Show Me ...

...How To Use a Single Pot to Operate a Speedbrake Lever

Summary

This tutorial will show you how to use just one potentiometer to control your speedbrake lever. Utilizing as an example the default B737 within Flight Simulator, you will learn how to divide the potentiometer's range of travel into zones to suit the different actions required throughout the speedbrake lever's range of travel, including stowing, arming, and scaled deployment of the speedbrake in flight.

You don't have to have a speedbrake lever to try this tutorial - try it with just a bare potentiometer if you wish.

This tutorial assumes you have read and understood the tutorial entitled "How to Wire Up Potentiometers to an Input Module".

You will need...

- a SIM-board USB Master Module
- a SIM-board USB Input Module (with potentiometer capability)
- 2 USB cables
- a potentiometer
- wire
- crimping tool, some crimps and crimp houses
- wire strippers
- latest version of the SIM-board Universal Control software
- a registered version of FSUIPC

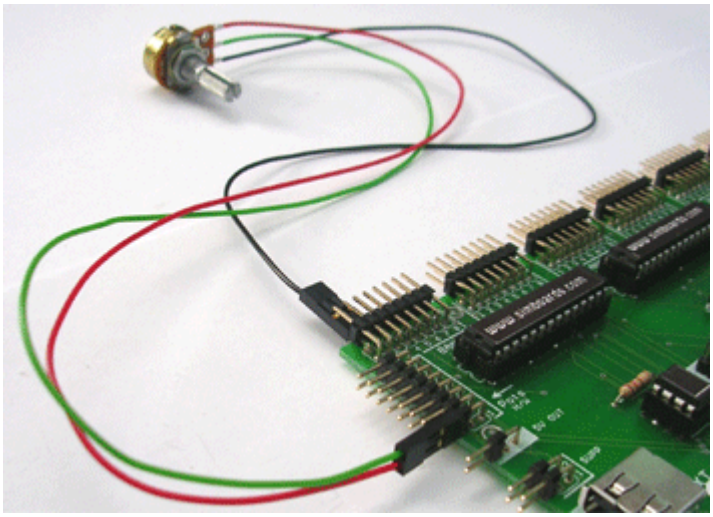
This "Show Me How..." tutorial is provided in addition to the SIM-board USB Help Documentation. It is recommended you refer to both this tutorial and the Help Documentation for your modules.

Step 1: Connect your Potentiometer

(For best results, we recommend the use of 5K or 10K potentiometers where possible.)

Follow steps 1 to 6 given in the tutorial entitled "How to Wire Up Potentiometers to an Input Module" *(click*

to open in a new window) to connect your potentiometer to the Input Module; install the drivers (if not done already) and load the SIM-board Universal Controller software.



Step 2: Test your potentiometer

To begin configuring the potentiometer, select the tab titled "(Pots 1-8)" to reveal the pot nodes. Then click to expand "Node 1" to reveal the pot configuration settings.

Then click on the "Calibration Settings" text to reveal the calibration settings properties. Adjust the window so you can see all the settings available.

