecting the Single Thrown Ball

3.2.1 Ball Select Buttons / LEDs (Figure 3-1)

There are eight Ball Select buttons and eight Ball Select LEDs across the top of the Delta Control Panel. The eight Ball Select buttons are used for several purposes including:

1. **Adding a Ball to a Drill** – To add a ball, press a Ball Select button for a ball number (1-8) that is not in use (LED above the button OFF). The ball will become "active" and the Ball Select LED above the button will begin flashing ON/OFF. Attributes (PLACE, SPEED, SPIN, etc.) from the previously "active" ball will automatically be copied to the just added ball, however it can be modified as needed at this point.
2. **Removing a ball from a Drill** – To remove a ball that is in use, hold the Ball Select button down for at least two seconds, for the ball you wish to remove. The corresponding Ball Select LED will turn OFF indicating that the ball is no longer in use.
3. **Making a ball "active"** – To edit the attributes of a ball that is already in use (LED ON), the ball must be made "active". Do this by pressing the Ball Select button once, briefly. The corresponding LED will begin flashing ON/OFF and you can now edit the ball's attributes.
4. **Removing all the balls in a Drill** – Pressing both the Ball 1 and the Ball 8 Select buttons and **holding** for 2 seconds will remove all the balls from a Drill – along with their settings, in one step.

Below is a summary of the eight Ball Select LEDs and the status that they provide:

OFF – The corresponding ball is not programmed and is not currently being used

ON Yellow – The corresponding ball is currently in use

ON GREEN – The Ball Select LEDS for Ball 1 and Ball 2 can be ON with GREEN color in addition to Yellow. The GREEN indicates that the ball is configured as a Serve ball and as a result, will have a short time delay before it is thrown.

Flashing ON/OFF Yellow or Green – The corresponding ball is “active”, and its settings can be configured and/or changed.

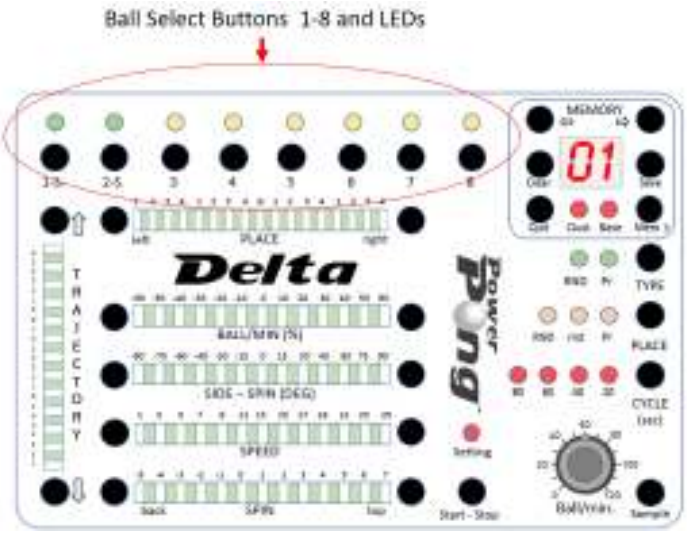


Figure 3-1

3.2.2 1-S and 2-S Buttons (Figure 3-2)

Ball 1 and Ball 2 have additional functionality and can be designated as SERVE balls. Doing this provides an added delay before the ball is thrown. To make Ball 1 or Ball 2 a SERVE ball, press the Ball 1-S or Ball 2-S Select button twice rapidly. The Ball Select LED will start flashing ON/OFF GREEN to indicate that the ball has now successfully been designated as a SERVE and is “active”. This means the attributes for the SERVE can now be set. When saving the Drill, the SERVE designation WILL be saved. To turn this SERVE designation OFF, press the 1-S and/or 2-S button twice rapidly.

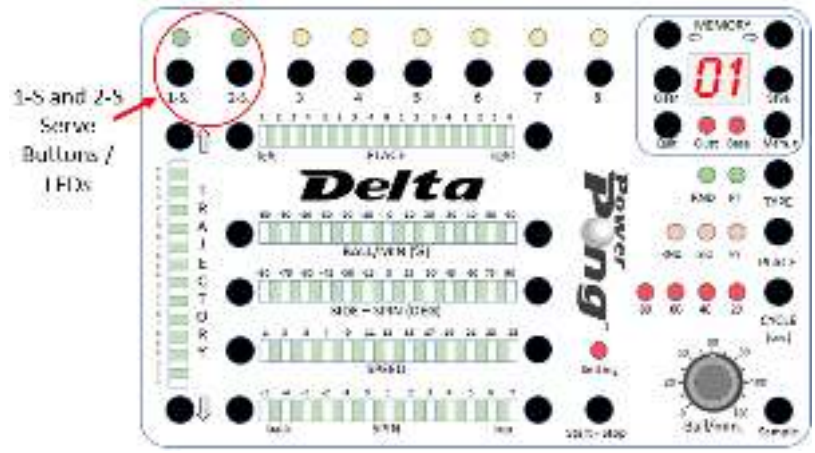


Figure 3-2

3.2.3 PLACE Buttons / LED Display (Figure 3-3)

The left/right PLACE buttons are used to set the placement of the ball, related to the centerline of the table. When the Green “G” LED is lit on the PLACE LED Display, the ball will be delivered approximately down the center line of the table. Press the left PLACE button to have the ball

delivered left of the center line or press the right PLACE button to have the ball delivered right of the center line. Additional presses of the left/right PLACE button will cause the ball to be delivered further to the left/right of the center line. The PLACE LED display will always provide you with an indication of the ball placement of the table.

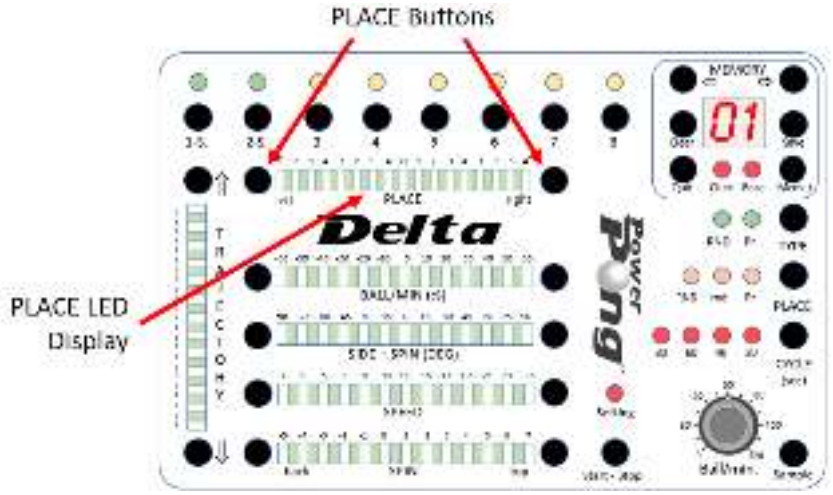


Figure 3-3

3.2.4 TRAJECTORY Buttons / LED Display (Figure 3-4)

The Trajectory buttons raise or lower the "active" ball trajectory (throw angle). One short press of either button will change the trajectory by about one-half degree, either up or down. If you hold either button down (long press), the change in trajectory can be made rapidly. The Trajectory LED display will update with major changes (8 or more short presses) of the trajectory button.

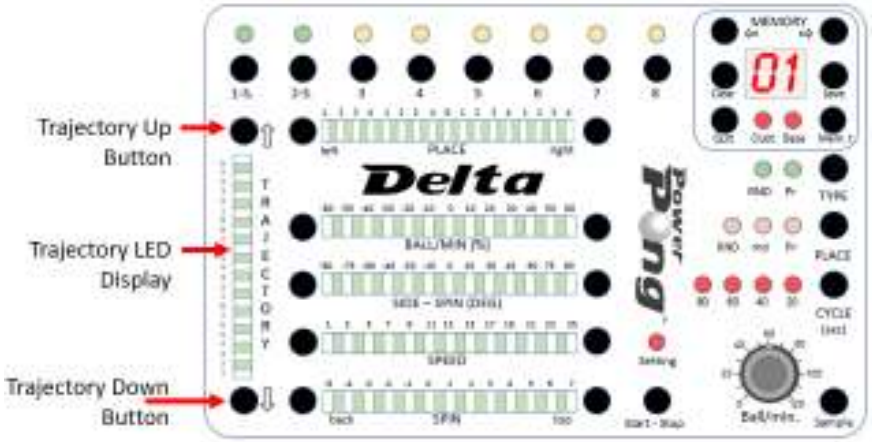


Figure 3-4

3.2.5 SIDE-SPIN (DEG) Buttons / LED Display (Figure 3-5)

The SIDE-SPIN (DEG) buttons change the direction and amount of side spin on the "active" ball. When the "0" LED is illuminated, there is no side spin on the "active" ball. Pressing the left/right SIDE-SPIN buttons, will change the amount of spin and whether the spin is left or right. The Side-spin LED will update with each click (left or right).

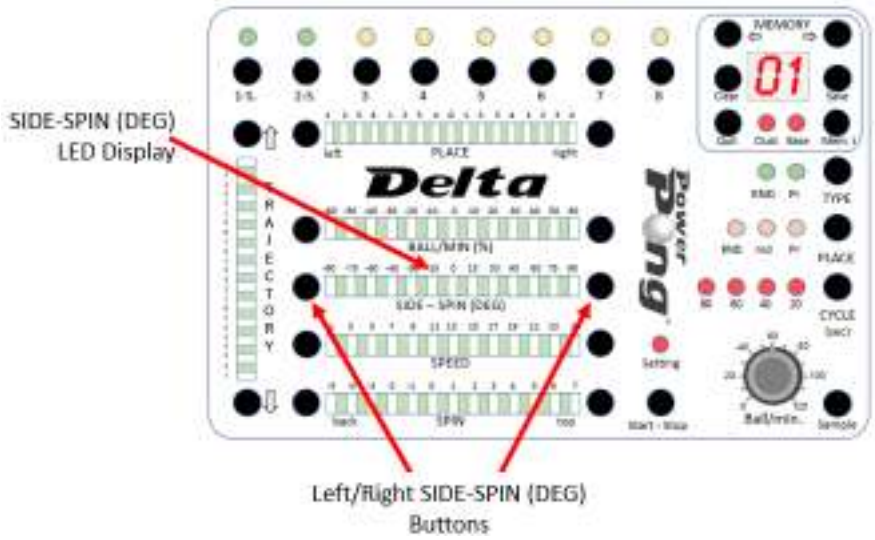


Figure 3-5

3.2.6 SPIN Buttons / LED Display (Figure 3-6)

The Spin buttons reduce or increase the amount of spin on the "active" ball – either Top-spin or Back-spin. A setting of zero indicates no spin (dead ball). Settings to the right of zero (1 to 5) indicate stronger and stronger amounts of Top-spin. Settings to the left of zero (-1 to -4) indicate stronger and stronger amounts of Back-spin. The Spin LED will update with each click (left or right) and will apply to the active ball.

