# A Detailed Guide to Expert Simulation in MaxPlusII

For CprE 483/484

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Stepping Motor Controller

- This presentation uses a stepping motor controller as the project for the simulation.

- The stepping motor controller has four outputs (ph[0..3]), only one of which is active at a time.

- The motor outputs are updated by the clock.

- The circuit features an asynchronous reset, as well as a synchronous reset1, which is used to load the value of Bval (number of steps to take) into the machine.

- The machine can go in forward and reverse (fr), but will only take the number of steps specified by Bval. After that, it will stay stopped, until reset or reset1 is triggered.
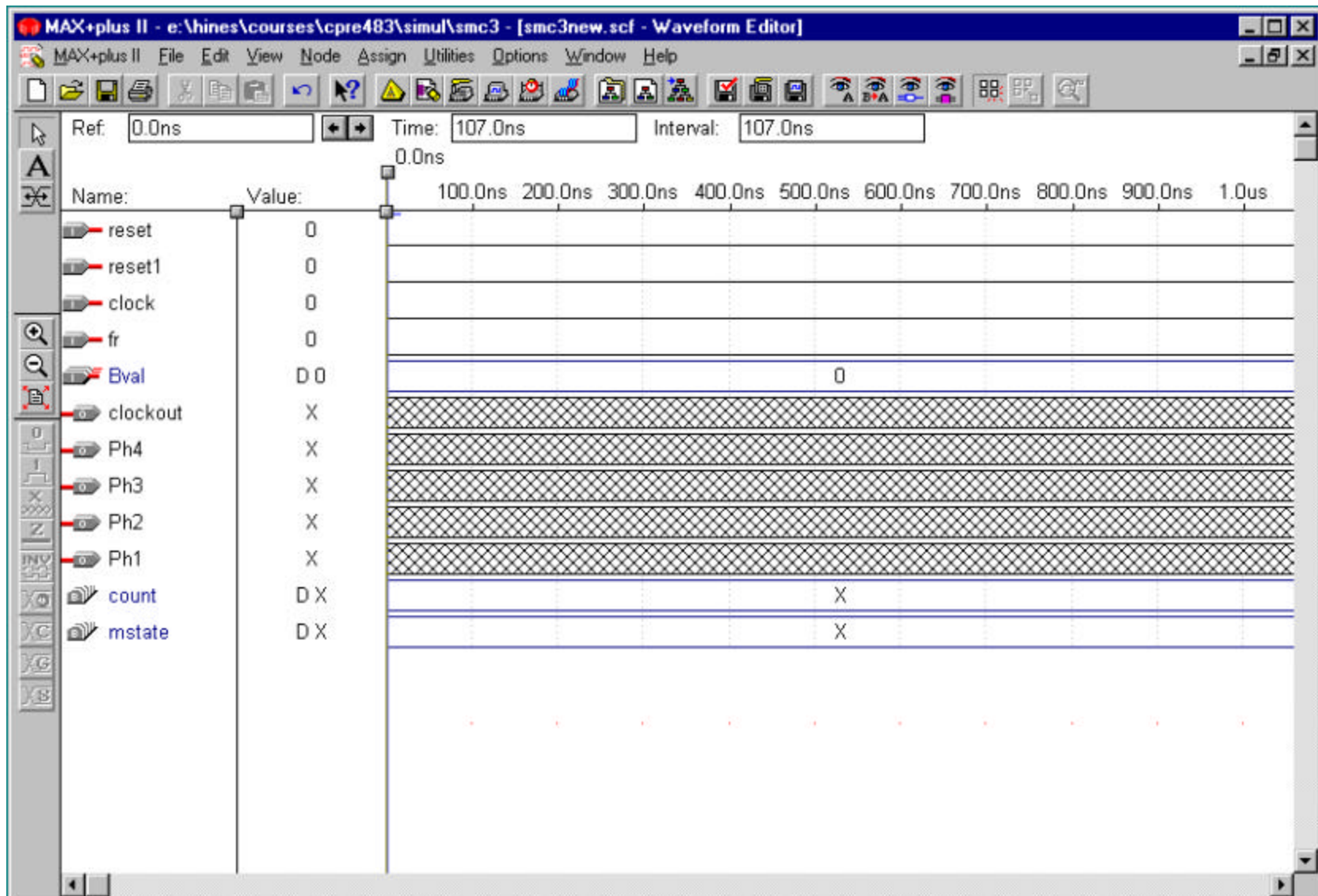
- This is the initial diagram, after we have added all of the nodes to it using the menu item "Node->Enter Nodes from SNF".
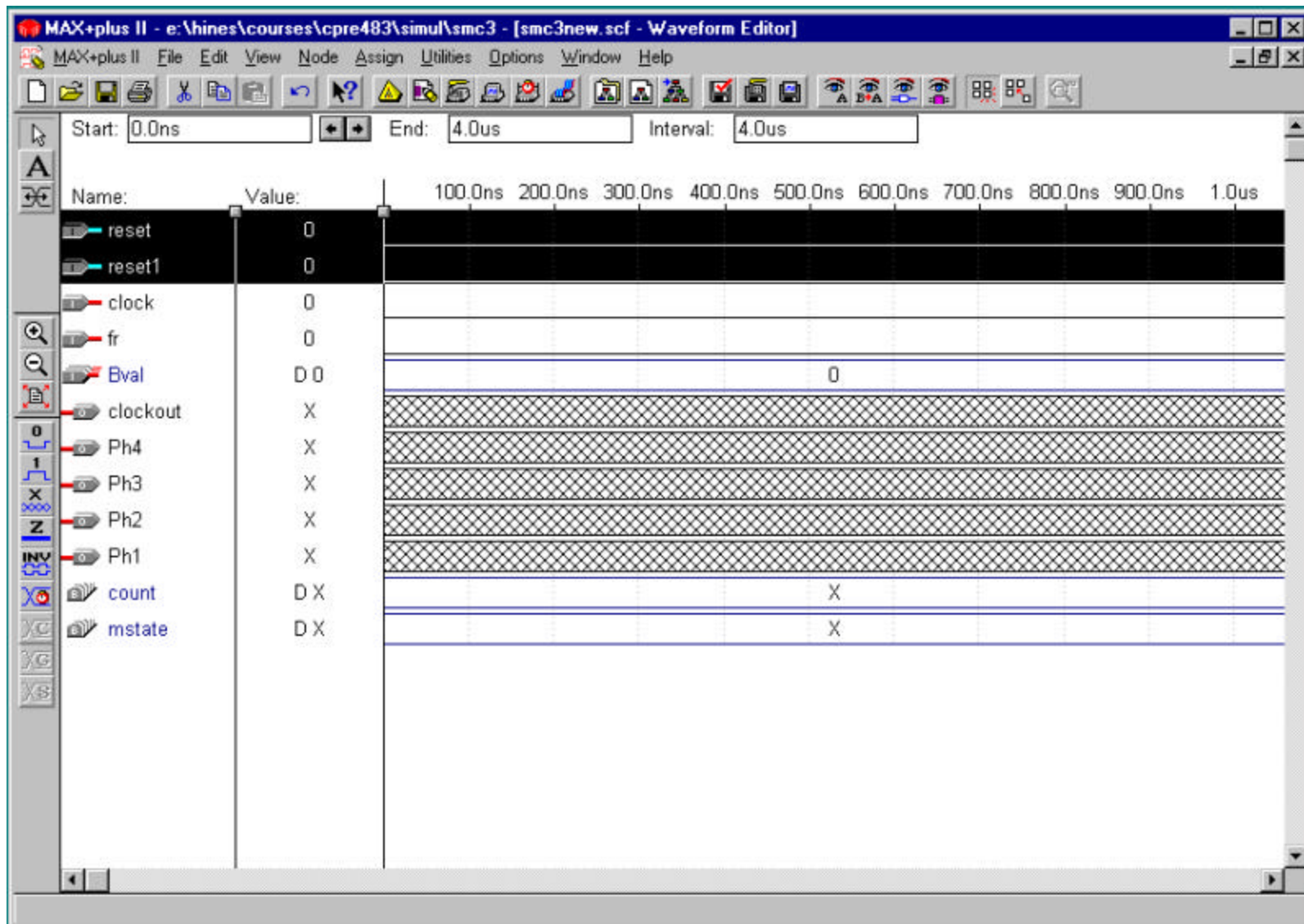
- Now we select both of the reset inputs by clicking and dragging the mouse over the words "reset" and "reset1" in the diagram.
