Table Tennis Robot

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PowerPong 2001

developed by Csaba Lukács

Operation Manual

Œ certificated!

Important: Please read instructions carefully prior to use!

The chapter **Control Panel (Summary Description)** explains the basic preparations for the operation of the Table Tennis Robot *PowerPong 2001*

PowerPong 2001 Table Tennis Robot

from novice to professional, from defender to attacker,
... ideal for every type of player and every level of play

You are now the owner of a Table Tennis Robot by Butterfly, developed by Csaba Lukács (Hungary). **The manufacturer offers a 2 year full warranty and a 5 year service for repairs and replacement parts, starting with the date of purchase. Please keep your receipt!**

- World novelty: A unique head with 3 discs
- Discs made of tough foam with a special coating for longevity
- Compact, solid, functional workmanship, built together with a big collecting net (6 kg)
- Well thought-out and easy to use control panel
- Programmed and random throwing of balls with different spin, speed, direction and trajectory
- Computer-controlled adaptation for length (equal length to corners and the centre of the table)
- Memory and AFC (Automatic Frequency Control) functions
- Remote control
- All functions adjustable from the player's side on the control panel
- Adjustable height of the balls

Please note:
- Please read this operation manual carefully before using the machine!
- The ball machine may only be connected 100-230 V voltage!
- The ball throw discs rotate at high speed. For that reason, avoid touching the discs during operation!
- The Table Robot *PowerPong 2000* should only be used in closed and dry rooms!.

If you take this advice into account, your " *PowerPong 2001* " will always be a great training partner and a friend (Amicus is Latin for „Friend").

1. Assembly

You should assemble the following main parts of the machine:
- Integrated throw mechanism with net   - DC 24V adapter (100-240 V net)
- Control box   - Extension cord
- Control box holder

Other belongings: Allan keys, throw disc, tube for setting distance, reserve rubber for the net, sticker vel-cro for fixing the robot

1. Put the machine on the table with the net closed and with the connectors towards you. **(Fig. 1.)**
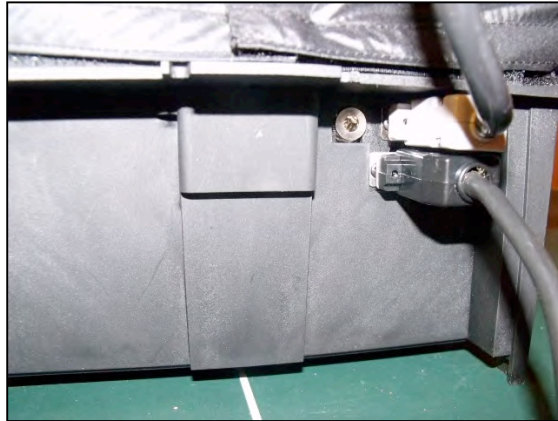

Fig 1.

Fig 2.

2. Connect the cable coming from the throw head to the 15 pole connector found on robot body (the upper one), then connect the coaxial DC plug of the adapter close near the 15 pole connector, finally connect one end (the smaller connector)of the extension cord in the 26 pole connector found under the 15 pole one. **(Fig. 2)**.

Attention: *Connect the cables very carefully, because the pins could get wraped (twisted) very easily.*

3. Turn down the net keeping poles until the first collision, then turn out the hanging poles (used for hanging the machine on the table) in the position seen on the photo, and put the adapter and the extension cord on the floor. **(Fig. 3.)**
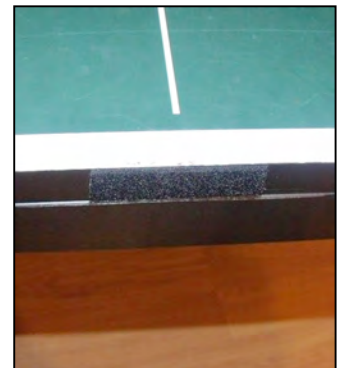

Fig 3.

Fig 4.

Fig. 4a.

