Displays designed

ECLS Sum

Smoke

Cabin	1.3	Payload	A↑ B
L Flt Dk	0.0	R Flt Dk	-0.1
Av Bay 1	2.4↑	Av Bay 1	2.3↑
Av Bay 2	-0.1	Av Bay 2	0.3
Av Bay 3	0.0	Av Bay 3	0.2

Atmospher

Cabin P	14.70		
dP/dt HW	-.20↓	BU	-.00
dP/dt Equiv	.00		
% 02	22.2		
pp02 A	3.26	B 0.00↓	C 3.26

	1	2
PCS 02 Flow	0.0	0.0
N2 Flow	5.0H	0.0
N2 Qty	131	131

Fans

Av Bay	1	2	3
Fan Sw	AB	AB	AB
Temp	95	90	80
Fan ΔP	3.34	3.36	4.20

IMU Fan ABC ΔP 4.44

Cab Fan AB ΔP 6.00

HX Out T 67

Water Loop

	1	2
Pump Sw	Off/B	On
Accum Qty %	45	55
Pump Out P	29	63
Out T	89	66
ΔP	0	39
Ich Flow	4	958
Out T	39	43
Cab HX In T	39	43

Freon Loop

	1	2
Pump Sw	B	B
Accum Qty %	32	32
Freon Flow	2165	2165
PL HX Flow	286	286
Aft CP Flow	277	277
Rad In T	113	105
Rad Out T	44	43
Isol Vlv	Rad	Isol
NH3 Pressure	140	250
Evap Out T	30↓	30↓

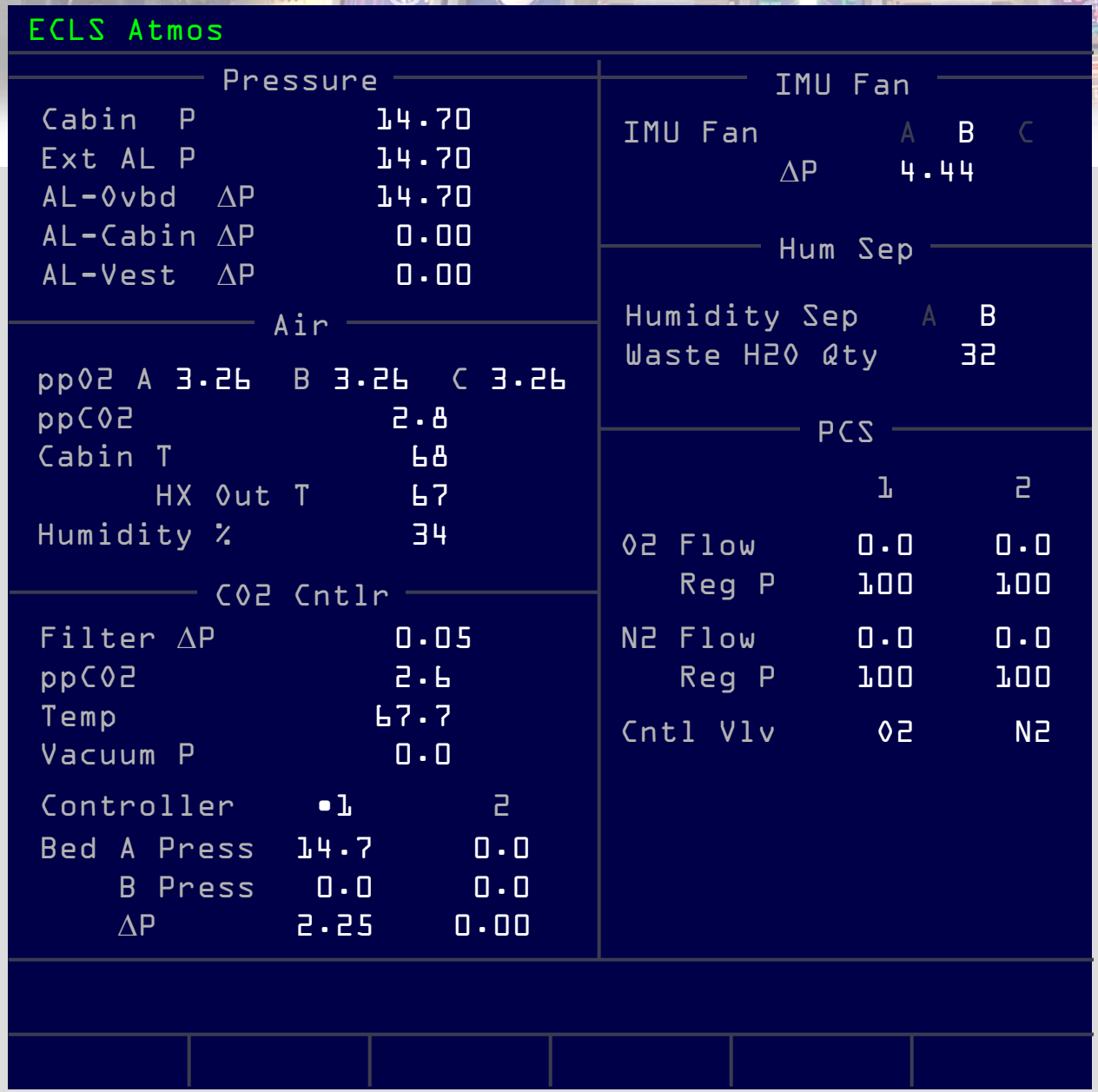
This shows the Orbit version of the display (more data shown for Atmosphere, Water Loop, Freon Loop) with some malfunctions. The data that was hidden is not needed for any AESP, APCL, EPCL, ASC, ENT, or ORB OPS procedures.

New FDA Class 1 indication: red background with white letters (cabin leak and smoke)

SMOKE
- Av bay 1 has a real fire, av bay 3 has a false fire, Payload A has indications

ATMOSPHERE
- Hardware dP/dt sensor failed, false indication of cabin leak
- PPO2 B is failed
- N2 flow sys 1 sensor OSH

FREON LOOP
- Rad isolation valve 2 has tripped
- Evap Out T Low caused by NH3 leak



There are six main sections.

Co-location and/or better arrangement of data that was formerly spread out over several displays. Some data hidden based on C-load values.

