

Franconia Robotix

HEX-E

Assembly Manual Version 1.1 (new ARC-32 V2)

Important:

Be careful and patient during assembly of this kit.

Keep away from young children!

The kit contains small parts which might be swallowed.

Only operate HEX-E in dry rooms! Keep away from liquids!

Recycle parts after lifetime, send it back to us, do not drop into trash.

Needed tools and parts upon assembly:

- Philips pozzi drive
- Wrench SW 5,5
- Charger, if not included, for Li-po 7,4V 1000mAh battery
- 3x AAA Battery für PS-2 wireless controller
- Scissors

1: Assembly of the legs

The hip joints are 3D printed parts, marked with „R“ for right side legs and „L“ for left side legs. Mount the ball bearings as shown



Press the 3mm nut into the inside six edged hole of the hip joint. Then the screw into the bearing and then the distancer from the outside through the hole and tighten.

Assembled look:

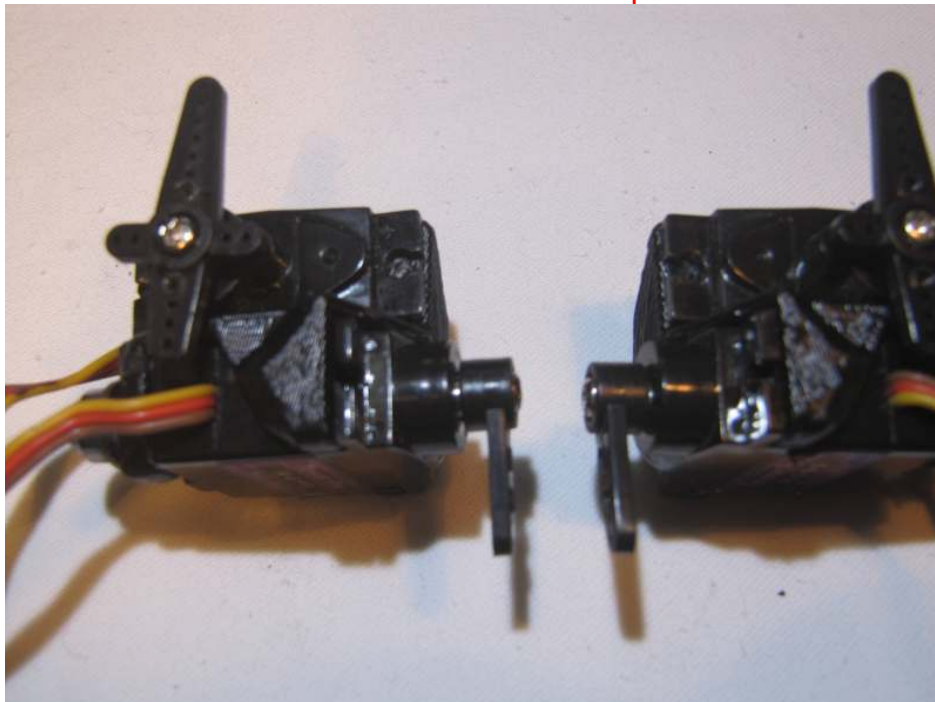


Now we add the servo motors to the hip joints:.

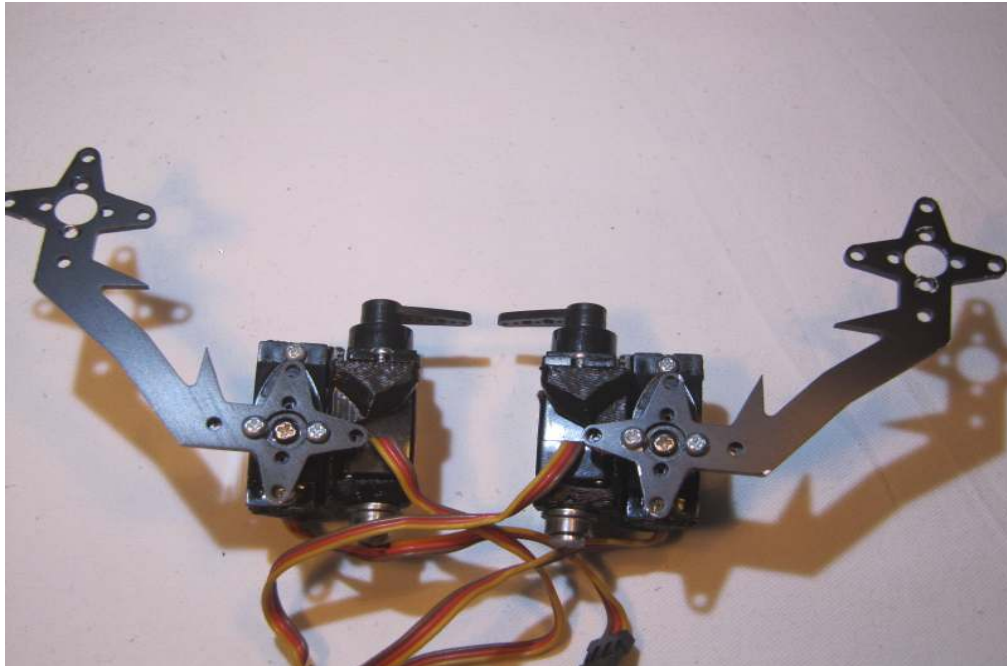
While you attach the servos with their screws (Tin screws 2,5x8mm), be aware not to overtighten the screws because the 3D printed plastics will be damaged.



Make sure the servo horn is in Middle position. You need to cut the servo arm on the lower side as shown because it touches the plastics. Use a scissors to cut.

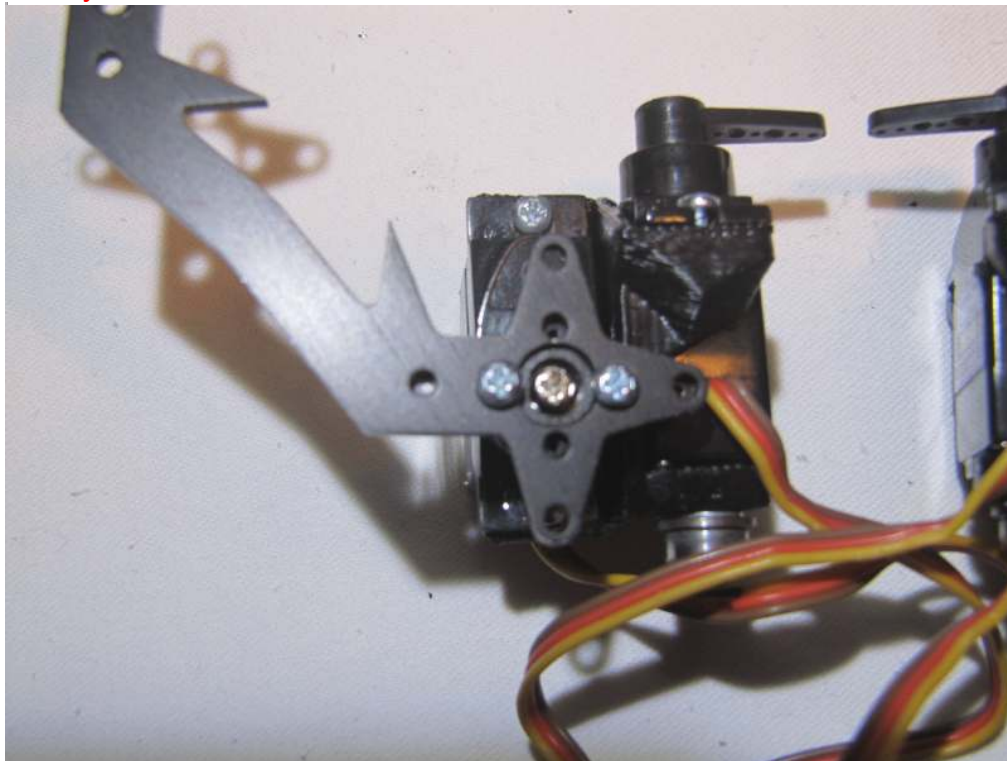


Now the upper leg aluminium brackets are screwed to the swervo arms of the hips as shown. **Be careful again to not overtighten the screws just make them grip firmly but no more!**

