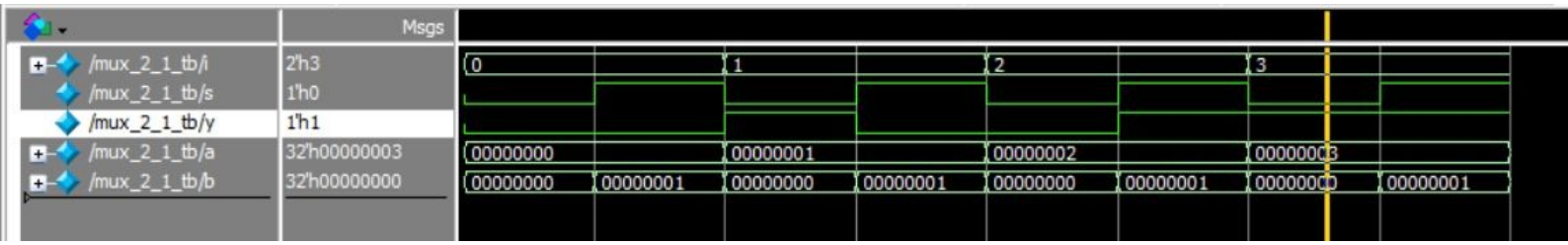
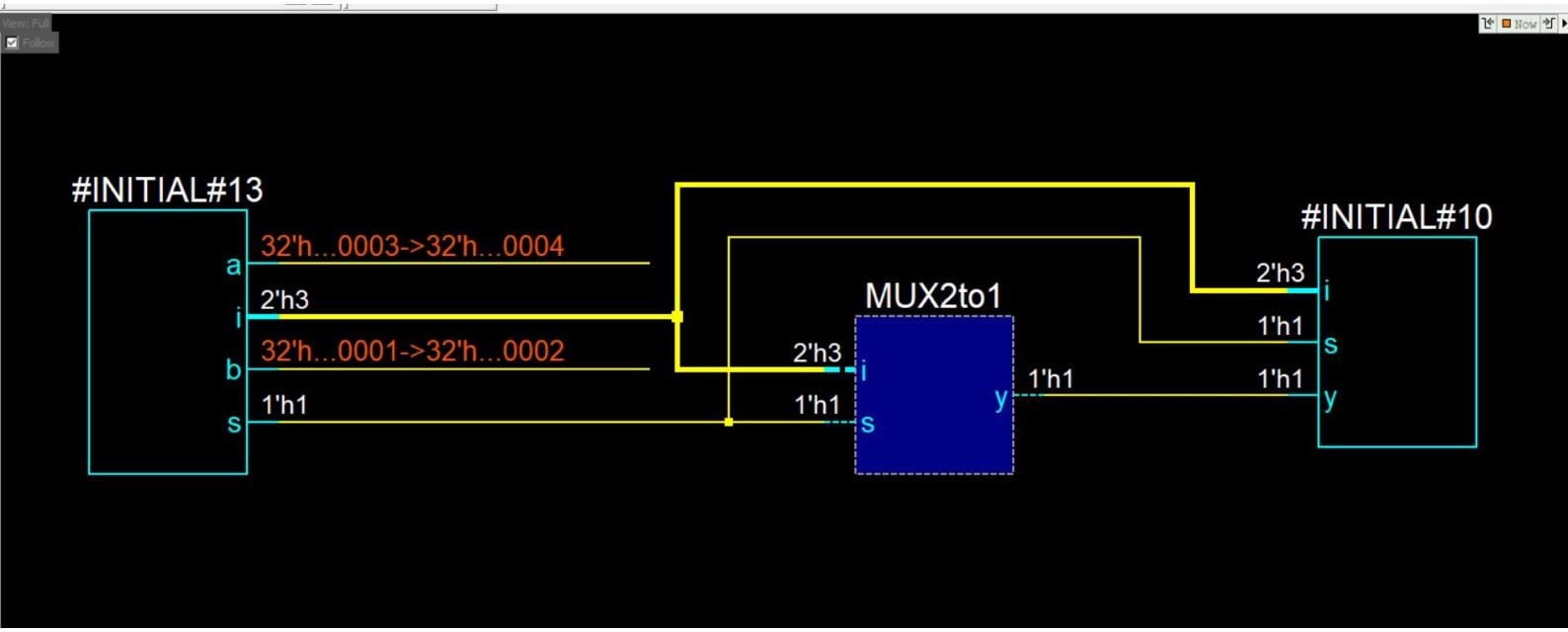
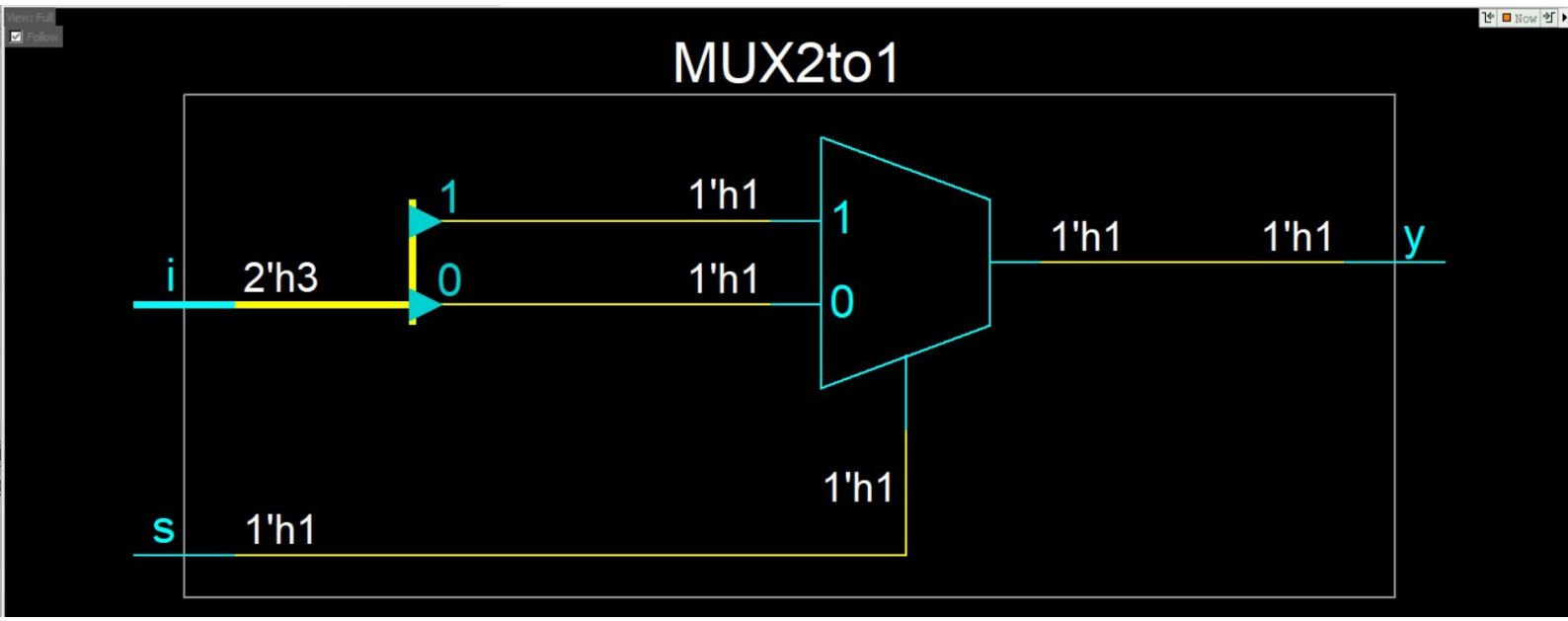
```
Ln#
1  module mux_2_1(
2            input [1:0]i,
3            input s,
4            output y);
5            assign y = s?i[1]:i[0];
6  endmodule
```

```
Ln#
 1  module mux_2_1_tb();
 2
 3          reg [1:0]i;
 4          reg s;
 5          wire y;
 6          integer a,b;
 7
 8          mux_2_1 MUX2to1(i,s,y);
 9
10          initial begin
11          $monitor("i=%0b,s=%0b,y=%0b",i,s,y);
12          end
13          initial begin
14          for(a=0;a<4;a=a+1)begin
15                  i=a;
16                  for(b=0;b<2;b=b+1)begin
17                          s=b;
18                          #5;
19                  end
20          end
21          end
22  endmodule
23
```

```
VSIM 8> run -all
#  i=0,s=0,y=0
#  i=0,s=1,y=0
#  i=1,s=0,y=1
#  i=1,s=1,y=0
#  i=10,s=0,y=0
#  i=10,s=1,y=1
#  i=11,s=0,y=1
#  i=11,s=1,y=1
```


