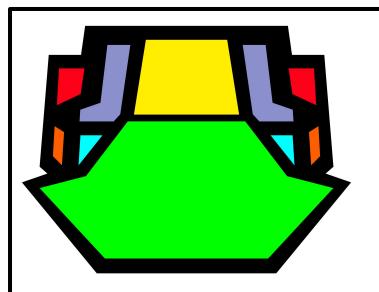


# SLIPPER ASSEMBLY INSTRUCTIONS

**Versions** – Anvil through Disruptor

\*As with most instructions it is HIGHLY recommended to read <u>ALL THE WAY</u> through the instructions multiple times before starting. Often a later step clarifies earlier steps.

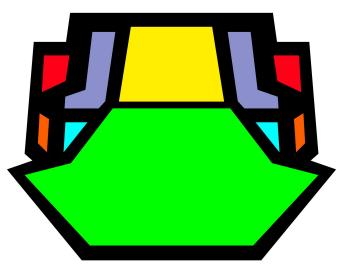


Thank you for purchasing **Slipper**, a non-destructive 150g combat robot.

**Slipper** is designed to be **easy** to assemble, battle, maintain, and customize if desired.

150g combat robots are known as "Fairyweight" in the US and "Antweight" throughout the rest of the world.

Slipper is quite competitive "out of the box" and can be upgraded to be a serious contender in almost all 150g competitions.



### ! Safety! First and Always!

Turnabots are among the safest combat robot kits available.

\*HOWEVER\* There are still several things to be aware of:



**LiPo batteries** can be VERY dangerous. Charging should ONLY be done in a LiPo bag or FAR from anything flammable.

Do NOT cut both wires of a battery at the same time. If you need to change connectors, cut one wire, install it in the new connector, then cut the other wire.

If a LiPo has sustained any damage or has "puffed" do NOT charge it. DISCARD it (safely and properly).



Do not lick any electronics. Do not allow children or pets to lick any electronics.

After anyone touches any electronics, faces must not be touched and hands must be washed with soap, and cold water, particularly before eating.

### **Table of Contents**

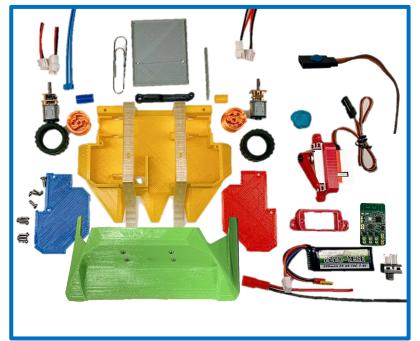
\*As with most instructions it is HIGHLY recommended to read <u>ALL THE WAY</u> through the instructions multiple times before starting. Often a later step clarifies earlier steps.

These instructions will cover every single step in properly assembling your Slipper Kit.

There are 3 sections to these instructions; each page is bordered by the below colors

Standard Kit Assembly Instructions (pages 6-29) Pre-Soldered Kit Assembly Instructions (pages 29-38)

Setup / Radio /
Programming Instructions
(TBD – available in the video)







# Tools - Required and Useful

### Pre-Soldered Kit

#### Required:

- 1. Small Phillips Screwdriver
- 2. 1.5mm hex (allen) driver (key)

#### <u>Useful</u>

- Super-glue / cyanoacrylate (tires, wheels, repairs, etc. Using "accelerator / activator" is recommended)
- 2. Needle-Nose Pliers (often helpful for placing servo screws among other uses)
- 3. Thin Acetate (flexible plastic for the front edges of wedges. Often applied with thin "carpet tape" or glue)
- 4. File(s) useful for removing sharp edges

### Standard Kit

#### Required:

- 1. Soldering Iron / Station at the very least you'll want something with adjustable temperature and a small tip
- 2. Solder if using leaded solder BE AWARE OF LEAD POISONING. Lead-free solder can be used successfully
- 3. Flux paste or pen, incredibly helpful
- 4. Flush-Cutters (aka side-cutters)
- 5. Wire Strippers decent "auto-strippers" are now available for under \$12 on Amazon and are worth it
- 6. Needle-Nose Pliers (often helpful for holding wires while soldering, placing servo screws, etc)
- 7. Small Phillips Screwdriver
- 8. 1.5mm hex (allen) driver (key)

#### <u>Useful</u>

1. File(s) – useful for removing sharp edges

### Assembly is very straightforward (you can do it)

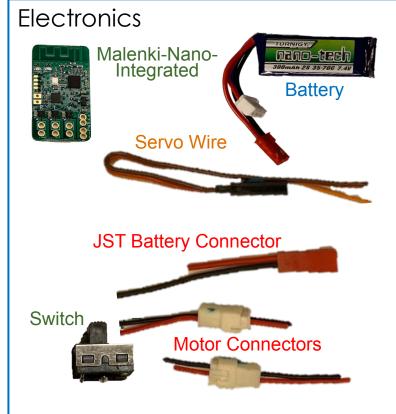
Every single step will be covered in these instructions.

With the **Standard Kit**, **START** by laying out the parts. (Note the **LEFT** side and **RIGHT** side)

Yours may be different colors than the below images, but you'll have the same shape parts.

- 1. Top Armor
- 2. Micro Servo Adapter
- 3. Plow
- 4. Left armor
- 5. Right Armor
- 6. Left Arm
- 7. Right Arm
- 8. Chassis
- 9. Left Wheel
- 10. Short Spacer
- 11. Link
- 12. Long Spacer
- 13. Right Wheel



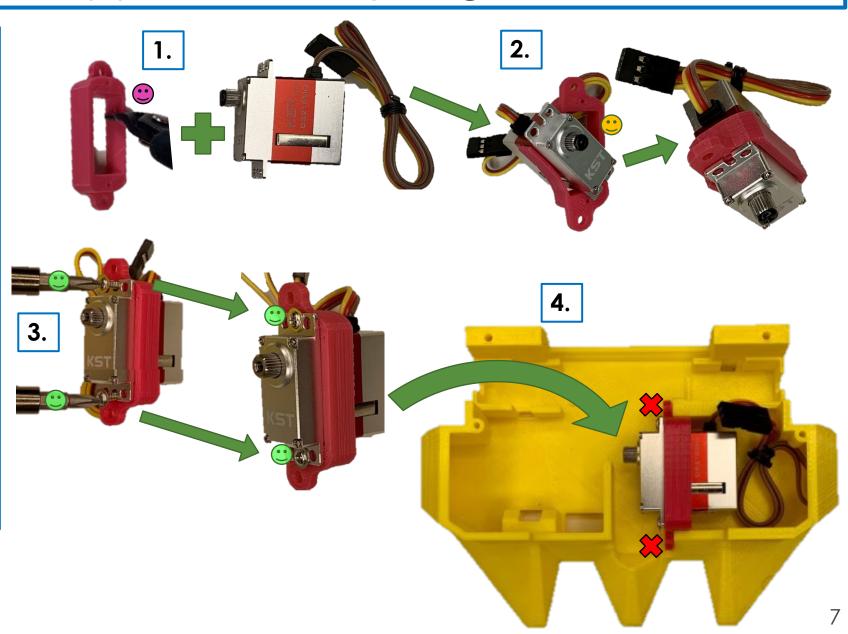




### Standard Slipper Assembly Page 1/23

#### Micro Servo Adapter installation:

- 1. If the Micro Servo Adapter
- does not have a split at the bottom you may want to snip it at the indicated location.
- 2. Place the Micro Servo into the
- Micro Servo Adapter noting the orientation of the servo shaft, the adapter ears, and the adapter side that fits into the chassis mounts.
- 3. Install the 2 servo mounting
- screws, you do want these relatively tight)
- 4. Place the Servo into the Chassis but do not install the
- screws from the adapter to the chassis yet.

