

THE CLAIM

A module claims *module* plus every feature it has, each behind the panel: PWR-BUS for its power header, PWR-DC12 or PWR-A6, a VID-REF port kind. A picture jack on the front is in the port list (VID-CVBS, VID-YPBPR), not a feature.

EIS draft, module (PWR-BUS-IN)

EIS draft, module (PWR-BUS-IN, VID-REF-IN)

WHAT IT PUBLISHES

FIGURE	ID
<i>Width in HP; depth behind the panel's back face, to its deepest point</i>	PANEL-003
<i>Max current on +12 V, -12 V, +5 V; 0 for a rail not drawn</i>	PWR-001
<i>Port list: a class or unclassified per port, and any range other than the default</i>	SIG-001
<i>Each VID-REF-IN and VID-REF-OUT port's formats, by ID</i>	VID-001
<i>PWR-DC12: entry variant, current at 12 V, input range</i>	DC-001 PWR-001 DC-002

- ☐ Keep the claim line and these figures in one claim file, eis-claim.yaml; *eis claim* checks it.

READ

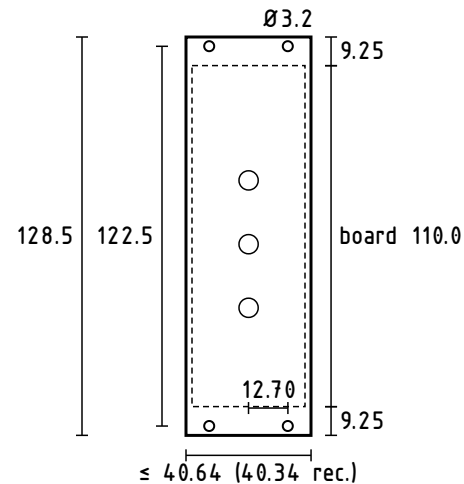
5.2 modules, 6.1–6.8 power, 7.1–7.4 signals and video, 8.1 the USB port. Annexes H, J, K, N, O, Q.1.

READING THIS SHEET

■ shall □ recommended ○ may

IDs omit the EIS- prefix. Italic lines are informative notes. This reference is informative: the clauses and the register govern.

FRONT PANEL · 8 HP 3U



- No more than 2.0 mm thick. PANEL-004
- 5052 aluminum or FR-4, 1.6 to 2.0 mm; the screw window assumes ≥ 1.6 mm.
- An N HP panel is no wider than $N \times 5.08$ mm. PANEL-002
- Make it 0.3 mm narrower, so neighbors do not bind.
- A patch jack is a 3.5 mm mono (TS) socket. PANEL-005
- Dimensions hold within the register's tolerances; one with none stated is a limit. PANEL-013
- Thinner than 1.6 mm: ships with screws that fit the length window. PANEL-014

HEIGHT AND HOLE SPAN

	PANEL	HOLE SPAN	USUAL BOARD
1U	39.65	33.65	21.10
3U	128.50	122.50	110.00

- One HP is 5.08 mm; one rack unit is 44.45 mm. RACK-001 RACK-002
- A module is 1U or 3U high. PANEL-001
- A 3U panel is 128.5 mm high; a 1U panel 39.65 mm. PANEL-006 PANEL-007
- The hole span is the same on the panel and between the row's inserts. PANEL-009

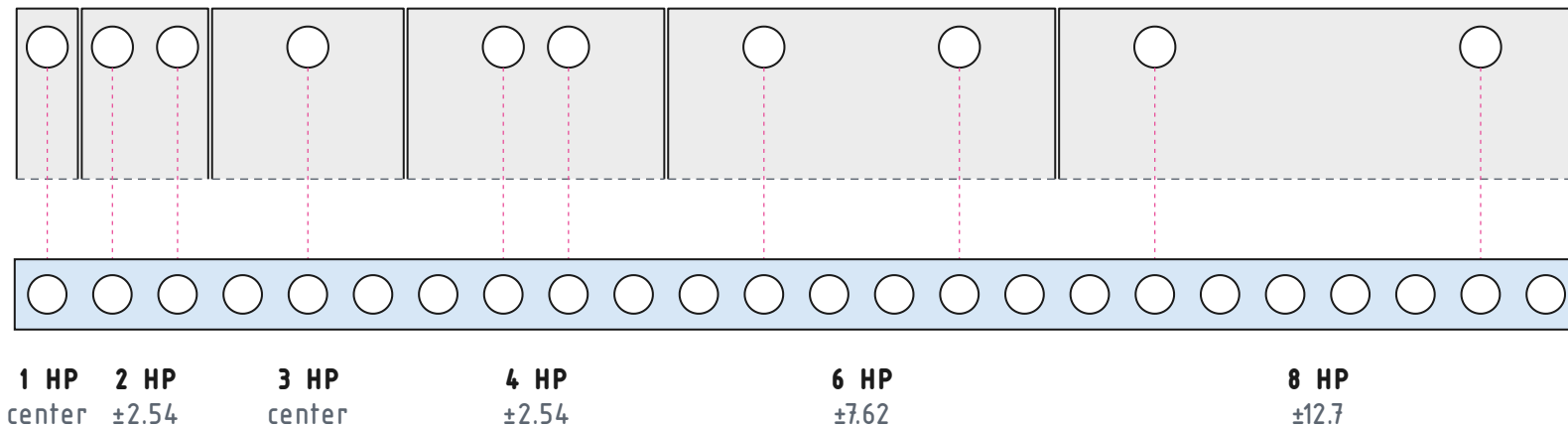
3U is 4.85 mm under three rack units, in the 132.55 ± 0.4 mm aperture; 1U is 4.80 mm under one.

