Hall A GEM Gas Flow Sensor Chassis

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    - Super BigBite will use six chassis
  - Chassis with BigBite panels in rack
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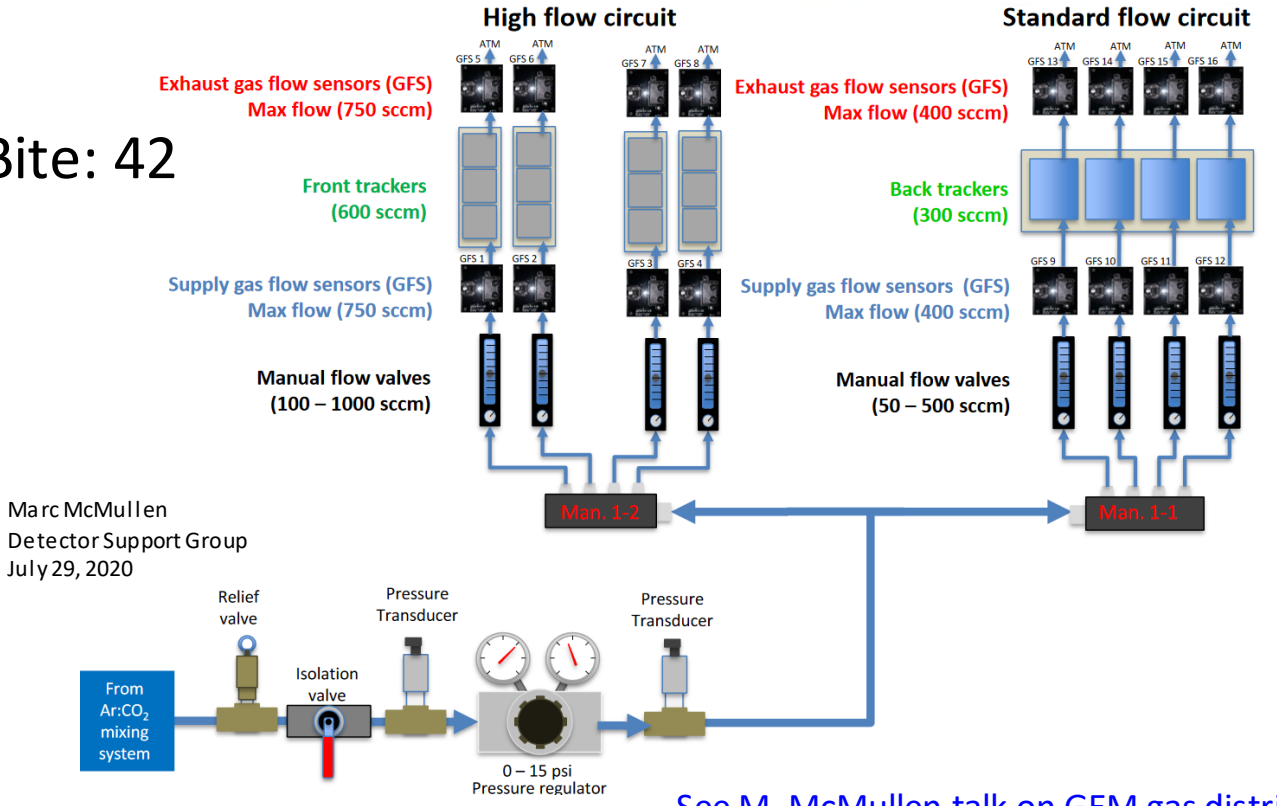
- Conclusion

Hall A GEM Gas Distribution

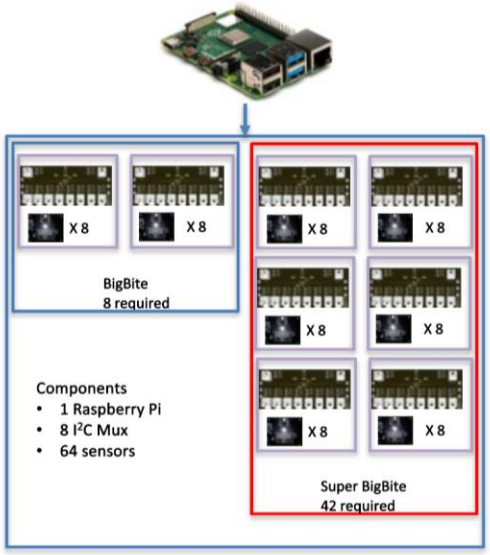
- Two distribution set ups for BigBite and Super BigBite
- Set ups are identical with exception of number of gas output channels
  - BigBite: 8
  - Super BigBite: 42



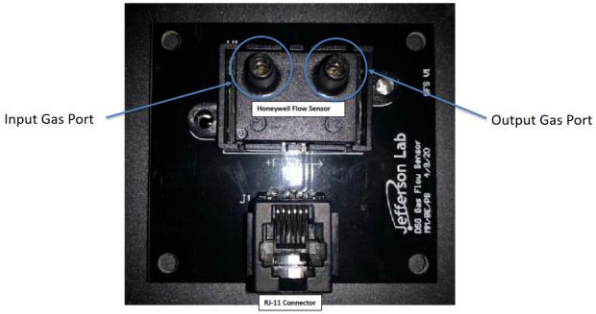
See M. McMullen talk on GEM gas distribution

Gas Distribution Instrumentation and Controls

- Raspberry Pi-based I²C readout of Honeywell HAF Flow Sensors using a DSG-developed multiplexer PCB