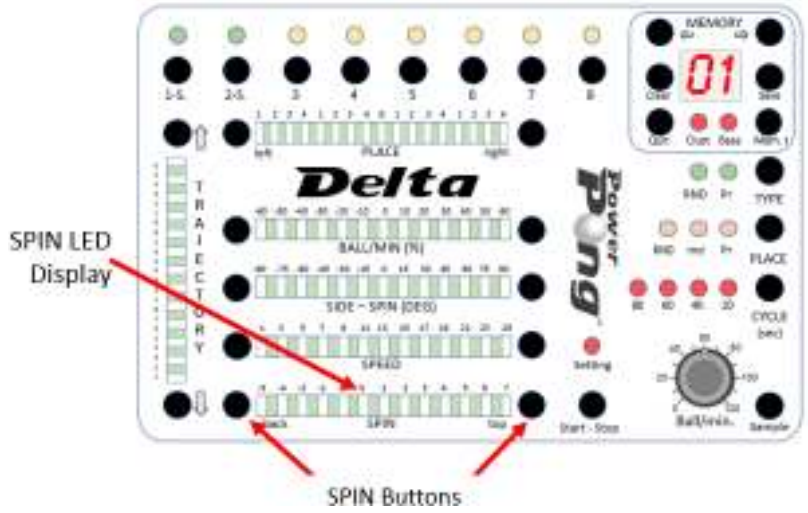


Figure 3-6

3.2.7 SPEED Buttons / LED Display (Figure 3-7)

The Speed buttons reduce or increase the speed of the ball. There are 19 increments of speed adjustment. The Speed LED will update with each click (left or right) and will apply to the active ball.

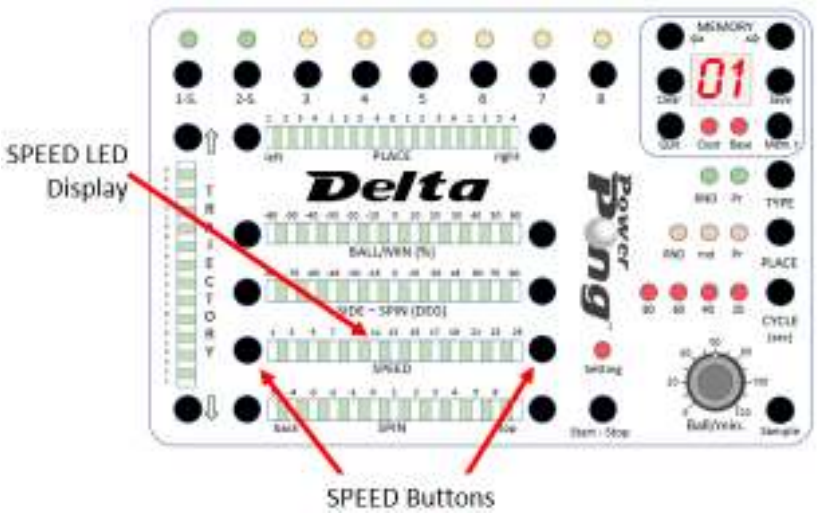


Figure 3-7

3.2.8 BALL/MIN (%) Buttons / LED Display (Figure 3-8)

Based on the types of balls you configure in a Drill; you may wish to vary the amount of elapsed time from one ball to the next. The BALL/MIN (%) setting allows you to increase or decrease this time (on a ball-by-ball basis), which is normally a constant function of the Ball/min (rotary dial) setting. If you feel that the timing between two balls is too short, you can use the left button to set a negative value, which in effect, reduces the set Ball/min setting (for this ball). This results in a longer delay before the next ball. If you feel that the timing between two balls is too long, you can use the right button to set a positive value, which in effect, increases the Ball/min setting (for this ball). This results in a shorter delay before the next ball.

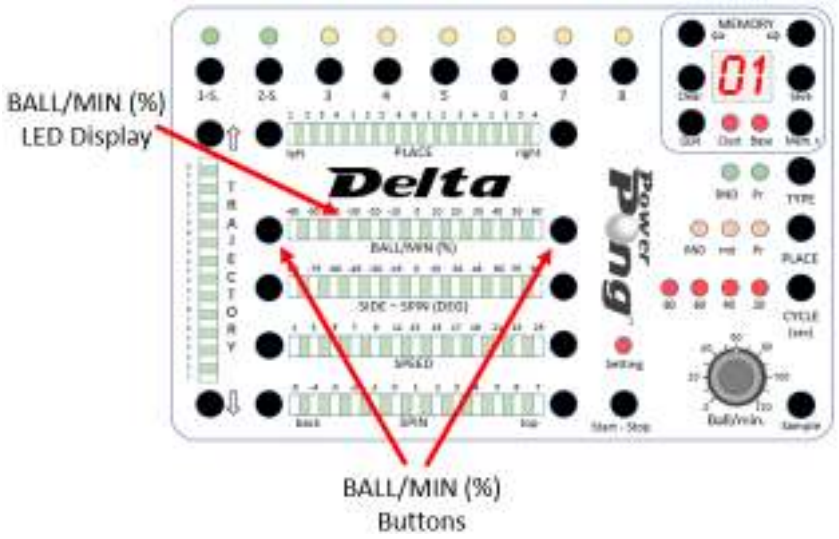


Figure 3-8

3.3 Controls Affecting All Thrown Balls

3.3.1 Ball/min. Rotary Dial (Figure 3-9)

The Ball/min. rotary dial increases or decreases the rate, or frequency of thrown balls. This control affects all balls thrown, not just the active ball. An adjustment of 0 to 120 balls per minute is possible. Turning the Ball/min rotary dial to the "0" position will stop the Ball Feed Motor and the three Throwing Motors.

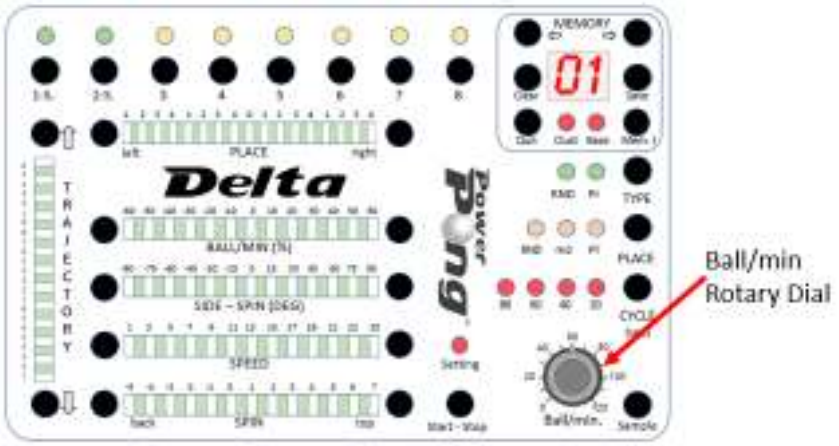


Figure 3-9

3.3.2 TYPE Button / LEDs (Figure 3-10)

The TYPE button is used to introduce a degree of randomness to your practice sessions by randomly changing the order of ball TYPES that are thrown. To activate the random function, press the TYPE button once. The RND LED will illuminate. Now, rather than stepping sequentially through the defined ball types, the Delta robot will randomly choose between the ball types that you have identified for balls 1 through (up to) 8 and will continue to randomly select random types until you turn RND OFF and/or stop the robot.

Note: RND mode requires that you have at least TWO defined balls.

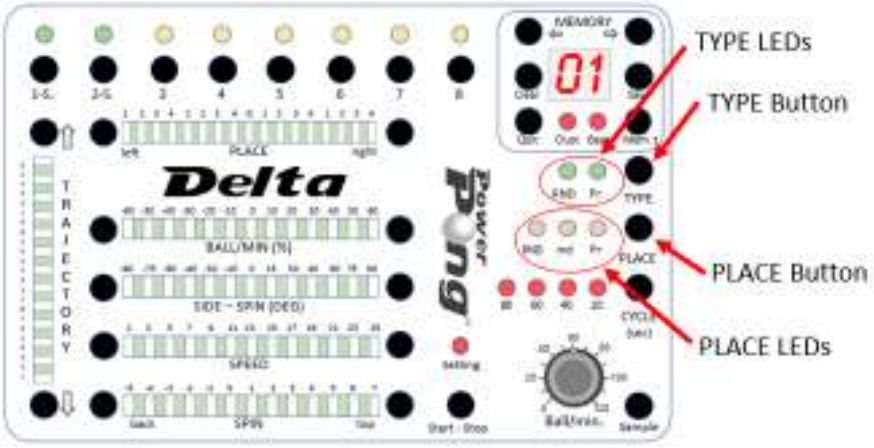


Figure 3-10

3.3.3 PLACE Button / LEDs

The PLACE button has two functions both related to randomly placing balls on the table as described below.

Random Placement mode - Pressing the PLACE button the first time will select Random Placement mode and will illuminate the rnd LED. Random Placement mode is similar to the less precise shots that a human might deliver. With Random Placement, balls are delivered within an area of approximately 20cm, relative to or around the originally set placement/location.

Random Sequence mode - Pressing the PLACE button the second time will select Random Sequence and the RND LED will illuminate. In Random Sequence mode, the robot will treat the ball settings separately from the PLACE settings. randomly select one of the placements in the current Drill/sequence and throw to that location, then randomly select another placement in the Drill and throw to it, etc. This feature creates many different variations within a 6-ball Drill. Random Sequence mode requires at least two Balls to be active and/or in a Drill. If there is only a single Ball active and/or in a Drill, Random Sequence cannot be activated and the RND LED will not light.

Random Placement mode plus Random Sequence mode – Pressing the PLACE button a third time will activate both Random Sequence and Random Placement, simultaneously. The RND and rnd LEDs will both illuminate. This option will give you the greatest randomness during your practice sessions.

Pressing the PLACE button, a fourth time will turn both Random Sequence mode and Random Placement mode off (and both RND and rnd LEDs will turn off).

Note: When using the Random Placement mode, it is best not to choose ball placements that are close to the side of the table, end line of the table, or near the table net. If you do, some balls are likely to be placed over the side, over the end of the table or into the net because of the increased area/randomness of the placement for the balls.

The following table summarizes the actions the Delta robot will take, based upon the 8 combinations possible in setting the TYPE and PLACE buttons.

SETTINGS		RESULTS		
TYPE	PLACE	Ball Type Sequence	Placement Sequence	20 cm Variation
Pr	Pr	Type 1, Type 2, Type 3, sequential up to 8	Place 1, Place 2, Place 3, sequential up to Place 8	No
Pr	rnd	Type 1, Type 2, Type 3, sequential up to 8	Place 1, Place 2, Place 3, sequential up to Place 8	Yes
Pr	RND	Type 1, Type 2, Type 3, sequential up to 8	Random from defined placements 1 thru 8 max	No
Pr	rnd+RND	Type 1, Type 2, Type 3, sequential up to 8	Random from defined placements 1 thru 8 max	Yes
RND	Pr	Random sequence from defined types 1 thru 8 max	Place 1, Place 2, Place 3, sequential up to Place 8	No
RND	rnd	Random sequence from defined types 1 thru 8 max	Place 1, Place 2, Place 3, sequential up to Place 8	Yes
RND	RND	Random sequence from defined types 1 thru 8 max	Random from defined placements 1 thru 8 max	No
RND	rnd+RND	Random sequence from defined types 1 thru 8 max	Random from defined placements 1 thru 8 max	Yes

3.3.4 CYCLE Button (Figure 3-11)

The Delta robot includes a CYCLE function which will insert a rest period periodically during your practice session. Pressing the CYCLE button, the first time will illuminate the 20 red LED and will result in the robot throwing balls for 20 seconds, followed by a rest period of 10 second. Pressing the CYCLE button a second time will illuminate the 40 red LED and will result in the robot throwing balls for 40 seconds, followed by a rest period of 20 seconds. Pressing the CYCLE button a third time will illuminate the 60 red LED and will result in the robot throwing balls for 60 seconds, followed by a rest period of 30 seconds. Pressing the CYCLE button a fourth time will illuminate the 80 red LED and will result in the robot throwing balls for 80 seconds, followed by a rest period of 40 seconds. Lastly, pressing the CYCLE button a 5th time will turn off the CYCLE function.