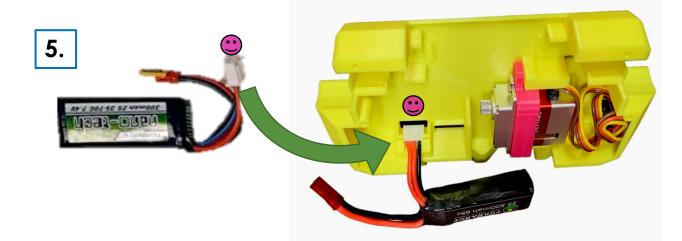


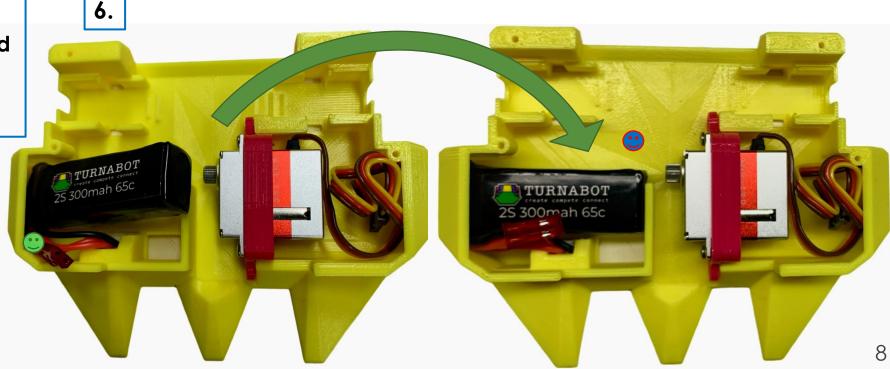
### Standard Slipper Assembly Page 2/23

#### **Charging Port/Battery**

#### Installation:

- 5. Insert the battery charging
- connector into the mount.
  Keeping the connector very straight makes this step easiest. It can be a bit tricky, but it's worth making charging easy.
- 6. Place the Battery into the
- Chassis with the wires tucked into the front corner. The
- battery should fit snugly into the pocket.





### Standard Slipper Assembly Page 3/23

Motor Orientation (Installation is on the next slide. Do NOT force the motors into the chassis while flat on a hard surface):

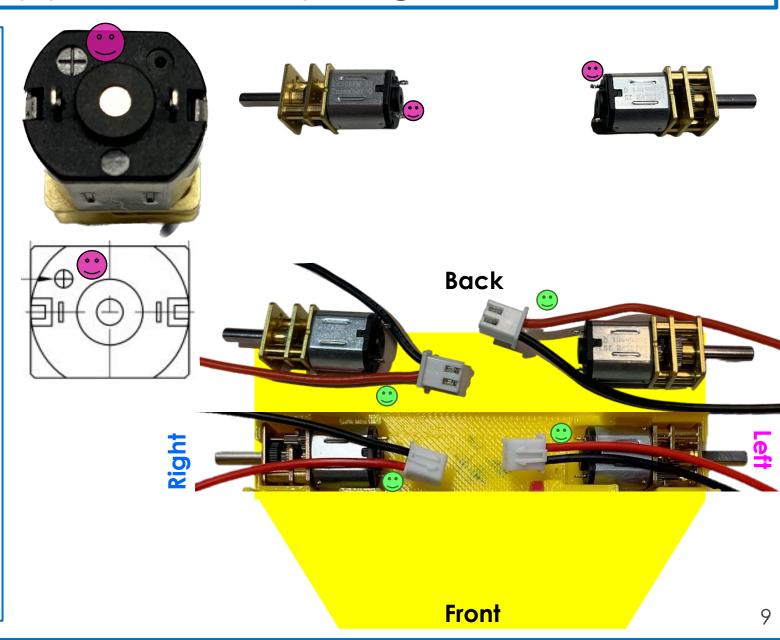
We make a general practice of having
"Plusses Up" to make it easier to see when installed. It helps know where the wires go. This is helpful with troubleshooting, particularly in pit sessions between battles.

Turnabot motors may also have the RPM and name laser engraved on the "Top"

"Plusses Up" on Turnabot motors generally result in the Red Wire to the front on the Right side of the bot and

to the back on the Left side. The male side of the motor connector goes to the motor.

\*Connect the Red Wire to the PLUS regardless of the orientation of the connector. The motor connectors themselves may vary as to which side will be up with the Red Wire properly connected to the PLUS terminal.

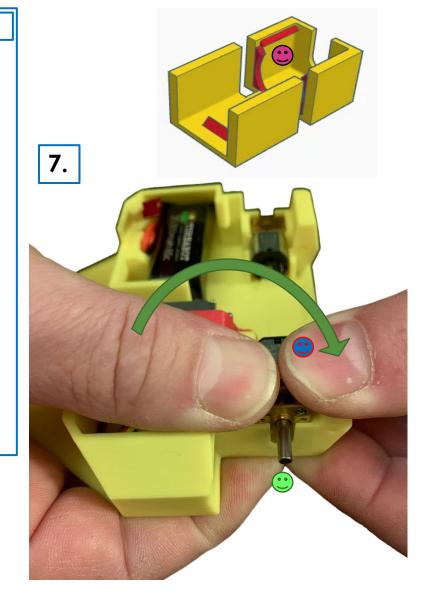


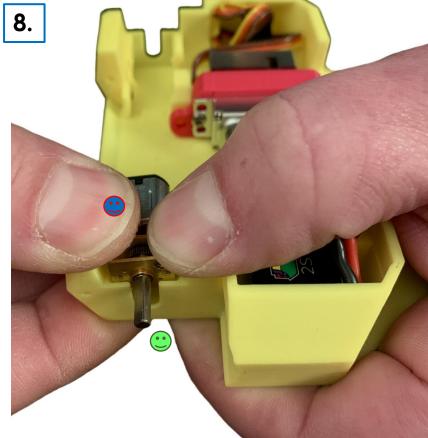
### Standard Slipper Assembly Page 4/23

#### **Motor Installation:**

The Turnabot chassis have "motor retention features" to help hold the motors in place even if the zip-ties are damaged. To keep the retention as strong as possible care should be taken to avoid over-stressing the chassis and to avoid "wiping" away the retaining features.

- 7. Hold the chassis with your
- fingers under the chassis and your thumbs on the motor mount walls. GENTLY flex the
- motor mount area open ever so slightly while guide the motor into place.
- 8. Repeat on the opposite side.

