Before start, carefully read this User Guide and retain it for future reference.

RoboPHILO has been designed carefully for safety purposes. However, any electrical device, if used improperly, has the potential for causing fire, electrical shock or personal injury. To help ensure safe operation, follow these guidelines:

- Observe all warnings, precautions, and instructions.
- Regularly inspect the battery pack for damage.
- Stop use, unplug the charger and disconnect the battery pack immediately if PHILO functions in an abnormal manner, produces unusual sounds or smells or becomes too hot to touch.

Items required to assemble and operate RoboPHILO:
- 2 pcs AAA battery for IR remote controller
- PC (Microsoft Windows XP or Vista, RS232 port) for motion editing
- Silicone grease (as lubricant for rubber O-ring)
- Super glue

If your PHILO is the assembled version, you may follow the procedures below for quick startup check.

1. Assemble the stand as shown in above.
2. Securely put PHILO on the stand by slightly press the hooks to pass through the shoulder rings.

RoboPhil is not a toy.
- Remember that safety is the most important thing. Always keep the User Guide at hand for quick reference.

This model is suitable for people of 15 or above. Keep RoboPhil and its parts away from children. Supervision is required for inexperienced user.
Follow these procedures for quick startup check.

- Make sure the power switch is "OFF".
- Check the IR receiver. It should be plugged into the socket on the PCB board.
- Press the sides of battery cover to remove it.
- Connect the battery pack to the power lead inside battery compartment.
- Put the battery cover back.

Plug in the charger to wall socket and connect the charger plug to the RoboPhilo. The red charging light should be on while charging, and will turn to green when the battery is fully charged. You can plug in the charger and perform programming and charge the battery at the same time. However, do not perform programming with the charger alone without the battery, as it will cause overloading of the charger. It takes about 1.5 hours to fully charge the battery (longer if you are performing programming in parallel). After the battery is fully charged, or you have finished programming with the RoboPhilo, always unplug the charger.

- Put two AAA batteries into the IR remote controller. The battery compartment is at the back of the remote controller.
- Hold the hook of the stand to prevent the robot from swinging, then switch the power on.
- Wait for a few seconds until all servos are moving to places.

It will take a few seconds for PHILO to activate.

- Release RoboPHILO from the hook.
- Put RoboPHILO on a rigid, flat and level surface.

When losing balance, it will fall down and may cause damage or injury.

If you are operating RoboPHILO on a table, make sure it will not fall from the table to the ground below. While RoboPHILO can survive most falls on level surface as a result of unbalanced movements, dropping from an altitude will definitely damage some servos.

RoboPHILO performs better on wooden floor. Avoid operate it on rough surfaces such as carpet and avoid operate it on slippery surfaces such as glass.
Follow these procedures for quick startup check.

- Both the IR remote controller and RoboPHILO has same Robot ID default setting at 31. You do not need to pairing them up for quick startup check.
- For better signal transmission, point the IR remote controller to the back of RoboPHILO.
- Effective control distance is about 20 foot.

Handheld Remote Controller control up to 4 robots independently with 4 channels assignments.
Program Routines for 12 remote keys and up to 99 two digits key commands.

- POWER - turn on/off the servos
- Turn 30° left
- Move 1 step left
- Move 1 step backward
- Stand up from a face down on the floor position
- Get down to the floor with the head facing the floor
- Remote Key
  - Press the remote key to send the remote key command to PHILO to execute the assigned Routine motion

- Press "REPEAT" to repeat the previous motion until "Enter" or new motion command is pressed.
- Walk 1 step forward
- Turn 30° right
- Move 1 step right
- Stand up from a back down on the floor position
- Get down to the floor with the back on the floor
- Setup the Robot ID to send the command.
  - Press "POWER" + "SETUP", 00-31, one of the CH-A to CH-D key to assign the 2 digit Robot ID to the Channel Key pressed.
  - After the channel key is pressed, the command will send to the assigned Robot ID.
  - You can control up to 4 robots with one remote by pressing the specific channel key to switch the robot ID to send the command to.

All Channels have Robot ID 31 after battery is changed.

The factory tuned settings are already uploaded into your RoboPhilo (Ready to Walk version only).
You need to update the default philo-motion file with the factory settings before you can use the GUI Motion Creator software.
Follow the steps listed in 'Save the factory tuned settings to the default motion file' before the 'Fine Tuning' section in this User Guide.
Features and Index.

Features:
1. 20 servos for 20 degree of freedom including head, waist, leg turning, arms and legs
2. Each motion routine can have up to 30 sequences, and each sequence can have up to 15 poses.
3. Sequence and pose can be reused for other motions to save flash memories
4. One motion routine can have up to 450 pose transitions.
5. RS232 serial connection to PC for motion programming and execution
6. Infra Red Hand held remote to execute the user created program motions

Hardware Features
- Controller:
  - ATmega32-16PU
  - Interrupt Driven kernel for InfraRed remote
  - Servos handling
  - 24 servo channels
  - up to 8 I/O interface for add on hardware
  - 8KB flash for more than 200 user motions
- InfraRed Remote:
  - can play 121 user defined motion routines
  - control up to 4 RoboPhilo independently
- Power:
  - Charger can be used for motion programming while charging the battery to extend the time of play
  - provide regulated 5V DC and unregulated 6V - 7.2V DC for add on hardware

Software Features
- Graphical User Interface
  - Fine tune the servo setting
  - Create motion routines
  - Pose can be reused by other sequence to save storage
  - Sequence can be reused by other routine to save storage
  - User can use the PC to run the motion step by step to create the motion
  - Download the motion and setting to RoboPhilo
  - Once download, motion can be run through the infra red remote controller
  - Motion routines can be shared among user by exporting the routines to a motion file
  - User can run other's motion by importing the motion file

Contents
- Quick Startup Check 1 - 3
- Features and Index 4
- Build the left arm 5 - 8
- Build the right arm 9 - 12
- Build the left leg 13 - 18
- Build the right leg 19 - 24
- Build the upper body 25 - 28
- Build the body 29 - 36
- Save the factory tuned settings to default motion file 37
- Coordinate system for each joint 38
- Fine Tuning 39 - 47
- Final assembly 48 - 50
- Motion Creator PHILO 51 - 58
- Hand Held Remote 59
- Motion File details 60 - 63
- Motion Library 64
- Sample Motion Routine Exercise 65 - 72
- LoadPhilo Utility 73 - 77
- Safety Instructions 78
Build the left arm of RoboPHILO.

Parts to assemble the left arm of RoboPHILO.

Before assembling, please check the right amount of each part is included.

Assemble the left arm.

**Step 1**

1. RB027-B
2. RB027-A

**Step 2**

1. KA2x6
   - 4 pcs
2. RB003-A

**Step 3**

Remove the bottom plate of both SV4032-B and SV4032-C.

Keep all the screws PA2x18 for next steps.

Over tighten screw will damage the part.
When the screw has brought the two parts in contact, add 1/16 of a turn will do the job.

To distinguish between the RB003-A and RB003-B, look for the countersinks provided only for the RB003-A.
Build the left arm of RoboPHILO.

Assemble the left arm.

Step 4

PM2x27
4 pcs

SV4032-C

Step 5

PM2x27
4 pcs

SV4032-B

RB003-B

Step 6

This side of RB001 faces top of SV4032-B.

RB001

PA2x5
4 pcs

Step 7

Do not press too hard.

Caution: Carefully slide the top and then the bottom of SV4032-C into RB001.

Do not tighten this screw.

PA2x5
RB004

The battery, PCB, 1 pc RB010, 4 pcs PA2x5 and 1 pc PA2.5x8 are needed for this step.

Tuning the left arm.
Build the left arm of RoboPHILO.

**Tuning the left arm.**

**Step 1** Move the jumper from 2-pin slot 5 to slot 1.

The initial position of the jumper is on 2-pin slot 5. Move this jumper to slot 1.

The PCB has 15 3-pin slots on the left hand side. The elbow is allocated to slot 6.

Slot 1 is the jumper position for tuning.

**Step 2** Make sure the power switch is 'OFF'.

Plug in the elbow servo SV4032-C to slot 8. Connect the battery as shown.

Black wire at outer edge of PCB

**Step 3** Switch on the power. The red light will be on and the SV4032-C will rotate to its default position, 90°. It will take a few seconds to complete the process.

**Step 4** Align the cross marks on bottom of RB001 and RB003-A as shown.

Unscrew the PA2x3 a few turns such that the elbow can move freely.
Build the left arm of RoboPHILO.

**Step 5** There are 4 large holes and 4 small holes on RB010. Insert RB010 to SV4032-C and try to align the 4 larger holes to the holes on RB001. If the holes do not line up, remove RB010 and rotate it by 90°, re-insert and check again if the holes align better. You may need to repeat this step a few times to find the best aligned holes.

