

MrBaddeley R2D2 MKIII BODY Instructions Version 1.0

For other parts and instructions use the link below.

WWW.Patreon.com/mrbaddeley
R2 Printed build, MK2 and V2 Overview
https://youtu.be/VL6NjYcGnEg

Rev1.0DW

Main Body Parts

Body Rings for 500mm Beds

- Main Body 1
- Main Body 2
- Main Body 3
- Skirt
- SkirtPeg Qty. 12

Body Rings Cut Version (300mm beds)

- Ring 1
 - Main body 1a
 - Main body 1b
 - Main body 1c
 - Main body 1d
- Ring 2
 - Main body 2a
 - Main body 2b
 - Main body 2c
 - Main body 2d
 - Main body 2e
- Ring 3
 - Main body 3a
 - Main body 3b
 - Main body 3b
 - Main body 3d
 - Main body 3e
 - Main body 3f

^{**}There are several versions of the cut skirt, the choice in which you choose will vary the parts**

Body Hardware List

- M6 35mm bolts Qty. 12 (These are for the skirt attachment)
 - If you plan on using the 2-3-2 center leg you will need the following
 - M6 40mm bolts Qty. 8
 - M6 50mm bolts Qty. 4
- M6 Washers Qty. 12 (These are for the skirt)
- M6 Nuts Qty. 12 (These are for the skirt)
- M4 threaded rod, 500mm long Qty. 8 (4 for the body & 4 for the shoulders)
- M4 20mm Bolt Qty. 1(Bolt for top ring)
- M4 Nuts Qty. 17
- M4 Washers Qty. 17
- \$3003 Servo's Qty. 3

(Note, the 4 threaded rods, 8 nuts and 8 washers will be used later for the shoulder modules)

R2D2 MKIII Main Body – Features



- Optimized for larger printers (500mm bed) (There is also an optimized cut version for 300mm beds)
- Prints in 3 main rings plus the skirt
- Everything is bolted together, glue is not structurally required.
- Minimized for no supports (all body details use 70 degree angles)
- Greebles optimized for minimum parts needed to be printed and all can be bolted.
- Reduced filament used (under 7 rolls of filament)
- Improved utility are mechanisms
- All servo mounts are now part of the body
- Improved / simplified integrated hinges
- Integrated panels for bread-pans, charge port & data port
- "Slide rear panel" for charge and data ports easy finish & options
- 4mm threaded bars running the length of the frame for strength
- Swappable should modules for further options
- Mounting brackets for boards and customizations
- Swappable top ring for customized Lazy Susan support
- Magnetic catch options for charge door
- Integrated magnet hold for "restraining bolt"
- Locating latches around the rings for alignment & easy finishing



Printing the three parts is relatively straight forward. PLA+ was used, both PLA and PLA+ should be fairly standard. For the settings, 0.2 Layer height, 3 walls (1.2mm thick) and 20% infill. You can up the wall thickness to ease sanding. **NO SUPPORT IS NEEDED**, there is some tight angles, but you don't need supports. You may have a little messy faces, but all on the inside of the model and mine came out quite clean.

For layer adhesion, I used hairspray and glass, bedweld or a PEI sheet will work as well. I did use rather a lot of hairspray for a really good coverage and tried to get the filament to print quite close to the bed. Brims were used (4 layers) to minimize and lift. It's much easier if you can ensure a perfectly flat base so do try to optimize your bed adhesion before printing.

Once printed, remove the brims however suits (use light sandpaper or a small knife) but use whatever method suits you.

For the supports, a butter knife will work or any "scraper" should help.

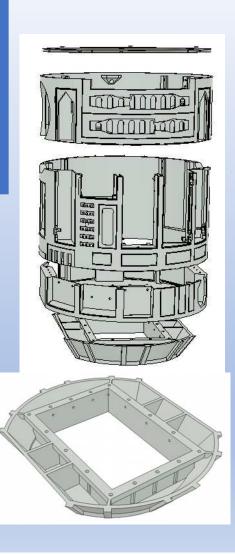
On the base, you will see two supports two supports on either side at the base (where the flat sides are). Wedge the scraper or knife in-between the layers and they should just pop off.

On ring 2, you will see the coin slots and some supports on the lower panels, again use the scraper on the lower supports to pop off. For the coin slots, I used a hammer and a large screw driver. It took some confidence, but tap the supports to loosen and slide out. Once you have done a couple it's fairly east.

For the upper ring, you will be used to removing the lower supports so it will be easy. For the utility arms, you can snap the columns out and the supports should snap out (use the knife / scraper to squeeze between the ring and the support).

