

Gear Door Sequencing with the 14MZ

by George Manning

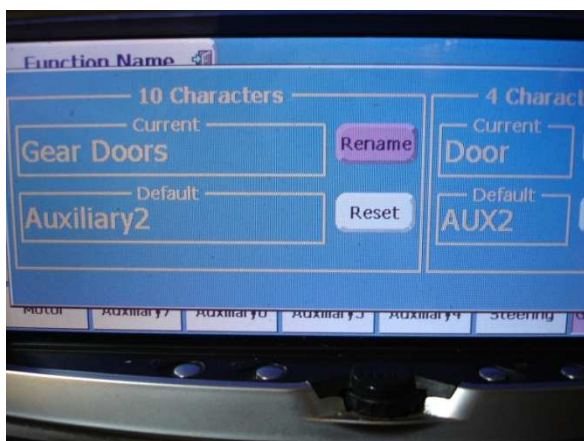
After reading the suggestion a few weeks ago to add the programming feature for gear door sequencing to our radios I thought I would give an example of how I've addressed the issue using the software we already have. First I will explain how I've set things up for doors that are closed when the landing gear is in the up and down position. Then once you understand the concept, it's really easy to set up standard doors. My examples of gear door sequencing will be done using a 14mz however quite a few of our radios are capable of a very similar set up.

I will assume you have already set up a pair of standard air control valves for both your gear doors and landing gear with whatever servos you plan to drive them with. I like using the ones with the adjustable flow for my doors so the speed can be controlled.



You will need to know what direction your valves raise and lower your gear and open and close your doors but you don't need to have the servos connected yet. Once you have this figured out, do not have any air in your system during the set up or you'll have a mess to fix. Once all the programming is done you'll be able to tell if everything is working correctly just by watching the servos.

1: Enter the Function naming menu and rename any function you don't plan to use in your model as "Gear Doors" also change the short abbreviation to Door. Of course you can use different names if you like up to 10 characters for the full name and 4 characters for the abbreviation, or if your radio does not have the ability to change the names just write down what Aux # you plan to use for the doors.



2: Now in the Function menu pick a channel you would like to use for the doors and click on the function Name, this will allow you the option to select the Gear Door function you renamed in the

previous step. At this time change the control and trim for both the Gear door channel and Gear channel to Null. You will not need any switch assigned nor do you want one. (These channels will be controlled by a P-mix)



3: At this point I suggest you set your "End Points (ATV)" to a max of 30% for both directions of the servo travel. Do this for both the Gear and Gear Door channels. (The idea is you don't want to accidentally overdrive your linkage for your air valves and burn up a good servo or break a drive train gear.)

4: Next go to the Programmable Mix menu and select an unused mix. Change the tab that says "INH" to "ON". Now make the master whatever switch you normally use for your landing gear. In my case it is SW-E. Now change the slave to Gear. Next change the tab that says "Linear" to "Line". Select the first point all the way on the left in the graph using the "<<" key and using the "Rate" tab set it to -152.4%, this is the same as max throw. Do the same for the point all the way on the right only make its rate +152.4% or again max throw. At this point the graph will show the first point all the way on the left at the bottom and the one on the right all the way on the top with the rest straight across the middle.

5: Do everything you just did in the above step on a separate available P-Mix but this time make the slave channel Gear doors.

6: Now is the time to adjust the throws and directions of your servos for the Gear and Gear Doors channels, so first make sure you don't have your servo arms and links connected and turn on your receiver. Observe the direction of travel and reverse them if necessary so that the gear will be down and the doors up when your selected switch is in the gear down direction. Next you can go to your End Point (ATV) screen and adjust the actual servo travel throws as you normally would so that the servo has the maximum throw that the valve will allow without any binding. I like to try to use at least 100% throws in both directions so the servo is being utilized at its best but most of the time the Valve's throw distance is just too short. You should still try to do the best you can. Whether you have 30% throw or get 140% it will not have that big of an effect on the rest of the programming so do whatever you are comfortable with.

