’PLEN’－Desk Top Hobby Robot

Instruction Manual

English Manual Prepared by

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Safety Precautions

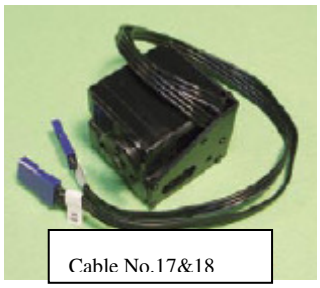
In order to minimize the risk of possible harm, and or damage, to property of the users (and third parties) of this product, we strongly recommend that you thoroughly read through this manual before you attempt to assemble and use PLEN.

- Prior to starting the assembly of 'PLEN', prepare in advance a clear , flat work surface, free of obstacles that may hamper the assembly operation.(1mx1m should be sufficient)
- To prevent the risk of fire or electric shock, do not expose this product, or individual components, to such things as water or excessive moisture. Furthermore, do not attempt to tamper with, or insert foreign objects into this product, or the individual components.
- To prevent the risk of fire or electrical problems, do not cover this product during times of operation. (eg. cloths or blankets)
- To prevent the risk of fire or mechanical/electrical problems, do not attempt to disassemble, modify, or tamper with the control base and /or servo motors, in any way what so ever.
- To avoid fire or mechanical/ electrical problems, use only the parts/ components listed. Do not use battery packs or servo motors, other than those recommended.
- When recharging the battery pack, do so in a location that is open, ventilated, and is clearly visible (not concealed). Do not attempt to recharge 'defective' battery packs.
- AC adapter, 3P10-N1012, included with the components, is compatible with most electrical supplies world wide. (If in doubt, please visit our web site www----------.).
- When the control base is exposed (uncovered), care should be taken to prevent short circuiting the components.
- During the assembly process, while moving parts are still exposed, take care to avoid 'catching fingers' in the moving parts while operating.
- Only operate this product on a clear, flat, stable surface. Do not drop, or expose to vibrating machines/devices.
- Keep this product away from infants and small children, unless strictly supervised.

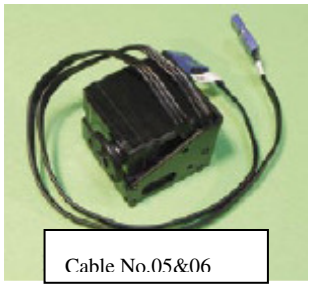
Recommended Tools to build PLEN

A Phillips head screw driver (#0,#1)
Scissors
Tweezers
A screw stopper agent

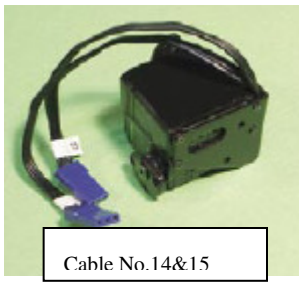
PARTS LIST 1



R. Ankle Servo Block (long)



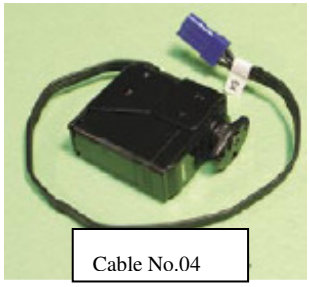
L. Ankle Servo Block (long)



R .Thigh Servo Block (short)

L .Thigh Servo Block (short)

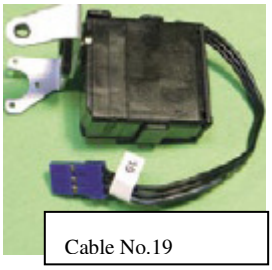
R. Knee Servo Unit



L. Knee Servo Unit

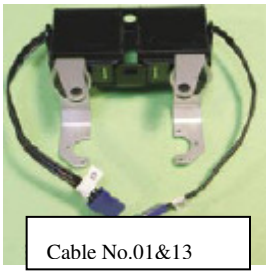
R. Arm Servo Unit

L. Arm Servo Unit



R. Shoulder Servo

L. Shoulder Servo



Waist Servo Unit

Back Frame

Elbow Frame x 2

R. Thigh Frame

L. Thigh Frame

Shin Frames x 2

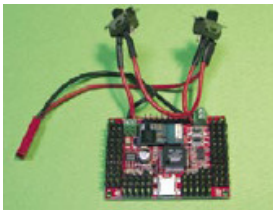
R. Ankle Frame

L. Ankle Frame

Sole Plates x 2

Switch Bracket

Neck Plate x 2



Controller Circuit Board

LED Board

Battery Pack

Battery Charger

USB Cable

CD ROM

Vinyl Cable

PARTS LIST 2

Face Plate
Part A

Head
Part B

Neck Plate
Part C

Stomach
Cover

Back Cover

Elbow Covers

R. Arm Cover

L. Arm Cover

R. Shin Cover
(outer)

L. Shin Cover
(inner)

R. Shin Cover
(inner)

L. Shin Cover
(outer)

Shin Cover
(front x2)

Thigh Cover
(x2)

R. Cover
(instep)

L. Cover
(instep)

Sole Cover
(x2)

M1.7
Flat top screws

M2x2.5
Flat top screws

M2x4
Flat top screws

M3
Flat top
Screws

M2.6
Round top
Screws

M2
Round top
Screws

M2x8
Round top
Screws

Self Tapping
Screws

Spacer
$\phi 3 \times 5$

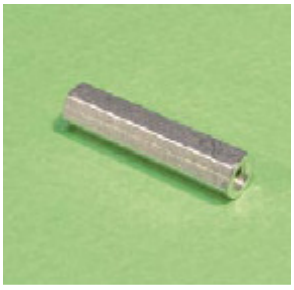
Servo Joints
a.k.a “Horns”

Parts list 3 (roller skate kit)

Roller Skate Frame A (x2)

Roller Skate Frame B (x4)

Roller Wheels (x8)



Roller Wheels Axle Spacers (x4)

M3×15 Flat top Screws (×8)

M2×5.5 Round top Screws (x8)

Roller Wheel Spacers ϕ4x3 (x16)

Right Leg Unit Assembly - Stage 1

Parts

Sole Plates (x2)

R. Cover (instep)

R. Ankle Frame

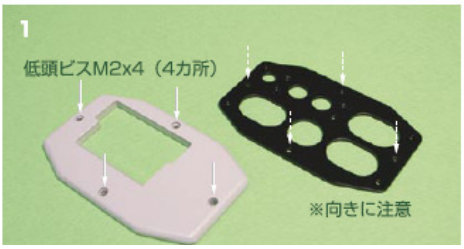
R. Ankle Servo

Flat top screw M1.7 (x3)

Flat top screw M2×4 (x4)

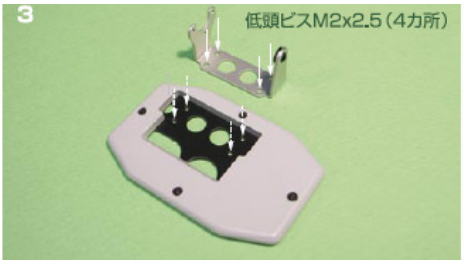
M2×2.5 (x4) Flat top Screw

M2.6 (x1) Round top Screw



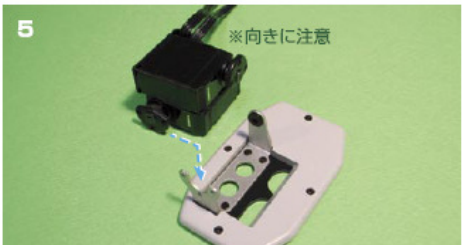
Attach the R instep Cover to the Sole Plate and secure using M2x4 Flat top screws.

Shown assembled.

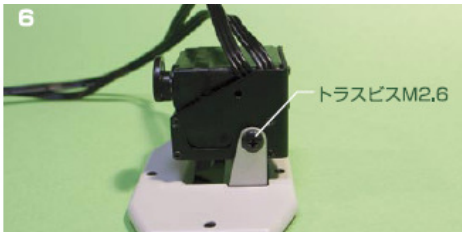


Attach the R ankle frame to the Sole Plate, and secure using M2×2.5 Flat top screws.

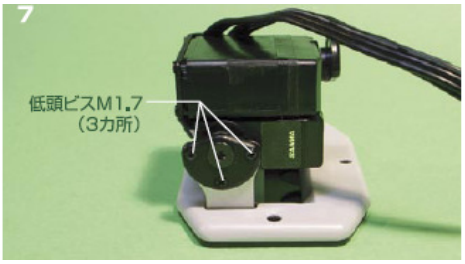
Step 3 shown assembled.



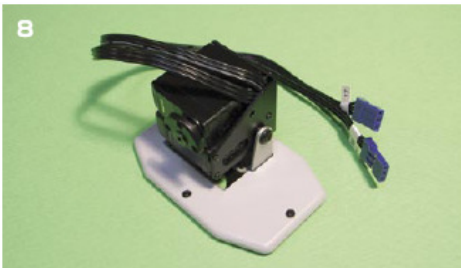
Attach R Ankle Servo Motor to the Ankle Frame as shown.



Secure using M2.6 Round top screw.



Attach the Servo Joint and secure using M1.7 Flat top screws.

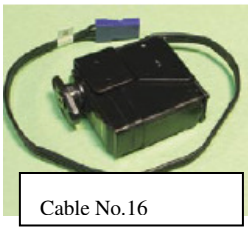


R Leg Unit (Stage 1) shown assembled

Right leg unit assembly - Stage 2

Necessary Parts

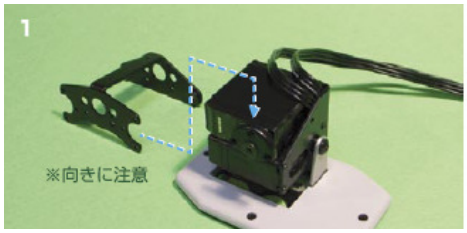
Shin Frame



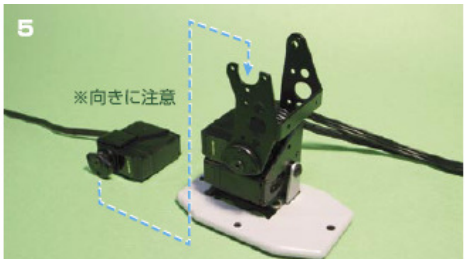
R. Knee Servo Motor

M1.7 Flat Top screw (x6)

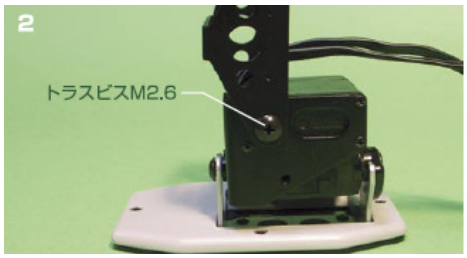
M2.6 Round Top screw (x2)



