

Bugs found in the design :

Bug 1:

missing pready signal assignment

output pready, // Line 97 - declared but never assigned

we have to add pready signal as input in cfg_ctrl module and vending machine module and have to assign the pready as high like below

assign pready = 1'b1; // Always ready as per simple APB protocol

Bug 2:

Wrong Address Decode Logic :

systemverilogif (paddr[15:12] == 0) begin // Lines 33 & 41

As Per spec, vending_machine_cfg is at 0x4000_0000, items start at 0x4000_0004 so we have to decode the address as below

systemverilogif (paddr == 16'h0000) begin // For vending_machine_cfg

Bug 3:

Array Bounds Violation : //Lines 37 & 45

systemverilogitem_cfg[paddr[11:0]] <= pldata; // Line 37 - can access 0-4095 but array size is only 32 which is beyond MAX_ITEMS(32)

prdata_r <= item_cfg[paddr[11:0]]; // Line 45 - same issue

we have to replace the lines with this item_cfg[paddr[6:2]] <= pldata;

Bug 4:

Missing Configuration Address Mapping: //line 41

Current code doesn't follow spec's address mapping (0x4000_0000 base).

so we have to Update address decode logic to handle proper offsets:

replace line 41 with this if (paddr == 16'h0000) begin.

Bug 5 :

Currency value mismatch : //line 101

As we see in line 101 the currency value given as
input [\$clog2(MAX_NOTE_VAL) : 0] currency_value, as we know this give
the value of 8 bit as MAX_NOTE_VAL is 100 , $\$clog2(100) = 7$ but we have to
take 7 bit currency value so we have to replace that line as

input [6:0]currency_value, or

input [\$clog2(MAX_NOTE_VAL)-1 : 0] currency_value.

Bug 6:

Configuration Mode Bug:

.psel (psel), // Line 142

psel and pwrite should be gated with cfg_mode

psel (psel && cfg_mode),

Bug 7:

Missing Reset for vending_machine_cfg //Line 28

if (!prstn) begin

 for (int i =0; i<MAX_ITEMS; i++) begin

 item_cfg[i] <= 32'h0;

 end

 // Missing: vending_machine_cfg <= 32'h0;

end

vending_machine_cfg register is not reset, leading to undefined initial state.

Bug 8:

Missing Empty Item Handling //line 120

Spec requires special handling when item is not available - should dispense change immediately and indicate empty item.

Add in vending_machine module around // line 120

```
if (currency_valid) begin
```

```
    if (current_item_cfg_sync2[23:16] == 0) begin // Item not available
```

```
        // Immediately return change and indicate empty item
```

some other bugs are missing currency clock as mentioned in spec human insertion speed should be 10khz to 50 Mhz .