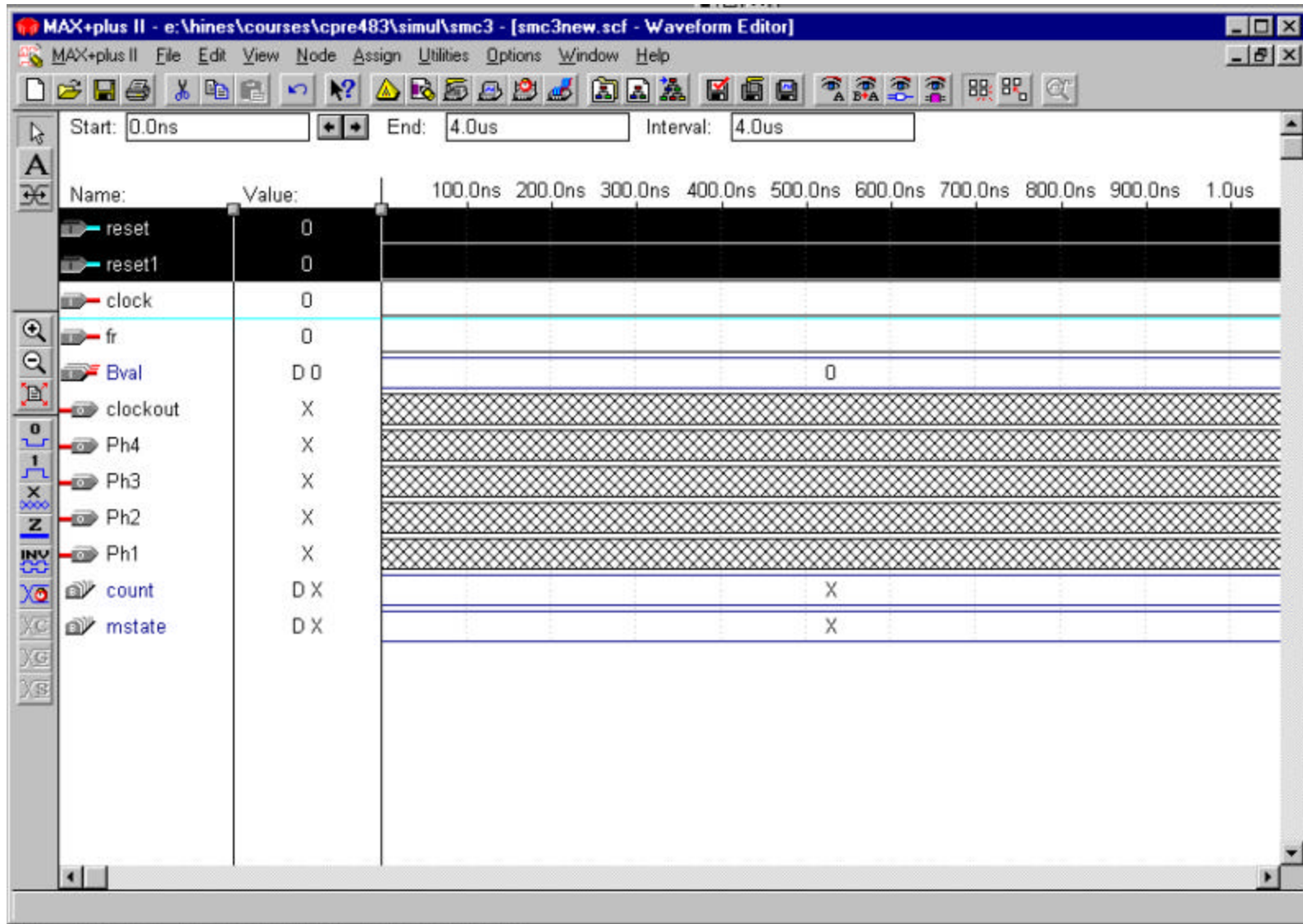
- Next, click one of the "I" symbols in the Name box for the elements that we have selected. We then drag the mouse to the new place where we want those signals to be. You can see where they are going by watching the blue line.
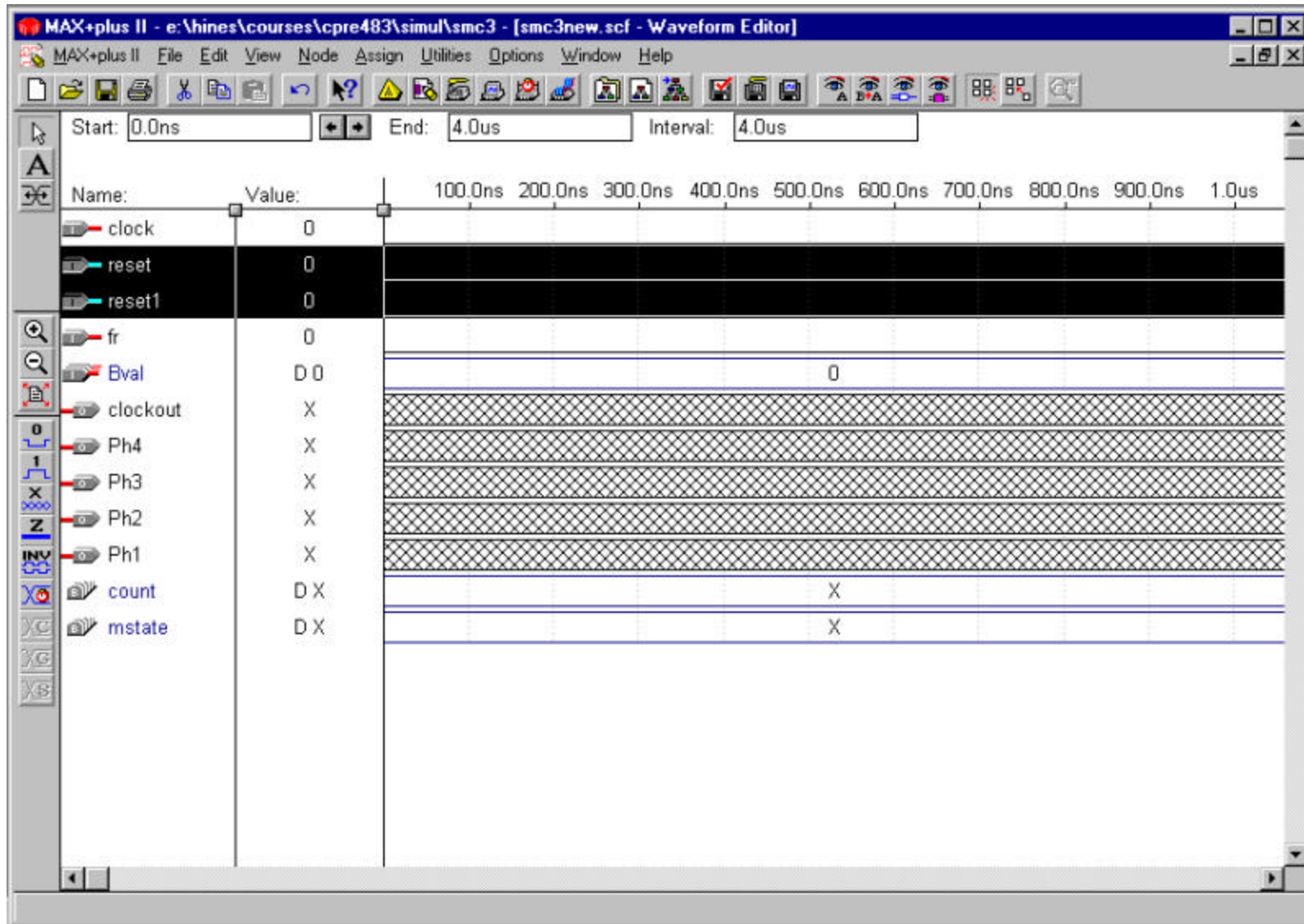
- Then release the mouse button, and the selected signals will be moved into place in the diagram. Here, we have put "reset" and "reset1" below the "clock" signal.
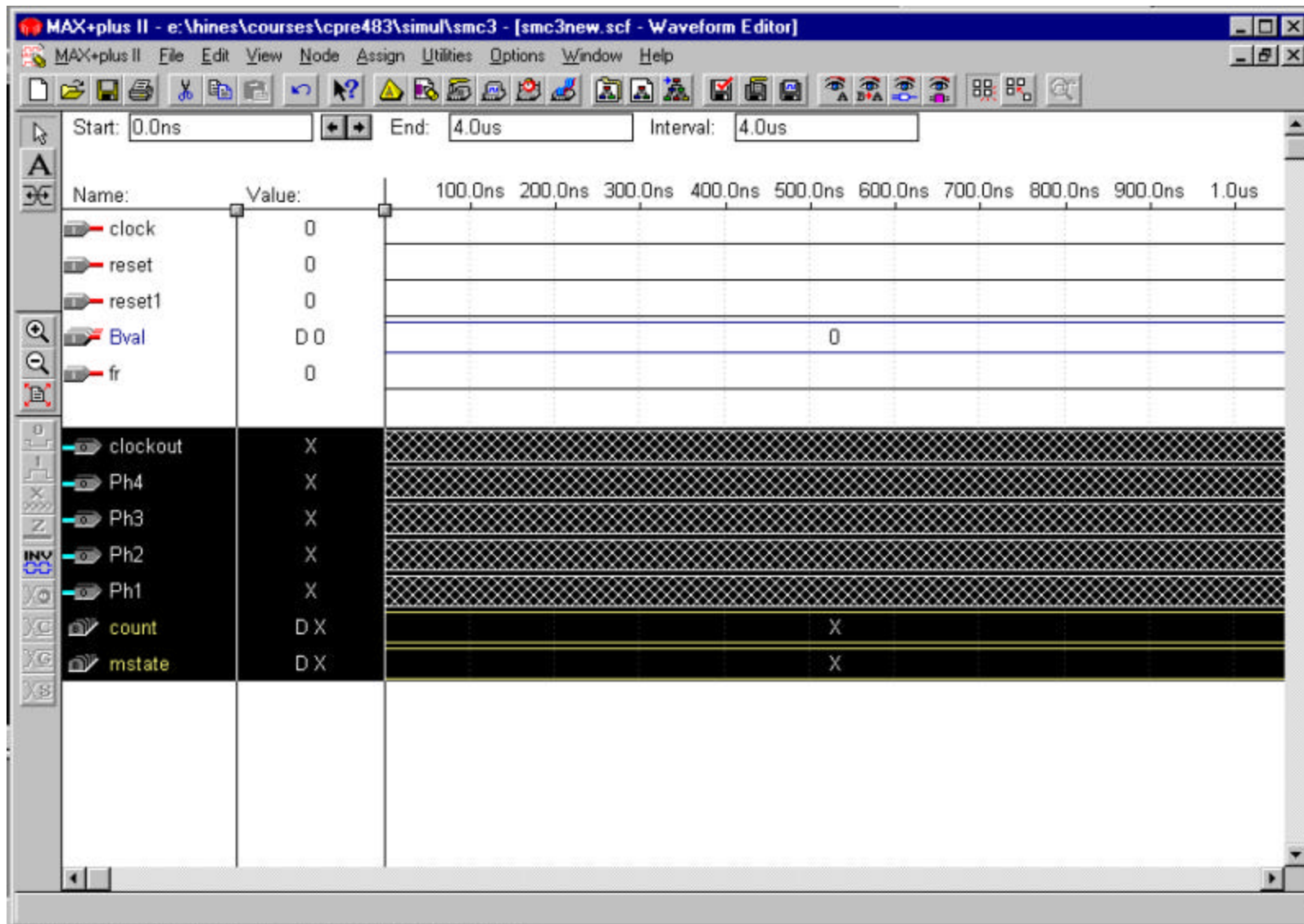
- In this picture, I have adjusted the order on some of the inputs. I have also moved all of the outputs down a blank space in the diagram to make it easier to read.