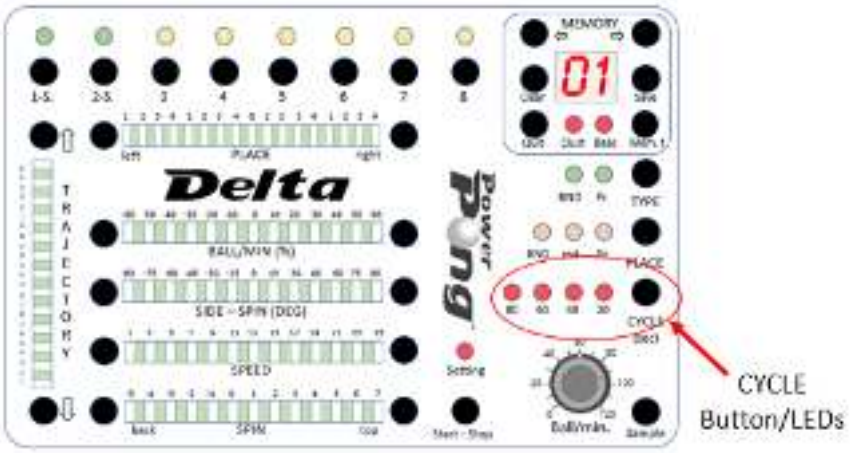


Figure 3-11

3.4 Memory Control Buttons / LEDs

The Delta robot has 99 Memory Locations which can store Drills/sequences of two to six different ball types and placements. 40 of the Memory Locations (60-99) come with pre-loaded Drills for your practicing experience. In this section, the controls related to Memory Locations and Drills are explained. Drills are covered additionally in Section 4.

3.4.1 MEMORY LED Display (Figures 3-12 and 3-13)

The Memory LED Display is used to indicate which mode the Delta robot is in (Non-Memory/Instant Play mode, Base Memory mode, Cluster mode, etc.). Base Memory/Drill locations and Cluster/Drill locations are provided as well. If the Memory LED Display is flashing a number, this indicates that the Memory Location is unused and is not holding a Drill, Cluster, etc..

Figure 3-12

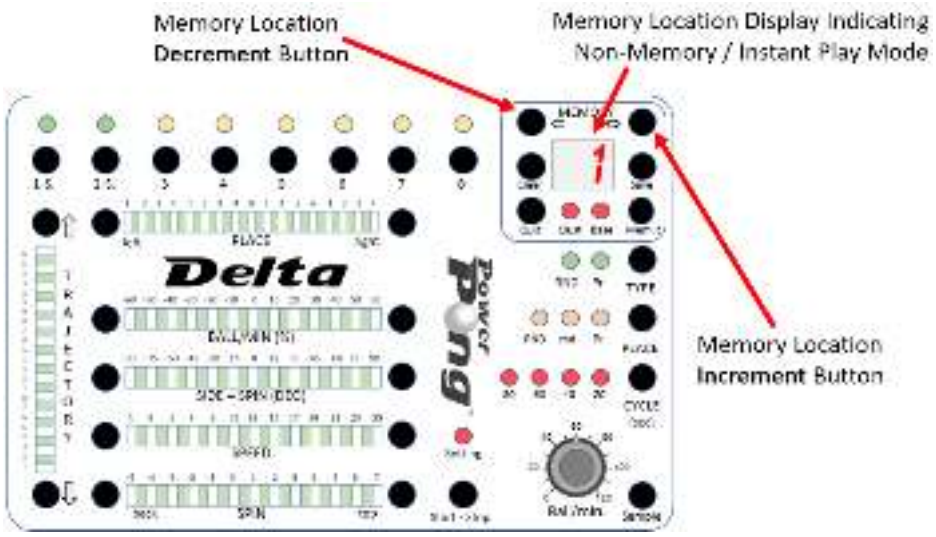
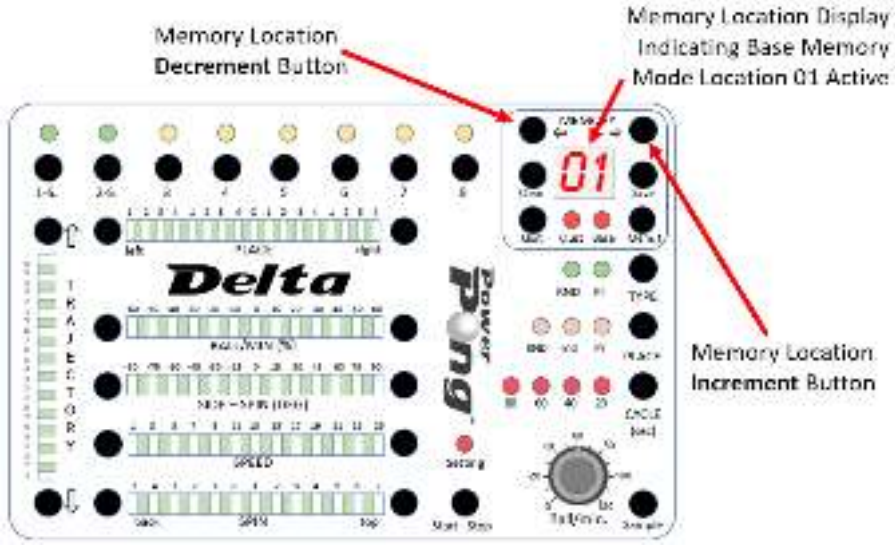


Figure 3-13



3.4.2 Memory Location Increment Button (Figure 3-13)

Pressing the Memory Location Increment button once will **increment** the active Memory Location by 1. Holding the button down will **increment** the Memory Location at a faster rate. Pressing this button while the number 99 is displayed will cause the controller to loop forward to Memory Location 01.

3.4.3 Memory Location Decrement Button (Figure 3-13)

Pressing the Memory Location Decrement button once will decrement the active Memory Location by 1. Holding the button down will decrement the Memory Location at a faster rate. Pressing this button while the 01 is displayed will cause the controller to loop back to Memory Location 99. A flashing Memory LED Display indicates that the Memory Location is not holding a Drill.

3.4.4 Clear Button (Figure 3-14)

Pressing and holding the Clear button for 2 seconds will erase/clear the contents of the Memory Location for the position identified by the Memory LED Display. The ball attributes such as Spin, Speed, Side-spin, etc. will all be reset to their default settings. A flashing Memory LED Display verifies that the Memory Location has been cleared successfully.

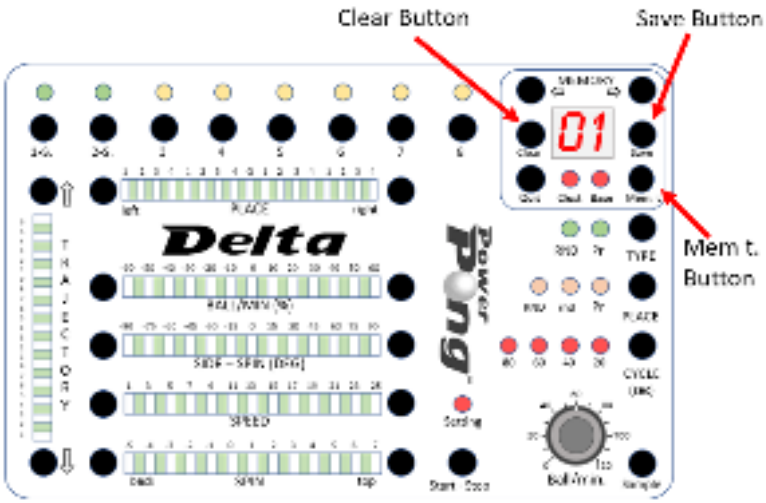


Figure 3-14

3.4.5 Save Button (Figure 3-14)

Pressing and holding the Save button until it becomes blank will save the current Drill based on the number of active balls and the settings for each active ball. Upon releasing the button, the Memory Location will again be displayed. The Save button is also used to save Clusters.

Note: Saving a Drill/Cluster will erase any Drill/Cluster that was previously stored in the indicated Memory Location.

3.4.6 Mem.t Button (Figure 3-14)

The Mem.t Button is used to switch the Delta robot between the available Memory modes used with the robot including Non-Memory mode, Base Memory mode, and Cluster mode.

3.5 Drill Controls

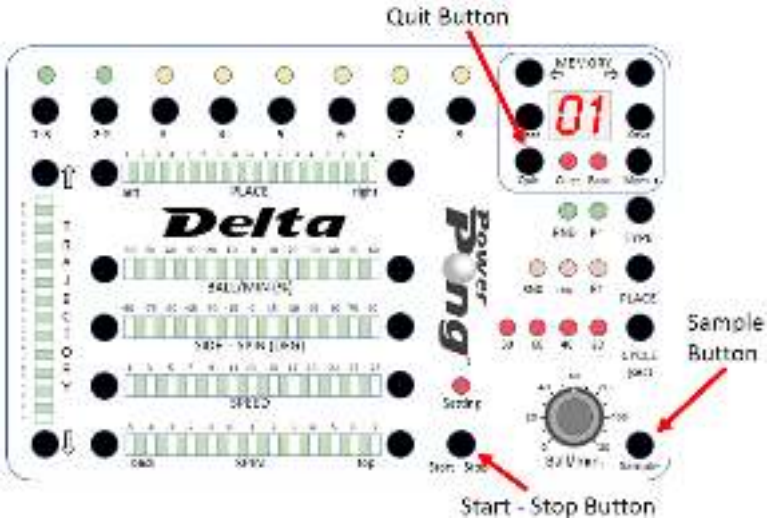
3.5.1 Sample Button (Figure 3-15)

Pressing the sample button will cause the active ball to be delivered continuously until the button is pressed again. This allows you to set ball attributes to your design, without starting the Drill itself. The balls are delivered at a rate between 55 and 60 balls per minute.

3.5.2 Start - Stop Button (Figure 3-15)

Press the Start - Stop button briefly to start or stop (toggles) ball delivery.

Figure 3-15



3.5.3 Quit Button (Figure 3-15)

The Quit Button when held down for approximately 2 seconds will put the control panel back into Non-Memory/Instant Play mode.

3.6 Resetting the Delta Robot (Figure 3-16)

Holding the PLACE left/right buttons together for approximately 3-5 seconds will reinitialize the throwing head of the robot. This is similar to turning the robot OFF/ON and can be done as part of troubleshooting any abnormal throwing related activity.