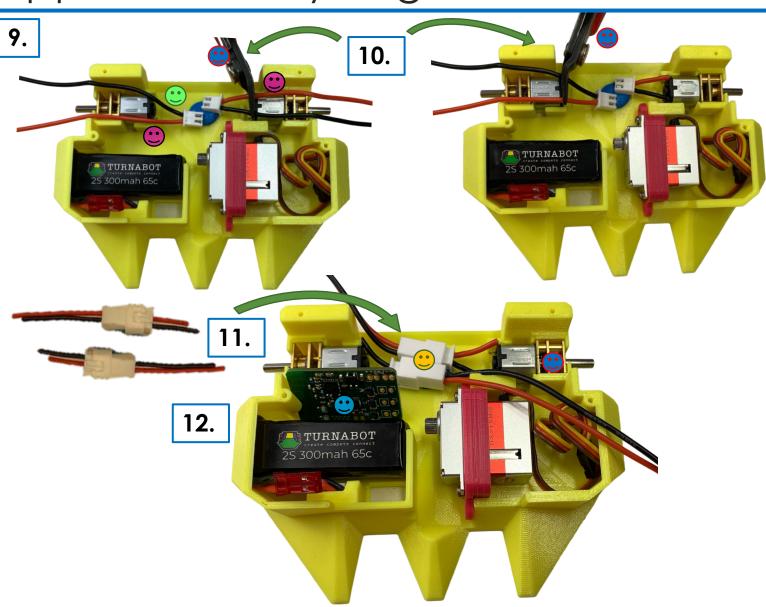




### Standard Slipper Assembly Page 5/23

#### Wiring routing and trimming 1/4:

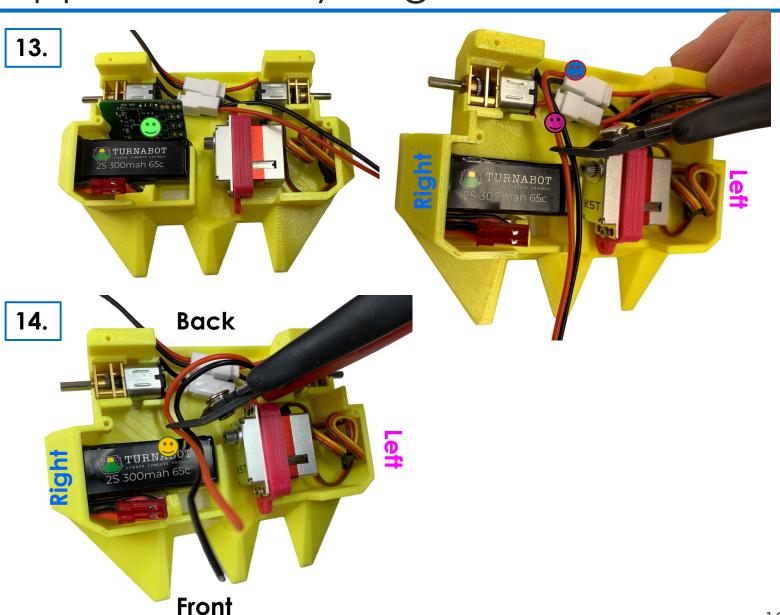
- 9. A dot of Blu-Tak under the motor
- connectors is very helpful for wiring. Place the motor connectors into the Blu-Tak so that the Red
- Wires are aligned to the PLUSSES on each motor.
- 10. Snip the wires aligned with the
- motor plates. Generally snip one at a time.
- 11. Assemble the motor connectors
- and place them back into the Blu-Tak.
- 12. Place the Malenki-Nano between
- the right motor and the battery as shown.



### Standard Slipper Assembly Page 6/23

#### Wiring routing and trimming 2/4:

- 13. Note where the Malenki is and
- noute the wires from the Left motor
- connector around to where they will meet the back of the Malenki.
- Routing the LEFT motor connector wires toward the back of the bot improves the routing. Snip the wires long enough to go through the Malenki, almost to the battery.
- 14. Route the RIGHT motor connectors in a loop back around to the back
- of the Malenki. Snip the wires where they'll go through the Malenki.

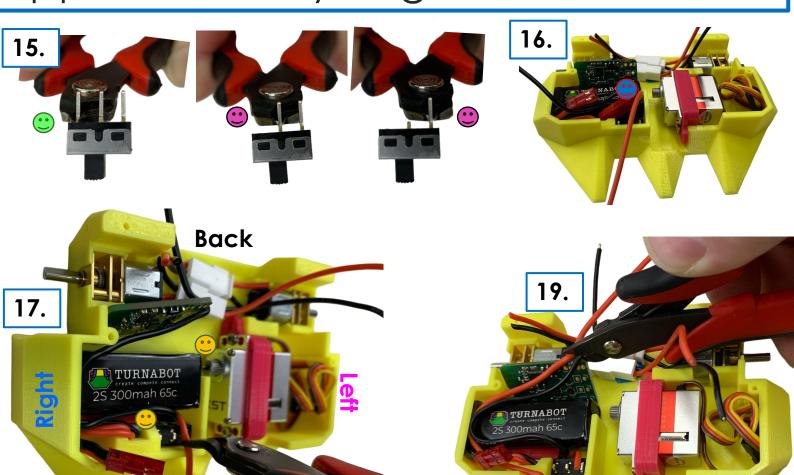


### Standard Slipper Assembly Page 7/23

**Front** 

#### Wiring routing and trimming 3/4:

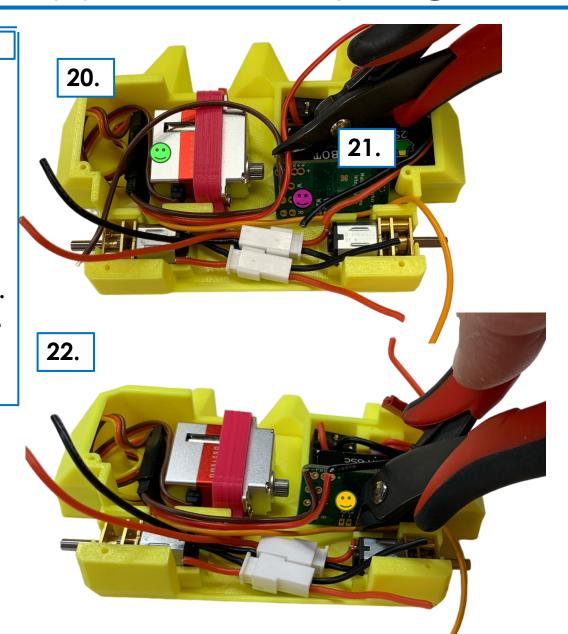
- 15. Cut one leg of the switch all the
- way off. Cut the other two legs just
- above the bulges.
- 16. Insert the JST Battery Connector
- between the battery and the charge port mount.
- 17. To ease battery swaps the Black
- Wire is routed along the RIGHT
- corner of the bot, then to the Malenki.
- 18. The Red Wire is cut at the further leg of the switch. The cut portion of Red Wire is routed along the corner and then to the Malenki.
- 19. The Red and Black wires are cut where they go through the Malenki.



### Standard Slipper Assembly Page 8/23

#### Wiring routing and trimming 4/4:

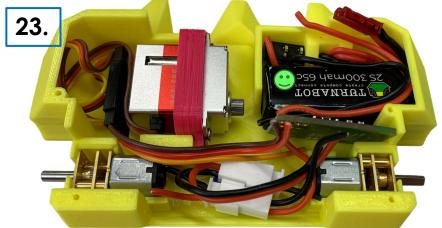
- 20. Connect the servo extension lead
- to the servo itself. Tuck the connector in next to the servo.
- 21. Route the servo extension wires over to the Malenki. Split the
  - Orange (signal) wire off from the Red (B+) and Black (B-) wires. Snip the Red (B+) and Black (B-) wires where they go through the Malenki.
- 22. Snip the Orange (signal) wire at the
  - where it reaches the gold PWM solder pad.



### Standard Slipper Assembly Page 9/23

#### Final checks before soldering:

- 23. It's worth some final checks before soldering. The trimmed
- end harness in the bot should look like the image to the right.
- 24. Take the wires out and strip the ends. These strippers are handy.
- 25. These are reference images for what it will look like completed.





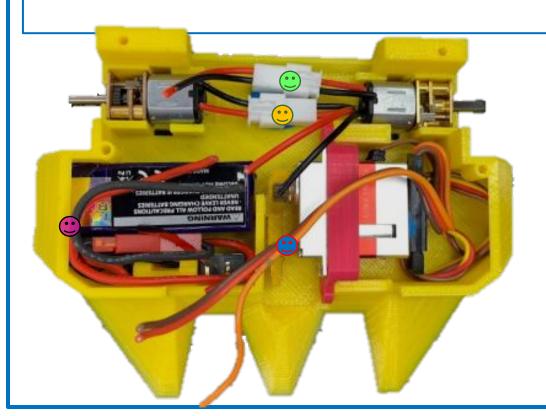
### Standard Slipper Assembly Page 10/23

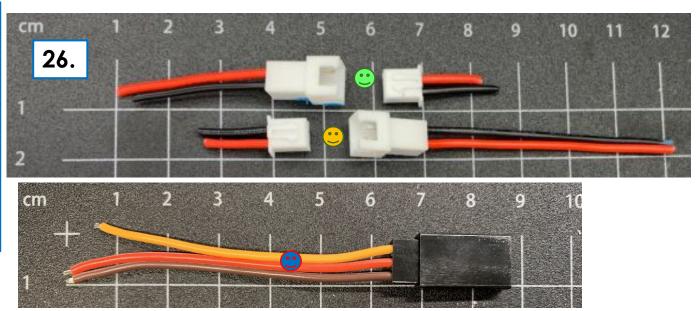
#### Wire Lengths:

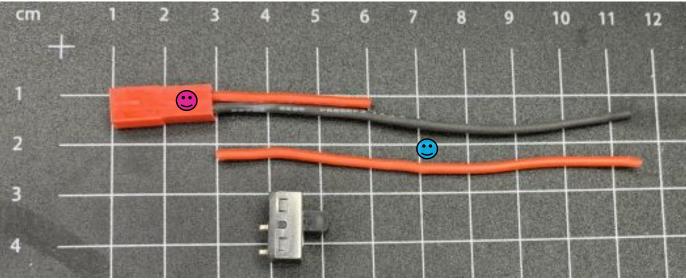
26. If you would prefer, you can cut your wires to the lengths visible in the images on the right.