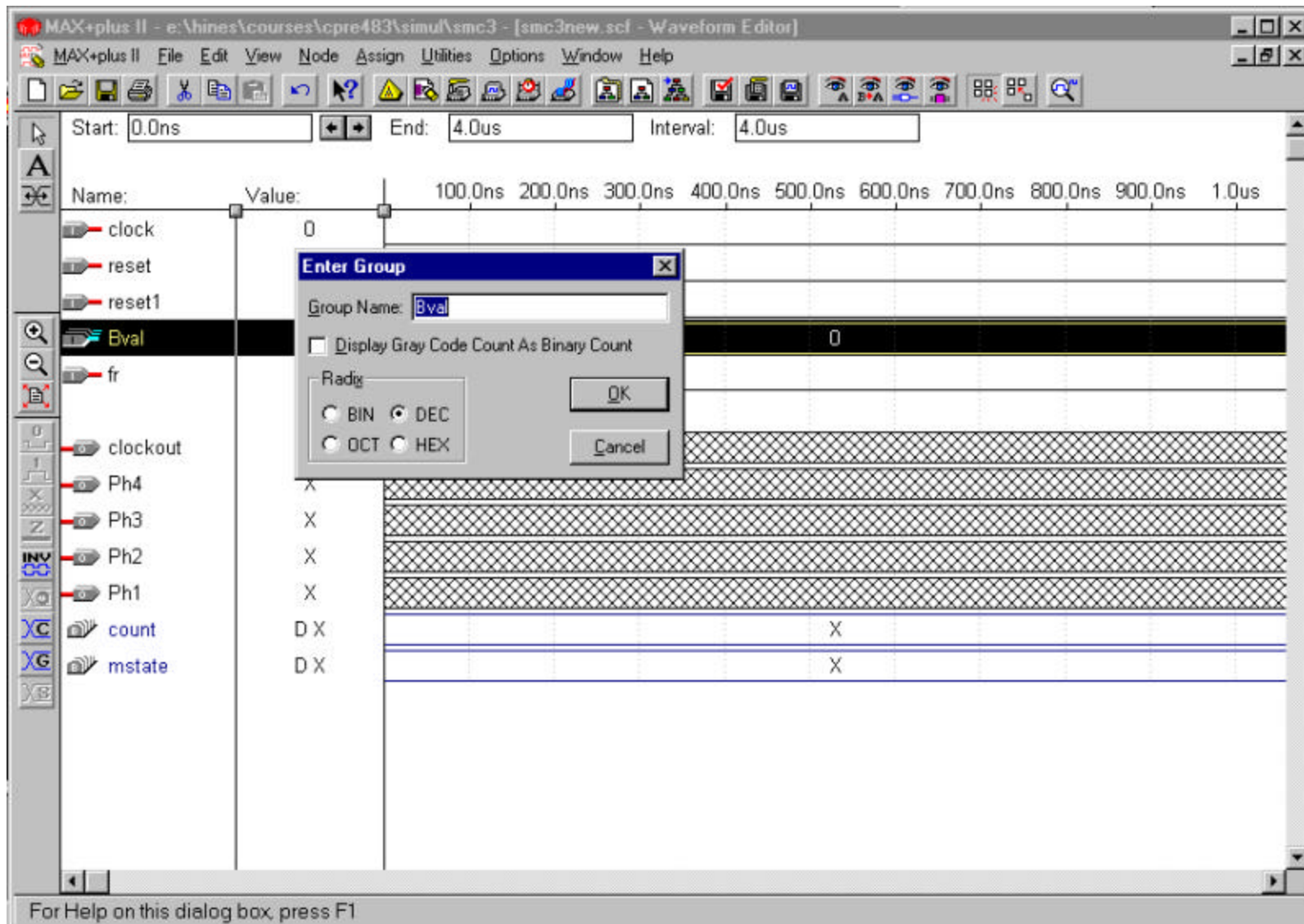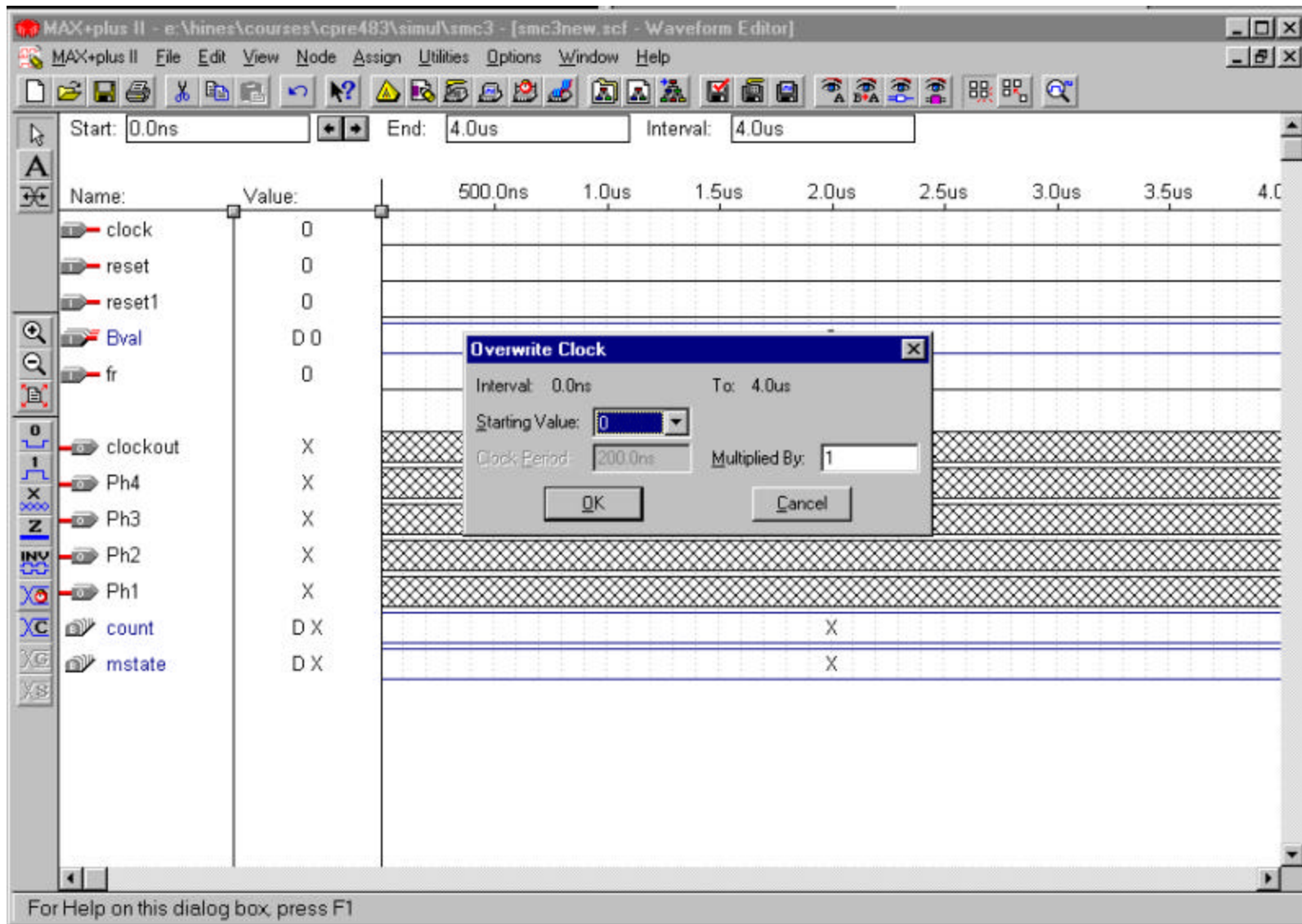
- Next, double-click on the value column for "Bval". From here, we can choose which format to display this signal in. Sometimes it is easier to read decimal than hex or binary.