BOARD AND DEPTH

- A board stays ≥ 9.25 mm clear of the top and bottom panel edges. PANEL-012
- The module extends ≤ 50 mm behind the panel's back face, to its deepest point.

A deeper module conforms; its depth is checked against the row's (ENG-001). 94.8 % of surveyed modules are within 50 mm. Hole patterns and board types are on the next two sheets.

EIS · Mounting holes from 1 to 8 HP, over one rail insert



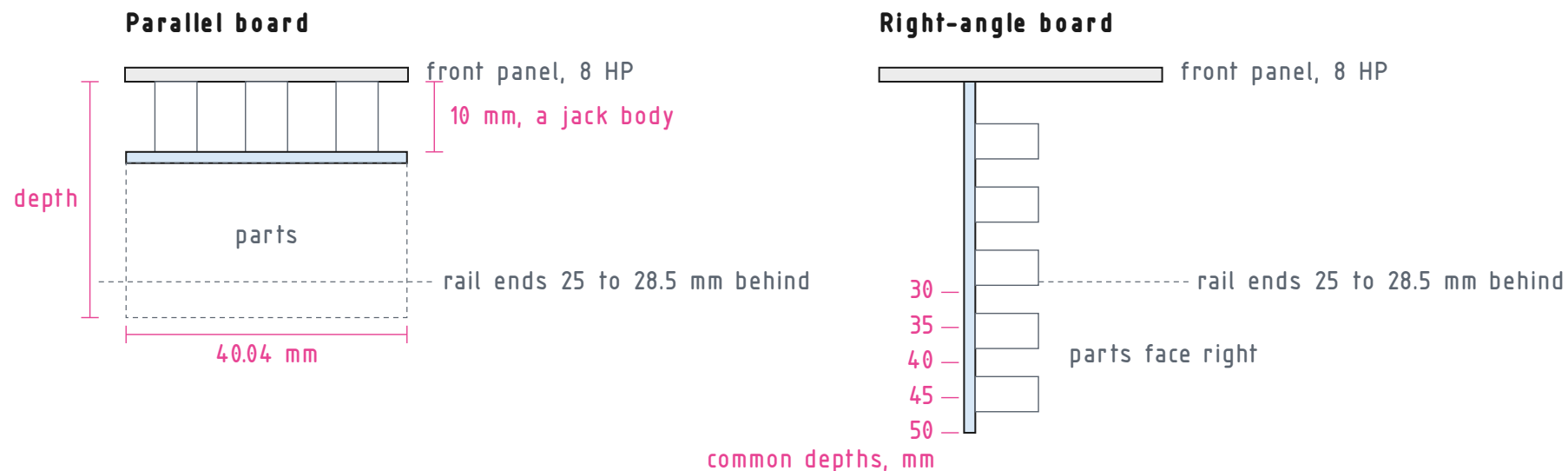
rail insert: a hole every 5.08 mm, 2.54 mm in from each HP boundary

Each hole is a whole number of HP plus 2.54 mm from the panel's nominal left edge (PANEL-011), so it meets an insert hole wherever the panel sits in the row. Holes are drilled $\varnothing 3.2$ mm (PANEL-010) and are 3.0 mm in from the top and bottom edges (PANEL-008).

Under each width: the hole positions from the panel's center, in millimeters. The outer hole is 7.62 mm in from each nominal edge; a 1 HP or a 3 HP panel has one hole on its center, and a 2 HP panel has its holes at ± 2.54 mm.

Hole patterns from 1 to 8 HP over one rail insert (5.2.1).

EIS · Parallel and right-angle boards, seen from above



A parallel board stands about 10 mm behind the panel, the height of a jack body, and is $N \times 5.08 - 0.6$ mm wide. A right-angle board stands on the panel's back with its left edge to the panel. Either way the module publishes how far it reaches behind the panel (PANEL-003); EIS recommends at most 50 mm.

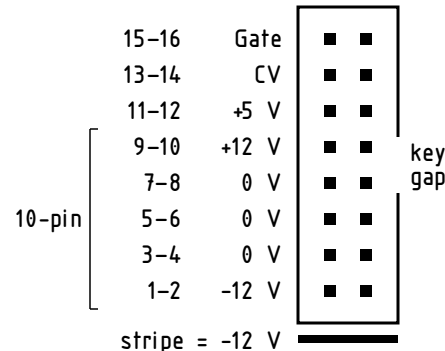
Parallel and right-angle boards seen from above (5.2.2).