Finally clean up the bottom holes and top pegs so the three rings set clean and easy.

Note, it's probably best to fit the Charge Port and Data Port inner panels before gluing. They will clip in afterward, but it's easier before gluing.



Fitting the rings together is extremely easy, the three just stack and you'll see a number of holes at the top of the model where the 4mm rods fit.

It's worth it at this stage to print both the skirt and the top ring so you can assemble the whole body. (You'll have to remove / refit the top when it comes to fitting the shoulder modules and the lazy susan).

Let's start with the skirt, print the skirt in the same settings on the previous page (the orientation is the same as in the picture, upright with no support (trust me). You'll see a small file called "skirt pegs" (you can fit up to 16 of these). These are to fit in the diamond holes on the skirt and support the 6mm bolts in the skirt, this makes assembly easier.

25mm M6 bolts should fit comfortably in the skirt, you've got a 45mm gap so you can fit the longer, these could be used later if we add the optional center leg mechanisms. Fit the bolts in the skirt, the corner ones may be extremely hard to fit but there's more than enough support without the corner holes. Once the bolts are in, put a nut on top to hold and glue in the diamond ped to support the bolts. This should give you 12 bolts. This should give you 12 bolts if you ignore the corners (which is overkill so feel free to reduce).

Print the top ring 450mm susan, this is for a 450mm susan, it probably won't fit directly to your susan, but it can be drilled / modified.

Finally, bolt the skirt on and stack the three rings. Finally put the top rin in place, this is the main body pretty much complete.

The final part is to fit the M4 threaded rod which hold the body together and glue the three rings together.

The length of the bars are 497mm, I bought 500mm rods, fitted them and then trimmed them accordingly with a Dremel (spin the bar on the Dremel grinding plate to bevel the ends, making the nuts easier to go on.

Note, greebles (white bits) are not needed at this time, just in the photo because they wanted to be!



Once you have done a dry fitting, we can now glue the rings together and assemble the main body. Check the locating pegs/holes in between a pieces so that they have a snug fit without any gaps.

Firstly, make sure you have familiarized yourself with the overall build and have completed a dry fit of the body.

Take Qty. 4 of the threaded rods, put a nut on one end and a washer on top of the nut. Place the bars into the lower ring (with the skirt bolted on) so that they protrude from the top up into the air.

Apply glue of your choice around the top edge, leeping well away from the holes so we don't inadvertently block or glue the bars.

Once complete, slide ring 2 onto the 4 threaded rods, sliding them down onto the lower ring and ensure the alignment legs/holes fit together solidly. You can at this stage use nuts to hold the rings together until it dries, or continue with the next ring (I like to live dangerously, so I carried on).

With the second ring in place, repeat! Glue the upper edge of the ring and slide the top ring onto the 4 threaded rods, slide down and locate the alignment pegs and push the rods up so they protrude out of the top of the frame.

Finally, put a washer and nut on each bar and tighten the frame (note at this stage we haven't fitted the top ring which the susan sits on.

Tighten the nuts quite tight, this holds the frame while the glue sets, check all aspects to make sure the frame is well glued and solid.

Leave the glued body to set (overnight typically), loosening the top nuts and remove the nuts/washers, leaving the lower nuts in place.

I would recommend using locktite on the lower nuts at this stage to precent loosening later on. Finally! Put the top ring on, replace the washers and nuts to complete the body build!

R2D2 Main Body – Greebles

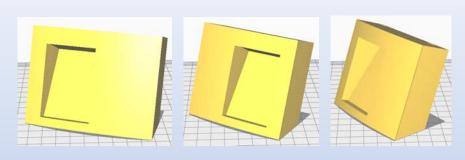
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Greebles

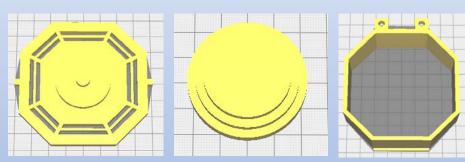
Coin Returns

- Front Coin RT
- Rear Coin RTL
- Rear Coin RTR



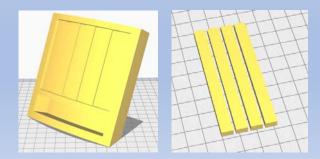
Hexport

- Hex Base Qty. 2Hex Centre Qty. 2
- Hex Frame Qty. 2



Pocket Vent

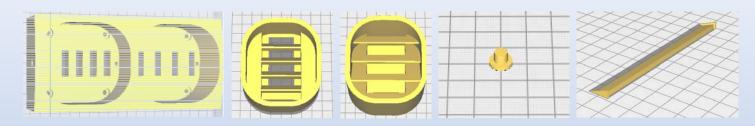
- Pocket Vent Qty. 2
- Pocket Vent Fingers Qty. 8