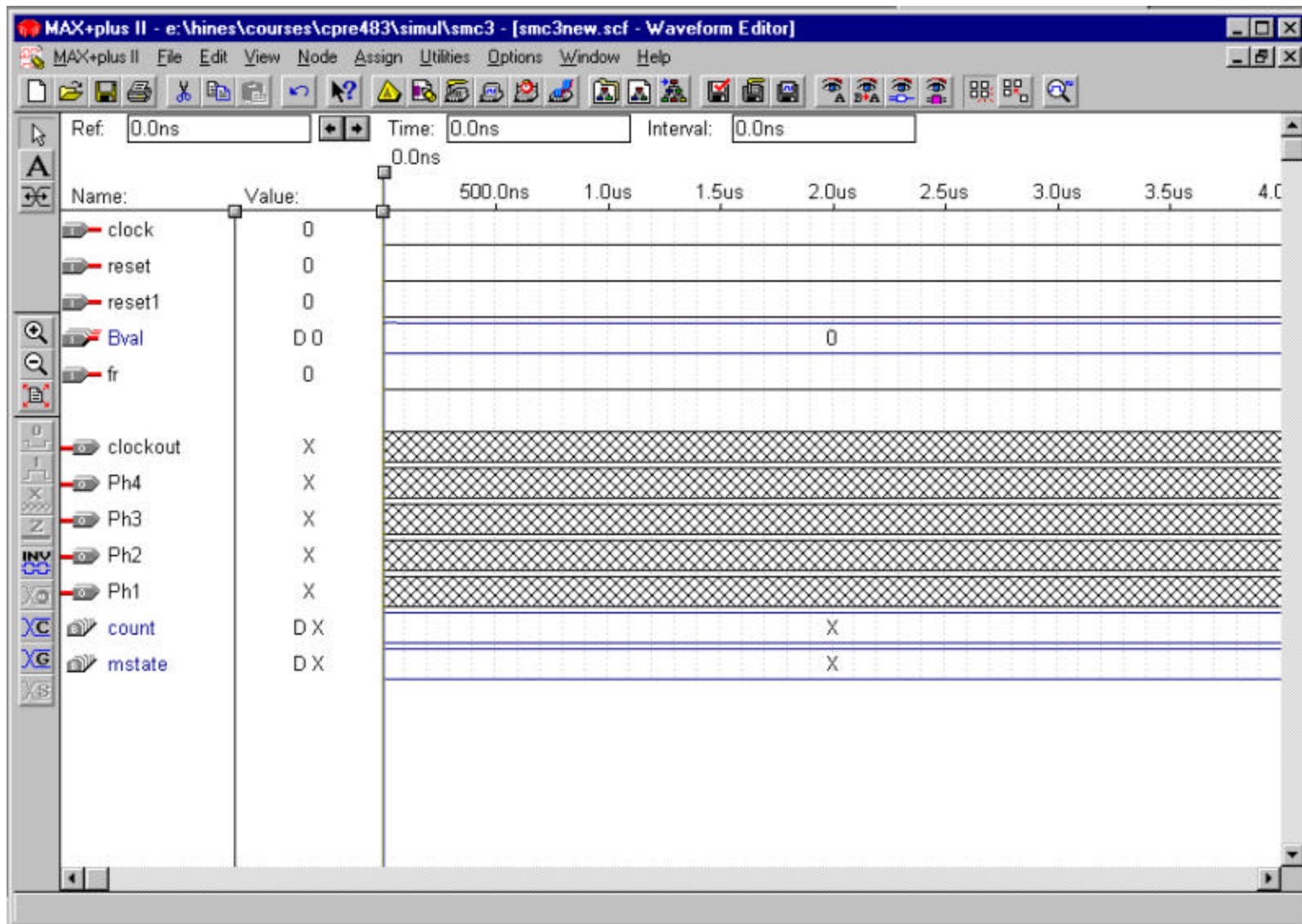
- Choose "DEC" from the box to show "Bval" in a decimal format. Then click OK.
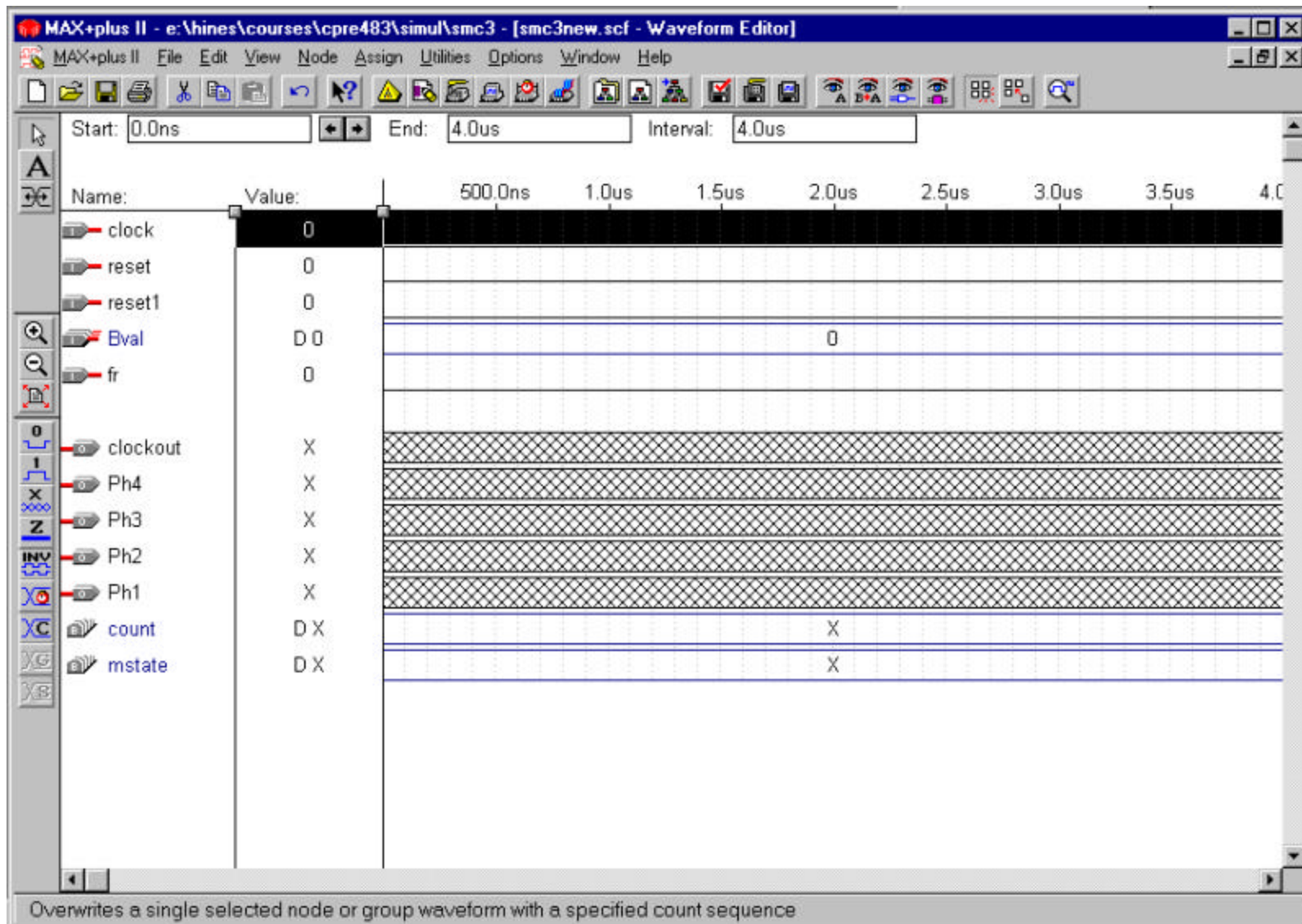
- Now click on the value column of "clock". You will see that it highlights the entire signal display for "clock".

- Then click on the clock button (red alarm clock), on the left side of MaxPlusII. This is typically used to generate square wave signals. The "Multiplied