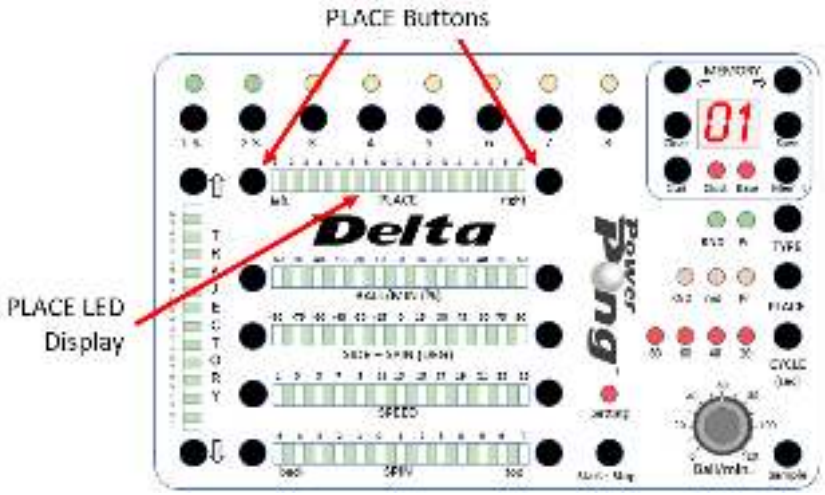


Figure 3-16

Section 4: Operation of the Delta Robot

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4.1 Tips for Best Operation and Longevity

For best operation and longevity, follow the guidelines below.

- The Delta robot works best when using the supplied Power Pong table tennis balls. Additional balls may be ordered from powerpong.org when needed.
- New balls should be washed and dried, to remove residual manufacturing dust before being used in the Delta robot.
- Keep all balls, new or old, that you use in the robot clean. When the balls contact the floor in your playing area, they may pick up dirt and various debris. This dirt/debris can be transferred into the robot, onto the robot ball throwing wheels, reducing the performance of the robot. See Section 5 (Maintenance) for instructions on cleaning the Delta robot.
- The Delta robot is designed for use in dry, indoor rooms. Do not use outdoors or in any wet or damp environment.
- Avoid leaving your robot where it is exposed to heat such as a hot car or trunk.
- Do not allow objects including dented balls, hair, string, etc. to fall into the collection net where they can work their way into the robot. These objects can cause ball jams, interfere with correct operation and/or damage the robot.

4.2 Starting the Delta Robot

1. Setup the Delta robot as covered in Section 2, including placing at least 50 table tennis balls into the net trays. For best results, use the supplied balls from Power Pong.
2. If not already done, plug the Delta robot power adapter into a power outlet. After a brief startup/initialization sound, the Ball 1 LED on the Control Panel should be flashing.
3. Set the Rotary dial for Ball/min to 25.
4. Press the Start button on the Remote-Control FOB, or the Start - Stop button on the Control Panel (to start). You will hear the wheels start spinning and balls will begin loading into the machine and travelling up the ball throwing assembly. After a few seconds, the first ball will reach the top of the Ball Feed Tube and will be delivered. Balls will continue to be delivered until you press the Start - Stop button again or press the Stop button on the Remote-Control FOB.

4.2.1 Checking and Adjusting Right/Left Ball Placement

Upon power-up of the Delta robot, the first balls that are thrown will be Basic Balls and should be delivered near the centerline of the table. **It is also important** especially for using Drills, that the robot throws forehand and backhand balls (when placement settings indicate) at a similar distance from the centerline. We will check this by configuring the robot to throw balls alternating between the left and right side of the table (backhand/forehand) and observing where the balls land in relation to the centerline. If balls are delivered at a similar distance from centerline (example: backhand is 10 inches right of centerline and backhand is 10 inches left of centerline), then no adjustment is necessary. If the distances vary by more than 2 inches, an

adjustment is recommended. Perform the following steps to check for proper adjustment. See Figures 4-1 and 4-2.

1. Turn the Delta robot OFF by unplugging the power supply from the power outlet, wait 10 seconds, turn the robot back ON by plugging the power supply back into the power outlet.
2. The Ball Select LED for Ball 1 will be flashing. Press the left PLACE button **twice** so that Ball 1 will be delivered to the left of the centerline. (Figure 4-1) The LED under the "3", two positions left of the "G" on the PLACE LED Display must be lit.
3. Press the Ball Select Button for Ball 2. The Ball Select LED for Ball 2 will start flashing. Press the right PLACE button **four times** so that Ball 2 will be delivered to the right of the centerline. (Figure 4-1) The LED under the "2", two positions right of the "G" on the PLACE LED Display must be lit.
4. Set the Ball/min rotary dial to 25. (Figure 4-1)
5. Press the Start – Stop button. Balls will now be delivered alternately between the left and right side of the table (backhand/forehand). (Figure 4-2)

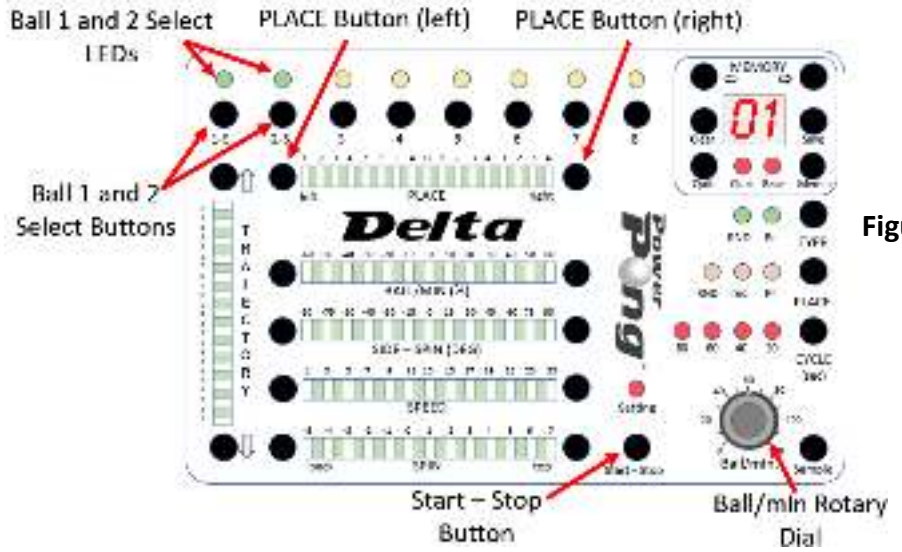


Figure 4-1

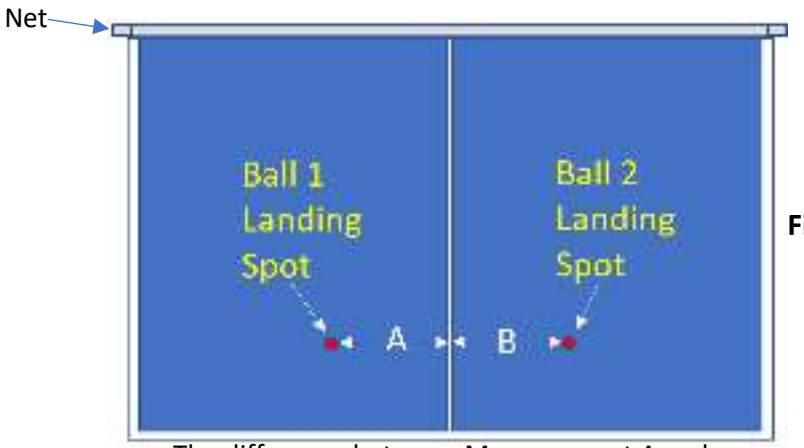


Figure 4-2

The difference between Measurement A and Measurement B must be 2 inches or less.

6. Measure the distances A and B as shown in Figure 4-2.

7. Stop the robot from throwing balls by pressing the Start – Stop button.
8. If the **difference** between A and B is **greater** than 2 inches, perform steps 9 and 10. If the difference between A and B is **less** than 2 inches, no adjustment is required.
9. At the robot base, loosen the Ball Height Adjustment Knob on the rear of the Ball Feed Tube Locking Assembly and carefully rotate the Throwing Head Assembly as needed.
10. Restart the ball delivery by pressing the Start - Stop button on the Control Panel and re-measure A and B (Figure 4-2). If the difference between A and B is still greater than 2 inches, repeat steps 5-9 until the difference between Measurement A and Measurement B is **less** than 2 inches.

4.2.2 Checking Ball Placement (Depth)

It is also important that the basic ball lands 14" to 16" from the end of the table. To check this, perform the following steps.

1. Turn Off the Delta robot, wait 10 seconds and turn the Delta robot back on.
2. Set the Balls/min to 25 with the rotary dial.
3. Press the Start – Stop button.
4. The balls should land anywhere from 14" to 16" from the end of the table. If this is not the case, adjustment and/or calibration is required. Proceed to Section 5 and perform the Calibration procedure.

4.3 Instant Play / Non-Memory Mode

Immediately upon power up of the Delta robot, a "1" will be displayed for the Memory Location. This is different than "01". The "1" means that the robot is in Non-Memory mode. You can use nearly all of the robot features; however, you won't be able to save to memory. This is typically used for Instant Play when you just want to start practicing without setting up or using a Drill.

Perform the following steps:

1. Set of the Ball/min rotary dial to a value greater than 0.

2. Press the Start - Stop button on the Control Panel or the Start button on the Remote-Control FOB. The robot will begin throwing balls to you based on the ball placement and settings for Ball 1. You may adjust the placement, as well as all other controls at this point to achieve the desired spin, speed, etc.

3. Press the Start - Stop button on the Control Panel to stop the robot.

4.3.1 Instant Play / Non-Memory Mode Practice Ideas with One Ball

Below are a few examples of exercises you can do just using Ball 1 setup.
Note: For left hand players Forehand/Backhand instructions will be reversed.

Forehand Practice - Set the Ball 1 Placement using the PLACE buttons to deliver balls to the right of Center. Press the Start - Stop button to begin. The robot will repeatedly throw forehand balls.

Backhand Practice - Set the Ball 1 Placement using the PLACE buttons to deliver balls to the left of Center. Press the Start - Stop button to begin. The robot will repeatedly throw backhand balls.

Alternating Forehand/Backhand Practice Emphasizing Footwork - Set the Ball 1 Placement using the PLACE buttons to deliver balls to the Center. Press the Start - Stop button to begin. Use footwork to alternatively position yourself for forehand, then backhand.

Keep in mind that during these Instant Play Mode practice exercises, you can always adjust the following controls from the Control Panel:

- Ball Speed
- Ball Trajectory (Note: You can also adjust the Ball Throwing Height, by adjusting the throwing head assembly (follow instructions in Section 2)
- Side Spin
- Top/Bottom Spin
- Balls / Minute
- Random TYPE and PLACE mode can also be utilized

You can also adjust the height of the Throwing Head assembly to one of four possible heights to vary the balls that are thrown to you!

4.4 Delta Robot Drills / Base Memory Mode

Drills are sequences of two to eight balls, thrown to different locations (if desired), with different spins and speed (as desired), that will be repeated, allowing you to create an endless number of training exercises. Once a Drill is designed and setup, it can be saved to a Memory Location of the Delta robot for future use. The robot must be in Base Memory Mode. If there is a "1" on the Memory Location LED press the Memory Increment button to activate Base Memory Mode. The display will indicate "01" (or any other numeric value other than "1").

4.4.1 Pre-Configured Drills (Table 4-1)

The Delta robot comes with 40 pre-configured Drills in Memory Locations 60 through 99, that can be easily accessed and used for training. The Drills are designed to be used with the throwing head at the 2nd ring/height however adjustments may be utilized. Following is a listing/description of the Drills. Note that the terms "forehand" and "backhand" refer to a right handed player.