WIDTHS, MM

HP	NOMINAL	PANEL	BOARD
1	5.08	4.78	4.48
2	10.16	9.86	9.56
3	15.24	14.94	14.64
4	20.32	20.02	19.72
6	30.48	30.18	29.88
8	40.64	40.34	40.04
10	50.80	50.50	50.20
12	60.96	60.66	60.36
14	71.12	70.82	70.52
16	81.28	80.98	80.68
18	91.44	91.14	90.84
20	101.60	101.30	101.00
24	121.92	121.62	121.32
28	142.24	141.94	141.64
32	162.56	162.26	161.96
42	213.36	213.06	212.76
84	426.72	426.42	426.12

Keep 7.0 mm around each hole for the M3 screw head (RAIL-005, RAIL-010). More than four screws at 3U above 42 / 51 HP (5052, 1.6 / 2.0 mm) or 27 / 33 HP (FR-4): Annex J.

POWER HEADER · FROM THE MATING SIDE



- A 2 × 5 or 2 × 8 pin header on a 2.54 mm grid; a cable ends in IDC sockets that mate it. BUS-002
- Pinout: -12 V on 1-2, 0 V on 3-8, +12 V on 9-10; a 16-pin header adds +5 V on 11-12, CV on 13-14, gate on 15-16. BUS-003
- The marked conductor is -12 V and points to the -12 V end. BUS-004
- The board marks the -12 V end of each power header. BUS-019
- A shrouded header, seen from the mating side with -12 V at the bottom, has its key gap on the right; a keyed socket matches it. BUS-005

Community tables with +12 V on 7-8 and +5 V on 15-16 put +12 V on a module's 0 V pins.

- A bus cable supplied with the module is keyed, the marked conductor on -12 V. BUS-010

The bus gives ±12 V at every header and may give +5 V (BUS-001). A power ribbon is ≤ 400 mm with ≥ 28 AWG conductors (BUS-015).

POWER ENTRY, BEYOND THE CARD

- Limit inrush current when the rails come up. A module with its own +5 V regulator leaves pins 11-12 undriven. List an expander or link header as an unclassified port named for what it connects to (Annex N). The installer sums the published currents against the bus board and the supply (ASM-001).

0 V

- Keep panel-mounted parts whose body touches the panel free of 0 V; an insulated jack does that.

Patch and coax cables join the 0 V of the products they connect; the supply publishes its earth bond (GND-003).

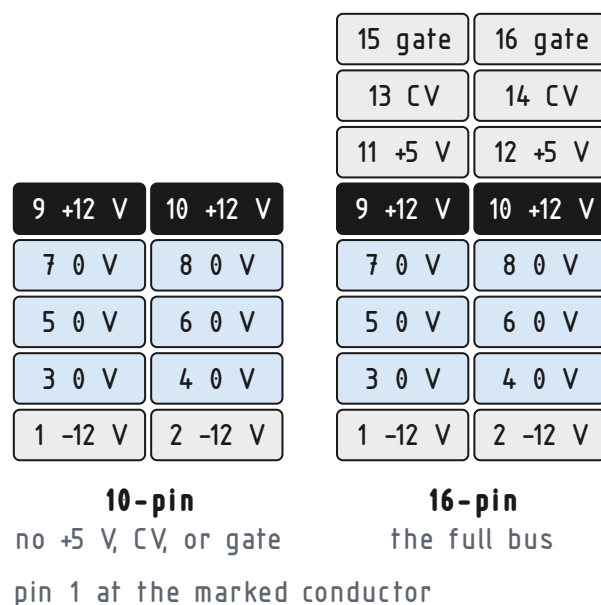
BUS CV AND GATE

- Listen to or drive bus CV or gate only when a jumper or switch is set to. BUS-016
- Drive or receive at the BUS-CV and BUS-GATE limits. BUS-017 BUS-018

BUS NET	LEVEL	Z OUT / IN
BUS-CV	1.00 V/oct pitch CV; ceiling ±12 V	1 kΩ / 100 kΩ
BUS-GATE	0 / +5 V; high ≥ +3 V, low ≤ +1 V at the receiver	1 kΩ / 100 kΩ

BUS-CV is pitch CV: an LFO on it detunes every listener. One transmitter per line (ASM-002).

EIS · Module power entry: what a module may draw, and through which header



- Draws only +12 V and -12 V, and may draw +5 V (BUS-006).
- The 10-pin header is enough when the module uses neither +5 V nor bus CV or gate (BUS-007).
- At most 2 A on any rail through one header: two IDC contacts of about 1 A each (BUS-008). A module that needs more takes a second header or a DC entry.
- Never sources current into a bus rail (PWR-004).
- Survives a reversed ribbon (BUS-009); its every 0 V pin is tied to its 0 V (GND-001).
- Another header on the module does not mate a power ribbon, or survives one (BUS-011).