Attach the Shin Frame to the R Ankle Servo Block. (Stage 1 assembly) as shown

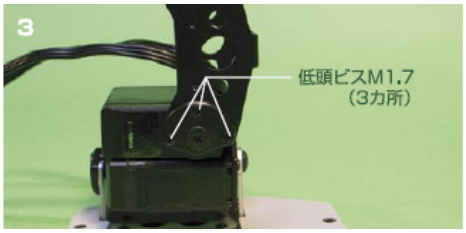


Attach the R Knee Servo Unit to the Shin Frame as shown



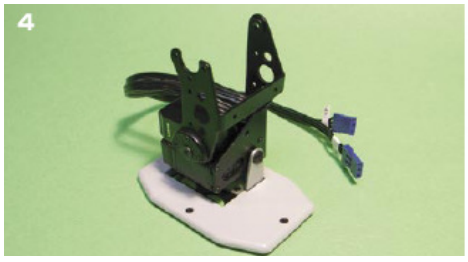
Secure using M2.6 Round top screw

Secure using M2.6 Round top screw

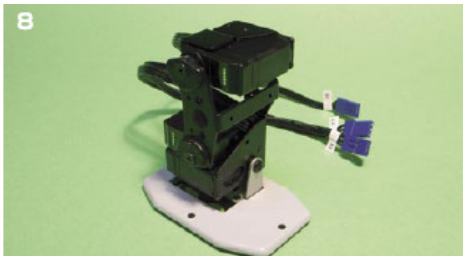


Attach the Servo Joint to the Shin Frame as shown, and secure using M1.7 Flat top screw

Attach the Servo Joint and secure using M1.7 Flat top screw



Step 1,2 and 3 shown assembled



Right Leg Unit (Stages 1＋2)shown assembled

Right Leg Unit Assembly - Stage 3

Parts

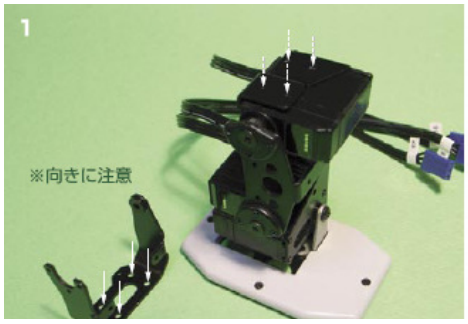
R. Thigh Frame

R Thigh Servo Block (short) Cable No14,15

M2×2.5 Flat top screw (x4)

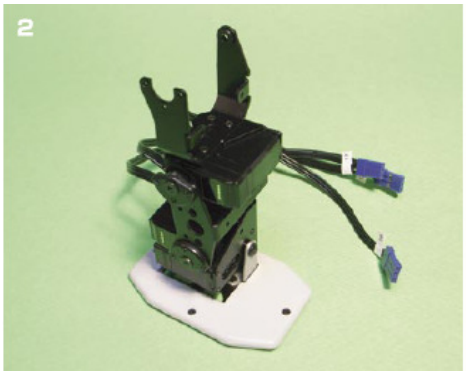
M1.7 Flat top screw (x3)

M2.6 Round top screw (x1)



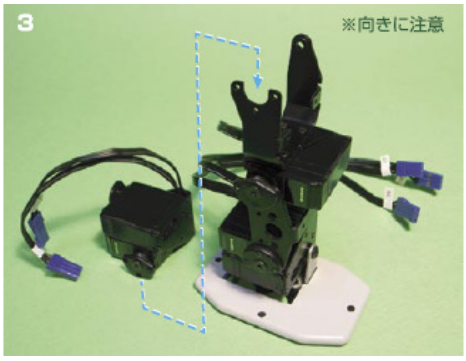
Attach R Thigh Frame to the R Knee Servo Unit and secure using M2×2.5 Flat top screw (x4)

Secure using M2.6 Round top screw

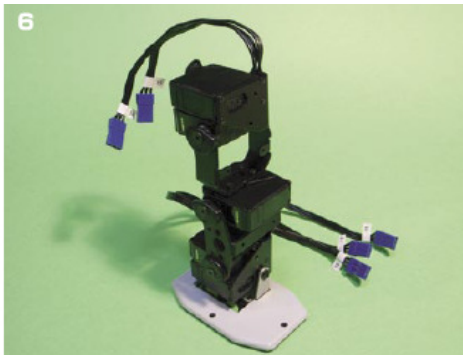


Step 1 shown assembled

Attach the Servo Joint and secure using M1.7 Flat top screw



Attach R Thigh Servo Block (Step1) to the R Thigh Frame



The complete R Leg Unit shown assembled

Left Leg Unit Assembly - Stage 1

Parts

Sole Plates (x2)

R. Cover (instep)

R. Ankle Frame

Cable No.05&06

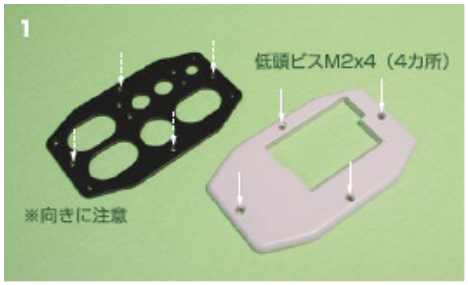
R. Ankle Servo (cable No. 05,06)

Flat top screw M1.7 (x3)

Flat top screw M2×4 (x4)

M2×2.5 (x4) Flat top Screw

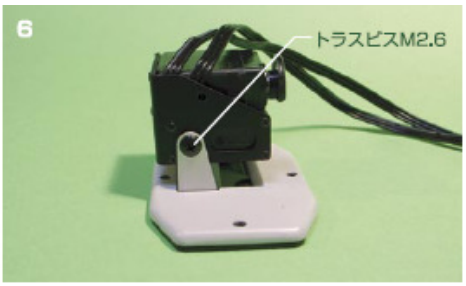
M2.6 (x1) Round top Screw



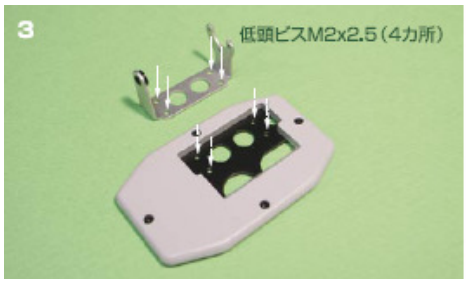
Insert 4 M2x4 screws as shown

Please pay attention to the orientation

As shown



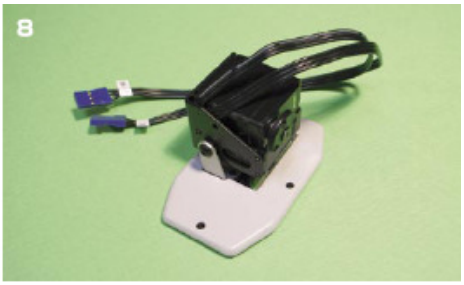
Insert Round top M2.6 screw



Insert 4 M2x2.5 Flat top screws

Lock down the servo with 3 M1.7 Flat head screws

As shown



Complete assembly as shown

Left Leg Unit Assembly: Stage 2

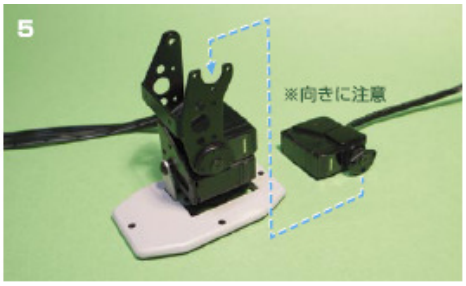
Shin Frame

Cable No.04

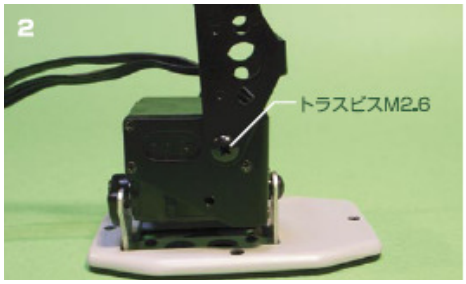
Flat top
M1.7 (x6)

Round top
M1.7 (x6)

Pay attention to orientation of brackets

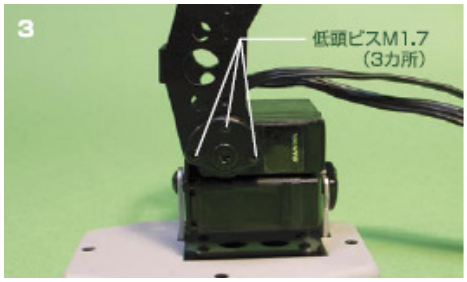


Pay attention to orientation of brackets



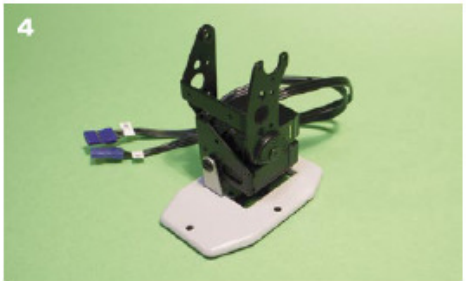
Insert Round top M2.6

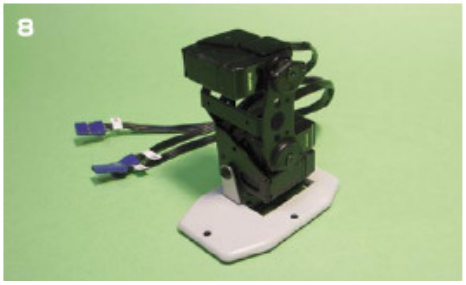
Insert Round top M2.6



Lock down the servo motor with 3 M1.7 screws as shown

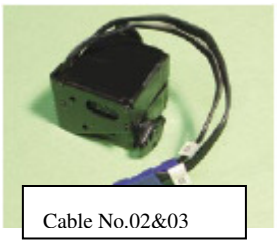
Lock down the servo motor with 3 M1.7 screws as shown





Left Leg Unit Assembly: Stage 3

L. Thigh Frame



L Thigh Servo Block (short)

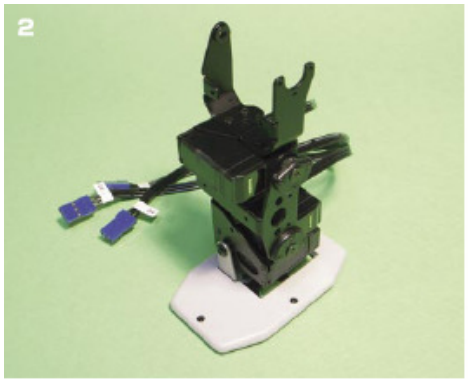
M2×2.5 Flat top screw (x4)

M1.7 Flat top screw (x3)

M2.6 Round top screw (x1)