**Step 6** Apply screws to fix RB010. It is normal that the bottom marks are not in perfect alignment at this stage, it will be adjusted electronically at the fine tuning stage. Do not tighten these screws.

**Step 7** Switch off the power and remove the battery and left arm from the PCB.

**Step 8** Check to see if the forearm can bend forward by 90° or more and backward by 90° or more. If not, repeat the whole process starting from Step 1.

**Step 9** Add 2 pcs PA2x5 and tighten all the screws.
Parts to assemble the right arm of PHILO.

Before assembling, please check the right amount of each part is included.

Assemble the left arm.

Step 1

Step 2

Step 3

Remove the bottom plate of both SV4032-B and SV4032-C.

Keep all the screws PM2x27 for next steps.
Build the right arm of RoboPHILO.

Assemble the right arm.

Step 4

PM2x27 4 pcs
SV4032-C

Step 5

PM2x27 4 pcs
SV4032-B
RB003-B

Step 6

PA2x5 4 pcs
RB001

This side of RB001 faces top of SV4032-B.

Do not press too hard.

Step 7

Do not tighten this screw.

Carefully Slide the top and then the bottom of SV4032-C into RB001.

The battery, PCB, 1 pc RB010, 4 pcs PA2x5 and 1 pc PA2.5x8 are needed for this step.

Tuning the right arm.
Build the right arm of RoboPHILO.

**Step 1**  
The initial position of the jumper is on 2-pin slot 5. Move this jumper to slot 1.

Slot 1 is the jumper position for tuning.

**Step 2**  
Make sure the power switch is 'OFF'. Plug in the elbow servo SV4032-C to slot 6. Connect the battery as shown.

**Step 3**  
Switch on the power. The red light will be on and the SV4032-C will rotate to its default position, 90°. It will take a few seconds to complete the process.

**Step 4**  
Align the cross marks on bottom of RB001 and RB003-A as shown.
Build the right arm of RoboPhilo.

**Step 5** There are 4 large holes and 4 small holes on RB010. Insert RB010 to SV4032-C and try to align the 4 larger holes to the holes on RB001. If the holes do not line up, remove RB010 and rotate it by 90°, re-insert and check again if the holes align better. You may need to repeat this step a few times to find the best aligned holes.

![Diagram of RB010 and RB001 alignment](image)

*This mark may not exactly line up, try to line it up as close as possible.*

**Step 6** Apply screws to fix RB010. It is normal that the bottom marks are not in perfect alignment at this stage, it will be adjusted electronically at the fine tuning stage.

![Diagram of applying screws](image)

*Do not tighten these screws.*

**Step 7** Switch off the power and remove the battery and right arm from the PCB.

**Step 8** Check to see if the forearm can bend forward by 90° or more and backward by 90° or more. If not, repeat the whole process starting from Step 1.

**Step 9** Add 2 pcs PA2x5 and tighten all the screws.

![Diagram of adding screws](image)

*Add 2 pcs PA2x5 and tighten all the screws.*
Build the left leg of RoboPHILO.

Parts to assemble the left leg of PHILO.

Before assembling, please check the right amount of each part is included.

Assemble the left foot:

Step 1  Move the jumper on PCB from 2-pin slot 5 to slot 1. Make sure the power switch is 'OFF'. Plug in the left foot servo SV4032-E to slot 15. Connect the battery.

Step 2  Switch on the power. The red light will be on and the SV4032-E will rotate to its default position, 90°. Connect the battery to this 3-pin slot. Black wire at outer edge of PCB.

Step 3  Align the flat surface of RB005 parallel to the side of SV4032-E as shown. They may not align perfectly. Try to align it as parallel as possible.
Build the left leg of RoboPHILO.

Assemble the left foot and the lower leg.

**Step 4** Switch off the power. Remove the battery and the left foot servo from the PCB.

**Step 5**

**Step 6**

**Step 7**

**Step 8** Keep all the screws PM2x27 for next steps.

**Step 9**
Build the left leg of RoboPHILO.

Assemble the left foot and the lower leg.

**Step 10** Add the white O-ring in between the SV4140 and the RB036. Add a small drop of silicone grease as lubricant on the O-ring.

⚠️ Do not press too hard.

Carefully slide the top and then the bottom of SV4140 into RB036.

Assemble the upper leg.

**Step 11** Remove the bottom cover of 2 pcs of SV4032-D.

Keep all the screws PM2x27 for next steps.

**Step 12**

**Step 13**

Do not press too hard.

**Step 14**

**Step 15**
Assemble the upper and lower leg.

**Step 16**

- Do not press too hard.
- Carefully slide the top and then the bottom of SV4032-D into RB002.

**Step 17**

- Be careful of the relative positions of RB001 and RB002.

**Step 18**

- This side is at the same side as RB010.
- Do not press too hard.
- Carefully slide the top and then the bottom of SV4032-D into RB002.

Tuning the left leg.

The battery, PCB, 1 pc RB010, 4 pcs PA2x5 and 1 pc PA2.5x8 are needed for this step.
Build the left leg of RoboPhilo.

Tuning the left leg.

**Step 1**  Move the jumper on PCB from 2-pin slot 5 to slot 1. Make sure the power switch is 'OFF'. Plug in the left foot servo SV4032-E to slot 15, the SV4140 near the foot to slot 14, the SV4032-D near the SV4140 to slot 13, the remaining SV4032-D to slot 12.

Connect the battery.

**Step 2**  Switch on the power. The red light will be on and all servos will rotate to their default positions. It will take a few seconds to complete the process. Although the foot servo SV4032-E has been tuned at the beginning of assembling, it is recommended to check if the leg assembly is within 85° to 95° relative to the foot. If the angle is outside this range, please dismantle the parts and repeat the process from Step 1 in the section 'Assemble the left foot'.

**Step 3**  Align the cross marks at 1, 2, and 3 as shown.

**Step 4**  Insert RB010 to the servo at 1 in Step 3 and try to align the 4 larger holes to the holes on the servo at 1.

If the holes do not line up, remove RB010 and rotate it by 90°, re-insert and check again if the holes align better. You may need to repeat this step a few times to find the best aligned holes.
Tuning the left leg.

**Step 5**  
Apply screws to fix RB010. It is normal that the bottom marks are not in perfect alignment at this stage, it will be adjusted electronically at the fine tuning stage.

**Step 6**  
Repeat Step 3 to Step 5 for 2 and 3.

**Step 7**  
Switch off the power and remove the battery and all servos from the PCB.

**Step 8**  
Check the travel of each servo at 1, 2 and 3, such that they can bend forward by 90° or more and backward by 90° or more. If not, repeat the whole process starting from Step 1 of 'Tuning the left leg'.

**Step 9**  
Add 2 pcs PA2x5 on each RB010 and tighten all the screws on both sides of the leg.
Parts to assemble the right leg of PHILO.

Before assembling, please check the right amount of each part is included.

- SV4140: 1 pc
- SV4032-D: 2 pcs
- RB011: 1 pc
- RB011-R: 1 pc
- RB009: 1 pc
- RB003-A: 1 pc
- RB003-B: 1 pc
- RB003: 1 pc
- RB001: 1 pc
- KA2x6: 12 pcs
- PA2x5: 24 pcs
- PA2.5x8: 4 pcs
- PW2x8: 4 pcs
- RB008: 4 pcs
- RB004: 3 pcs
- RB005: 1 pc
- RB007: 1 pc
- RB010: 3 pcs
- White O-ring: 1 pc

To fit the longer SV4140, RB036 is made longer than RB001.

To fit the longer SV4140, RB035 is made longer than RB003-A.

Assemble the right foot.

**Step 1** Move the jumper on PCB from 2-pin slot 5 to slot 1. Make sure the power switch is 'OFF'. Plug in the right foot servo SV4032-E to slot 15. Connect the battery.

**Step 2** Switch on the power. The red light will be on and the SV4032-E will rotate to its default position, 90°. Connect the battery to this 3-pin slot. Black wire at outer edge of PCB.

**Step 3** Align the flat surface of RB005 parallel to the side of SV4032-E as shown. They may not align perfectly. Try to align it as parallel as possible.
Step 4  Switch off the power. Remove the battery and the right foot servo from the PCB.

Step 5

Step 6
This side is on the left.

Step 7
This side is on top.

Step 8  Keep all the screws PM2x27 for next steps.

Step 9
Assemble the right leg of RoboPhilo.

**Step 10**  Add the white O-ring in between the SV4140 and the RB036. Add a small drop of silicone grease as lubricant on the O-ring.

⚠️ Do not press too hard.

ør Carefully Slide the top and then the bottom of SV4140 into RB036.

Assemble the upper leg.

**Step 11**  Remove the bottom cover of 2 pcs of SV4032-D.

Keep all the screws PM2x27 for next steps.

**Step 12**  SV4032-D

**Step 13**

Do not press too hard.