Table 4-1

Memory Position	Drill Description
6o	Light Topspin to forehand
61	Light Topspin to backhand
62	Light topspin 1 to forehand and 1 to backhand
63	Light topspin 1 to forehand and 1 to middle
64	Light topspin 2 to backhand and 1 to forehand
65	Light topspin 2 to backhand and 2 to forehand to variation of placements
66	Light topspin to backhand, middle, backhand and forehand

67	Heavy topspin to backhand
68	Heavy topspin to backhand, middle, and forehand
69	Seven light topspin to variation placements
70	Light medium under spin to backhand
71	Light medium under spin to forehand
72	Light medium under spin to backhand, middle, and forehand
73	Eight light to medium under spin to variation of placements
74	Very heavy under spin to the middle of the table
75	Eight very heavy under spin to variation of placements
76	One light medium under spin to forehand and one very heavy underspin to forehand
77	No spin ball to forehand
78	Heavy right side spin to backhand w/light top spin
79	Heavy right side spin to forehand w/light top spin
80	Eight power shots to variation of placements
81	Lob to forehand
82	Lob to forehand and backhand
83	Lob with under spin to backhand
84	Under spin serve
85	Eight under spin lobs to variation of placements
86	Side spin serve to forehand
87	Side spin serve to backhand
88	No spin serve to backhand
89	No spin serve to backhand, light topspin to forehand and light topspin to middle
90	No spin serve to forehand, light topspin to backhand, light topspin to forehand and lob to middle
91	Under spin to forehand, and light topspin to forehand
92	Heavy underspin serve to backhand, light topspin to forehand, middle, and backhand
93	No spin serve close to middle, 2 light topspin to forehand, and lob to middle
94	Side spin serve, 2 side spin shot to backhand, 1 to wider backhand, and 1 to forehand
95	Light topspin to mid forehand, power shot to mid forehand
96	Light topspin to mid backhand, power shot to mid backhand
97	Under spin serve to mid forehand, long under spin forehand, topspin to mid forehand, lob to forehand, power shot to forehand
98	Under spin serve to backhand, lob to middle, power shot to forehand, and lob to backhand
99	Under spin serve to mid forehand, lob to middle, power shot to backhand, and lob to mid forehand

4.4.2 Selecting / Starting a Drill (Figure 4-3)

1. Turn on the Delta robot.

2. Press the Mem t. button to enter Base Memory mode.
3. Select the desired Drill number with the Memory Location Increment/Decrement buttons. The Drill automatically becomes active. The number of balls in the Drill will be indicated by the number of LEDs illuminated above the Ball Placement Select Buttons.
4. Set the Ball/min rotary dial to a value greater than 0.
5. Press the Start - Stop button to start the selected Drill. The robot will start throwing/cycling through the balls that are in the Drill until you press the Start - Stop button again to stop.

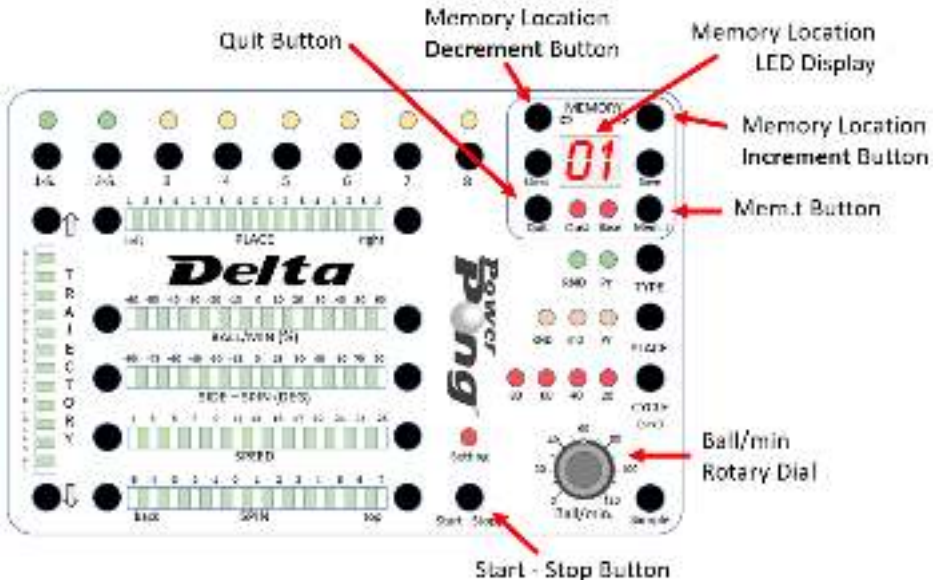


Figure 4-3

NOTE: If the balls are either landing short (into the net) or long (over the edge of the table) perform the calibration in Section 5-5. KEEP IN MIND, WHEN YOU'RE ADJUSTING OR SETTING UP YOUR DRILLS, YOU MUST WORK WITH SPIN, SPEED AND TRAJECTORY TO GET THE DESIRED RESULTS.

4.4.3 Creating a New Drill

Before programming the Delta robot with a new Drill, you may find it useful to design your Drill ahead of time, on paper or in your head. Think about the number of balls that you want in your Drill as well as the ball attributes including ball placement, ball speed, ball height, spin, etc., for each ball. When you are ready to enter the Drill, perform the following steps.

1. Turn the Delta robot On
2. Enter Base Memory mode by pressing the Mem t. button. The Base LED will illuminate.
3. Using the Memory Increment/Decrement buttons, choose a Drill location. Available locations will be flashing ON/OFF. Locations that already have a Drill will not be flashing.
4. Make Ball 1 the Active Ball (if it's not already) by pressing the Ball 1 Select button. The active ball will be indicated by the flashing LED above Ball Select Button.
5. Set the specific ball attributes (Spin, Speed, Trajectory, and placement) for Ball 1.
6. Press and hold the Sample button to test your Ball 1 setup. Make any adjustments to Ball 1 as needed.

7. Press the Ball 2 Select button which will add Ball 2 to your Drill. It will also copy the Ball 1 settings to Ball 2 (except for placement).

   Note: When adding new balls to a Drill, it is best to have the PLACE button is set to PR (not rnd or RND) to prevent random place settings from being indicated on the PLACE LED Display.

8. Set the specific ball attributes that you want for Ball 2 (Spin, Speed, Trajectory, and placement).
9. Press and hold the Sample button to test your Ball 2 setup.

Continue this process until you have the desired number of balls in your Drill. When you have finished setting up your Drill, you can press the Start - Stop button to start the Drill. The Delta robot will cycle through all the balls in your Drill, and then repeat until the Start - Stop button is pressed again.

4.4.4 Saving a Drill

1. To save a Drill, the Delta robot must be in Base Memory mode. Press the Mem.t button until the Base LED is illuminated.
2. Select the Memory Location where you want to save the Drill using the Memory Location Increment/Decrement buttons. Remember that locations 60 through 99 are preconfigured with Drills during the manufacturing/setup process.
3. Press and hold the Save button until the LED display becomes blank. This indicates that the Drill is saved in the Delta robot's memory.

Note: If you save a new Drill in positions 60 through 99 (which holds one of the pre-configured Drills), or any location that you have previously stored a Drill to, you will **overwrite** (and lose) the Drill in that location!

4.4.5 Modifying an Existing Drill

1. Press the Start - Stop button to stop the robot from throwing balls.
2. Press the Mem.t button to enter Base Memory Mode.
3. Choose the Drill that you would like to modify using the Memory Location Increment/Decrement buttons.
4. Use the Ball Select buttons to select the ball(s) in the Drill that you would like to change. The Ball Select LED will flash ON/OFF for the selected ball.
5. Make your desired change using appropriate control(s) (Spin, Speed, Trajectory, etc.)
6. Save the Drill with your changes by pressing the Save button until the Memory Location becomes blank. This indicates that the Drill has been saved successfully.

4.4.6 Clearing A Drill

If you want to remove a Drill from the Delta robot (clear), perform the following steps:

1. Enter Base Memory Mode by pressing the Mem.t button. The Base LED will illuminate.
2. Using the Increment/Decrement buttons, select the Memory Location for the Drill that you want to remove/clear.

3. Press and hold the Clear button until the Memory Display LED is flashing.

4.5 Delta Robot Clusters

The Power Pong Delta provides an advanced feature called Clusters. A Cluster is a grouping of several Drills saved in the Delta robot memory, as one continuous playable exercise. The Delta robot will save up to 10 Clusters with up to 32 Drills per Cluster. This is an extremely powerful feature and one that clearly sets the Power Pong Delta apart from its competition. Once you start playing a Cluster, it will repeat until the robot is stopped. Random features (previously described) as well as the Cycle feature can also be applied and used with Clusters.

When a Cluster is played, one repetition of each Drill in the Cluster is played, and this process repeats in a loop. For example, if Drills 1, 2, and 3 are saved into a Cluster, one repetition of Drill 1 is played, followed by one repetition of Drill 2, and finally one repetition of Drill 3. The repetition continues looping until the robot is stopped.

Note: Any changes that are made to any Drills that are part of a Cluster, will automatically be part of the cluster and observed when the Cluster is played.

Note: You may find it useful to document which Drills you place into any given Cluster along with the position in the Cluster for future reference.

4.5.1 Adding Drills to a Cluster

Following is a summary (Figure 4-4) of the steps required to add a Drill into a Cluster. After this summary, you will find an example to help you better understand this process.

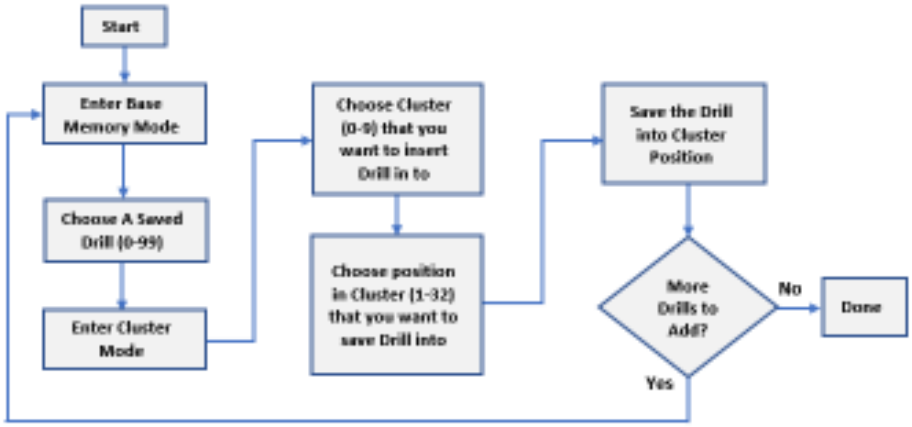


Figure 4-4

Example – Adding Two Drills to a Cluster

In this example, we will add the Drills stored in Memory positions 75 and 89 into positions 20 and 21 of Cluster 3. You may wish to perform the steps on the Delta robot to familiarize yourself with the procedure.

1. Turn on the Delta robot.
2. Activate Base Memory Mode by pushing the Mem.t button once. The Base LED should now illuminate, and the Memory Display will show 01 indicating Memory Position/Drill. The display may be flashing which simply means that there is no Drill stored at that location.