Msgs
/mux_2_1_tb/i
/mux_2_1_tb/s
/mux_2_1_tb/y
/mux_2_1_tb/a
/mux_2_1_tb/b
2'h3
1'h0
1'h1
32'h00000003
32'h00000000
0
1
2
3
00000000
00000001
00000002
00000003
00000000
00000001
00000000
00000001
00000000
00000001
00000000
00000001

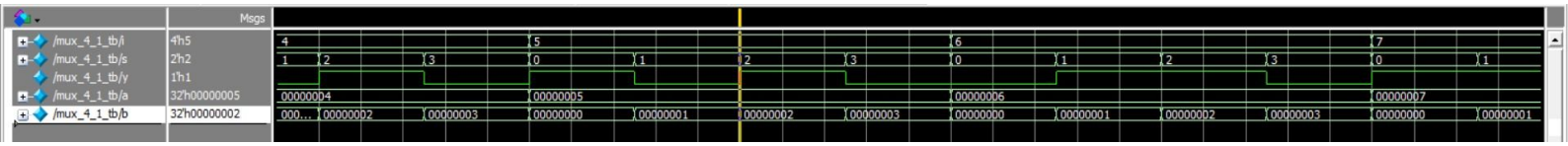

#INITIAL#13
a
32'h...0003->32'h...0004
i
2'h3
b
32'h...0001->32'h...0002
s
1'h1
MUX2to1
2'h3
i
1'h1
s
y
1'h1
#INITIAL#10
2'h3
i
1'h1
s
1'h1
y