(You are reading this <u>BEFORE</u> starting, right?)

You can see the lengths of the Left Motor 
Connector, the Right Motor Connector, the Servo Connector, JST Battery Connector and the Red Wire from Switch to Malenki.



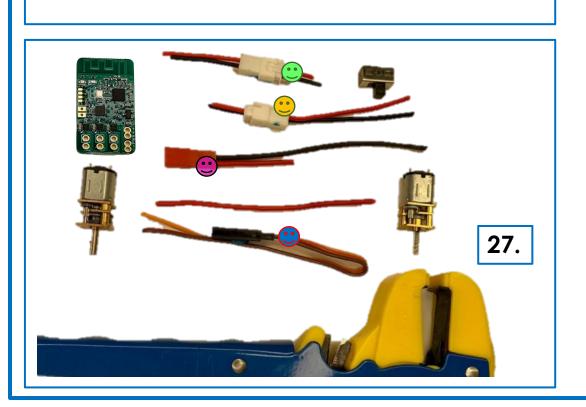


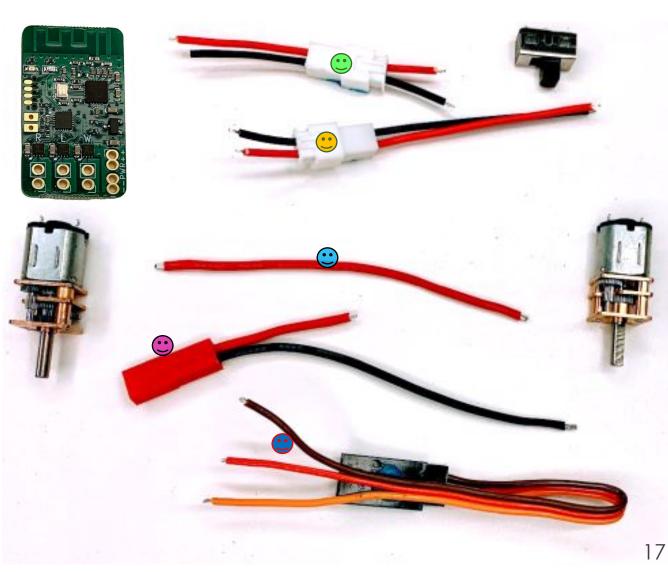


### Standard Slipper Assembly Page 11/23

#### Strip all the wires:

- 27. Strip all exposed wire ends 1-2mm. Including
- the Left Motor Connector, the Right Motor
- Connector, the Servo Connector, the JST
- Battery Connector and the Cut Red Wire from Switch to Malenki.





### Standard Slipper Assembly Page 12/23

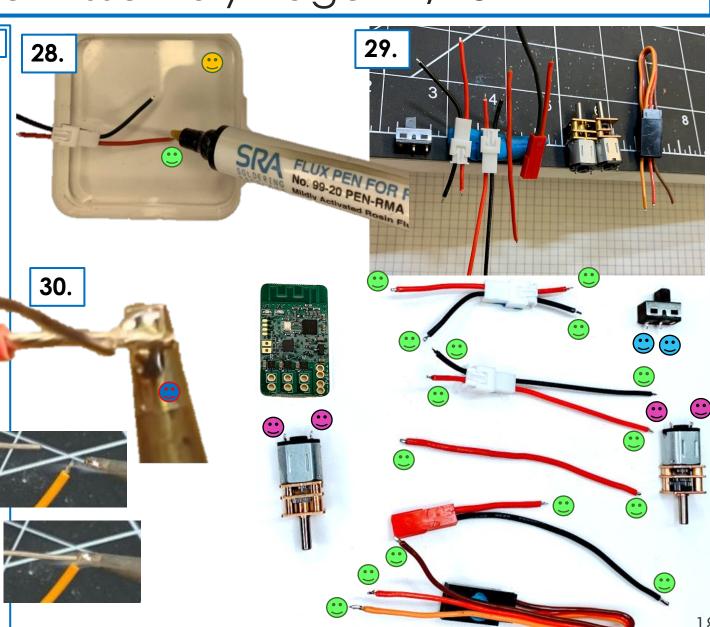
#### Tinning (Do NOT tin the Malenki):

- 28. Start by putting flux on ALL 15 of the wire ends, the 2 Switch Terminals, and all 4 of the Motor
- Terminals. (Flux is very sticky, take care not to get it on anything you don't want it on. We use a small tray to contain
- it. It is well worth using flux it gets the solder to flow where you want it with significantly less heating of parts.)
- 29. Set everything up so that you can tin all the wires and terminals. (Tinning is getting a bulb of solder onto all the components that you will be soldering.)

\*Do not tin the Malenki\*

#### 30. Tinning basics:

- a) Heat the iron
- b) Clean your iron tip
- c) Touch the solder to the iron to put a drop (aka "pillow") of solder on it to improve heat transfer to the wire
- d) Touch the iron to the "back" of the wire or component to support it as you heat it. Particularly if you fluxed your wire or component, after a moment you will see the solder from the iron wick into the wire or component.
- e) You can then feed solder into the "front" of the wire or component. You'll want to get enough solder into / onto the wire or component that many joints have enough solder already on the mating parts that they don't require additional solder. That said, with combat robots you'll often add solder to make the joints as strong as possible.



### Standard Slipper Assembly Page 13/23

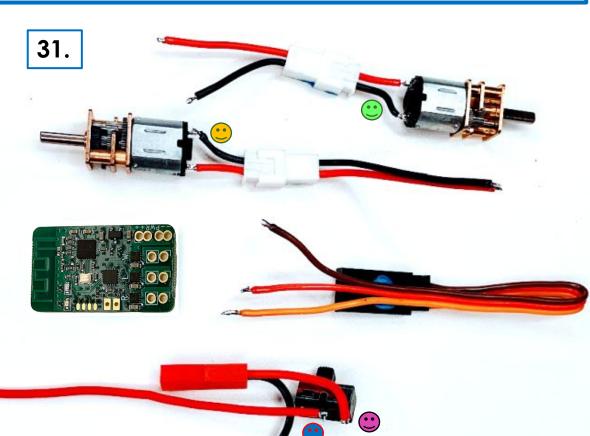
#### Solder the wires to the components:

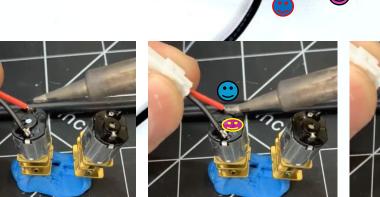
- 31. Solder the Motor Connectors to the Motors, The Left is
- offset toward the back of the bot, the Right is offset
- o toward the front of the bot. There are details on the
- <u>next slide</u> for soldering the Red Wire on the JST Battery Connector to the far switch leg and the Cut
- portion of the Red Wire from to the near switch leg.

It is important to have as strong of a joint as possible between the motor terminals and the motor connector wires. The failure of these joints are among the most common causes of losing drive, which often results in losing battles.