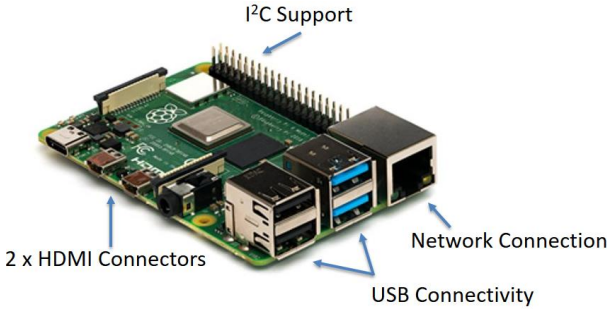


System diagram of GEM gas supply flow sensor readout

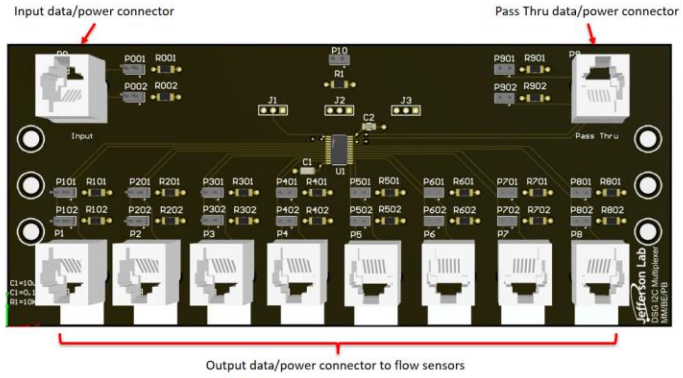


DSG designed flow sensor board

DSG-designed flow sensor PCB with RJ11 connector for power and I²C communication



Raspberry Pi 4 Single-Board Computer



DSG-designed flow sensor multiplexer

Marc McMullen
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July 29, 2020

See M. McMullen talk on GEM gas distribution

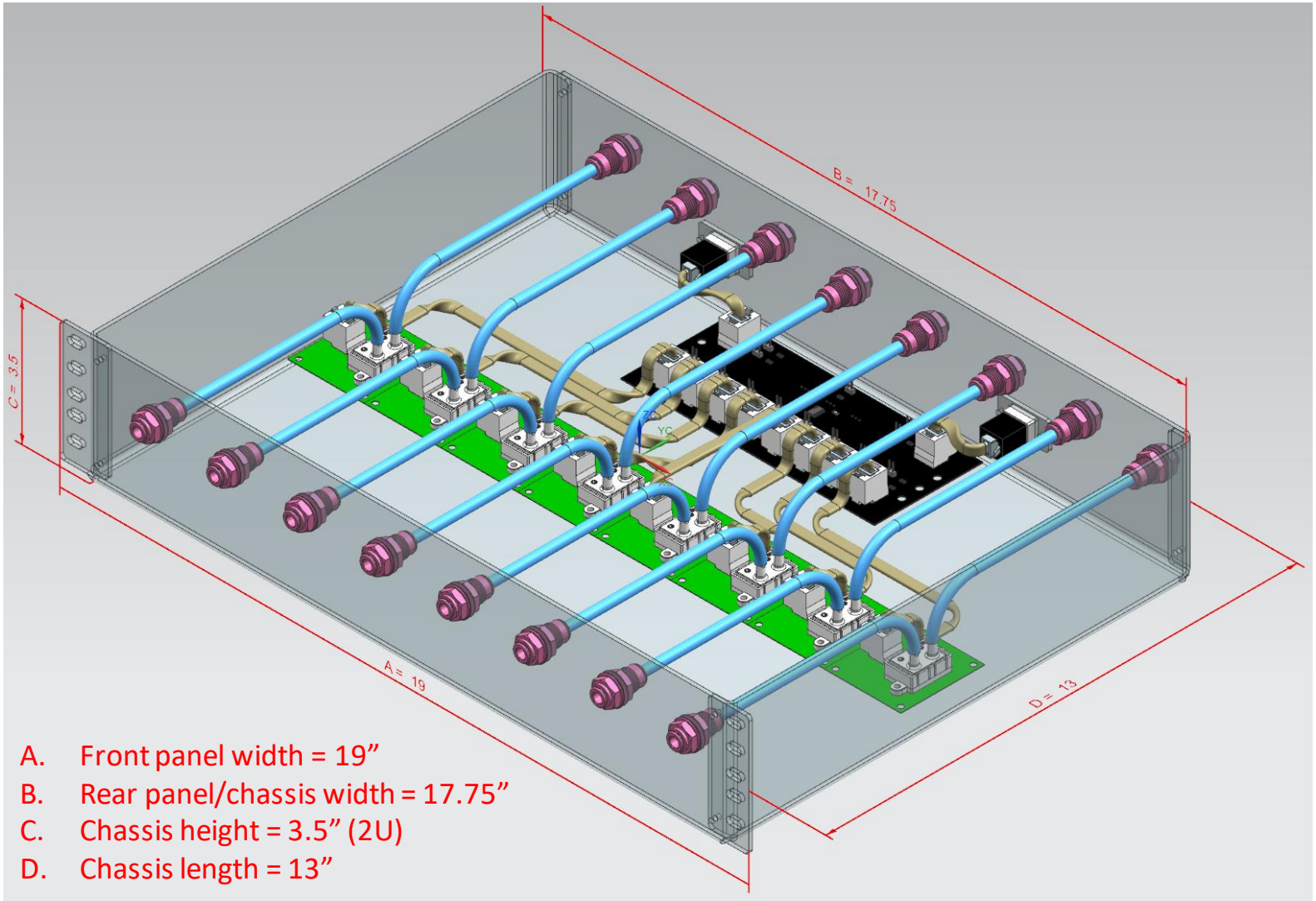
Flow Sensor Chassis

- Eight flow sensors grouped together in one rack-mountable chassis
- Each chassis contains one eight-channel multiplexer PCB
  - Multiplexer is necessary because flow sensors are all factory-assigned the same I^2C address
  - Multiplexer also has a data pass through to allow multiple chassis to be chained together and read out by a single Raspberry Pi

Notable Chassis Design Features

- Chassis dimensions: 17.75” wide x 13” long x 3.5” tall
- Front panel is 19" wide x 3.5" tall with mounting holes for rack
- ~6” piping length for all ¼” OD Tygon tubing
- All gas line bends have at least 1” bend radius
  - 1” bend radius is minimum recommended for ¼” OD Tygon tubing
- Multiplexer PCB mounted horizontally in chassis under gas lines
- Two RJ11 feedthroughs for controls cabling
  - One feedthrough is input to multiplexer
  - Second feedthrough is pass-through for controls signals

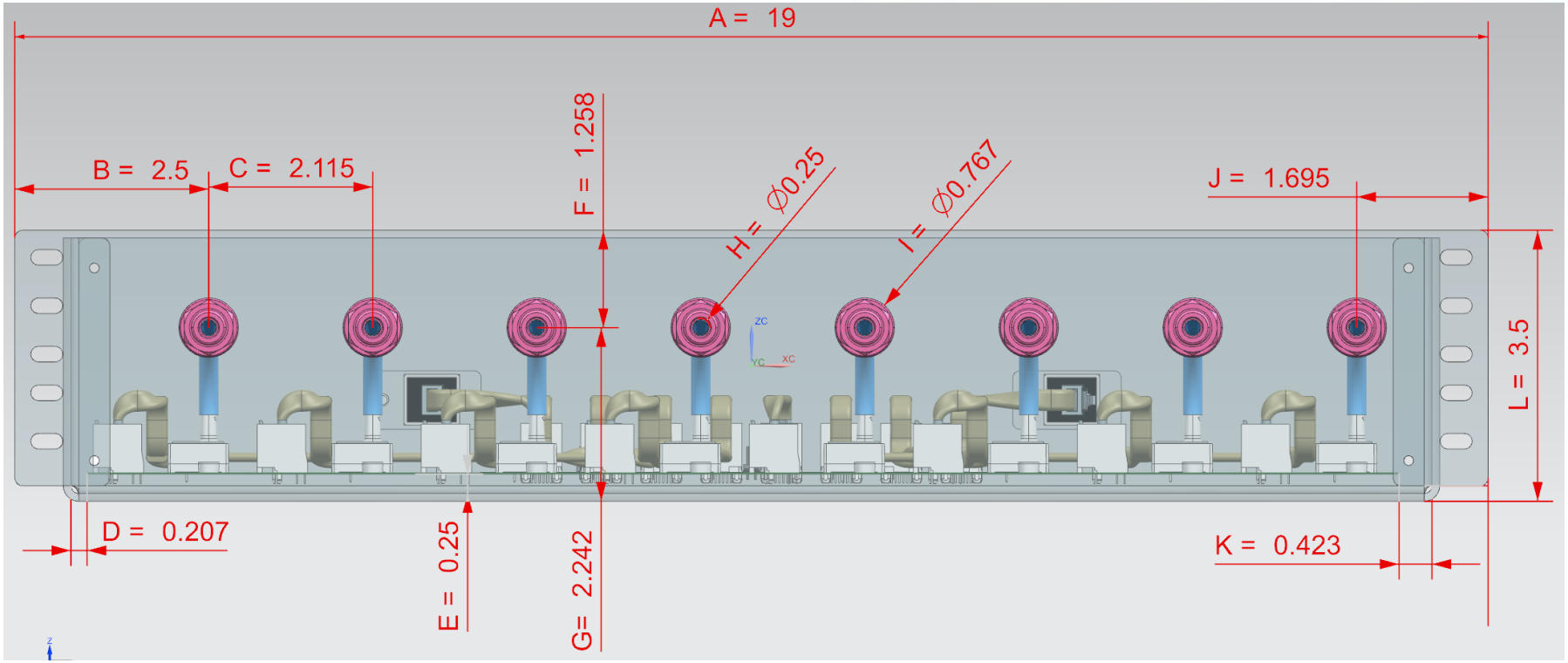
Isometric



A. Front panel width = 19”
B. Rear panel/chassis width = 17.75”
C. Chassis height = 3.5” (2U)
D. Chassis length = 13”

NOTE: Actual chassis will include service loops in controls cabling to allow easier removal of PCBs