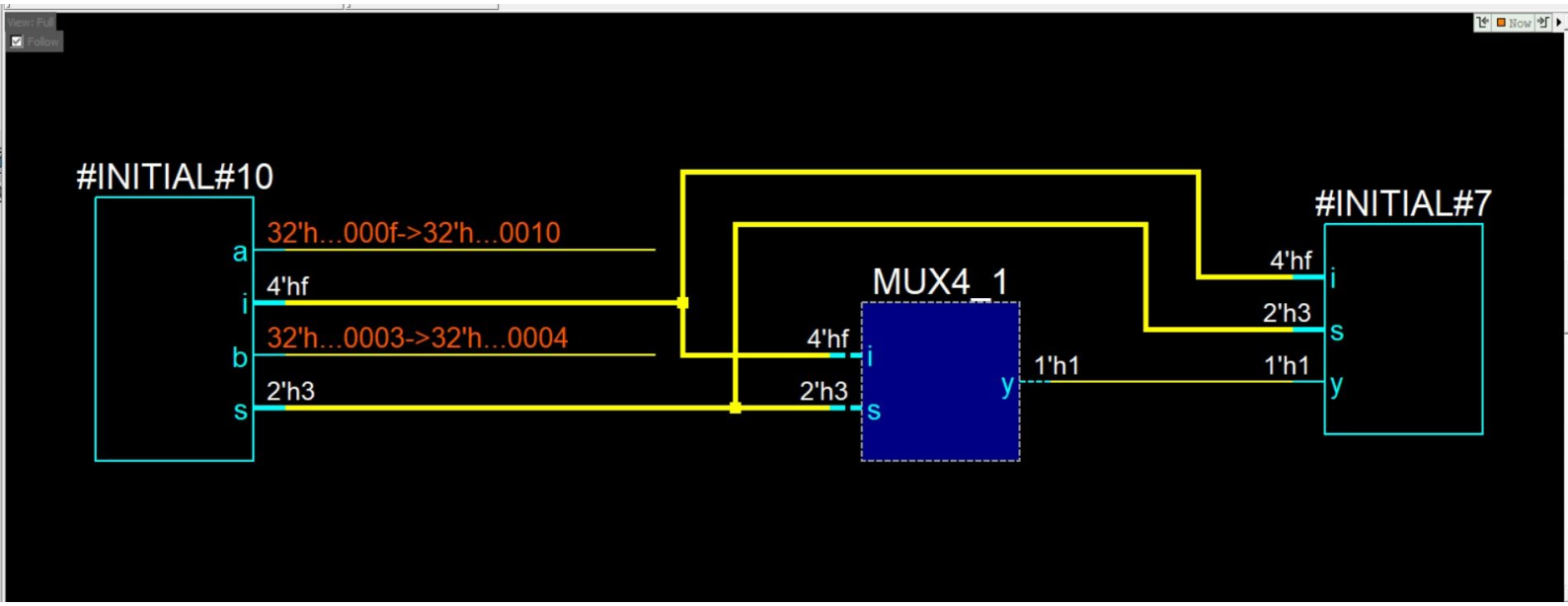

MUX2to1
i
2'h3
1
0
1'h1
1'h1
1
0
1'h1
1'h1
y
1'h1
s
1'h1

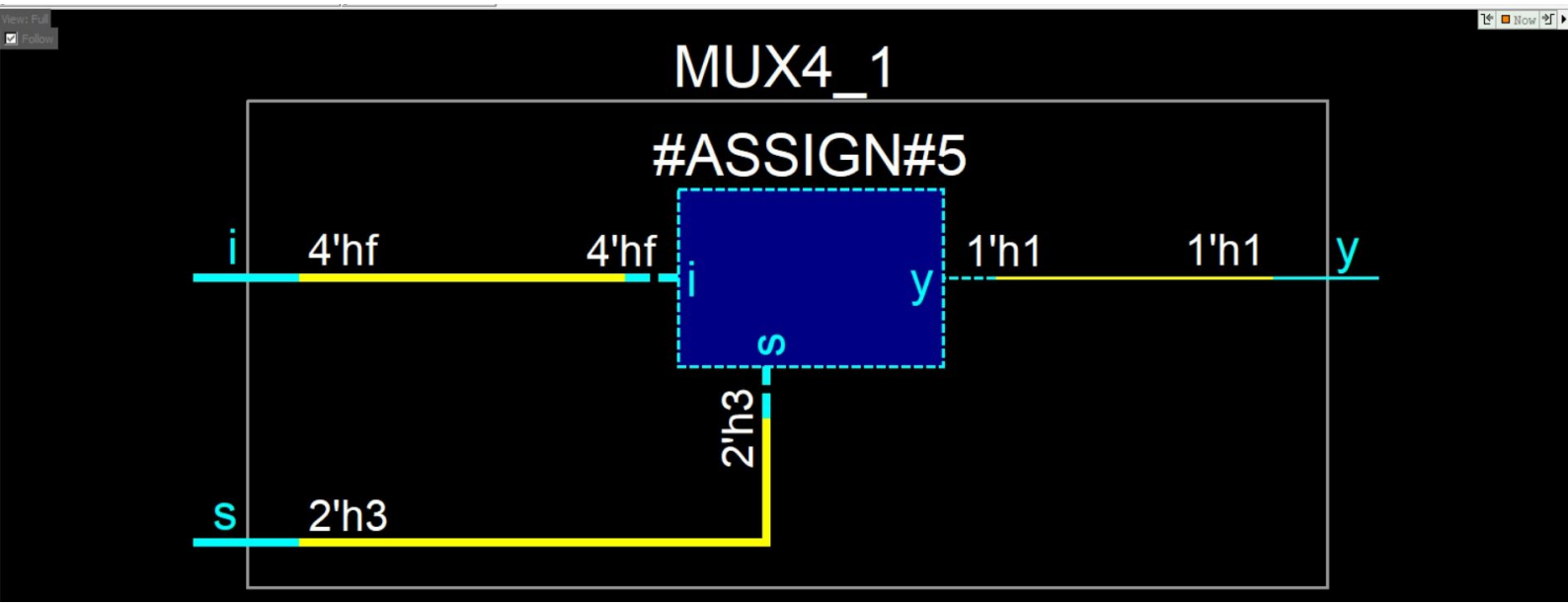
```
module mux_4_1(
        input [3:0]i,
        input [1:0]s,
        output y);
        assign y = (s[0]==0)?((s[1]==0)?i[0]:i[2]):((s[1]==1)?i[3]:i[1]);
endmodule
```