PRESSURE
- AL-Vest DP is blanked if no vestibule

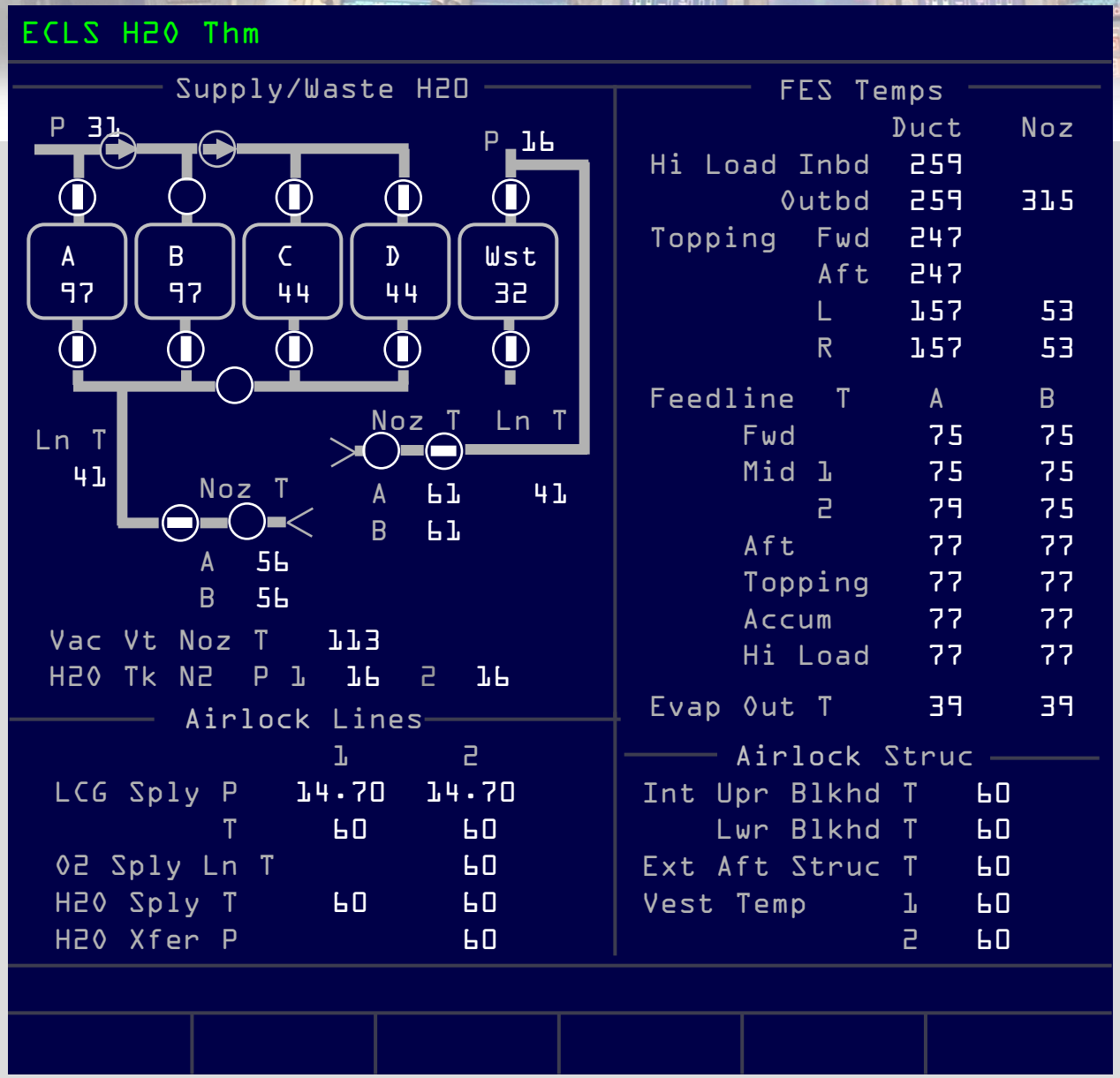
AIR
- New Humidity value - “weather report”

CO2 CNTLR
- Will be blank if not installed

IMU FAN
- Added fan switch settings

HUM SEP
- Added fan switch settings
- Waste H2O qty needed for some mal procedures

PCS
- O2/N2 system



There are four main sections.

Co-location and/or better arrangement of data that was formerly spread out over several displays. Some data hidden based on C-load values.

SUPPLY/WASTE H2O

- Graphic shows H2O system layout
- Valves shown as either OP or “not OP” (open circle) due to telemetry limitations

FES TEMPS

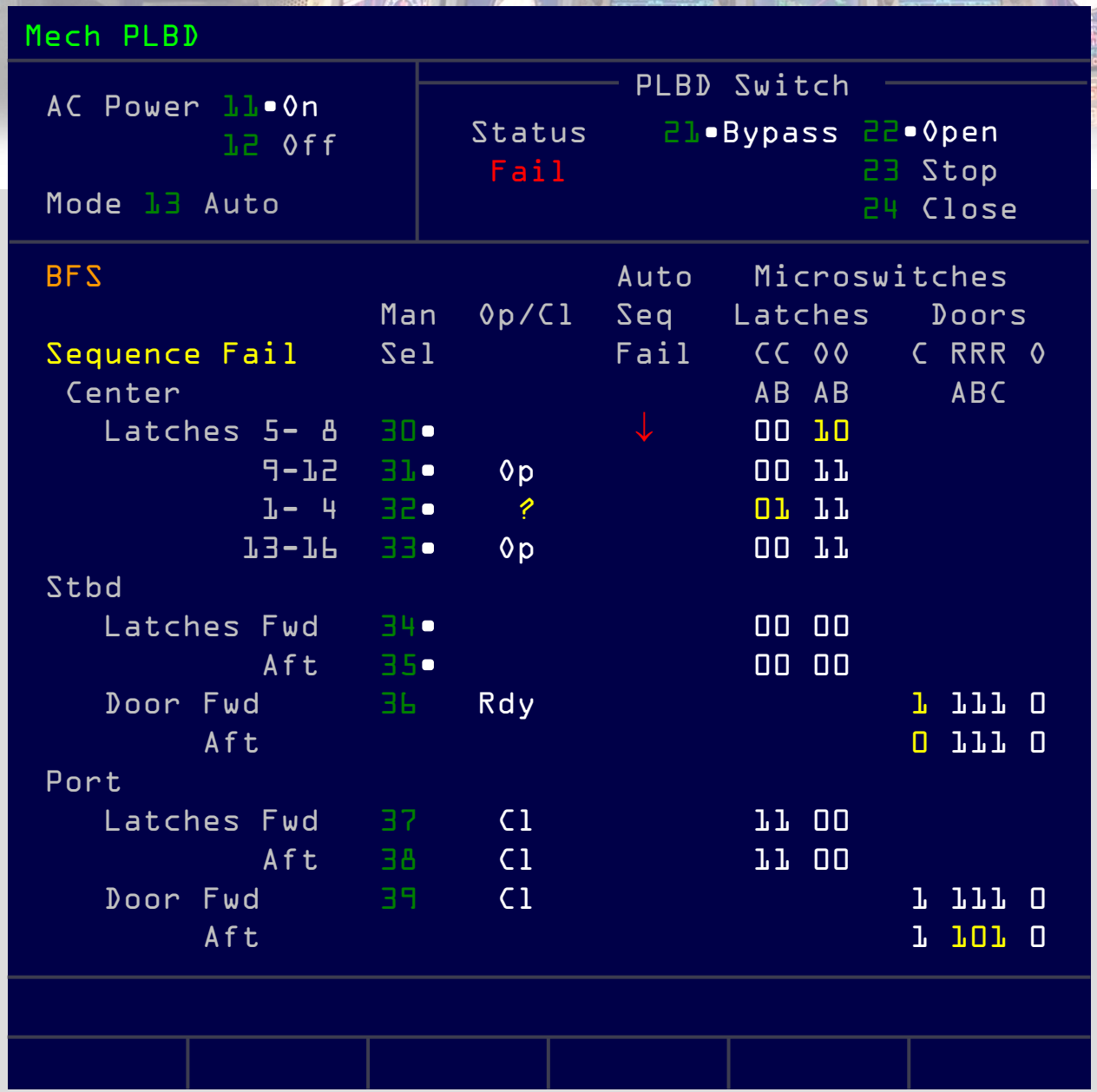
- Only used in FES troubleshooting

AIRLOCK LINES

- For O2, H2O transfer between shuttle and airlock

AIRLOCK STRUC

- Bulkhead and structure temps
- Vest temps will be blanked if vestibule not installed