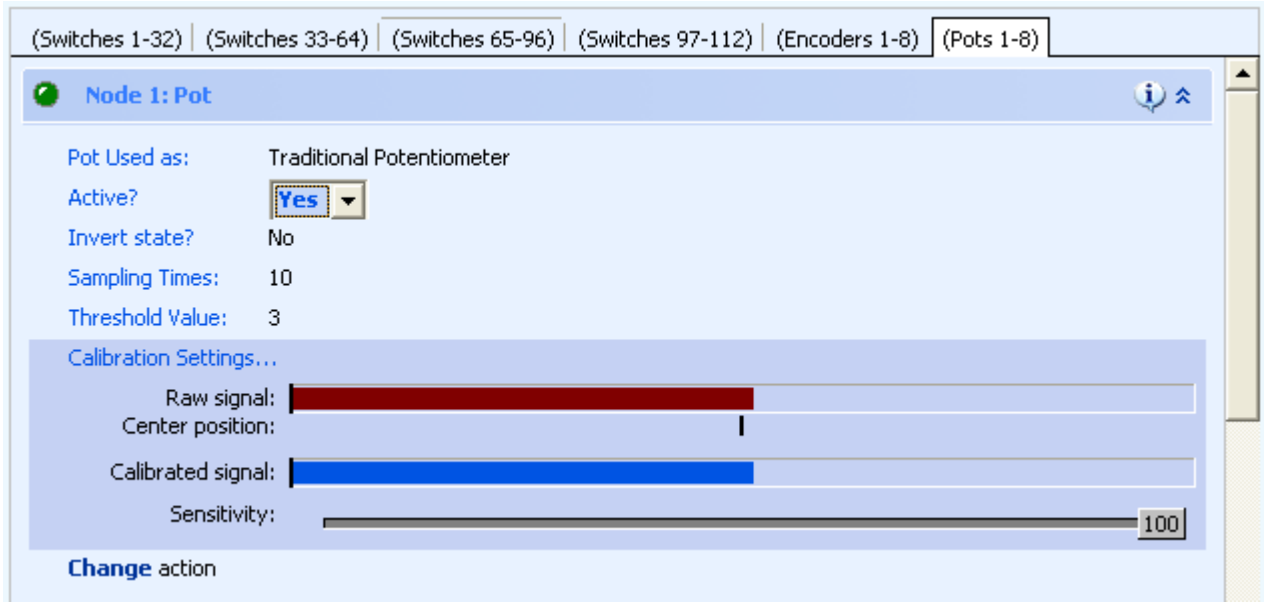
Next, change the "Active?" property to "Yes". This will activate this pot node for use. You will then see red and blue bars appear in the "Raw Signal" and "Calibrated Signal" areas. This represents the current position of the pot as detected by the SIM-board USB Input Module.

Twist your potentiometer through its range of movement, and notice the slider bars changing to reflect the new position of the pot.

If the pot bars do not appear to move, or are fixed fully red and blue, then the pot wires have been connected wrongly. In this case you should swap the H, L and W pins to a different combination until the bar is representative of the current position of the pot *(see previous tutorial)*.

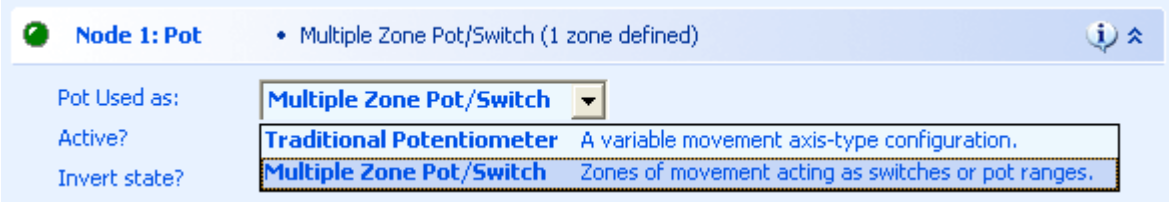
If you find that twisting your pot in a clockwise direction produces a reducing red/blue bar combination, set the "Invert state?" property of the pot node to "Yes" which will reverse the signals in software.

If this test performs correctly, you have successfully wired up your pot to the associated node.



Step 3: Set the potentiometer type

For the setting named "Pot Used As", select "Multiple Zone Pot/Switch" from the drop down list.



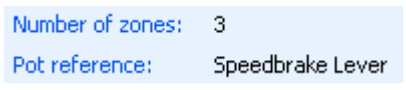
Step 4: Set up the zones required

The speedbrake on a typical B737 has essentially 3 functions that require to be controlled. Firstly, the speedbrake must be capable of being stowed away - this happens when you move the lever to the down position. Secondly, it needs to be armed for auto-deployment on landing - this happens when you move the lever out of the stowed detent and move it rearwards slightly into a light notch. Lastly, you require to be able to use the speedbrake in flight throughout its range of movement, depending on the amount of deployment you (the pilot) require.

We therefore need to define these 3 zones so that we can assign these various actions to them.

To make the zones, firstly click on the "Numer of zones" parameter and click the up arrow to increase the number of zones to 3.