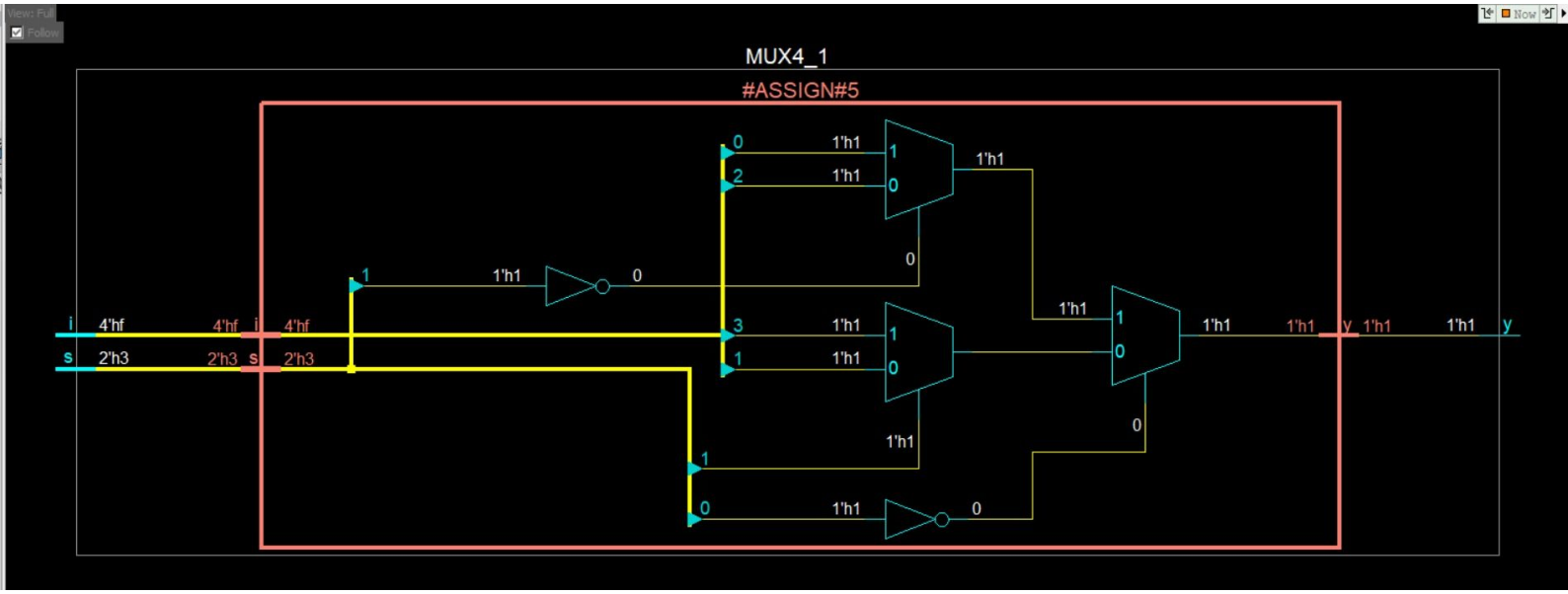
```
1  module mux_4_1_tb();
2          reg [3:0]i;
3          reg [1:0]s;
4          wire y;
5          integer a,b;
6          mux_4_1 MUX4_1(i,s,y);
7          initial begin
8          $monitor("Time=%0t,i=%0b,s=%0b,y=%0b",$time,i,s,y);
9          end
10         initial begin
11         for(a=0;a<16;a=a+1)begin
12                 i=a;
13                 for(b=0;b<4;b=b+1)begin
14                         s=b;
15                         #5;
16                 end
17         end
18         end
19 endmodule
20
```

```
VSIM 3> run -all
# Time=0,i=0,s=0,y=0
# Time=5,i=0,s=1,y=0
# Time=10,i=0,s=10,y=0
# Time=15,i=0,s=11,y=0
# Time=20,i=1,s=0,y=1
# Time=25,i=1,s=1,y=0
# Time=30,i=1,s=10,y=0
# Time=35,i=1,s=11,y=0
# Time=40,i=10,s=0,y=0
# Time=45,i=10,s=1,y=1
# Time=50,i=10,s=10,y=0
# Time=55,i=10,s=11,y=0
# Time=60,i=11,s=0,y=1
# Time=65,i=11,s=1,y=1
# Time=70,i=11,s=10,y=0
# Time=75,i=11,s=11,y=0
# Time=80,i=100,s=0,y=0
# Time=85,i=100,s=1,y=0
# Time=90,i=100,s=10,y=1
# Time=95,i=100,s=11,y=0
# Time=100,i=101,s=0,y=1
# Time=105,i=101,s=1,y=0
# Time=110,i=101,s=10,y=1
# Time=115,i=101,s=11,y=0
# Time=120,i=110,s=0,y=0
# Time=125,i=110,s=1,y=1
```