What a module may draw, and through which header (6.4).

PATCH JACKS, BEYOND THE CARD

- Insulate every patch, RCA, BNC, and SMA jack from the panel.
- Label each port's class, on the panel or in the manual.

A 3.5 mm TRS port for MIDI or headphones is a port, not a patch jack; it is unclassified or named from Annex I, and EIS places no requirement on it.

PATCH CLASSES

CLASS	NOMINAL	RANGES	ID
MOD-AUDIO	±5 V nominal; ±10 V full scale	B10 default; B5 B1	SIG-005
MOD-CV	±10 V at B10; by range	B10 default; U10 B5 U5 B1 U1	SIG-006
MOD-CV- 1VOCT	1.00 V/oct	none default; B10 B5	SIG-007
MOD-GATE	high ≥ +3 V, low ≤ +1 V	—	SIG-011
MOD-TRIG	rising edge ≥ +3 V, ≥ 1 ms	—	SIG-012
MOD-CLK	square, as a gate	—	SIG-013
MOD-VIDEO	0 to +1 V; ceiling +1.2 V	U1 default	SIG-008

Typical source 1 kΩ into 100 kΩ; for MOD-VIDEO the impedances are limits. Ranges never relax ±12 V.

RANGES, BEYOND THE CARD

- An output claims the smallest range that holds its signal; an input the largest it accepts.
- Print a range other than the default on the panel next to the jack.
- Label pitch ports 1 V/oct; publish a pitch output's tracking accuracy.

A port that names no range has its class's default.

VIDEO ON PATCH JACKS · MOD-VIDEO

Pictures, ramps, keys, video-rate control: 0 to +1 V at U1; ceiling +1.2 V; damage ±12 V.

- A port claiming MOD-VIDEO meets its limits; its input and output impedances are on the patch card. SIG-008
- A patch jack carries patched signals only: never the video reference, and it lists no format of clause 7.3. SIG-015

VIDEO REFERENCE PORTS · REAR, CLAIMED BY KIND

- The reference is taken or given at a rear port, claimed by kind. V75-010
- VID-REF-IN locks to it and lists formats; VID-REF-OUT gives one the module generates. V75-011 V75-012 VID-001
- VID-REF-PASSTHRU: a buffered copy of VID-REF-IN into one load, marked PASSTHRU; VID-REF-LOOPTHRU: a loop pair with a TERM switch; both only with VID-REF-IN. V75-013 V75-014
- A selected or published format's timing and video sync structure match its row. VID-002
- Publish the horizontal offset after the reference in ns per format, and any adjustment (phase_ns).

Composite color only on interlaced SD; component on any format. A locking port takes the selected format; EIS requires no conversion.

PWR-A6 ENTRY · 6.8

- A6-VH3: JST VH, 3 circuits on 3.96 mm; pin 1 +6 V, 2 0 V, 3 -6 V; marked ±6 V. A6-001 A6-007
- Meets its published behavior with each rail 5.55 to 6.25 V at the entry. A6-003
- Withstands 6.6 V on either rail. A6-004
- At most 1 A per rail through one entry. A6-005
- PWR-A15 entry: A15-MF4, Mini-Fit Jr 2 × 2 (1, 2 0 V; 3 -15 V; 4 +15 V), marked ±15 V; rails 14.0-15.6 V at the entry, withstands 16.5 V, ≤ 2 A per rail. A15-001 A15-003 A15-004 A15-005 A15-007

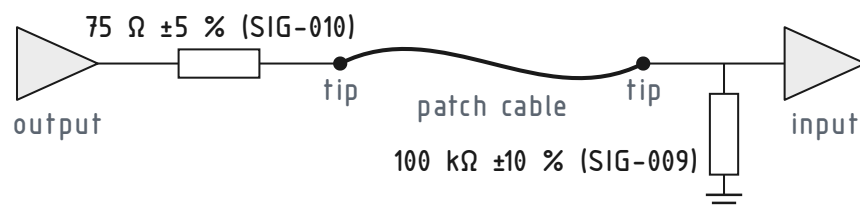
With the bus for logic, the two entries are not alternatives; the claim file says the module needs both.

EIS · The patch interface and its limits

Audio, CV, pitch, gate, trigger, and clock



Video, MOD-VIDEO



75 Ω into 100 k Ω arrives at almost unity gain. A MOD-VIDEO output has no other source impedance (SIG-010), so every video output and input in a system match.

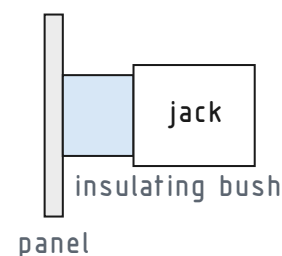
On every patch jack

An input withstands ± 12 V indefinitely (SIG-002).

An output survives a short to 0 V or to another output (SIG-003).

An output never drives the tip beyond ± 12 V (SIG-004).