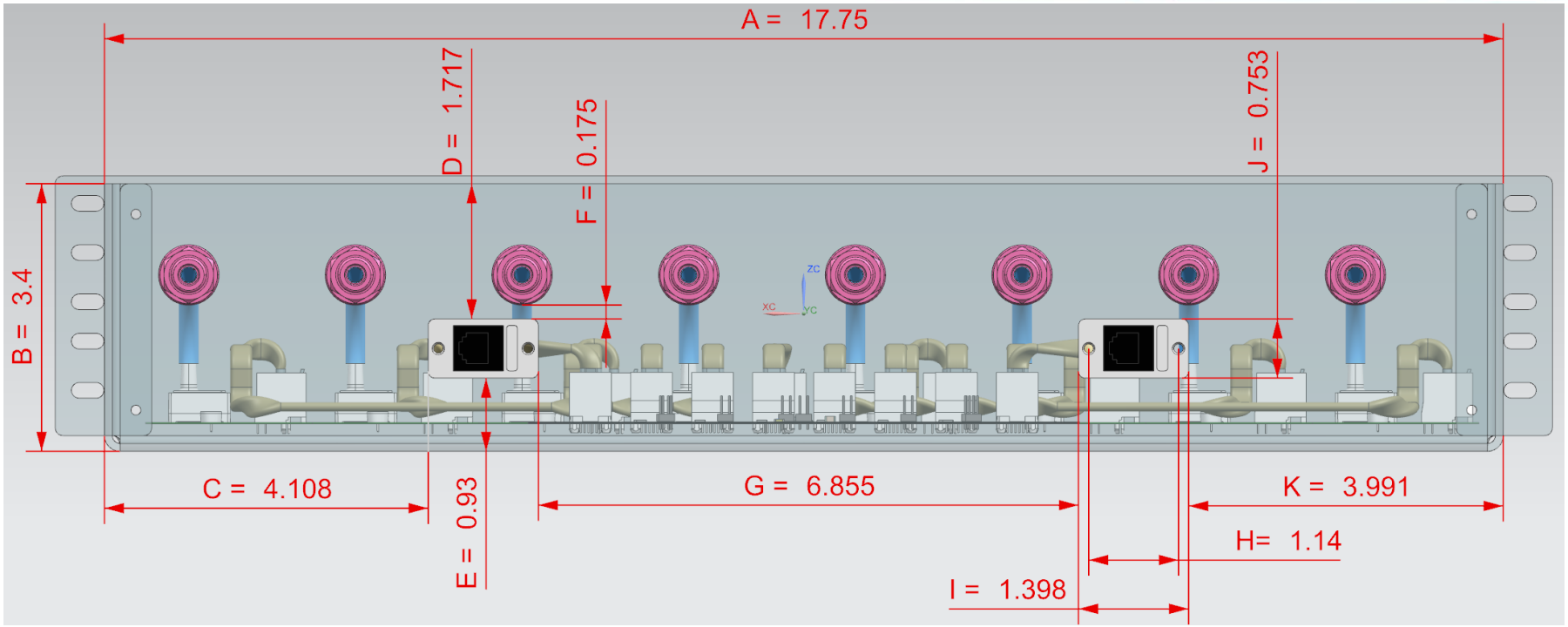
Front



A. Front panel width = 19”
B. Left edge of front panel to first gas output = 2.5”
C. Distance between gas output ports = 2.115”
D. Distance between left chassis wall and left-most flow sensor PCB = 0.207”
E. Distance between PCBs and bottom of chassis = 0.25”
F. Distance between center of gas output port to top edge of front panel = 1.258”
G. Distance between center of gas output port to bottom edge of front panel = 2.242”
H. Gas output port internal diameter = 0.25”
I. Gas output port panel feedthrough diameter = 0.767”
J. Right edge of front panel to last gas output = 1.695”
K. Distance between right chassis wall and right-most flow sensor PCB = 0.423”
L. Chassis height = 3.5” (2U)

NOTE: Actual chassis will include service loops in controls cabling to allow easier removal of PCBs

Back

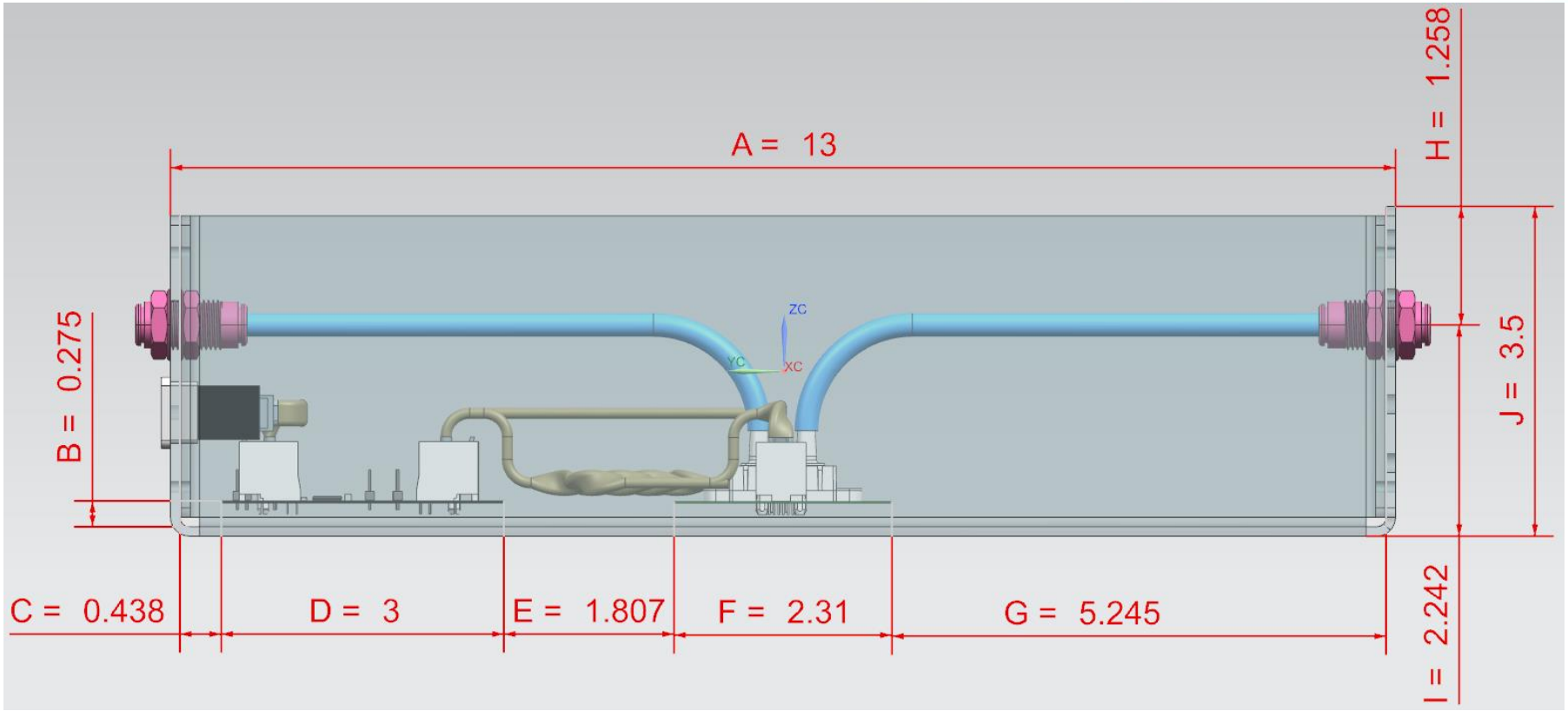


A. Rear panel width = 17.75”
B. Rear panel height = 3.4”
C. Distance from outer chassis edge to output RJ11 feedthrough = 4.108”
D. Distance from bottom edge of chassis to bottom of RJ11 feedthroughs = 0.93”
E. Distance from top edge of chassis to top of RJ11 feedthroughs = 1.717”
F. Distance between top edge of RJ11 feedthroughs to bottom edge of pusk-lock connector = 0.175”

A. Distance between RJ11 feedthroughs = 6.855”
G. Distance between RJ11 feedthrough mounting holes = 1.14”
H. Width of RJ11 feedthrough = 1.398”
I. Height of RJ11 feedthrough = 0.753”
J. Distance between edge of input RJ11 feedthrough and edge of chassis = 3.991”

NOTE: Actual chassis will include service loops in controls cabling to allow easier removal of PCBs