Greebles

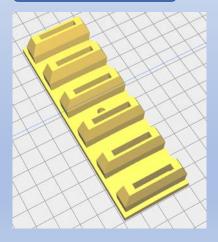
Vent Assembly

- Centre Vent Panel
- Lower Front Vent
- Upper Front Vent
- Vent Frame Lower Hold
- Vent Frame Upper Hold



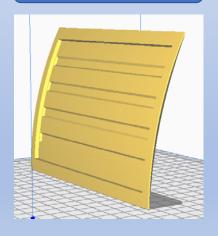
Coin Slot

• Coin Slots



Side Vents

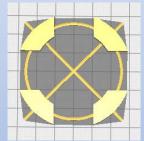
- Side Vent Qty. 2
- Side Vent –Fingers Qty. 8

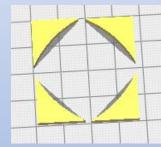


Power Coupler

- Power Coupler Details
- Power Coupler Back
- Power Coupler Main

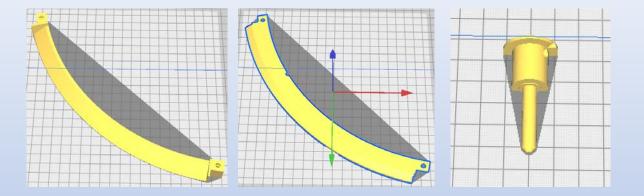


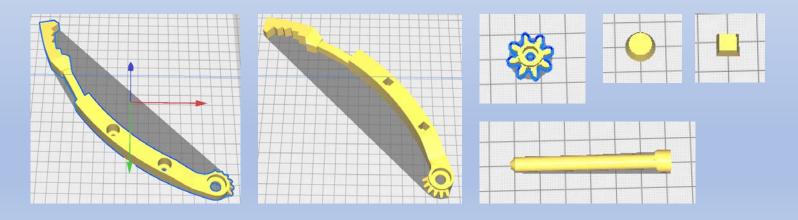




Utility Arms

- Lower Data Port
- Upper Data Port
- Upper Utility Pin
- Utility Arm A Qty. 2
- Utility Arm B Qty. 2
- Utility Arm Servo Gear Qty. 2
- Utility Lower Pin
- Utility Plug A Qty. 4
- Utility Plug B Qty. 4



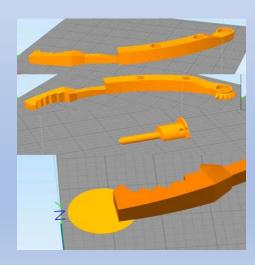


Greebles & Utility Arms Hardware List

- M4x30 Bolts Qty. 4
- M4x12 Bolts Qty. 8
- M4x10 Bolts Qty. 19
- M4 Square Nuts Qty. 27
- M4 Hex Nuts Qty. 4
- 606ZZ Bearings Qty. 4
- MG966 Servos Qty. 2

R2D2 Main Body – Utility Arms

Hint: Helper Discs are thin pieces of plastic placed at each corner or end and stop the curling/lifting.
There's one in the STL directory.. Highly Recommended!



For this next section, we are going to assemble the Utility Arms and Greebles.

Greebles are all the little details/parts needed for R2.

For all prints, 20% infill, 3 outer layers (1.2mm) and 0.2 layer height by default, however I do switch to 0.1 layer for detailed parts. However, 0.2 will be fine though 0.1 does save on sanding.

I have finally gone through most of the parts and sorted out the orientation, so they should print fine as they drop onto the bed. (Watch out if I've missed any, if there's any at an odd angle, drop them to the bed).

Use helper discs on each corner or end, they are superb at enduring no warping/curling and relatively east to remove.

I print small pieces in PETG and larger sections in PLA+, PETG doesn't shrink as much as ABS, but still shrinks and cause warping on large prints. PLA+ is pretty bomb proof when it comes to warping. Highly recommended for the larger rings etc.

I've noted in the file names if multiple parts are needed (x2 etc.).

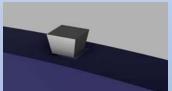
The greebles in most cases are generally single prints.

This will cover the Utility arm assembly and Greebles.