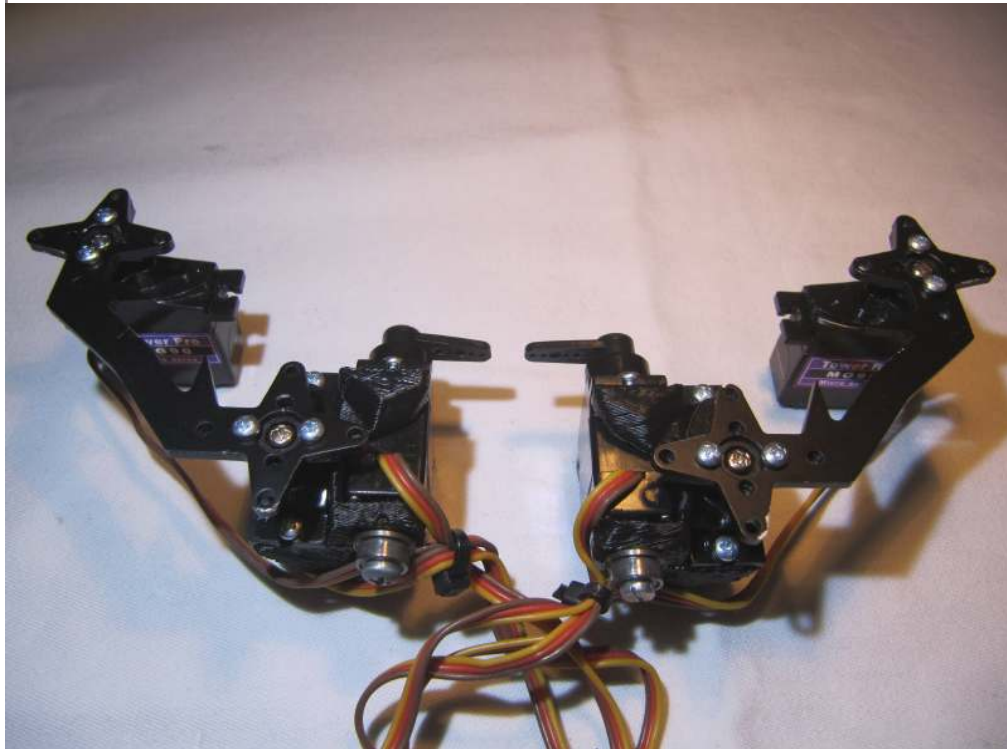


Look at the upper legs they carry **UNILATERALLY** a sink at the location of the servo horn. This is needed so that the servo horn is connected neatly to the upper leg. Place the upper legs onto the servo so that the sink is looking towards the servo.

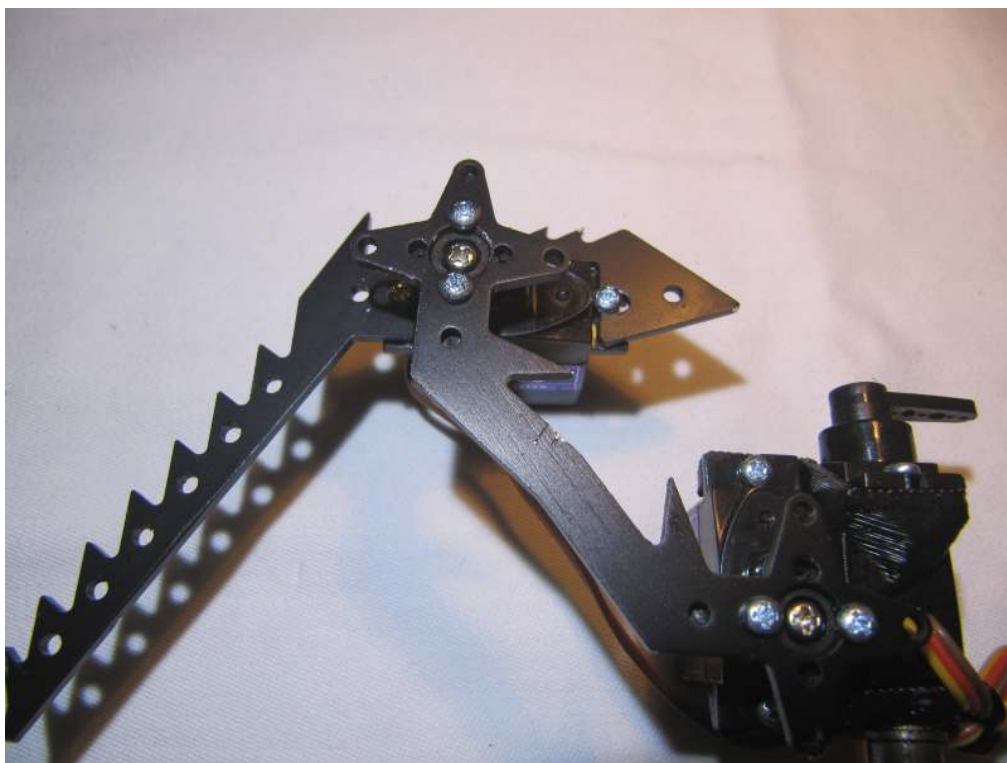
Finally it should look like this:



Now attach the knee servo motors:.



Here too, cut the servo horn at the upper side so that it does not collide with the plastics. Now attach the feet aluminium parts to the knee servo as shown. The feet are attached to the **UPPER SIDE** of the knee servo using 2x M2x8 nuts.



Both legs should look now this way:



To see if the position of the servo arms is ok and to ease the later calibration process of the legs, the legs should look like this when being folded:



This is the „HOME“ position. When you turn the servos by hand be very careful, because the servos can be damaged by high pressure or force.

If this position cannot be reached then unscrew the servo arm off the servo by releasing the middle screw and change position and screw it back again.!

Repeat all steps so that you have 3 RIGHT legs and 3 LEFT legs in the end!

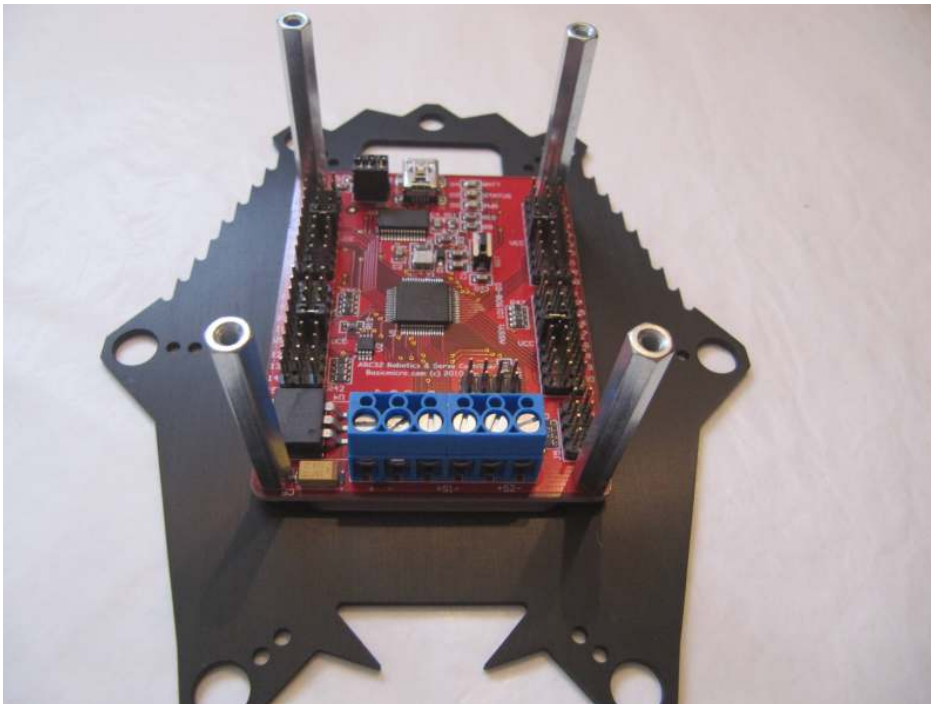
2. Body

Take one of the identical aluminium base plates and add 4x M3x6 screw from one side and the 4x nut M3 on the other side. Tighten the nuts.



Now add the ARC-32 Controller board as shown and screw the 4 standoffs to it. Do not overtighten the standoffs! **Tighten firm by hand is all you need!**

Should look like this now, USB to the back, power screw terminals to the front.