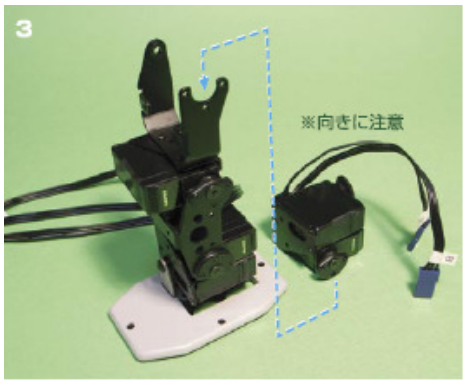
Insert (4) M2x2.5 screws

Insert one Round top M2.6 screw

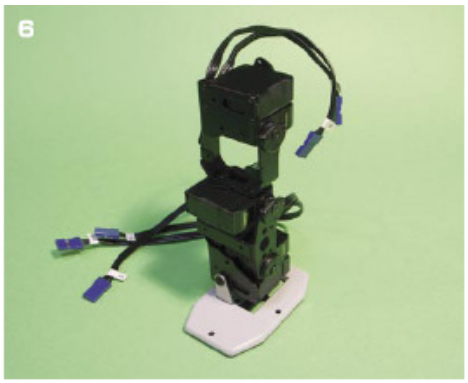


As shown

Lock down the servos with 3 M1.7

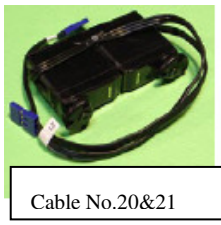


Mount servo block on leg



As shown

Arm Unit Assembly



R. Arm Servo Unit

L. Arm Servo Unit

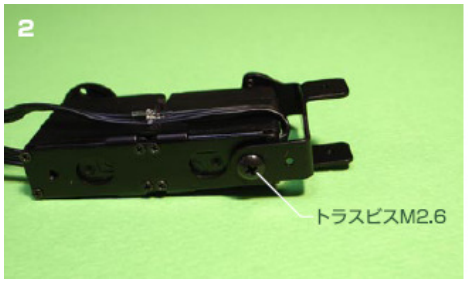
Elbow Frame (x2)

Flat Top M1.7 (x6)

Round Top M2.6 (x2)

Right Arm Assembly

Connect the elbow frame to the right arm servo unit



Secure to front with M2.6 screw

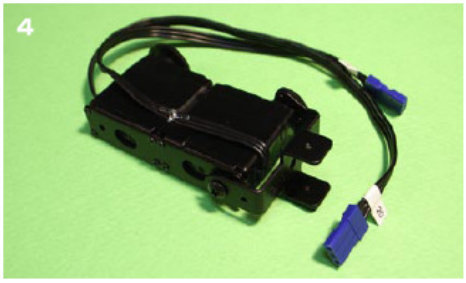
Lock down servo with 3 M1.7 screws

Left Arm Assembly

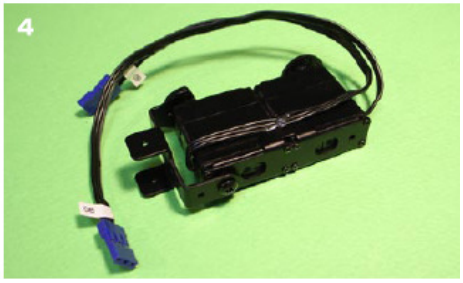
Connect the elbow frame to the left arm servo unit

Secure to front with M2.6 screw

Lock down servo with 3 M1.7 Screws



Completed R. Arm assembly

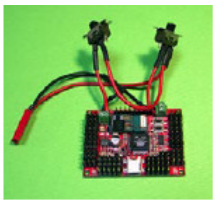


Completed L. Arm assembly

Body (Upper) Unit Assembly - Stage 1

Parts

Back Frame



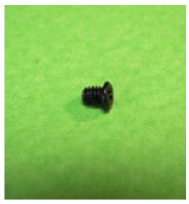
Control Circuit Board

Cable No.19

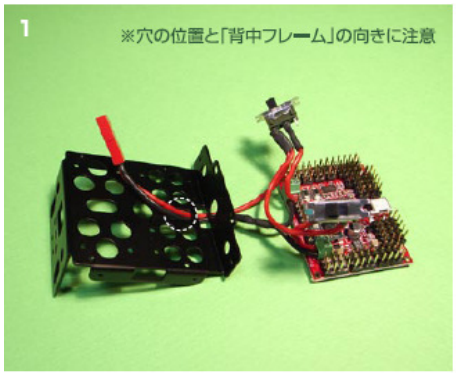
R. Shoulder Servo Unit

Cable No.07

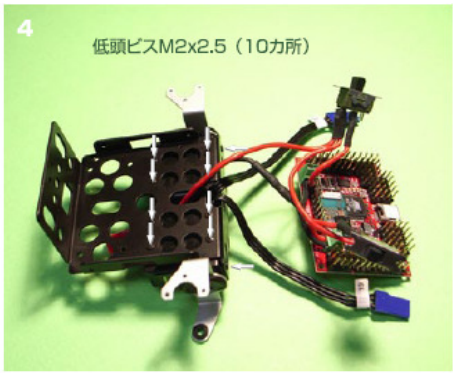
L. Shoulder Unit Cable



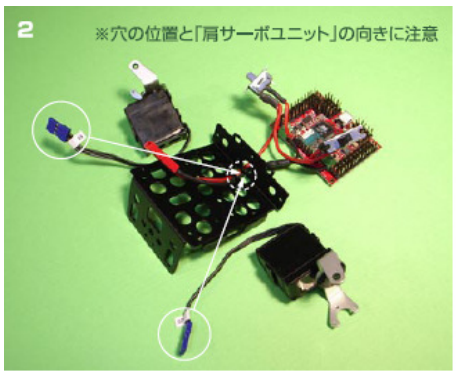
M2×2.5 Flat Top screw (x4)



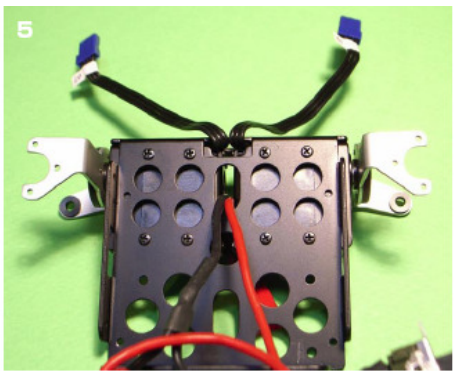
Thread the cables of the Control Circuit Board through the Back Frame



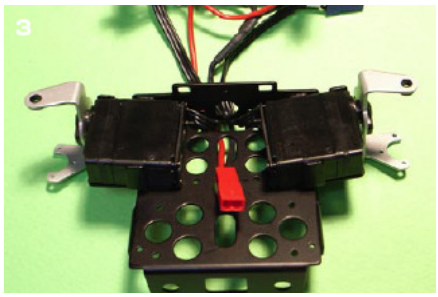
M2x2.5 Flat Top screw as shown.



Thread the cables of Shoulder Servo



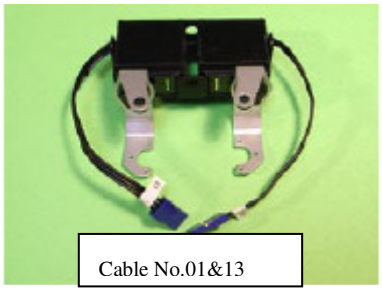
Ensure the cables are as shown



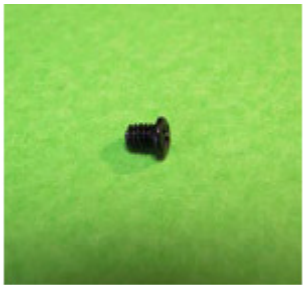
Shows steps 1 and 2 completed. Check!

Body (Upper) Unit Assembly - Stage 2

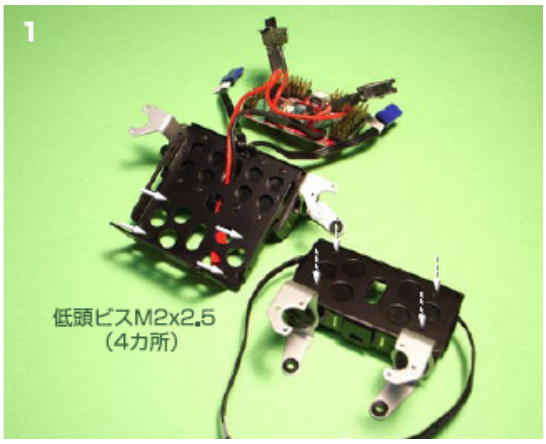
Parts



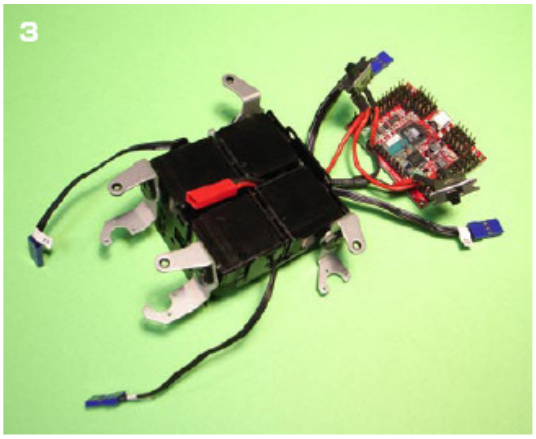
Waist
Servo Unit



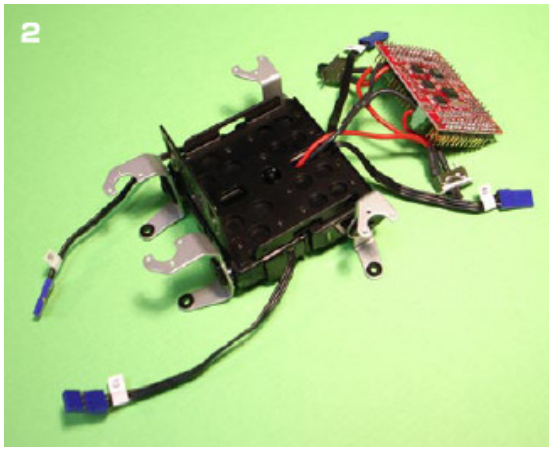
M2×2.5
Flat top screw (x4)



Attach Waist Servo Unit to Back Frame
Secure using M2×2.5 FlatTop screws.



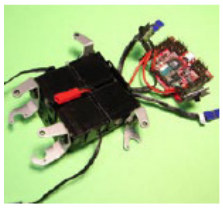
The Back Frame unit is complete



Ensure the positioning is as shown.