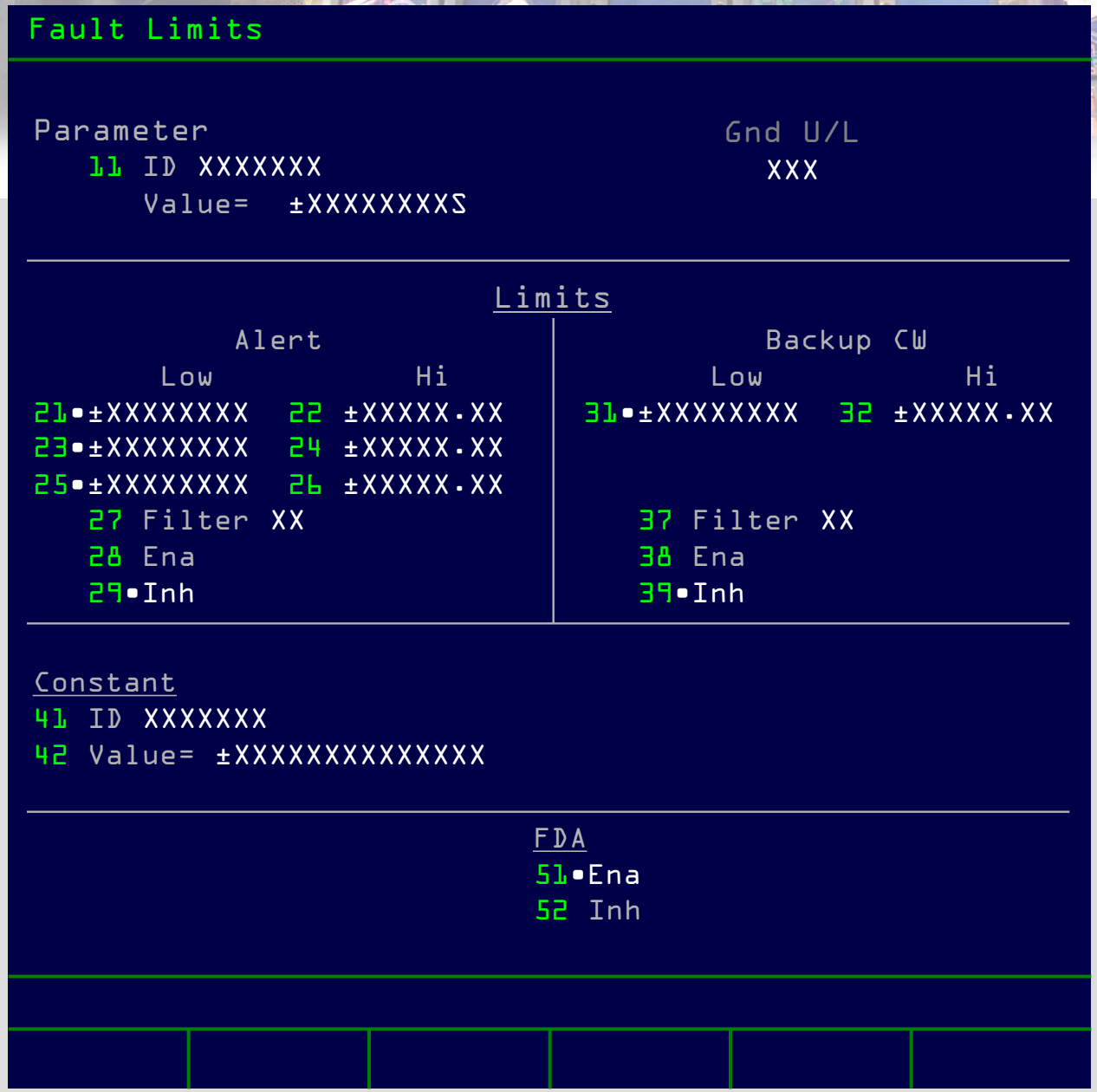


Used for opening and closing the Payload Bay Doors. Combines of BFS SM Spec 63 and PASS SM OPS 202

Better arrangement of data and fields
- gathered all switch data in one location (was some at top, some at bottom of page)
- extra blank space between CL, OP, and RDY m/s for easier reading
- moved door m/s to separate lines for easier reading (was on line with latches)
- add color to switch status, auto sequence fail, OP/CL dilemma statuses

Added info fields
- BFS - crews need info whether BFS or PASS SM software in use
- Config Fail, Sequence Fail - new displays no longer have a fault line (all msgs go to Fault Sum display)

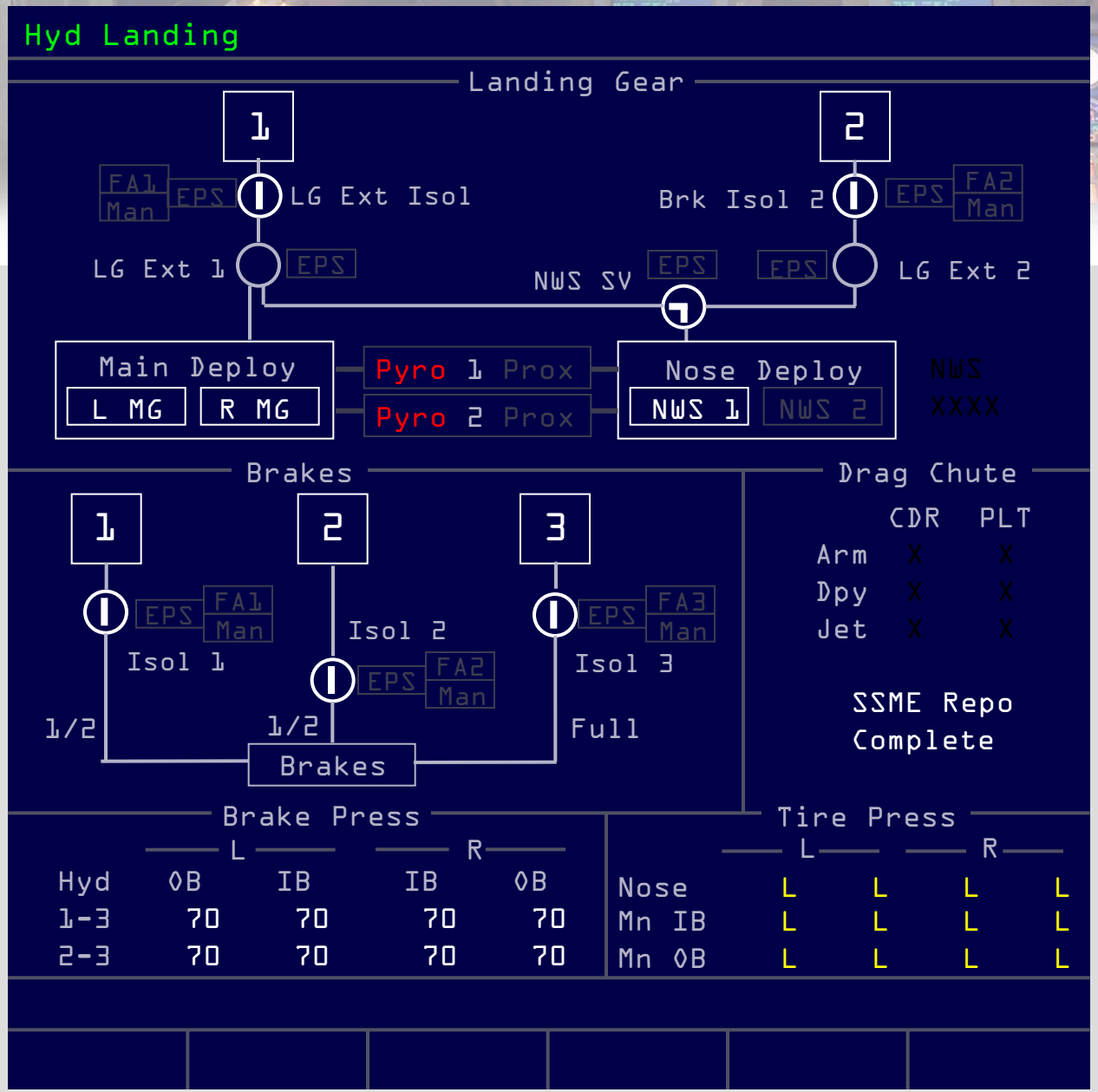
Mismatched microswitch pairs or triplets turn yellow to bring to crew's attention