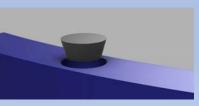
R2D2 Main Body – Utility Arms











First, let's assemble the Utility Arms, you will need two sets of these.

Print the two parts (A & B) out, they go together as shown in the diagram. The ends have two holes for filament pegs for alignment, this section is glued and the two larger holes are where you bolt the main body together. The bolts are M4x12mm, hex countersunk heads with M4 square nuts. (You will need 4 of each for the two utility arms). I would recommend clamping the ends as the glue sets.

Once assembled, you can glue in the plugs, there's two shapes, you will need two of each per arm. Glue these in so they are flat with the surface and cover the bolts. Then fill/sand to a smooth finish. This is pretty much your utility arms completed. Finally put the two 6mm bearings (606ZZ, 6x17x6mm) into the arms, they should fit quite snugly into the larger holes.

You can sand, fill, paint and finish these obviously before fitting.

The arms fit into the main frame and held in place with the Upper Utility Pin and the Lower Utility Pin. These are very snug as to minimize any movement (some sanding may be needed to get the pins set). The frame is designed so the arms slide into a holding position and should operate smoothly. You may need to gently sand the upper and lower pins if they are too tight. Also, the frame may need light sanding/smoothing to get a correct fit.

You will see the gear from the inside, these can be servo operated and the frame has servo fixings built in (MG966), you will need two of these.

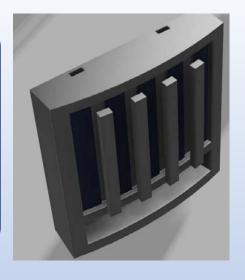
The servo gears (x2) should fit directly onto the servo and can be screwed on with the screws provided with the servo. The servo then screws into the brackets on the inside of the upper ring.

T his is the Utility Arms completely assembled.

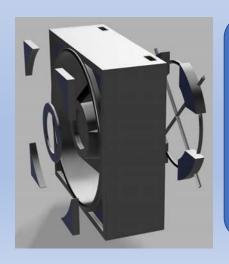
R2D2 Main Body – Greebles



The Side Vents are painted and then the fingers slot into the frame as shown. Glued with the appropriate glue.



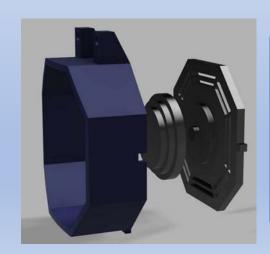
The Pocket Vents are painted and then the fingers slot into the frame as shown. Glued with the appropriate



The power
Coupler is mad
of 7 parts for
ease of printing.
The main frame
is silver, the
other parts are
blue. Assemble
as shown and
glue with the
appropriate glue

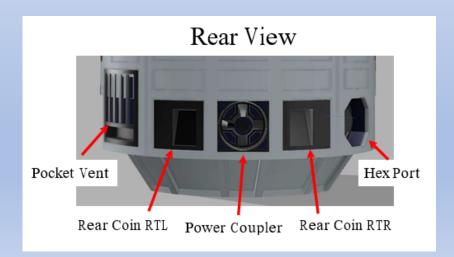
Glue Options

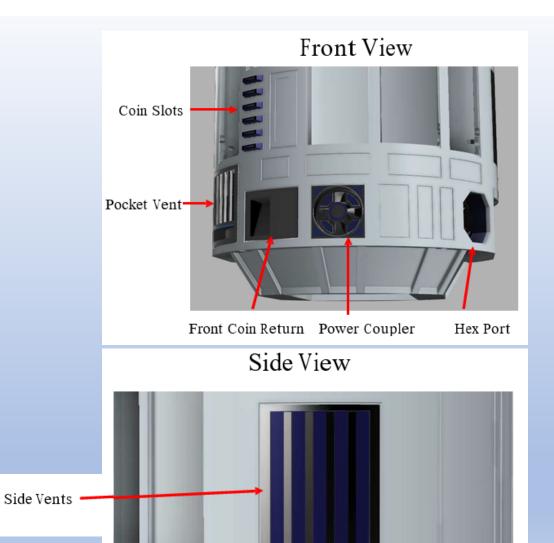
There are many options for glue. I basically go for super glue for PLA & PETG (you can use an accelerator) and Acetone welding for AMS. I will use 2 part epoxy glue for structural PLA



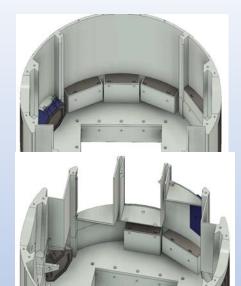
The Hex Ports are made of 3 parts, the rear and circle steps are silver with the main frame being blue.
Assemble as shown and glue appropriately.

