



The Doctor Who Mini-Playfield
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Update
V1.2

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Disclaimer

I have only worked on my personal DW and everything seems to be factory original, but if I had to put a disclaimer out there, I would say that your mileage may vary because some of my machine is not factory original or your machine may not be factory original. The basics should hold true under most circumstances and at least this will serve as a pictorial guide to disassembly.

Don't attempt any task that you do not feel comfortable completing. If you need help, get a pro (or a hack-pro with some skills).

- An energized mini-playfield has incredible torque and will easily cut off a finger or crush part of your hand (“!Warning Keep hands away from mini-playfield”)
- Some of these circuits are high voltage and will kill you.
- A playfield falling on your head will kill you.

Enough said?

Using this document

All are free to use this doc for aiding repair of their machines. However, as a user of the document you have the added responsibility of informing me of mistakes or points that require clarification. Please be sure to email me at pinball_faz at live.com.

Thanks in advance.

Before Starting

Unplug the machine and make sure you have a large work area around the machine and a work surface to store parts and tools.

Tools:

Bally Doctor Who Operations Manual, 1992 (Download from ipdb.org)

Screwdrivers

Nut Drivers

Wrench Set

Allen Wrench Set

Allen Wrench Bit

Optional:

Lots of clean rags

Novus 2

12 DC Power Source (not required, but really handy)

Digital Camera - take lots of pictures as you go so you can put things back together!

Pad and pen to take notes

New set of rubbers

Any shiny mods

1. Introduction

This document describes how to disassemble and diagnose issues with the Doctor Who (DW) Mini-Playfield (hereafter referred to as the MPF). After I ran into a problem with my DW I was searching the internet and found a few sites with some documentation; but nothing comprehensive. Furthermore, the manual provided was incomplete and ambiguous. After I pulled all gathered information together (and made a few guesses and mistakes) I have successfully pulled it apart several times. This was big deal for me as it was my first effort in performing pinball repair; I am not a long-time pinball expert.



Figure 1 The Mini-Playfield in place

Recently, I picked up a few extras from Cliffy (A Doctor Who Cliffy Protector a handful of his colored post sleeves) and PBR (a rubber kit and some new balls). I went to install them and realized that I could not put these shiny new parts on my very dirty machine; I purchased it un-shopped. This was my excuse to tear off the upper playfield, clean the whole thing and document the removal of the Mini-Playfield (MPF).

2. The MPF before work begins

Whether you have a mechanical issue, opto issue or just trying to clean things up, make sure you understand what your limits are ahead of time. Take it slow and get to know your machine. Change out some rubber, throw on some colored post sleeves, or just hunt around to become familiar with the machine. Above all, make sure you leave enough time to take care of your list and any surprise fixes. You really don't want to be taking the MPF apart a bunch of times or leaving it out of your machine for extended periods. You cannot play the machine at all without the MPF. These connectors/screws really do not want to be disconnected/connected a bunch of times; it loosens connector's contacts and weakens wood fibers surrounding screws in the playfield.

As you can see by this MPF, it needs lots of work:

- The ball deflectors are heavily oxidized
- Cliffy Protector needed
- The rubber posts / donuts are dull
- The MPF body is really dirty
- The spring steel flap is buckled



Figure 2 Time Expander raised

3. Disassembly

All of the assembly instructions are just playing back the disassembly instructions in reverse order. Focus on these instructions as a guide to help out in both. Also, this document is not meant to be a complete replacement for what is provided in the operations manual, but a supplement to it. I will add special notes where there is a point of ambiguity in the original documentation. The story of disassembly is really told by the pictures. I tried to get the best angles to point out what is important, so if the old adage of “a picture is worth a thousand words” is true, I have 30,000+ words for you.

3.1 Before the power is disconnected!

Bring the game into “Test” mode and enter the Mini-Playfield diagnostics. Raise the MPF to the top tier. Power off the game after the MPF has raised completely. Without the playfield being raised there is no access to the screws holding the MPF Support Bracket to the MPF itself. (section 3.5.3)

3.2 Get Ready

As stated before, you need to prepare the game to be worked on. Make sure it’s unplugged and you have full access all around the machine. Set aside a clean work-area for sub-assemblies, screws, etc. Organization is key to getting it all put back together.

Remove the lock down bar and the playfield glass.

3.3 Remove the Outer MPF Cover Assembly



Figure 3 Remove MPF Cover Assembly

There are 4 screws that hold on the Outer MPF Cover Assembly. It’s just a piece of sheet steel. **Note:** The right upper nut (near the pop bumper) can be difficult to get off. It is slotted so all you need to do is loosen the nut and slide the cover off.

3.4 Remove Mini-Playfield from main Playfield

This step causes a lot of confusion. I re-read the operations manual several times and really did not get it until I got into the disassembly process before it was clear. There are

three distinct tasks required to perform in order to safely remove the MPF.



- 1) Remove the Door Release Bracket
- 2) Disconnect the connectors for all wires that go into the MPF
- 3) Unscrew the brackets tying the MPF to the playfield.
- 4) Lift MPF out of the playfield.

Figure 4 Upper MPF with Cover Removed

NOTE!

Note: These are the screws that hold the MPF to the playfield. Don't touch until the Door Release Bracket is removed first!

THESE ARE THE SAME SCREWS!

3.4.1 Remove the Door Release Bracket

This is the part that burns everyone. Lift the playfield and secure with the prop-rod. There's a roller attached to a bracket that causes the Dalek targets to drop. The bracket is attached to two of the screws that hold the MPF to the playfield. This is not really clear in the instructions and when you have the playfield flipped up, you really don't draw the conclusion that these are the same screws.

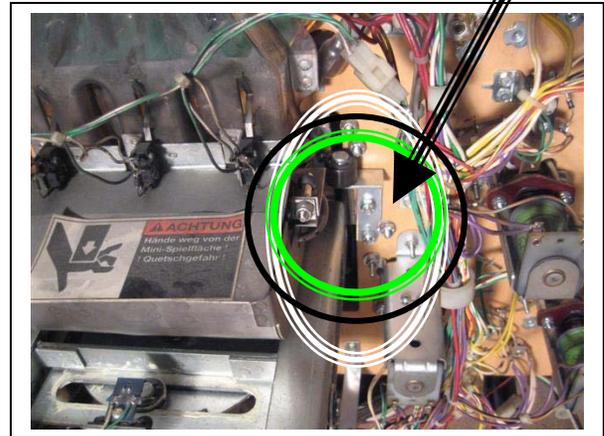


Figure 5 Under the playfield. The elusive Door Release Bracket (right).

The view of the underside of the playfield (left). The circled area reveals the elusive Door Release Bracket. It is held on with two nuts; the "bolt" that each nut is secured to is the same screw shown in the note above!

Here's a close-up of the bracket. Failure to remove these nuts will cause heart-ache and potentially stripping the head of the screw.



Figure 6 Door Release Bracket with retaining nuts / without nuts / bracket removed

3.4.2 Disconnect bundle of connectors to the MPF

There are several connectors to the MPF. One controls the MPF motor, another the opto circuits, lights and each of the MPF Ball Ejectors.