by" value is the number of cycles the signal will stay high or low before switching.
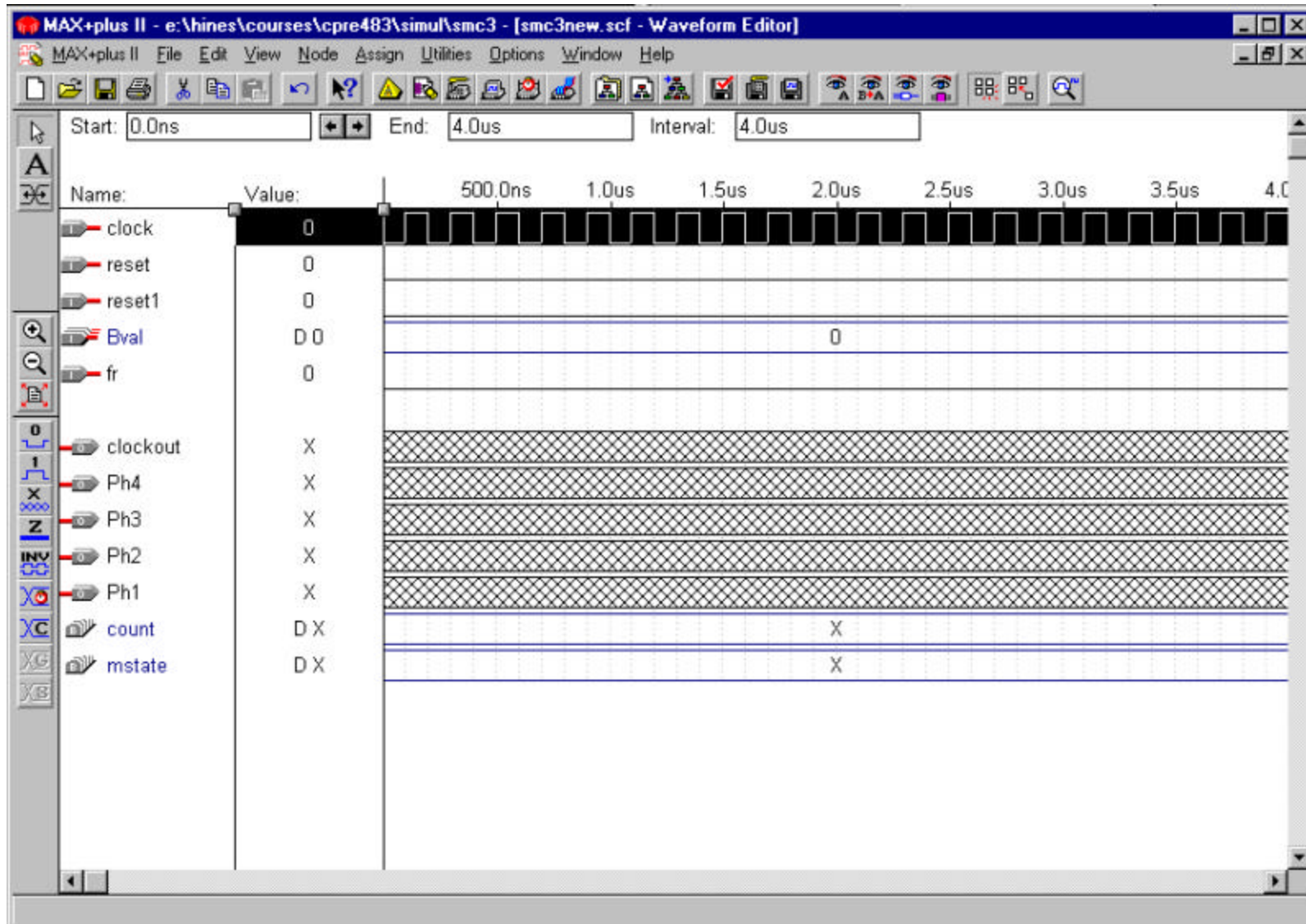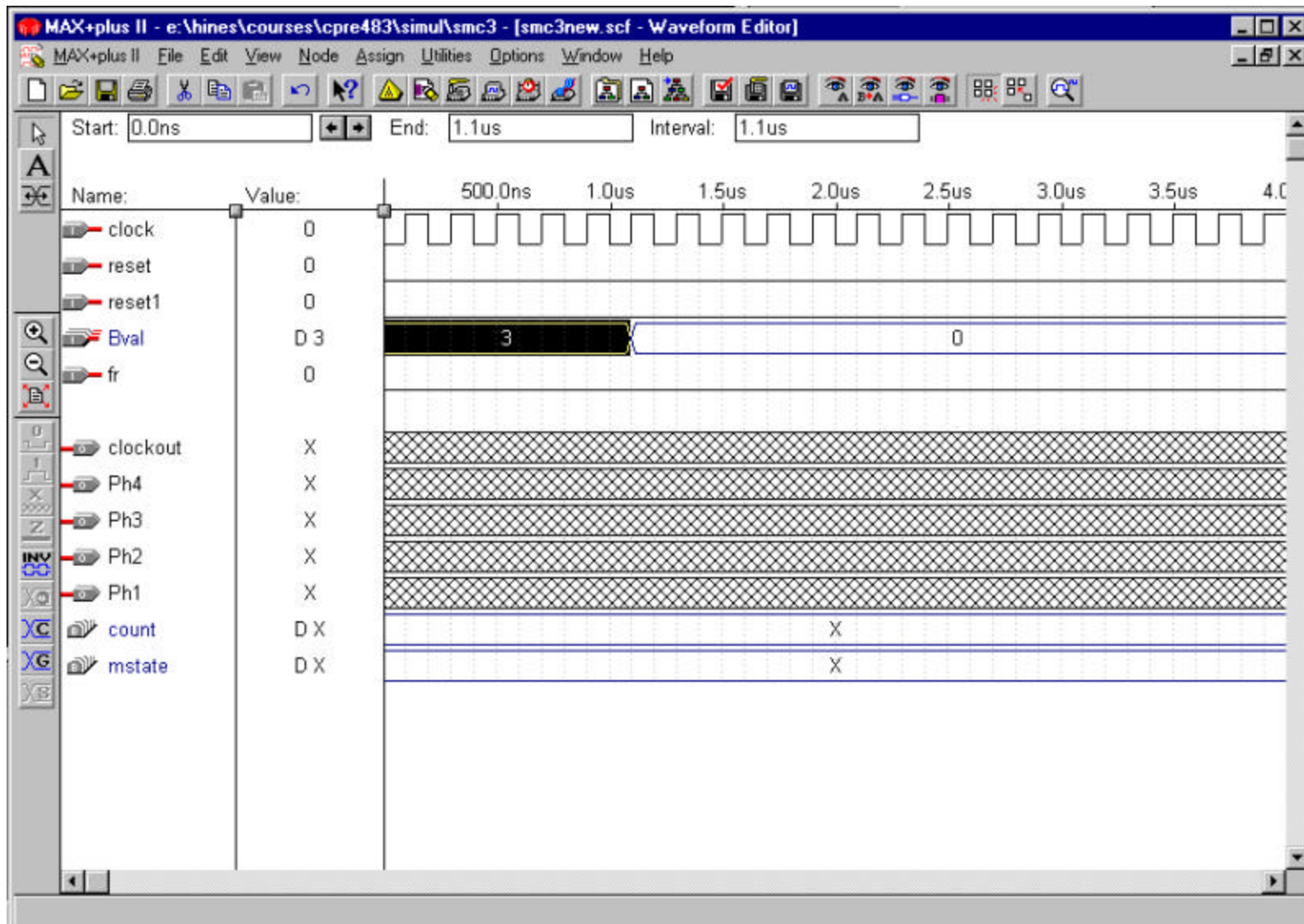
- Select '1' for the "Multiplied by" choice and then click OK. The resulting square waveform is shown above.
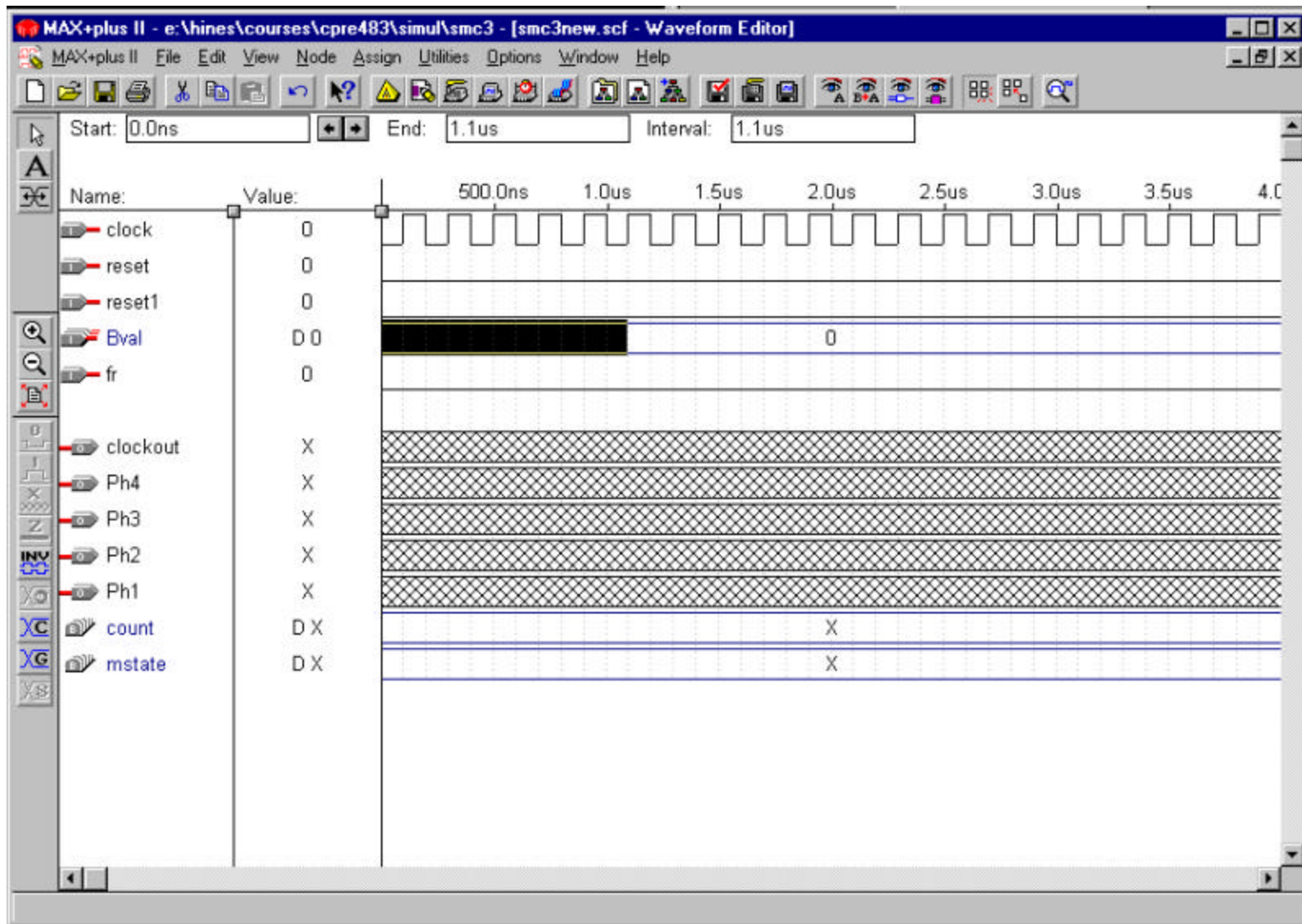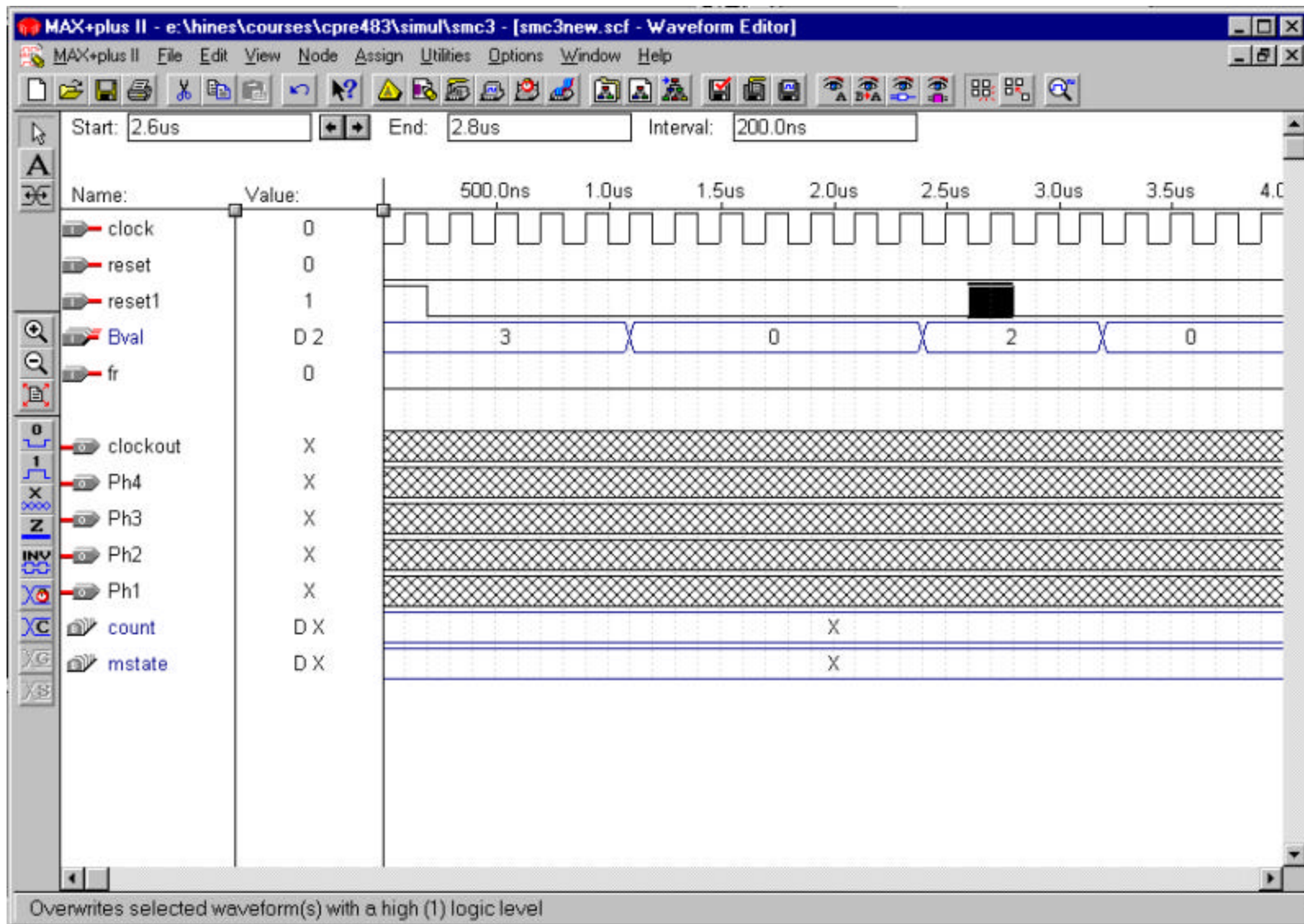
- Next, click and drag for a few clock cycles on the "Bval" input signal.