Attaching the Arm Units

Parts



Body Unit

R. Arm Unit

L. Arm Unit

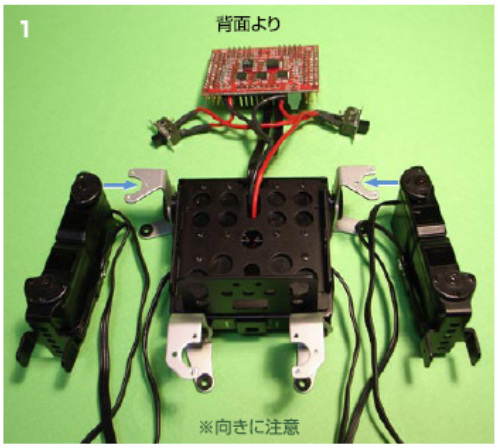
Vinyl Cord
(for Cable Ties)

M1.7 Round

Top screw (x6)

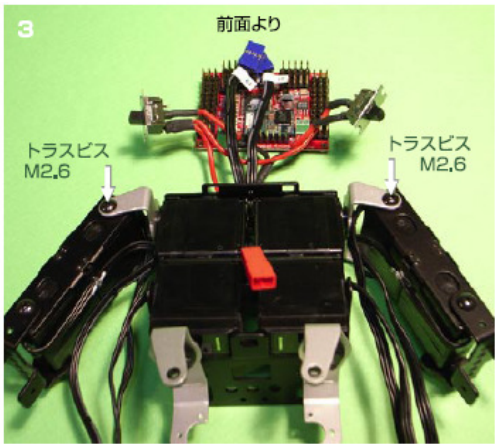
M2.6 Round

Top screw (x2)

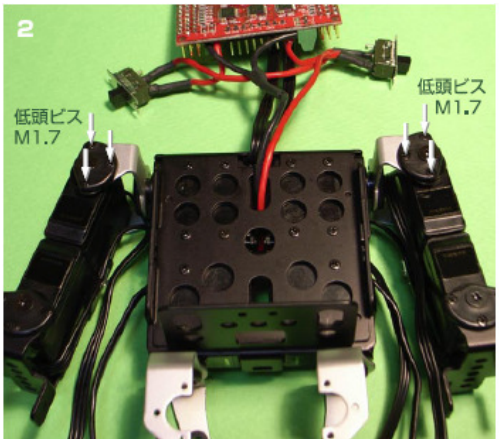


Attach each Arm Unit to the Body (Upper) Unit as shown.

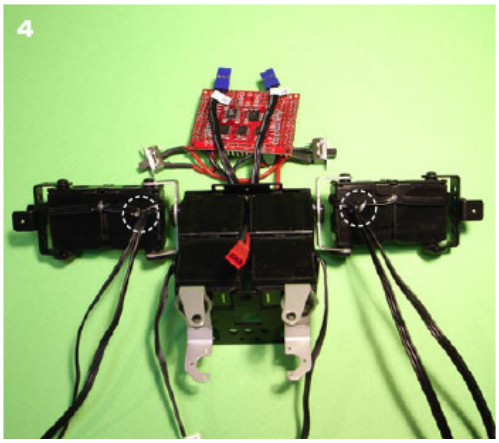
.



Secure the front of the arm units to the Shoulder Frames, and secure using M2.6 Round top screws as shown

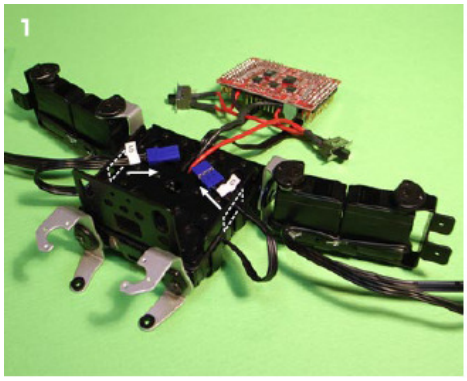


Attach the Servo Joint and secure using M1.7 Flat top screws.

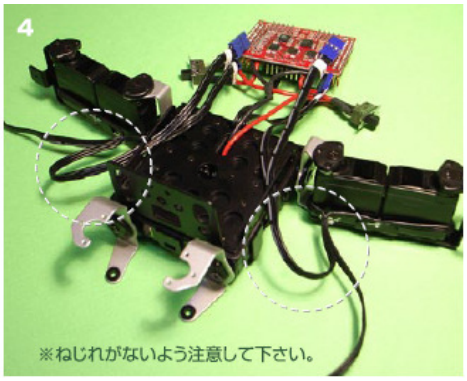


Group the cables of each arm unit and secure using the Vinyl Cord as shown.

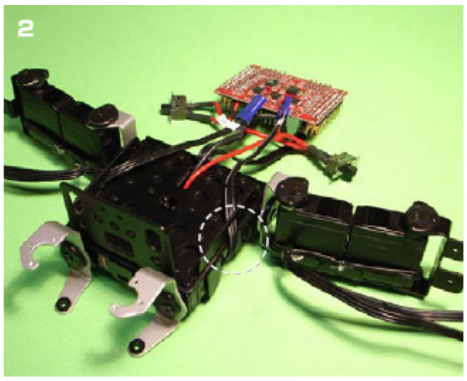
Upper Body half Assembly



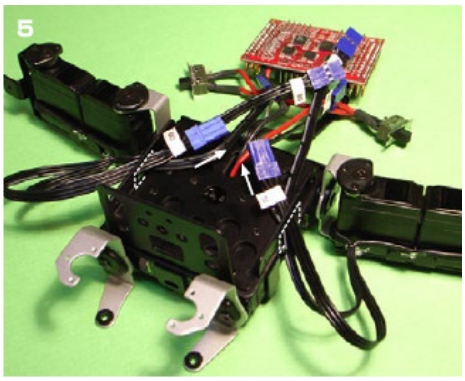
Thread the cables (No. 01 and 13) through the Back Frame as shown.



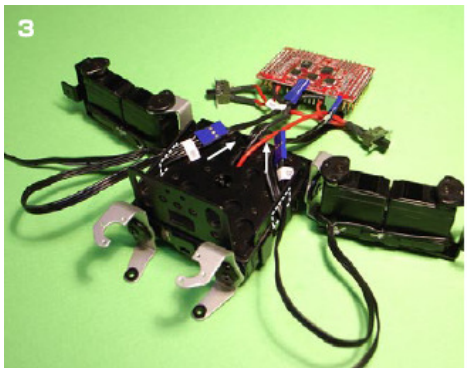
Take up the slack in the cables so they look like the 'smooth loop' as shown.



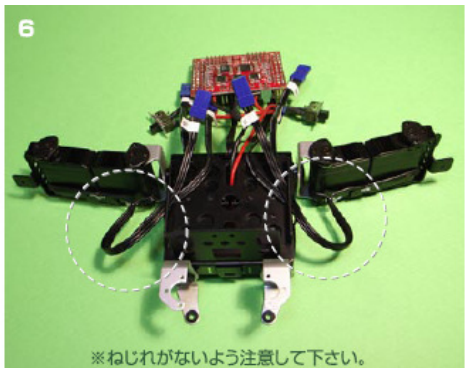
Please ensure that the root of the cable cannot be twisted or slackened.



Thread the cables (No. 09 and 21) through the Back Frame as shown.



Thread the cables (No. 08 and 20) through the Back Frame as shown.



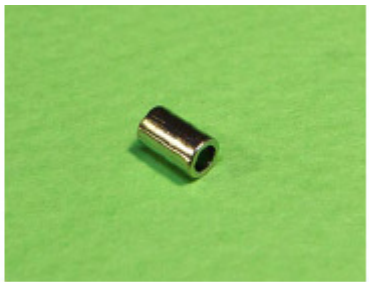
Take up the slack in cables No. 8 and 20 until they resemble the smooth loop as shown in the illustration. Then band the cables together using the Vinyl Cord.

Securing the Control Circuit Board

Parts

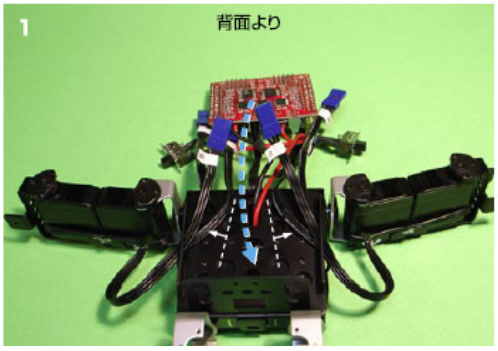
M2×8 Round top screw

(x4)

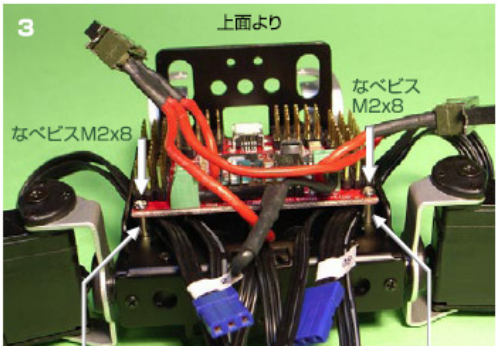


φ3×5 Spacer

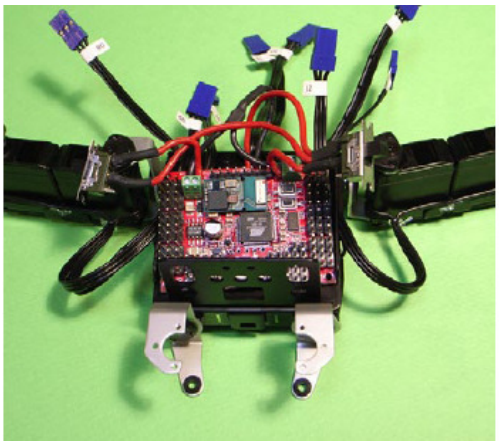
(x4)



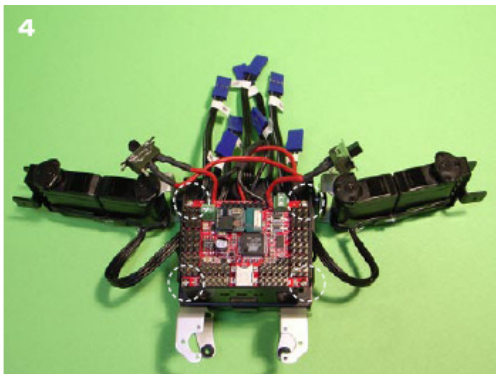
Position the Control Circuit Board over the Back Frame as shown. At this time, ensure that the cables corresponding to the right and left sides of the robot are clearly positioned off centre to the respective right and left sides of the Back Frame as shown.



Position the steel Spacers between the Control Circuit Board and Back Frame as shown.



Check that the locating holes (x4) of the Control Circuit Board line-up correctly with those of the Back Frame, and that all the cables are positioned correctly as shown.