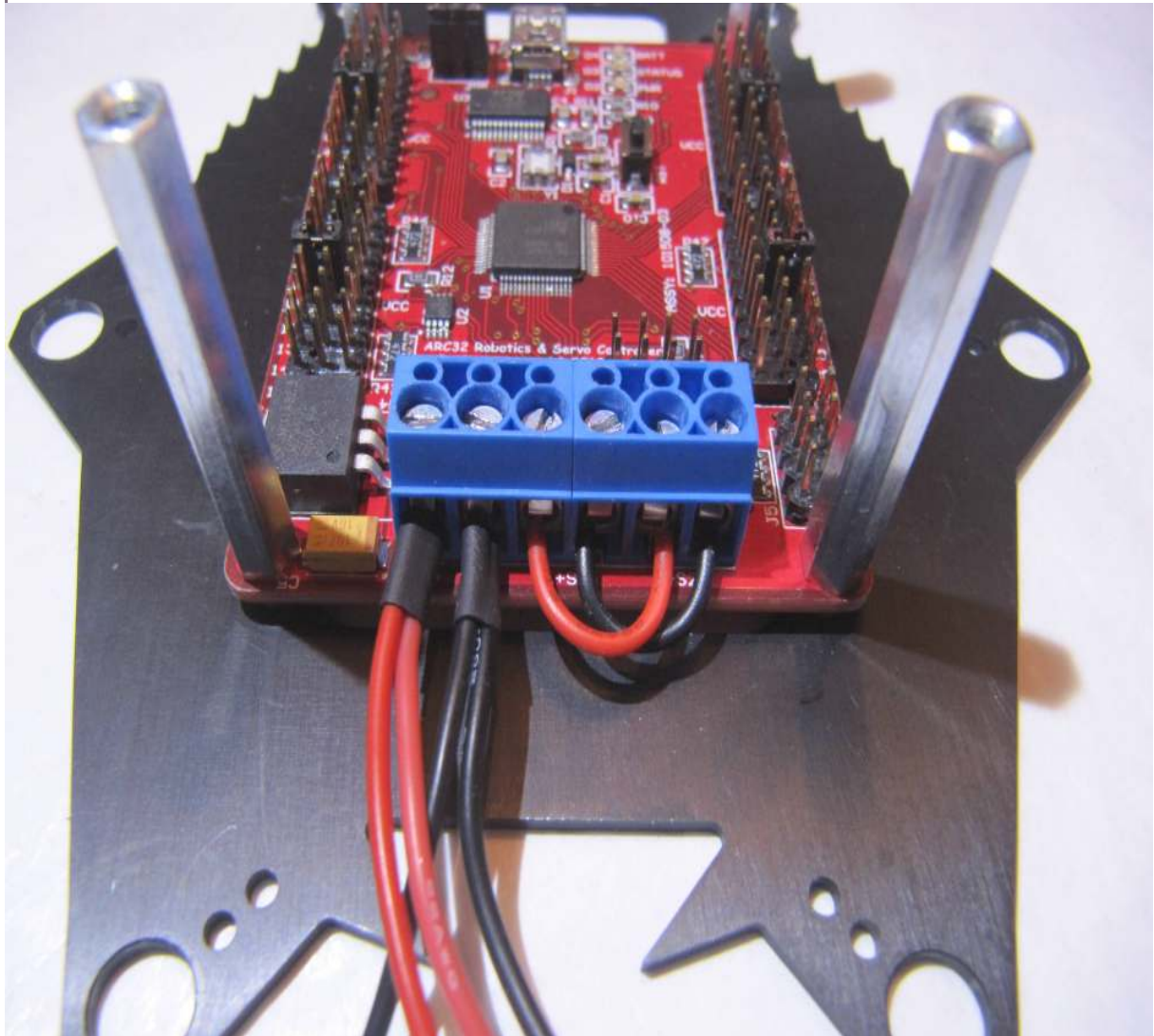
Now first electrical step: bridge the Power connectors as shown:

WATCH OUT! Bridge 1 with 3 and 2 with 4.