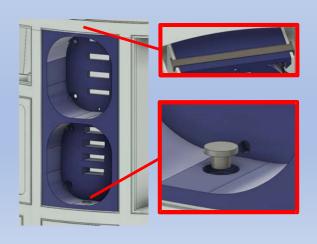
R2D2 Main Body – Greebles





R2D2 Main Body – Greeb<u>les</u>





Next you can fit the greebles to the main body. (The body is glued and assembled in the previous instructions).

To fit all of the lower greebles, you will need Qty. 18 - M4x10mm Hex countersunk head bolts and Qty. 18 – M4 square nuts (two per greeble with the square nuts fitted to the main frame).

Next you can fit the Coin Slots, note the square nut drops into one of the slots in the "Coin Slot" hole in the frame. This will fit with a M4 10mm Hex countersunk bolt and of course the M4 square nuts.

Next we will fit the Vent Assembly.

The Centre Vent Panel is printed / finished / painted first along with the two vents.

Once finished / painted, the two vents fit into the Centre Vent Panel. The Vent Panel Upper Hold and Vent Panel Lower Hold glue into place to hold the Centre Vent Panel securely into place.

Next, if you are fitting the speakers, note the four holes, the speakers bolt on with bolts going from the outside to the inside and nuts fitted inside the frame. I used "DROK 3-inch 15W HIFI Full Range Speakers with 90dB High Sensitivity, Circular 8 ohm 45mm Hight Loudspeakers"

Finally fit the two Vents and these can be screwed in from the rear using 2.5mm self tapping screws.

R2D2 Main Body – Shoulders/ Greebles

Should Hardware List

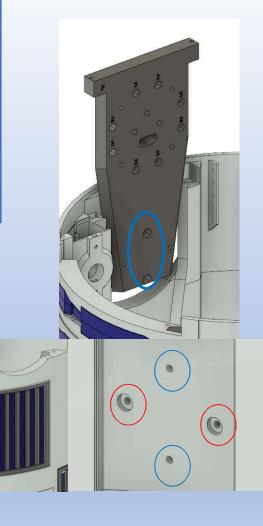
Qty. 4 – M4x30mm Bolt

Qty. 4 – M4 Hex Nuts

Qty. 4 – M4x12mm Bolt Qty. 4 – M4 Square Nut

Should Parts List

A Shoulder Module Fixed B Shoulder Module Fixed



Next we will fit the two shoulder modules. Note these are not glued in, but bolted into the frame. You will see that there is a "F" on one corner, this indicates the front of the model. Make sure the "F" is to the front and slot this onto the frame.

The Shoulder modules are held in with Qty. 2 – M4x30mm hex countersunk bolts per shoulder module. These screw into the holes behind the side vents and a hex nut is tightened on the inside to hold it firmly in place.

Also, there is two M4 threaded rods which go virtually through the hole frame holding these in place. These rods also go through the upper ring so it does not need fitting at this stage. They are around 370mm long. I would recommend fitting and checking the length before cutting the threaded rods.

After the should modules are fitted and bolted in, the Side Vents can be fitted over the holes/bolts.

Two square nuts drop into the Side Vents and they are held in place with M4x12mm bolts (x2 per vent). These bolts go through the two large holes at the bottom of the shoulder modules, through the frame and into the square nuts in the side vents.

Once completed, the shoulder modules are bolted in and the side vents bolted on the outside. This completes the fixed shoulder modules (except the threaded rods which we will fit when we fit the upper ring).



Congratulations, this is stage two completed for the body!

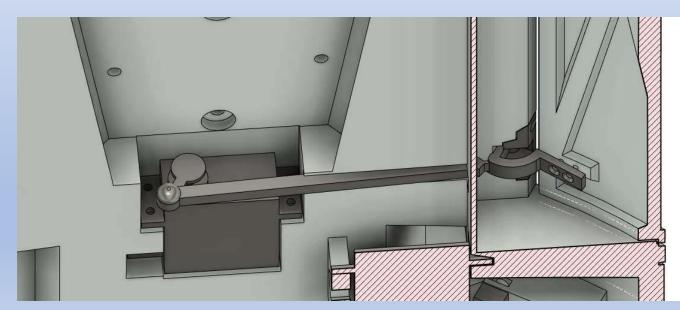
At this stage, you should have a fully assembled body, all of the greebles and the fixed shoulder modules. Note there's two sets of holes in the Fixed Shoulder Modules depending on whether you want a 2 or 3 leg model.