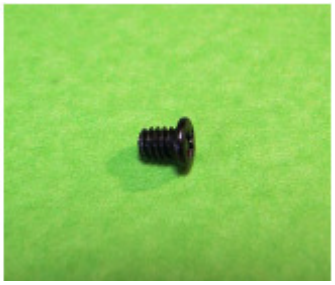


Fasten down and secure using M2x8 Round top screws (x4). This should be done gradually, say in a clock-wise direction, with each screw being turned in increments so as to avoid trapping the cables. Caution! At this point, do not attempt to reposition the cables by force. The Control Circuit Board has

Securing the two Main [ON/OFF] Switches from the Control Circuit Board

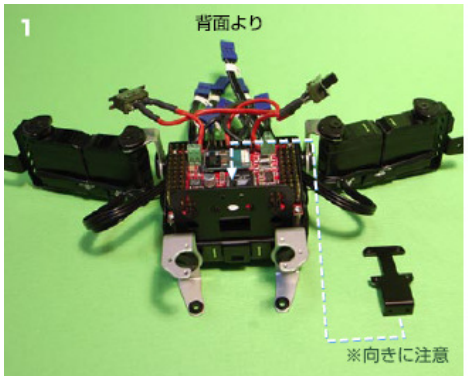
Parts

Switch Bracket

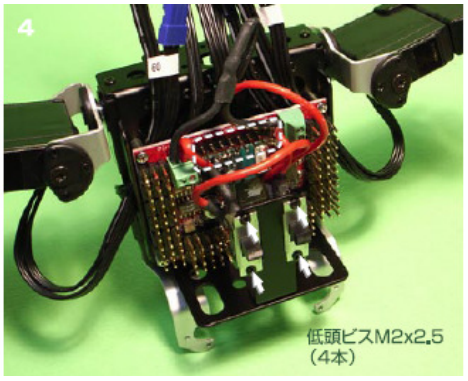


M2x2.5

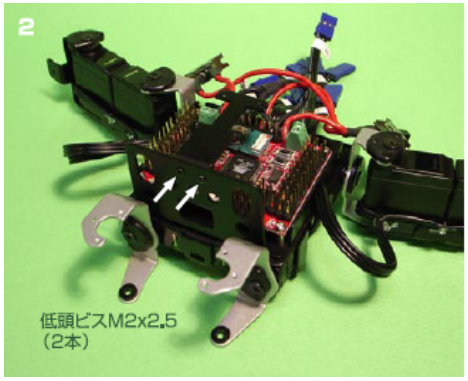
Flat Top screws (x6)



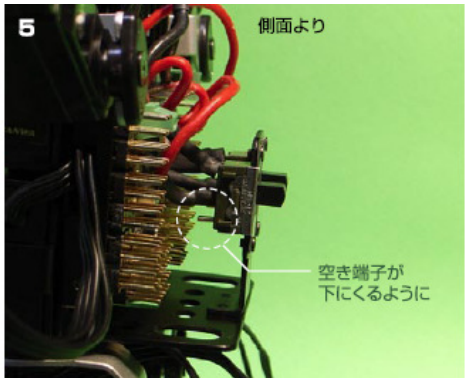
Position the Switch Bracket on the Back Frame as shown.



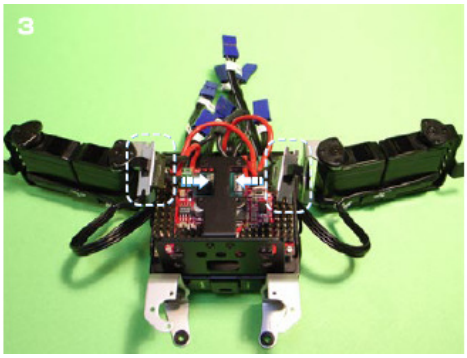
Secure the switches using M2x2.5 Flat top screws (x4)



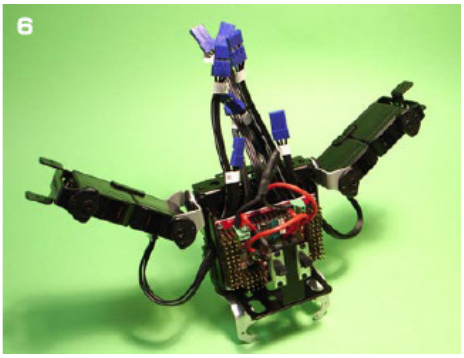
Secure the Switch Bracket using M2x2.5 Flat top screws (x2)



From the side, visually check that the switches are positioned exactly as shown.



Attach the two Main Switches from the Control Circuit Board to the Switch Bracket, as shown.



The Body (Upper half) O.K. assembled so far, shown as a free standing unit.

Attaching the Leg Units

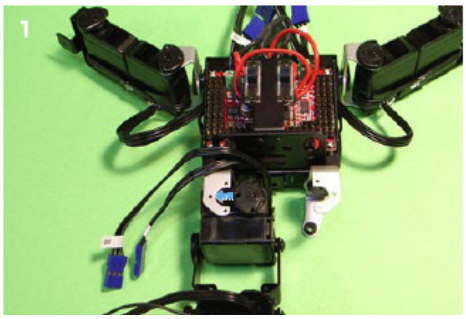
Parts

Right Leg Unit

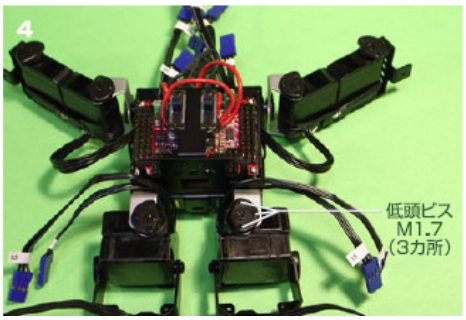
Left Leg Unit

M1.7
Flat top screw
(x6)

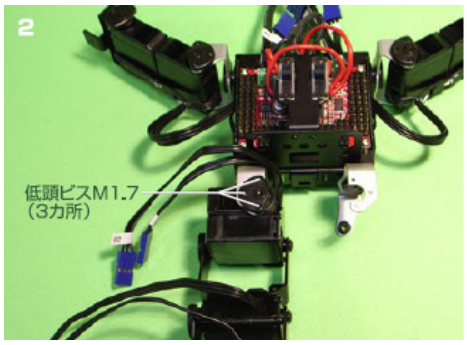
M2.6
Round top screw
(x2)



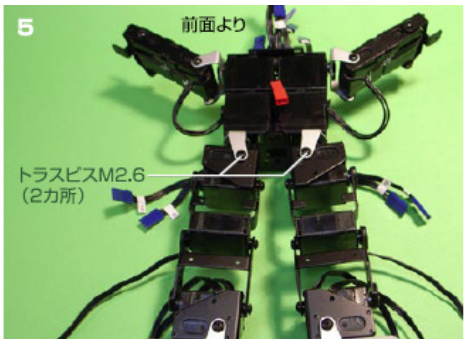
Position the Body (Upper half) Unit as shown and attach the Left Leg Unit to the Waist Servo Unit as indicated.



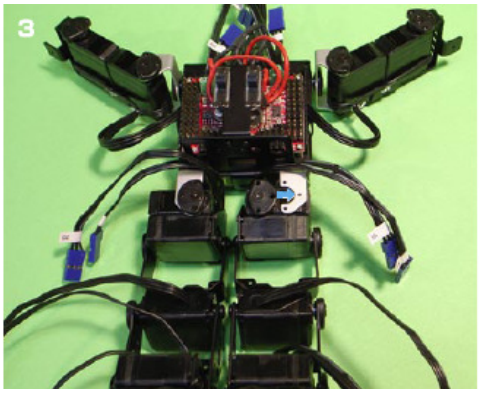
Attach the Servo Horn and secure using M1.7 Flat top screw(x3).



Attach the Servo Horn and secure using M1.7 Flat top screw(x3).



Turn the robot over (onto its back) and screw in the remaining two M2.6 Round top screws (x2) as shown.

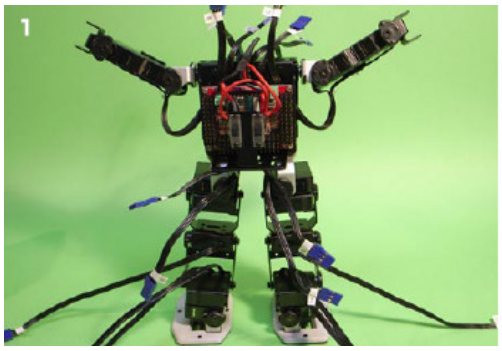


Attach the Right Leg Unit to the Waist Servo Unit as indicated

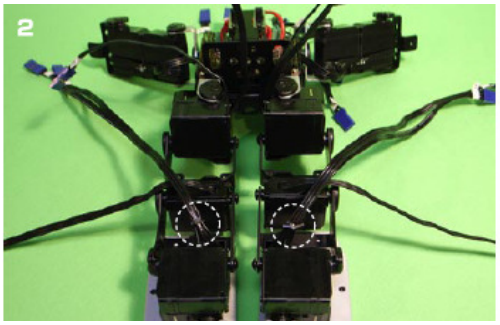
Banding/Securing the Cables - Stage 1

Parts

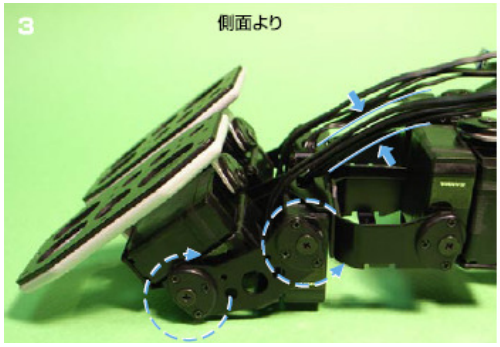
Vinyl Cord
(for Cable Ties)



Shows the robot before banding.

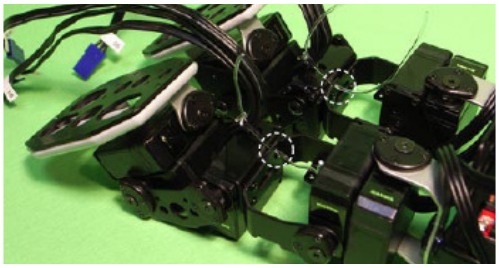


Band the cables of the ankles [No. R17/18] together and [L 05/06] together ,and bind using the Vinyl Cord as shown.



Position the ankle joints as shown (soles up). Group the cables together behind the knee (do the same on both the left and right leg).

Band the Knee Servo Unit cable to the banded Ankle Servo Unit cables at the base of the Knee Servo Unit cable as shown (both legs). ie [R16 to R17/18] and [L04 to L05/06].

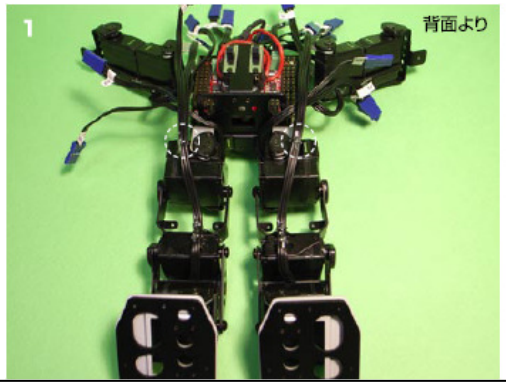


Without cutting the Vinyl Cord, thread it through the Knee Frame of the Knee Servo Unit (lower side to upper side) as shown.

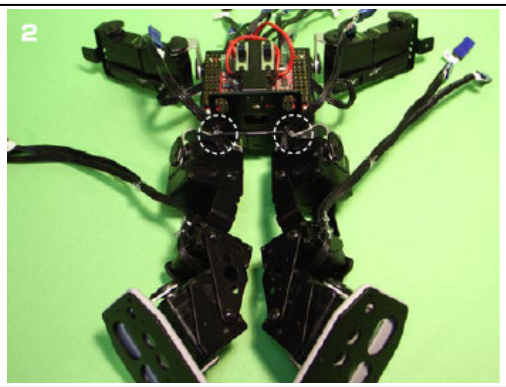
Pass the banded group of cables (from step 4.above) over the Knee Frame and cable tie to secure using the loose Vinyl Cord (on the upper side of the Knee Frame) as shown (both legs).