Msgs
/mux_4_1_tb/i
4'h5
/mux_4_1_tb/s
2'h2
/mux_4_1_tb/y
1'h1
/mux_4_1_tb/a
32'h00000005
/mux_4_1_tb/b
32'h00000002
4
5
6
7
1
2
3
0
1
2
3
0
1
2
3
0
1
00000004
00000005
00000006
00000007
000...
00000002
00000003
00000000
00000001
00000002
00000003
00000000
00000001
00000002
00000003
00000000
00000001


#INITIAL#10
a
i
b
s
32'h...000f->32'h...0010
4'hf
32'h...0003->32'h...0004
2'h3
MUX4_1
4'hf
2'h3
i
s
y
1'h1
#INITIAL#7
4'hf
2'h3
1'h1
i
s
y

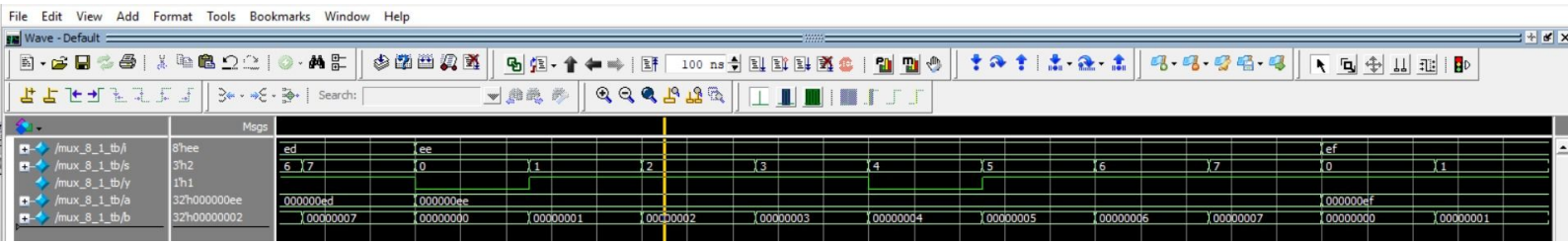

MUX4_1
#ASSIGN#5
i
4'hf
4'hf
i
y
1'h1
1'h1
y
s
2'h3
2'h3
s

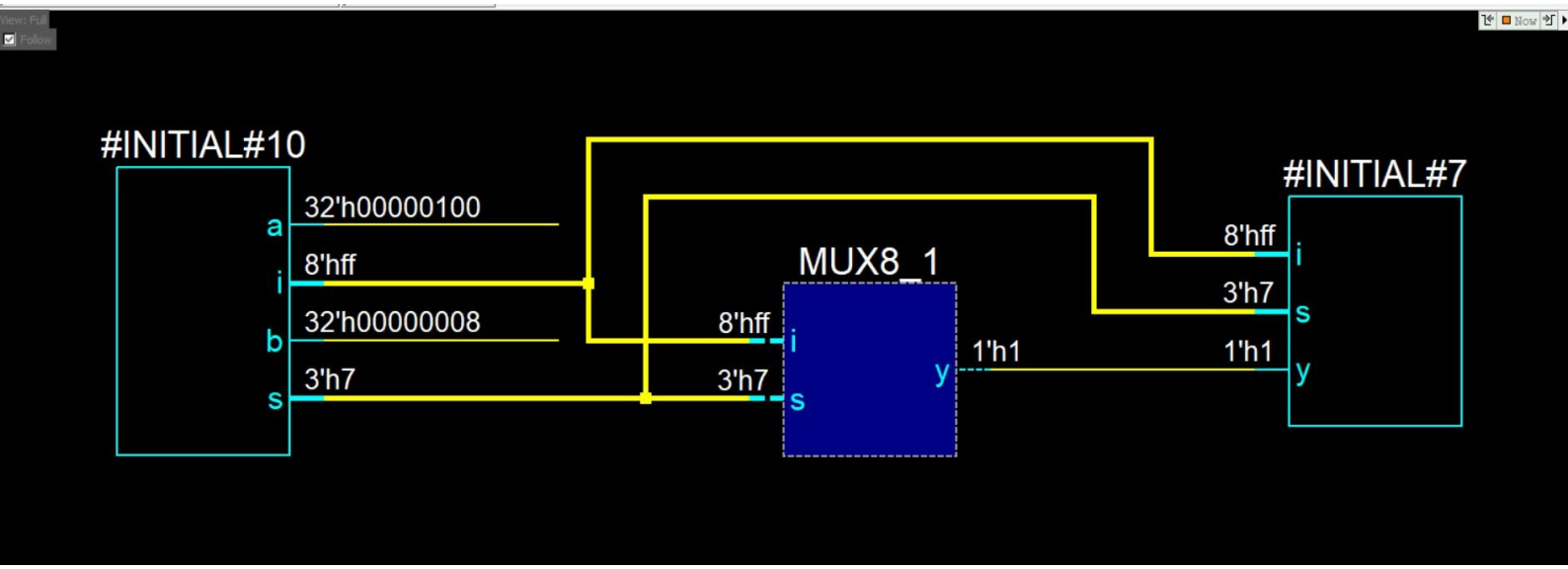

MUX4_1
#ASSIGN#5
i
4'hf
4'hf
i
4'hf
s
2'h3
2'h3
s
2'h3
0
1'h1
1
0
2
1'h1
1
0
1'h1
0
1
1'h1
0
3
1'h1
1
0
1
1'h1
1'h1
1
0
1'h1
1'h1
y
1'h1
1'h1
y
1
0
1'h1
0
1'h1
0