3. Press and hold the Memory position Decrement button to choose Drill 75. The Memory display should now indicate 75.
4. Press the Mem.t button to activate Cluster mode. The “Clust” LED should now illuminate, and the Memory Display will show C0. This is the first Cluster position. If C0 is flashing ON/OFF, this means that there is nothing stored in this Cluster location.
5. Use the Memory Location Increment button to choose Cluster 3. The Memory display should now indicate C3 and again, it will be flashing if there is nothing stored there.
6. Press the Mem.t button again to select that Cluster location. The Clust and Base LEDs will both be illuminated, and the Memory Display will show the active Memory Location in Cluster 3, such as 00.
7. Use the Memory Location Increment / Decrement buttons to choose Location 20. The Memory display should now indicate 2.0. It will be flashing if the location is empty. Note that when you are observing a memory location in a Cluster, the value (in this case 20, will be displayed with a “.” after each digit. This is done to clearly indicate that you are working in a Cluster rather than the Base Memory locations, holding Drills.
8. Press the Save button for two seconds. The Memory Display will continue to indicate 2.0. however, it will NOT be flashing ON/OFF, indicating that there is now a Drill in that location. In addition, the appropriate Ball Select LEDs will be illuminated, just as if we were to play Drill 75.

Now, we will leave Cluster mode and get back to Base Memory mode to identify our next Drill (89) to add to the Cluster 3, position 21.

9. Press the mem.t button once to get back to Base Memory Mode. The Base LED should now be illuminated and the Clust LED should be OFF.
10. Use the Memory Position Increment / Decrement buttons to select Drill 89. The Memory display should now indicate 89.
11. Press the mem.t button to get into cluster mode. The Clust LED will illuminate, and the Memory Display will indicate the most recently visited Cluster location of C3.
12. Press the mem.t button to select this Cluster location. Both the Cluster and Base LEDs will be illuminated at this time. The Memory Display will indicate 2.0. (the most recently used position in the Cluster).
13. Use the Memory Location Increment button to choose position 21. The Memory Display will indicate 2.1.
14. Press the Save button for 2 seconds to store Drill 89 into position 21 of Cluster 3.

You now have successfully saved Drill 75 in position 20 of Cluster 3 and Drill 89 in position 21 of Cluster 3.

4.5.2 Removing a Drill from a Cluster

1. Turn on the Delta robot.

2. Activate Base Memory Mode by pressing the Mem.t button once. The Base LED should now illuminate, and the Memory Display will show 01 indicating Memory position/Drill.
3. Press the Mem.t button to activate Cluster mode. The “Clust” LED should now illuminate, and the Memory Display will show C0.
4. Use the Memory Location Increment button to choose the Cluster that contains the Drill that you wish to delete.
5. Press the Mem.t button to activate/select the Cluster.
6. Use the Memory Position Increment/Decrement buttons to choose the Drill that you wish to delete.
7. Press the Clear button for two seconds, until the Memory Display starts to flash ON/OFF.

4.5.3 Removing a Cluster

1. Turn on the Delta robot.
2. Activate Base Memory Mode by pressing the Mem.t button once. The Base LED should now illuminate, and the Memory Display will show 01 indicating Memory position/Drill.
3. Press the Mem.t button to activate Cluster mode. The “Clust” LED should now illuminate, and the Memory Display will show C0.
4. Use the Memory position Increment button to choose the Cluster that you wish to delete.
5. Press the Clear button for two seconds, until the Memory Display starts to flash ON/OFF.

4.5.4 Playing a Cluster

1. Turn on the Delta robot.
2. Activate Base Memory Mode by pressing the Mem.t button once. The Base LED should now illuminate, and the Memory Display will show 01 indicating Memory position/Drill in Base memory.
3. Press the Mem.t button to activate Cluster mode. The “Clust” LED should now illuminate, and the Memory Display will show C0.
4. Use the Memory position Increment button to choose the Cluster that you wish to play.
5. Adjust the Ball/min. setting and press the Start - Stop button to begin play. The robot plays from the beginning the Drill or Drills found in the Cluster (in ascending order). The robot will skip any positions in the Cluster that are empty, in the event that Cluster positions were not filled sequentially.

Note: To save time, if you have chosen a Drill that you wish to add to a Cluster, you can simply press the Mem.t button once to active Cluster mode, choose the desired Cluster, and press the Save button. The Drill will automatically be saved in the first open position in the Cluster.

4.5.5 Using Random Features with Clusters

If you turn on the Type RND function while using Clusters, the robot will throw the first ball in a Drill that is part of a Cluster (**which you may configure as a Serve**), and the remainder of the balls will be delivered randomly.

Note: As covered in Section 3, designating a ball as a Serve ball, will cause a 1-2 second delay before the ball is thrown, very similar to match play. This function will be utilized in Clusters in the same way.

The rnd and RND Place functionality is also available in Clusters just as in Drills.

4.5.6 Editing Drills While Playing a Cluster

While playing a Cluster, if you wish to modify one of the balls in a Drill, you can do the following:

1. Stop the play using the Start - Stop button on the Control Panel.
2. Press the Mem.t button once – which will put the Delta back into Base Memory mode.
3. Edit the ball(s) as needed.
4. Press the Save button for 2 seconds.
5. Press the Mem.t button once to return to Cluster mode.
6. Start play by pressing the Start - Stop button.

4.6 Using the Remote-Control FOB

The Delta robot comes with a small wireless Remote-Control FOB (Photo 4-1) which has a range of 4-5 meters (13-16 feet) giving you the ability to start and stop the robot throwing balls without having to press the Start - Stop button on the Control Panel.

The (+) and (–) keys can be used to increase/decrease the Ball/min setting.

You may wish to keep the remote in your pocket to ease the start/stop of balls during Drills.

Photo 4-1



4.7 Preparing for Transport and/or Storage

1. Turn off the Delta robot by unplugging the power adapter from the wall power source.
2. Disconnect/unplug the power connector and control panel connector from the side of the Delta Robot Base Assembly. See Photo 4-2.



Photo 4-2



Photo 4-3

3. Disconnect the control panel cable from the control panel. See Photo 4-3.
4. Disconnect the side nets from the table center net supports.
5. Lift the Delta robot from its mounted position on the table, set it on top of the table, and rotate 180 degrees to give you access to the front of the robot.
6. Loosen the throwing height adjustment knob and slowly rotate the throwing head 180 degrees (towards rear of robot) allowing it to drop down so that none of the painted rings are visible.
7. Slightly tighten the throwing height adjustment knob to hold the throwing head in place.
8. Remove all balls from the collection net / ball feed area.
9. Gently raise the two corners of the collection net, to about **halfway** position as shown in Photo 4-4.



Photo 4-4



Photo 4-5



Photo 4-6

10. Unscrew the two thumbscrews on the cable that connects the throwing head to the Robot Base Assembly and unplug the cable. See Photo 4-5.
11. Swivel the base support legs back over the robot base. See Photo 4-6.
12. Fold/tuck as much of the netting, including the side nets, into the center of the partially folded up robot.

13. Gently fold first one side of the net completely down, followed by the other side. Use caution not to force the net, and carefully guide the net supports into position by hand.
14. Place the robot, along with all other pieces into a protective storage/transport box.
15. When transporting, exercise caution to prevent any damage to the robot.

Section 5: Maintenance and Repair

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Caution: Before performing any maintenance or repairs, unplug your robot from the wall power source.
Caution: If you observe any exposed wires on the Power Adapter cord/cabling, disconnect from power immediately and replace. Failure to do so could result in serious harm.

5.1 General Cleaning of the Delta Robot

For best performance from the Delta robot and for best longevity, the robot must be kept clean. The surface of the Delta Robot may be cleaned with a moist cloth and a mild, water-based cleanser as necessary. Do not expose the Delta robot to excessive amounts of liquid. Do not submerse any part of the robot in liquid.

Note: The Ball Throw wheels have a special coating that prolongs their lifetime. Do not attempt to clean the wheels with any chemical, as chemicals can harm the coating/wheel.

5.2 Deflector Assembly / Deflector Strip Cleaning and Replacement

When the Delta robot throws balls, the balls contact the Deflector Assembly left/right surfaces and the Deflector Strip (Photo 5-1). Over time, dust/debris will build up in these areas and if not cleaned, will reduce accuracy and consistency of the thrown balls. During extended use of the Delta robot, the factory installed white Deflector Strip can develop an indentation or even a hole where the balls repeatedly strike it. At that point the Deflector Strip must be serviced. Perform the following procedures to both clean and service/replace the Deflector Strip.

Photo 5-1



5.2.1 Deflector Assembly/Deflector Strip Cleaning

Caution: When cleaning and/or servicing the Deflector Assembly or Deflector Strip, to prevent damaging the Throwing Head assembly, it is critical that the Deflector Assembly is not manually pushed/forced upwards. Always use the robot functionality to move the deflector assembly upwards with the Control Panel Trajectory UP buttons as follows.

1. Turn the Delta robot ON.

2. Press/hold the Trajectory UP button on the Control Panel, to move the Deflector Assembly to the maximum UP position.
3. Turn the Delta robot OFF.
4. Disconnect the Throwing Head cable that plugs into the Robot Base Assembly.
5. Remove the Throwing Head assembly and lay flat on a work surface.
6. While holding the deflector assembly firmly to minimize movement, clean the Deflector Strip and the Deflector Assembly Left/Right surfaces with a soft cloth. If any dust/debris has hardened, it may be necessary to use isopropyl alcohol to clean along with a plastic scraper.

5.2.2 Deflector Strip Service/Replacement

When the factory installed Deflector Strip becomes worn to the point where there is an indentation or a hole, you can cover the worn Deflector Strip with one of the replacement Deflector Strips that shipped with your robot. There are two types of Deflector Strips provided as spares. The first is a thin, non-sponge-backed strip - which we will use in this procedure. The second, is a thicker, sponge-backed strip identical to what's installed from the factory.
The factory installed sponge-backed Deflector Strip can be covered ONE TIME with the thin non-sponge-backed replacement Deflector Strip. This is a very easy/quick procedure and will provide you with many additional hours of robot usage.

Applying the Thin Deflector Strip

To apply the thin replacement Deflector Strip (Photo 5-2) over the sponge-backed Deflector Strip, perform the following:

1. Turn the Delta robot ON.
2. Press/hold the Trajectory UP button on the Control Panel, to move the Deflector Assembly to the maximum UP position.
3. Turn the Delta robot OFF.
4. Disconnect the Throwing Head cable that plugs into the Robot Base Assembly.
5. Remove the Throwing Head Assembly and lay flat on a work surface.
6. While holding the Deflector Assembly firmly to minimize any movement, clean any dust/debris from the installed Deflector Strip
7. Peel the orange-colored paper backing off the thin replacement Deflector Strip (Photo 5-3).
8. Apply the adhesive side of the thin Deflector Strip directly over the factory installed Deflector Strip (Photo 5-4).



Photo 5-2



Photo 5-3

Photo 5-4



Replacing the Sponge-Backed Deflector Strip

When the thin Deflector Strip that was applied over the sponge-backed/factory installed Deflector Strip becomes worn (indentation or hole), you must remove BOTH strips and apply the replacement sponge-backed Deflector Strip. Perform the following:

1. Turn the Delta robot ON.
2. Press/hold the Trajectory UP button on the Control Panel, to move the Deflector Assembly to the maximum UP position.
3. Turn the Delta robot OFF.
4. Disconnect the Throwing Head cable that plugs into the Robot Base Assembly.
5. Remove the Throwing Head assembly and lay flat on a work surface.
6. While holding the deflector assembly firmly to minimize any movement, remove both Deflector Strips from the Deflector Assembly. The original strip will have to be lifted off the Deflector Assembly carefully. If necessary, use a plastic scraper tool to avoid scratching the metal.
7. Peel the orange-colored paper backing off the sponge-backed replacement Deflector Strip.
8. Press firmly/apply as shown in Photo 5-5, as close as possible to where the old strip was removed.

