

Flight Instrument Panel Project
By Gary T Smith



(snippets taken from [here](#))

What I want:

A basic, generic, USB-powered instrument panel for Microsoft Flight Simulator that displays unique telemetry data (altitude, speed, heading, vs) on each individual 7-segment display and contains unique inputs that allow the pilot to raise/lower landing gear and flaps, spoilers, brakes

- Telemetry data is received from a client on the PC via UART
- Switch/button data is transmitted to client on PC via UART
- “Generic”/”Basic” so that all functionality can be utilized on any aircraft type

(Original) Hardware Specifics:

2x Five-Digit 7-Segment Displays w/ Backlight (Altitude, +/- Vertical Speed)

2x Three-Digit 7-Segment Display w/ Backlight (Heading, 0-999 Ground Speed)

4x Two-Way switches (Gear, Parking brake, NOOP, NOOP)

2x Push-Buttons (Brakes, NOOP)

2x Rotary Knobs (Flaps, Spoilers)

4x LEDs w/ matching color to display backlight (**Button LEDs omitted**)

4x I²C drivers (For each set of 7 segment displays)

Will need ≥ 13 bit I²C port expander (7 segments + 5 digits)

MCP23017 16-bit i²c i/o expander

1x custom PCB

Plans:

Microcontroller streams data to/from PC via UART, multiplexes through all four sets of 7-segment displays via I²C chips (to reduce pin constraints), and reads button/switch/potentiometer data from input pins. Sends button/switch/pot data to PC via UART.

Wiring:

- 16 I/O pins will be used (4 LED output, 8 input - switch/button/rotary, 4 I²C data)
- Common SCL (For all 4 I²C chips)
- Common 5V/GND/3.3V
- Each unique 7-segment display set will be connected to a unique I²C chip

Power Consumption:

Links/Resources:

Autodesk EAGLE library for MCP23017 E/SP:

<https://www.snapeda.com/parts/MCP23017-E/SP/Microchip%20Technology/view-part/5520745/?ref=search&t=%20MCP23017>

Datsheet for MCP23017

<https://ww1.microchip.com/downloads/en/devicedoc/20001952c.pdf>

Datasheet for 7seg

<http://www.xlitx.com/datasheet/5611AH.pdf>

Datasheet for 3-digit 7seg

<http://www.xlitx.com/datasheet/5631AH.pdf>