4. Hang the machine on the table as you can see on the photo and turn the head in the table's direction with the help of the big screw found on the body. **(Fig. 4.)**

Please note: *A sticker velcro can be found on the inner surface of the hanging unit that is mounted to the table. It is advised to stick the pair of this sticker found in the other belongings on the table, because so the machine stands much more stable on the table. It is important to do that especially when children play arround the table.* ***(Fig.4a.)***

5. Turn down the poles of the net in a way, that standing behind the machine and gripping the top points of the net keeping poles pull those down in the two directions. **(Fig. 5.)** Then the back vertical part of the net mechanism lifts up automatically. Fit the plastic corner elements found on the ends of the net keeping poles exactly to the corners of the table how you can see below.**(Fig. 6.)**

Please note: *There can be found sticker velcros on the inner surfaces of the plastic corner elements. When the companion pieces (found among the other belongings) are put on the corners of the table then the net can be fixed more stable to the table.*
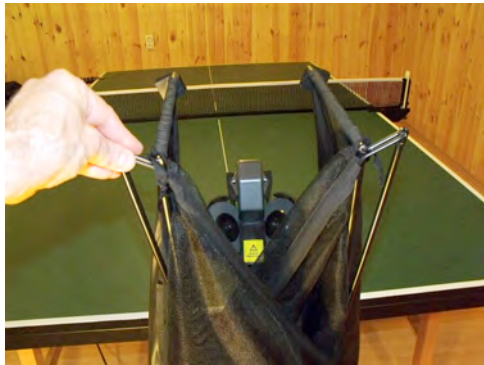
Fig. 5.

Fig. 6.

Then pull the end of the ball collecting net between the table tenis net and its metal net holder and fix the rubber bands at the fastening screws of the table tenis net **(Fig. 7).** Push the sticker velcro fixed to the side of the ball collecting net to its companoin piece fixed to the plastic corner as it can be seen on **(Fig. 8.)** Hang the control box to its holder found on the side of the table.**(Fig. 10.)**

Fig. 7.

Fig. 8.

Fig. 10.

2. Control box (Short description)

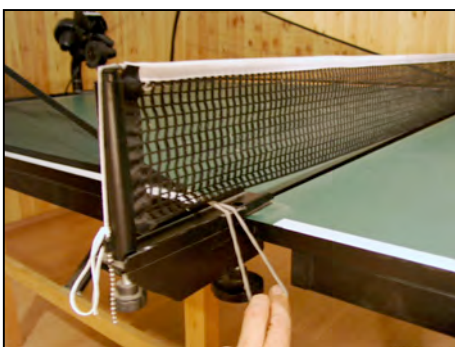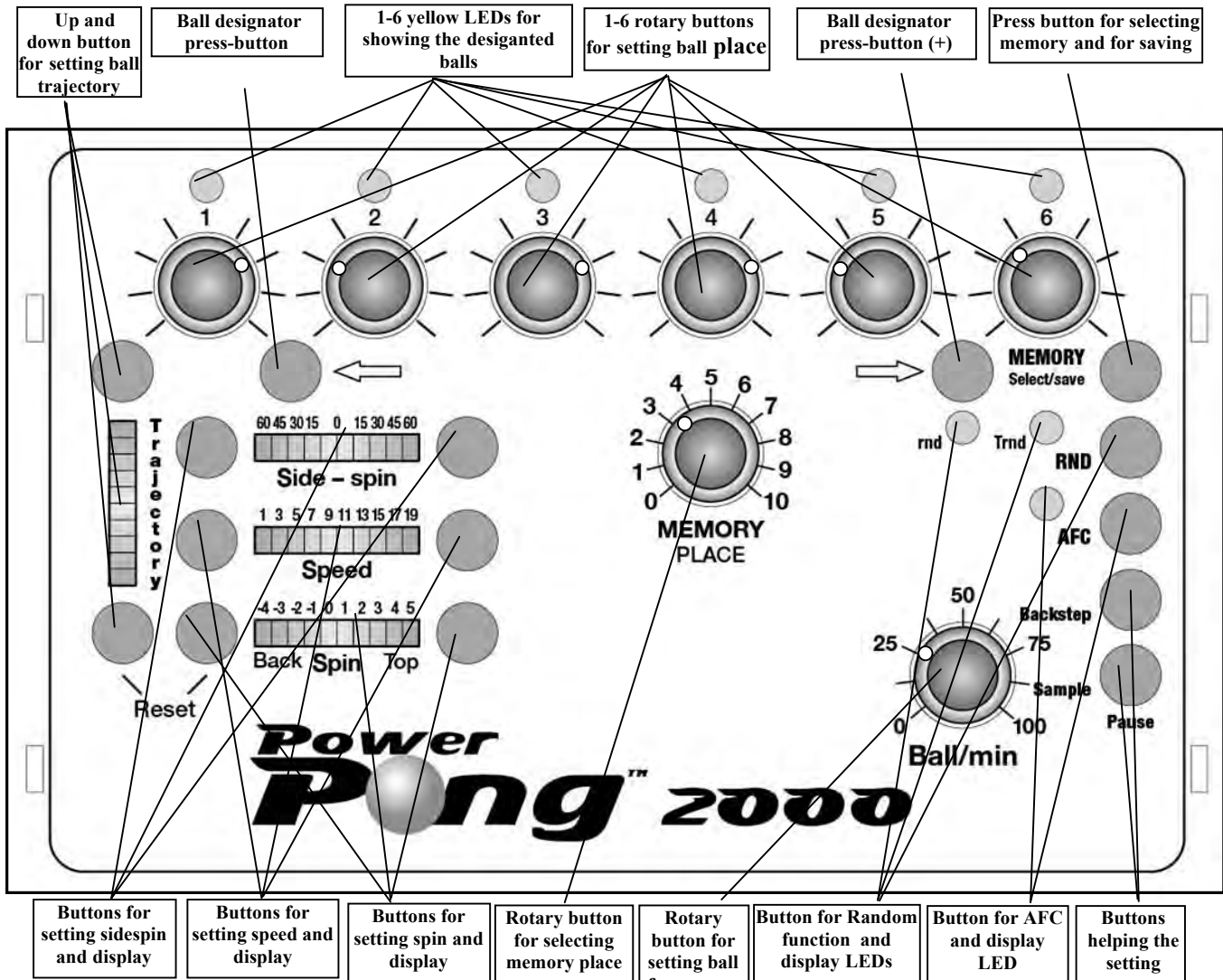| Up and down button for setting ball trajectory | Ball designator press-button | 1-6 yellow LEDs for showing the desiganted balls | 1-6 rotary buttons for setting ball place | Ball designator press-button (+) | Press button for selecting memory and for saving |