Banding /Securing the Cables - Stage 2

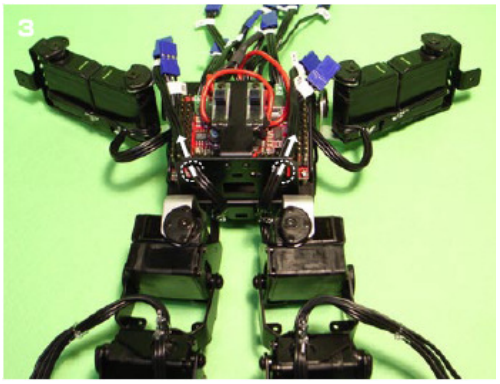
Using Vinyl Cord (for Cable Ties)



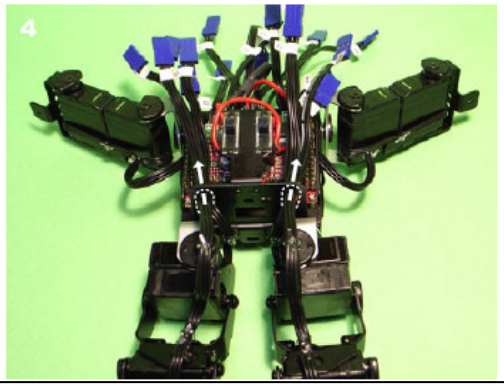
Continuing from Stage 1, Step 6 (page 20), extend the banded cables from the knees up and over the Thigh Servo Units, and band/bind once more using the Vinyl Cord at the position shown (approximately level with the Thigh Servo Joint).



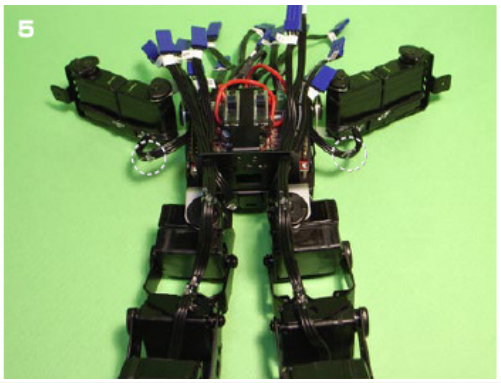
Group the cables from the Thigh Servo Motor and band/bind using the Vinyl Cord. [R14/15, L 02/03].



Thread the banded cables from step2, through the holes in the base of the Back Frame as shown.

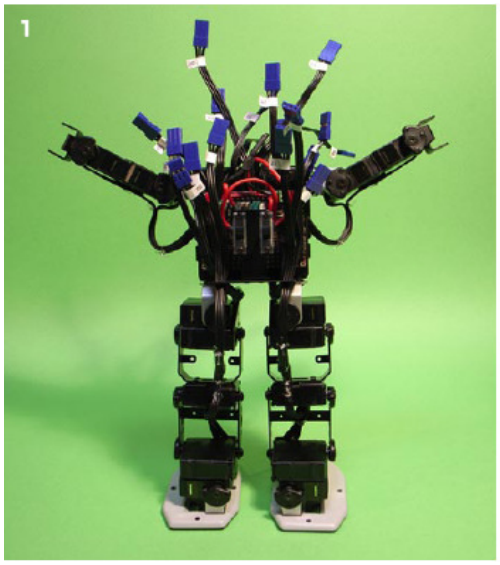


Thread the banded cables from Step1, through the holes in the base of the Back Frame (as Step 3) as shown.



Then, band/bind the cables from the Arm Servo Motors (approximately at the bottom of the cable loop), using the Vinyl Cord. Repeat for Right /Left.

Connecting the Cables to the Control Circuit Board



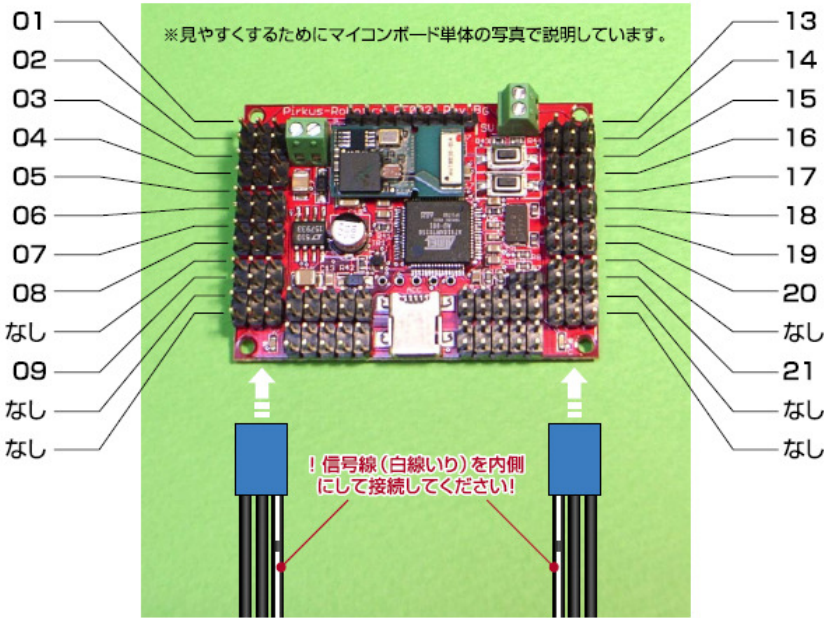
Before connecting the cables.

Robot shown free standing

After connecting the cables.

2

Control Circuit Board



Left Right

Connect the cables to the Control Circuit Board according to the Cable reference number and the Circuit Board Port number as shown above.

Notice! The WHITE stripe visible on each cable must face inwards when connecting.

Also, ensure the ports without assigned numbers are ‘blank’ Circuit Board Ports

Head Unit Assembly/Positioning - Stage 1

Parts

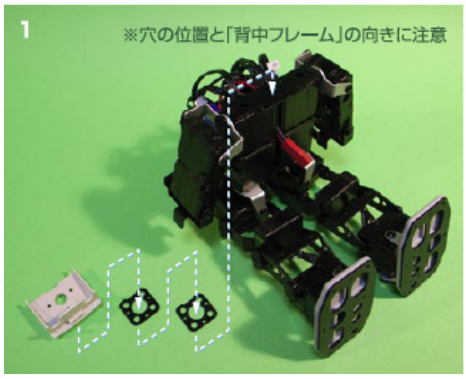
Face Plate Part A

Neck Plate Part C

Spacers (x2)

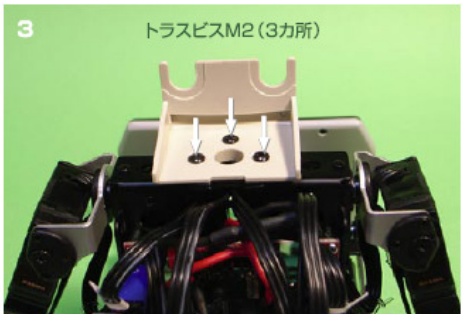
LED Board

M2 Round Top screw

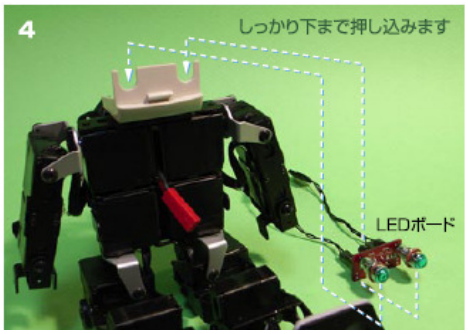


Position the robot as shown in a sitting position. Note the location of the three holes on the top of the Back Frame.

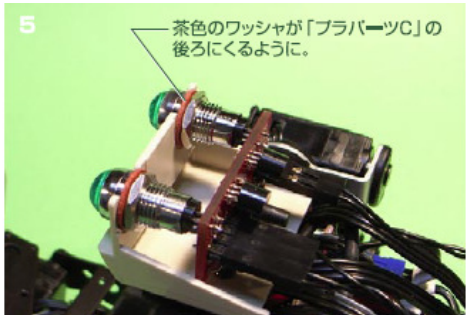
On the smooth (base) surface of the Neck Plate, position the two spacers (one on top of the other) as shown.



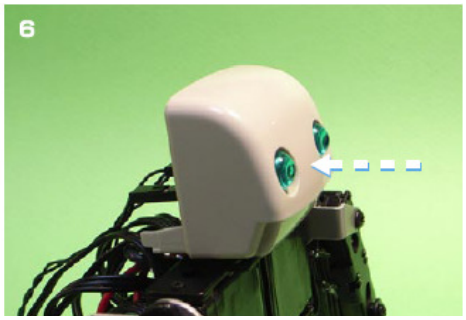
Turn the Neck Plate/Spacers Assembly over, and position it on top of the Back Frame as shown. Secure using M2 Round top screws (x3)



Firstly, ensure the L/R securing nuts (and washers) on the L.E.D Board have been 'backed-off' a couple of turns. Then, position (downwards) onto the Neck Plate as shown



Ensure that the brown washers are pushed plush up against the back of flapper C, as shown.



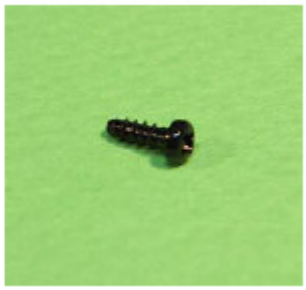
The Face Plate Part A can now be attached to the Neck Plate by simply 'clipping' into place from the front, horizontally, as shown.