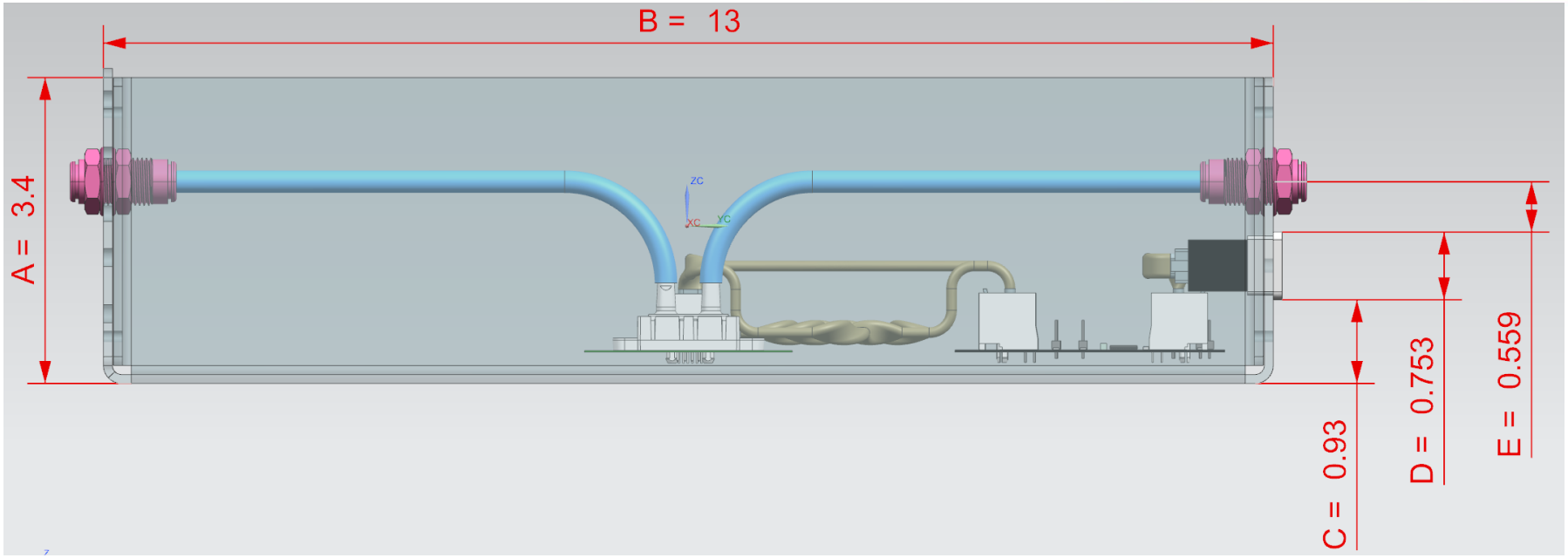
Left



A. Chassis length = 13”
B. Bottom of PCBs to chassis bottom = 0.25”
C. Rear of chassis to edge of multiplexer PCB = 0.438”
D. Width of multiplexer PCB = 3”
E. Distance between multiplexer PCB and flow sensor PCB = 3”
F. Flow sensor PCB width = 2.31”
G. Distance between flow sensor PCB and front of chassis = 5.245”
H. Top of chassis front to center of push-lock connector = 1.258”
A. Bottom of chassis to center of push-lock connector = 2.242”
G. Chassis height = 3.5 “ (2U)

NOTE: Actual chassis will include service loops in controls cabling to allow easier removal of PCBs

Right

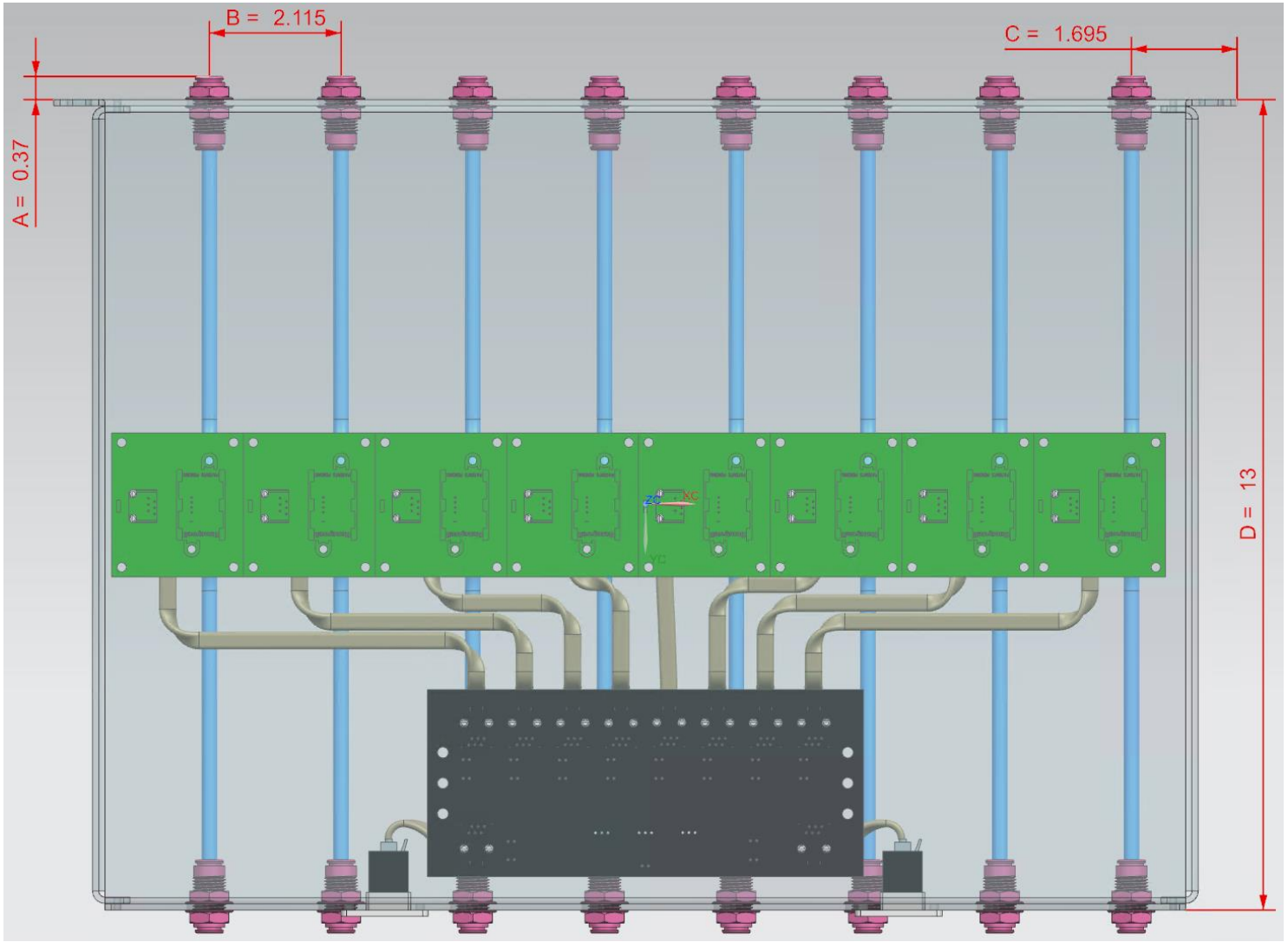


A. Rear panel height = 3.4”
B. Chassis length = 13”
C. Distance from bottom edge of chassis to bottom edge of RJ11 feedthrough = 0.93”
D. Distance from bottom edge of RJ11 feedthrough to top edge of RJ11 feedthrough = 0.753”
E. Distance from top edge of RJ11 feedthrough to center of push-lock connector = 0.559”

NOTE: Actual chassis will include service loops in controls cabling to allow easier removal of PCBs

Bottom

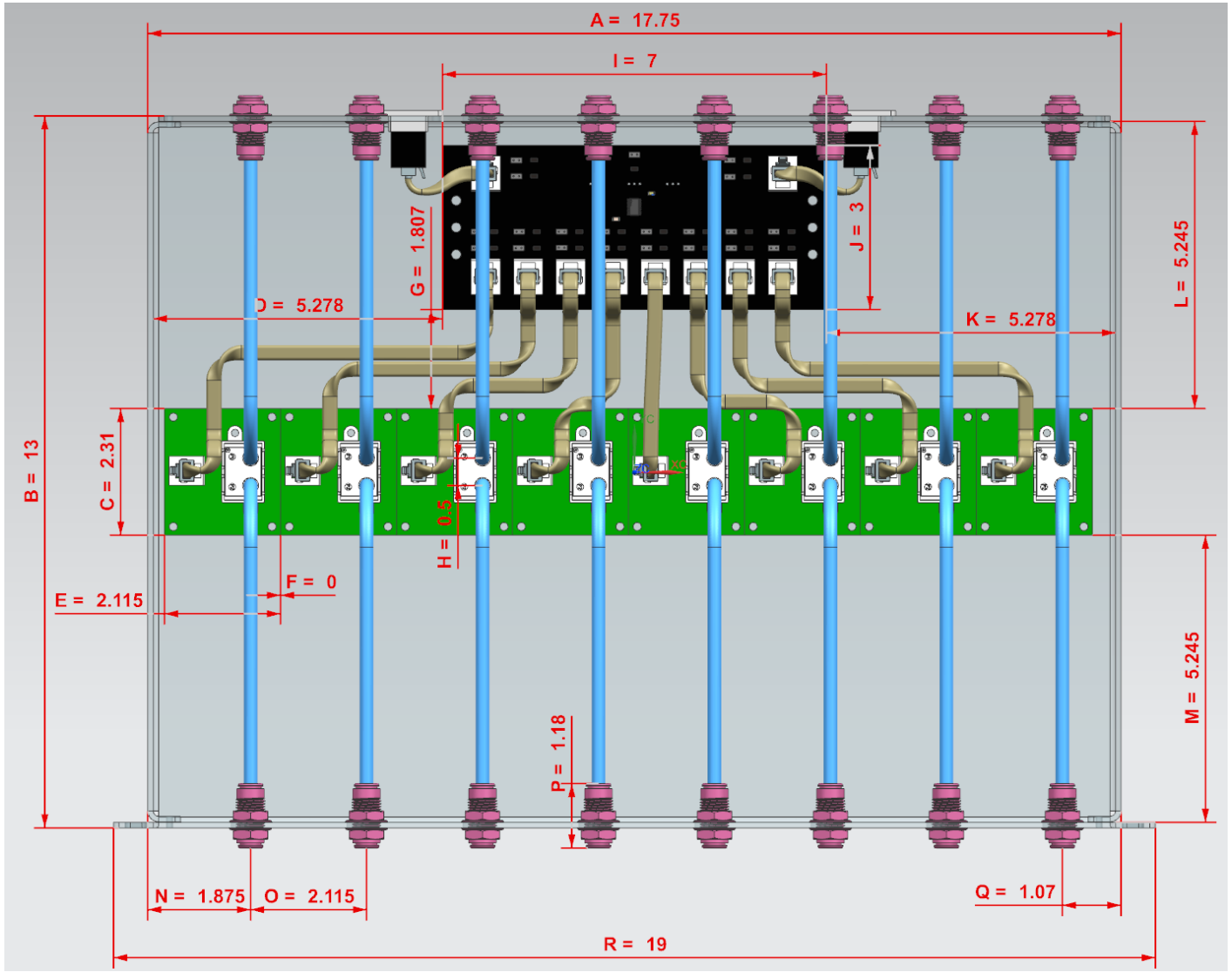
A. Distance between panel and face of push-lock connector = 0.37”
B. Distance between gas output ports = 2.115”
C. Distance between last channel’s output port and edge of front panel = 1.695”
D. Chassis length = 13”