| Buttons for setting sidespin and display | Buttons for setting speed and display | Buttons for setting spin and display | Rotary button for selecting memory place | Rotary button for setting ball f | Button for Random function and display LEDs | Button for AFC and display LED | Buttons helping the setting |

-**With the help of the 1-6 rotary buttons for setting the ball place** it is possible to set such 6 different places (points) along the latitude of the table, where we would like the robot to place the balls. For example: Ball 1 ⇒ middle, Ball 2 ⇒ left, Ball 3 ⇒ right, Ball 4 ⇒ right … Like it is shown on the drawing.

- **Ball designator press-buttons (+) (-)**   Selecting the number of the placing points
- **Buttons for setting the spin and display:**   Ball spin level setting and feedback
- **Buttons for setting the speed and display:**   Ball speed level setting and feedback
- **Buttons for setting the sidespin and display:** Ball sidespin level setting and feedback
- **Buttons for setting the ball traject. and display:** Ball trajectory level setting and feedback
- **Rotary button for setting the ball frequency**   Control. the ball frequency approx. 0-100 ball/min
- **Rotary button for selecting memory place:**   Selecting 11 possible memory places
- **Press-button for selecting memory and for saving** Saving in memory (pushing it for long) and
  (MEMORY Select/save)   activating the memory place (pushing it for short)
- **Button for Random function and display LEDs**   Switch on/off of two types of random functions
- **AFC switch button and display LED**   Switch on/off of the automatic frequency control
- **Button helping the setting (Backstep)**   Buttons for stepping back from the actual balls
- **Button helping the setting (Sample)**   Giving actual balls while it is continuously pushed
                                                     (during making the setting). It has two functions:

1. Keeping it pushed the robot gives continuously the actual ball which can be set in the meantime.
2. Pushing it shortly – independent of the stage of the Ball/min button – it gets in „stop" position (the red light starts to flash). Now it is possible to change any of the sets. Pushing it again shortly the ball feeding starts if the „Ball/min" is not is „0" position.