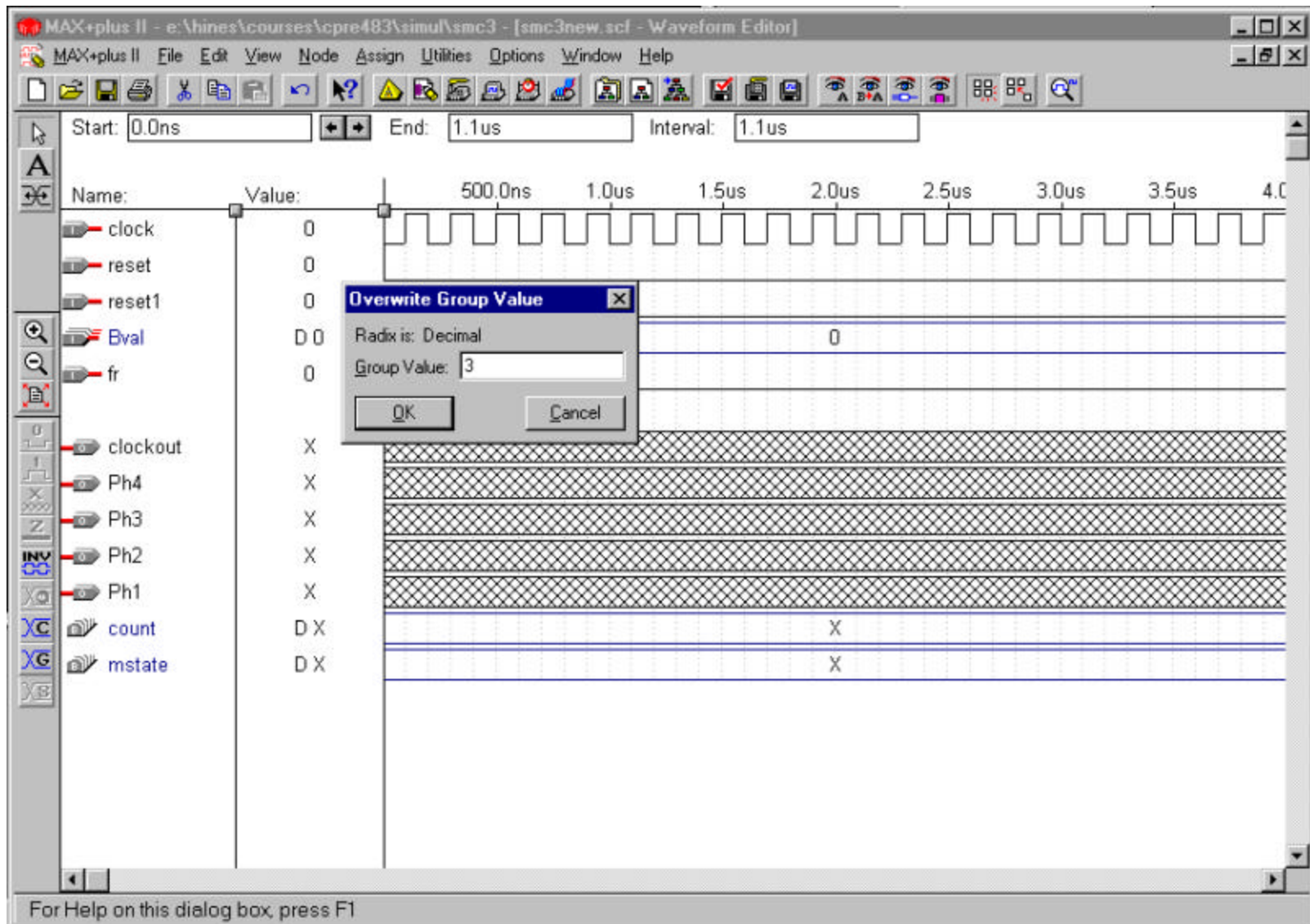
- Click the "G" button on the left side of MaxPlusII. This is used to edit group values. Type in 3 and click OK to change the decimal value of the "Bval" lines to 3 ("0011" in binary).

- Here is a picture of the result of changing the group value to 3.

- Next adjust a few more group values for "Bval", and also set "reset1" to 1 in a few places by selecting a group of time inputs and then clicking the "1" button on the left side of MaxPlusII.
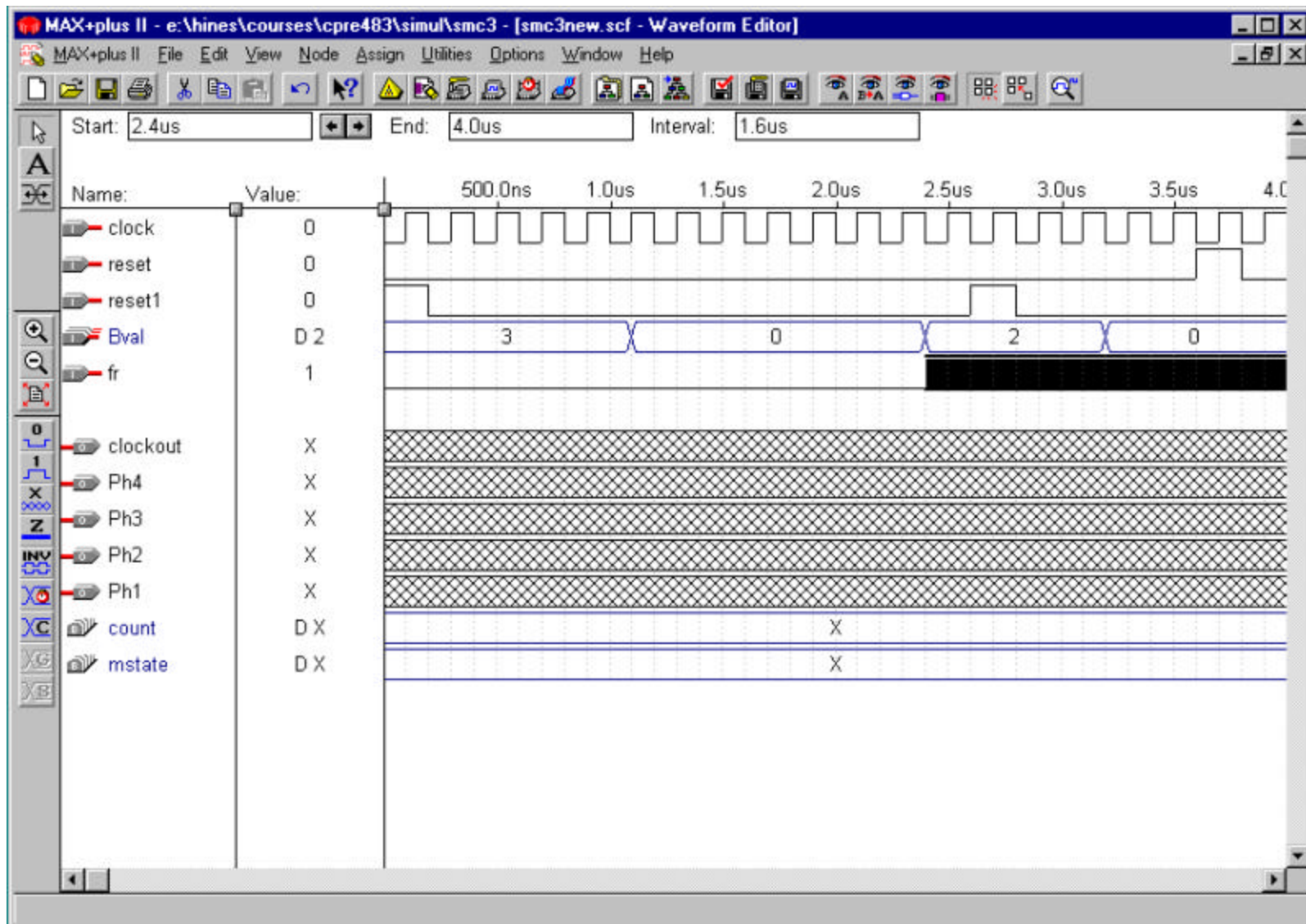
- Next select the last major part of "fr" (forward/reverse) and change its value to 1 so that we can test to make sure that the stepping motor controller works in forward and reverse.