Note: Before you get out masking tape labeling each side of the connection, let me save you some trouble. They all have unique sized connectors as well as all being keyed (there is only one orientation that will allow the two connectors to join). This means you can unplug all the connectors going to the MPF with confidence of getting them hooked up the correct way when you go to re-assemble. Keep in mind, there are connectors all over the place under the play field. You are **ONLY** interested in unplugging the connectors directly to the MPF.

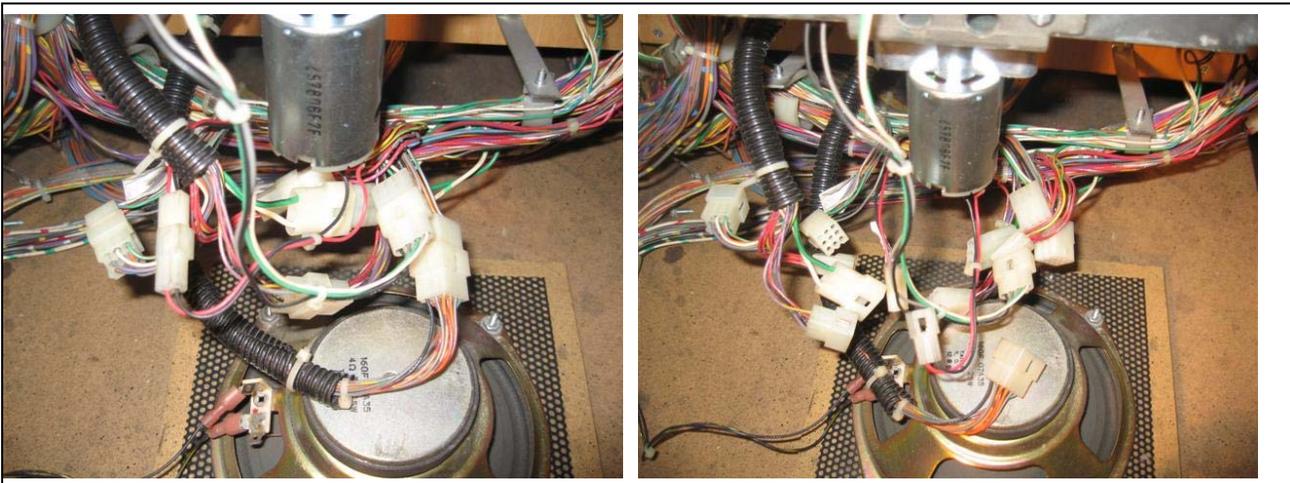


Figure 7 Disconnecting wire bundle to MPF

3.4.3 Remove MPF retaining screws

Remember these screws? Now it's time to lower the playfield again and unscrew them. After they are removed, the only thing holding in the MPF is gravity.



Figure 8 Remove MPF Retaining Screws

3.4.4 Lift out the MPF with care

Now for the tricky bit. The MPF is not a box that pulls straight up. Notice as I lift out the MPF that the three door drop assembly is hanging out over the playfield.



Figure 9 Lift out MPF

NOTE! Motor Sticks out

If I was to pull straight up, I would hit the “playfield glass” channel. Taking this channel off is kind of a pain and if you maneuver the MPF front and back it can work its way out. Don't forget about the MPF motor; it can catch on the underside of the MPF. Go slow and easy and it should just lift out with NO resistance. If it catches on anything, back off and try again. Maybe you missed a connector or one of the connectors caught on something. If all things go well...you have a big hole in your playfield.

3.5 About the Mini-Playfield

The MPF is now removed; let's get a good look at it.



Figure 10 The MPF - up close and personal

The MPF is much simpler than it looks. I would break it up into the following categories:

- MPF Cover Assembly
- MPF Upper Playfield components
- Three door drop target assembly
- Opto assembly
- Main support bracket w/cam assembly
- MPF Lower Playfield components (ball poppers, lights, etc)
- MPF board itself

3.5.1 MPF Cover Assembly

The MPF Cover Assembly is a plastic shell that is held on with 6 screws. The picture below (screws already removed) shows the locations of where all six screws go.



Figure 11 Removing the MPF Cover Assembly [Screw locations and connector]

(Left: Top/Front Right: Back view)

Note the light assemblies attached to the cover. The flasher and “Time Expander Lock” are both riveted into the plastic. When the cover is removed, don’t forget about the wires supporting the light functions. Conveniently the single connector handles the whole cover assembly. The picture on the right is a rear view of the MPF. Circled is the connector (unplugged) that supports the flasher/”lock” lights on the cover assembly. After this is disconnected and the screws removed, the cover assembly can lift off. The wire will have to snake thought the hole in the MPF. It may be wrapped around other wires components.

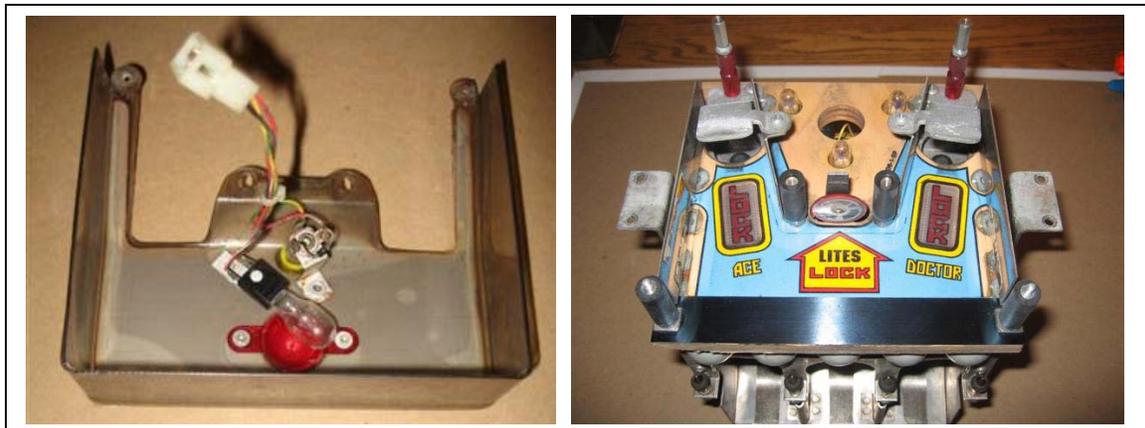


Figure 12 Cover Assembly removed

Removal of components on the upper MPF is pretty straight forward. I had a lot of polishing to do; I stripped mine bare and cleaned the whole thing. However, hold off on removing the posts, etc until AFTER the lower playfield components are removed.

3.5.2 Removing MPF Three Door Assembly

The MPF Three Door Assembly is the set of chutes with the Dalek drop targets. It's a pretty heavy duty collection of stainless parts that make up this component.