For soldering these critical joints, the best technique we have found is to have well-tinned wires along the outside of well-tinned motor terminals and touching the iron to the inner side of the terminals, ensuring that the solder flows from the wires through the terminals.









### Standard Slipper Assembly Page 14/23

#### Solder the Switch:

- 32. The switch is near the front of the bot, meaning it can take a lot of impact. You'll want to heavily tin the
- ctroinals to create a strong joint.
- 33. With well-tinned terminals and wires, hold them to give maximum contact areas.
- 34. Heat the far terminal until the solder flows from the
- Battery Connector wire to the terminal.
- 35. Holding the Cut Red Wire to give maximum contact with the close terminal, heat the terminal until you get a solid solder joint.









### Standard Slipper Assembly Page 15/23 (overview)

#### Solder the wires to the Malenki:

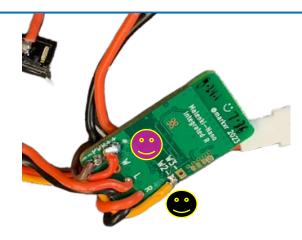
#### Completed harness for reference.

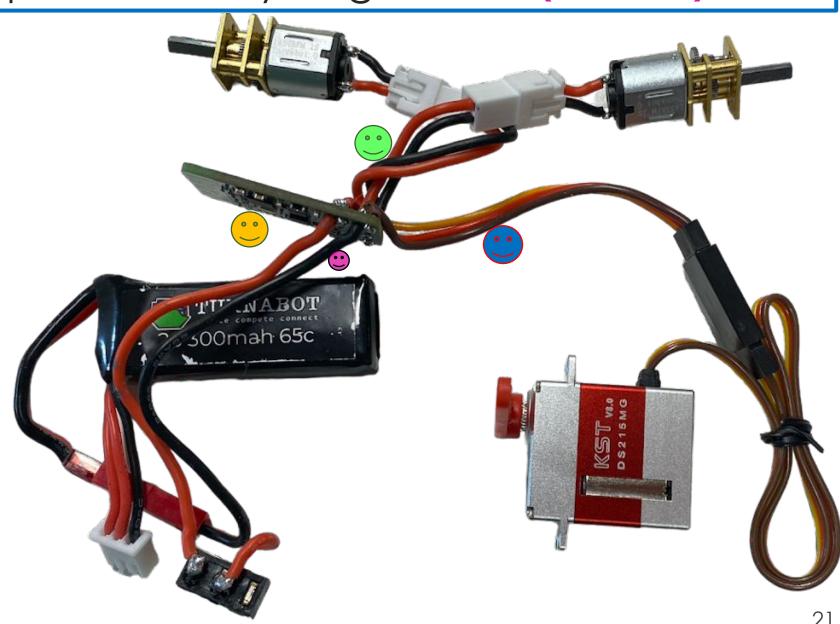
We refer to the side with the components  $\odot$  as the Front.

The motor wires and the servo wires connect to the Back.

The B- (Black) , and Switch Power (Red), connect to the Front.

Note that Slipper does not use the Weapon (W) ports. The servo Signal wire (Yellow) is connected solder pad (C). closest to the through-holes (W2-).



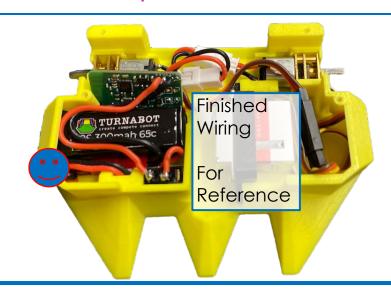


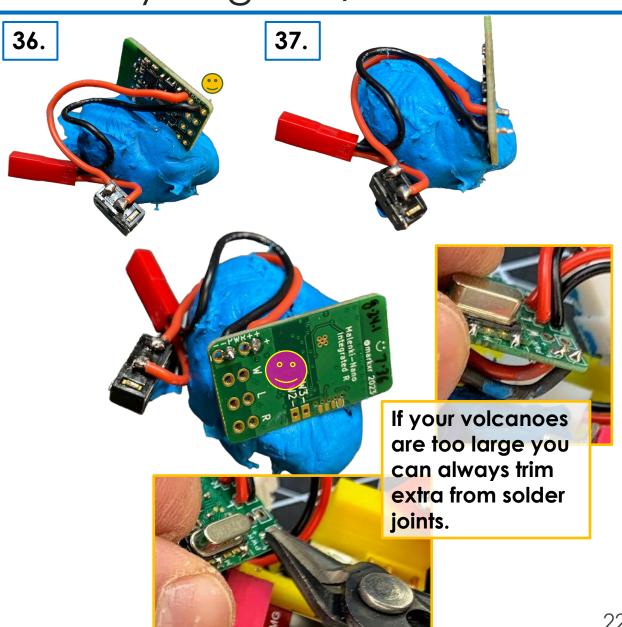
### Standard Slipper Assembly Page 16/23

#### Solder the Power and Ground to the Malenki:

Image below: The Cut Red Wire and the Black wire from the JST Battery Connector (B-) route to the corner before going to the Malenki to simplify battery swaps.

- 36. The Cut Red Wire and the B- go through the PWR+
- and PWR- though-holes respectively. If they don't easily fit through you can trim the solder bulbs a bit.
- 37. Again, a bit of Blu-Tak secures the wires while we solder. Again, heat the ring for a moment before
- sliding to the wire, when the solder on the wire melts, you can feed a touch more solder if necessary.
- \* NOTE \* it's helpful to leave the Malenki on the Blu-Tak for the next step.





### Standard Slipper Assembly Page 17/23

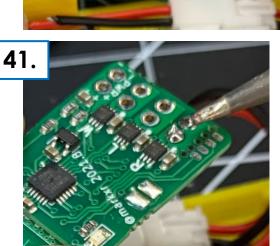
#### Solder the Right Motor Wires to the Malenki:

- 38. The Right Motor wires go through the "R"

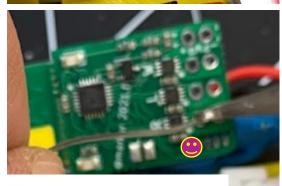
  "Solder-Rings" / "through-holes" with the Red Wire
- closest to the "R" on the Malenki.
- 39. Soldering wires into through-holes is best done by soldering the "back" of the board. As with most soldering, the "work-holding" is extremely important. All components (wires and Malenki in this case) should be held securely in place by something other than your hands, allowing you to have the iron in one hand and the solder in the other hand. Blu-tack works extremely well to hold the wires and the Malenki in a position allowing stable access to the back of the solder holes. (There are many great soldering videos on YouTube that are well worth watching if you are new to soldering. The Turnabot Soldering Videos will be released ASAP.)
- 40. With well-tinned motor wires securely and safely held through the through-holes, use the iron to heat
- the ring for a moment before sliding it to heat the
- wire for another moment, before feeding the solder to the joint.
- 41. The ideal solder joint looks like a volcano.

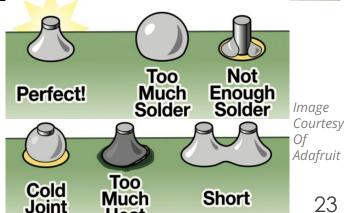












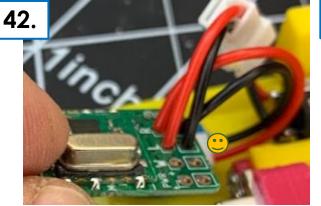
### Standard Slipper Assembly Page 18/23

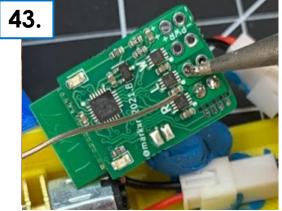
#### Solder the Left Motor Wires to the Malenki:

- 42. The Left Motor wires go through the "L"

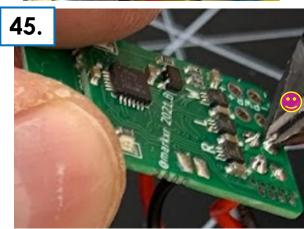
  "Solder-Rings" / "through-holes" with the Red Wire

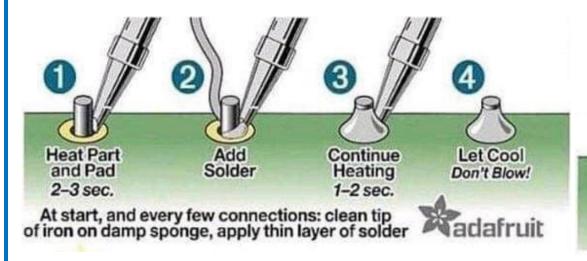
  closest to the "L" on the Malenki.
- 43. With well-tinned motor wires securely and safely held through the through-holes, (Blu-Tack) use the iron to heat the ring for a moment before sliding it to heat the wire for another moment, before feeding the solder to the joint.
- 44. The ideal solder joint looks like a volcano.
- 45. If there is excess length on the wires you can always trim them with flush cutters.