**Step 14**

**Step 15**
Build the right leg of RoboPHILO.

**Step 16**

1. Do not press too hard.
2. Carefully slide the top and then the bottom of SV4032-D into RB002.

**Step 17**

- Be careful to the relative positions of RB001 and RB002.

**Step 18**

- Do not press too hard.
- Carefully slide the top and then the bottom of SV4032-D into RB002.

---

**Tuning the right leg.**

The battery, PCB, 1 pc RB010, 4 pcs PA2x5 and 1 pc PA2.5x8 are needed for this step.

- RB010 3 pcs
- PA2x5 12 pcs
- PA2.5x8 3 pcs
Build the right leg of RoboPHILO.

**Tuning the right leg.**

**Step 1** Move the jumper on PCB from 2-pin slot 5 to slot 1. Make sure the power switch is 'OFF'. Plug in the right foot servo SV4032-E to slot 15, the SV4140 near the foot to slot 14, the SV4032-D near the SV4140 to slot 13, the remaining SV4032-D to slot 12.

Connect the battery.

**Step 2** Switch on the power. The red light will be on and all servos will rotate to their default positions. It will take a few seconds to complete the process.

Although the foot servo SV4032-E has been tuned at the beginning of assembling, it is recommended to check if the leg assembly is within 85° to 95° relative to the foot. If the angle is outside this range, please dismantle the parts and repeat the process from Step 1 in the section 'Assemble the left foot'.

**Step 3** Align the cross marks at 1, 2, and 3 as shown.

**Step 4** Insert RB010 to the servo at 1 in Step 3 and try to align the 4 larger holes to the holes on the servo at 1.

If the holes do not line up, remove RB010 and rotate it by 90°, re-insert and check again if the holes align better. You may need to repeat this step a few times to find the best aligned holes.
Build the right leg of RoboPHILO.

**Step 5** Apply screws to fix RBo10. It is normal that the bottom marks are not in perfect alignment at this stage, it will be adjusted electronically at the fine tuning stage.

**Step 6** Repeat Step 3 to Step 5 for \( \textcircled{2} \) and \( \textcircled{3} \).

**Step 7** Switch off the power and remove the battery and all servos from the PCB.

**Step 8** Check the travel of each servo at \( \textcircled{1} \), \( \textcircled{2} \) and \( \textcircled{3} \), such that they can bend forward by 90° or more and backward by 90° or more. If not, repeat the whole process starting from Step 1 of 'Tuning the right leg'.

**Step 9** Add 2 pcs PA2x5 on each RBo10 and tighten all the screws on both sides of the leg.
Parts to assemble the body of PHILO.

Before assembling, please check the right amount of each part is included.

Assemble the upper body.

Step 1  Right shoulder

Step 2  Repeat Step 1 to prepare for the assembling of left shoulder.
Build the upper body of RoboPHILO.

**Step 3**
Assemble the upper body.
- RB018-A 1 pc
- RB019 1 pc
- Shaft

A flat cut for the set screw of shaft is on the top side.

**Step 4**
Insert the two shoulder servos to RB018-A. Note the servo leads should go underneath the holes on RB018-A.

- RB018-B 1 pc
- KA2x6 4 pcs
- PWA2x8 4 pcs

The servo leads should not go through the holes on RB018-A.

**Step 5**

**Step 6**
- RB018-A 1 pc
- RB029 1 pc
- KA2x6 4 pcs
- RB020 1 pc
- KA2x6 4 pcs
Assemble the upper body.

Step 7  Waist servo

Step 8  Insert the waist servo inverted to RB020.

- The servo horn should be on the right hand side of Philo’s chest.

Step 9

- The smooth surface of RB021 should face out.

Tuning the shoulders.

Step 1  Move the jumper on PCB from 2-pin slot 5 to slot 1. Make sure the power switch is ‘OFF’. Plug the left and right shoulder servos SV4032-A to slot 4 on both sides of PCB. Connect the battery.

Step 2  Switch on the power. The red light will be on and the SV4032-A will rotate to its default position, 180°. It will take a few seconds to complete the process.

Connect the battery to this 3-pin slot. Black wire at outer edge of PCB.
Build the upper body of RoboPhilo.

Assemble the shoulder.

**Step 1**  Insert RB010 to the shoulder servo SV4032-A such that the large holes of RB010 are as perpendicular as possible to the shoulder servo. The holes may not align properly. Remove the RB010 and rotated it by 90°, re-insert and check again if the holes align better. You may need to repeat this step a few times to achieve the best match.

Add a small drop of silicone grease as lubricant on the O-ring.

Step 2  Switch off the power and unplug all the servo leads from the PCB.

Assemble the body.

**Step 1**  Insert KA2x6 4 pcs, RB017 1 pc, RB014-A 1 pc, RB016 1 pc.
Assemble the body.

Step 2

Step 3  Insert the left thigh pushrod into the RB015 with the waist pushrod. Insert the right thigh pushrod into another RB015.

Step 4

The left thigh pushrod is the same as the right thigh pushrod. Note the position of the pushrod relative to RB015.

The right thigh pushrod goes on top of the left thigh pushrod.
Assemble the body.

Step 5  Remove the bottom plate of the SV4032-C and keep the PM2x27 screws for the next step.

Step 6

Step 7

Step 8

Step 9  Add a few drops of super glue (not supplied) on both sides to securely bond the RB003-B and RB013 together; also the RB012 and the RB003-B.

Add a few drops of super glue (not supplied) on both sides to securely bond the RB003-B and RB024 together.
Step 10  Repeat steps 5 to 9 to assemble the right thigh. Use the RB025 instead of RB024 for the right thigh. Note that the thigh servo pinions should be close to each other towards the line of symmetry.

Step 11  

Step 12  

Step 13  

The other end of the pushrods should leave as shown.
Beware of the pushrod sharp ends. Wrap them by scotch-tape.
Assemble the body.

**Step 14**
- Lock nut: 1 pc
- Set screw: 2 pcs

**Step 15**
- RB032-A: 1 pc
- PA1.7x3: 2 pcs

**Step 16**
- PA2x5: 2 pcs

**Step 17**
Adhere the double side tape to a SV2030-A as shown.
- SV2030-A: 1 pc
- Double side tape: 1 pc
Step 1. Add the white O-ring in between the hip servo and the left leg. Add a small drop of silicone grease as lubricant on the O-ring.

- Do not press too hard.
- Carefully slide the top and then the bottom of SV4032-C into RB001.
- Note the chamfered corner of RB001 should be facing to the front.

Step 2. Before insert RB010 to the hip servo, tune the hip servo. Move the jumper on PCB from 2-pin slot 5 to slot 1. Make sure the power switch is 'OFF'. Plug in the left hip servos SV4032-C to slot 11 on the PCB as shown. Connect the battery.

Step 3. Switch on the power. The red light will be on and the left hip servo will rotate to its default position, 180°. It will take a few seconds to complete the process.

Connect the battery to this 3-pin slot. Black wire at outer edge of PCB.
Build the body of RoboPhilo.

**Step 4**  
Insert RB010 to the hip servo and try to align the 4 larger holes to the holes on the servo.

If the holes do not line up, remove RB010 and rotate it by 90°, re-insert and check again if the holes align better. You may need to repeat this step a few times to find the best aligned holes.

This mark may not exactly line up, try to line it up as close as possible.

**Step 5**  
Assemble the right leg to the body by repeating Step 1 to Step 4.

Note the right hip servo should be connected to slot 11 on the right hand side of PCB three pin slot.

**Step 6**  
Switch off the power and unplug all the servo leads from the PCB.
Step 7  
Assemble the limbs to the body.

Step 8  
Before inserting RK010 to the arm servo, 
tune the arm servo. Move the jumper 
on PCB from 2-pin slot 5 to slot 1. 
Make sure the power switch is 'OFF'. 
Plug in the left arm servos SV4032-B to 
slot 5 on the PCB as shown. 
Connect the battery.

Step 9  
Switch on the power. The red light 
will be on and the left hip servo will 
rotate to its default position, 90°. 
It will take a few seconds to complete 
the process.

Step 10  
Insert RK010 to the left arm servo 
and try to align the 4 larger 
holes to the holes on the servo.

Step 11  
Assemble the right arm to the body by repeating Step 7 to Step 10. 
Note the right hip servo should be connected to slot 5 on the right hand side 
of PCB three pin slot.
Build the body of RoboPhilo.

Assemble the PCB board.

Assemble the PCB board to the back of RoboPhilo.

Plug the servos to PCB board.

Plug the servo wire connectors to the PCB board according to the servo positions listed in this picture.

The next step is to fine tune the RoboPhilo. Follow all the steps in the Fine Tuning section and complete the fine tuning of RoboPhilo.
Save the factory tuned settings to the default motion file.