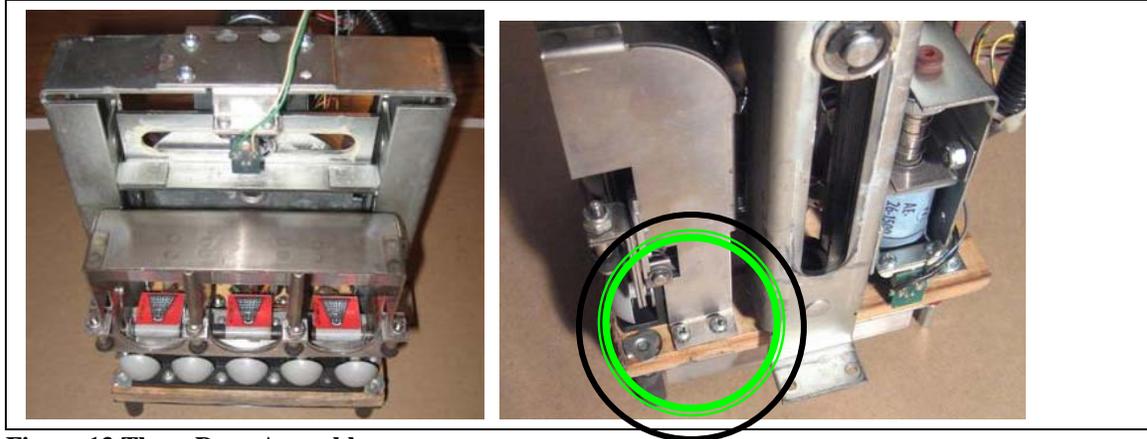
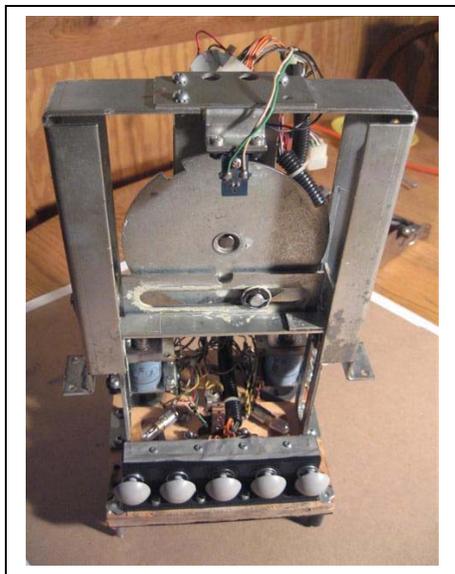


Figure 13 Three Door Assembly

With the MPF cover removed the posts make a nice platform that allow for taking off the remaining lower MPF components. The above photos show the front/side view of the Three Door Assembly. There are four screws that hold this to the MPF; two of these screws are shown in the right photo. Remove all four and the whole assembly will lift out. Put this to the side, another section talks about dismantling this further for cleaning.

3.5.3 Removing the MPF Main Support Bracket

The prior photo shows the MPF Main Support Bracket close to the wood, yet in the next photo it is raised up. The first instructions state that the MPF needs to be raised before any of these procedures start. However, I have a 12V DC power source and chose not to raise the MPF. I never throw away old wall-wart style power supplies. I chose not to raise the MPF in my earlier photos because the photos just became too busy looking and I lost too much detail shrinking the larger pictures. Leaving it lowered allowed for bigger photos of the areas of importance. **Note:** make sure the amperage



of the 12V DC power source is low. 300ma up to 1 amp is sufficient. No need hooking up a car battery☺.

Figure 14 Gaining access to MPF Main Support Bracket

The photo the below shows the location of the screws holding the MPF Main Support Bracket to the wood. Four screws later and the whole assembly will lift off.

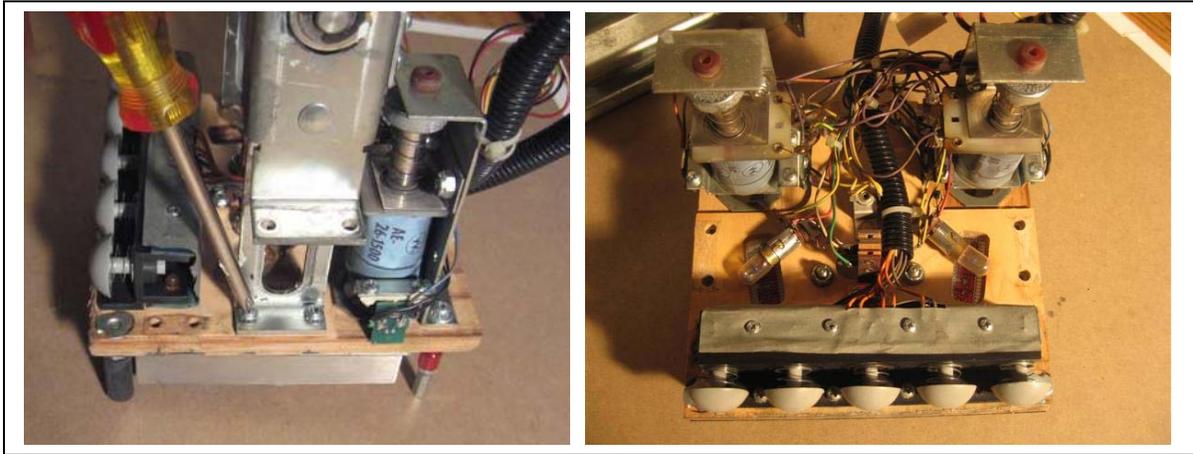


Figure 15 Removing the MPF Main Support Bracket

After the bracket is removed there is clear access to the Opto Assembly and all lower playfield parts. Removing the ball popper/lights is pretty straight forward at this point.

The rest of this page is dedicated to the MPF Main Support Bracket at various angles as a baseline of how it looks assembled.