3. Setting the features of the balls

The switch on of the machine

Put enough (50-60 pcs) balls in the net and turn the "**Ball/min**" button to 0 position before connecting the adapter to the power. After this connection the robot starts a short (approx. 10 s long) self positioning procedure. Then the control box automatically finds its basic position. The 1. yellow LED stats flashing, and the robot is ready for play. If you turn up the "**Ball/min**" button to a higher position, then the throwing motors start to work and the robot gives balls.

> ***Attention**: In case there wasn't at all enough ball in the robot, then it fills up itself, which takes approx. 10 sec, and it throws the first ball only after this procedure.*

We can define the following elements in order to set the ***PowerPong 2000*** easier.

The features of the thrown balls

When setting the balls it is necessary to set the type and the place of the balls which parameters are defined by the following parameters:

a.) Spin (side spin)
b.) Speed   } Ball type
c.) Trajectory (the height of the shot)

d.) Right-left placing   } Ball placing

One type ball given to one point

The „Ball/min" button must be in 0 position!

> ***Attention**: It is possible to set the parameters of that ball (actual ball), which ones yellow light is flashing.*

The first yellow light is flashing after the switch on of the robot. The parameters of this ball (Trajectory, Sidespin, Speed, Spin) can be changed with the help of the buttons for setting the ball curve, sidespin, speed and spin.

- **The ball traject. can be set upwards with the upper and downwards with the lower button.**
  One short push changes 1 unit, approx. 0,5 degree on the curve of the ball which can not be seen on the display because the lights change only after 8 units (fine set).
  In case pushing longer one of the buttons, then after approx. 1 sec it is possible to step quickly (with 8 jumps) the setting of the ball trajectory, which is also shown on the display (quick set).
- **The setting of the side spin it is possible by 15 degrees to right and to left.** (each push results a 15 degrees bigger spin to right or to left)
- **It is possible to set the speed in 19 positions.**
- **It is possible to set the speed in 11 positions:** (0) position (empty ball); (-1) – (-4) positions (backspin balls); (1) – (5) positions (topspin balls).
- **The place of the ball** can be set to right or to left with the turning button found under the yellow light.
- **The ball frequency** can be set with the "Ball/min" button turning it continuously in the 0-100 ball/min range.

Setting the ball first it is a procedure of continuous tryings (at least until the user is not practiced enough), which is, of course, helped a lot by the software of the robot. Therefore in case pushing the "**Sample**" button the machine gives an actual ball (one that is set momently) during the setting procedure. The robot throws such balls until the "Sample" button is pushed. It is possible so to set exactly a ball with the desired speed, trajectory and spin.

> **_Remark_**: _All the values can be continuously changed also in case the "Sample" button is pushed._

> **_Tip_**: _Exclusively when only the first ball is assigned, the values can be also changed when the "Ball/min" is not in 0 position!!!_

A certain type of ball given to more different places

In case a ball - that is set as it is described above - has to be given to more different places then as many balls have to be assigned with the **Ball designator button (+)** as many beats we want to have in the combination (max. 6) that will be played. (One more yellow LED goes up with each push. So many LEDs go up as many balls play in the program)

> **_Attention_**: _The robot uses always the parameters of the actual ball (except the place of the ball) when a new ball is designated, and the new designation will be the actual one. Therefore it is worthy to set correctly the type of the first ball, and then it is not necessary anymore to set the ball type (only the place) later in case of the other balls._

Then it is nothing more to do, just to set the place belonging to each ball with the help of the **Turning buttons for setting the place**.
After starting to throw the balls with the help of the "**Ball/min**" button the robot starts to give the designated balls one by one until the last one, and then jumping again to the first ball, and then the procedure is repeated.

Random ball placing (RND)

rnd play (small random)

In case the **rnd** is switched on with the **Button for random function (RND)** then the robot plays the set rally (described above) but not exactly to the set places, but to 20 cm big surrounding of those, which is closer to the real game.   Do not set the ball placing to the edge of the table when using the „rnd", because the machine can throw the balls near the table by reason of the ball spread!
(**It is enough the assigned ball to this finction**.)