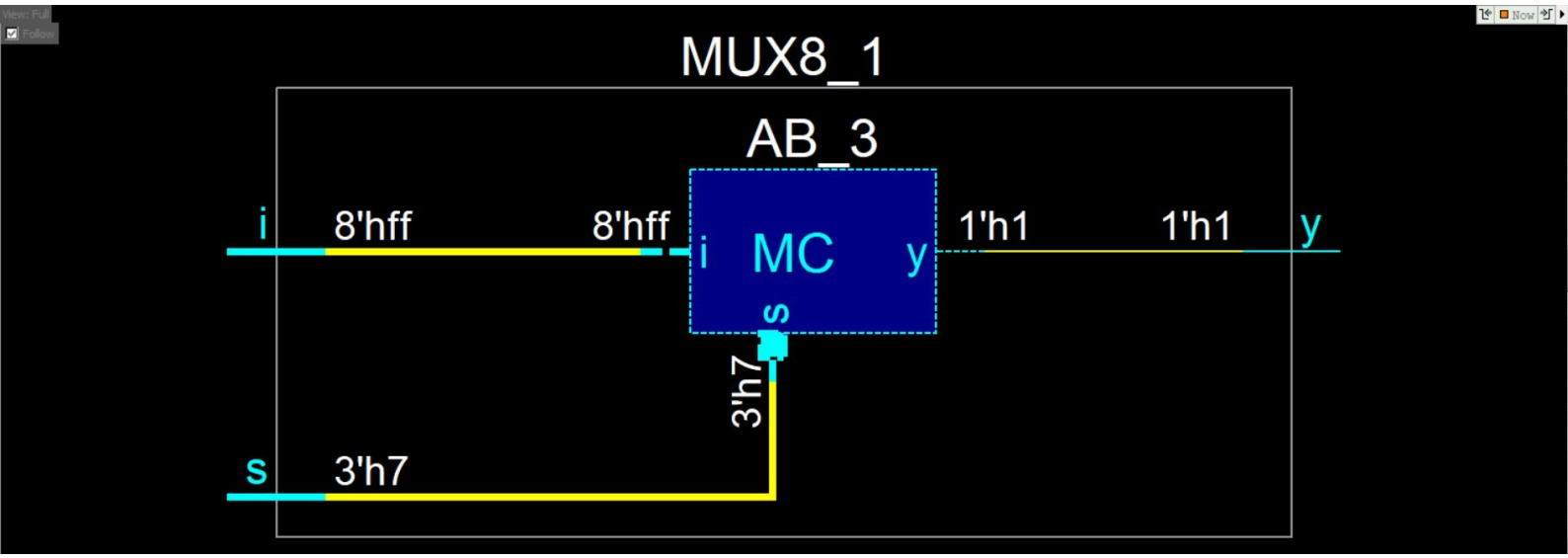
```
1  module mux_8_1(
2          input [7:0] i,
3          input [2:0] s,
4          output reg y
5  );
6          integer a;
7          always @(i, s) begin
8                  for (a = 0; a < 8; a = a + 1) begin
9                          if (s == a) begin
10                                 y = i[a];
11                         end
12                 end
13         end
14 endmodule
15
16
17
```

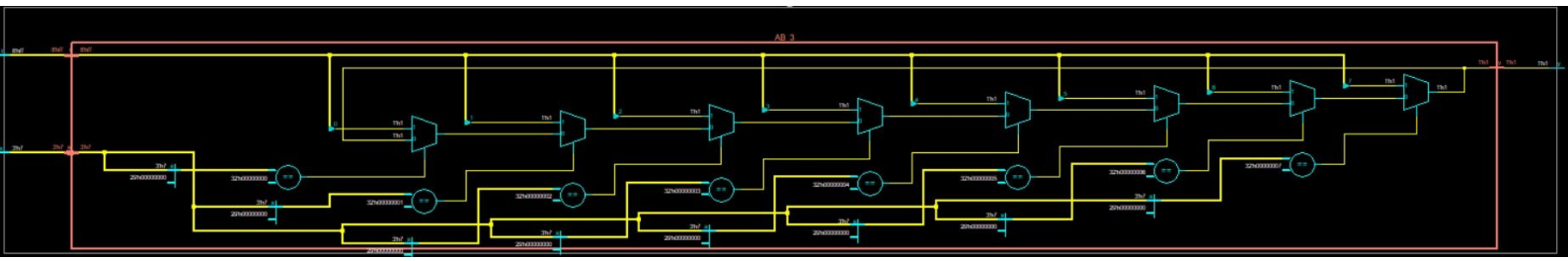
```
module mux_8_1_tb();
        reg [7:0]i;
        reg [2:0]s;
        wire y;
        integer a,b;
        mux_8_1 MUX8_1(i,s,y);
        initial begin
        $monitor("Time=%0t,i=%0b,s=%0b,y=%0b",$time,i,s,y);
        end
        initial begin
        for(a=0;a<256;a=a+1)begin
                i=a;
                for(b=0;b<8;b=b+1)begin
                        s=b;
                        #5;
                end
        end
        end
endmodule
```