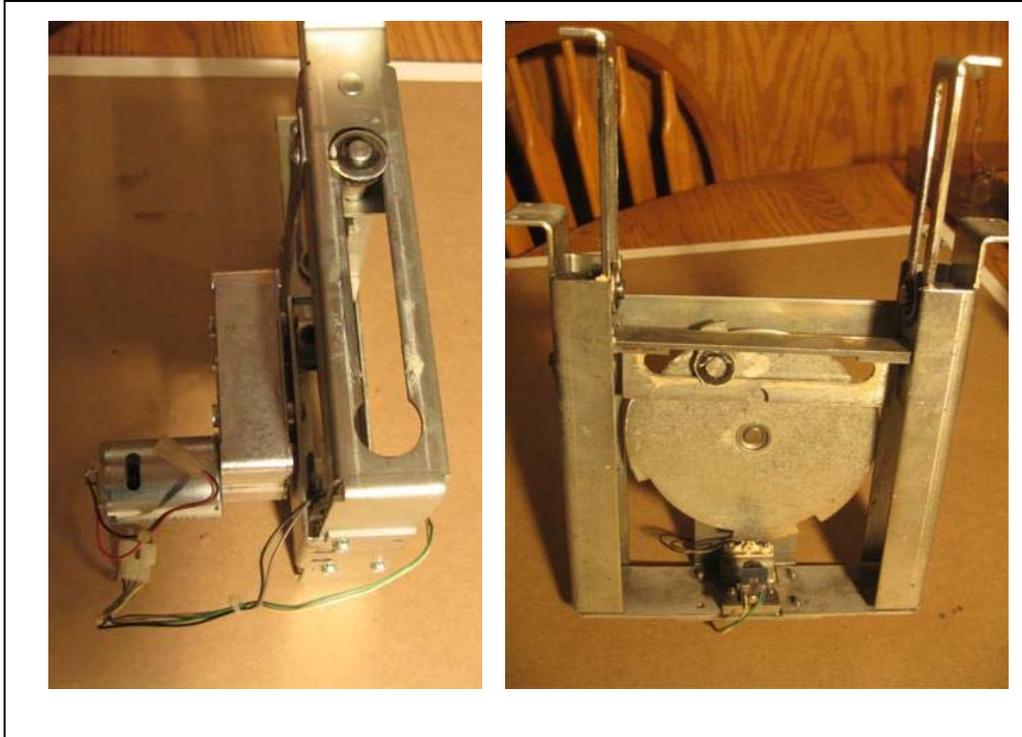


Figure 16 MPF Main Bracket Assembly

3.5.4 Disassembly of the MPF Main Support Bracket

The MPF Main Support bracket is used as an elevator for the MPF. It transfers the motion of the motor/gearbox to a cam that eases the playfield up and down. There are five major parts in this assembly:

- 1) Cam Assembly that transfers the rotational energy that moves the bracket
- 2) Motor mounting bracket holds the motor/gearbox to the exterior bracket housing
- 3) Motor/Gearbox itself
- 4) Exterior bracket housing which attaches to the main playfield (not the MPF)
- 5) Interior bracket housing which attaches directly to the MPF

The Exterior and Interior brackets are really straight forward at this point and there is no additional detail.

3.5.4.1 Remove Cam Assembly

This part is pretty straight forward. There are screws at the base of the exterior support bracket that need to be removed, but **don't remove them yet!**

Before I start I put a red “witness mark” on the left edge of the motor mounting bracket that extends onto the exterior bracket housing. This helps me to orient the pieces during reassembly...but now of course there are these pictures. Notice that I support the bracket with a few screw drivers. There is an opto at the bottom of the bracket and I don't want to damage it.

Before the screws are removed the cam needs to be disconnected from the arbor coming out of the gearbox. There are two set screws. Both must be loosened.

If a 12V DC source is available, use it to spin the motor and rotate the set screws into a comfortable position. Use a hex wrench to loosen. If the screw has not come out since 1992 it could be really stuck. There are alternative approaches. Try using a hex bit with a wrench to apply some extra “persuasion”. Once the screw has broken loose, go back to the hex wrench.

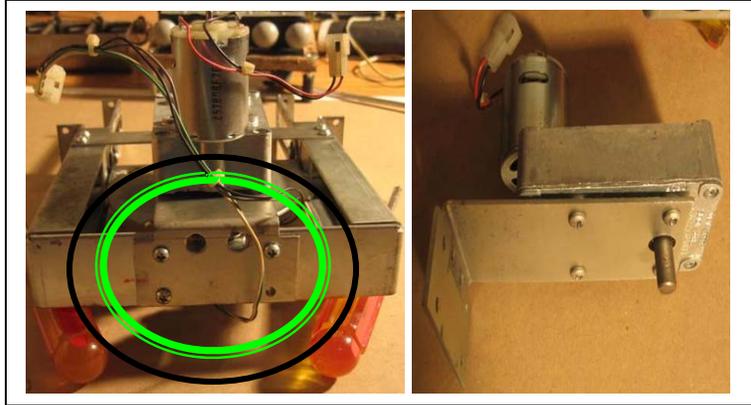
NOTE: The arbor has a D shape to it. The cam is keyed to the same D shape. This makes re-assembly relatively easy, but there is a story to be told later.



Figure 17 Remove Cam from arbor. There are TWO set screws

3.5.4.2 Remove Motor Bracket

After the Cam Assembly is disconnected from the gear box arbor, the motor bracket can be disconnected from the Main Bracket Assembly by loosening the screws shown in the left photo.



Now that the motor bracket is disconnected from the main bracket assembly (and the Cam Assembly) the screws attaching the motor bracket to the gear box are easily accessible (right photo).

Figure 18 Getting to the motor/gearbox

I added some photos (below) to show the Cam Assembly with the motor assembly removed. **Note** the optos at the bottom. They control the relative position of the cam in its motion. When the beam is broken, the game knows where in the cycle the MPF is located.

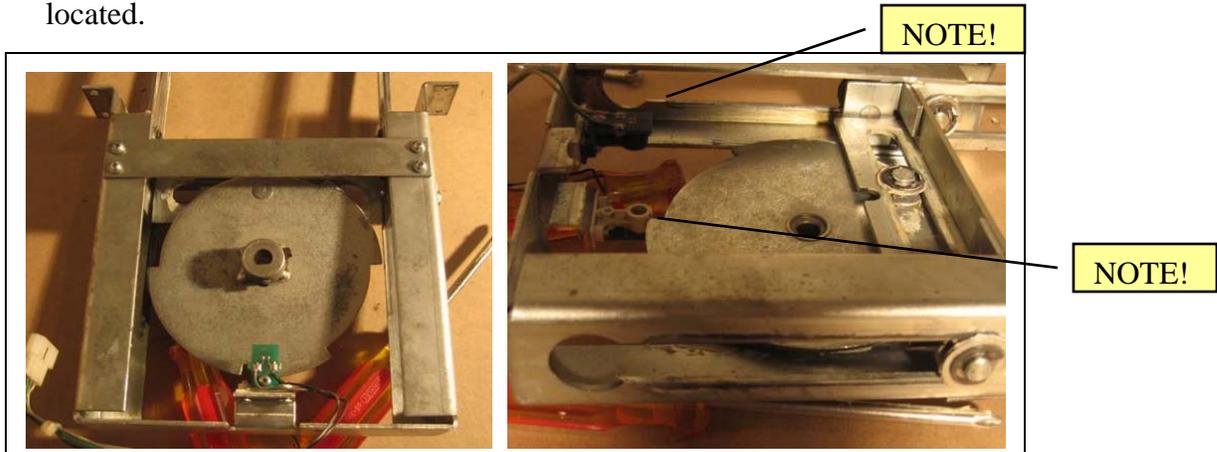


Figure 19 Mounting Bracket/Cam with motor removed

3.5.4.3 Motor Gearbox

After the motor mounting bracket is removed the screws holding the motor to the gearbox are very obvious. Replacing the motor is pretty simple, after the screws are removed, the motor slides right out of the gear box. Swapping in a new motor is pretty straight forward, but the motors are not generally labeled “Red” and “Black”. Nor are replacements shipped with leads already attached. The motor is driven by the “Bi-directional driver board” which suggests to me that it changes the polarity +/- on the circuit to make the MPF go up or down.