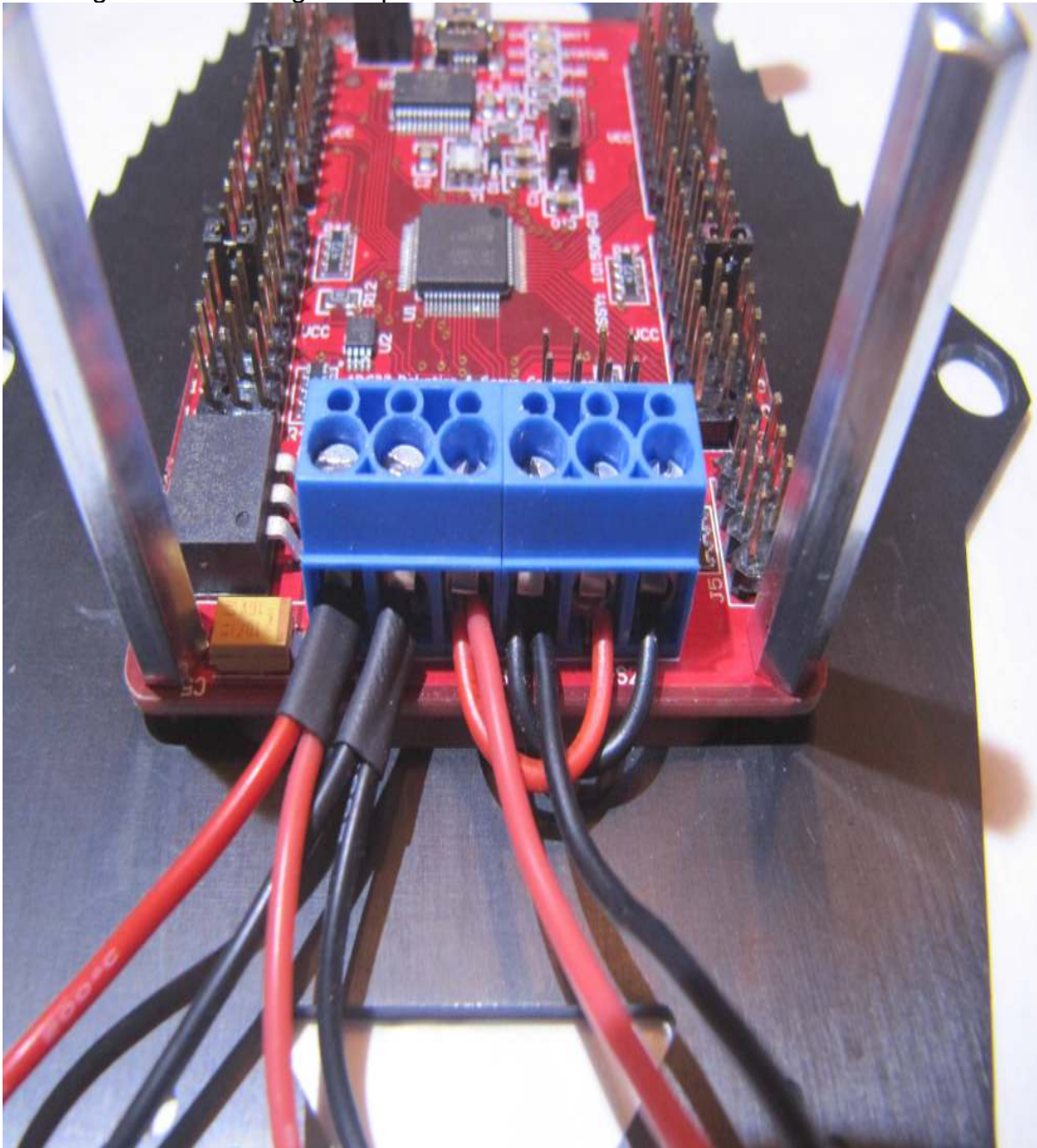
Red = Plus

Black = minus

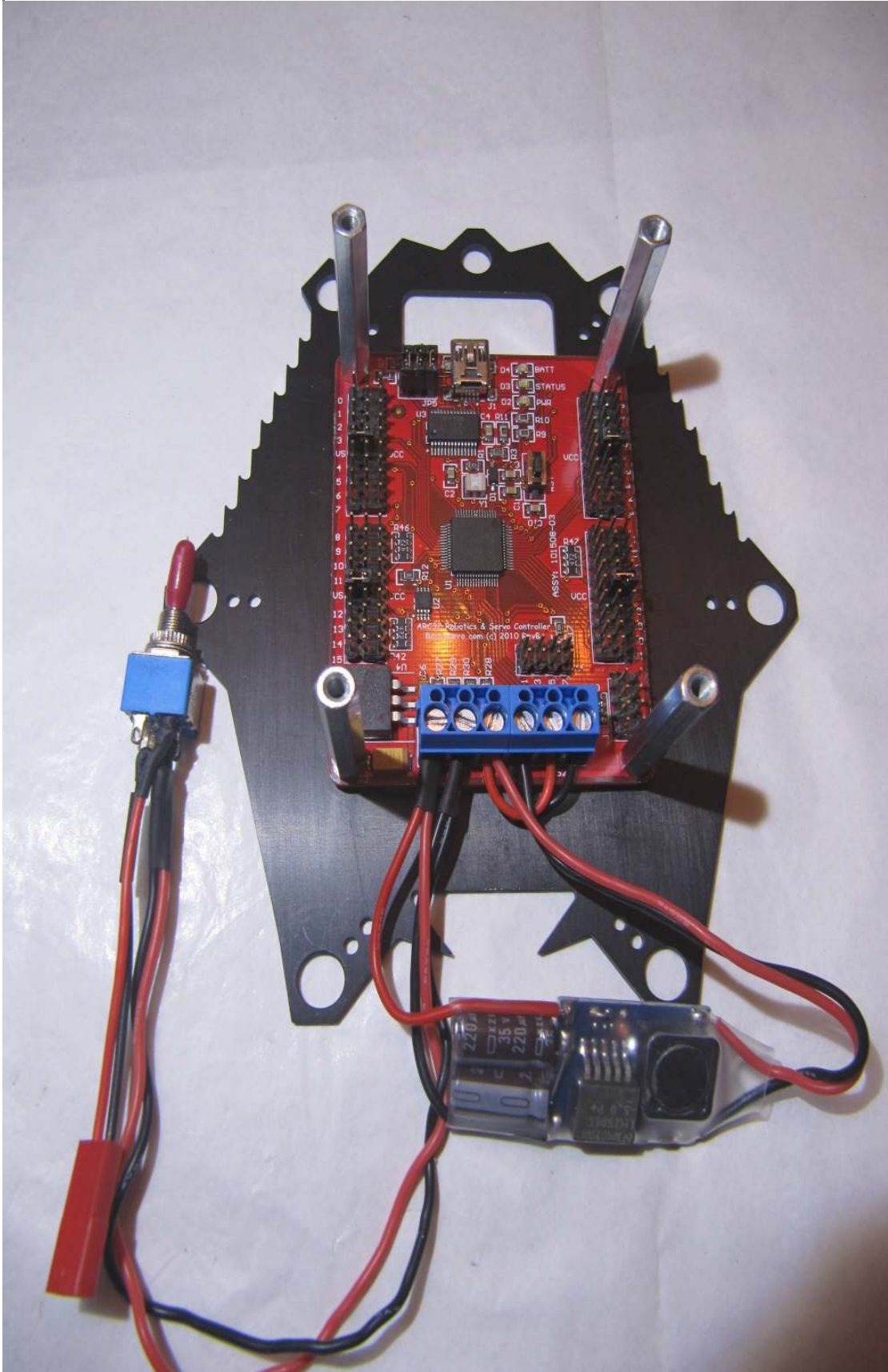
First make the bridges with the two short cables as seen on the image from 1 to 3 (black) and from 2 to 4 (red).



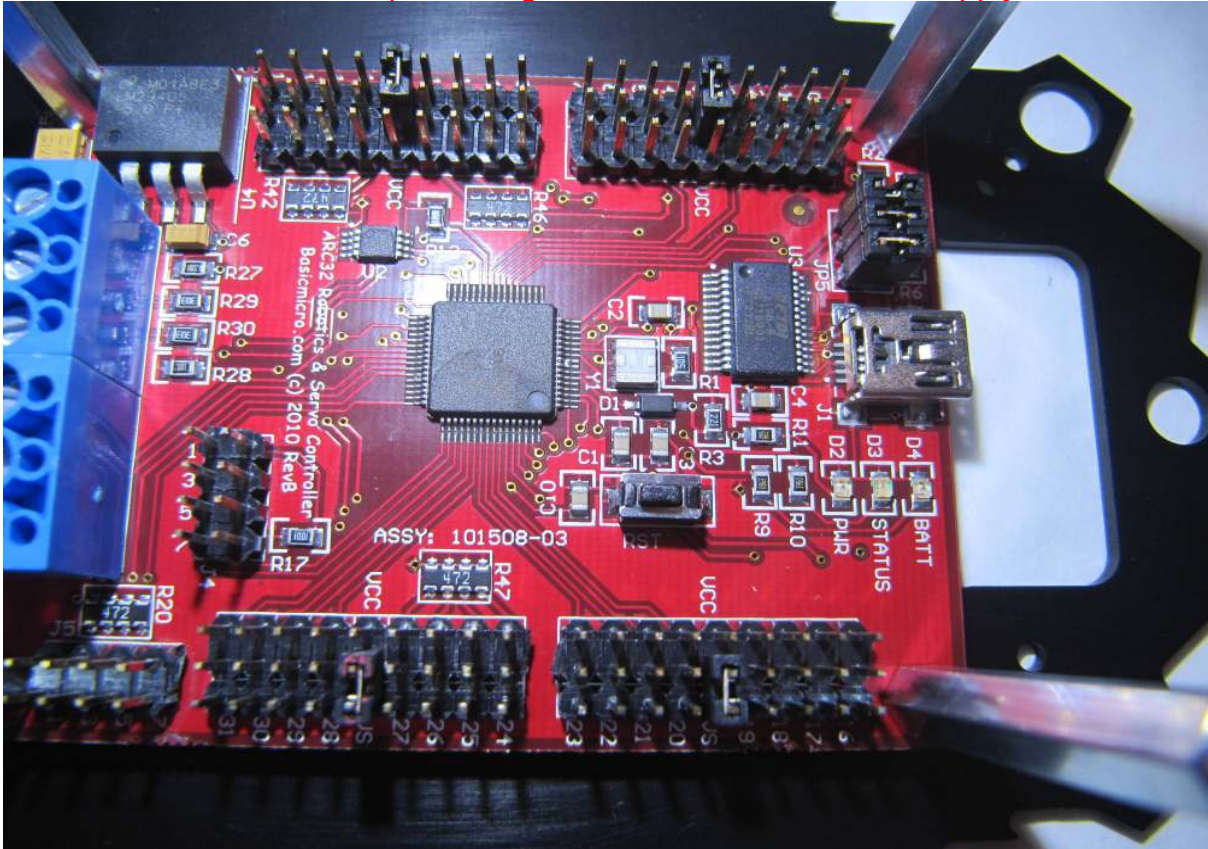
Now insert the DOUBLE wires from the BEC into VS-1 and tighten the screws. The single ended wires go into pin 3 and 4 as shown:



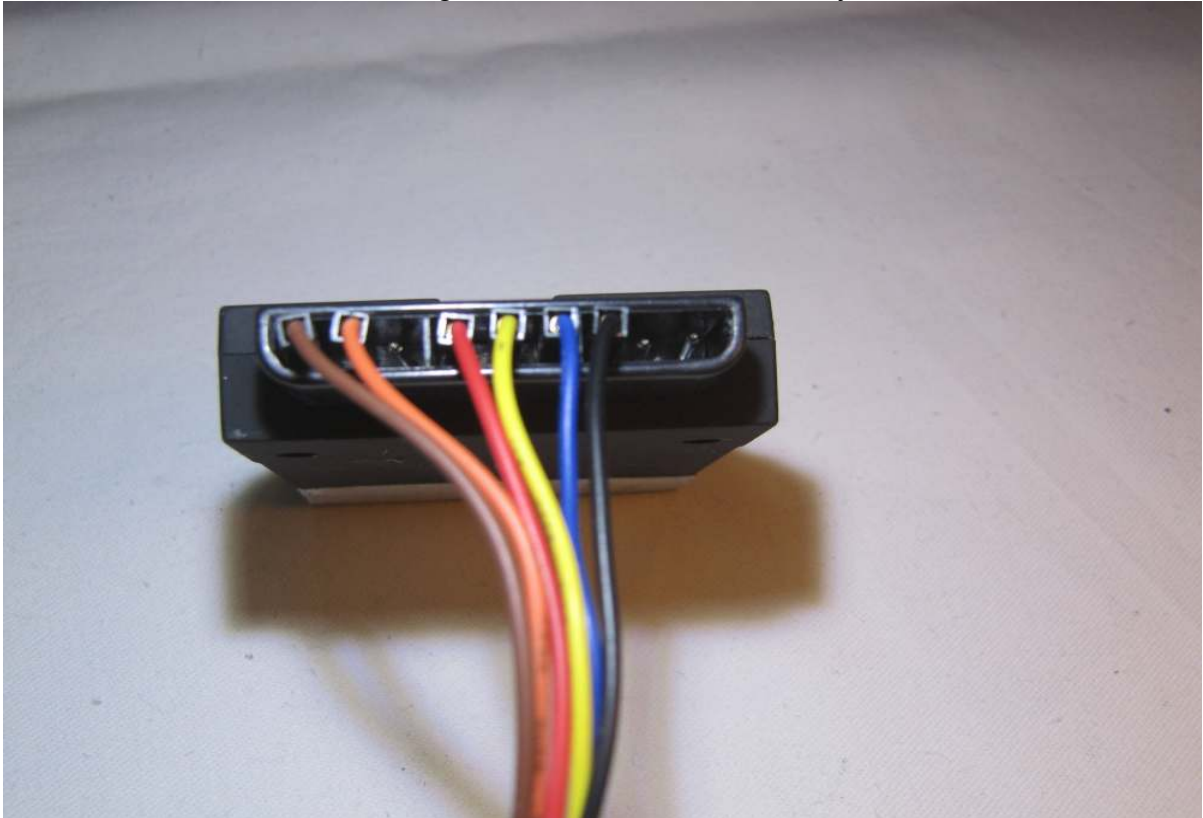
Tighten all screws. Final assembly should look like this:



WARNING: Watch the Jumper settings of the ARC Servo Power Supply!