We've also fitted some electronics, a couple of servos and 2 speakers, we will fit more electronics as we start to fit the top ring, gear and dome motor. Also, the door servos. You will need to ensure you have gotten enough cabling to reach around the frame. (There's a few options for the electronics so it's your choice. I prefer the Padawan 360 system but there's a few choices).

Next we will fit the doors, servos and then the upper ring to complete the main body.

Door Overview

Here's the door mechanism, basically there's a S3003 servo (others will fit) with a servo arm fitted. There's a peg which fits into a flex arm (I used Ninjatek Cheetah, which is semi flex), the flex arm slots into the peg and this moves the hinge. The flex arm slots into the hinge using a "arrow head" connector which pushes in with a small screwdriver. I have also added a full hinge / arm print, so the hinge is also printed in flex which may be easier (Door Servo Combined --- SemiFlex).



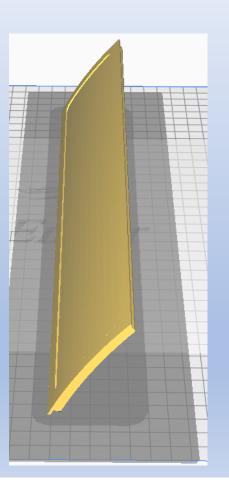
Doors

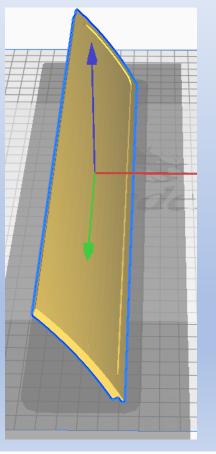
Doors

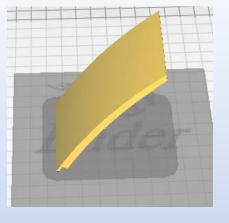
- Bread Pan Door A
- Bread Pan Door B
- Charge Panel
- Data Port Door

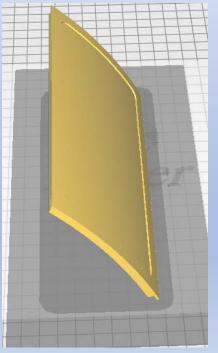
Hardware

- Qty. 14 No.02 Self Tapping Countersunk Screws 9.5mm
- Qty. 16 No.02 Self Tapping Countersunk Screws 6.5mm
- Qty. 8 2mm Pins
- 5mmx5mm Magent
- 3mmx3mm Magnet









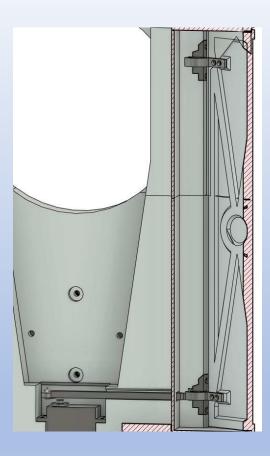


Door Build

There's two hinges per door, the top one is just a free hinge and the lower one is servo operated. The Hinges screw into the frame with self tapping screws – four (No.02 self tapping screws countersunk 9.5mm), two per hinge. The doors are held on with four (No.02 (2.2mm) x ¼ inch (6.5mm)).

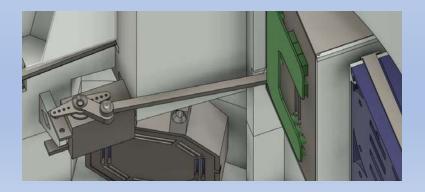
The hinges fit together as shown, with a 2mm rod going into the hinge, you could use filament, personally I used 2mm steel pins I cut down, but I would also recommend nylon filament. PLA may break, not too sure, but there's fairly easy to change.

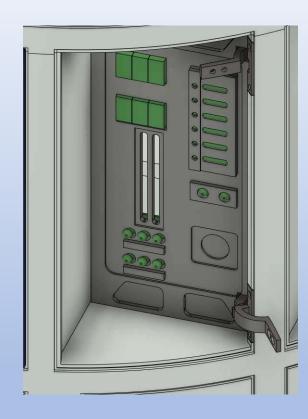
To assemble the door's, build the servo hunges, build the hinges, fix the hinges to the frame and finally screw on the doors. Repeat for both sides.