Note: If the 'eyes' of the LED Board do not line up centrally with 'sockets' of the Face Plate, repeat Step 5

Head Unit Assembly/Positioning - Stage 2

Parts

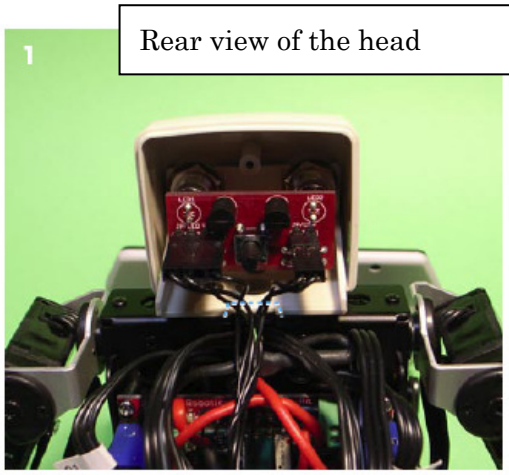
Head Part B



Self tapping screw (x1)

1

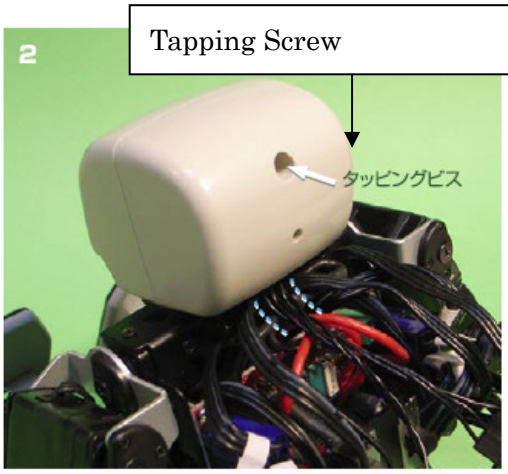
Rear view of the head



Neatly wrap the LED cables together in a pig-tail like fashion down the middle of the robot

2

Tapping Screw



Attach the back head cover, assuring that none of the LED cables are crimped and secure with the tapping screw

Attaching the Body Covers - Stage 1

Parts

Sole Covers (x2)

R. Shin Cover (inner)

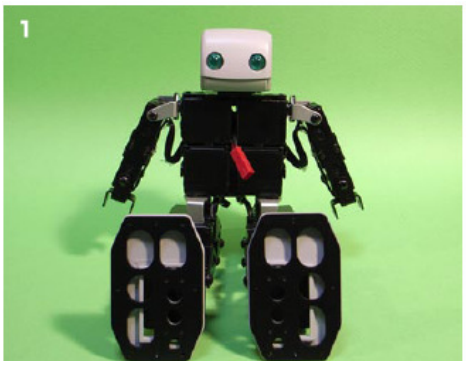
L. Shin Cover (inner)

R. Shin Cover (outer)

L. Shin Cover (outer)

M2x2.5 Flat Top Screw (x4)

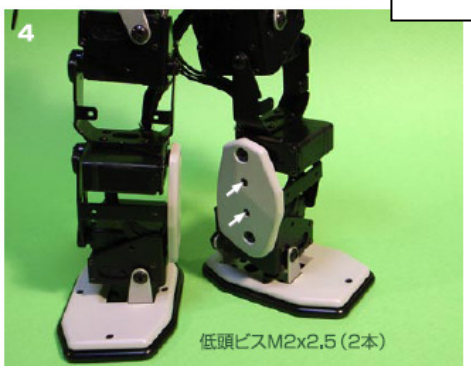
M2x4 Flat Top Screw (x12)



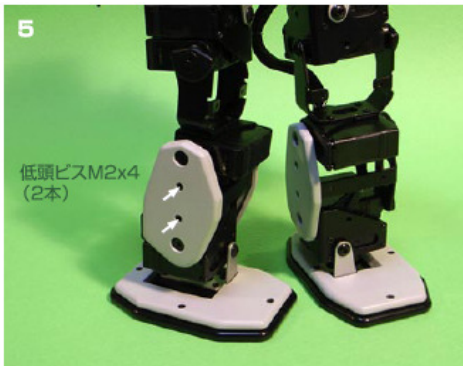
Position the robot in a sitting position as shown.

Attach the Sole Covers to the underside of the feet and secure using M2x4 Flat top screws(x4 per foot).

Attach the R. Shin Cover (inner) and secure using M2×2.5 Flat top screws(x2).



L. Shin Cover (inner).Repeat as Step 3.above.



Attach the R. Shin Cover (outer) and secure using M2x4 Flat top screws(x2).

L. Shin Cover (outer).Repeat as Step 5.above.

Attaching the Body Covers - Stage 2

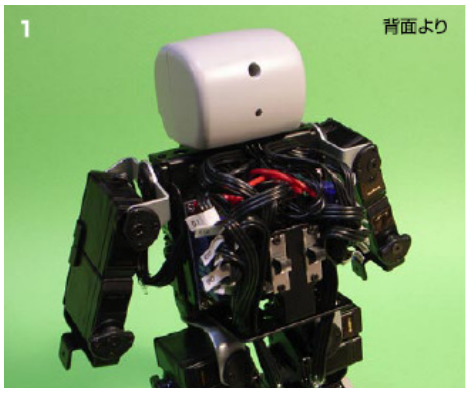
Parts

Back Cover

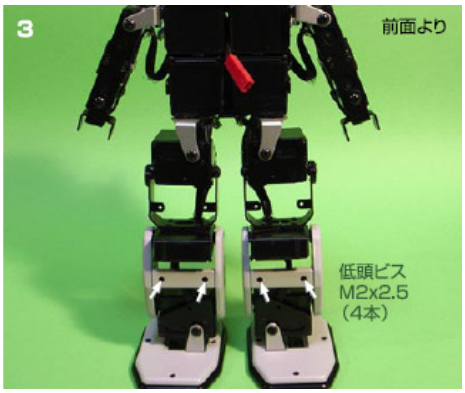
Shin Covers (front)

Thigh Covers (x2)

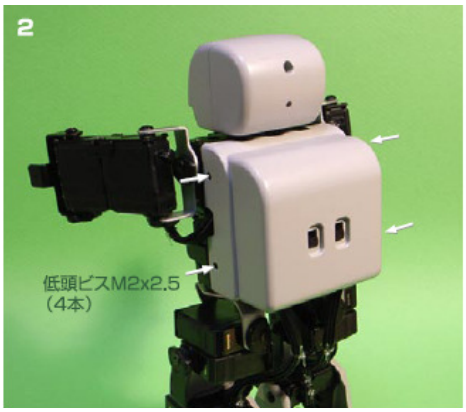
M2×2.5 Flat top screw



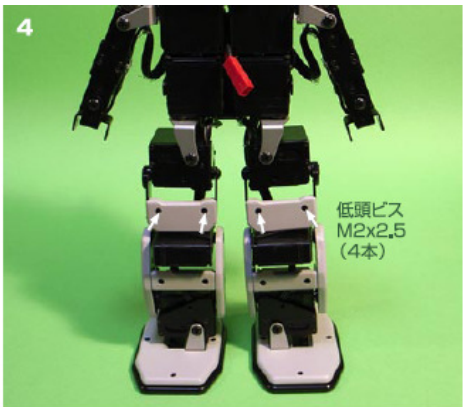
Using gentle pressure, ensure all the cables at the rear of the robot rest ‘snuggly’ against its ‘back’ as shown



Attach the Shin Covers (front) to the legs and secure using M2x2.5 Flat top screws (x2 per shin).



Attach the Back Cover and secure using M2x2.5 Flat top screws (x4) as shown. Be careful to ensure the Main ON/OFF switches are correctly located in the holes of the Back Cover and can be operated without hindrance.



Attach the Thigh Covers to the legs and secure using M2x2.5 Flat top screws (x2 per thigh).

Attaching the Body Covers - Stage 3

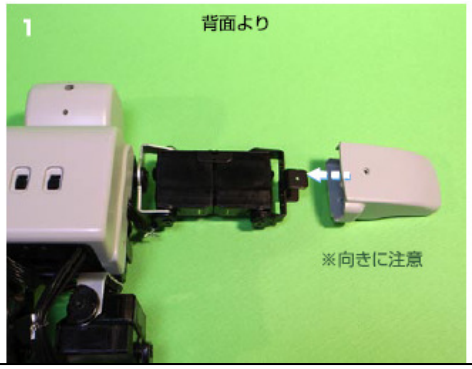
Parts

R. Arm Cover

L. Arm Cover

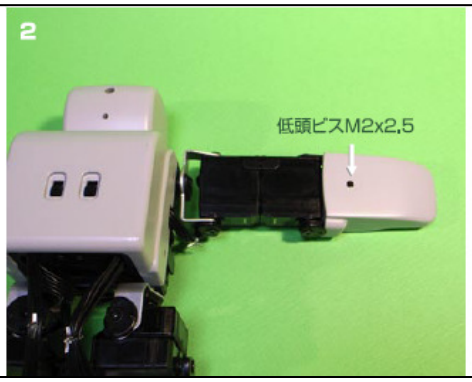
Elbow Cover (x2)

M2×2.5 Flat top screw

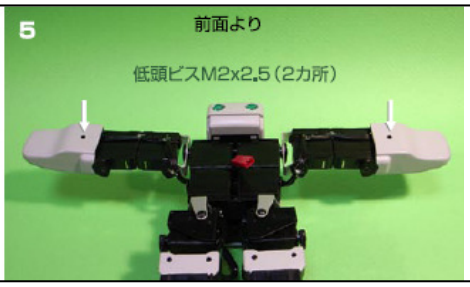


Attach the R. Arm Cover to the right Elbow Frame

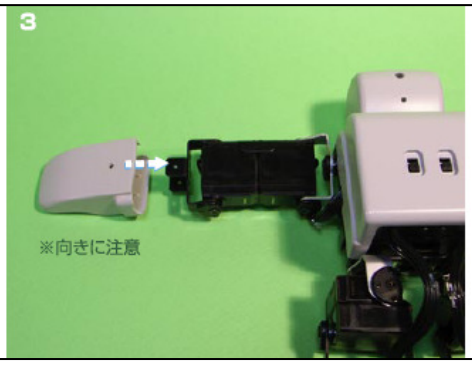
Secure using M2×2.5 Flat top screw(x1).



Secure using M2x2.5 Flat top screw(x1).



Turn the robot over (so it is on its back) as shown. Screw M2x2.5 Flat top screws(x1,L and R) into the holes indicated, thereby fully securing the Arm Covers.



Attach the L. Arm Cover to the left Elbow Frame.

Attach the Elbow Covers to the Elbow Frames, and secure using M2×2.5 Flat top screws (x1 each arm).

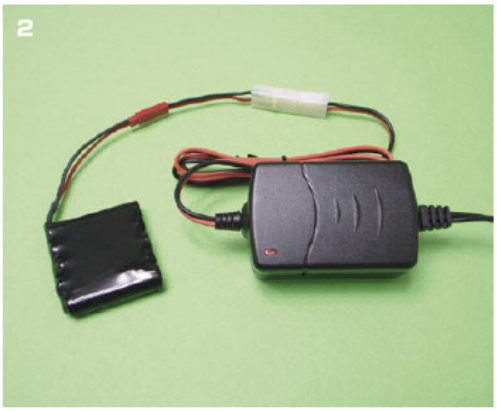
Charging the Battery Pack

Parts

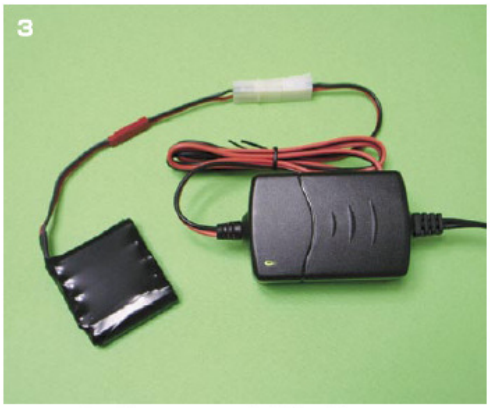
Battery Charger

Battery Pack

Connect the cables of Battery Charger and the Battery Pack. Plug the Battery Charger into the mains supply. A BLUE light (initially) indicates the charger is ON.