Now the PS2 receiver will be connected with the ARC-32.
Make sure to be careful here again, the PS2 receiver is very sensitive to errors.



PS2 receiver back view:
cables to be attached from left to right:

- 1=brown (PS2 DAT „PIN 40“)
- 2=orange (PS2 CMD „PIN 41“)
- 3=not connected
- 4=red (PS2 MINUS POL!!!!!!!)
- 5=yellow (PS2 PLUS POL!!!!!!!)
- 6=blue (PS2 SEL „PIN 42“)
- 7=black (PS2 CLK „PIN 43“)
- 8=not connected
- 9=not connected

Connections at the ARC-32:

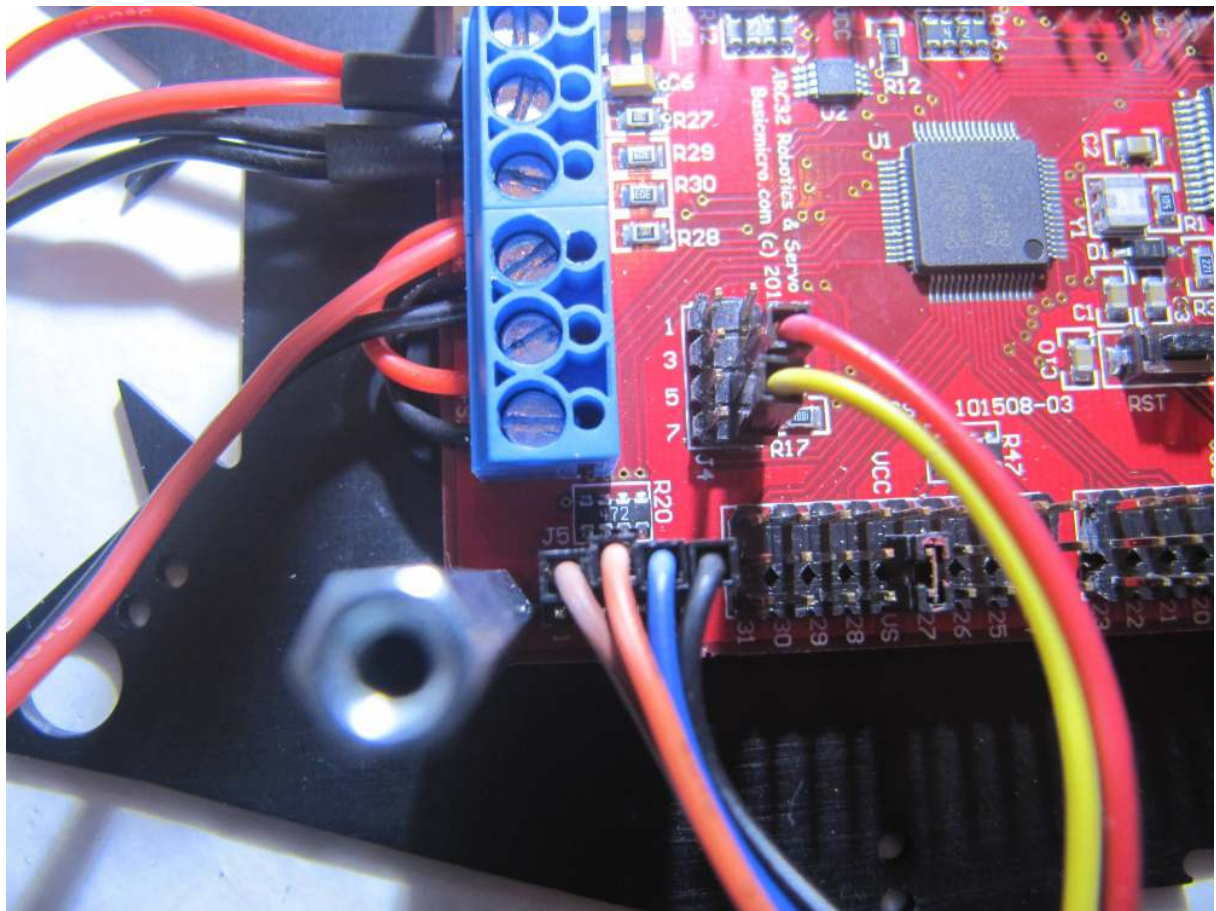
See datasheet of the ARC-32 if available from basicmicro.com website.
The PS2 receiver is attached at „J5 - AUX2 Header“ at following pins:

Pin 40: brown

Pin 41: orange

Pin 42: blue

Pin 43: black

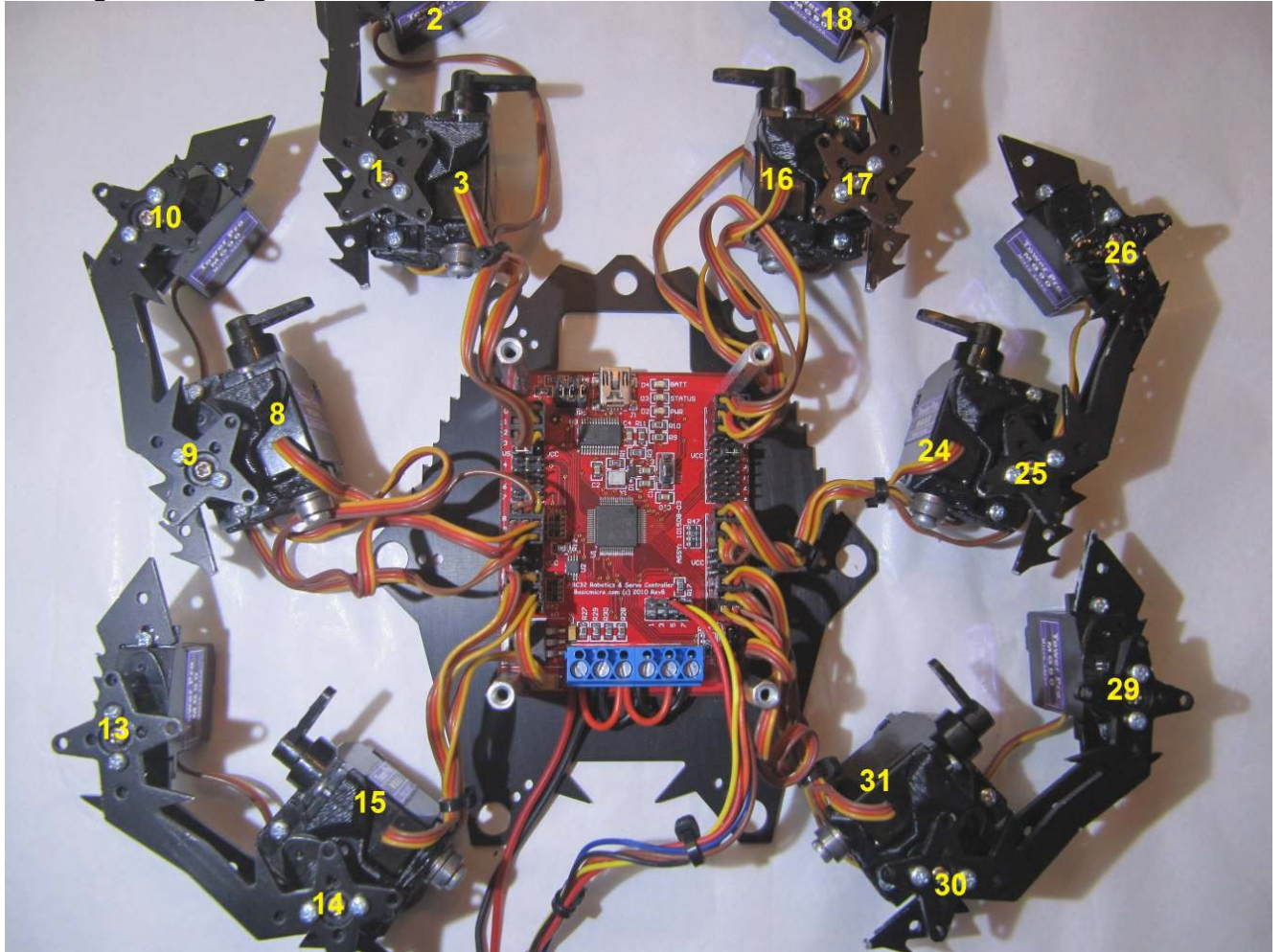


These pins are used for powering the receiver with 5VDC:
J4 - AUX1 Header.

Pin 6 GND: red!

Pin 8 VCC: yellow!