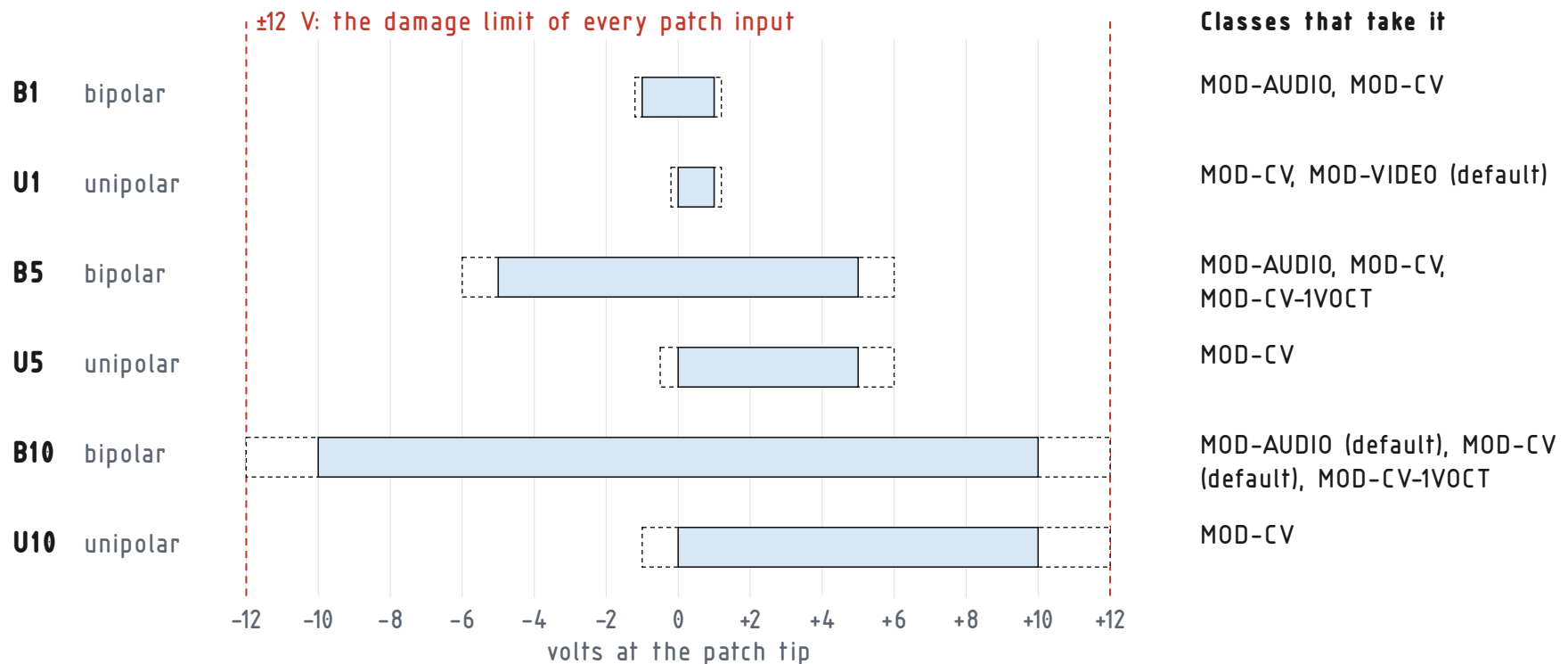
Insulated jacks, recommended



EIS recommends insulating every patch, RCA, BNC, and SMA jack from the panel.

The patch interface, its ± 12 V limits, and the insulated barrel (7.1).

EIS · The six ranges, on the ± 12 V patch axis

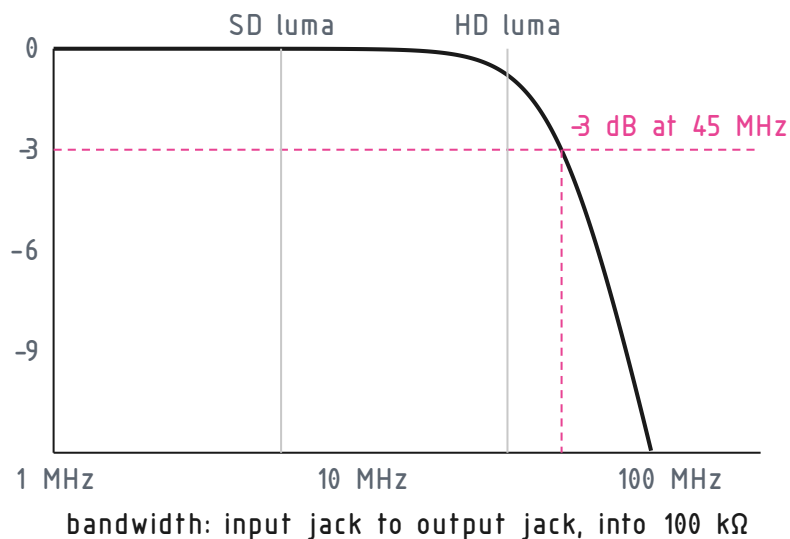


the full-scale swing a port is built for the ceiling an output stays within

A port claiming a range meets its limits (SIG-014): an output keeps its full-scale signal within the ceiling, and an input accepts the full swing without clipping. Every input still withstands ± 12 V.