If the motor is wired wrong the worst case scenario is that two errors are displayed:

“Mini-playfield Error - C.W. Direction Reversed”

“Mini-playfield Error - C.C.W. Direction Reversed”

If both messages come up, the wires are soldered onto the wrong leads. Swap the leads and try again. If only one of these messages is displayed it could be driver board issue.

Note: If the motor works, note the rotation by putting a 12V DC power source onto the motor terminals. Put the positive power feed on the motor lead with the red wire. Note which way the shaft spins and apply the power source to the new motor (swapping terminals) until the same movement is noted. Mark the positive lead and desolder the wires from the old motor and solder onto the new one.

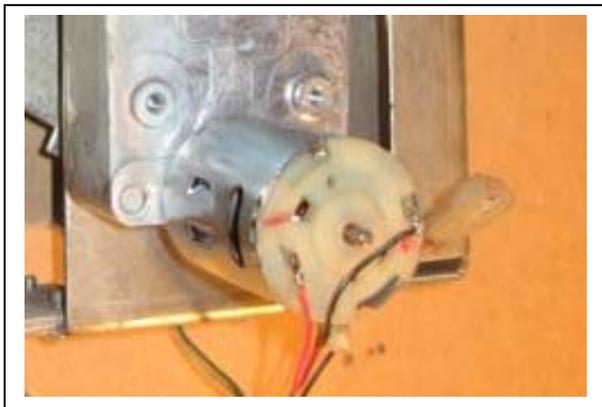


Figure 20 Wiring the motor

If the existing motor does not work, use this rule of thumb from my machine. If the red wire is hooked up to the correct lead (and the red lead is positive) the motor spins clockwise.

3.5.4.4 Exterior / Interior Bracket Disassembly

The bracket assemblies are riding on steel rollers held in place by a series of E-clips. There's not supposed to be any lube on any part in the game except where there is direct metal to metal contact. A thin coat of silicone grease repels dirt and ensures smooth action.

3.5.5 Gaining access to the Five Opto Targets

Earlier steps exposed the opto assembly on the MPF. This consists of a wire harness connecting to a plastic housing holding two facing PCBs (one with optos / one with LEDs) and the grey mushroom buttons. This assembly is held to the MPF with four screws. The picture on the right shows the whole assembly lifting off once the four screws are loosened.



Figure 21 Remove the Five Button Opto Assembly from the MPF

Once the retaining screws are removed, the whole assembly comes out. Eight screws hold the opto/LED PCBs into the plastic frame.



Figure 22 Opening up the opto assembly

The mushroom buttons are held in place by tiny E-Clips. Once the clip is removed, the plunger and plunger spring slide right off. The opto/LEDs themselves slide into hole in the plastic. The PCBs are really simple.

Here's a close-up of the boards showing the traces. There's a common trace for each PCB that runs to each opto/LED and the other leg of each diode runs to a unique solder point.

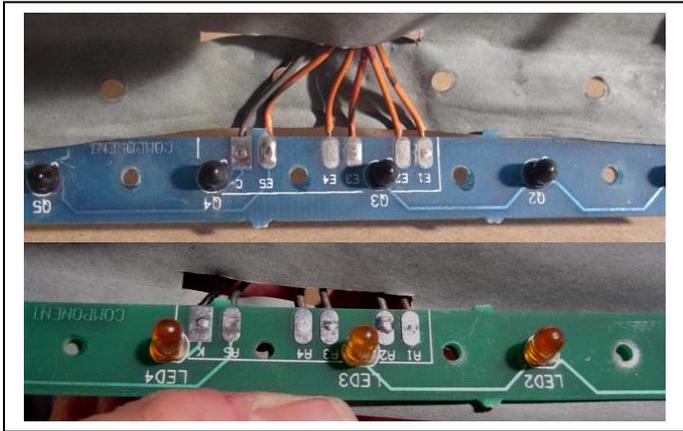


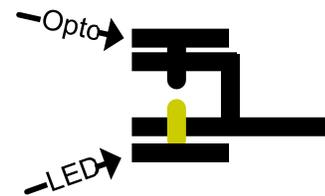
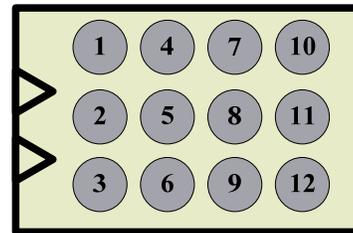
Figure 23 Opto/LED PCB close up

Use this chart to match up the solder point to each device leg. “Leg 1 PCB” refers to the solder point on the PCB where the trace from the device terminates. “Leg 2 PCB” indicates the common solder point used by the PCB which all common traces tie into. The codes “A#”, “E#” are printed on the original board (not sure about the repro boards out there).

Device	Leg1 PCB	Leg1 Pin	Leg 2 PCB	Leg2 Pin
Q1	E1	3	C	2
Q2	E2	4	C	2
Q3	E3	5	C	2
Q4	E4	6	C	2
Q5	E5	7	C	2
LED1	A1	8	K	1
LED2	A2	9	K	1
LED3	A3	10	K	1
LED4	A4	11	K	1
LED5	A5	12	K	1

Figure 24 Connector PCB reference

Notice each opto is labeled Q1-Q5 and the LEDs labeled LED1-LED5. Since I had this out and it worked, I ran some continuity tests to illustrate which connector pin went with which opto/LED. The illustration below matches the keyed connector. The numbering scheme matches the tiny numbers embossed on the connector.



Note: the opto PCB is mounted on top of the plastic housing and the LED PCB is on the bottom. If they become inverted the buttons will work but it will activate the wrong lights on the playfield.

3.5.6 Disassembly of the Three Door Assembly

The last component to be disassembled is the Three Door Assembly. There's not much reason to disassemble except if you want to polish it up. Upon inspection the screws holding it together seem fairly obvious, but it's really difficult to get to them because of the four mini-posts in the way. The photo shows where I loosened the mini-posts first and then the screws are easily accessible.



First remove each nut from the bottom of each of the four mini-posts.

Figure 25 Breakdown of the Three Door Assembly

If the desire is to change out the rubber rings, now is the perfect chance. I find the pressure required to get these tiny rings on/off is too great to perform the task fully assembled. You don't want to bend this thing, try to find a new one.

After the posts are removed, simply unscrew the two pair of screws on either side. Be sure to note the washers and goofy "nut" used to hold this together. These screws attach to a small rectangular piece of steel that has been tapped for the machine screws.

The posts connection point and the four screws hold the whole thing together.
Happy cleaning!

3.6 MPF Miscellany

The last bit of disassembly deals with all the posts, brackets and electronics screwed into the MPF plywood. This is really straight forward and did not warrant explanation. For my purposes, the entire MPF was stripped down to the surface and cleaned. Each of the ball guides came out and I polished off 15 years of oxidation.

3.7 Disassembly Conclusion

This marks the end of my disassembly story. I took the disassembly as far as I could. I'm sure there is something else to take apart, but perhaps that will be in V2 of this document.