Wiring of the 6 legs:

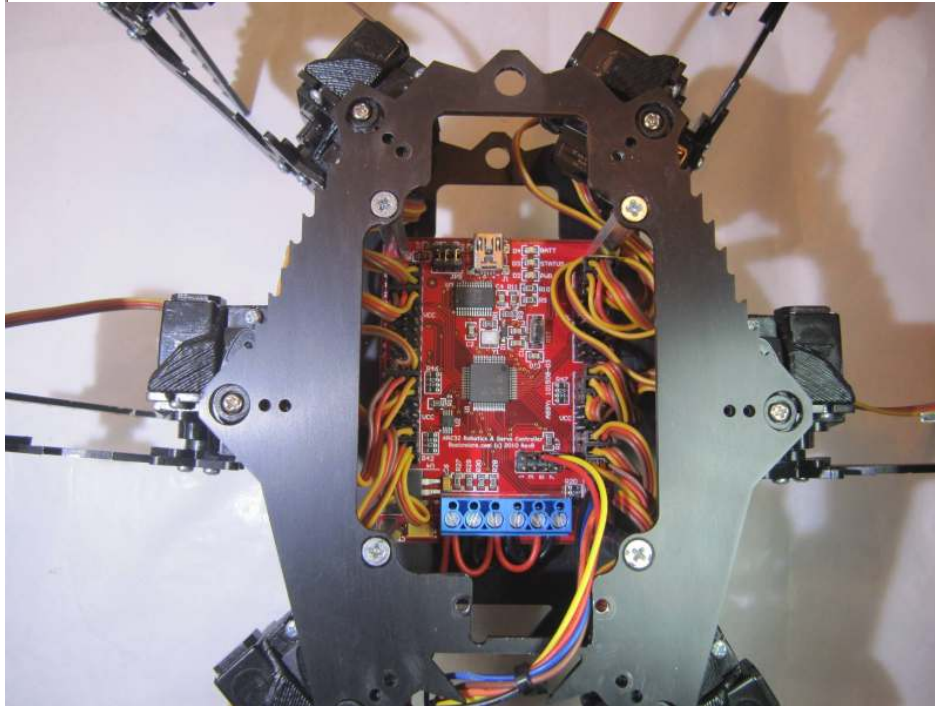


cRRCoxaPin	con P16	;Rear Right leg Hip Horizontal
cRRFemurPin	con P17	;Rear Right leg Hip Vertical
cRRTibiaPin	con P18	;Rear Right leg Knee
cRMCoxaPin	con P24	;Middle Right leg Hip Horizontal
cRMFemurPin	con P25	;Middle Right leg Hip Vertical
cRMTibiaPin	con P26	;Middle Right leg Knee
cRFCoxaPin	con P31	;Front Right leg Hip Horizontal
cRFFemurPin	con P30	;Front Right leg Hip Vertical
cRFTibiaPin	con P29	;Front Right leg Knee
cLRCoxaPin	con P3	;Rear Left leg Hip Horizontal
cLRFemurPin	con P1	;Rear Left leg Hip Vertical
cLRTibiaPin	con P2	;Rear Left leg Knee
cLMCoxaPin	con P8	;Middle Left leg Hip Horizontal
cLMFemurPin	con P9	;Middle Left leg Hip Vertical
cLMTibiaPin	con P10	;Middle Left leg Knee
cLFCoxaPin	con P15	;Front Left leg Hip Horizontal
cLFFemurPin	con P14	;Front Left leg Hip Vertical
cLFTibiaPin	con P13	;Front Left leg Knee

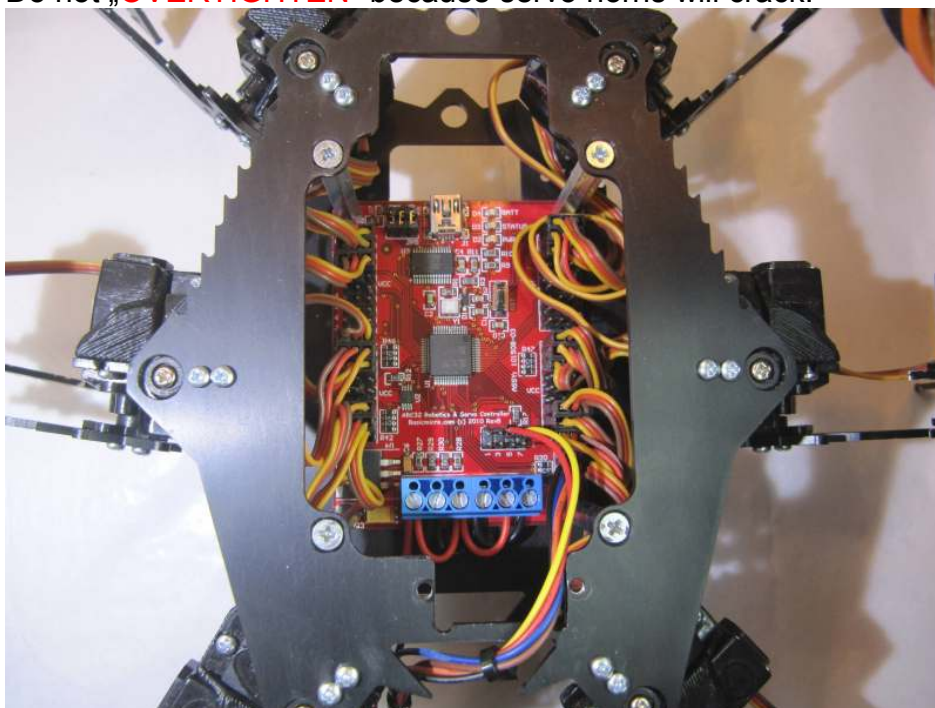
After cabling all, the top aluminium body plate can be added.
The HEX-E is nearly complete now and gains its final shape.

Add the ball bearings to the upper plate to attach the hips of the assembled legs

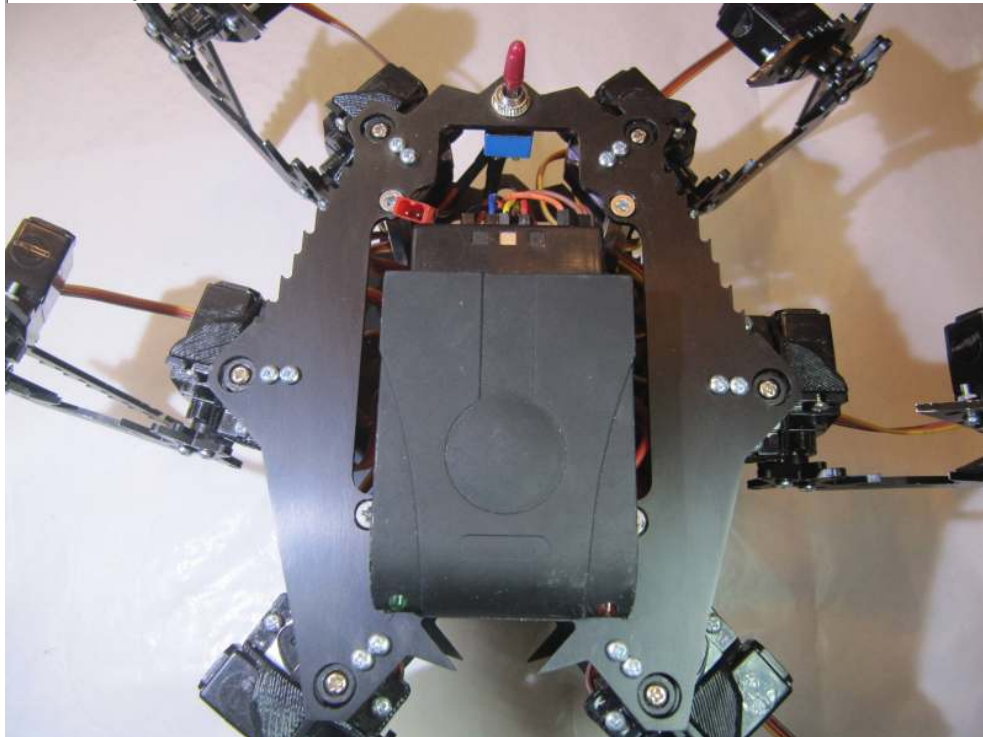
Place the upper plate on top of the HEX-E and attach with screws M3x6 (do not tighten at all right now)



Now use the screws (tin screw 2,5x 6mm) to attach the legs.
Do not „**OVERTIGHTEN**“ because servo horns will crack.

