How to Set Up a Spektrum Gen2 Transmitter for the Apprentice SAFE Receiver (EFLR 310013)

This issue of Flight Notes will provide a step-by-step walkthrough for setting up a new model on your Spektrum Gen2 (DX6/7/9/18) transmitter for use with the Apprentice S 15e SAFE radio receiver (part number EFLR310013).

Before getting into the exact steps for setting up the model, let’s look at how E-Flite suggests we set up the model for basic operation according to the Apprentice S 15e manual.

NOTE: I’m going to assume that the DIP switches on the receiver are in their default setting (both OFF) for full three-mode operation. All of the Gen2 models allow you to use a three-position switch for flight modes.

**Suggested Transmitter Settings**

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Airplane</th>
</tr>
</thead>
</table>
| Switch Mapping | Gear: Switch B  
Aux1: Switch I (button) |
| Servo Direction | Reverse Aux1, all others normal |
| Servo Travel Limit Changes | None |

With those settings, the manual tells us that the switches will do these functions:

<table>
<thead>
<tr>
<th>Switch B</th>
<th>Flight Modes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Position 0 = Beginner Mode</td>
</tr>
<tr>
<td></td>
<td>Position 1 = Intermediate Mode</td>
</tr>
<tr>
<td></td>
<td>Position 2 = Experienced Mode</td>
</tr>
</tbody>
</table>

| Switch I (Button) | Panic Mode |

**Radio Signal Values**

Let’s understand how those switch settings will tell the aircraft what to do. The switches will cause different values to be sent to the aircraft on a given radio channel in order to perform the various control functions.
<table>
<thead>
<tr>
<th>Radio Channel</th>
<th>Control Values and Their Function</th>
</tr>
</thead>
</table>
| Control Sticks (channels 1-4) | Normal operation  
Do not use trim! For best results, ensure that the sticks are calibrated such that they send exactly 0 value when centered. |
| Gear (5) | +100% = Beginner Mode  
0% = Intermediate Mode  
-100% = Experienced Mode |
| Aux1 (6) | +100% = Activate Panic Mode |
| Aux2 (7) | Open for additional function (added by you!) |

**Step-by-Step Instructions**

Armed with all of that information, let’s go ahead and set up the transmitter.

1. Go to the System Setup menu, and find and select Model Utilities.

2. Choose “Create New Model”. Verify that yes, you want to CREATE a new model.

3. You’re returned to the System Setup menu with your new model selected as the current model.

4. Go to Model Type, and select the type “Airplane”. Verify that YES, data will be reset. (Although this seems unnecessary since the default for a new model is Airplane, I’ve read that it’s best to make sure the model is reset to default settings. Maybe that’s due to an old bug in a Spektrum transmitter a long time ago. Now it’s habit.)

5. Go to Model Name and give the model a name.  
   Hint: To erase the default text provided, click to select the first character (probably a number, since the default format is something like “10: Acro”) and then press the CLEAR button TWICE. (Pressing it just one clears just the one character.) Select “BACK” in the upper right corner when you’re done.

6. You can optionally change the picture of an airplane that the transmitter displays on the main screen. To do that, go to Aircraft Type. On the first screen where it shows the wing type, just leave that as “normal” and scroll down to “NEXT” in the lower right corner. On the second screen (Aircraft Options), scroll over until the picture of the plane is highlighted. Select that, and then change the picture as desired. Then choose “LIST” in the upper right corner.

7. Go to Channel Assign. On the first screen (Rx Port Assignments), ignore those settings and go to “NEXT” in the lower right corner. On the second screen (Channel Input Config), you map switches to radio channels. Make these changes:
Set GEAR to B
Set AUX1 to I
Set AUX3 to Inh (which means Inhibit, or “off”)
Set AUX4 to Inh

If you plan to use the Aux2 connection on the receiver, you may assign it to another switch here. If not, then also set AUX2 to Inh.

NOTE: If you don’t like these switch mappings, now is the time where you can change them to different switches if you prefer.

When you’re done, choose “LIST” in the upper right corner.

8. We’re going to take advantage of the fact that the transmitter supports “flight modes”. However, understand that what the transmitter calls a flight mode is not exactly the same as what the SAFE receiver calls a flight mode. On the SAFE receiver, you get totally different behavior from the aircraft when you change flight modes. In contrast, a flight mode on a transmitter means that you have more options for defining advanced features like throttle curves. This became popular with helicopter pilots who need may need very different transmitter settings based on whether or not they’re flying upside down. Nonetheless, we can apply the transmitter’s flight modes to the SAFE receiver. Doing so will make it display the name of the flight mode on the screen.

Choose F-Mode Setup from the menu. Set Switch 1 to the main switch for the flight mode control (the GEAR channel), which is switch B unless you just changed it.

At the bottom of the screen, you should see that there are 3 enabled flight modes. You can even test it. If you flip Switch B through its positions, you should see the text change at the bottom of the screen.

Choose “LIST” in the upper right corner to go back to the menu. It’s not necessary to change any of the other flight mode settings.