Time=9575,i=11101111,s=11,y=1
Time=9580,i=11101111,s=100,y=0
Time=9585,i=11101111,s=101,y=1
Time=9590,i=11101111,s=110,y=1
Time=9595,i=11101111,s=111,y=1
Time=9600,i=11110000,s=0,y=0
Time=9605,i=11110000,s=1,y=0
Time=9610,i=11110000,s=10,y=0
Time=9615,i=11110000,s=11,y=0
Time=9620,i=11110000,s=100,y=1
Time=9625,i=11110000,s=101,y=1
Time=9630,i=11110000,s=110,y=1
Time=9635,i=11110000,s=111,y=1
Time=9640,i=11110001,s=0,y=1
Time=9645,i=11110001,s=1,y=0
Time=9650,i=11110001,s=10,y=0
Time=9655,i=11110001,s=11,y=0
Time=9660,i=11110001,s=100,y=1
Time=9665,i=11110001,s=101,y=1
Time=9670,i=11110001,s=110,y=1
Time=9675,i=11110001,s=111,y=1
Time=9680,i=11110010,s=0,y=0
Time=9685,i=11110010,s=1,y=1
Time=9690,i=11110010,s=10,y=0
Time=9695,i=11110010,s=11,y=0
Time=9700,i=11110010,s=100,y=1
Time=9705,i=11110010,s=101,y=1
Time=9710,i=11110010,s=110,y=1


File Edit View Add Format Tools Bookmarks Window Help
Wave - Default
100 ns
Search:
Msgs
/mux_8_1_tb/i
/mux_8_1_tb/s
/mux_8_1_tb/y
/mux_8_1_tb/a
/mux_8_1_tb/b
8'hee
3'h2
1'h1
32'h000000ee
32'h00000002
_ed
_ee
_ef
_6 _7
_0
_1
_2
_3
_4
_5
_6
_7
_0
_1
_000000ed
_000000ee
_000000ef
_00000007
_00000000
_00000001
_00000002
_00000003
_00000004
_00000005
_00000006
_00000007
_00000000
_00000001


#INITIAL#10
a
i
b
s
32'h00000100
8'hff
32'h00000008
3'h7
MUX8_1
8'hff
3'h7
i
s
y
1'h1
#INITIAL#7
8'hff
3'h7
1'h1
i
s
y