NOTE: Actual chassis will include service loops in controls cabling to allow easier removal of PCBs

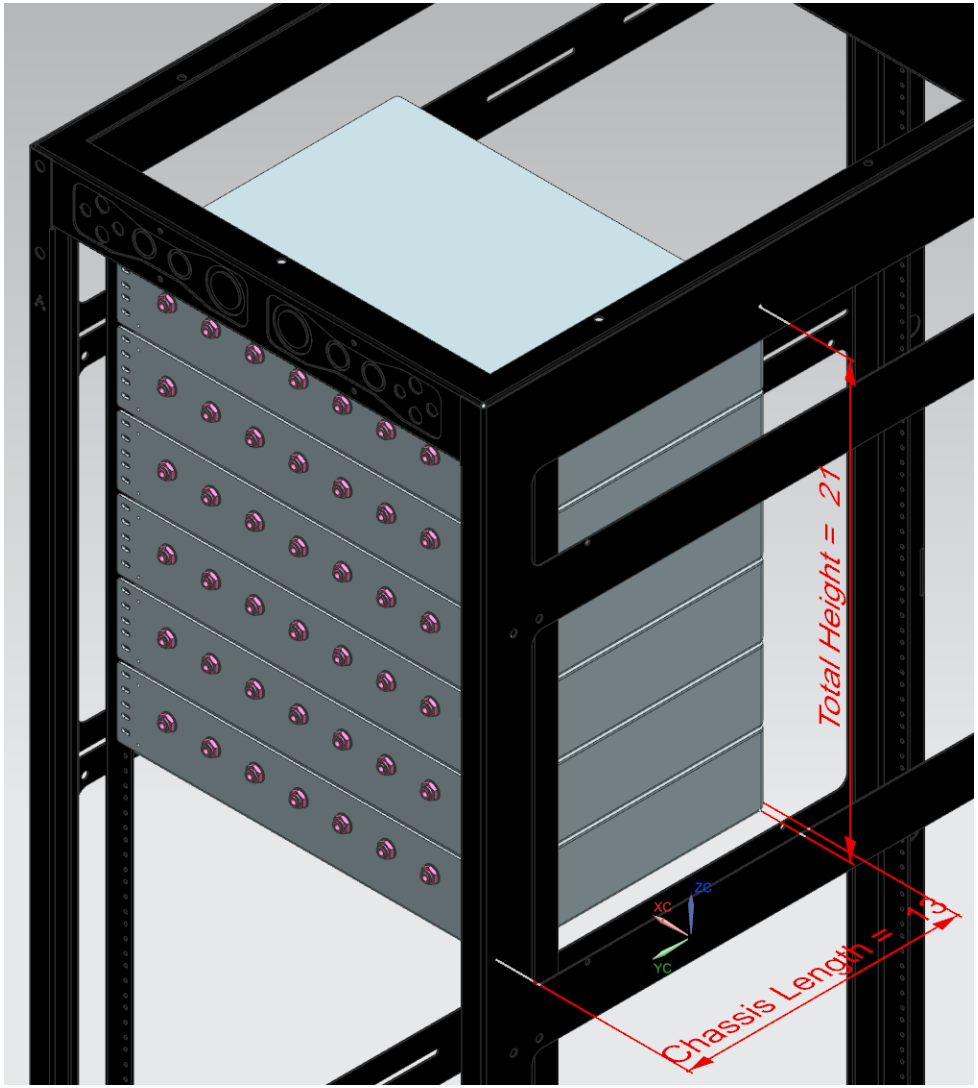
Top

A. Chassis width = 17.75”
B. Chassis length = 13”
C. Flow Sensor PCB width = 2.31”
D. Left wall of chassis to left edge of multiplexer PCB = 5.278”
E. Flow Sensor PSB length = 2.115”
F. Distance between flow sensor PCBs = 0”
G. Multiplexer PCB to flow sensor PCB = 1.807”
H. Distance between input and output port of flow sensor = 0.5”
I. Multiplexer PCB length = 7”
J. Multiplexer PCB width = 3”
K. Right edge of multiplexer to right wall of chassis = 5.278”
L. Rear wall of chassis to flow sensor PCB = 5.245”
M. Front wall of chassis to flow sensor PCB = 2.425”
N. Outer edge of chassis to center of first output port = 1.875”
O. Distance between output ports (center-to-center) = 2.115”
P. Overall length of push-lock connector = 1.18”
Q. Outer edge of chassis to center of last output port = 1.07”
R. Width of front panel = 19”