If your RoboPhilo is Ready to Walk version, the factory tuned settings are already uploaded. You need to follow the steps below to update the default philo-motion file with the factory settings before you can use the GUI Motion Creator software.

If your RoboPhilo is Kit version, skip this section and continue with the Fine Tuning section.

Generate the factory tuned motion file.

1. Open 'loadPhil0'.
2. Set the Com port by entering a.
3. Enter Com port number which is the Com port your PC is using to connect to RoboPhilo.
5. Wait for a few seconds to allow the RoboPhilo system to activate.
6. Enter g to generate new motion file with fine tune setting from your RoboPhilo.
7. Enter philo-motion and press Enter.
8. Enter a file name to save the motion file with factory tuned settings in your PC.
   As this file contains the factory tuned setting, you are recommended to always keep a copy of the file for future use.
9. The motion file with the factory tuned setting is saved in your PC. You may open it by Notepad and check with the settings in your Birth Certificate. They should be the same.
10. Skip the Fine Tuning section and continue with 'Motion Creator PHIL0' section.

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Generic Step to run Fine Tuning.

1. Put the Robot on the hanger.

 août The jumper on upper right hand corner of the PCB should be placed to 2-pin slot 5 for normal operation and fine tuning.

- Securely put PHILO on the stand by slightly press the hooks to pass through the shoulder rings.

2. Install the Motion Creator in your PC. (Windows XP or Vista Operation System)
   1. Put the PHILO CD and open the folder for installation.
   2. Double click the file dotnetfx and follow the instruction to install the .net 2.0 redistributable from Microsoft.
   3. Double click the file vcredist_x86 and follow the instruction to install the Visual c++ 2005 SP1 redistributable from Microsoft.
   4. Installation done.
   5. Connect the serial cable between the PC and RoboPhilo.
   6. If your RoboPhilo is Ready to Walk version, you need to save the factory tuned settings in your PC by following the steps in 'Save the factory tuned settings'.
   7. After the factory tuned setting has been saved, double click the file philo to start the Philo Motion Creator. Open the factory tuned motion file (output motion file name you just saved) to try out some motions.
   8. If your RoboPhilo is Kit version, follow the instructions in Fine Tuning section.
   9. motion-library/ readme.txt describes how to use the motion-library routines.

3. Connect the Philo to the computer by using the Serial cable provided.

4. Run Philo (Philo Motion Creator).

5. Select Configuration tab.

6. Select Port # to setup serial COM port.

7. Enter motion file name: Philo-motion click 'Open'
7. Select Fine tuning tab.

8. Enter different position value for a servo.
   e.g. right arm -- the arm should move. If not, change the COM port # in configuration tab and retry.

9. There are 3 values to tune for each joint.

   **Position** – change the servo position.
   **Offset** – define the servo position at 0 degree.
   **ATV** – adjust the physical travel angle for the input position degree.

10. Common Fine Tuning step for joints allow 0 degree.

   a. Enter 0 to position to move the joint at 0 degree.
   b. Increase or decrease the offset value to line up the marker.

   c. Enter position 180° degree.

   d. If the angle from 0 to 180° is less than 180° degree, increase ATV by clicking the up arrow of ATV. Otherwise, click the down arrow of ATV until the marks align.

11. Click “Save” button to save the tuning setting for this servo.

12. You need to use “Save Motion” in configuration tab to save the tunings to a file, otherwise, the tunings will be lost after the program exits.
13. You can click ‘Save Motion’ to save to the same file after each joint tuning.
14. Save to a different motion file name philo-motion2 to keep the original default motion file.
15. Open the new file philo-motion2 for subsequent motion work.

**Fine Tune Right Upper Arm.**

1. Enter 0 to right upper arm position. Adjust offset to align marker.

2. Enter 180 to right upper arm position. Adjust ATV to align marker.

**Fine Tune Right Elbow.**

1. Keep the upper arm at 90° by entering 90 to right upper arm position.

2. Enter 0 to right elbow position. Adjust offset to align marker.

3. Enter 180 to right elbow position. Adjust ATV to align marker.

**Fine Tune Right Shoulder.**

1. Keep the arm and elbow straight by entering 90 to right upper arm position and right elbow position.

2. Enter 0 to right shoulder position. Adjust offset to make the two lines parallel.

3. Enter 180 to right shoulder position. Adjust ATV to make the two lines parallel.

Similarly, fine tune the left upper arm, left elbow and left shoulder by repeating all the steps.
1. If the RoboPhilo's shoe cover is on, take it off.

2. Enter 90 to right foot position. Adjust offset until the two lines are parallel (a).

3. Enter 60 to right foot position. Adjust ATV until it line up with 60° (b).

4. Repeat steps 2 and 3 until it lines up 60° without more ATV adjustment (b).

5. Enter 120 to right foot position. Adjust ATV until it lines up with 120° (c).

6. Repeat steps 2 to 5 until the 90 position is correct, 60 and 120 are good enough without ATV adjustment.
Fine Tuning.

**Fine Tune Right Ankle.**

1. Enter 90 to right foot position.
2. Enter 90 to right knee position.
3. Enter 0 to right ankle position.
4. Enter 180 to right ankle position. Adjust ATV to line up markers.

**Fine Tune Right Knee.**

1. Enter 150 to right leg position.
2. Enter 90 to right ankle position.
3. Enter 0 to right knee position. Adjust offset to line up markers.
4. Enter 0 to right ankle position.
5. Enter 180 to right knee position. Adjust ATV to line up markers.

\[ \theta < 180^\circ, \text{ increase ATV value} \]
\[ \theta > 180^\circ, \text{ decrease ATV value} \]
Fine Tuning.

**Fine Tune Right Leg.**

1. Enter 0 to right upper arm position to raise the arm.
2. Enter 90 to right leg position. Adjust offset to line up markers.
3. Enter 180 to right leg position. Adjust ATV to line up markers.
4. Repeat steps 2 and 3 until it lines up 180° without more ATV adjustment.

**Fine Tune Right Hip.**

1. Enter 90 to right hip position. Adjust offset to line up markers.
2. Enter 180 to right hip position. Adjust ATV to line up markers.
3. Repeat step 1 and 2 until 180 line up markers without more ATV adjustment.

**Before Head Fine Tuning.**

Install the head pushrod and head turn servo horn such that the head is facing to the front.

Note that the head pushrod is inserted into the second hole from the tip of the servo horn.
Head Fine Tuning.

1. Enter **90** to head position.
   Adjust offset to line up **90°**.

2. Enter **60** to head position.
   Adjust ATV until it lines up with **60°**.

3. Repeat step 1 and 2 until it lines up with **60** and **90** without more ATV adjustments.

4. Enter **120** to head position.
   Adjust ATV until it lines up with **120°**.

5. Repeat step 1 to 4 until the **90** position is correct, **60** and **120** are good enough without ATV adjustment.

Before Waist Fine Tuning.

Install the waist pushrod and waist turn servo such that the upper body is facing to the front.

Waist Fine Tuning.

1. Put protractor along the waist.

2. Enter **90** to waist position.
   Adjust offset to line up **90°**.

3. Enter **60** to waist position.
   Adjust ATV until it lines up with **60°**.

4. Repeat step 2 and 3 until it lines up with **60°** and **90°** without more ATV adjustment.

Note that the waist pushrod is inserted into the first hole from the tip of the servo horn.
5. Enter 120 to waist position. Adjust ATV until it lines up with 120°.

6. Repeat steps 2 to 5 until the 90 position is correct, 60 and 120 are good enough without ATV adjustment.

Before Leg Turn Fine Tuning.

Install the leg turn pushrods and both leg turn servos such that the feet are facing to the front.

Note that the leg pushrods are inserted in to the second hole from the tip of the servo horns.

Right Leg Turn Fine Tuning

1. Draw 2 horizontal and 1 vertical line on a piece of paper as shown.
2. Unplug the servo horn for both leg turn servos.
4. Enter 90 for both legs turns in the Fine Tuning tab.
5. Position the foot to line up with the vertical and horizontal line as shown.
6. Plug on the servo horn, but do not put the screw yet.
7. Adjust offset until the foot lines up with the vertical and horizontal lines.
8. Enter 70 to right leg turn position. Adjust ATV base on the angle is larger than 20° or not.
9. Enter 90 to right leg turn position. Adjust offset until the foot lines up with the vertical and horizontal lines.
10. Check and make sure the leg turn servo does not hit the Y shape support frame.
11. Check and make sure the leg turn servo linkage does not hit into each other.
12. Repeat step 8 to 11 until it lines up 90 and 70 without more offset and ATV adjustment.
13. After finished the fine tuning process, put the screw back on the horn.

Similarly, fine tune the left leg, left foot, left ankle, left knee, left hip and left leg turn by repeating all the steps.
Final Fine Tuning.