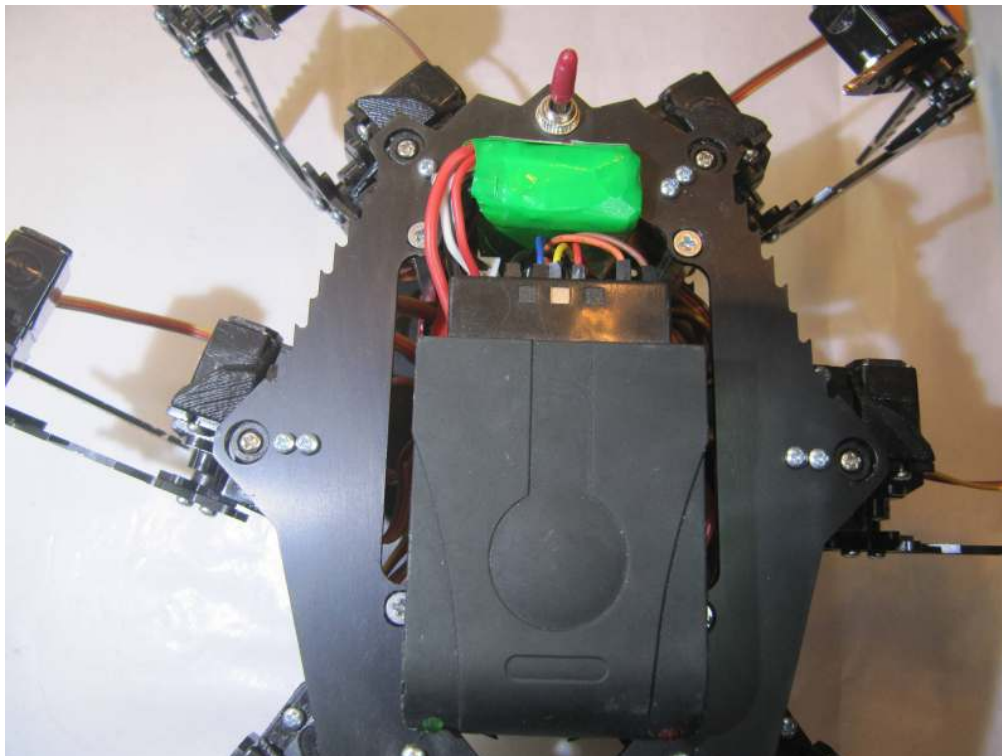


Now the PS2 receiver can be attached with the already applied double sided tape to the front part and the ON/OFF switch can be inserted into the back end.



Finally the Battery is inserted into the back of the HEX-E gesteckt and this concludes the assembly of HEX-E.

!BEFORE YOU ATTACH THE BATTERY, CHECK ALL CABLES ONCE AGAIN. WRONG POLARITY WILL SEVERELY DAMAGE THE ELECTRONICS AND MOTORS!



We continue with the calibration of the legs:

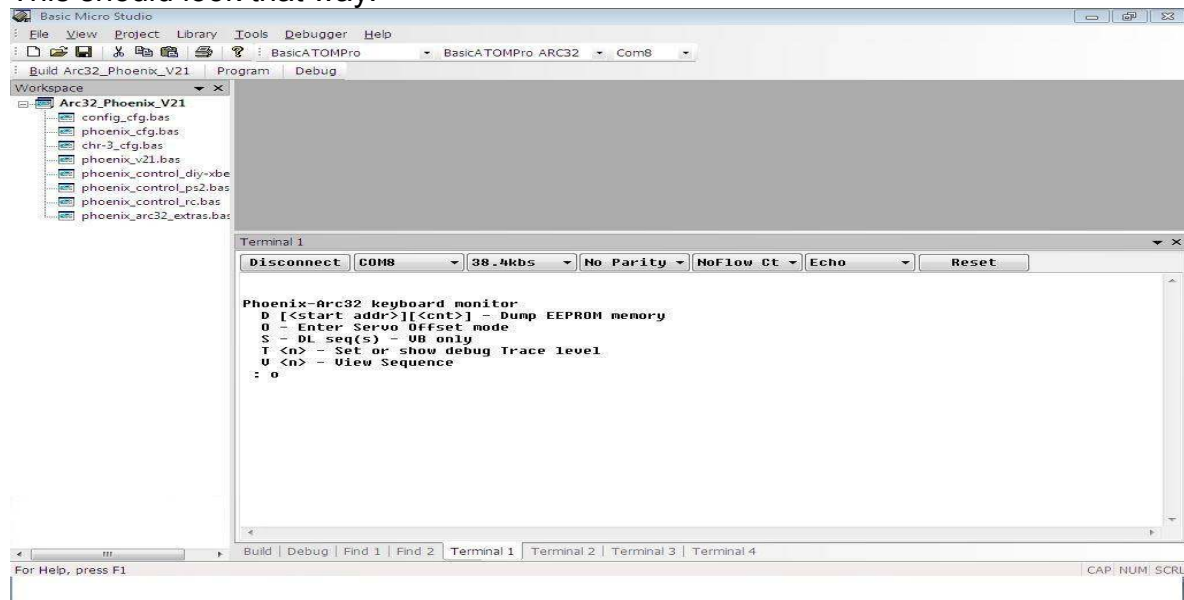
Download the programming environment for the ARC-32 „Basic Micro Studio“ (http://www.basicmicro.com/Downloads_ep_43.html) from BasicMicro.

Install the software and open „Arc32_Phoenix_V21.prj“ which is available by download. (You should have received a link from us, if not: support@nodna.de)

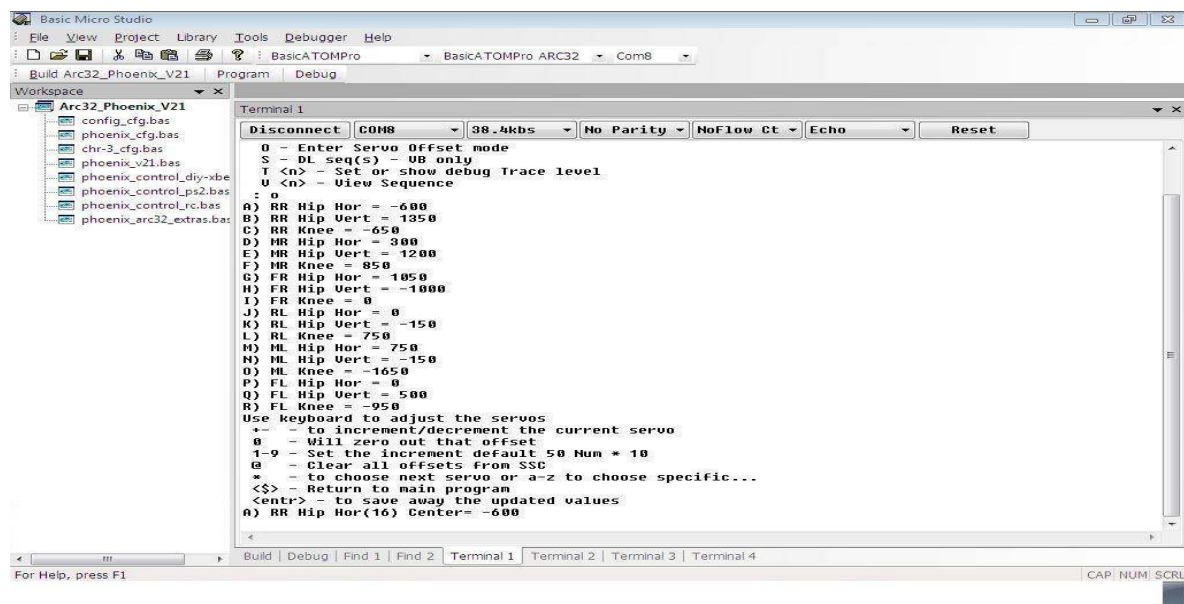
Place the HEX-E onto some small books or a stand, so that the legs can move freely. Switch on HEX-E and connect the ARC-32 by USB cable with the PC. Select the type of processor in the first column above (BasicAtomPro) and select the board type in the second column (BasicAtomPro ARC32). Select your virtual COM-Port in the third column.

Open a Terminal in the lower section „TERMINAL“ with 38.400kbs.

This should look that way:



Now we can begin with direction of the leg servos
Start the Terminal with „O“.