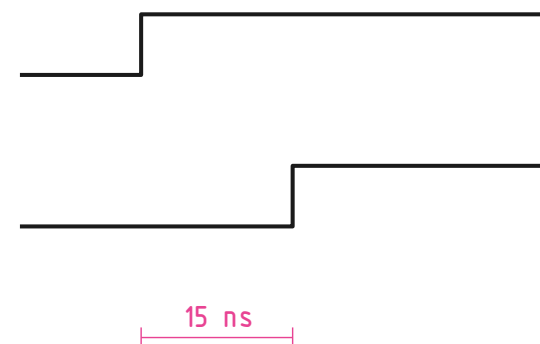
The six ranges on the ± 12 V patch axis, and the classes that take each (7.2).

EIS · A MOD-VIDEO path: bandwidth and delay

**delay**

path A: 12 ns

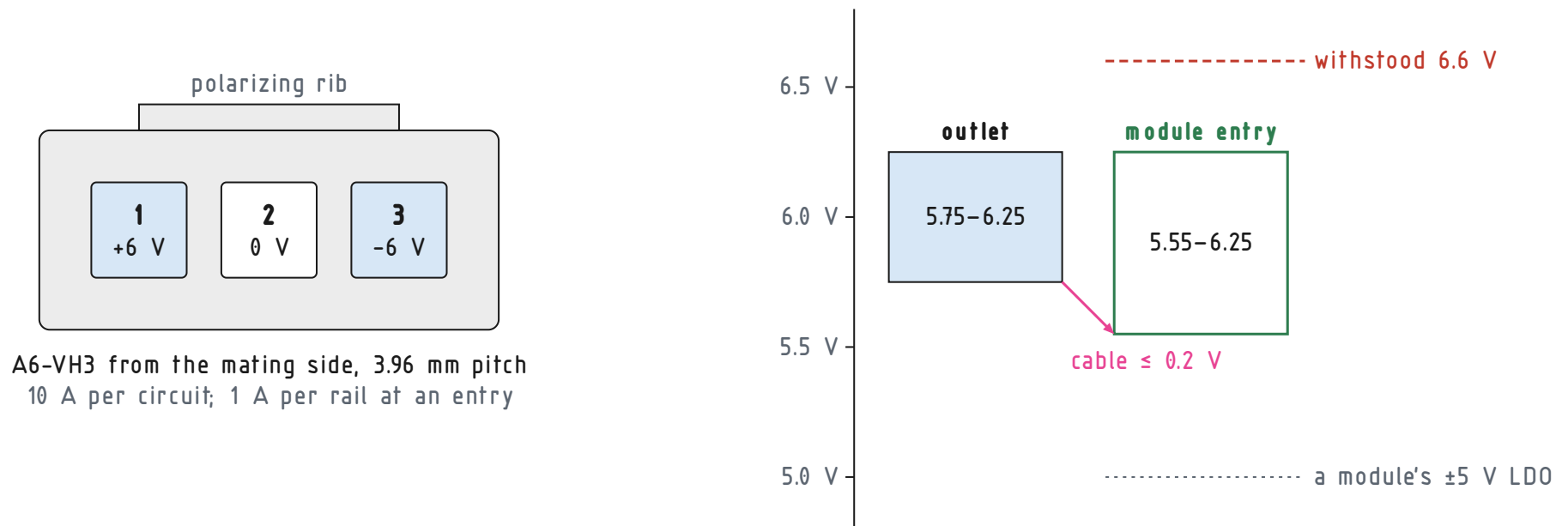
path B: 27 ns



Two copies of one picture through paths 15 ns apart land about one HD sample apart on the screen (13.5 ns at 74.25 MHz).

EIS recommends publishing both figures for each MOD-VIDEO path in the claim file, and placing black at 0 V and full scale at +1 V.

EIS · PWR-A6: the A6-VH3 entry and the voltage window



One connector for PWR-A6 only (A6-001). An outlet holds its window to its rating (A6-002); a module works across the entry window (A6-003), survives 6.6 V (A6-004), and draws at most 1 A per rail (A6-005).

PWR-A6: the A6-VH3 entry, its pins, and the voltage window from the outlet to the module (6.8).

VIDEO TIMING FORMATS

FORMAT	LINES	SAMPLES	CLOCK, MHZ
525i59.94	525	1716	27.000
625i50	625	1728	27.000
480p59.94	525	858	27.000
576p50	625	864	27.000
720p50	750	1980	74.25
720p59.94	750	1650	74.25/1.001
720p60	750	1650	74.25
1080i50	1125	2640	74.25
1080i59.94	1125	2200	74.25/1.001
1080i60	1125	2200	74.25
1080p23.98	1125	2750	74.25/1.001
1080p24	1125	2750	74.25
1080p25	1125	2640	74.25
1080p29.97	1125	2200	74.25/1.001
1080p30	1125	2200	74.25
1080p50	1125	2640	148.5
1080p59.94	1125	2200	148.5/1.001
1080p60	1125	2200	148.5

Porches, video sync widths, and field counts:
data/video__timings.json.