9. Go to Spoken Flight Mode. This screen lets you change the flight mode names as well as the voice alert assigned to each mode. Set the names as follows. Choose voice alerts for each mode that make the most sense to you. Unfortunately, there aren’t any voice alerts that exactly match the names of the flight modes.

To change the mode you’re editing, actually flip the switch to that mode.
Switch B position 0 = Beginner Mode
Switch B position 1 = Intermediate Mode
Switch B position 2 = Experienced Mode

For the three modes I chose voice callouts “Self-Level”, “Stability Mode”, and “Manual
Mode”.

Choose “BACK” in the upper right corner when you’re done with all three modes.

10. Back on the System Setup menu, choose “< Main Screen >”. Then, click the scroll wheel again to get into the Function menu.

11. Choose Servo Setup. The screen initially shows “Travel”, so select that and change it to say “Reverse”. This is where we reverse the direction of the Aux1 channel as directed. After you select “Reverse”, scroll down to the “AX1” channel and click the wheel to flip that one to the reverse direction. Then choose “LIST” in the upper right corner to go back to the menu.

12. Out of habit from flying helicopters, I like to set up a throttle hold switch so you can turn on the switch to effectively disable the motor. To do that, select Throttle Cut from the menu. Change it from “Inhibit” to a switch of your choice – I prefer switch H because that’s the HOLD switch on the DX8. It should default to a position of -130%, but you want to change that to -100%. Then, select “LIST” in the upper right corner to go back to the menu.

13. Select Timer from the menu. This is where you adjust the countdown timer so you know how long your battery will last. Change the time to a value that’s appropriate for your model and flying habits. If you’re not sure which value to use, consult the manual for your model. Note that it is not good for the batteries to keep flying until the motor reaches the Low Voltage Cutoff warning. You want to land before that happens! Over time you’ll find the optimum setting for the timer based on your flying habits.

Then choose “NEXT” in the lower right corner.

Change the Alert settings to your liking. I prefer to have the voice call out each minute, so I set Every Minute, 1 Minute, 30 Seconds, and Expiration to Voice. Having the tone from 10sec to 1sec makes it start beeping at 10 seconds.

Choose “LIST” when you’re done making changes to go back to the Function menu.

14. Choose Custom Voice Setup. First, let’s add a voice callout to the button so it talks when we press the button for Panic Mode. Choose “< Add New Sound Event >” to add a new event. Next, select “Switch Change Report”. Then choose Switch I, and for position 1 choose the phrase “Panic”. Then choose “BACK” in the upper right corner. Now add another new sound event for the throttle hold switch. It’s another Switch Change Report for Switch H. On position 0, have it say “Normal”, and on position 1, have it say “Hold”.


To get back to the menu, choose “BACK” in the upper right corner, and then choose “< BACK >” from the list of events.

Testing Your Setup

You can check your work without the airplane! For that, we’re going to use the Monitor screen. If you’re still in a menu, exit back out to the main model screen.

From there, roll the scroll wheel once to the right. That will show you the Monitor screen. It has a number of vertical graphs – one for each channel – that visually show the current value on that channel as well as reporting an actual number above each graph.

The THR, AIL, ELE, and RUD channels will move with the sticks. Go ahead and play with it. By the way, if your sticks are not showing exactly 0 when they’re centered, then you need to calibrate the sticks. If the receiver sees a value other than 0 when the stick is centered, it would consider that as input. The smarter receivers really don’t like trim on the transmitter. If you find that you need to trim a control surface, you can adjust it in-flight, but as soon as you land you should adjust that control surface mechanically and then reset the trim to 0. If you leave the trim at a value other than 0 from flight to flight, you’ll find yourself adjusting the trim constantly.

Now let’s test the switches. With all switches in position 0 (the normal “starting point”), you should have a value of 100 on GER and -100 on AX1. The other channels that you set to “Inh” during Channel Assignment will read 0 now.

Let’s flip through the flight modes. As you flip the flight mode switch, you should see the value of GER change as follows:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginner Mode</td>
<td>100%</td>
</tr>
<tr>
<td>Intermediate Mode</td>
<td>0%</td>
</tr>
<tr>
<td>Experienced Mode</td>
<td>-100%</td>
</tr>
</tbody>
</table>

If you don’t get the correct value on GER to match the mode you think you’re in, then something is set up incorrectly.

Next, press button I. Channel AX1 should change from -100 to 100 when you press the button.

Finally, move the throttle stick up. No matter where you leave the throttle stick, flipping switch H should drop the value of THR all the way to -100.

If all tests out well, go ahead and bind the receiver to the transmitter. Turn off the transmitter, install the bind plug on the receiver, and then power up the receiver. When the light on the receiver starts flashing quickly, hold down the bind button and turn on the transmitter. Keep holding the bind button until the transmitter announces “Binding”. After you successfully bind
the receiver, power everything off and remove the bind plug. In the future, you should always turn on the transmitter first and then turn on the airplane. You only do the power-up steps “backwards” this one time in order to bind the receiver to the transmitter.