Identical to current SPEC 60 except:

- Checkpoint commands moved to DPS displays
- Comm buffer info moved to Comm displays

Used for changing Class 2 (Backup CW - Master Alarm) and Class 3 (SM Alert) limits



New display shows schematic of landing gear and brakes systems, plus other data relevant to landing:

- APU status
- Valve status (open or not open)
- Landing gear pyros and prox boxes
- Gear up/down status
- NWS selection
- Drag chute status
- SSME Repositioning, NWS

Fail status lights duplicate hardware

EPS bus loss logic

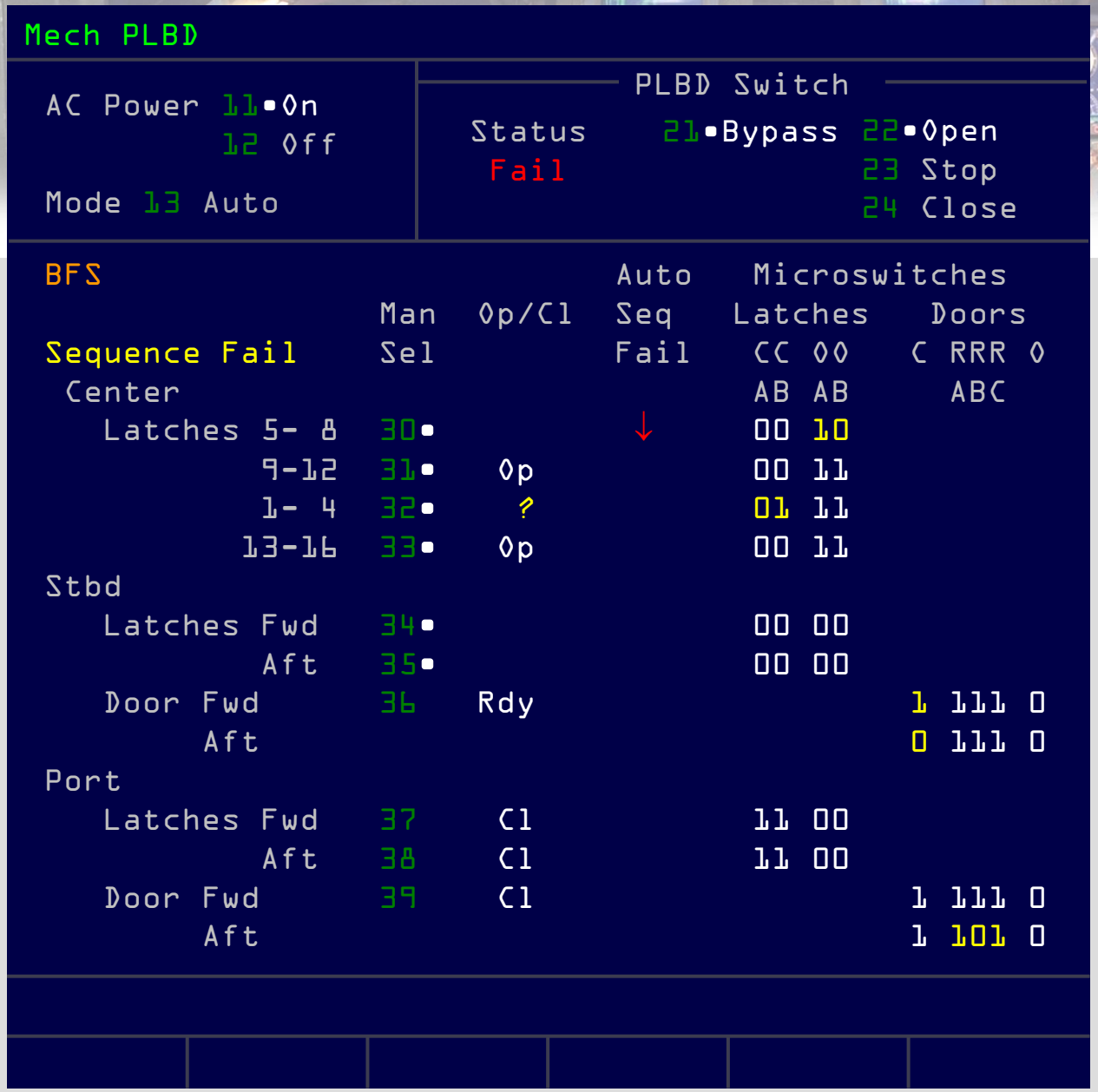
- Valves have fail flags next to them for EPS (valve is failed present position), FA# (GPC command to valve won't work), MAN (switch won't work)
- Pyros, prox box, drag chute, NWS status (red = failed)

Mech PL Ret

	Latch 1 AB	2 AB	3 AB	4 AB	5 AB
PL Sel 1					
Latched	11	11	10	11	00
Rdy-for-Lat	11	11	11	11	00
Released	00	00	00	00	00
PL Sel 2					
Latched	00	00	00	00	00
Rdy-for-Lat	00	00	00	00	00
Released	00	00	00	00	00
PL Sel 3					
Latched	00	00	00	00	00
Rdy-for-Lat	00	00	00	00	00
Released	00	00	00	00	00

Better arrangement of data (latch/release formerly on same line to save space, etc.)