4. Assembly of the Mini-Playfield

This is the part of the story that's always fun for me. If I did my job organizing parts correctly during disassembly, the re-assembly should be a snap.

4.1 Get sub-assemblies ready for integration into MPF

There are 4 major sub-assemblies that need to be attached to the Mini-Playfield

- Main Bracket Assembly
- Opto Assembly
- Three Door Assembly
- MPF Cover Assembly

4.1.1 Main Bracket Assembly

The first time I took the MPF apart this part really frustrated me. The MPF was binding going up. It went down fine, but the motor could not generate enough torque to pull the MPF back up without help (me pulling). I feared the worst and bought a new motor. After I got the thing apart I realized that the motor was working just fine and the binding was occurring INSIDE the Main Bracket Assembly. Turns out, it could have been resolved with an adjustment.

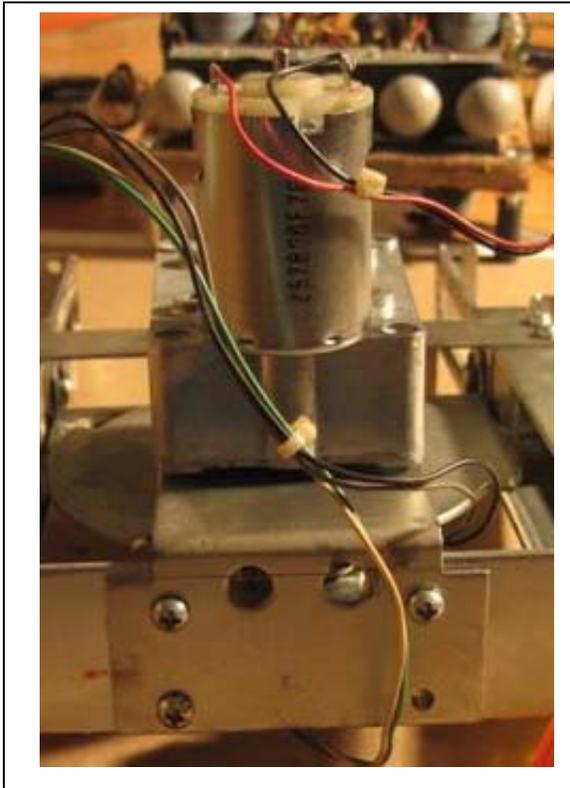


Figure 26 Attach Motor to Gearbox to Main Bracket

Re-assemble by following the disassembly instructions in reverse

Step 1: Attach the motor to the Gear Box (see figure 18)

Step 2: Attach the Motor Bracket to the Gear Box (see figure 20)

Step 3: Attach the Motor Bracket to the Main Bracket Assembly. Be sure to align the witness marks to make sure the motor is facing the correct way. Slide the D-shaped arbor coming out of the gear box onto the matching D-shaped hole in the Cam Assembly but **DO NOT TIGHTEN** the set screws yet. First put in the screws that attaches the Motor Bracket Assembly to the Main Bracket Assembly (in photo to the left).

Step 4: Align Cam on the Gearbox Arbor (next section).

4.1.2 Align Cam Assembly on Gearbox Arbor

NOTE: Before the set screws on the Cam Assembly are tightened the cam/motor must be aligned. The D shape of the Gearbox Arbor allows easy alignment of “rotational” orientation of the Cam to the Gearbox. However, it does not excuse aligning the Cam on the shaft (left to right). These illustrations demonstrate how the misalignment can occur; it is highly exaggerated for clarity. The alignment must be perfect. If the cam is not perfectly aligned inside the Main Bracket Assembly the Cam will bind and the motion of the MPF will be jerky.

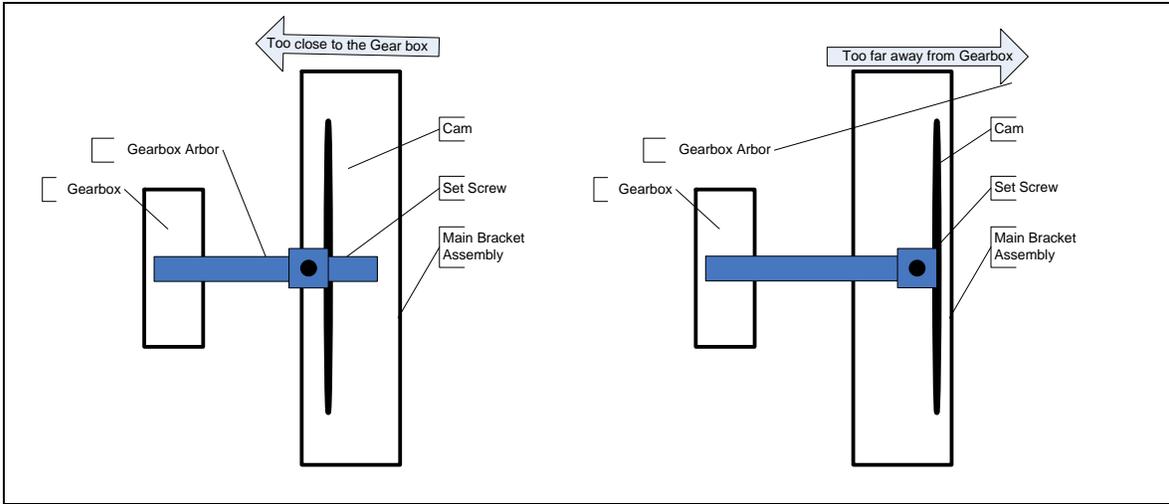


Figure 27 Illustration of misaligned Cam Assembly (top view)

After the Cam Assembly is aligned lightly tighten one of the set screws, then test the unit. Use your 12V DC power source to run the motor up / down. Look for really smooth action with no binding or excessive vibration. It should be really smooth. Once the assembly is working well, tighten both set screws to lock into position.