Rnd play (big random)

In case switching on the **Rnd** (pushing ones more the **RND** button) the machine doesn't throw anymore the set balls in their set order, but in random way, jumping here and there among the designated balls. Therefore it can not be foreseen where the robot throws the next ball. It is sure only the fact that the balls are thrown to one of the set places.
(**It needs at least 2 assigned balls to use this function.**)

> **_Tip_**: _In case one place is set more times within the program, then this place will be chosen randomly of course but with bigger probability then the other set places._

Rnd and rnd together play

Rnd and **rnd** functions will be available together with pushing thrid time the **RND** button.
So as it is described above the robot throws the balls arround the places selected random out of the set positions. With pushing the button fourth time is possible to get out of the **RND** function.

Throwing different type of balls

The *PowerPong 2000* robot is suitable to throw different type of balls one after the other to different places.

This time the set described above differs only in the fact that not only the place but any other parameters of each newly assigned ball can be changed with buttons speed, spin, trajectory, side spin. (see page 5.: *Control box (short description))*

Do not forget that the newly assigned ball takes the parameters of the previous ball (except the place). Therefore we want to have an assigned ball more times in the program, it's advisable to step back to this earlier set ball (and make it actual) with the help of the "Backstep" button and then to assign the new ball. (So it is not necessary to set again the desired ball parameters, only the place.)

After finishing with the set of all the balls the robot starts to play the set point with turning up the "Ball/min" button, and the parameters of the actually thrown ball appear on the display during playing the point.

This is necessary because it could turn out that the set parameters of either of the balls has to be changed. In this case the "**Ball/min**" button has to be set on **"0"** position, then step with the "**Backstep**" button to the ball that needs to be changed – making it actual – and changing the parameters that appear there, and it is also possible to try it immediately with the "Sample" button. In case the change is OK, the point can be started.

The **rnd**" and the „**Rnd**" functions can be used here in the same way like it is described in chapter "**A certain type of ball given to more different places"**

Tip: *This function is suitable to set points with service, or to give more services – also different ones - one after the other, just the curve and the speed - as it is typical to a service – has to be set in a way that the ball to snap on that side of the table where the robot stands.*

The height of the release head

Most table tennis robots do not have this possibility; however, with the *PowerPong 2000* the ball is returned at different heights in a realistic match play manner.

In case of the *PowerPong 2000* the release height is adjusted in the following way: it is quite easy to push down the net thanks to its spring holding mechanism **(Fig. 11.)** The curved tube which holds the release throw head can be pulled up and down in the ball tube found under it when the hand screw is loosened **(Fig. 12.)**. Finally adjust the desired height in a way that one of the silver signs found on the thinner internal tube to the top margin of external thicker tube, then tighten the hand screw.

| Fig. 11. | Fig. 12. |

AFC function

The application of the "**AFC**" (automatic frequency control) may have sense in case there are given different type of balls (slow and fast ones in turn) within a rally. (See the above described.)
The robot takes into consideration that it has thrown a quick or a slow ball, and depending on it can give more often or more seldom balls, getting closer this way to the real game.

> ***Remark**: **This function has been born based on the experience that usually the quick balls are given back quickly, but usually it needs more time to give back the slow and short balls. (Of course this is not available to all situations.)***

Memory

The above described settings and their play have been made with the help of the programs set on the operating board.
The set exercise perishes with switching off the machine.
Regarding that it takes minutes to set a really good exercise, therefore in case of the ***PowerPong 2000*** it is possible to save quite easy 11 pcs of such points that are desired to be used more times.

Saving points in the memory

Turn the "**MEMORY place**" button to that position where you want to save the point set on the operating board (0-10 places).
Push for long (approx. 2 sec) the "**MEMORY Select/save** "button until the light starts to flash. This flash means that the point is saved in the memory cell.

Playing the saved point from the memory

In case the "**MEMORY Select/save** " button is pushed for short then that program appears on the operating board which is saved in that memory to which the "**MEMORY place**" button shows. (except the values of the ball place).
In such case all the lights change to flashing mode showing that the robot is in memory function and it plays from the memory.
Then the earlier saved point can be played with starting the „**Ball/min**".
Only the set of "**Ball place**" „**Ball/min**", „**AFC**" and „**RND**" values can be changed in such case. It is not possible to change the parameters of the balls.