Mismatched microswitch pairs turn yellow to bring to crew's attention



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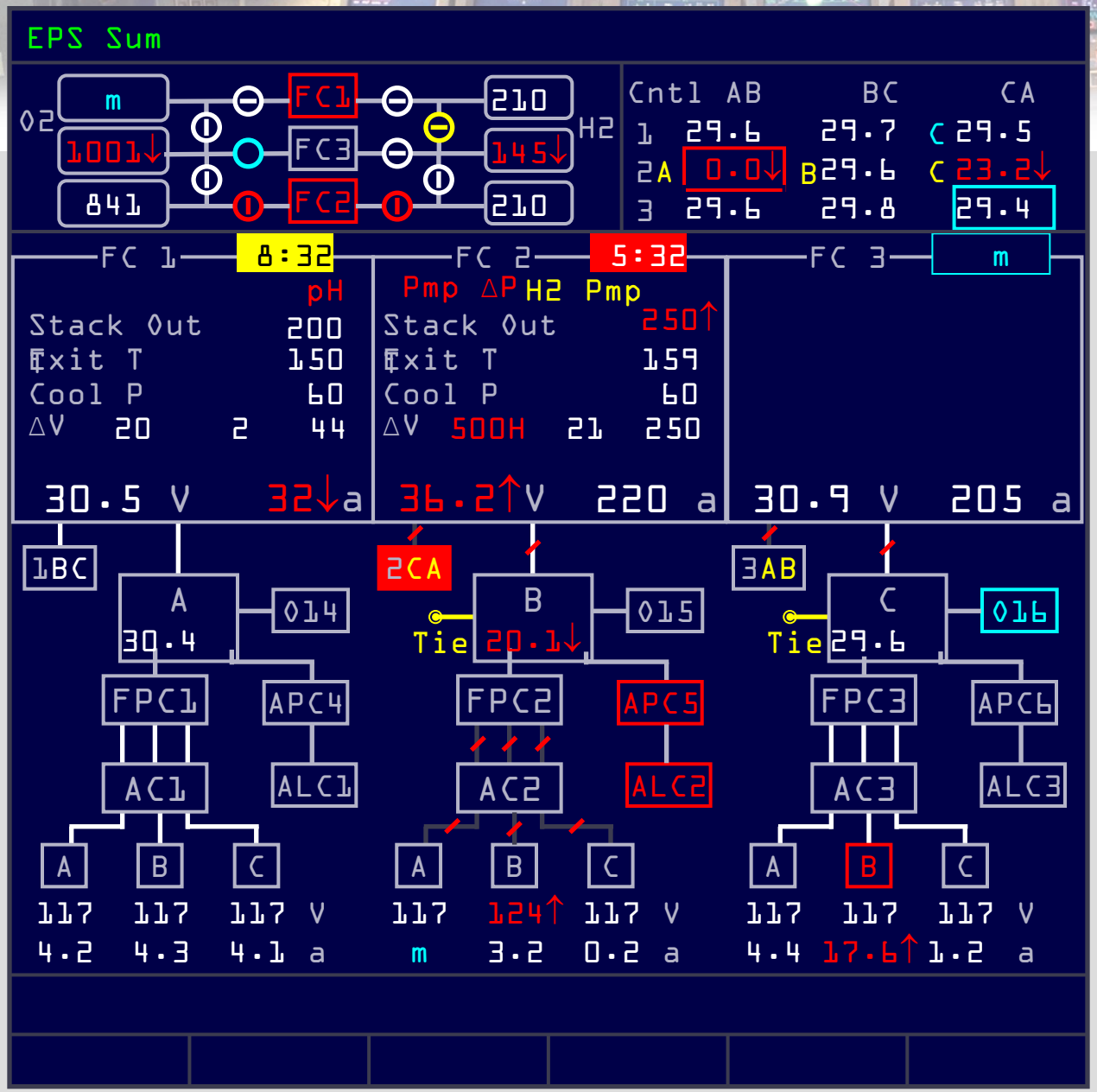
Displays co-designed

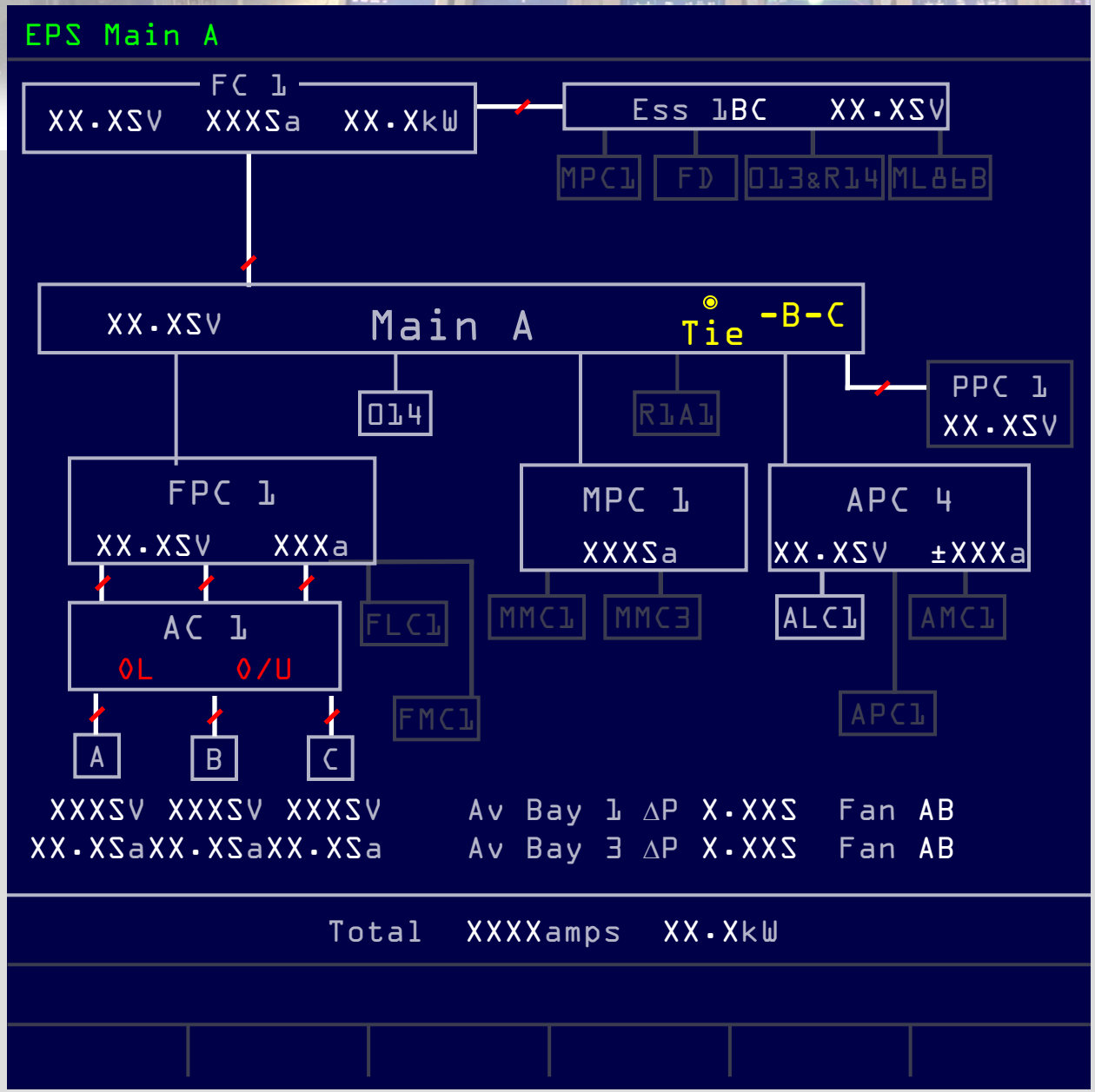


Cryo section:
• status of fuel cells, reac valves, manifold valves, tank pressures