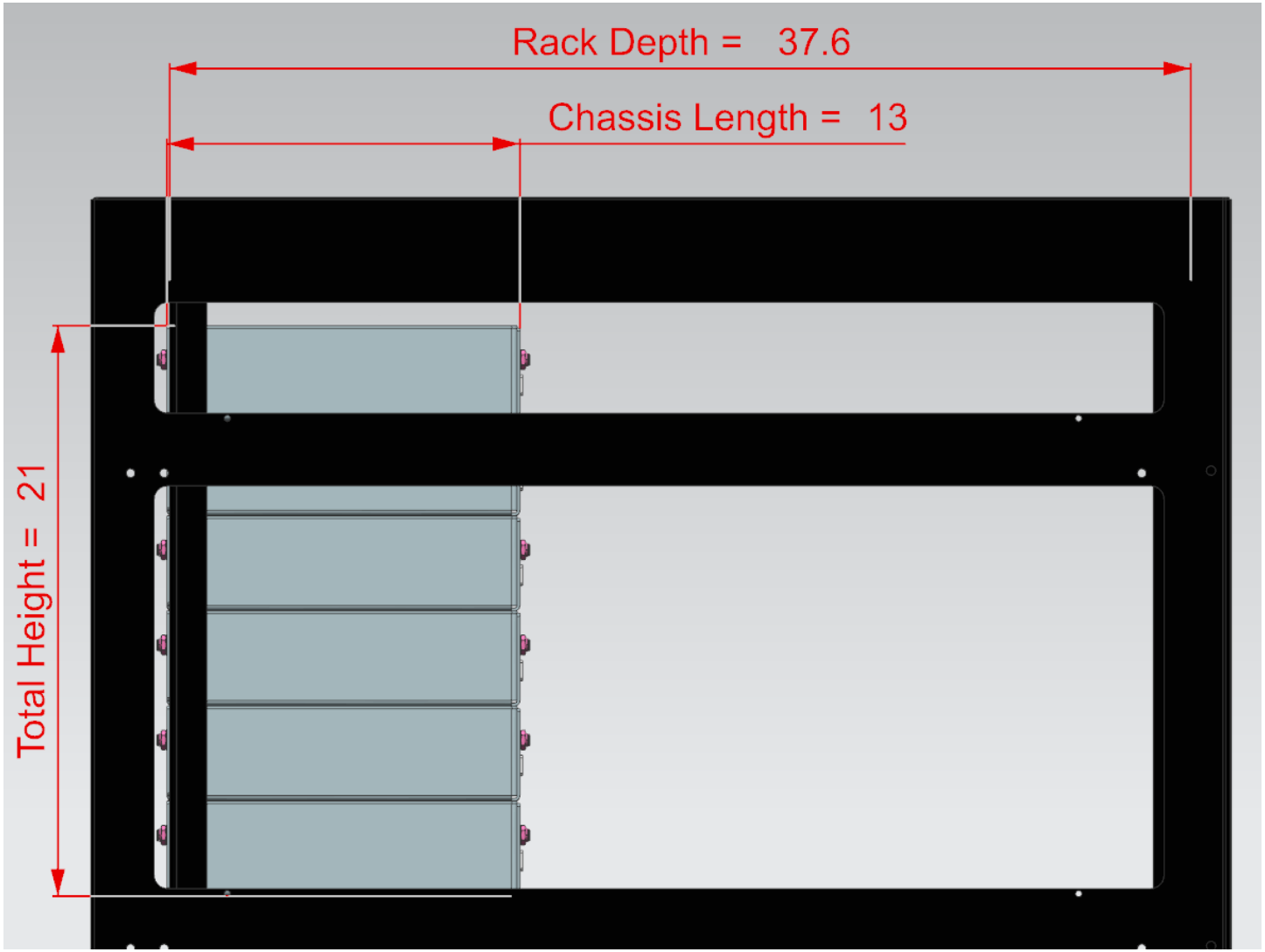


NOTE: Actual chassis will include service loops in controls cabling to allow easier removal of PCBs