Changing programs in the Memory

(Or „Ball/min"= 0, or „Sample" to be in stop position)
It is possible to change easily the set of the balls in the already saved programs with stepping with the „Backstep" button on the ball which is selected to be changed in the program taken out from the memory. After making the changes the program has to be saved again in the memory with using the „**MEMORY select/save**" button.

Ball Frequency (Balls/min)

With rotary switch "Ball/min", the ball frequency can be chosen continuously. An adjustment of 0 to 100 balls per minute is possible. When turning the Ball/min button in "0" position, in addition to the feeding motor also the three throwing motors will stop.

> ***Attention**: **In this case it seems like the robot is switched off, because the motors stop turning and the robot is silent, however the whole robot remains under current which can be seen from the fact that the lights found on the control panel are still on. Plug off the adapter from the current if you want to switch off the machine entirely!***

Turning the *PowerPong 2000* off and Putting out of Service

1. Pull the adapter from current when going out from the place where the machine works. Do not let the robot switched on without control.
2. If the robot is taken temporarily from the table, then put the adapter, the control box and the extension cord in the ball holder part, fold the net in middle stage and get down the robot from the table. The robot can be put away so easily and quickly until the next practice.

Transport

When the robot is to be transported to another place, also the net keeping poles have to be turned until the first collision. (**Fig. 3)**
Turn the hanging poles and the head in the direction of the robot and turn the net keeping poles in totally upper position.
Transport the robot in such position.
Do not forget to pack the adapter, the control box and the extension cord.

4. Maintenance and Repair

Important: **Before executing maintenance and repair works, always first unplug from the mains!**

– **During the operation of the ball machine, make sure that no small parts (for example hairs, in-dented balls, etc.) get into the collection net and thus into the machine, because they can lead to ball jams.**

– The ball shooting discs are very durable (at least 500 hours). Nevertheless, these discs will finally wear off after intense use. One sign for a worn disc is that the machine releases the balls at irregular lengths at high speed. This means that the surface of the discs does not have enough grip on the balls. For that reason, the distance of the discs has to be adjusted.

Put the plastic adjusting tube in the release hole found between the discs (**Fig. 13.)**. Loosen first, for example, the black imbus "adjusting" screw near the cover- with the bigger allan key found among the accessories - of he lower motor (**Fig. 14.)** and turn up the motor (gripping its cover) towards the adjusting tube until the disc touches it. (**Fig. 15.)** Do all this also with the other two motors.
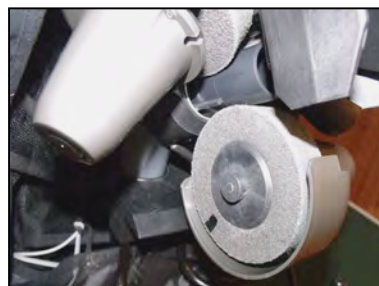

| Fig. 13. | Fig. 14. | Fig. 15. |

Please note: *The correct distance is 35-36 mm. This is the diameter of the adjusting tube. The release mechanism functions perfectly up to a distance of 37-38 mm.*

– When the distance cannot be adjusted anymore, the ball throw discs have to be replaced. Therefore loosen the screws **(Fig.16.)** found in the plastic disc holders – with the smaller allan key found among the accessories - (regarding all 3 discs), then remove the "adjusting screws" found at the two upper motors (it is not enough only to loosen those) **(Fig. 17.)** Then totally turn up the two upper motors gripping their casings and turning those away from the throwing hole in order to make possible the pull down of the throw discs from the shafts of the motors. **(Fig. 18.)**

Fig. 16.	**Fig. 17.**	**Fig. 18.**

Then the ball throw disc is pulled off the motor shaft. **(Fig. 19.a,b,)** Take away the plastic discs from the ball throw foam (it is held together by three screws) and insert those onto the new foam disc. Fix this set again with the three screws.

Fig. 19a.	**Fig. 19b.**

Slide the new disc onto the shaft in a way that the end of the shaft to be 0,5-1 mm out **(Fig. 18.),** and tighten the warm screw. Then adjust the correct distance of the discs with the help of the adjusting tube as it is described above.