Control bus:
• RPC status
• box around bus shows Bus Loss Logic status (red = failed, cyan = missing data prevents accurate determination)

Fuel cell:
• dynamic countdown timer (running in background) based on same calcs as MCC uses on console, tells crew how long they have to shut down FC (yellow -> red -> flashing red)
• if anything inside the box goes out of limits, all data appears (except for pump/pH), otherwise blank

Buses:
• lost bus turns red
• connection TLM is white (nominal) or red slash (disconnected), no TLM is gray
• yellow bus tie status



Box color:
- lt gray = status OK
- red = bus lost
- cyan = bus loss logic can't tell
- dk gray = info only - no bus loss logic, placeholder for future (INCR 2)

Connection lines:
- white = TLM shows connected
- dk gray w/red slash = TLM shows disconnected
- cyan = TLM missing
- lt gray = no TLM
- dk gray = connect to bus w/o logic (bus ID not supported yet)

Essential bus:
- yellow letter = tripped RPC

Bus Tie status
- "Tie" = this bus
- -A, -B, -C = other bus

EDO
- Pallet bus info when installed

Total power
- total amps, kW for all 3 fuel cells

- AC bus overload, over/undervolt indications

- Av bay fan info for 3-phase motor stop mals

Fu Cell

	1	2	3
Power	7.7	5.6	6.6
Voltage	30.2	30.2	30.4
Current	254	186	218
Δamps	68	-32	-36
Stk Out T	204	199	205
In T	180	179	180
Exit T	154	151	150
Cool Press	60	60	60
Pump			ΔP
H2 Pump	0.6	m	0.5
Ready	Yes	Yes	No
O2 Flow	0.0↓	4.1	4.1
Reac	Cl		
H2 Flow	-0.2↓	0.2	0.2
Reac	Cl		

Total

Current 658 Power 19.9

ΔV		1	2	3
	SS1	20	40	20
	SS2	500H	2	12
	SS3	18	168↑	20

H2O

FC pH ↑

Common H2O Ln pH ↑

Pri Ln T	140	m	140
Alt Ln T	78	82	76
Rlf Vlv T	75	80	90

Line T 77

Noz T A 204 B 197

Htr Sw Off

Purge

Ln O2 T 76

H2 T1 84 T2 73

FC2

Pump Loss Timer

FC1	FC2	FC3
11 Ena	12 Inh	13 Ena
:48		5:22

Co-location and/or better arrangement of data that was formerly spread out over several displays (SM SYS SUM 1 & 2, SPEC 69

Add FC power (kW), stack in T

Pump loss timer
- Tells crew how long they have to shut down FC
- Same comps as used in MCC, based on current state (pumps, temps, etc.), always running in background
- Yellow if > 5:00, red if < 5:00, flashing red if < 1:00
- Item entry to enable/disable timer (sensor failures will trick it)

EPS Cryo

O2 Tk		1	2	3	4	5	6	7	8	9
Manf	P	870	870							
	Vlv	Cl	Op							
Cntl	P	1000	1000	850	m	870	870	870	870	870
Tk	P	1000	1000↑	850	860	870	870	870	870	870
Qty	%	95	95	95	95	95	95	95	95	95
Fluid	T	-282	-268	-268	-282	-282	-282	-282	-282	-282
Htr	T1	-282	-268	-268	-282	-282	-282	-282	-282	-282
	T2	-282	-268	-268	-282	-282	-282	-282	-282	-282

Htr	Cur	Snsr	Trip
1	A/B	/	/	/	A/	m/m	/	/	/
2	A/B	/	/	/	/	/	/	/B	/

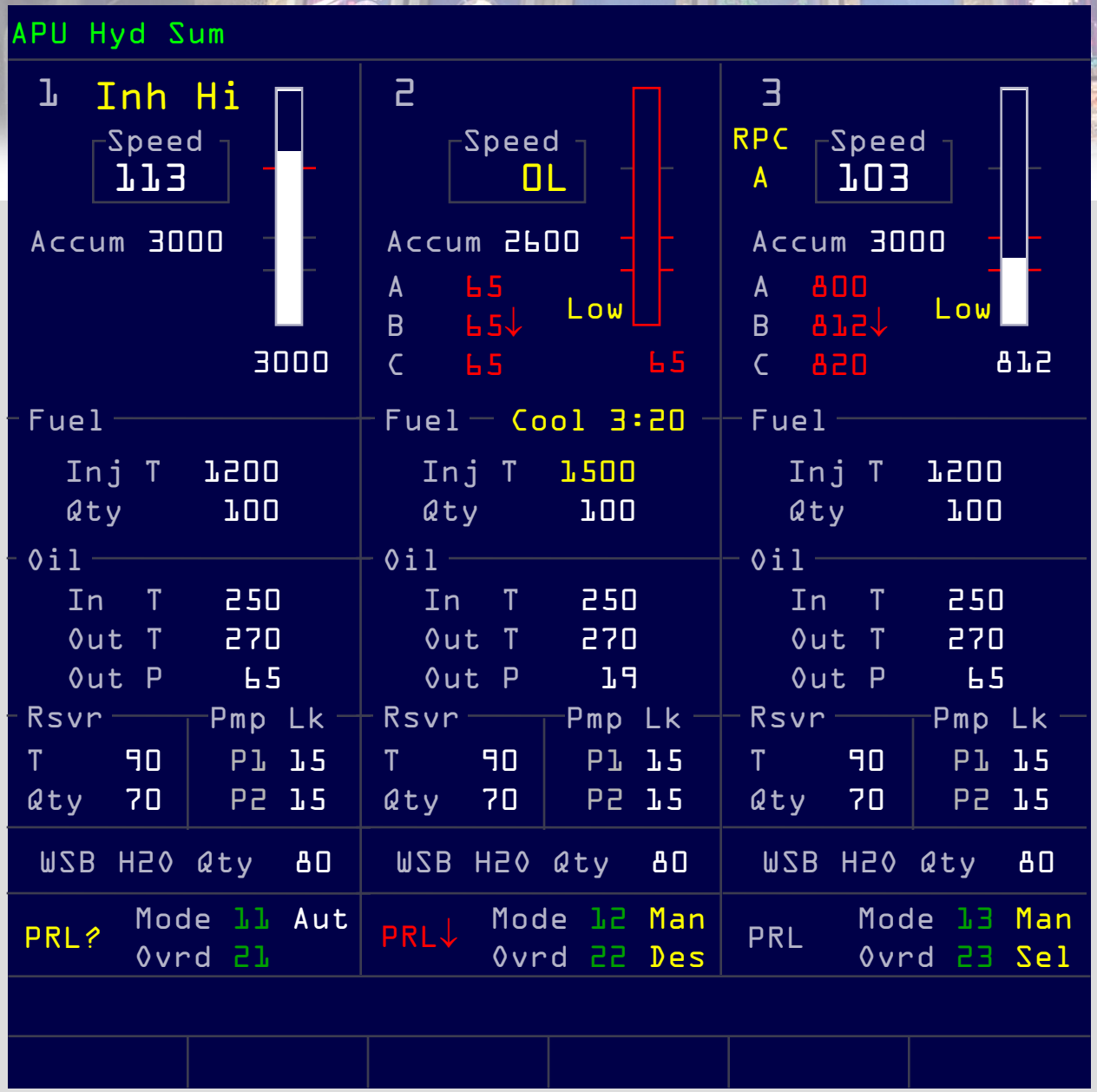
H2 Tk		1	2	3	4	5	6	7	8	9
Manf	P	260	260							
	Vlv	Cl	Op							
Cntl	P	260	260	145L	260	260	260	260	260	260
Tk	P	260	260	260	260	260	260	260	260	260
Qty	%	95	95	95	95	95	95	95	95	95
Fluid	T	-400	-400	-400	-400	-400	-400	-400	-400	-400
Htr	T	-400	-400	-400	-400	-400	-400	-400	-400	-400