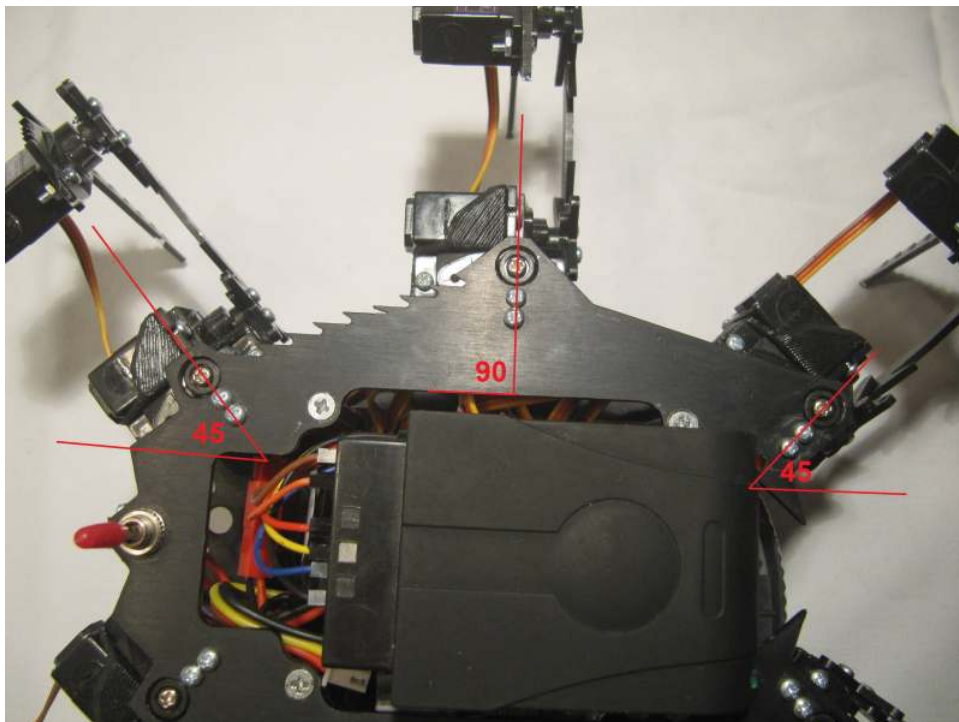


With the letters A-R you can select each single servo.
While you enter the letter, the leg moves.

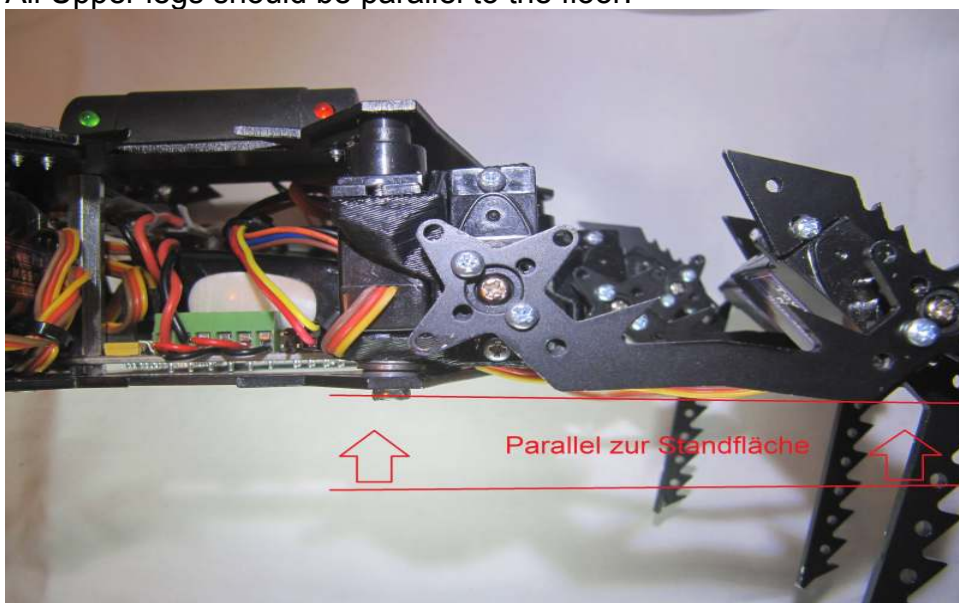
By pressing + or – the servos can now be calibrated one by one.

If the range -2000 or +2000 is not enough to reach the desired goal position, then unscrew the servo horn and replace it a few degrees differently.

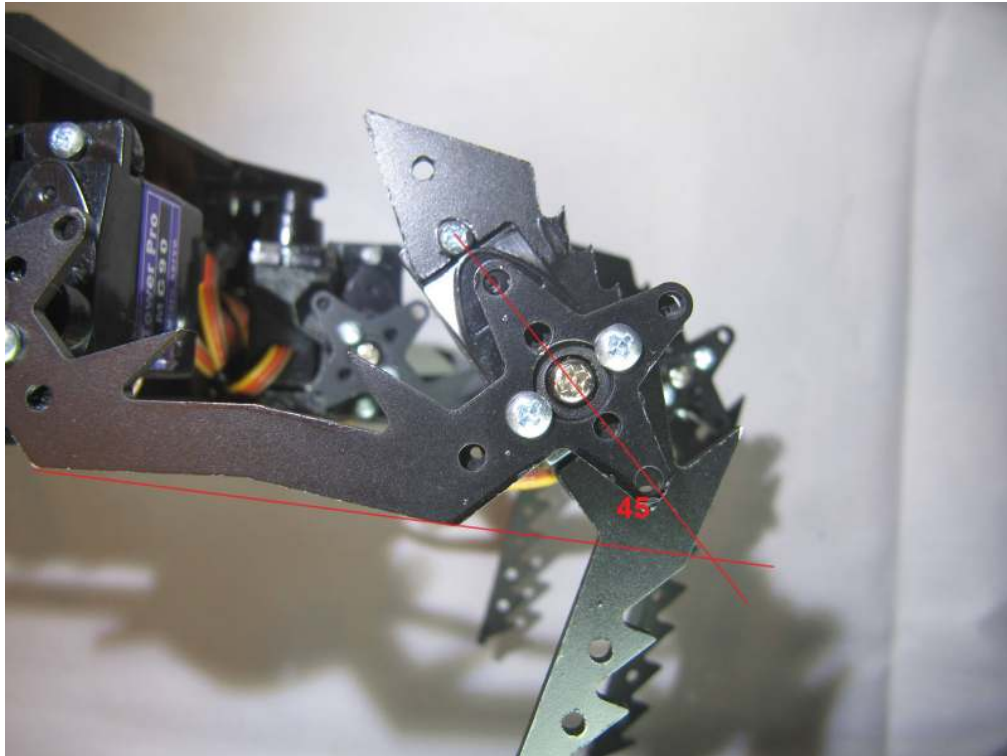
Seen from above, the two front legs and the two back legs should be in an angle of 45 degrees towards the body and the middle two legs should be in an angle of 90 degrees towards the body:



All Upper legs should be parallel to the floor:



The knee servos should be 45 degrees towards the upper leg and be in line with the upper leg star shape.



Now press „ENTER“ and the terminal program stores the values as fixed offset values.

Now press „PROGRAM“ and HEX-E is being programmed with all gaits and offsets.

Detach USB Cable. Place Battery into the back and we can make first walks:

Switch on PS2 Gamepad (the red LED of the receiver should constantly lit.)

Press „START“ Button at Gamepad (HEX-E should be in a ducked position and you should hear humming of the motors)

Press „TRIANGLE“ at Gamepad: HEX-E is standing up

Here are more button controls of the GAMEPAD:

PS2 CONTROLS:

[Common Controls]

- Start Turn on/off the bot
- L1 Toggle Shift mode
- L2 Toggle Rotate mode
- Circle Toggle Single leg mode
- Square Toggle Balance mode
- Triangle Move body to 15 mm from the ground (walk pos) and back to the ground

- D-Pad up Body up 10 mm
- D-Pad down Body down 10 mm
- D-Pad left decrease speed with 50mS
- D-Pad right increase speed with 50mS

[Walk Controls]

- select Switch gaits
- Left Stick (Walk mode 1) Walk/Strafe
(Walk mode 2) Disable
- Right Stick (Walk mode 1) Rotate,
(Walk mode 2) Walk/Rotate
- R1 Toggle Double gait travel speed
- R2 Toggle Double gait travel length

[Shift Controls]

- Left Stick Shift body X/Z
- Right Stick Shift body Y and rotate body Y

[Rotate Controls]

- Left Stick Rotate body X/Z
- Right Stick Rotate body Y

[Single leg Controls]

- select Switch legs
- Left Stick Move Leg X/Z (relative)
- Right Stick Move Leg Y (absolute)
- R2 Hold/release leg position

[GP Player Controls]

- select Switch Sequences
- R2 Start Sequence

Have FUN!
Franconia Robotix

Troubleshooting:

-BEC is becoming hot

Switch off! Check all cables. Check polarity and damaged cables. Make a pause of 30 minutes after 1 hour run.

-HEX-E jitters uncontrolled and makes strange moves

check battery and recharge
check Gamepad batteries and replace

-HEX-E does not move after powering up

check connection of battery
check connection of PS2 receiver
check batteries of PS2 gamepad
check cables for short circuit

-Servo does not move

check if it is attached correctly to the ARC-32
check servo cables for damage
check joint if something is stuck
replace defective servo

Technical support is available here: support@nodna.de