REAR COAX · VIDEO REFERENCE PORTS

- Every jack in the tree is RCA, BNC, or SMA; insulation from the panel is recommended. V75-001
- Center pin video, shell 0 V. V75-002
- Every video reference port is COAX-IN (75 Ω to 0 V at the jack), COAX-OUT (75 Ω series, driven at twice line level), COAX-PASSTHRU, or COAX-LOOPTHRU, never a patch jack. V75-015
- Each reference port marked IN, OUT, PASSTHRU, or TERM beside it. V75-016

COAX-IN is the usual module port, one per distribution output (V75-005). Line level: 1 V p-p composite scale, ± 300 mV tri-level. The module's patch jacks stay MOD-VIDEO; a front picture jack is VID-CVBS or VID-YPBPR in the port list, recommended COAX-IN or COAX-OUT form.

HEAT AND MASS · ANNEX O

$$P \leq 12 \text{ V} \times I(+12) + 12 \text{ V} \times I(-12) + 5 \text{ V} \times I(+5)$$

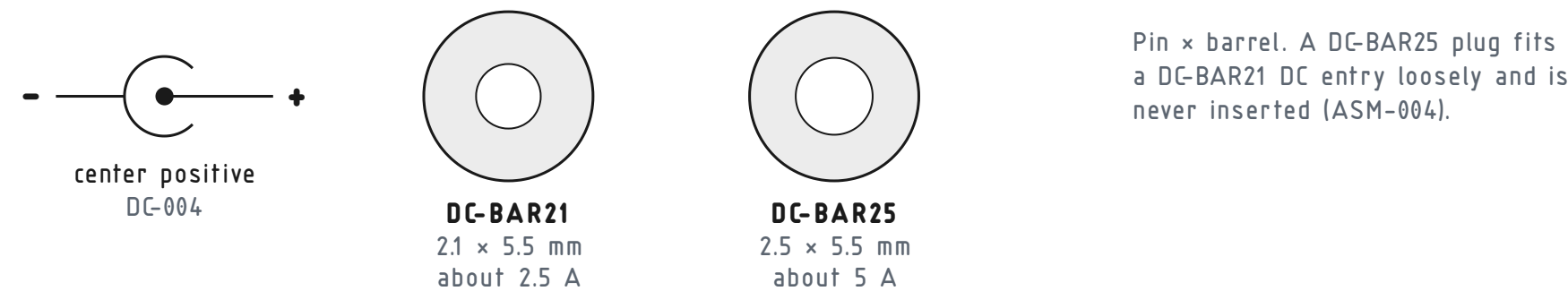
- Say so when dissipation is much higher than the current suggests.
- Heavy enough to bend its panel in transport: publish the mass; supply a bracket if needed.

DC ENTRY · PWR-DC12

- Publish the DC entry variant, the max continuous current at 12 V (taken at the entry or delivered at each output), and the min and max input voltage. DC-001 PWR-001 DC-002
- Marked beside it: polarity symbol, nominal voltage, max current. DC-011
- A DC entry never uses the pinout of a 10-pin or 16-pin power header. DC-003
- Above 5 A, a multi-pin entry rather than a barrel.
- With a power header too, it never needs both sources connected at once. PWR-003
- A barrel DC entry tolerates reverse polarity without damage. DC-006
- The DC rail's -V is the module's 0 V. GND-001

Polarity and pin functions are on the DC entry card; reference parts in data/dc__12.json. The installer connects one source (ASM-003). On DC the bus currents may be 0; the DC rail never feeds the bus (PWR-004). A product with PWR-DC12 outlets feeds modules on DC-BAR21 or DC-VH2 (DC-009).

EIS · PWR-DC12 power entry: barrel polarity and multi-pin pin functions



Multi-pin variants and their pin functions

DC-VH2 10 A	pin 1 +V	pin 2 -V							
DC-DIN4 15 A	pin 1 +V	pin 2 -V	pin 3 -V	pin 4 +V	pin 5 shell				
DC-MF6 24 A	pin 1 +V	pin 2 +V	pin 3 +V	pin 4 -V	pin 5 -V	pin 6 -V			
DC-MF8 28 A	pin 1 +V	pin 2 +V	pin 3 +V	pin 4 +V	pin 5 -V	pin 6 -V	pin 7 -V	pin 8 -V	

A product with a multi-pin variant implements these pin functions (DC-005); its cables connect each pin to the same pin (DC-008).

Modules take power from a PWR-DC12 outlet on DC-BAR21 or DC-VH2, never DC-BAR25 (DC-009).

DC entries: barrel polarity and sizes, and multi-pin pin functions (6.7).