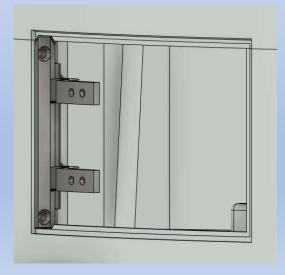
Data Port Door

The Data Panel is effectively the same build, same hinges and same servo arm / screws. The mount point for the servo arm is as shown.





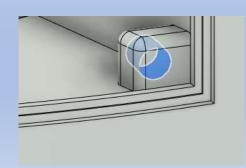




The Charge Panel again is the same build, you will be familiar by now how the hinges go together etc. The difference is it is a single hinge block. As with the Data Panel, the rear slide in the panel may need removing to fit the hinge block, so the hinge block in first, then the rear panel, then the door can be fitted.

This one has a 5mm diameter 5mm deep magnet also glued in the door frame (use two part epoxy) to keep the door closed (this one is manually opened).

A 3mm diameter, 3mm deep round magnet also glues into the door using two part epoxy.

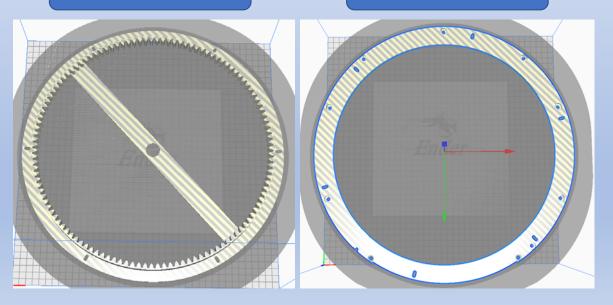


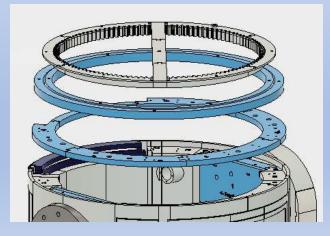
Ring Hardware List

- 450mm Lazy Susan
- Qty. 6 M4x50mm Countersunk Bolts
- Qty. 6 M4x30mm Countersunk Bolts
- Qty. 6 M4 Washers
- Qty. 12 M4 nuts

Dome Gear Ring

Top Ring





The ring assembly has three main parts (you need to assemble these first if you haven't already.

First the inner gear, the Lazy Susan (obviously this is purchased, I used a 450mm from ebay and another one from Amazon on my second droid), they are slightly different.

Lastly the lower ring which sits inside the main body (but does Not glue in).

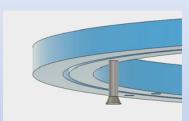
The diagram shows the order etc.

First of all, you will have to prepare the Lazy Susan. You will find the Lazy Susan comes with plastic plugs and some holes around to mount to a standard board etc. (standard internet pic on the right).

What we want to do is firstly remove all the plastic plugs and basically we're going to drill 4mm holes around the inner and outer ring where the plugs go. You can keep with the three holes on the inner ring, but you will have 6 on the outer ring (I had six in both the inner and outer rings, the inner 6 gives a better fixing to the inner gear but is probably overkill. Obviously use the holes where the plastic plugs came from as the guide holes, you are just drilling them through at 4.5mm.

Once drilled these also need to have to be slightly countersunk as we are going to use 4mm bolts which can be countersunk on the inner ring.





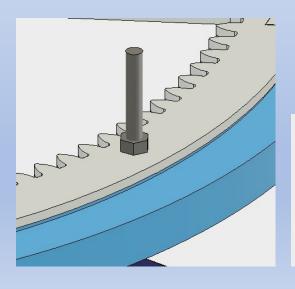


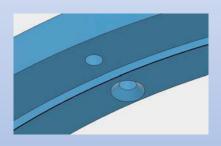
So at the end of the drilling process, you should have 6 holes on the outer ring evenly spaced and 3 or 6 countersunk (Countersink only underneath) on the inner ring.

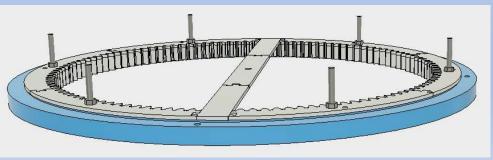
Next you can attach the inner gear so it sits on the top of the inner ring and use M4 bolts which sits in the countersunk holes in the Susan. These should be flush underneath and the bolts stick out quite a bit at the top. I used 50mm (or 45mm) M4 countersunk bolts, the bolts, the holes on the dome effectively sit on these. Now again, if the holes you have drilled and the gear holes don't line up, you may have to drill or file out the holes to fit. Similarly the holes in the dome may need adjusting.