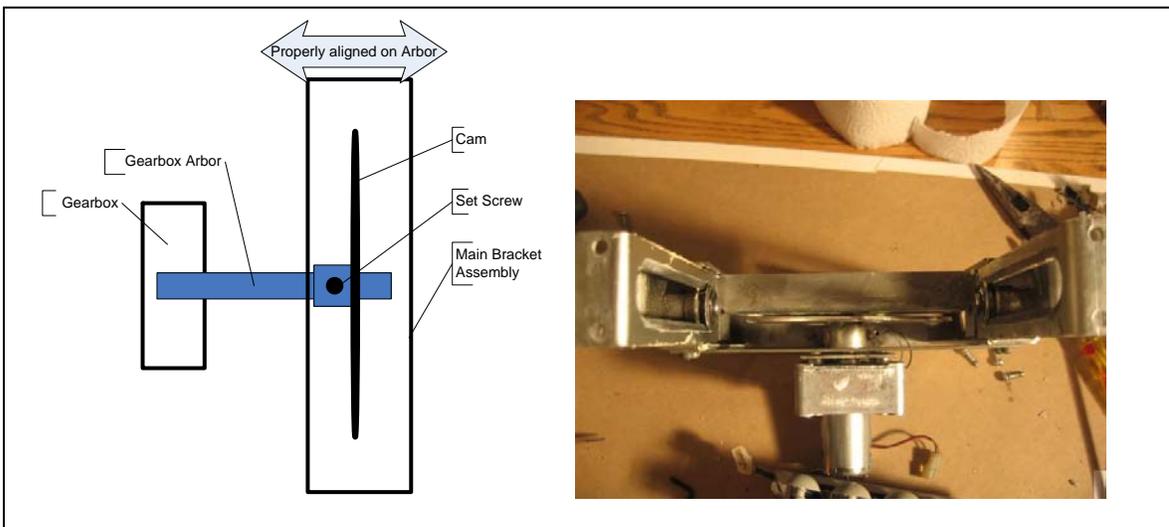


Figure 28 Illustration and photo of properly aligned Cam Assembly

4.1.3 Assembling the Five Target Optos

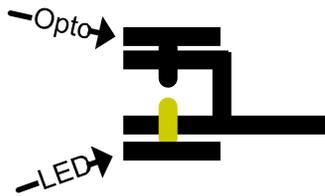
The opto assembly is pretty straight forward. A few gotchas to watch out for though.

Step 1: If the mushroom buttons were taken off the plastic housing, they must go back on first. Slide a spring on to the mushroom plunger and insert plunger into the housing.



Figure 29 Correctly Assembled Mushroom Plunger in the housing

Use these pictures to help orient the plunger spring and housing. Then insert the plunger and put on the tiny E-clips with a pair of needle nose pliers. **NOTE:** Try using a piece of blue painters tape over the face to hold the button tight in the housing. It helps getting the E-clip on without the plunger shooting across the room.



Step 2: Make sure the opto / LEDs are really clean. Wipe down with a dry clean cloth removing all dust.

Step 3: Slide the opto PCBs into the housing. Remember, the opto receivers go on TOP. Failure to do this will cause the buttons to work backwards. The key to remember here is that the opto / led pair must be directly across from each other. If misaligned the opto will fire erratically or not at all. Also, make sure that the paper sleeve over the optos is in good shape. Light noise can cause erratic operations as well.

Step 4: Put all 8 screws into the opto assembly locking it all together (see figure 22).

4.2 Integrating the MFP sub-assemblies onto the MPF

As stated earlier the entire MPF was stripped bare and everything polished. The ball guides were exceptionally oxidized; it took a lot of Dremel work to get them shiny.

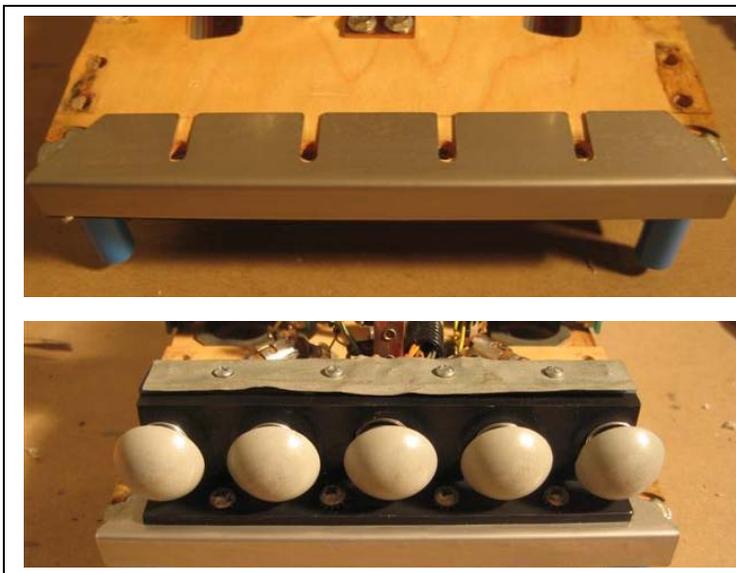


I got some help from Cliffy adding his colorful post sleeves. Looks pretty sweet!

Figure 30 The top of the MPF gets a makeover

The metal flap in front of the MPF was a bit rusty so I picked up one a while ago. But the flap kept buckling in the middle. This time when I re-assembled everything, I put a piece of double stick cellophane tape under the flap. The flap has been flat and true for a while now so I think this solution works well.

4.2.1 Attach the opto bank



The main purpose of this disassembly is to clean and really make the playfield look good. With a 15 year old beat up piece of wood staring at me, I HAD to throw a Cliffy Protector on. It simply goes underneath the opto assembly. Add screws and this assembly is in place. Snake the wires out the back of the MPF. The upper photo shows the protector being set into place and the lower photo after the opto assembly has been re-attached.

Figure 31 Installing the opto bank with Cliffy Protector

4.2.2 Attach the Main Support Bracket w/motor

The Main Support Bracket should have the Motor Bracket, Gearbox and Motor already attached. Make sure the bracket is fully extended (raised position); this is required to gain access to the screw holes on the bracket.



Figure 32 Attach Main Support Bracket

NOTE: The only thing to watch out for is to make sure the motor is pointed out the **BACK** of the MPF. Look at figure 33 for a good view of the proper orientation. The bracket itself is held onto the MPF with 4 simple screws.

4.2.3 Attach the Three Door Drop Target

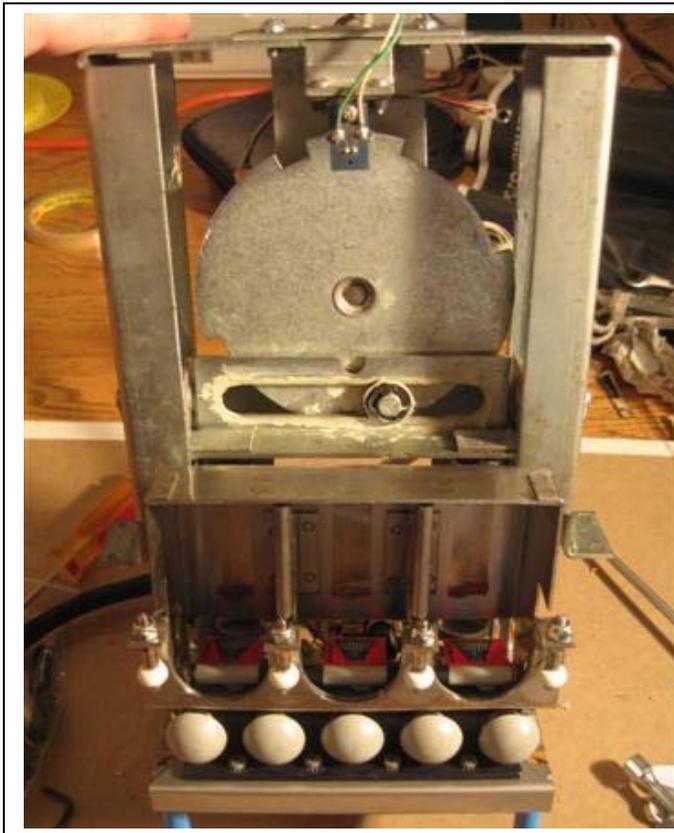


Figure 33 Attach Three Door Drop Targets

The Three Door Drop Target should be shiny with some new rubber bits. It slides easily back into place over the opto bank held on by four screws. Use this photo as a guide to insure assembly is correct.