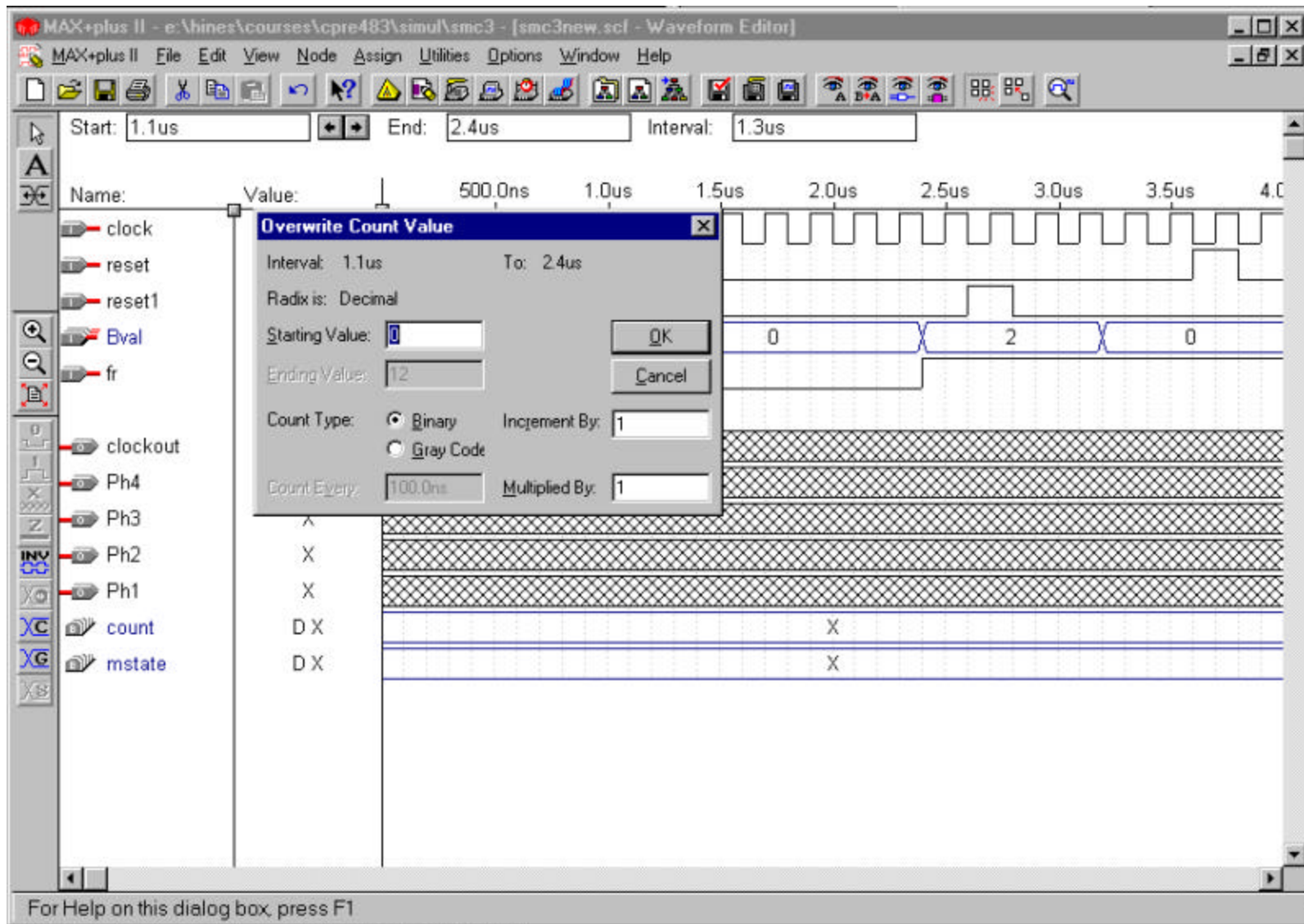
- Now select a portion (several spaces worth) of the "Bval" signal that has not had a value set yet. Click on the "C" button to the left. This is the count button that is used to make a signal change value in a periodic fashion.
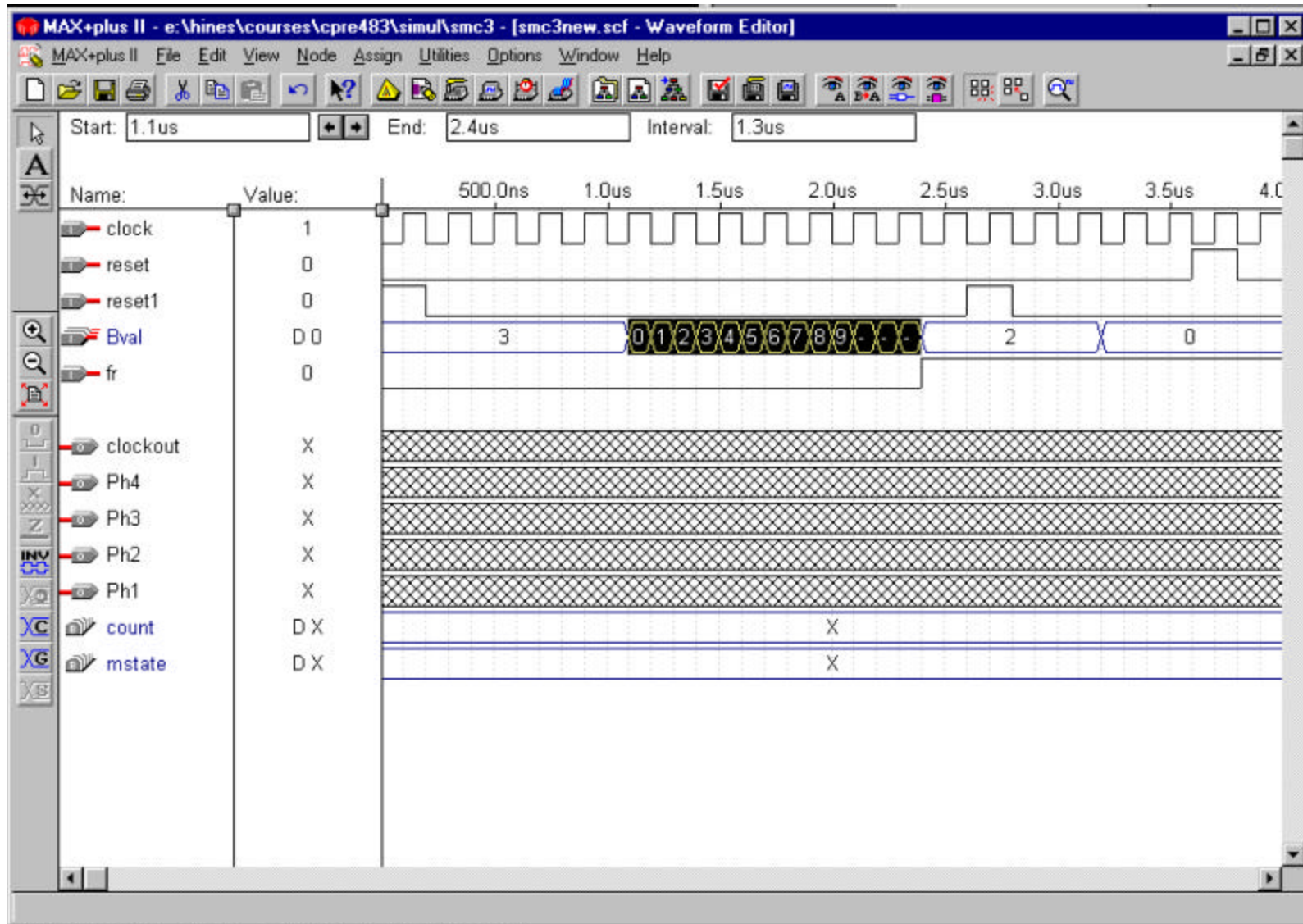
- The count value works very similar to the clock button. You can set a starting value of any number, an increment amount, as well as a multiplier (how many cycles it goes before changing). Here is starting at 0, incrementing by 1, and a multiplier of 1.
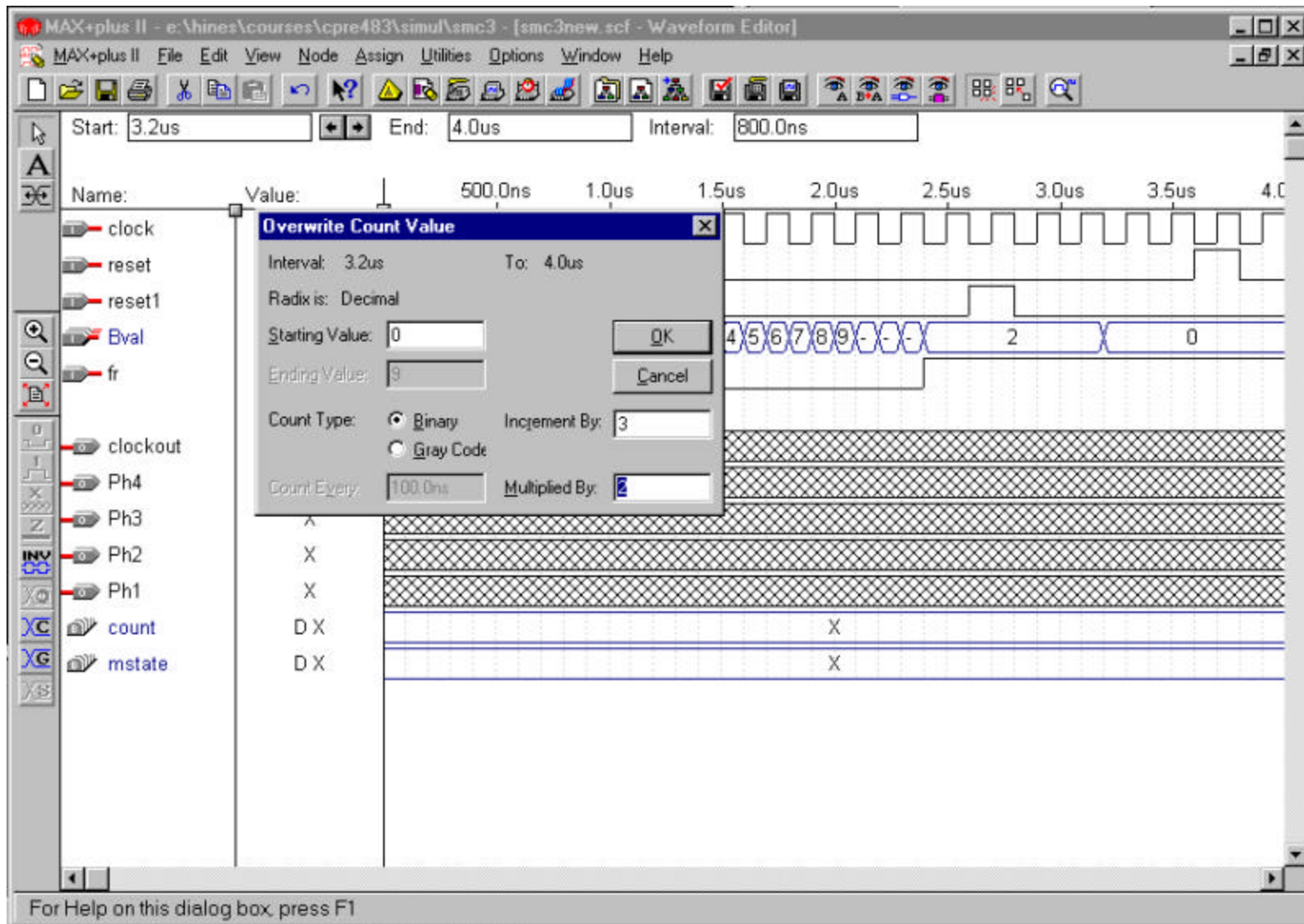
- Here I am changing the count value to increment by 3 with a multiplier of 2 for the last portion of the "Bval" signal.