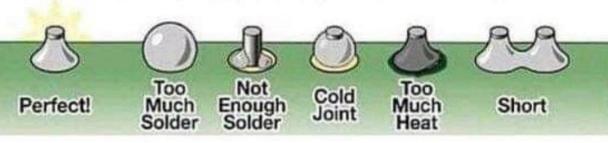












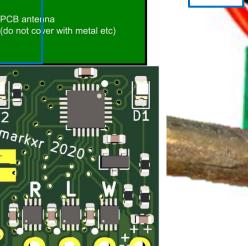
### Standard Slipper Assembly Page 19/23

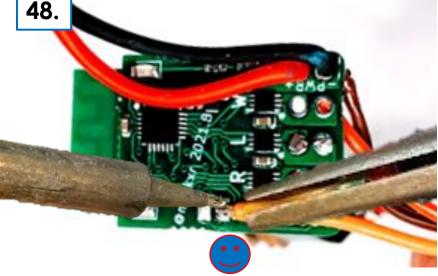
#### Solder the Servo wires to the Malenki:

- \* Note \* it's helpful to have the Malenki on the Blu-Tak.
- 46. The servo Ground Wire (Brown in these photos)
- solders to the joint of the Black Wire from the JST Battery connector though the PWR- through-hole.
- 47. The servo Power Wire (generally Red) similarly solders to the joint of the Cut Red Wire from the switch through the PWR+ through-hole. It can be
- helpful to use needle nose to hold these wires close to the end to get a secure joint.
- 48. The servo Signal Wire (Orange in these photos) is soldered to the WEAPON2 pad (closest to the through holes / bottom of the Malenki).









PWM outputs 1-2ms pulses for servo or another ESC (3.3v only 20mA max) WEAPON3

WEAPON2 (surface pads)

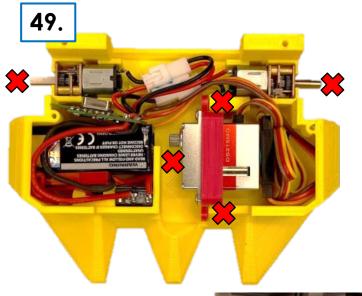
Programming / debug Leave unconnected in robot.

### Standard Slipper Assembly Page 20/23

#### You're almost done! Radio / Servo setup:

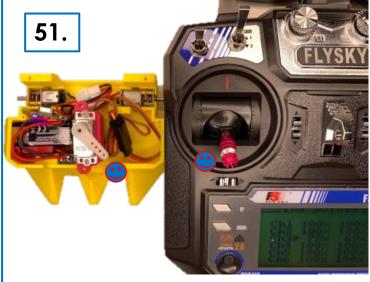
- 49. At this point in the assembly of any bot,
- BEFORE installing the wheels and servo horn and hard-mounting the servo, it's a good idea to make sure that the bot won't run away or put the servo horn hard into the chassis. You can now turn on the bot. On the Malenki the Red LED will light up and the Blue LED will begin flashing rapidly.
- 50. To bind a FlySky FS-i6, hold the Bind
- button while switching it on. To bind a
- Turnigy Evolution, hold the power button to turn it on, click the wrench, scroll down and touch RX bind. The blue LED will go solid.
- 51. With the stick down the servo should be
- near 45° the servo body.
- 52. With the stick up the servo should be
- slightly toward the rear of the bot.

If you're unfamiliar, please see Section 3 for additional instructions on radio setup.











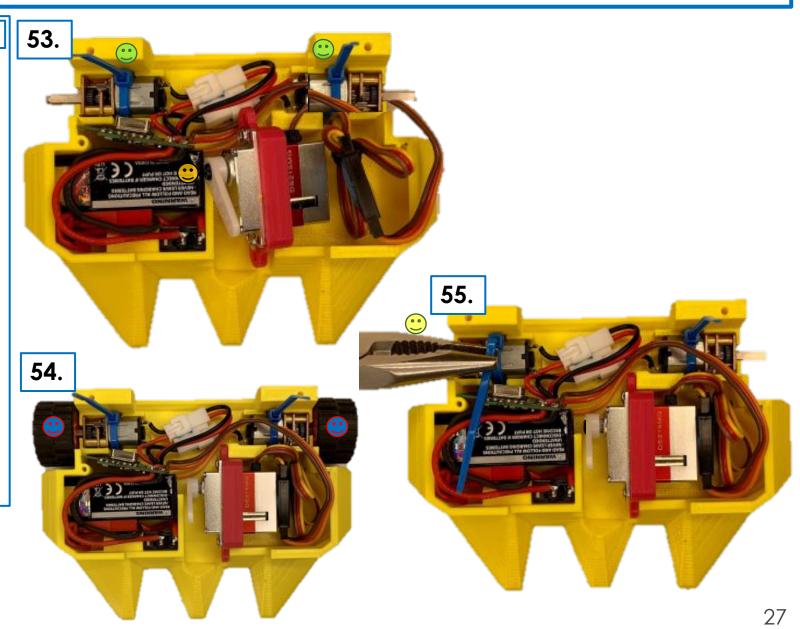
### Standard Slipper Assembly Page 21/23

#### Motor (optionally Wheels) installation:

- 53. With the Servo Horn properly installed and the End Points set to ensure a
- consideration safe servo range, install the Servo
- horn Screw. Install the Zip Ties to the motors.
- 54. You may want to use pliers and "roll"
- them to get the Zip Ties as snug as you can without breaking them.
- 55. Optional You can continue building, but if you'd like, you can
- e temporarily install the Wheels (without glue) because....

#### Congratulations! YOU HAVE A ROBOT!!!

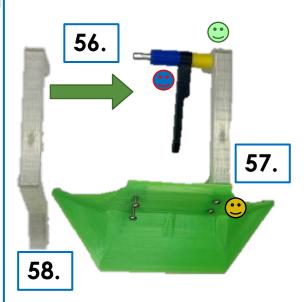
At this point you can drive it around and actuate the flipper servo.

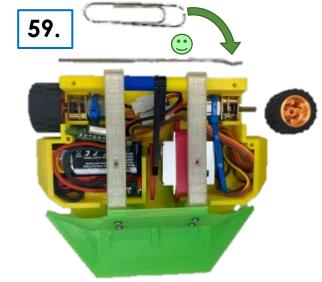


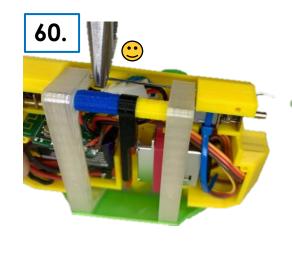
### Standard Slipper Assembly Page 22/23

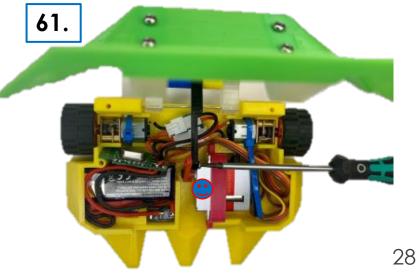
#### Flipper Assembly and installation:

- 56. Assemble the flipper. The arms are printed to have Left and Right Arms, the side that was on the printer bed has a slightly smaller hole which helps retain the aluminum rod.
- Install the rod into the left arm.
- 57. Install the Rod and Left Arm to the Plow
- using 2 of the M2 x 6mm button-head
- screws and install the Short Spacer, Link, and Long Spacer.
- 58. Install the Right Arm.
- 59. Straighten out the Paper Clip. Cut it to the
- length of the Chassis Rear Uprights (between the Wheels) and put a "V" bend in one end.
- 60. If you installed it, remove the Left Wheel,
- install the Paper Clip through the rear uprights and the Arms. Use pliers near the Right Arm to pull the "V" into the upright.
- 61. Reinstall the Left Wheel and screw the Link
- to the servo horn.









