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module DisplayControlUnit (
    input wire clock500Hz, reset,

    input wire[7:0] phrase,

    output reg[4:0] char_index,

    output reg RS,RW,
    output wire E,
    output reg[7:0] DB
);

    assign E = clock500Hz;

    // Estados
    parameter
        FS1 = 4'd0,
      FS2 = 4'd1,
        FS3 = 4'd2,
        FS4 = 4'd3,
        ClearDisplay = 4'd4,
        DisplayControl = 4'd5,
        EntryMode = 4'd6,
        ReturnHome = 4'd7,
        SetAddress = 4'd8,
        WriteChar = 4'd9;

    reg[3:0] PresentState,NextState;

    // Bloco sequencial - Estados
     always @(posedge reset or posedge clock500Hz) begin
        if(reset) begin
            PresentState <= FS1;
            char_index <= 5'd0;
        end
        else begin
            PresentState <= NextState;
            if(PresentState == WriteChar) begin
                char_index <= char_index + 5'd1;
            end
            if(NextState == ReturnHome) begin
                char_index <= 5'd0;
            end

        end
    end

    // Bloco Combinacional - Estados
    always @(*) begin
        case(PresentState)

            default: begin
                RS = 1'b0;
                RW = 1'b0;
                DB = 8'b00111000;
                NextState = FS1;
            end

            FS1: begin
                RS = 1'b0;
                RW = 1'b0;
                DB = 8'b00111000;
                NextState = FS2;
            end

            FS2: begin
                RS = 1'b0;
                RW = 1'b0;
                DB = 8'b00111000;
                NextState = FS3;
            end

            FS3: begin
                RS = 1'b0;
                RW = 1'b0;
                DB = 8'b00111000;
                NextState = FS4;
            end

            FS4: begin
                RS = 1'b0;
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                    RW = 1'b0;
                    DB = 8'b00111000;
                    NextState = ClearDisplay;
                end

                ClearDisplay: begin
                    RS = 1'b0;
                    RW = 1'b0;
                    DB = 8'b00000001;
                    NextState = DisplayControl;
                end

                DisplayControl: begin
                    RS = 1'b0;
                    RW = 1'b0;
                    DB = 8'b00001100;
                    NextState = EntryMode;
                end

                EntryMode: begin
                    RS = 1'b0;
                    RW = 1'b0;
                    DB = 8'b00000110;
                    NextState = WriteChar;
                end

                ReturnHome: begin
                    RS = 1'b0;
                    RW = 1'b0;
                    DB = 8'b10000000;
                    NextState = WriteChar;
                end

                SetAddress: begin
                    RS = 1'b0;
                    RW = 1'b0;
                    DB = 8'b11000000;
                    NextState = WriteChar;
                end

                WriteChar: begin
                    RS = 1'b1;
                    RW = 1'b0;
                    DB = phrase;


                    if (char_index == 5'd15) begin
                        NextState = SetAddress;
                    end
                    else if (char_index == 5'd31) begin
                        NextState = ReturnHome;
                    end
                    else begin
                        NextState = WriteChar;
                    end
                end
            endcase
        end

    endmodule
```