1. Select Pose tab.
2. Select 'init' in Pose Name.
   Click 'Get' button.
   Click 'Play'.
3. Check and adjust the two legs line up, and the bottom of the feet are level.
4. Select 'sitdownstr' in Pose Name.
   Click 'Get' button.
   Click 'Play'.
5. Check and adjust the bottom of the feet are level.
6. Do the Fine Tuning again to line them up if necessary.
7. Click 'Save Motion' in Configuration tab to save the settings and click 'Open' to open the file. Power off the RoboPhilo.
   Click 'Connect' within 10 seconds.
   Click 'Load Motion'.
   Click 'Download Tuning/Setting'.
   Click 'Disconnect'.
   Power off the RoboPhilo.
9. You have completed the Fine Tuning of the RoboPhilo.
   You can power on the RoboPhilo to play.

Wrap the servo wires.

Wrap the servo wires by using the supplied wire wrapping tubes.

Hold the wrapped wires by RB046.

Cut the wire spiral down so that it only spiral the wire up to the hip cover, such that the hips have more freedom to turn.

RB046
4 pcs
and
PA1.7x7
8 pcs
Assemble the RB040 and RB041 to the body.

Assemble the lower back cover to the body.

Assemble the front and back covers.
RoboPhilo final assembly.

Assemble the left foot covers.

Assemble the right foot covers.

Pasting the body decals on the arms.

Left

Right

Crop and paste the decals to the arm.
Pasting decals above the front body.

Crop and paste the decals above to RoboPhilo.

Pasting decals above the back body.

There are different color schemes of decals.
1. PHILO Installation
   a. dotnetfx
   b. vcredist_x86
   c. philo
   d. PHILO-motion
   e. loadPhilo
   f. motion-library

2. PHILO Operations
   a. Configuration Operations
   b. Pose Operations
   c. Sequence Operations
   d. Routine Operations
   e. Key Operations
   f. Fine Tuning Operations

3. Hand Held Remote
4. Motion File details
5. Sample Motion Routine exercise
Motion Creator Installation

System Requirement: Windows XP or Vista Operating System with 512MB

1. Put in the PHILO CD and open the folder for Installation.
2. Double click the file dotnetfx and follow the instruction to install the .net 2.0 redistributable from Microsoft.
3. Double click the file vcredist_x86 and follow the instruction to install the Visual C++ 2005 SP1 redistributable from Microsoft.
4. Installation done.
5. Connect the serial cable between the PC and RoboPhilo
6. If your RoboPhilo is Ready to Walk version, you need to save the factory tuned settings in your PC by following the steps in next page 'Save the factory tuned settings'
7. After the factory tuned setting has been saved, double click the file philo to start the Philo Motion Creator. Open the factory tuned motion file (output motion file name you just saved) to try out some motions.
8. If your RoboPhilo is Kit version, follow the instructions in Fine Tuning section.
9. motion-library/ readme.txt describes how to use the motion-library routines.

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Configuration Tab

Use the configuration tab to open the motion file to make modification or to download the latest motions to the RoboPhilo. After you open the motion file, you can use the other tabs to modify the motion or fine tune the RoboPhilo. You can connect to the RoboPhilo and download the current opened motions to the RoboPhilo.

1. Global Serial COM Port Setting
   Port # - select the COM port from the available list of serial port to connect the PC and RoboPhilo.

2. Global Setting
   - Default setting for moving RoboPhilo.
   - Speed – 0 - 15
   - Mode – C = continuous mode.
   - E = equal steps mode.
   - W = wait mode.
   - Steps – 0 - 127
   - Position increment – 0 - 100
   - Need to set up the remote to send command at the same ID.
   - Need to set up the remote to send command at the same ID.
   - 0 is the fastest.
   - All servos will arrive at the final position at the same time.
   - Each step unit is 20 ms wait.
   - Move faster with larger step value for the ‘Continuous Mode’ with non zero speed.
   - Define the number of steps to reach the final position for the ‘Equal Steps mode’.
   - Define the number of 20ms intervals to wait for the ‘Wait mode’.
   - Defines the increments for each click of the up down button for position.

3. File
   - Motion file name – file to open or save. (don't type in the extension ".txt")
   - Open - to read in the motion file.
   - Save Motion - to save the latest motions and fine tune settings to the motion file.

4. Program Robot
   - Download motion to RoboPhilo

After the RoboPhilo is connected to the PC, it will show the Serial Number and the Firmware version of RoboPhilo.

Serial # - Serial Number for RoboPhilo
Version # - Firmware version for RoboPhilo
Connect – (1) Connect the serial cable from the PC to RoboPhilo, (2) Select the com port, (3) Power up the RoboPhilo. (4) Click ‘connect’ within 10 seconds.
Disconnect – switch to command mode for RoboPhilo motion after download.
Load Motion – download the imported motion to RoboPhilo after the connection is successful.
Load Tuning/Setting – download the fine tuning and other settings to RoboPhilo.
Pose Tab

Use the Pose tab to design the RoboPhilo pose by entering the Servo Joint positions in degrees. After you open the motion file, you can retrieve the existing Pose name positions for modifications. You can save the new or modified Pose to the same name or another unique name. Each Pose can be used in more than one sequence. You can connect the RoboPhilo to a PC and play the motions interactively.

1. Servo Position – Current RoboPhilo position
   Click the up down arrow or enter the degree value for the servo joint position, RoboPhilo will move to the position.

2. Pose
   Pose Name – The position name assigned to the current positions.
   Get – Retrieve the positions for the Pose Name from the opened motion file.
   Save – Save the current positions to the Pose Name. **You need to save the motions to a motion file, otherwise, the motion settings will be lost after you exit the program.**
   Delete – Delete the Pose name.

3. Play – Play motion to RoboPhilo
   After the RoboPhilo is connected to the PC in command mode, you can press play to move RoboPhilo to the current positions.
   Speed – 0 – 15  
   0 is the fastest
   Mode – C = continuous mode.  
   E = equal steps mode. All servo will arrive at the final position at the same time.  
   W = wait mode. Each step unit is 20 ms wait.
   Steps – 0 – 127
   Move faster with larger step value for the 'Continuous Mode' with non zero speed.  
   Define the number of steps to reach the final position for the 'Equal Steps mode'.  
   Define the number of 20ms intervals to wait for the 'Wait mode'.
   Position Increment – defines the increments for each click of the up down button for position.
   Auto Play – If checked, RoboPhilo will move on any change in the positions, otherwise, RoboPhilo will move after you click 'Play' button.
   Play – Move RoboPhilo to the current specified positions.
Sequence Tab

Use the Sequence tab to design a series of movement states by assigning the speed and mode to move the specific Pose name one after the other.

Each State Name defines the speed and mode to move to the Pose name. State Name are unique per Sequence and cannot be shared with another Sequence.

After you open the motion file, you can retrieve the existing Sequence name's state for modifications.

You can save the new or modified Sequence to the same name or another unique name.

Each Sequence can be used in more than one Routine assignments.

You can connect the RoboPhilo to a PC and play the Sequence interactively.

1. Sequence

Sequence definition

Seq - Click the up down arrow to reorder the states to move

Speed - 0 - 15 ( 0 is the fastest )

Mode - C = continuous mode
        E = equal steps mode.
        All servo will arrive at the final position at the same time.
        W = wait mode. Each step unit is 20 ms

Steps - 0 - 127
Move faster with larger step value for the 'Continuous Mode' with non zero speed.
Define the number of steps to reach the final position for the 'Equal Steps mode'.
Define the number of 20ms intervals to wait for the 'Wait mode'.

Select - Mark State assignments for deletion or Play

Reset - Reset assignments to previously saved version

Apply Changes - Update all the new sequence changes

Delete - Delete the selected state assignments

2. Sequence Name - The name assigned to the current Sequence States

Get - Retrieve the positions for the Pose Name from the opened motion file.

Save - Save current Sequences to the Sequence Name.
You need to save the Sequence to a motion file, otherwise, the Sequence settings will be lost after you exit the program.

Delete - Delete the Sequence name.

3. Play - Play Sequence to RoboPhilo

After the RoboPhilo is connected to the PC in command mode, you can press play buttons to move RoboPhilo through the current Sequence states.

Select All - Mark all the states in this page for deletion
Clear All - Uncheck all the states for deletion or Play
Play All - Move RoboPhilo through the current specified order of states one after the other.

Play Prev - Move RoboPhilo to the previous specified state
Play - Move RoboPhilo through the current specified state
Play Next - Move RoboPhilo to the next specified state
Routine Tab

Use the Routine tab to design a series of movement states by assigning the Sequence to move one after the other.

Each Routine Name defines a list of Sequence to move one after the other. Routine Name are unique per Motion File and can be used with another Key command assignments.

After you open the motion file, you can retrieve the existing Routine name’s state for modifications.