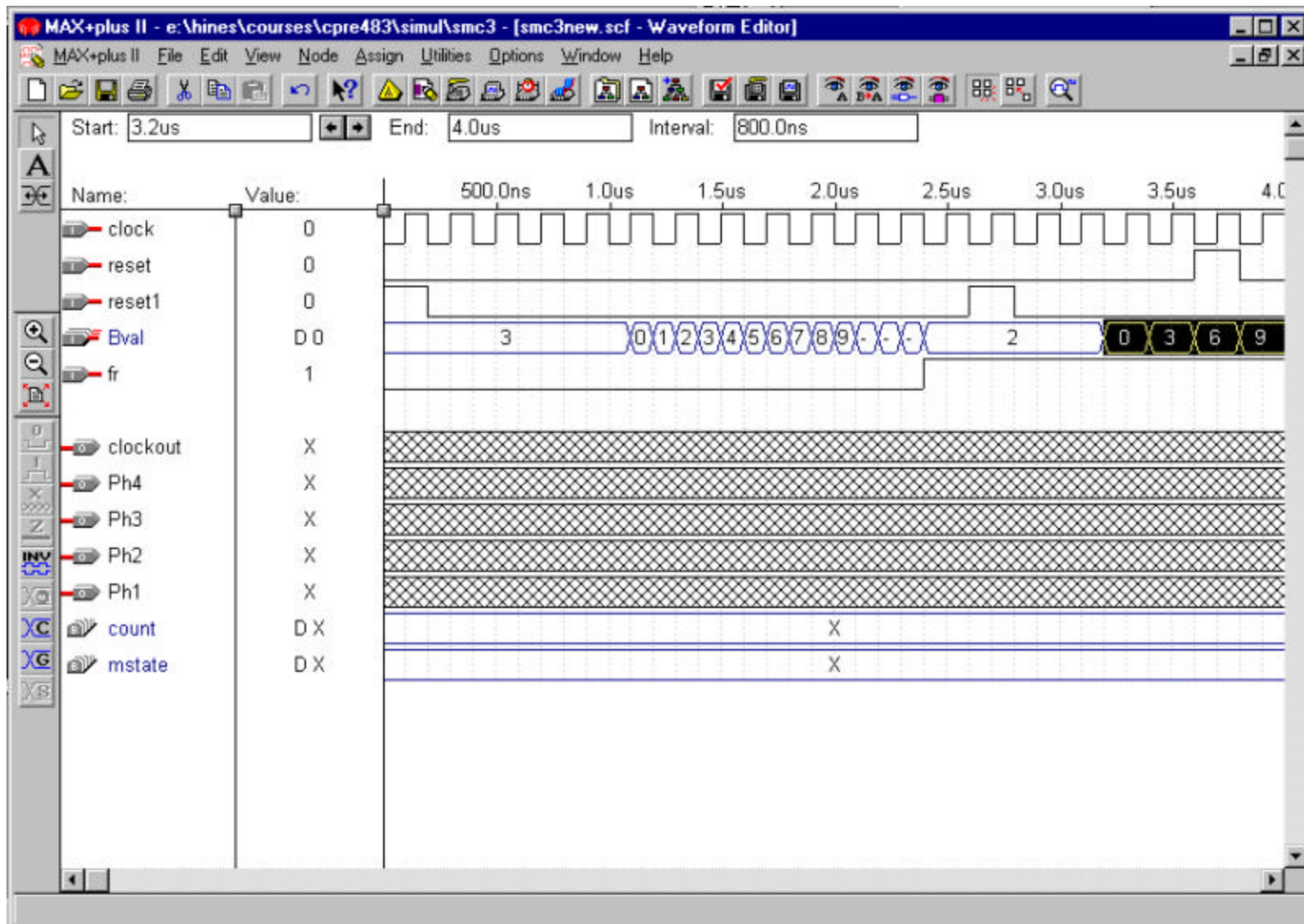
- After clicking OK, this is the resulting waveform that I get. Now that I have set up the situations that I want to test, I will actually perform the simulation (save and simulate or <ctrl> - <shift> - l).
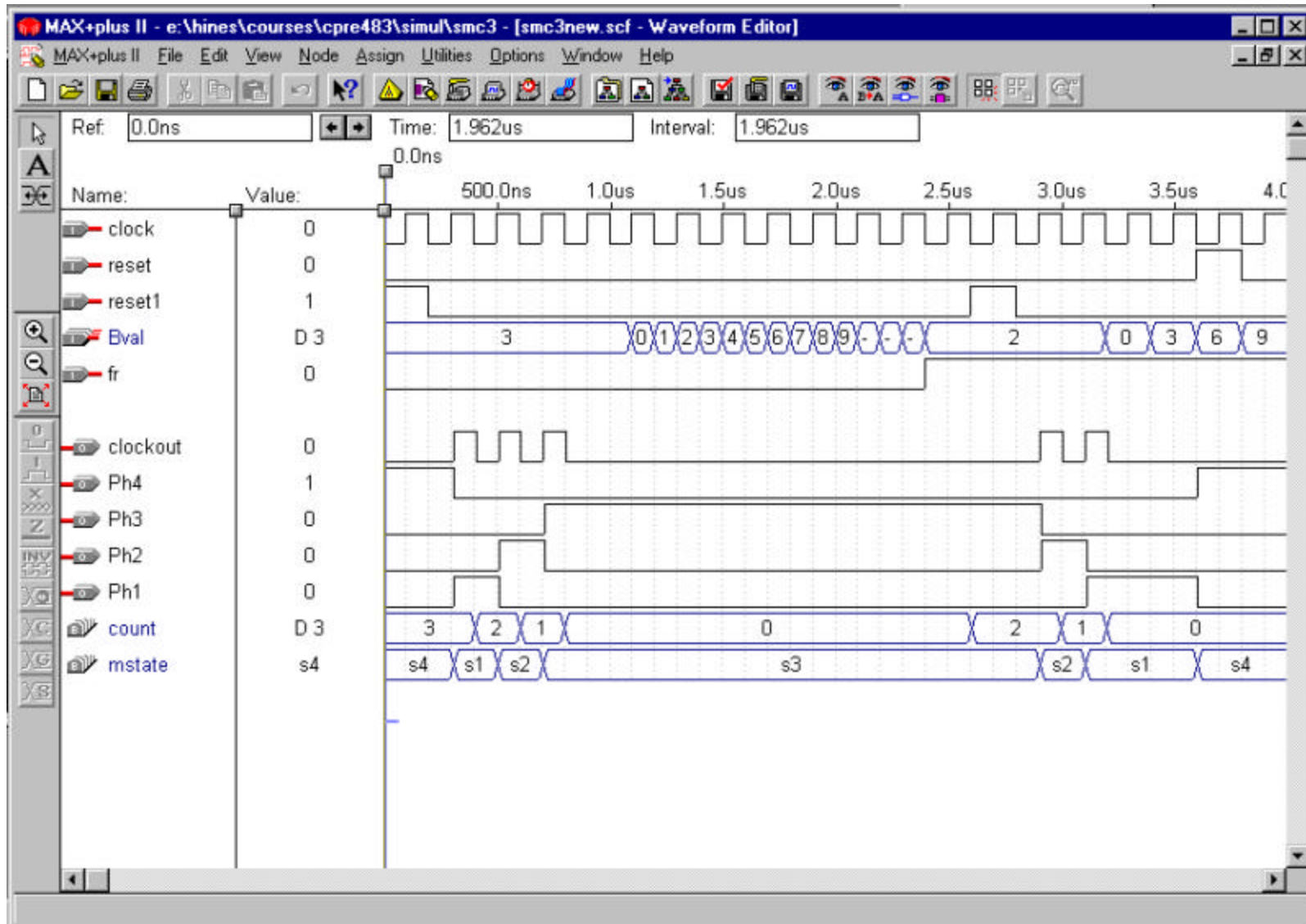
- Here is the resulting waveform, showing the expected proper results. Notice that "mstate" actually shows the text name of the states that I have declared. Buried ("B") nodes are sometimes invaluable when debugging a circuit.