– If a **ball jam** should occur, the machine tries automatically to remove the machine tries automatically to remove the jam by turning the motor and remove the jam by turning the motor and the throw discs forwards and motor and the throw discs forwards and backwards (7-8 times). In case the wards and backwards (7-8 times). In case the feeding motor and the three times). In case the feeding motor and the three throwing motors jam for motor and the three throwing motors jam for any reason the machine stops motors jam for any reason the machine stops in self-defence. Then the machine stops in self-defence. Then the fault signal is the following: all Then the fault signal is the following: all the 6 yellow lights start to flash following: all the 6 yellow lights start to flash on the control box. You have no other choice than, to take out the head from the machine, and take out the offending balls from the bottom part of the robot with the help of a pencil or screwdriver, etc. through the cleaning hole found there**. (Fig. 20.)**

Fig. 20.

− Once every 4-6 months, the stop pin, which is needed to adjust the ball throw length, needs a really slight application of silicon oil (just enough to cover the end of the match-stick).

− The pin is easily accessible in the release head. The rest of the machine needs no maintenance. However, it is recommended to remove dirt and dust from the surface of the robot with a moist cloth and a mild cleansing agent from time to time.

5. Error Management

Problem	Solution
The robot does not function after mounting it.	Check the correct connection of the extension cord on the body and the control box.
	When the small green control light found on the adapter (put under current) is not on, this means that the adapter is damaged, it has to replaced.
	If the rotary switch V. for ball frequency ("Ball/min") is set on "zero" then it has to be turned on a bigger value.
Ball released with irregular lengths	Check distance of ball throw discs, discs worn (see page 11.)
The robot sometimes releases balls irregularly: two balls quickly one after the other then misses to throw a ball.	The silver sign found on the tube of the robot head was not put exactly to the tp margin of the body tube. Put of the signs exactly to the top margin of the tube! (page 8.)
Ball jam; the yellow lights flash on the control unit	Foreign body or defect ball obstructs ball transport ⇒ remove (see page 11.) and switch on the robot again.
Random function (RND) on the control panel cannot be activated, green indicator light cannot be switched on	At least two balls must be activated, at least two yellow indicator lights must glow (see page 7.)
Ball gets stuck between ball throw discs. The yellow light flash on the control unit.	Pull out the adapter from current, remove ball from it between the shooting discs, adjust the Ball/min button to "0" position, then start the play again.

Attention: **If you are not able to solve the problems with the help of this check list, a specialist must be consulted! Please contact your specialist supplier or the Power Pong service address (page 16.).**
Always sign the problem when the power cable is defect. It has to be changed immediately because it can cause death.

6. List of Replacement Parts

List of Replacement Parts

mobil -100 Body with net
mobil -101 Robot head
PowerPong 2000   -102 Control unit
mobil -103 Holder for control unit
mobil -104 DC adapter (24V; 2,5A)
mobil -105 Extension cord
mobil -106 Throwing motor

mobil -107 Feeding motor
mobil -108 Oscillating head motor
mobil -109 Motor for height adjustment
mobil -110 Ball throw disc
mobil -111 Shaft for ball throw disc
mobil -112 Ball placement mechanism
mobil -113 Motor casing (3 pieces)

Further replacement parts on demand!

7. Technical Data

Supply current: 100-230 V, 50-60 Hz alternating current, approximately 40 W
The ball machine can be operated in a temperature range of 0 - 40 °C.
Weight: 6 kg (with net)
Overall dimensions (with net): Height 0,75 m; Width 0.28 m; Depth 0.25 m

A type examination test was done for the electrical adpter device

of conformity a Low Voltage directive 73/23/EEC
as last amended by EEC Directive 93/68/EEC
Registration No.: AN 50091861 0001
Report No.:   17004848 001

as is apparent from Test Report No. NTEK-2010NT1115351E
and NTEK-2010NT1115353SS

The robot *PowerPong 2001* is permitted to bear the **CE**

trademark. <u>Manufacturer</u> : LCS Kft., H- 2100 Gödöllő, Ibolya u. 50.