You can save the new or modified Routine to the same name or another unique name.

Each Routine can be used in more than one Key command assignments.

You can connect the RoboPhilo to a PC and play the Routine interactively.

1. Routine – Sequence definition
   - Seq - Click the up down arrow to reorder the Sequence
   - Sequence Name – Select the sequence name to add to the Routine.
   - Select - Mark Sequence assignments for deletion or Play
   - Reset - Reset assignments to previously saved version
   - Apply Changes - update all the new Routine changes
   - Delete - Delete the selected Sequence assignments

2. Routine Name – The name assigned to the current Sequences
   - Get – Retrieve the sequence states for the Sequence Name from the opened motion file
   - Save – Save current Sequences to the Routine Name. You need to save the Routine to a motion file, otherwise, the Routine settings will be lost after you exit the program.
   - Delete - Delete the Routine name Sequence Name – The name assigned to the current Sequence States

3. Play – Play Routine to RoboPhilo
   - After the RoboPhilo is connected to the PC in command mode, you can press play buttons to move RoboPhilo through the current Routine sequences.
   - Select All - Mark all the Sequence in this page for deletion
   - Clear All - Uncheck all the Sequences for deletion or Play
   - Play All - Move RoboPhilo through the current specified order of Sequences one after the other
   - Play Prev - Move RoboPhilo to previous specified Sequence
   - Play - Move RoboPhilo to current specified Sequence
   - Play Next - Move RoboPhilo to next specified Sequence
Key Tab

Use the Key tab to assign the Routine to the 2 digit key command or remote key command.
After you save the assignments and save the motion file from the Configuration tab, you can open the new motion file and download the motion along with the key assignments to RoboPhilo.

You can then use the remote to run the Routine as follows,
- Press up to 2 digit keys for 0 - 99 then "Enter" to execute the Routine assigned to this key command.
- Press the Remote Key marked KEY1 to KEY 12 to execute the Routine assigned the Remote Key command.

1. Key # Operation assignment

Routine Name - Select the Routine for the key number.
Select - Mark Routine assignments for deletion or Play.
Previous - Show previous 15 key numbers assignments.
Next - Show the next 15 key numbers assignments.

2. Remote Key

Routine Name - Select the Routine for the remote key.
Select Key - Mark Routine assignments for deletion or Play.

3. Play

Run PHILO with the selected Routine.
Select All - Mark all the routine assignment in this page for deletion and Play.
Clear All - Uncheck all the Routines for deletion or Play.
Delete - Delete the selected Routine assignments by setting it to no_op.
Update Changes - updates all the new key assignment changes for the key# on the current page, otherwise, the current changes are lost after you scroll to the previous or next page.
Play - Run PHILO with the selected Routine.
Reset - Reset assignments to previously saved version.
Save Keys - Save the current settings.

You need to save the Key setting to a motion file, otherwise, the Key settings will be lost after you exit the program.
Fine Tuning Operations.

**Fine Tuning Tab**

RoboPhilo requires fine tuning to move the motion position more accurately. You can follow the steps for each servo to adjust the offset and ATV value.

**Position** - Move the servo to the specified degree  
**Offset** - Define the position of the servo at 0 degree  
**ATV** - Adjust the servo travel angle for 180 degree  
**Set Init Position** - Save the current position as the power on position. You need to follow by ‘save’ to save this setting, and then ‘save motion’ in Configuration Tab to save it to the motion file before downloading the setting.

Open the factory motion file. Follow the manual to fine tune the RoboPhilo.  
Once you have finished the settings, you need to save the settings to the motion file in the Configuration tab.  
Save to a new motion file name. Save a copy of the motion file as back up.  
Use the new motion file to create your own motion routines.

![Fine tuning interface](image)

**Up/Down arrow**  
Click the up down arrow or enter the value for the position, offset or ATV. Once you enter the value, RoboPhilo will move the corresponding servo.

**Reset button**  
Reset the current settings to a previously saved check point.

**Save button**  
Save the current settings to a check point that you can reset back to. Once you have finished the settings, you need to save the settings to the motion file in the Configuration tab.
Hand Held Remote.

Handheld Remote Controller control up to 4 robots independently with 4 channels assignments. Program Routines for 12 remote keys and up to 99 two digits key commands.

**POWER** – turn on/off the servos. In power off mode, RoboPhilo will keep the Controller running only.
**SEND** – Not used
**SPEED** – Not used
**MODE** – Not used
**STEPS** – Not used

Press up to 2 digits then “Enter” to issue a 2 digit key command to RoboPhilo to execute the assigned Routine motion.

“SERVO” – Not used
“POSITION” – Not used

Press “REPEAT” to repeat the previous motion until “Enter” or new motion command is pressed.

- Turn 30° left
- Move 1 step left
- Move 1 step backward
- Stand up from a face down on the floor position
- Get down to the floor with the head facing the floor
- Turn 30° right
- Walk 1 step forward
- Move 1 step right
- Stand up from a back down on the floor position
- Get down to the floor with the back on the floor

**Remote Key**
Press the remote key to send the remote key command to RoboPhilo to execute the assigned Routine motion.

**Setup the Robot ID to send the command.**
Press “POWER” + “SETUP”, 00-31, one of the CH-A to CH-D key to assign the 2 digit Robot ID to the Channel Key pressed.

After the channel key is pressed, the command will send to the assigned Robot ID.
You can control up to 4 robots with one remote by pressing the specific channel key to switch the robot ID to send the command to assigned robot.

All Channels have Robot ID 31 after battery is changed.
Motion File

The motion file contains the configuration parameters and the motion with remote control key assignments.

The file contains 5 sections with the section name taken as the first parameter:
1. config - defines the general configuration parameters.
2. servo - defines the configuration parameters for each servo joint.
3. pose - defines the position for each servo.
4. sequence - defines the list of states to move.
5. states - defines the speed and mode to move to the specified pose.
6. routine - defines the list of sequence to move.
7. key - defines the routine assignments to 99 two digits key command and 12 remote key command for the handheld remote controller.

Setup RoboPhilo

RoboPhilo comes with the factory default motion file. It contains the factory settings and the predefined motion with remote key assignments. You need to run the Motion Creator program - philo and open the motion file to download to RoboPhilo.

Create new motion

Make a copy of the factory default motion file before creating your own motion. Since the configuration and servo settings are necessary for RoboPhilo to function, you need to open the factory default motion file first. You can then modify the motions or add your new motions with new remote key assignments. After you complete the motion changes, you need to save all the changes and save the motions to another motion file.

Download the new motion to PHILO

You need to open the new motion file and connect the PC to RoboPhilo for download. Download the motion and the tuning/setting to RoboPhilo.

Do not change the order of the parameters token order. Do not change the order of the Key section for 2 digits key, predefined key and the remote key.
General Configuration Parameters

**Pulse1** — pulse parameter (not changeable)
**Pulse2** — pulse parameter for 1 deg (not changeable)
**Pulse3** — Pulse parameter for servo (not changeable)

**Remoteld** — Robot ID. After open this motion file and download the tuning/setting to RoboPhilo, RoboPhilo will use this Robot ID.

**LowPower** — Value used to blink the LED once the battery voltage drops before this value. The value can be 0 – 100. The higher the number, the earlier the LED will blink.

---

<table>
<thead>
<tr>
<th>NAME</th>
<th>Initial position</th>
<th>Offset</th>
<th>ATV adjustment</th>
<th>Upper Limit</th>
<th>Lower Limit</th>
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<td>10</td>
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<td>200</td>
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<td>43</td>
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<td>128</td>
<td>125</td>
<td>0</td>
</tr>
</tbody>
</table>

**Servo Configuration Parameters**

**NAME** — Servo name for the joint

**LHAND** — Left hand servo (Not used)
**HEAD** — Head servo
**LLT** — Left leg turn servo
**LHIP** — Left hip servo
**LLEG** — Left leg servo
**LKNEE** — Left knee servo
**LANKLE** — Left ankle servo
**LFOOT** — Left foot servo
**RSHOULDER** — Right shoulder servo
**RARM** — Right upper arm servo
**RELBOW** — Right elbow servo
**RWRIST** — Right wrist servo (Not used)

**RHAND** — Right hand servo (Not used)
**WAIST** — Waist servo
**RLT** — Right leg turn servo
**RHIP** — Right hip servo
**LSHOULDER** — Left shoulder servo
**LARM** — Left upper arm servo
**LELBOW** — Left elbow servo
**LWRIST** — Left wrist servo (Not used)
**RFOOT** — Right foot servo
**RANKLE** — Right ankle servo
**RKNEE** — Right knee servo
**RLEG** — Right leg servo

**Init pos** — Initial position in degrees after power on

**Offset** — Define the position of the servo at 0 degree

**ATV adjustment** — Define the servo travel parameter for 180 degree degrees

**Upper Limit** — The upper limit of angle for the servo to turn

**Lower Limit** — The lower limit of angle for the servo to turn
Pose Configuration Parameters
name – Pose name for the joints positions
LS – Left shoulder servo
RS – Right shoulder servo
LUA – Left upper arm servo
RUA – Right upper arm servo
LE – Left elbow servo
RE – Right elbow servo
LW – Left wrist servo (Not used)
RW – Right wrist servo (Not used)
LHD – Left hand servo (Not used)
RHD – Right hand servo (Not used)
HEAD – Head servo
W – Waist servo
LLT – Left leg turn servo
RLT – Right leg turn servo
LH – Left hip servo
RH – Right hip servo
LL – Left leg servo
RL – Right leg servo
LK – Left knee servo
RK – Right knee servo
LA – Left ankle servo
RA – Right ankle servo
LF – Left foot servo
RF – Right foot servo

Sequence Configuration Parameters
NAME – defines the name for this sequence containing a list of the states.