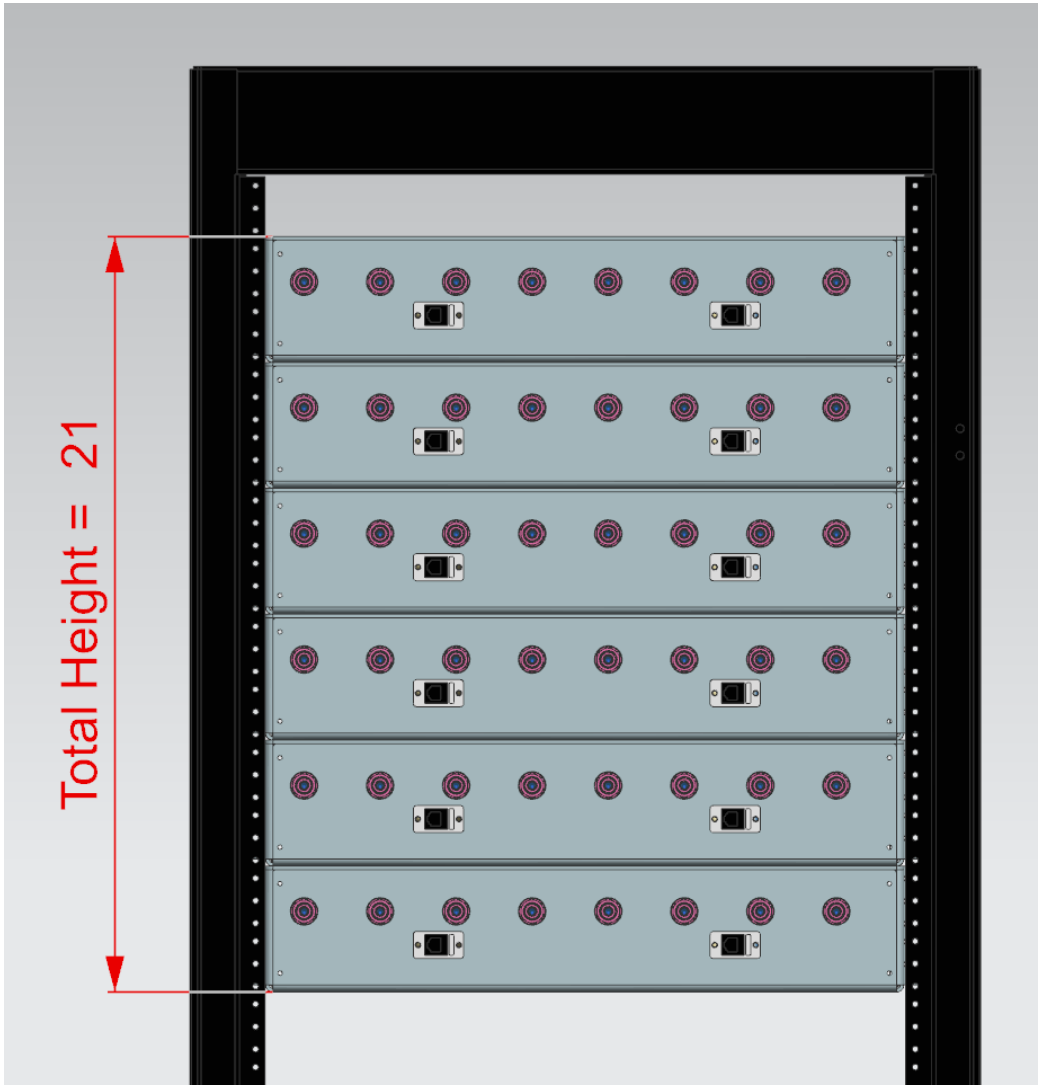
Rack-Mounted – Isometric



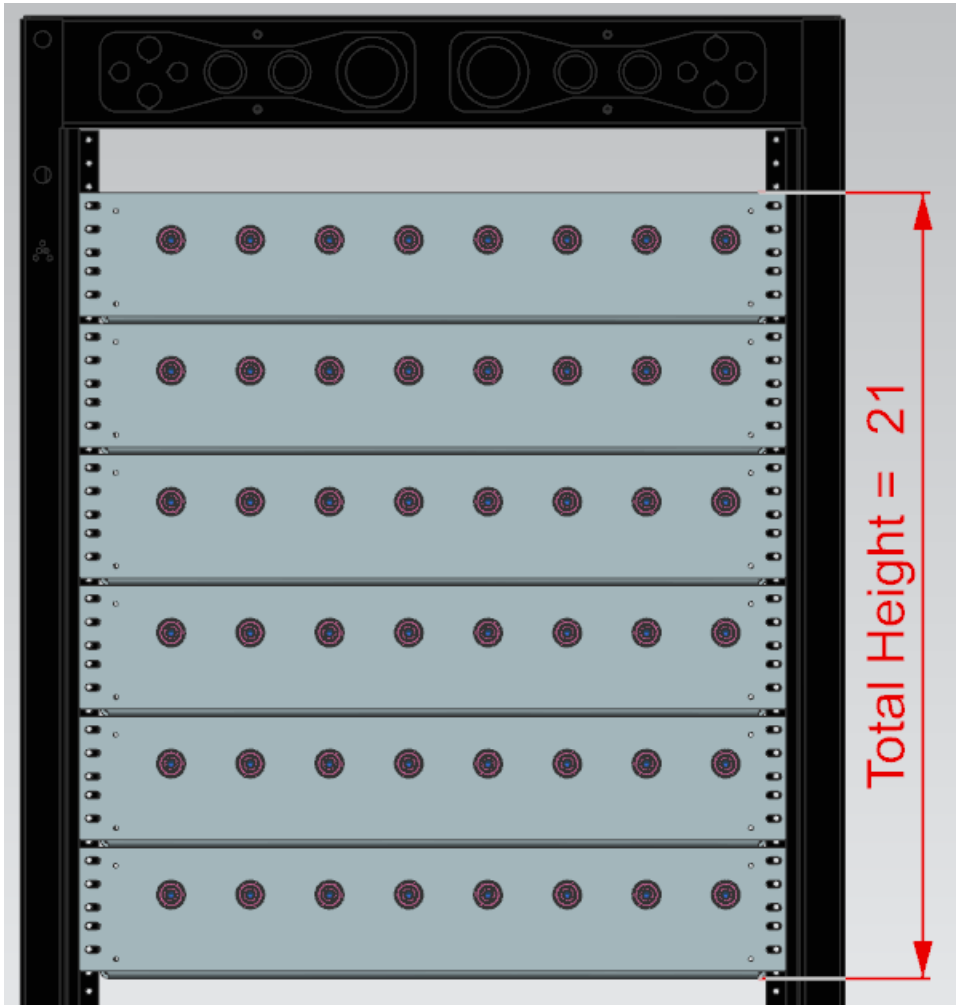
Rack-Mounted – Left



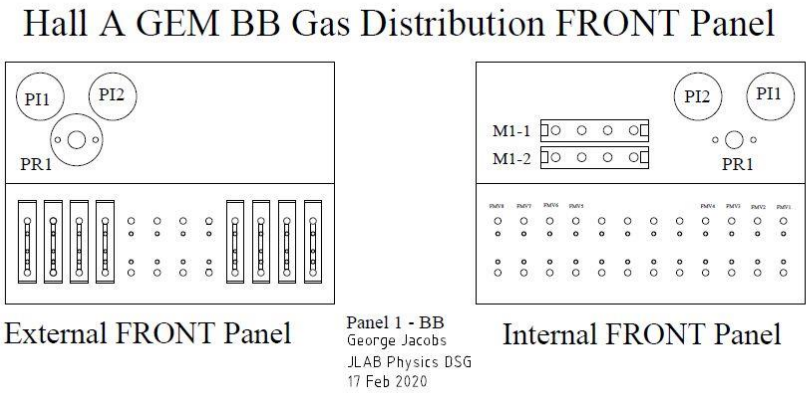
Rack-Mounted – Front

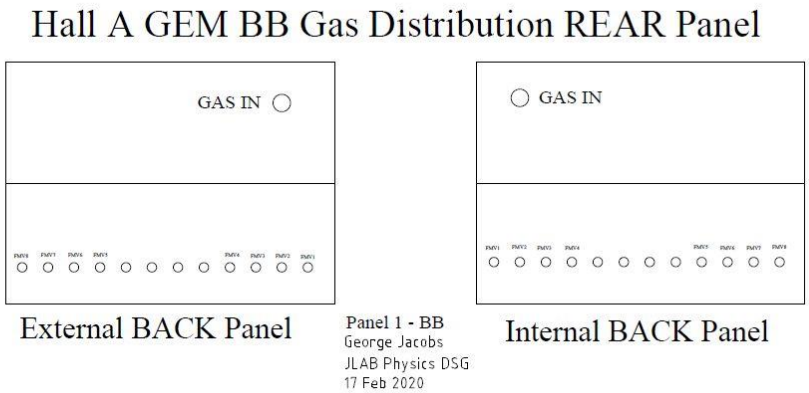


Rack-Mounted – Back



DSG BigBite Gas Panel Design





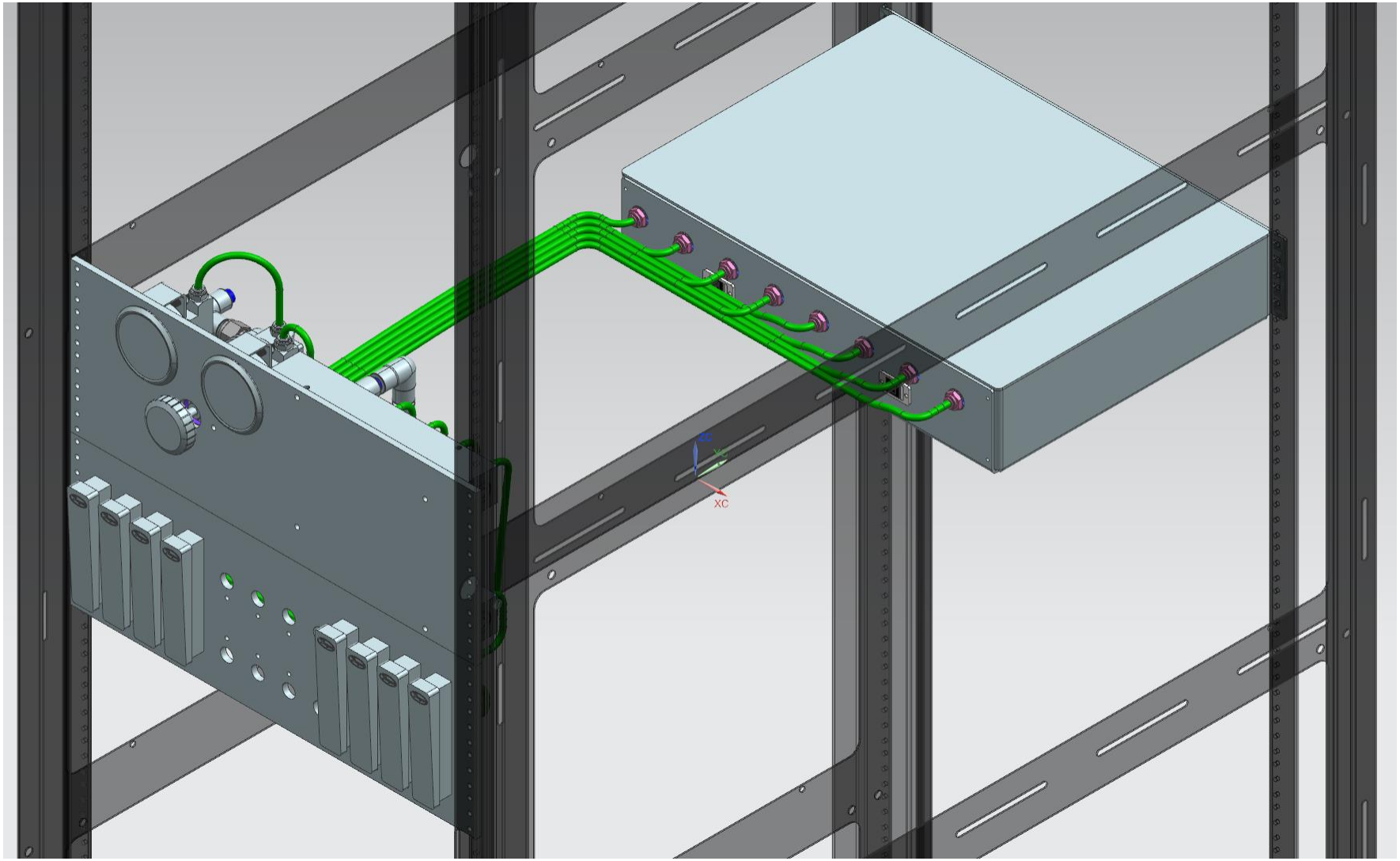
- Pressure regulator and manual flow control valves on the front panel
- Single ½" input gas line into the upper rear panel
- Controls flow for 8, ¼" gas lines with room for expansion

Marc McMullen
Detector Support Group
July 29, 2020

[See G. Jacobs talk on GEM gas distribution]

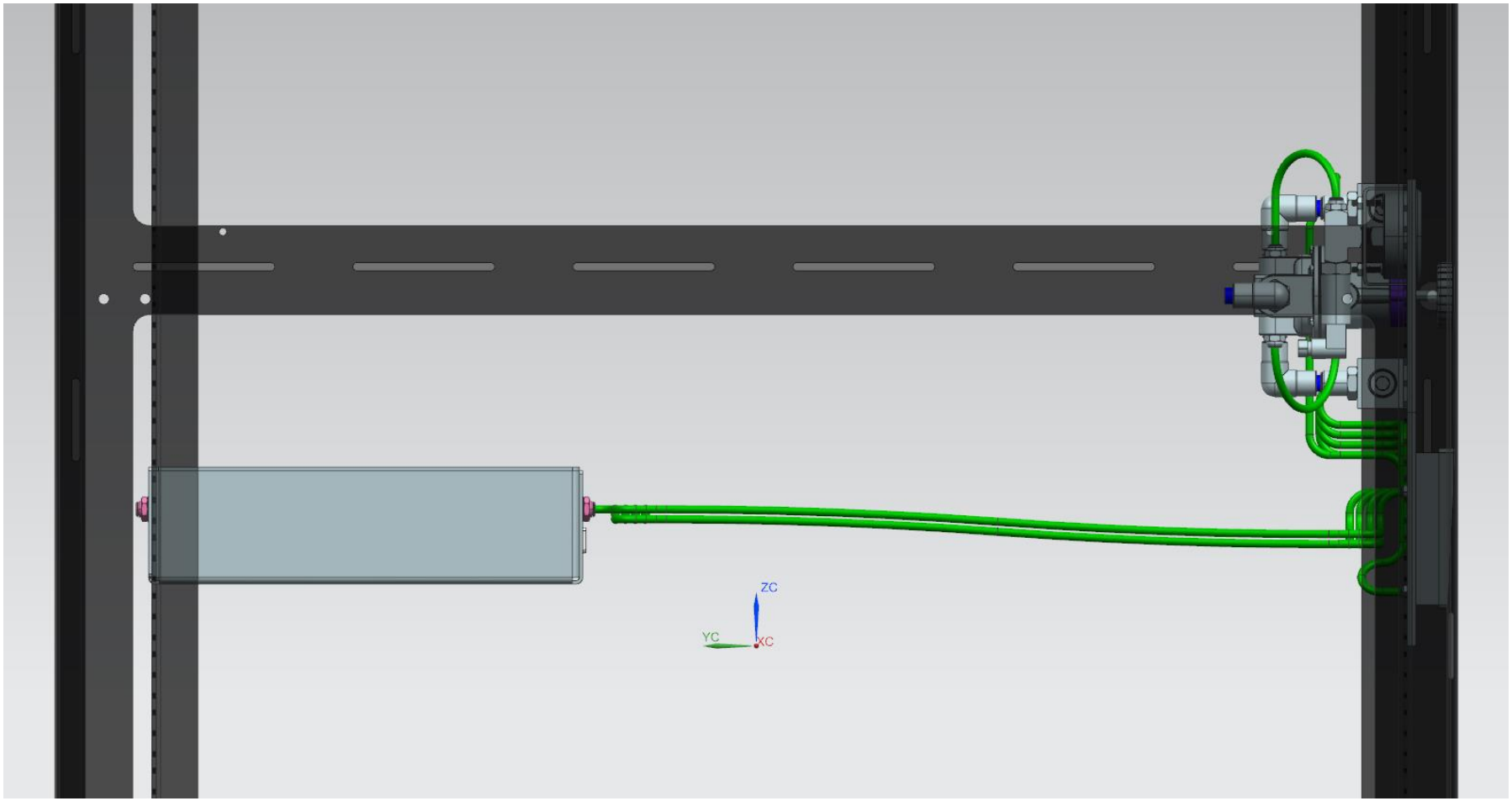
[See M. McMullen talk on GEM gas distribution]