EDO Pallet Strc T					
Stbd	A	20	B	20	
Port	A	20	B	20	

Co-location and/or better arrangement of data that was formerly spread out over several displays (SM SYS SUM 2, SPEC 68, SPEC 168)

Tanks 4-9 are installed on mission-specific basis - field will be blank if not present (C-load)

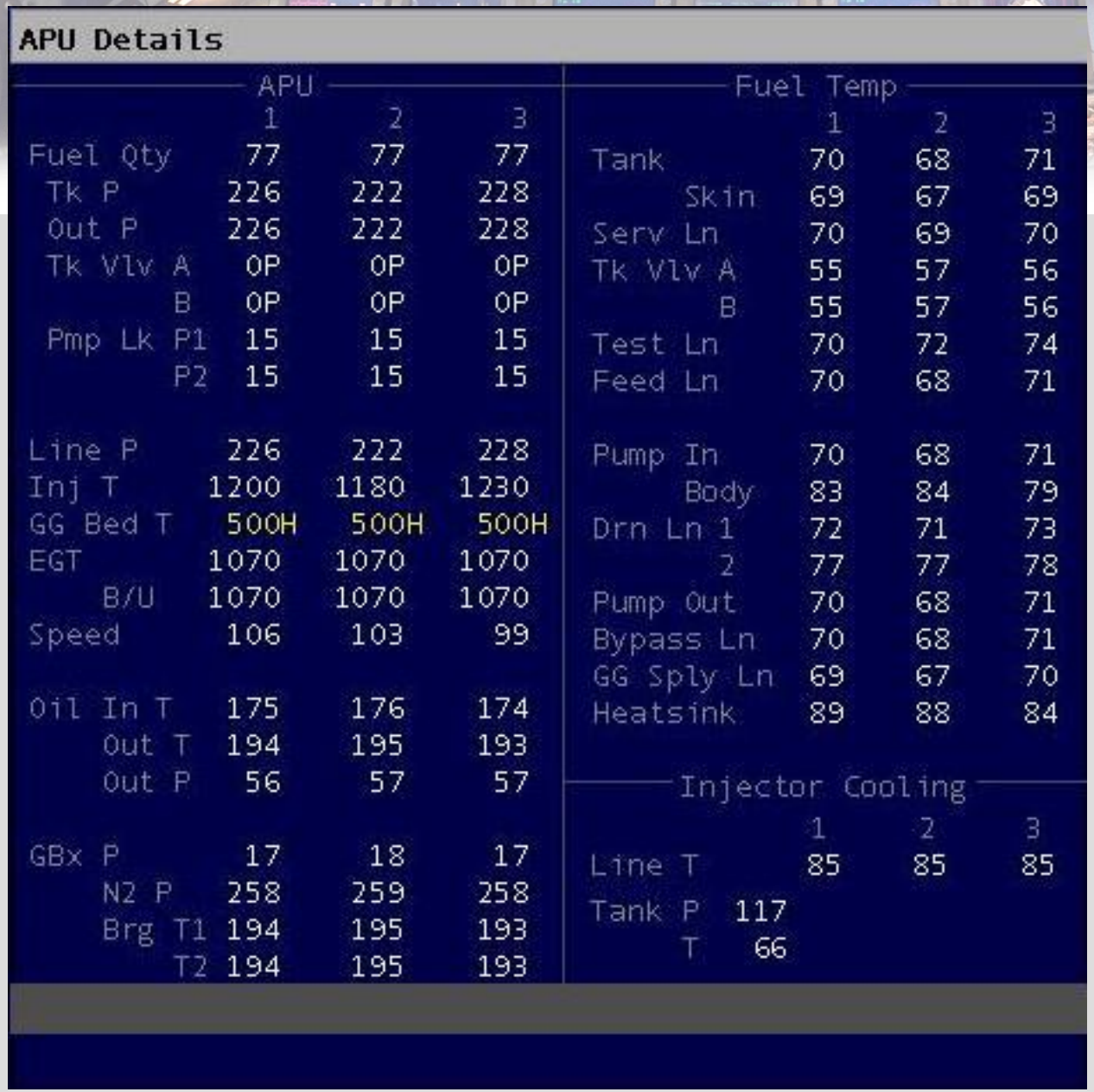
- 4-5 are individual tanks
- 6-9 are EDO pallet
- Pallet structure temps



Co-location and/or better arrangement of data that is formerly spread out over several displays (SM and GNC)

Enhancements over current displays:

- Speed and Auto-Shutdown status shown
- Add Cooldown timer
- Shows all three Hyd P sensors
- Better insight into PRL
- Add second Pump Leak P snsr
- Add APU RPC fail status