When the light changes to RED, the Battery is charging.



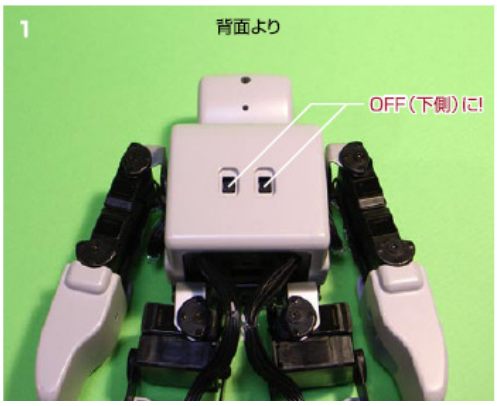
When the light changes back to BLUE, the Battery Pack has been fully recharged. Note! A drained battery will take about 40 minutes to fully recharge. Once charged, unplug the Battery Charger before disconnecting the Battery Pack.

Installing the Battery Pack

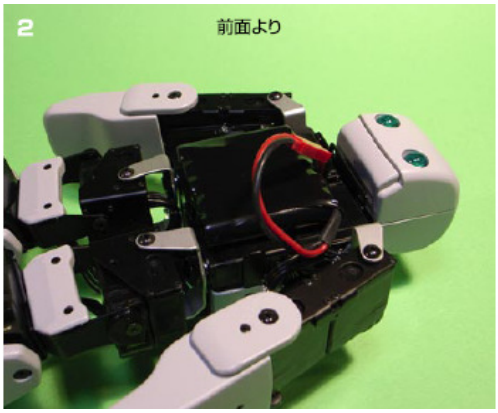
Parts

Battery Pack

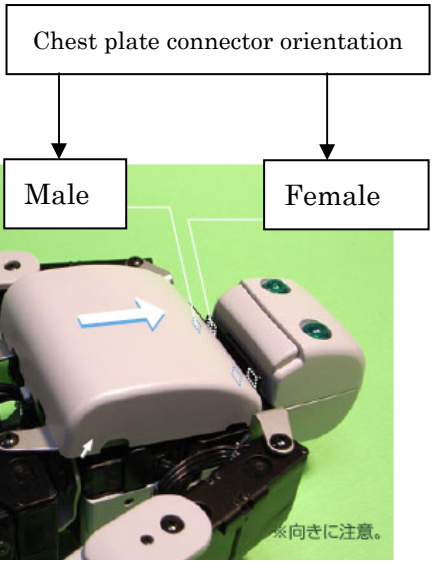
Stomach Cover



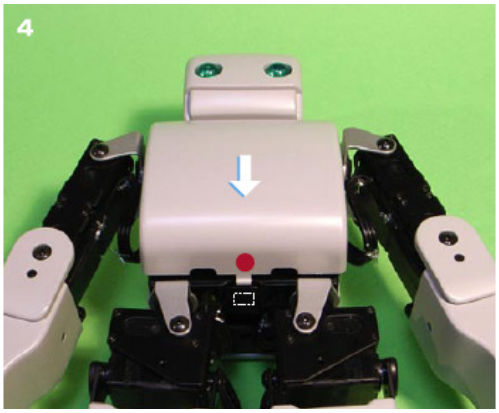
Ensure both Main Switches are in the OFF position (down).



Connect the cable from the Battery Pack to the Main switch connector (protrudes from the centre of the 'robot's chest'). Caution! When the robot is not being used, disconnect the battery cable from the Main Switch connector.



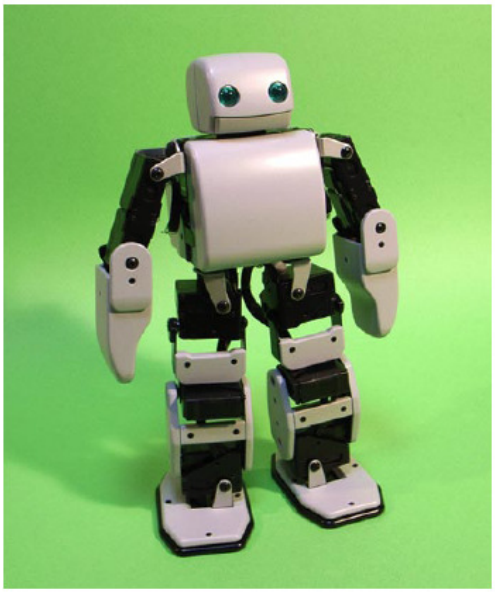
Position the Stomach Cover over the Battery Pack and slide it up and over. The top of the cover locates in two recesses in the robot's neck as shown.



At the base of the Stomach Cover (centre) is a RED mark. The 'catch' below this mark locates and secures the Stomach Cover to the Waist Servo Unit.

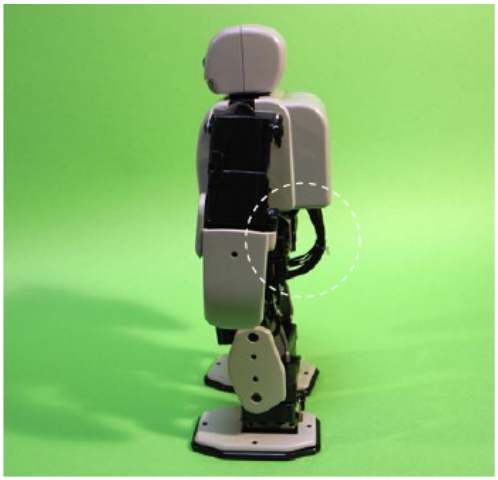
Note To release the Stomach Cover, simply push UP (towards the head) with a finger on the RED mark.

The Finished Product



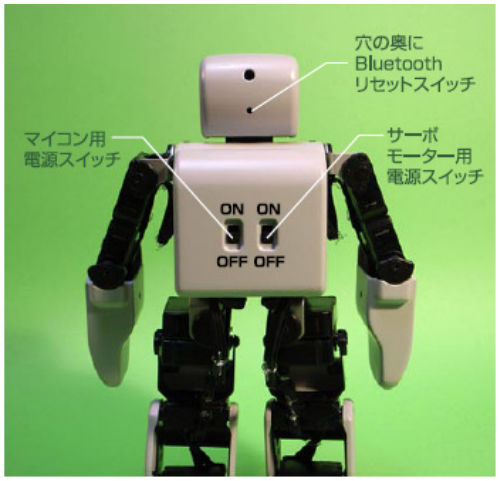
Front View

Rear View



Side View

Take up the slack in the cables as shown.



Use a non-metallic stick when pushing the reset button of the Bluetooth.

The reset button of the Bluetooth is in the small hole of the back of the head.

Roller Skating kit-Assembly and Attachment

Parts

Roller Skate
Frame A(×2)

Roller Skate
Frame B(×4)

Roller Wheels

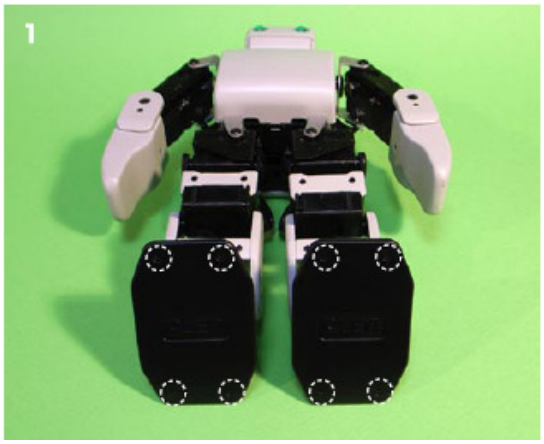
Roller Wheels
axle spacers

M3x15
Round top screw

φ4×3 Steel
Spacers (x16)

M2 x 5.5
Flat Top screw(x8)

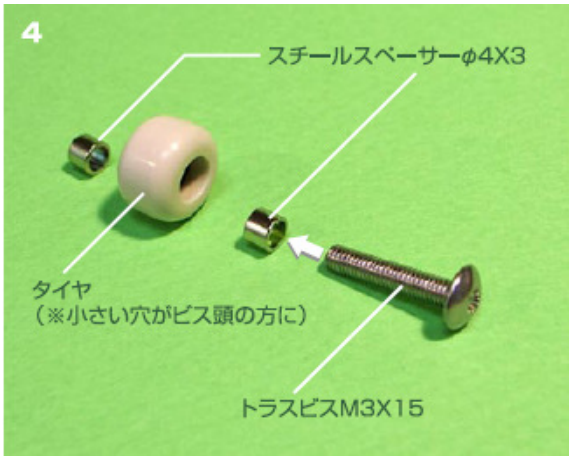
M2x2.5
Flat Top screw(x12)



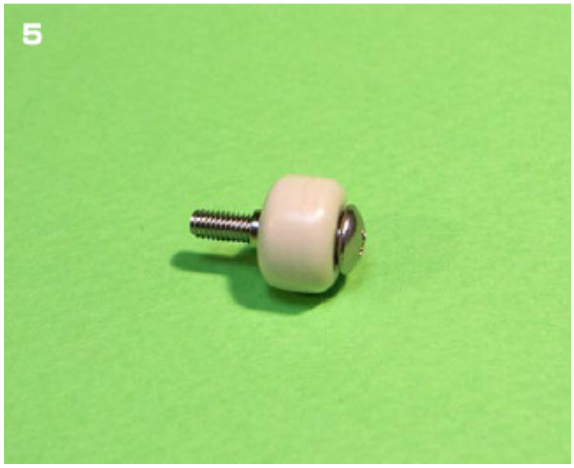
1. Take off the Flat top screws of Sole Plate.

Attach the Roller Skate Frame A to the Sole Plate ,and secure using M2x5.5 Flat top screw.

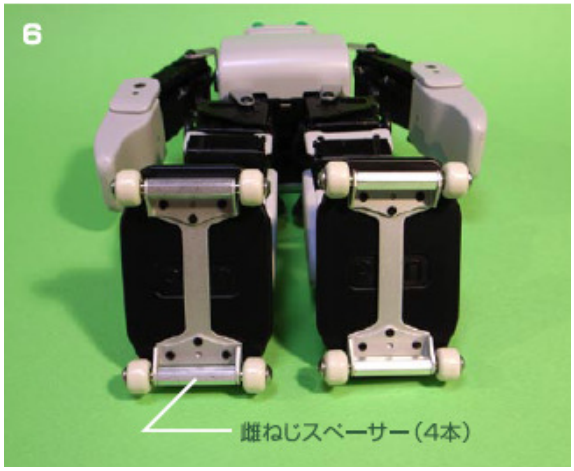
Attach the Roller Skate Frame B to the Sole Plate ,and secure using M2x5.5 Flat top screw.



Set the Roller Wheel between the spacers and put the Round top screw into the Roller Wheel.



Roller Wheel unit shown completed.(x8)



Set the Roller Wheels axle spacers to the Roller Skate Frame B.
Attach the Roller Wheel units to the Roller Wheels axle spacers.

Roller Skate kit shown completed.