State Configuration Parameters
NAME – defines the name for states.
Speed – 0 – 15
0 is the fastest.
Mode – C = continuous mode.
E = equal steps mode.
W = wait mode.
Steps – 0 – 127
All servos will arrive at the final position at the same time.
Each step unit is 20 ms wait.
Move faster with larger step value for the 'Continuous Mode' with non zero speed.
Define the number of steps to reach the final position for the 'Equal Steps mode'.
Define the number of 20ms intervals to wait for the 'Wait mode'.
Pos name – defines the pose name for this state to move at the speed and mode defined.
Routine Configuration Parameters

NAME – defines the Routine name that contains a list of sequences in one line.
Sequence name – defines the sequence name for the motion.

Key Configuration Parameters

NAME – defines the key name assigned to the Routine.
Routine name – defines the routine name assigned to the key command.
KEY_1 .. KEY_99 – defines the key name for the 2 digits key command.

KEY_NW – key name for turn left
KEY_N – key name for move forward
KEY_NE – key name for turn right
KEY_W – key name for move left
KEY_E – key name for move right
KEY_S – key name for move backward
KEY_FRONT_UP – key name for stand up from face down to the floor
KEY_FRONT_DOWN – key name for get down with the head facing the floor
KEY_BACK_UP – key name for stand up from back down to the floor
KEY_BACK_DOWN – key name for get down with the back on the floor
REMOTE_KEY_1 .. 12 – defines the key name for the 12 remote key commands

Do not change the order of the parameters token order.
Do not change the order of the Key section for 2 digits key, predefined key and the remote key.
1. How to use the motion library

Since RoboPhilo can store up to 8K bytes of motions, you can tailor what motion to download to RoboPhilo, not to have more than 8Kb of motions.

The RoboPhilo CD comes with a library of motion files that you can add to the base-motion file to meet your need.

You can start with the base-motion file and then add the other motions to this file as follows,
a. use notepad open the other motion file you want to add
b. select 'edit', 'select'all', 'copy'
c. select 'file', 'exit' to close the file
d. use notepad to open the 'base-motion' file
e. go to the end of the file
f. select 'edit', 'paste'
g. select 'file', 'save', 'exit' to save the file
h. use 'philo' GUI motion creator and open the new file, then download it to RoboPhilo.

You may find multiple pose and sequence after adding multiple motion library routines.
Example: reset, lean. If they have not been changed, you can leave the multi pose or sequence names in the system, it will work. You can delete them and keep one in the final motion file to save storage. If you have changed some of them, you need to decide which one to keep.

2. Motion library contents

base-motion - basic routines for move forward, backward, left, right, turn left, turn right, stand up, sitdown, front up, front down, back up, back down

philo-motion - base motion plus bow, dance, flipfwd, kungfu, pushup, soccer

bow - bow forward, bow back routine
dance - sample dancing routines
eight - exercise routine showing eight glamour styles
fastwalk - fast walking routine
flipfwd - flip over routine
kungfu - short kung fu routines
kungfu2 - more kung fu routines
nnwalk - more walking routines as reference
pushup - push up routine
salute - salute routine
soccer - soccer routines for blocking, getup and kicking
welcome - welcome routine
taichi - simple tai chi routine
Sample Motion Routine Exercise.

1. System Requirement:
   a. Windows XP or Vista Operating System.

2. Put in the PHILO CD and open the folder for Installation.
3. Double click the file dotnetfx and follow the instruction to install the .net 2.0 redistributable from Microsoft.
4. Double click the file vcredist_x86 and follow the instruction to install the Visual C++ 2005 SP1 redistributable from Microsoft.
5. Installation done.

6. Double click the file philo to start the Philo Motion Creator.
7. Select “Configuration Tab” to continue.
Configuration Tab

Connect the serial cable from the computer to the RoboPhilo.

Power on RoboPhilo.

Select the COM port from the list. For multiple COM ports computer, you need to do some motion to validate the port is the one connected to RoboPhilo in the next steps.

Import the factory default motion file to try out a sample motion sequence.

Wait for the “Initialization is done” message, click ok.

---

① Select the COM port from the list of available serial port to connect the PC and RoboPhilo.
For multiple COM ports computer, you need to do some motion to validate the port is the one connected to RoboPhilo, in the next steps.

② Enter the motion file “philo-motion”. Click “open” to open the motion file to try out the sample routine sequence.

③ Select “Pose Tab” to continue.
Pose Tab

Use the Pose tab to design the RoboPhilo pose by entering the Servo Joint positions in degrees.

After you open the motion file, you can retrieve the existing Pose name positions for modifications.

If the RoboPhilo does not move, try plug the serial cable to another port until it moves.

Play motion to RoboPhilo.

Select “lean” from the Pose Name.

Click “Get” to retrieve the pose positions.

Click “Play” to move RoboPhilo to the pose.

If RoboPhilo does not move, try plug the serial cable to another COM port.

Click “Auto Play” to turn on auto play mode.

Click the up/down or enter new position angle to the Right Arm Joint, the arm should move.

Select “init” from the Pose Name.

Click “Get” to retrieve the pose positions.

Click “Play” to move RoboPhilo to init position.

Select “Sequence Tab” to continue.
Sequence Tab

Use the Sequence tab to design a series of movement states by assigning the speed and mode to move the specific Pose name one after the other.

Select a sequence from the list of sequence name.

Try Play All, Play, Play Next, Play Prev.

Play Sequence to RoboPhilo.
Select "RP-sitdown" from the Sequence Name.
Click "Get" to retrieve the list of states for the sequence.
Click "Play" to move RoboPhilo to the leandown state.
Click "Play Next" to move RoboPhilo to the next state.
Click "Play Prev" to move RoboPhilo to the previous state.
Click "Play Next" again until "sitdownstr" state is played.
Select "standup" from the Sequence Name.
Click "Get" to retrieve the list of states for the sequence.
Click "Play All" to move RoboPhilo to stand up position.
Select "Routine Tab" to continue.
Routine Tab

Use the Routine tab to design a series of movement states by assigning the Sequence to move one after the other.

Create a routine from existing sequence.

Try Play All, Play, Play Next, Play Prev.

Play Routine to RoboPhilo.
Select “flip-fwd” from Seq 1 Sequence Name.
Select “back_up” from Seq 2 Sequence Name.
Click “Update Changes” to update the new changes.
Enter “flip-fwd” to the Routine Name.
Click “Save” to save the two sequences to the routine name “flip-fwd”.
Click “Play All” to move RoboPhilo flip forward and then stand up again.
Click “Save” to save the new Routine.
Congratulations!
You have created a new Routine from the list of sequence.
Select “Key Tab” to continue.
Key Tab

Use the Key tab to assign the Routine to the 2 digit key command or remote key command.
Assign the new Routine to a remote key.
Try “Play” to run the Routine for the specified key.

Run RoboPhilo with the selected Routine.
Select “sittdown_up” from the KEY 1 Routine Name to assign “sittdown_up” to KEY 1.
Click “Update Changes” to update the new changes for this page.
Click the check box for KEY 1
Click “Play” to move RoboPhilo sit down and then stand up again.
Click “Save Keys” to save the changes.
Congratulations!
You have successfully assign a routine to the remote key.
Select “Configuration Tab” to continue.
Sample Motion Routine Exercise.

Configuration Tab

Save the newly created motion.

Save the newly created motion to a new motion file using "Save Motion".

You can play the new motions with the newly created motion file through the computer.

Save the newly created motion.

Enter the motion file "my_motion".

Click "Save Motion" to save all the motions to the new motion file.

Click OK to save the file.

You can play the motions connecting to the computer.
Configuration Tab

Load the new motions to the RoboPhilo.

Download the new motion to the RoboPhilo.

Use the remote to exercise the newly created motion.

Use the remote to exercise the newly created motion.

Power off RoboPhilo.
Power on RoboPhilo.