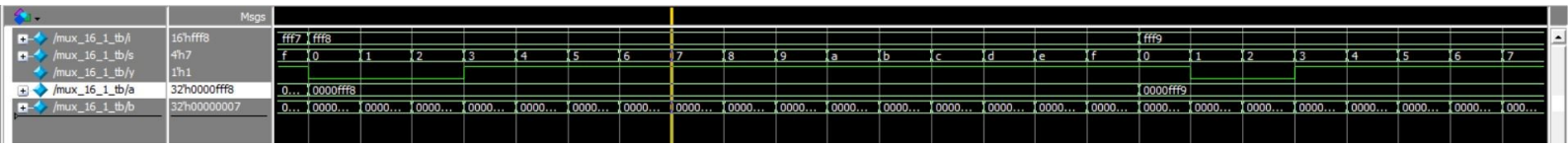

MUX8_1
AB_3
i
8'hff
8'hff
i
MC
y
1'h1
1'h1
y
s
3'h7
3'h7
s

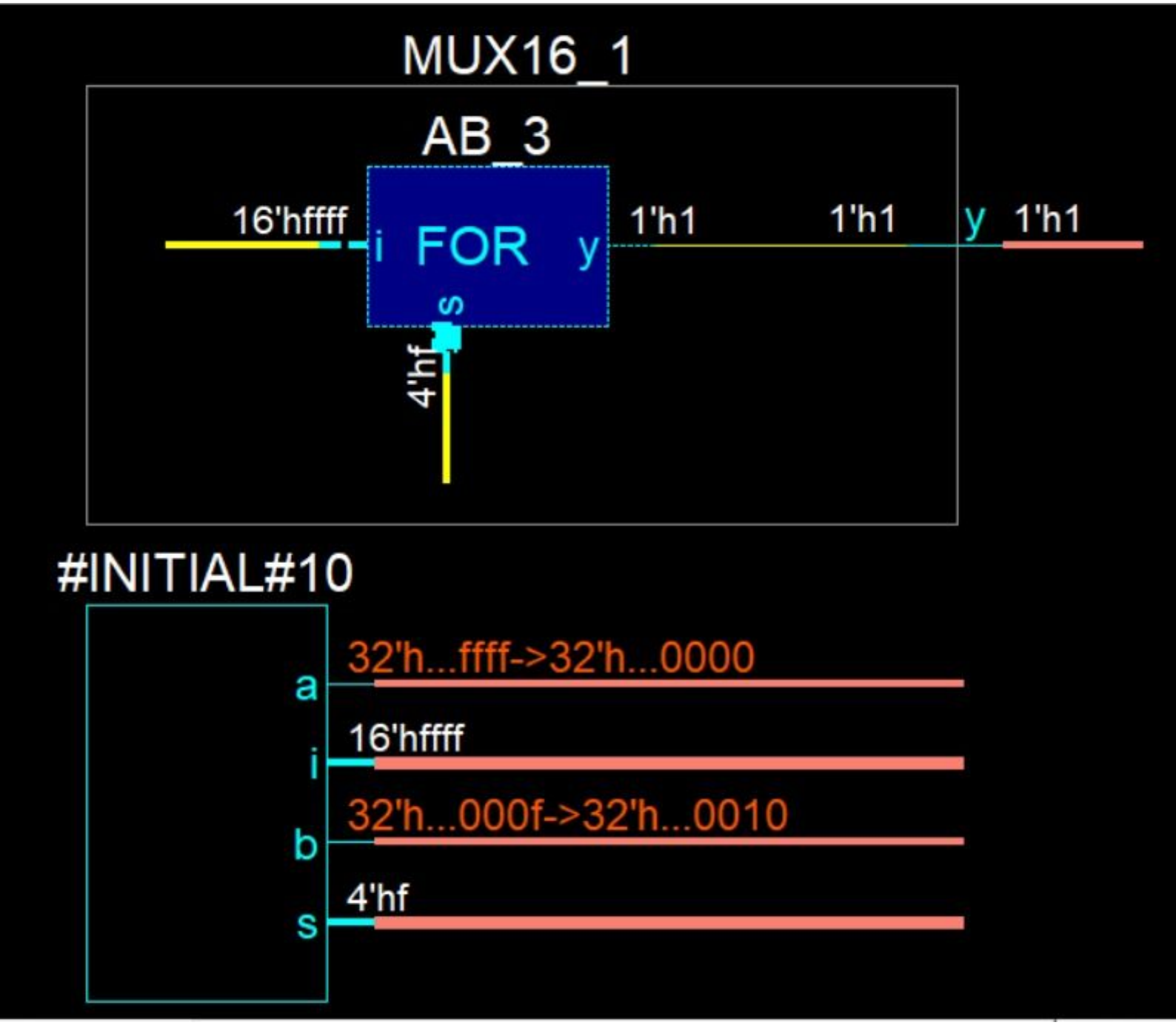

AB_3

```
1   module mux_16_1(
2           input [15:0] i,
3           input [3:0] s,
4           output reg y
5   );
6           integer a;
7           always @(i, s) begin
8                   for (a = 0; a < 16; a = a + 1) begin
9                           if (s == a) begin
10                                  y = i[a];
11                          end
12                  end
13          end
14  endmodule
15
16
```

```
1  module mux_16_1_tb();
2          reg [15:0]i;
3          reg [3:0]s;
4          wire y;
5          integer a,b;
6          mux_16_1 MUX16_1(i,s,y);
7          initial begin
8          $monitor("Time=%0t,i=%0b,s=%0b,y=%0b",$time,i,s,y);
9          end
10         initial begin
11         for(a=0;a<65536;a=a+1)begin
12                 i=a;
13                 for(b=0;b<16;b=b+1)begin
14                         s=b;
15                         #5;
16                 end
17         end
18         end
19 endmodule
20
21
```

Time=5237280,i=1111111110111010,s=0,y=0
Time=5237285,i=1111111110111010,s=1,y=1
Time=5237290,i=1111111110111010,s=10,y=0
Time=5237295,i=1111111110111010,s=11,y=1
Time=5237300,i=1111111110111010,s=100,y=1
Time=5237305,i=1111111110111010,s=101,y=1
Time=5237310,i=1111111110111010,s=110,y=0
Time=5237315,i=1111111110111010,s=111,y=1
Time=5237320,i=1111111110111010,s=1000,y=1
Time=5237325,i=1111111110111010,s=1001,y=1
Time=5237330,i=1111111110111010,s=1010,y=1
Time=5237335,i=1111111110111010,s=1011,y=1
Time=5237340,i=1111111110111010,s=1100,y=1
Time=5237345,i=1111111110111010,s=1101,y=1
Time=5237350,i=1111111110111010,s=1110,y=1
Time=5237355,i=1111111110111010,s=1111,y=1
Time=5237360,i=1111111110111011,s=0,y=1
Time=5237365,i=1111111110111011,s=1,y=1
Time=5237370,i=1111111110111011,s=10,y=0
Time=5237375,i=1111111110111011,s=11,y=1
Time=5237380,i=1111111110111011,s=100,y=1
Time=5237385,i=1111111110111011,s=101,y=1
Time=5237390,i=1111111110111011,s=110,y=0
Time=5237395,i=1111111110111011,s=111,y=1
Time=5237400,i=1111111110111011,s=1000,y=1
Time=5237405,i=1111111110111011,s=1001,y=1
Time=5237410,i=1111111110111011,s=1010,y=1
Time=5237415,i=1111111110111011,s=1011,y=1
Time=5237420,i=1111111110111011,s=1100,y=1


Msgs
/mux_16_1_tb/i
16'hfff8
fff7
fff8
fff9
/mux_16_1_tb/s
4'h7
f
0
1
2
3
4
5
6
7
8
9
a
b
c
d
e
f
0
1
2
3
4
5
6
7
/mux_16_1_tb/y
1'h1
/mux_16_1_tb/a
32'h0000fff8
0000fff8
0000fff9
/mux_16_1_tb/b
32'h00000007
0000...


MUX16_1
AB_3
16'hffff
i
FOR
y
1'h1
1'h1
y
1'h1
s
4'hf
#INITIAL#10
a
32'h...ffff->32'h...0000
i
16'hffff
b
32'h...000f->32'h...0010
s
4'hf