7: Now the fun part, go back to your P-Mix for your gear and we can now set up the timing of the gear. In the graph box leave the center point in the center position, however take the rest of the points and set all the ones on the left side of center to the same max throw you have for point one (in the case of the 14MZ that will be -152.4%) Now set all the ones on the right side of the center point to the max matching the last point. You will have a graph that looks a little like a backwards Z. You can adjust the location of the two points either side of the center point from left to right using the "<" or ">" key. The idea is to make the vertical line as vertical as possible. Now the graph should look like three straight lines, one across the bottom to the center point then a vertical line to the top followed by a line across the top.



Next click on the "Speed" tab and set the tab from slave to master since we are going to change the speed of the channel that the switch affects not the speed of the servo. Also at this point consider that the doors need time to open before the gear can go in or out so at this time set both in and out delays to 24 for starters, the higher the number the longer it will take before the gear servo moves but the servo speed will still be quick. If you watch the graph you'll see that the progression of the line on the graph moves slowly and based on how vertical the line is in the center of the graph, the signal to the servo is still quick from one extreme to the other. I think you are going to get the idea of how this system works now. If you want to turn on your receiver to see what it does, you'll observe that after you flip the gear switch there will be a delay before you gear servo actually moves. We can fine tune the timing after the doors are set up.



8: To get the gear doors to react as soon as the switch is moved, the points on the graph have to be set up differently than the gear, but the idea is still the same. Leave the first point as it is; all the way down on the left side of the graph, but take the next point and put it all the way to the top. Move the point to the left to make the line very close to vertical between the first and second point. It has to have some angle but very little. Take the last point on the right and move it from the top all the way to the bottom extreme. Now take the second to last point and put it all the way to the top plus move it to the right so that it is now nearly vertical with only a slight angle. Take all the rest of the points between the second one and the second to last one and put them all at the top of the graph. You graph should now look like a side view of an upside down bucket. There are only three lines once again, however the first is near vertical with a slight lean to the right, the second is flat across the top, and the third is vertical with a slight lean to the left.



Next click on the "Speed" tab, change the tab that says slave to master since once again, we are going to change the speed of the channel that the switch affects not the speed of the servo. Now I would suggest you start with 26 as a setting for both in and out. In this case the higher the number the longer the doors will stay open.



9: Air up the doors at this time and turn your receiver on. If both your gear and doors use the same supply air then pinch off the feed line to the gear valve for now. Next you can observe that the gear door servo will move as soon as you flip the gear switch on your transmitter, then after a delay it will return. Also you can see the gear servo move after its delay, if the delay is too long or too short change your speed setting in the p-mix. If you are satisfied that based on your air pressure and speed of your doors you have enough time to get your landing gear out you can now air up your Gear and now it's just a matter of how long you want your doors open and how soon you want your gear to move. Remember that when you actually fly your plane the air speed greatly affects how the doors and gear will work so I suggest you leave the door open time set to a long setting until you actually see how the gear and gear doors are affected in flight. Also remember that you can change the time it takes for each movement by changing the time setting for in or out on the p-mix speed setting, when you started your timing set up I had you set both directions the same but you will most likely end up with them slightly different.

That is it for setting up that type of doors!

The changes needed from the previously explained door set up to the type of doors that stay open while the gear is down are all done by making changes with the points on the graph and speed settings. Mainly the door graph will have a near vertical line close to the left edge of the graph when the doors will have to move first and then a straight line over to the other side of the graph so it will end up looking like an L on its side. The speed for bringing the doors down will be set to 0 and instantaneous, however to go up the delay will be controlled by the raising the speed number in the p-mix so that the gear will have enough time to get up before the doors close. As for the gear graph it will be the opposite of the doors so that the gear go up instantly and are delayed coming down. The graph will look like two lines with one across the bottom and a near vertical one on the right.

I hope this helps.

The only real limitation in Futaba's programming is our own imagination since Futaba's programming ability is so extensive that many people find it a bit overwhelming.

George Manning Jr