Photo 5-5



5.3 Throwing Wheel Maintenance

The Delta robot throwing wheels are very durable and typically last for 500-1000 hours. During normal use these wheels will wear. As the wheels wear, the space between the 3 wheels increases, preventing the wheels from properly gripping the ball as it is thrown. An indication that the throwing wheel clearance has increased is when the robot throws balls inconsistently, particularly when throwing at high speed. Use the following procedures to first check the clearance, and then, if necessary, adjust wheel clearance.

When the wheels have worn to the point where they can't be adjusted properly any longer, the wheels must be replaced. All three wheels must be replaced at the same time. Note that the procedure is slightly different for the lower wheel compared to the upper wheels. Perform the procedures as follows.

5.3.1 Checking Throwing Wheel Clearance

1. Using a Power Pong supplied table tennis ball, insert into the space between the 3 wheels (Photo 5-6) and move it in and out. The ball should move in and out of this area with slight contact of the 3 throwing wheels. If there is NO contact with the wheels and/or the ball simply falls into the Ball Feed Tube, wheel clearance adjustment is required.

Note: New robots will have a tight fit. No adjustment is required in that case.

Photo 5-6



5.3.2 Adjusting Throwing Wheel Clearance

Perform the following procedure for wheel adjustment.

1. Use the supplied 4 mm hex wrench, slightly loosen the adjustment screw for each of the 3 motors so that the motors can be moved by hand, but not loose enough so they move without your assistance. See Photos 5-7 through 5-9.



Photo 5-7



Photo 5-8



Photo 5-9

2. Using a table tennis ball, adjust/slide the 3 motors consistently to decrease the gap between the wheels. The ball should pass through the opening while touching the surface of the 3 wheels and requiring a small amount of pressure to pass through the wheels and drop down into the Ball Feed Tube.

3. Tighten the 4 mm adjustment screw for all 3 motors. Retest and re-adjust if necessary.

5.3.3 Lower Wheel Removal / Replacement

1. Using the 2 mm hex wrench, loosen but do not remove, the small setscrew that holds the wheel onto the shaft of the motor (Photo 5-10).

Photo 5-10



2. Note how far the wheel was slid onto the motor shaft, and then slide the wheel off the motor shaft.
3. Slide the new replacement wheel onto the motor shaft positioned similarly to the wheel that was previously removed and slightly tighten the setscrew.

4. Manually spin the wheel and ensure that it's not rubbing on any surface. If it is rubbing, loosen the setscrew and slightly move the wheel's position on the shaft. Slightly tighten the setscrew and test again to be sure that the wheel no longer rubs on any surface.
5. When the wheel spins without any rubbing, tighten the screw securely.

5.3.4 Upper Wheels Removal / Replacement

The upper wheels are removed and replaced in a slightly different fashion, due to the proximity of the Head Panel and the Oscillation & Trajectory Motor Cover. Follow the procedure below for both upper wheels, however, do one wheel at a time.

1. Remove the throwing head assembly and carefully lay on a work surface.
2. Remove the two Phillips screws that hold the **upper left** motor cover in place and remove motor cover. (Photo 5-11)

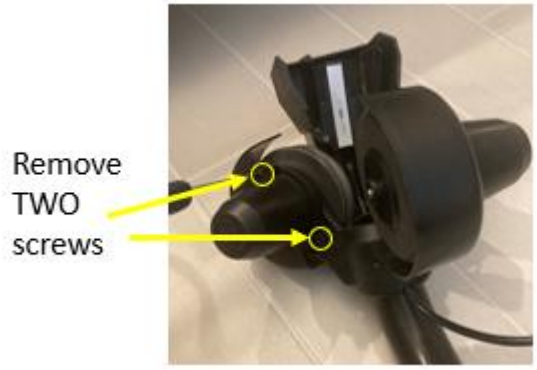


Photo 5-11

3. Remove the Phillips screw and the hex bolt to remove the motor from its mounting location. (Photos 5-12 and 5-13). Note the position of the rubber band securing the motor signal wires. Be careful not to stretch/stress the cable between the motor and the throwing head.

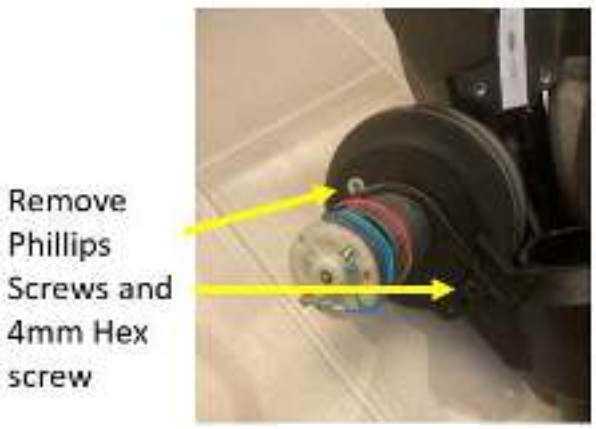


Photo 5-12



Photo 5-13

4. Using the 2 mm hex wrench, loosen but do not remove, the small setscrew that holds the wheel onto the shaft of the motor (Photo 5-10)
5. Note how far the wheel was slid onto the motor shaft, and then slide the wheel off the motor shaft.

6. Slide the new replacement wheel onto the motor shaft positioned similarly to the wheel that was previously removed and slightly tighten the setscrew.
7. Manually spin the wheel and ensure that it's not rubbing on any surface. If it is rubbing, loosen the setscrew and slightly move the wheel's position on the shaft. Slightly tighten the setscrew and test again to be sure that the wheel no longer rubs on any surface.
8. Remount the wheel assembly onto the throwing head assembly.
9. Replace the motor cover on the motor assembly.

5.4 Robot Base Assembly / Lower Ball Feed Path Cleaning

If dirt, debris, hair, etc. has dropped down into the Lower Ball Feed Path, it will have to be opened and cleaned. Perform the following steps.

1. Remove the robot main circuit board. Refer to section 5.7 for this procedure.
2. Set the robot up on the base.
3. Remove the Throwing Head Assembly from the Robot Base Assembly and set securely on the work surface.
4. Separate the Velcro net from the Robo t Base Assembly and secure the Velcro out of the way so that you have access to the top of the robot base. (See Photos 5-14 and 5-15)



Photo 5-14



Photo 5-15

5. Remove **16** screws from the top of the robot base as shown in Photos 5-16 through 5-18.

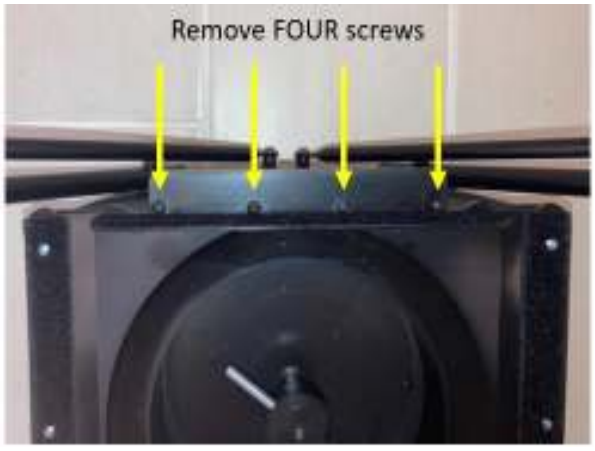
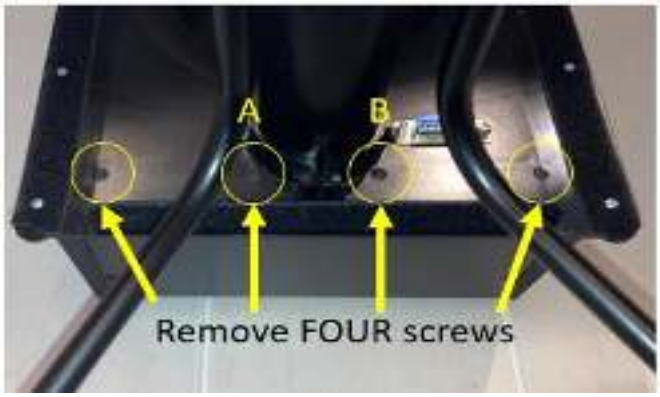


Photo 5-16



Photo 5-17



Note: For the two inner screws (A and B), use a short screwdriver to avoid stripping the screw heads.

Photo 5-18

6. After removing all 16 screws, gently lift to separate the upper portion of the robot base with the throw arm mounting assembly from the lower robot base. (Photos 5-19 and 5-20)



Photo 5-19



Photo 5-20

7. Remove any balls in the lower portion of the robot base.
8. Inspect/clean the lower portion of the robot base of any debris, dust, foreign objects, etc. as needed.
9. Examine the feed motor assembly and the gear assembly. Clear/remove any debris, dust, dirt, foreign objects, etc. (See photo 5-20)
10. When all assemblies are cleaned appropriately, re-assemble in reverse order.

Caution: Do NOT use a powered screwdriver as you re-insert the screws. The screws are inserted into plastic. To avoid stripping the plastic, only use hand screwdrivers.

5.5 Calibration

5.5.1 Checking Calibration

The robot comes pre-calibrated from the factory. To test calibration, perform the following:

1. Be sure that the robot legs are adjusted properly for the height of the table. (See Section 2 for details)

2. Turn off the Delta robot (unplug power cord), wait 10 seconds, and turn the robot back on.
3. Set the throwing head to the 2nd ring position.
4. Set the Ball/min rotary dial to 25.
5. Press the Start - Stop button or the Start button on the Remote-Control FOB. Balls should be thrown near the center of the table, and land 14-16 inches from the end of the table. If the measured distance is less than 14" or greater than 16", a calibration (Section 5.5.2) is recommended.

5.5.2 Performing Calibration

The goal of calibration is to set the proper placement for basic balls thrown, **14-16 inches** from the end of the table. In addition, calibration can be used to ensure that there is no spin on the basic ball thrown by the Delta robot.

IMPORTANT: Calibration is dependent upon the head working correctly, especially the wheels spinning. Always check for proper head function by powering off and on the robot, and carefully observing the head during the initialization. The Deflector Plate should move left, then right, and then down, followed by all wheels spinning forward for about 2 seconds. If the Deflector Plate does not move accordingly, or all wheels don't spin, then it is unlikely that calibration can resolve any issues. Further troubleshooting will be required to identify the cause of the issue. (See Section 6: Troubleshooting)
It is also important that the robot base is mounted properly on the table, not leaning forward or backward. This is covered in Section 2 of the manual.

1. Ensure that the throwing head height is set to the 2nd ring height.
2. Turn the Delta robot OFF.
3. After 10 seconds of being OFF, turn the Delta robot ON.
4. Activate Calibration by holding down both Trajectory Buttons at the same time. The robot will automatically start to throw Balls. The Delta LED display will show CA.
5. Verify that the balls are landing **14-16 inches** from the end of the table.
6. If the balls are not thrown far enough, increase the speed by pressing the right Speed button and/or increase the trajectory by pressing the top Trajectory button. If the balls are thrown too far, decrease speed by pressing the left Speed Button and/or decrease the trajectory using the bottom Trajectory button.
7. Press the Start - Stop button to save and exit calibration mode.