You should always ensure that the control surfaces move as expected before taking off. You can flip the “hold” switch (Switch H) if you like to prevent the motor from spinning up accidentally.

**Set up Rates – What are “high rates” or “low rates”?**

The terms “high rates” and “low rates” generally refer to how you can make the controls on a model aircraft either more gentle or more aggressive by making adjustments on your transmitter. It’s often beneficial to set up “low rates” especially if you’re not familiar with a new model or you’re not experienced with that type of aircraft.

There are two ways you can adjust how the control sticks “feel” or make the aircraft respond. One is Dual Rate, often expressed as D/R, DR, or “rate”. The other is Expo. You can use one or the other, or both at the same time if you like.

**How Dual Rate Works**

Dual Rate reduces the maximum amount of input you can provide on a control channel. By lowering the maximum value of input, you can’t make the aircraft turn as far as it otherwise would when you move the stick all the way out to the end of its range.

For example, let’s state that the stick normally has a range of 0% to 100% as you move it from the center to the outside edge. This would equate to a rate of 100%. When you move the stick halfway to the outside edge, it will send a value of 50%, or half of the 100% maximum value. So the stick response is linear – the value it sends is directly proportional to how far you move the stick. A graph of the response looks like this – a straight line as you move the stick from one end to the other.

Now let’s change the rate to a lower value – 70% is a common choice. With a rate of 70%, the maximum value the transmitter can send to the aircraft is only 70%. And again, the response is
linear. When you move the stick halfway between center and the outside edge, it will send half the maximum value, or only 35%. Here’s how the picture changes with a 70% rate.

![Diagram](image1.png)

So what you have done is not only limit yourself so you can’t over-control the aircraft, but also you have lowered the amount of signal sent to the aircraft for any given position of the stick. When rate was 100%, moving the stick halfway sent 50%. But with a rate of 70%, moving the stick halfway sends 35%. So for a given amount of physical stick movement, you have also reduced the amount of change that the aircraft receives, and the response is consistent across the entire range of stick movement.

**How Expo Works**

In contrast, Expo takes a completely different approach to making the controls feel a little less sensitive. Unlike Dual Rate, Expo does not change the maximum value of control you can send to the aircraft. Instead, Expo applies an exponential response curve (thus the name) to the way the stick movement is translated into control values. Now we really need a picture! Here’s what an Expo value of 50% would do. (That’s a little extreme, but it helps illustrate the point.)

![Diagram](image2.png)
By increasing the amount of Expo, you create a curve that’s very shallow near the center of the control stick and very sharp near the outside edges. The effect this has on your controls is to greatly reduce the sensitivity of the stick near the center, so there is very little change sent to the aircraft for a given amount of physical stick movement in that area. But on the flip side, the sensitivity to movement will be greatly increased out near the edge of the stick’s travel range.

Since most control movements should be small, reducing sensitivity around the center of the stick is usually a good thing. And since Expo isn’t changing the maximum amount of control you have, you can always get maximum response at the edge of the stick if you really need it.

**How to Add Rate or Expo to a Model on the Transmitter**

Adding Rate or Expo is pretty straightforward. From your main model screen, click the scroll wheel to get into the Function menu. On the menu, select “D/R and Expo”. You’ll then see a screen just like the earlier pictures.

You apply either Rate or Expo (or both) to each channel individually. The only channels you can choose are Aileron, Elevator, and Rudder. There’s a much different way to change Throttle if you wanted to (it’s called Throttle Curve, and is beyond the scope of this discussion).

First, select the channel you want to work with. In most cases, you’ll start with Aileron.

Then, scroll down to “Switch” and select the switch you want to use to select different rates. My favorite is Switch F.

After you select a switch, you’ll see two or three boxes appear which indicate the switch position you’re working with. You can then flip the switch itself to change positions.

Flip the switch to position 0, and make any changes you’d like to the rate and expo values for that position. If there are two numbers for each setting, then the transmitter will let you set different values for different directions of stick movement. When the stick is centered, both numbers will change together. Then, flip the switch to another position and change the values for that position.

Next, go back to the channel and change that if desired. The other channel that’s commonly changed is Elevator. Then repeat the process of flipping the switch to a certain position and changing the values as desired for each position.

The values you select will depend on personal preference and the specific aircraft. A typical starting point is to have “high rates” with 100% rate and 0% expo. “Low rates” would have 70% rate and some amount of expo if desired, such as 10% to 30%. A three-position switch would give you a third choice in between for “mid rates”.


After you set up the rates, you’ll want to set up a voice callout for the switch on the models that support it. Choose “LIST” in the upper right corner of the screen to get back to the menu. Then, choose “Custom Voice Setup.” Add a new sound event for a switch change report. Then, choose the switch you just used (Switch F if you followed my lead) and assign callouts to the different positions. There are several choices for rates in addition to “High Rates”, “Mid Rates”, and “Low Rates”, so scroll through them and see which make the most sense to you.

For this model, I set up “High Rates” on position 0 of Switch F and “Low Rates” on position 1. The high rates are the default rate of 100% and 0% expo. The low rates are 70% rate and 20% expo on the aileron and elevator channels.