# Standard Slipper Assembly Page 23/23

#### **Armor Installation:**

- 62. The Turnabot should look like this.
- 63. Install the Top Armor, with the last
- 2 M2x6 screws and the Right
- Armor and Left armor with the 4 Phillips screws.

#### 64. BATTLE!!! 😬







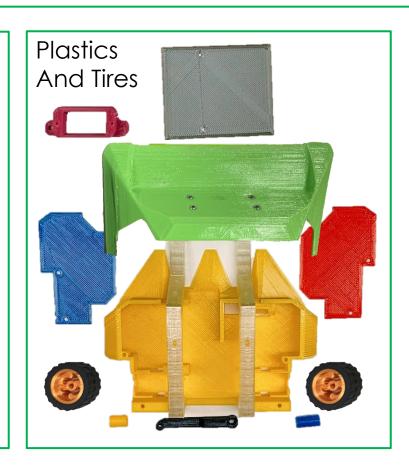
### Assembly is very straightforward (you can do it)

Every single step will be covered in these instructions.

If you have the **Pre-Soldered Kit**, **START** by laying out the parts. (Note the **LEFT** side and **RIGHT** side) (If you have a **Standard Kit**, go to page 14)

Yours may be different colors than the below images, but you'll have the same shape parts.

- 1. Top Armor
- 2. Micro Servo Adapter
- 3. Plow
- 4. Left armor
- 5. Right Armor
- 6. Left Arm
- 7. Right Arm
- 8. Chassis
- 9. Left Wheel
- 10. Short Spacer
- 11. Link
- 12. Long Spacer
- 13. Right Wheel



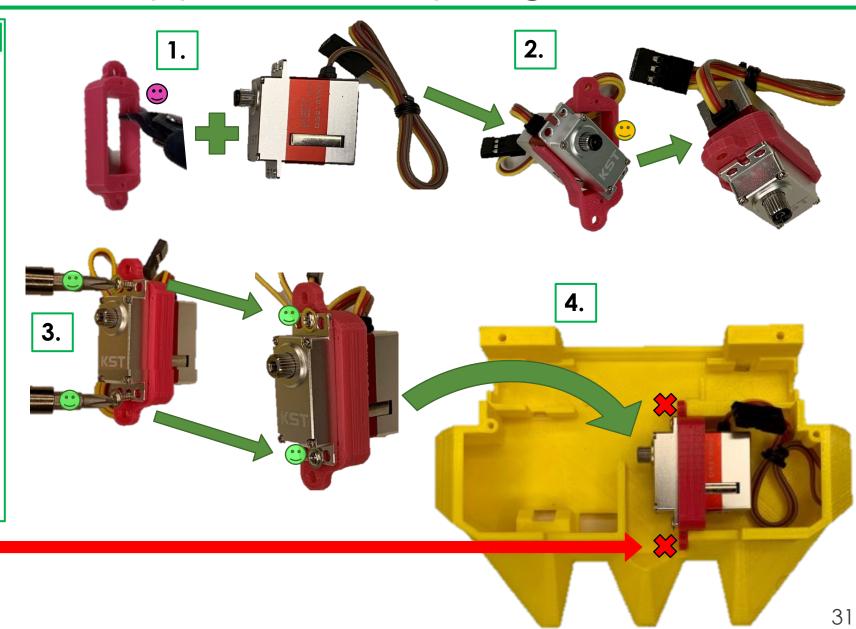




### Pre-Soldered Slipper Assembly Page 1/7

#### Micro Servo Adapter installation:

- 1. If the Micro Servo Adapter
- does not have a split at the bottom you may want to snip it at the indicated location.
- 2. Place the Micro Servo into the
- Micro Servo Adapter noting the orientation of the servo shaft, the adapter ears, and the adapter side that fits into the chassis mounts.
- 3. Install the 2 servo mounting
- screws, you do want these relatively tight)
- 4. Place the Servo into the Chassis but do not install the
- screws from the adapter to the chassis yet.

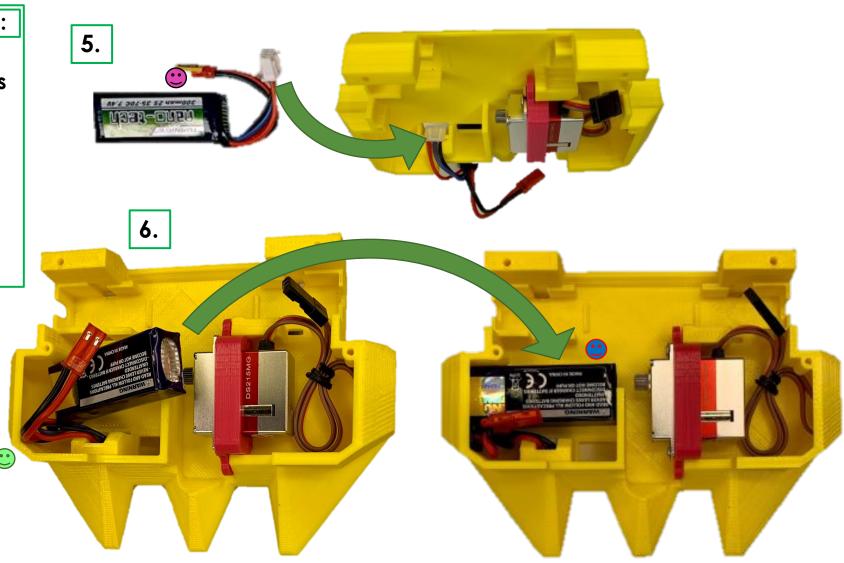


### Pre-Soldered Slipper Assembly Page 2/7

#### Charging Port/Battery Installation:

- 5. Insert the battery charging
- connector into the mount. This can be a bit tricky, but it's worth making charging easy.
- 6. Place the Battery into the
- Chassis with the wires tucked into the front corner. The battery should fit snugly into

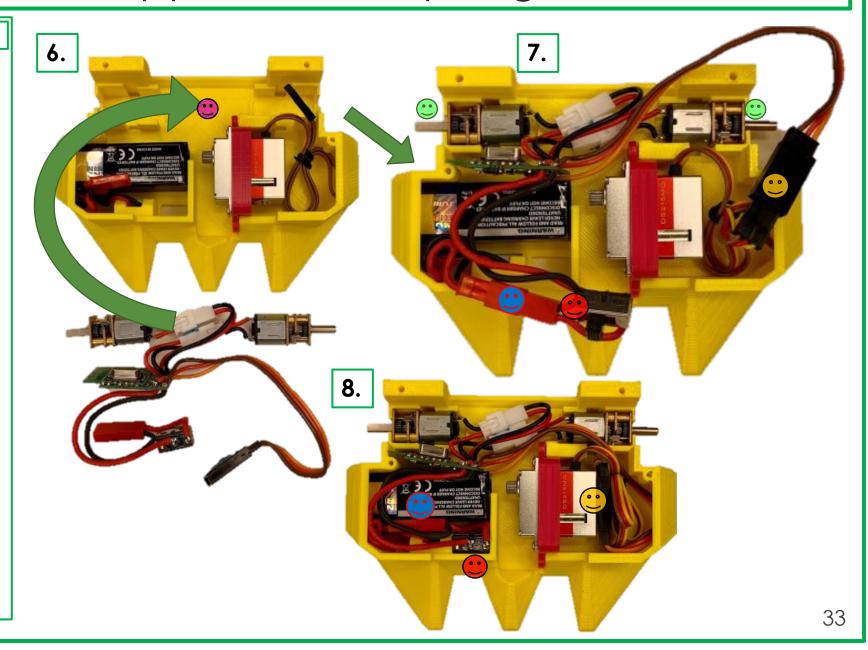
the pocket.