Note: This calibration may also be used to ensure that no spin is on the basic ball.

Perform the following steps to check for no spin.

1. Ensure that the throwing head height is set to the 2nd ring height.
2. Turn the Delta robot OFF.
3. After 10 seconds of being OFF, turn the Delta robot ON.
4. Activate Calibration by holding down both Trajectory Buttons at the same time. The robot will automatically start to throw Balls. The Delta LED display will show CA.

5. Verify that the balls thrown do NOT have any left/right spin, and as a result, curve to the right or left. If they are straight balls, no further adjustment is necessary. If they have some spin, perform the following.
6. Adjust the Left/Right spin buttons as needed until you have a no-spin ball.
7. Press the Start – Stop button to save and exit calibration.

5.6 Replacing the Battery in Your Remote-Control FOB

The Remote-Control FOB is powered by two 3V CR2016 button cell batteries. If the Remote-Control FOB stops working, it's likely that the batteries will need to be replaced. Perform the following steps:

1. Open the remote by inserting a coin or flat blade screwdriver in the slot located on the wide end of the Remote and twisting to open. Separate the halves of the remote. See Photo 5-21 and 5-22.

Photo 5-21





Photo 5-22

2. Remove the circuit board containing the batteries from the rubber button pad.
3. Carefully slide the battery holder with the batteries away from the circuit board.
4. Remove the two old batteries from the battery holder and discard the batteries. KEEP THE BLACK BATTERY HOLDER. See Photo 5-23.



Photo 5-23

5. Insert two new batteries with the positive side (+) of both batteries facing up into the battery holder as shown in Photo 5-24.
6. Reinsert the battery holder into the circuit board. Orient as shown in Photo 5-25.
7. Reinsert the circuit board into the rubber button pad. (Photo 5-26)
8. Reinsert the rubber button pad with circuit board and batteries into the top housing of the remote control with the battery side up. (Photo 5-27)



Photo 5-24

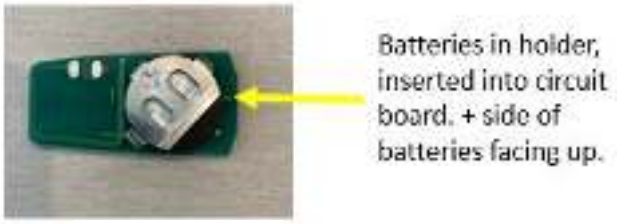


Photo 5-25



Photo 5-26



Photo 5-27

9. Position U-shaped handle as shown in Photo 5-27.
10. Place the other half of the plastic fob housing on top and press the top and bottom housings together, starting at the narrow end and working your way to the wide end until the housings snap in place.

5.7 Replacing the Main Circuit Board

If the robot does not function and all other possible causes (See Troubleshooting) have been eliminated, the main circuit board in the robot may have to be replaced. Perform the following steps.

1. Access the front panel of the robot. You can identify the front panel by the 4 Phillips screws and the orientation to the robot legs and Ball Feed Tube.
2. Remove the four Phillips screws (Photo 5-28).
3. The circuit board is held in place with one Phillips screw. Remove that screw (Photo 5-29).



Photo 5-28

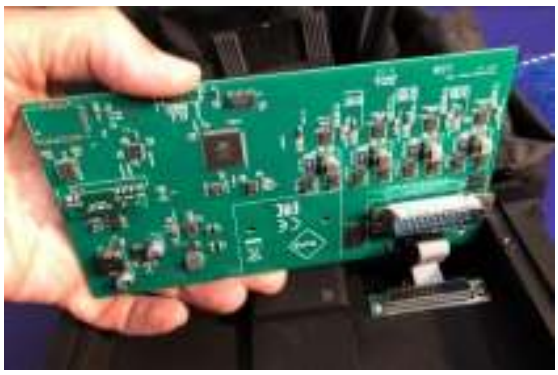


Photo 5-29

Caution: To avoid static electricity damage to the circuit board, avoid touching any components or circuit runs on the circuit board. Only touch the outside edge of the circuit board.

4. Gently raise the circuit board from its mounting. This step will disconnect the 25 pin D-Connector shown in Photo 5-30. Grasp the circuit board by the edges only to avoid static damage to components as shown in Photo 5-30.

Photo 5-30



5. Unplug the flat ribbon cable from the circuit board as shown in Photo 5-31 and 5-32.



Photo 5-31



Photo 5-32

6. Install the replacement circuit board by first reconnecting the flat cable to the connector on the circuit board. See Photo 5-24.
7. Set the circuit board into place by lining up the 25 pin D-Connector and gently pressing into position.
8. Install the screw (removed previously) that holds the circuit board in place. (See Photo 5-22)
9. Reinstall the panel (removed previously) and secure with 4 previously removed screws (Photo 5-21).

5.8 Pairing a New Remote-Control FOB

If you must replace your Remote-Control FOB, it will have to be paired with the Delta robot before it will function. To pair the new Remote-Control FOB with the Delta robot, perform the following procedure.

1. Press and hold BOTH the RND button on the Delta Control Panel, and the Start button on the Remote-Control FOB, and hold for 5 seconds.

5.9 Restoring Factory Supplied Drills

If you wish to restore the factory supplied Drills, perform the following procedure. **Any user-defined Drills that you have saved in positions 60-99 WILL BE OVERWRITTEN.**
Drills saved in positions 1-59 will NOT be affected by this procedure.

1. Unplug the power adapter from the AC power source to turn off the robot.
2. While pressing and holding the **Clear** button on the Delta Control Panel, plug the power adapter into the AC power source.
3. After 5 seconds, release the **Clear** button. The factory supplied Drills are now restored.

5.10 Typical Replacement Parts

Visit www.powerpong.org for an online listing of parts that can be ordered. Contact Power Pong support to order and/or for any parts that are not listed. Below are common replacement parts.

1. Power Adapter
2. Throwing Disks/Wheels
3. White Deflector strips (both Sponge-backed and non-Sponge-backed)
4. Black replacement rubber bands for attaching collection net sides to table net supports.
5. Throwing Height Adjustment Knob

Section 6: Troubleshooting

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6.1 Ball Jams

Ball jams are infrequent, and your robot can detect and react to problems in the ball channel. When the system detects a jam, it will attempt to automatically clear it by turning the Ball Feed Motor forward and backward.
Ball jams can be caused by several issues shown in the following list. Verify that none of the issues listed below exist with your Delta robot.

- dirt/debris/foreign objects in the ball feed path including on white deflector strip
- dirty/unwashed and/or multiple ball sizes being used simultaneously
- damaged ball or balls
- throwing wheels out of adjustment
- incorrect throwing head height (pay attention to rings)
- damaged Ball Feed Tube (if yes, contact Power Pong support)

If you do experience a ball jam, perform the following steps to clear it.

1. Unplug the Delta robot from the power source.
2. Check that a ball is not stuck among the 3 wheels (This can happen after adjusting the head height down). If so, simply remove those balls by hand and resume normal operations.
3. Remove all balls from the Delta robot.
4. Loosen the Throwing Height Adjustment Knob that secures the Ball Feed Tube and carefully remove the throwing head assembly from the robot, keeping it connected. Lay on work surface.
5. Lay the robot base on its side and push a pencil up into the access hole to free any stuck balls. Balls should move freely.
6. Plug the Delta robot back into the power source which will restart robot.
7. Remove all the balls from the collection area so that you can see the springs moving.
8. Verify that the spring moves in one direction only. (Without any balls in the machine, the ball stirring mechanism should rotate approximately 11-12 times before it stops)
9. If spring are moving in both directions, additional troubleshooting is required. (See Troubleshooting)
10. Using a pencil, then check that a ball moves through the tube without obstruction. If springs move in both directions, call support.
11. If the spring moves in one direction only, the ball jam has been cleared. You can reassemble and resume normal operation.
12. If it still moves in both directions, contact support for additional help.
13. Push one ball through the wheels and ensure that ball goes all the way through.

6.2 General Troubleshooting

PROBLEMS	POSSIBLE SOLUTIONS
Ball Throwing Head or Support Legs point towards back of robot.	Loosen the Throwing Height Adjustment Knob on the rear of the Ball Feed Tube Locking Assembly, then rotate head 180° so head points away from net. Grasp Support Legs and rotate them away from net (See Section 2).
Control Panel LEDs light up, but no balls are thrown.	Be sure that the Ball/Min knob is set to a level greater than zero. Press the Start - Stop button or Start/Stop on Remote-Control FOB to start ball delivery.
Balls thrown to wrong location.	Are there rubber bands around the Deflector? If yes, remove the bands so Deflector Plate can move freely. Those parts are used only during transport. Verify deflector plates are clean and there is no build-up (side or top). (Section 5) Disconnect AC power source. Disconnect/reconnect both ends of the Control Panel cable. Disconnect/reconnect the Throwing head cable. Check to be sure that no pins are bent/damaged. 15 pins must be present. Check to make sure that all connecting cables are plugged in all the way. Reconnect AC power.
Balls thrown at irregular depths.	Check wheel clearance. (Section 5) Clean White Strip on Deflector Plate with isopropyl alcohol. Replace if worn. (Section 5)
Double throws or missed throws.	Head height improperly adjusted. Must be locked in place with ring just above lock point. (Section 2)
Random function (RND) on the control panel cannot be activated. LED won't turn on.	To use the Random function in a Drill, there must be at least two Balls defined in the Drill. If only one Ball LED is lit, add a second Ball.
Balls get stuck between the ball throw discs. Yellow lights may be flashing on the control panel.	Turn off power and remove the ball(s). If balls continuously become stuck, there may be a bad Ball Throw Motor.
Balls are thrown with slight left/right spin, with controller set to no spin.	Perform Calibration procedure in Section 5.

Note: If you are not able to solve a problem with the help of this Troubleshooting guide, please contact Power Pong support for additional assistance. Refer to Section 1-5.

Technical Data

Electrical Specifications: 100-230V, 50-60Hz AC, approximately 60W Can be operated in a temperature range of 0–40°C (32–104°F).
Weight: 6 kg with net (13.2 lbs.), Overall dimensions (folded, with net): Height 0.75m, Width 0.28m, Depth 0.25m (2.5 x 0.9 x 0.8 feet).
An examination was done for the Power Supply:
Conformity with Low Voltage Directive 73/23/EEC, as last amended by EEC Directive 93/68/EEC—Registration #: AN 50091861 0001, Report #: 17004848 001. Also Test Reports # NTEK2010NT1115351E and NTEK-2010NT1115353SS.
The Power Pong DELTA table tennis robot is permitted to bear the CE trademark.
Manufacturer: LCS.kft

Warranty Information

FULL 3 YEAR MANUFACTURER'S WARRANTY

Manufacturer warrants to the original retail purchaser this product to be free from defects in material and workmanship for a period of 2 years from date of purchase.
Should the Power Pong Delta robot become defective due to material or workmanship during the warranty period, contact Power Pong support. You will be provided with return authorization and shipping instructions, or you will be sent a replacement part and instructions for replacement. If you must return the product, please pack it securely.
This warranty is not transferable and does not cover normal wear and tear, or damage caused by improper handling, installation, or use. This warranty is void if the product is in any way abused, damaged, or modified from its original state.
This warranty gives you specific legal rights, and you may have other rights that may vary from state to state, or country to country.