You may also wish to name this potentiometer by clicking on the "Pot reference" parameter and entering a suitable name. For this example we have called this pot "Speedbrake Lever". This naming allows easy tracking of your nodes when they are later categorized *(see separate tutorial for details on node categorization)*.



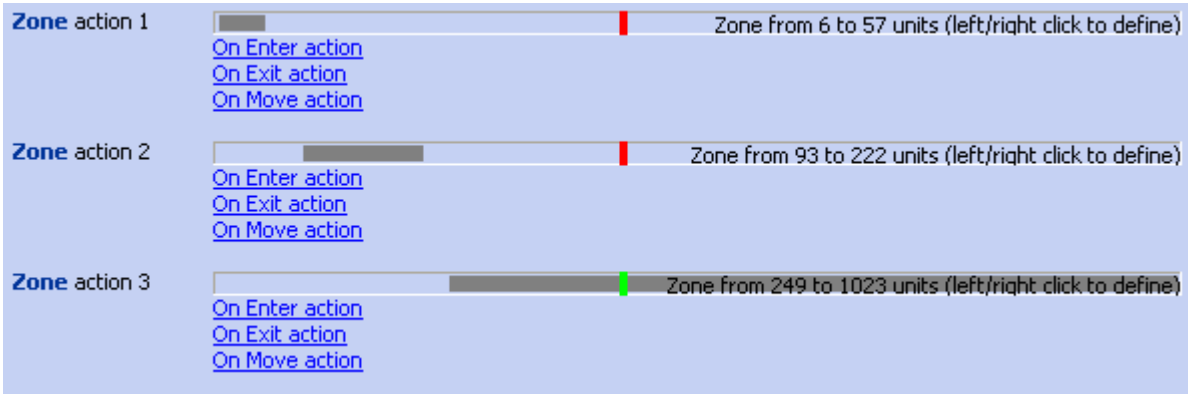
Step 5: Define the zones of movement

You will notice there are now 3 "Zone action" blocks shown, named "Zone action 1" to "Zone action 3". These zone blocks hold the configuration for each zone: where the zone starts and ends, what events to perform when the potentiometer position enters the zone from outside the zone, and what events to perform when it leaves the zone, and what events to perform when it moves within the zone.

The grey bar defines the zone itself. By default each zone is defined as being the whole potentiometer range. To change it, click on the bar with the left mouse button to define the start position (lower end) of the zone, and click with the right mouse button to define the end position (upper end) of the zone.

The example shows Zone 1 defined between 6 units and 57 units of potentiometer travel. This zone will represent the position of the pot when the lever is in the stowed position.
Zone 2 is defined as 93 to 222 units and represents the position of the pot when the lever is in the armed position.
Zone 3 is defined as a much larger zone (249 to 1023 units) and represents the position of the pot when the lever is moved outside of the armed position and into the free movement area.

Notice the small red and green vertical bar within each zone. This represents the current position of the potentiometer. If you move the potentiometer shaft now, you will see this position change within each zone. A green bar means the potentiometer is within the defined zone; a red bar means it is outside of the zone. Use these position bars to accurately define the range of movement you want to have for each zone.



Step 6: Set the software actions to be performed

Now that the zones are defined, we must tell the SIM-board Universal Controller what actions to perform when the potentiometer moves into, and within, these zones.

You will notice that each zone can have actions associated with it for when the potentiometer moves into the zone (On Enter); when the potentiometer moves out of the zone (On Exit); and can even perform actions when the potentiometer is moved within the defined zone (just like a normal, scaled potentiometer action) through the On Move action parameter.