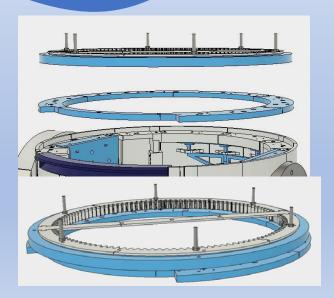
Basically, it is impossible to cater exactly for every Susan configuration so I have tried to hit the size I used and make the parts re-printable if any mistakes are made.

So after this, you should have the modified Susan with a firmly attached inner gear ready for assembly.









Next we are going to prepare the printed upper ring so it can be bolted to the Lazy Susan.

Firstly, place the Susan on top of the upper ring (note the upper ring is not attached to the main frame at the moment).

Make sure it's complete and centered and spin it around to see if any of the pre=drilled holes match up.

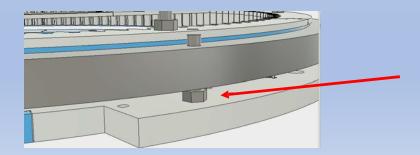
This whole assembly is in a couple of stages, firstly we match up (or drill) the holes in the outer Susan ring to the printed upper ring.

Then using M4x30mm countersunk bolts, we put bolts through the upper ring, use nuts / washers on the top side to give some spacing for the Susan and fix these in.

(The Lazy Susan is not attached at this point). Then we attach the upper ring to the body.

Finally bolting the Susan in place.

So, let's step through that... Firstly, the Susan needs some holes in the printed upper ring to attach to, if the ones there don't match, place, mark and drill some more 4.5mm holes and countersink underneath. (Note drilling printed plastic and countersinking is easy, so go lightly and slowly so you don't damage the printed ring to much). You may be lucky and find holes which match. Then, we push the 30mm M4 countersunk bolts through the Upper Ring and bolt / Washer on the stop side, this gives something for the Susan to sit on.



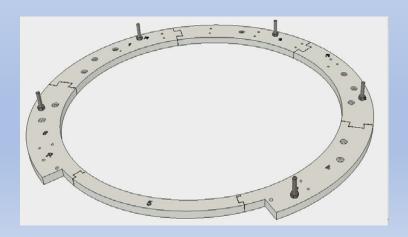
This should give you an assembly which looks something like this picture. We have M4x30mm Countersunk 5 bolts (can't do 6 as we have a recess), each countersunk underneath and bolted on top with some washers between the upper ring and the bolt.

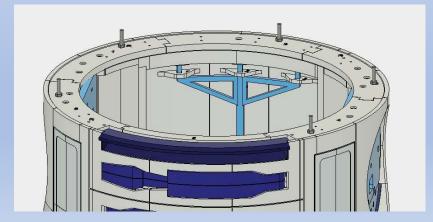
The washers are for spacing to adjust the height of the Susan, you will have to test to get the right gap for the dome, I used two washers and it was perfect.

I'd also advise using some locktite to hold the nuts firm as we then bolt the Susan on top of the upper ring once it's attached to the body.

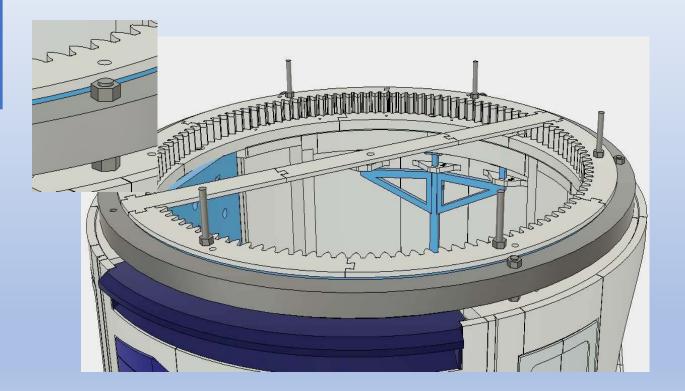
Before we attach the Susan, we are now going to fit the upper ring to the main body. This is fairly easy compared to the manual stuff we've just done as we are back in the printed parts world! So, fit the ring into the body, there's various bolt holes and self tapping holes to screw / bolt the upper ring to the body. I wouldn't recommend gluing as you may need to remove the ring for maintenance later on.

This should then give you a firmly attached Upper Ring, with 5 protruding bolts which are already bolted to the body. Then it's just a matter of finally fitting the Susan with the geared ring already in place and fixing, finally, the top nuts to hold it all together.





And you're all done! This is one of the more "manual" fixings, but stop by step it's not too difficult.





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