BigBite Gas Panel – Isometric



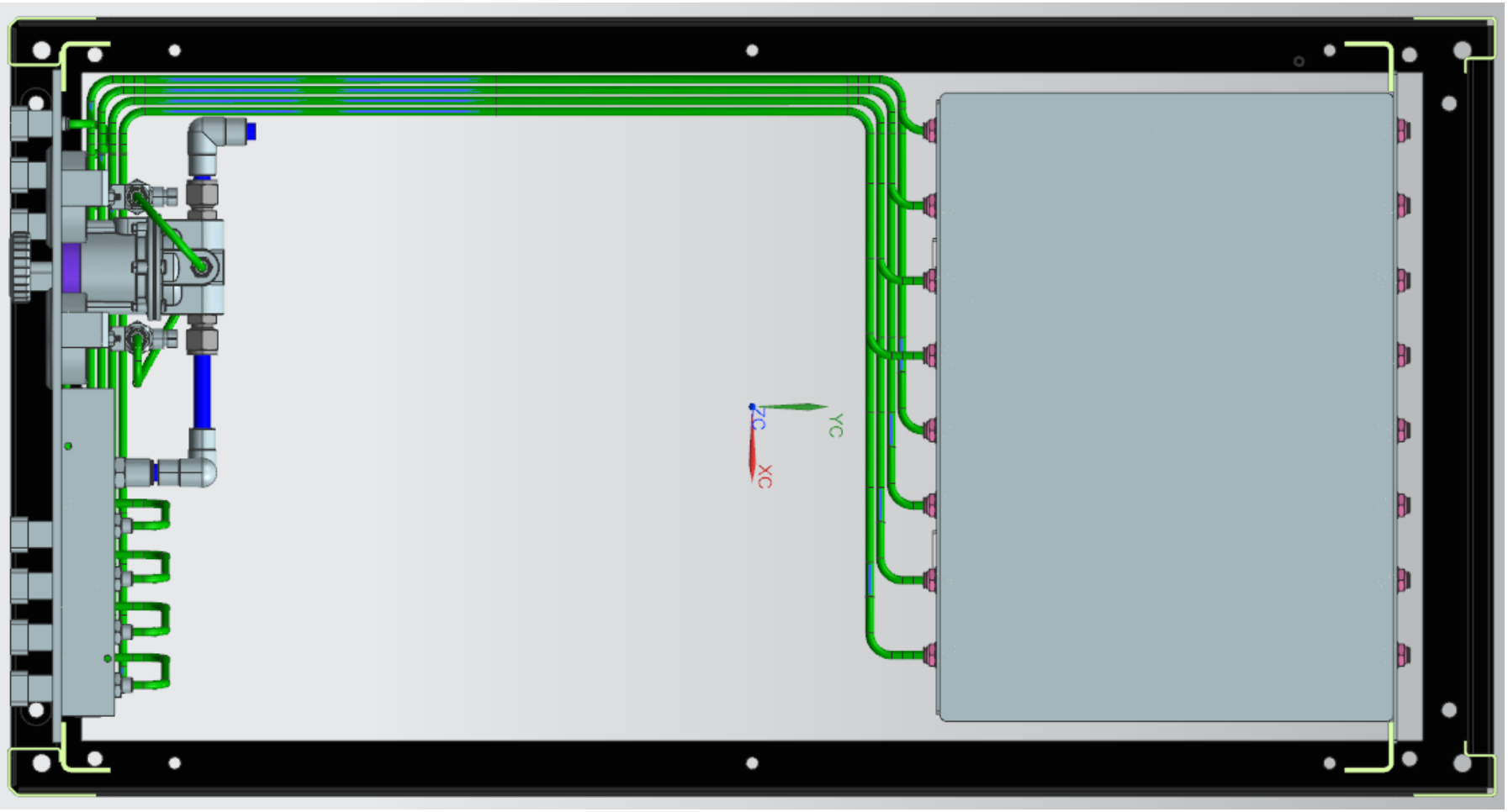
NOTE: Actual panel will include service loops in gas lines cabling to allow easier removal of chassis

BigBite Gas Panel – Left



NOTE: Actual panel will include service loops in gas lines cabling to allow easier removal of chassis

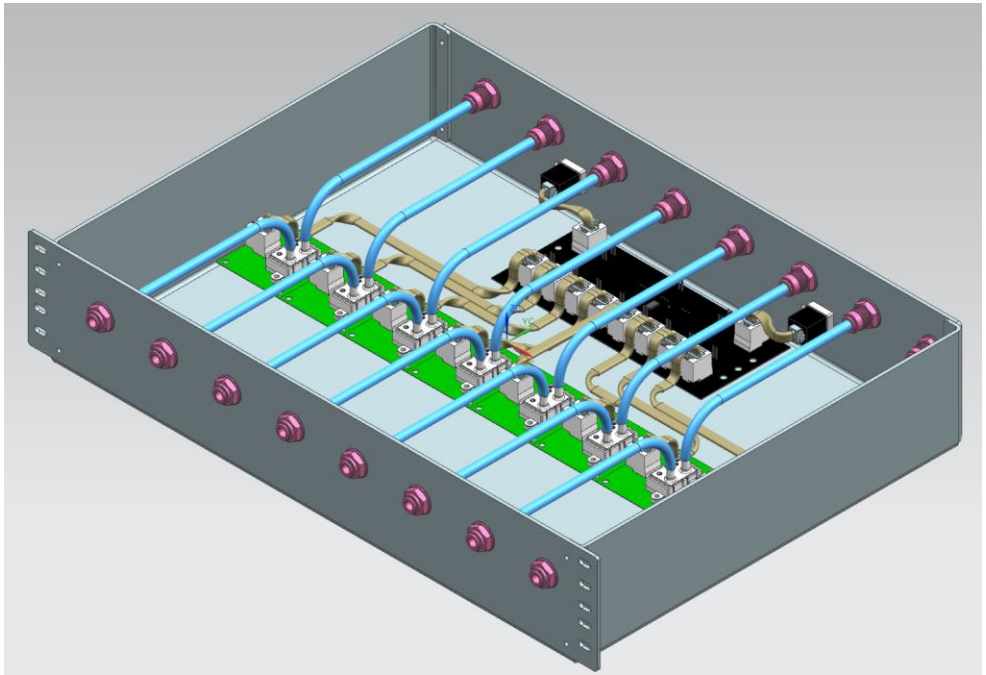
BigBite Gas Panel – Top



NOTE: Actual panel will include service loops in gas lines cabling to allow easier removal of chassis

Conclusion

- DSG has designed a rack-mountable chassis to house eight flow sensors and a multiplexer for Hall A GEM Gas distribution
  - Flow sensor PCBs and multiplexer PCB also designed by DSG



Thank You