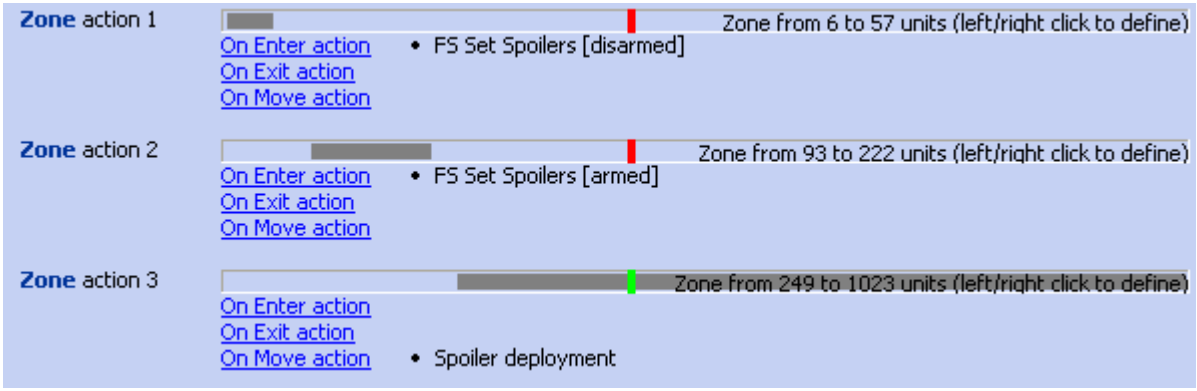
For this speedbrake lever example, we will be using the On Enter events of the first 2 zones, and the On Move event of the third zone.

Begin by clicking on the "On Enter action" parameter of Zone 1, and selecting "FS Set Spoilers [disarmed]" from the "FS : Flight Controls" subsection.

Next, click on the "On Enter action" parameter of Zone 2, and select the "FS Set Spoilers [armed]" action from the "FS : Flight Controls" subsection.

Finally, click on the "On Move action" parameter of Zone 3, and select the "Spoiler deployment" action from the "FS : Flight Controls" subsection.

The image below shows the correct setup.



Step 7: Load Flight Simulator

Load Flight Simulator on your PC, or if you are using WideFS over a network, ensure you have Flight Simulator and the appropriate applications of WideFS running and connected properly.

Once loaded, select the default B737 aircraft model as the active aircraft. If the thrust lever quadrant is not shown, press Shift-4 to bring it up.

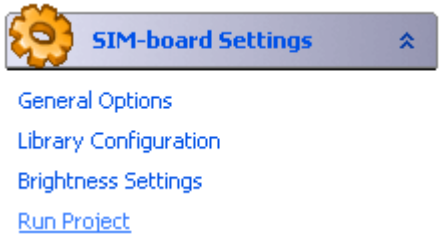
Step 8: Ensure you are in flight

Important! Due to the way in which Flight Simulator interprets speedbrake lever movement on the ground, you will be unable to properly test your assignments unless you are airbourne. Either perform a take off and engage the autopilot at an appropriate point, or use the slew function in Flight Simulator to get yourself into the air (press Y, then F4 to go up, then F2 to stop, then Y again to come out of slew mode, then set the autopilot and establish smooth flight).

Ensure that Flight Simulator is not paused before continuing.

Step 9: Run your test project

From the left hand side of the SIM-board Universal Controller window, select the "Run Project" option. Your simple project will begin to run, meaning that it is now active. If there is a problem with the project, or an error occurs, the details will be shown in the message area at the bottom of the window.



To test your project, minimize the SIM-board Universal Controller window and twist your pot. As you do so you should see the speedbrake lever move between its detents, and once out of the armed position, through its range of movement for deployment in the air. If you bring up the SIM-board Universal Controller window again and move your pot, you will be able to see the mapping between pot position, active zone and FS speedbrake lever position.

Once you have checked the operation, collapse the "Node 1 : Pot" by clicking on it. This will speed things up as the program no longer has to graphically draw the position of the bars.

Congratulations! You have now made your speedbrake lever interface using just a single potentiometer!

To stop your project, click on "Stop Project".

If you wish to verify the movements, you can use the "Shift-/" keyboard shortcut within FS to toggle the lever between

stowed and armed positions, and use the slash (/) alone to toggle between fully down (stowed) and fully up (deployed). Note the positions of the lever when you do this, and now run your project again and verify the same positions are achieved at the appropriate points when your potentiometer is moved.

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(How To Use a Single Pot to Operate a Flap Lever)