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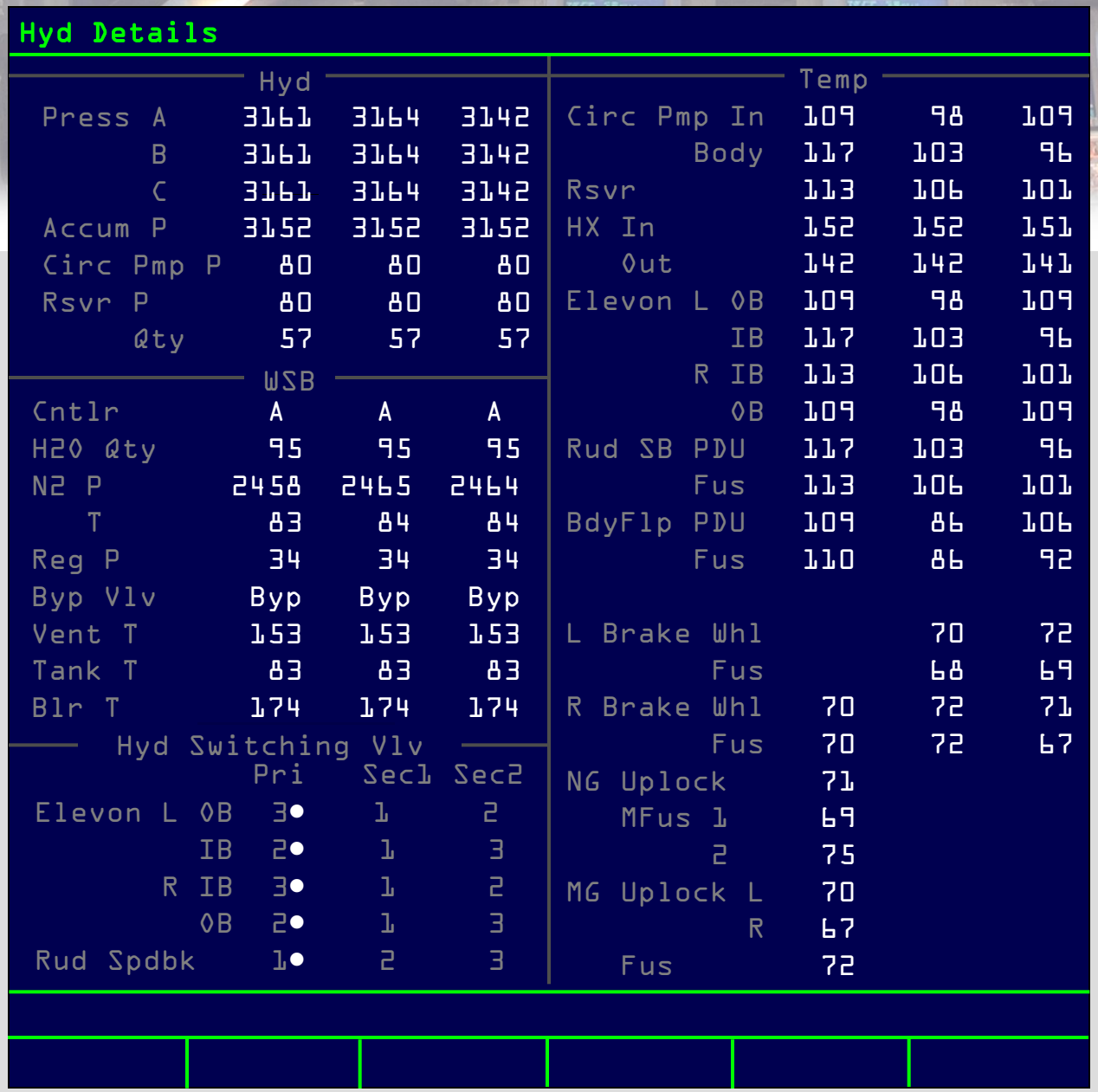

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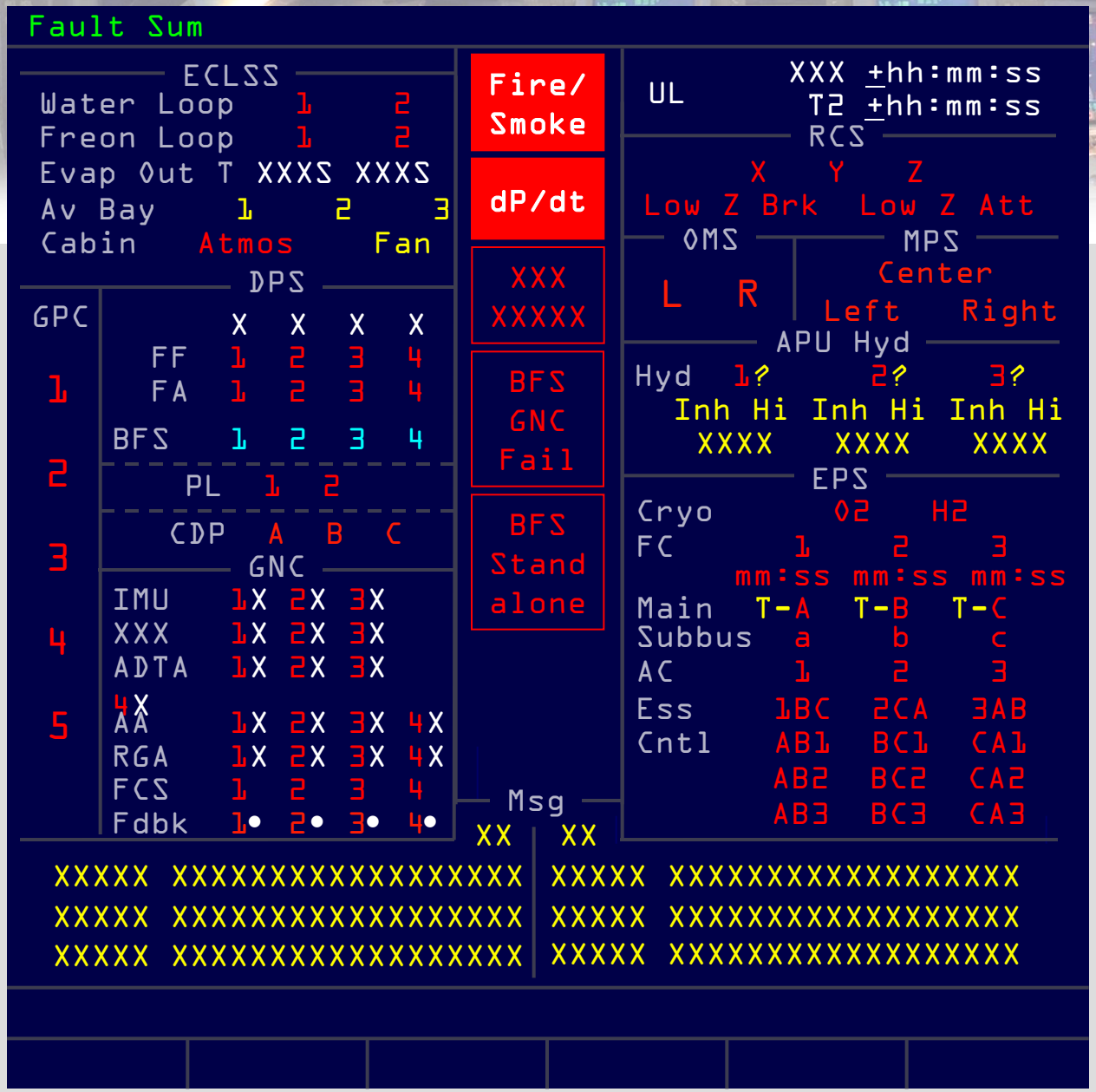

All fields shown

Center column
- Fire/Smoke and dP/dt lights same as on ECLSS SUM display
- other three boxes are DPS (3rd box is “Set Split” or “Non Univ”, 4th box is BFS total fail or just BFS GNC fail)

DPS
- current GPC/MDM/CDP status, strings, BFS tracking

GNC (nav, cntl)
- LRU status (“XXX” = “TAC” or “GPS”)

APU Hyd
- “?” is for PRL status
- “XXXX” is for cooldown timer
- “Inh Hi” is for switch settings

EPS
- Cryo/FC red if any problem
- FC shutdown timers
- bus tie info, bus/subbus status (“a” if FPC1, MPC1, APC4, ALC1, or O14)
- AC, ESS, Cntl if any problems

UL = uplink
T2 = 2nd timer, from TIME display