### Pre-Soldered Slipper Assembly Page 3/7

#### **Electronics Assembly Installation:**

- 6. Place the Electronics Assembly
- into the Chassis.
- 7. Make sure the gearboxes seat
- securely into the pockets.
- Ensuring that the switch is in the OFF position (on the side with the missing leg, Left in this
- (a) image) connect the Battery and
- the servo cable.
- 8. Tuck the switch into its slot.
- The switch can be stuck or glued into position. The lower it is, the easier it is to reach, which is "nice" but increases the chances of it getting hit in battle. Tuck the
- battery connector between the battery and the mount.
- Tuck the servo wires into the corner.

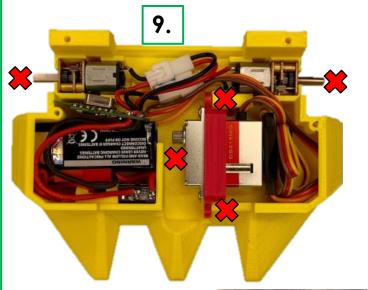


### Pre-Soldered Slipper Assembly Page 4/7

#### Radio / Servo setup:

- 9. At this point in the assembly of any bot,
- BEFORE installing the wheels and servo horn and hard-mounting the servo, it's a good idea to make sure that the bot won't run away or put the servo horn hard into the chassis. You can now turn on the bot. On the Malenki the Red LED will light up and the Blue LED will begin flashing rapidly.
- 10. To bind a FlySky FS-i6, hold the Bind
- button while switching it on. To bind a
- Turnigy Evolution, hold the power button to turn it on, click the wrench, scroll down and touch RX bind. The blue LED will go solid.
- 11. With the stick down the servo should be
- near 45° the servo body.
- 12. With the stick up the servo should be
- slightly toward the rear of the bot.

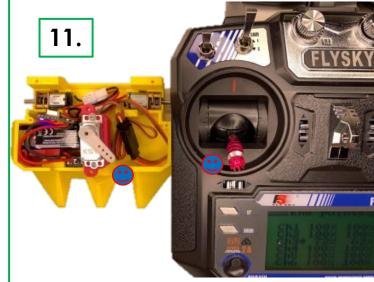
If you're unfamiliar, please see Section 3 for additional instructions on radio setup.





10.







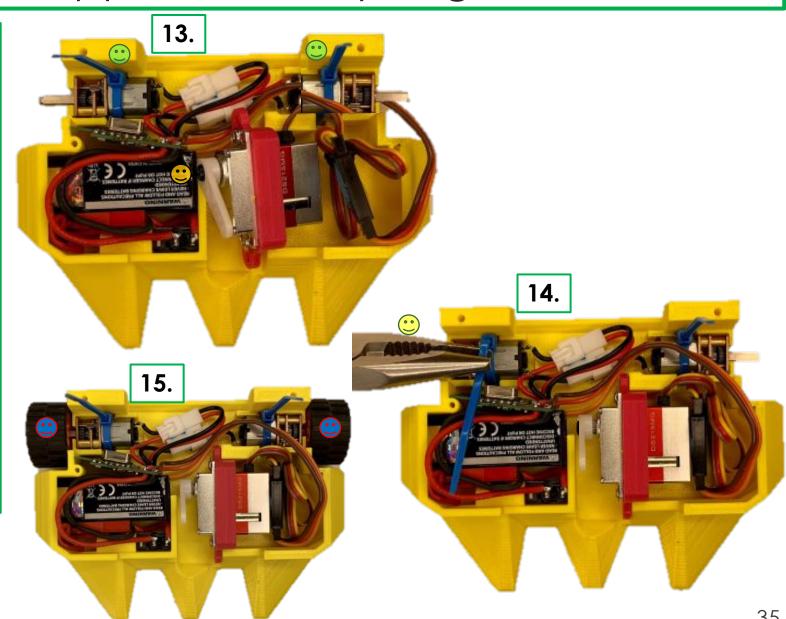
### Pre-Soldered Slipper Assembly Page 5/7

#### Motor (optionally Wheels) installation:

- 13. With the Servo Horn properly installed and the End Points set to ensure a
- safe servo range, install the Servo
- horn Screw. Install the Zip Ties to the motors.
- 14. You may want to use pliers and "roll"
- them to get the Zip Ties as snug as you can without breaking them.
- 15. Optional You can continue building, but if you'd like, you can
- temporarily install the Wheels (without glue) because....

#### Congratulations! YOU HAVE A ROBOT!!!

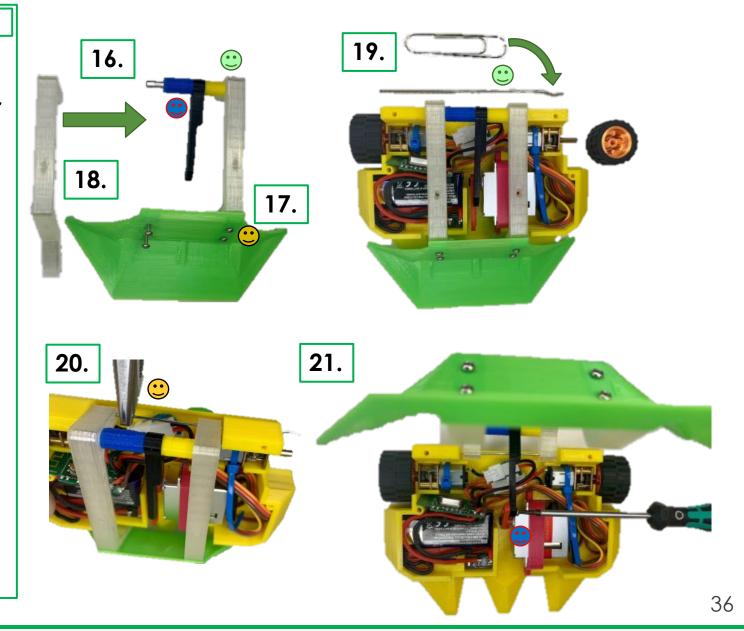
At this point you can drive it around and actuate the flipper servo.



### Pre-Soldered Slipper Assembly Page 6/7

#### Flipper Assembly and installation:

- 16. Assemble the flipper. The arms are printed to have Left and Right Arms, the side that was on the printer bed has a slightly smaller hole which helps retain the aluminum rod.
- Install the rod into the left arm.
- 17. Install the Rod and Left Arm to the Plow
- using 2 of the M2 x 6mm button-head
- screws and install the Short Spacer, Link, and Long Spacer.
- 18. Install the Right Arm.
- 19. Straighten out the Paper Clip. Cut it to the
- length of the Chassis Rear Uprights (between the Wheels) and put a "V" bend in one end.
- 20. If you installed it, remove the Left Wheel,
- install the Paper Clip through the rear uprights and the Arms. Use pliers near the Right Arm to pull the "V" into the upright.
- 21. Reinstall the Left Wheel and screw the Link
- to the servo horn.



### Pre-Soldered Slipper Assembly Page 7/7

#### **Armor Installation:**

- 22. The Turnabot should look like this.
- 23. Install the Top Armor, with the last
- 2 M2x6 screws and the Right
- Armor and Left armor with the 4 Phillips screws.

24. BATTLE!!! 😬







# Standard Slipper Assembly Page 23/23

Slammer Arms Squeezy substitute