- Opto buttons face **FRONT**
- Motor Faces **BACK**

4.2.4 Checkpoint

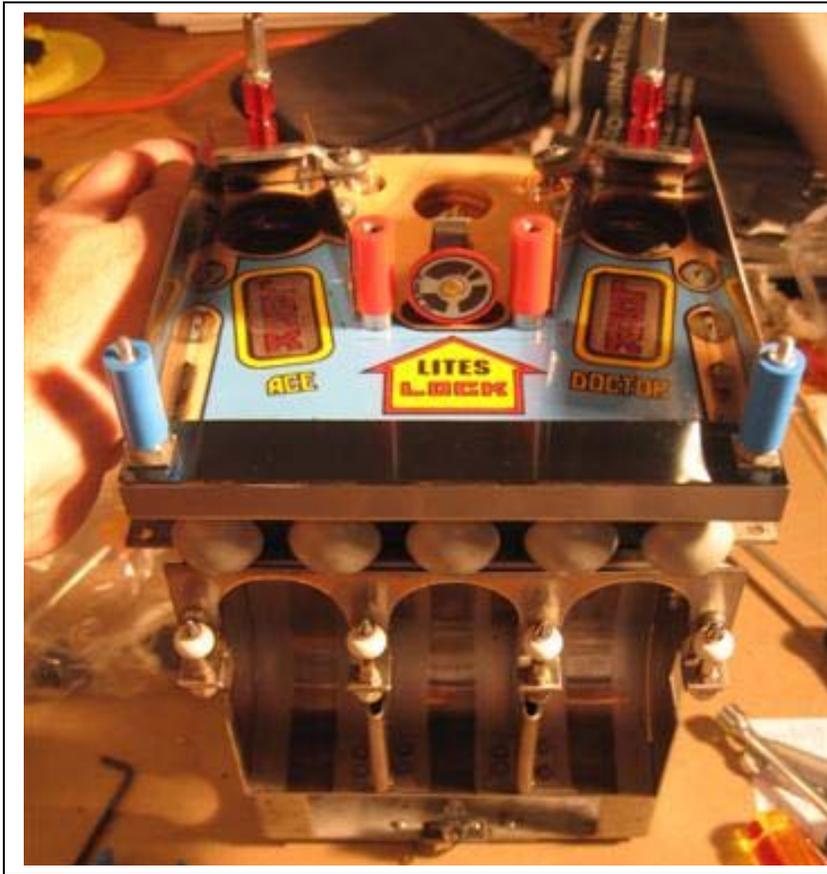


Figure 34 The only thing left to add is the Cover Assembly

Oddly enough, I did not take a photo after I added the MPF Cover assembly. It simply slides over the posts affixing with six screws.

At this point all the major components of the MPF are attached and all sub-assemblies attached.

Take break and admire the fully assembled MPF.

Ok...enough of that. Back to work!

5. Final hookup of the MPF

5.1 Insert fully assembled MPF back into the playfield

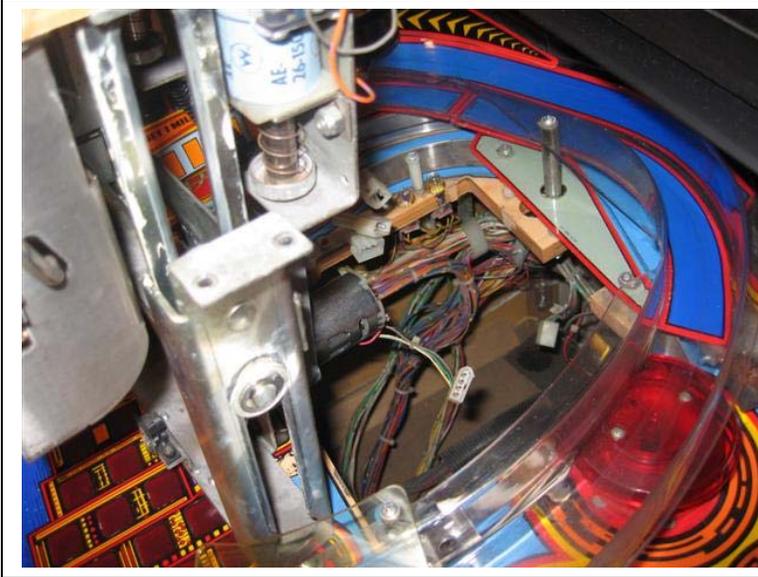


Figure 35 Preparing to insert the MPF into the playfield

The MPF is ready to insert back into the playfield. Remember how it was removed. The motor and the Three Door Assembly have to snake into the hole very carefully. Make sure all the wire bundles come through completely and none hang up inside the MPF.

Gravity holds the MPF into place on the playfield.

5.2 Final connections

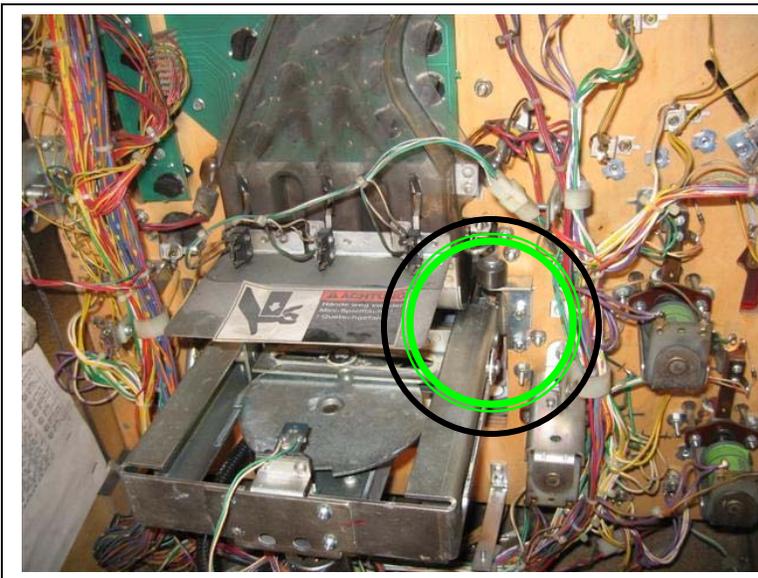


Figure 36 Final MPF Connections

The final steps of reconnecting the MPF are achieved by performing section 3.4 in reverse. Here's the cliff notes version:

- 1) Screw the Main Support Bracket to the PF (on top)
- 2) Attach the Door Release Bracket (underneath)
- 3) Attach the Outer MPF Cover Assembly
- 4) Plug it in
- 5) Test it out
- 6) Play some pinball!

This is the end of my story. Please contact me with any corrections (contact info in first section). Keeping the ball moving...all my best. Rich Fazio

6. The Gallery (after completion)