Click “Connect” within 10 seconds to start the download connection.

If the connection is successful, you can see the Serial No. and the version of the RoboPhilo.

Enter “my_motion” to the Motion File Name.

Click “Load Motion” to download the new motions to RoboPhilo.

Power off RoboPhilo.
Power on RoboPhilo.

Press KEY 1 on the remote, RoboPhilo will sit down and then stand up again.

Congratulations!

You have learned how to program the remote to play a newly created Routine.
Load PHILO program, motions and tuning settings to the RoboPhilo

Setup the COM port to connect PC to RoboPhilo
Use Verify option to check the motion file syntax error
Use Download menu to reload the PHILO program, motion and tuning setting

You may need to reload the PHILO program, motion and tuning setting if the RoboPhilo flash memory is corrupted after running in a very low power voltage.
If the RoboPhilo does not stand up after power on for 20 seconds, you may need to reload the program, motion and tuning setting again.

Setup COM port
Power on RoboPhilo
Enter “C” to select COM port setting
Enter the COM port number you have connected to the RoboPhilo
If successful, you can continue to reloading the program, motion and tuning setting.
(lower case input is ok)
Reload PHILO Program

Power on RoboPhilo
Enter “D” within 10 seconds to start the download connection
If the connection is successful, you can see the Serial No.
If it fails, double check the COM port connection. Do COM port setting again.
Enter “L” to load the PHILO program
Enter “philo” to the file name
Enter “00000009” as the default serial no.
Enter “W” and then “P” to reload the PHILO program to RoboPhilo
If successful, you need to power off and power on the RoboPhilo to use the new program before reloading the motion and tuning setting.
(lower case input is ok)
Reload PHILO motion and tuning setting

Power on RoboPhilo
Enter “D” within 10 seconds to start the download connection
If the connection is successful, you can see the Serial No.
If it fails, double check the COM port connection. Do COM port setting again.
Enter “L” to load the PHILO motion
Enter “philo-motion” to the file name
Enter “W” and then “M” to reload the PHILO motion to RoboPhilo
Enter “C” to load the PHILO tuning setting
Enter “W” and then “C” to reload the PHILO tuning setting to RoboPhilo
If successful, you need to power off and power on the RoboPhilo to use the new motion and tuning setting.
The motion and tuning setting need to be set together. (lower case input is ok)

Serial port COM1 successfully reconfigured for download.
Connected with robot

Robot Control Download Menu
Robot Serial No = 0000000000
1)Import encrypted program
L)oad motion
C)onfiguration update
W)rite Configuration/Motion/Program to Robot
E)xit

Import a motion file will clear all current motion state not saved

Enter input file name philo-motion

Success: Motion file loaded ok

dataStart = 5000 Length = 1106

Robot Control Download Menu
Robot Serial No = 0000000000
1)Import encrypted program
L)oad motion
C)onfiguration update
W)rite Configuration/Motion/Program to Robot
E)xit

This operation may take up to 10 seconds

Download to Robot successful

Robot Control Download Menu
Robot Serial No = 0000000000
1)Import encrypted program
L)oad motion
C)onfiguration update
W)rite Configuration/Motion/Program to Robot
E)xit

Update configuration successfully.
Verify motion file

Enter "V" to select the verification
Enter the motion file name to check the syntax correctness
If the motion file is loaded OK, the check is successful. You can use the motion file in the Motion Creator GUI 'Philo'
If there is syntax error, it will print out which pose, sequence or routine names are missing. It will stop at the first error. You may need to run the check again after the fix until the whole file is good.
Use this check if you copy motion routines from other files or you have manually edited the motion file.
It will also show how much flash memory is used for the motions in this file. It will show error if the motion is larger than 8K.
(lower case input is ok)
Retrieve Fine Tune Setting
Enter “G” to select the generate new motion file option
Enter the existing motion file name to be updated with new fine tune setting from the robot
Enter the output file name
If the motion file is loaded ok, it will generate a new motion file with the new fine tune setting retrieved from the robot.
You may get invalid large numbers if the robot is just power on, wait for a minute and do it again. You may also get invalid large numbers if the robot has low power, plug in the charger and do it again.
(lower case input is ok)
Technical Data

Name: RoboPhilo
Height: 13" (330.2mm)
Weight: 1.2 kg (1200g) with battery
Included: PCB unit
  36 kHz controller
  36 kHz receiver
  6V Ni-MH battery (RBKB05051)
  7.2V 1000mA charger (RBCGSAW08)
  Graphical motion editor software
  Hanger Stand

Safety precautions on the use and handling of battery ⚠️

- Batteries should be charged prior to use.
- When using a new battery for the first time or after long term storage, please fully charge the battery before use.
- For charging methods please refer to our technical handbook.
- Use the supplied charger (RBCGSAW08) for batteries.
- Do not reverse charge batteries.
- Do not short circuit batteries, permanent damage to batteries may result.
- Do not incinerate or mutilate batteries, may cause explosion or release of toxic material.
- Store batteries in a cool dry place.
- If there is excessive temperature or leakage from a battery, please stop using immediately.
- When the battery is hot, please do not touch it and handle it, until it has cooled down.
- Do not remove the outer sleeve from a battery pack nor cut into its housing.
- When using a battery, disconnect it from the device.
- Unplug a battery by holding the connector itself and not by pulling at its cord.
- After use, if the battery is still hot, allow it to cool down before recharging it.
- Never put a battery into water.
- During long term storage, battery should be charged and discharged once every 3 months.
- Do not attempt to take batteries apart or subject them to pressure or impact. Heat may be generated or fire may result. The alkaline electrolyte is harmful to eyes and skin, and it may damage clothing upon contact.
- Keep away from children. If swallowed, contact a physician at once.
RoboPhilo Additional Instructions

1. Preparing Servos before assembling the RoboPhilo.

Servos with taps to be removed.
SV4140 x 2, SV4032-B x 2, SV4032-C x 4, SV4032-D x 4, SV2031 x 1

- Please choose the above servos from the kit box as shown below.
- Please cut off the servo taps with a sharp cutter carefully as shown on the right and place them back in the kit box for later installation.

- SV4032-B x 2
  - Cut off the taps carefully with a sharp cutter.
  - Servo SV4032-B with taps removed.

- SV4032-C x 4
  - Cut off the taps carefully with a sharp cutter.
  - Servo SV4032-C with taps removed.

- SV4032-D x 4
  - Cut off the taps carefully with a sharp cutter.
  - Servo SV4032-D with taps removed.

- SV4140 x 2
  - Cut off the taps carefully with a sharp cutter.
  - Servo SV4140 with taps removed.

- SV2031 x 1
  - Cut off the taps carefully with a sharp cutter.
  - Servo SV2031 with taps removed.
RoboPhilo Additional Instructions

2. Revision of page 25, 27, 30, 31, 32

P.25
- SV2030A x 1 pc  →  SV2031 (ap removed) x 1 pc
- SV2030B x 2 pcs  →  SV2031 x 2 pcs
- RB008 x 12 pcs  →  x 16 pcs
- PWA2X8 x 20 pcs  →  x 24 pcs
- PA2X5 x 38 pcs  →  x 34 pcs

P.27
Correct size of screws use for step 9 are KA2x10 (4 pcs) in page 27.

Step 9

The smooth surface of RB021 should face out.

P.30
Code no of RB024 & RB025 revised as RB024S & RB025S in page 30..

Step 8
Add a few drops of super glue (not supplied) on both sides to securely bond the RB003-B and RB013 together; also the RB012 and the RB003-B.

Step 9 Correct size of screws use for step 9 are PWA2x8 (2 pcs) in page 30.

Add a few drops of super glue (not supplied) on both sides to securely bond the RB003-B and RB024S together.

Cut the RB008 and insert between screw PWA2x8 and the servo SV2031 onto the RB024S as shown.
RoboPhilo Additional Instructions

**P.31**

**Step 10** Repeat steps 5 to 9 to assemble the right thigh. Use the RB025S instead of RB024S for the right thigh. Note that the thigh servo pinions should be close to each other towards the line of symmetry.

**P.32**

**Step 17** Adhere the double side tape to a SV2031 as shown.

![Double side tape and SV2031](image)

3. Change the ATV for RLT from 146 to 130 before building the RoboPhilo.

1. Use notepad to open the “philo-motion.txt” file from the local disk copy.

![File Explorer with philo-motion.txt](image)

2. Lookup the ATV adjustment column for RLT with the value 146

<table>
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<th>NAME</th>
<th>Init pos</th>
<th>offset</th>
<th>ATV adjustment</th>
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<tr>
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3
RoboPhilo Additional Instructions

3. Change 146 to 130

4. Save and close the notepad.

5. Use "loadphilo.exe" to load the new motion file to the board first and please refer to page 73 to 75 of RoboPhilo User Guide before doing the fine tuning steps.