CTRL-USB PORT · A DEVICE

- USB 2.0 full speed on USB-PH4: pin 1 VBUS, 2 D-, 3 D+, 4 0 V. USB-001
- Marked USB; survives 5.25 V or 0 V on any pin. USB-002
- At most 100 mA from VBUS, never driving it; in a row it runs from its power entries. USB-003
- A lead: pin to pin, ≤ 300 mm, D+ and D- twisted. USB-004

IDENTITY

- iProduct is the product's name in its claim; iSerial is unique and stable. USB-005
- The maker's own SysEx manufacturer ID in MIDI-CI, never 7D. USB-006

Products of one maker may share a USB product ID; iProduct names the product.

PARAMETER INTERFACE

- USB-MIDI 2.0: alt 1 with one UMP endpoint pair; alt 0 USB-MIDI 1.0. USB-007
- MIDI-CI discovery; PE ResourceList, DeviceInfo, AllCtrlList, and CtrlMapList for toggles and lists. USB-008
- Each control: a map for a toggle or list, a stepCount when stepped, set by 32-bit CC, RPN, or NRPN. USB-009
- On a subscription to AllCtrlList, send every value, then each change. USB-010
- Keep working when the host closes the endpoints and opens them again. USB-011

UNITS

- x-units only with the ctrl-units-v1 schema served as JSONSchema resId ctrl-units-v1. USB-012

□ x-units on every continuous control.

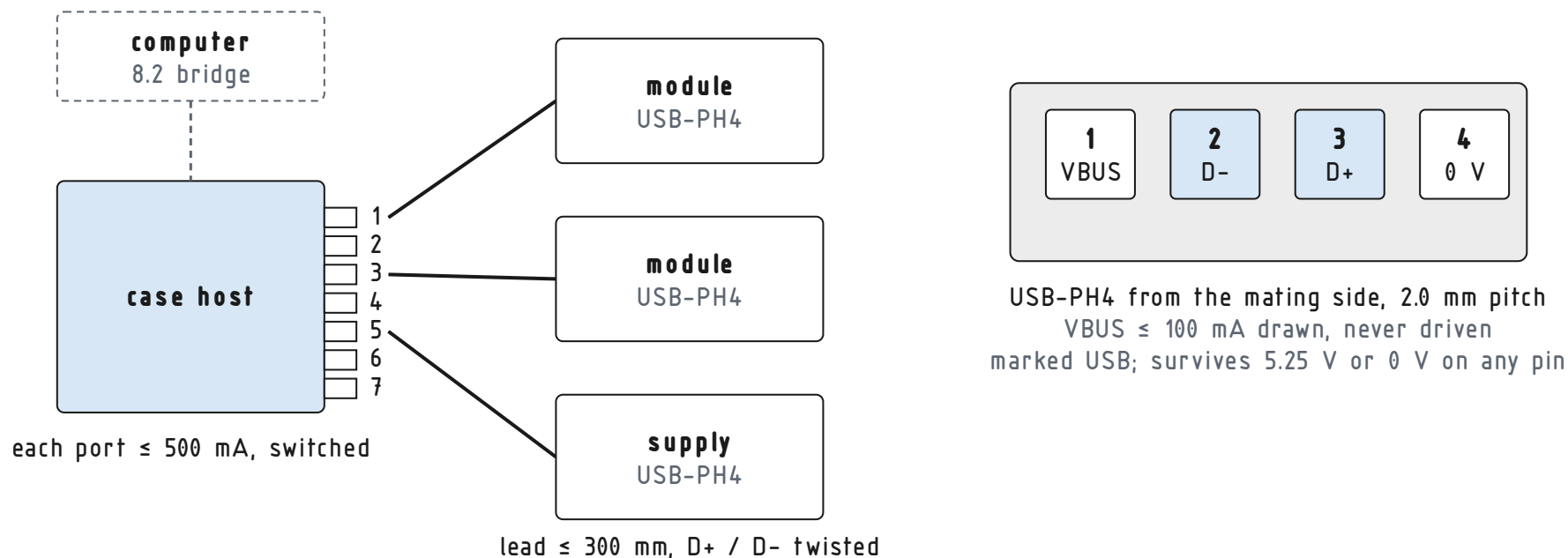
tools/pe_check.py checks a saved PE dump; data/examples/pe-video-reference-generator.json is the worked example.

CASE HOST · A MODULE

- Each downstream port limited to ≤ 500 mA and switched on its own. USB-013
- Each port marked with the number the host shows. USB-014
- Edits any CTRL-USB device with clause 8.1 alone; standard fields without x-units. USB-015
- Subscribes again when it reopens a parked device. USB-016
- A computer link follows the host bridge protocol of 8.2. USB-017

A case host is a module and meets every module requirement. Its claim file gives ctrl_usb.role: host, the port count, the per-port limit, and whether it has a bridge. Console commands and firmware formats stay the maker's.

EIS · CTRL-USB: a case host, its ports, and the USB-PH4 port behind each product

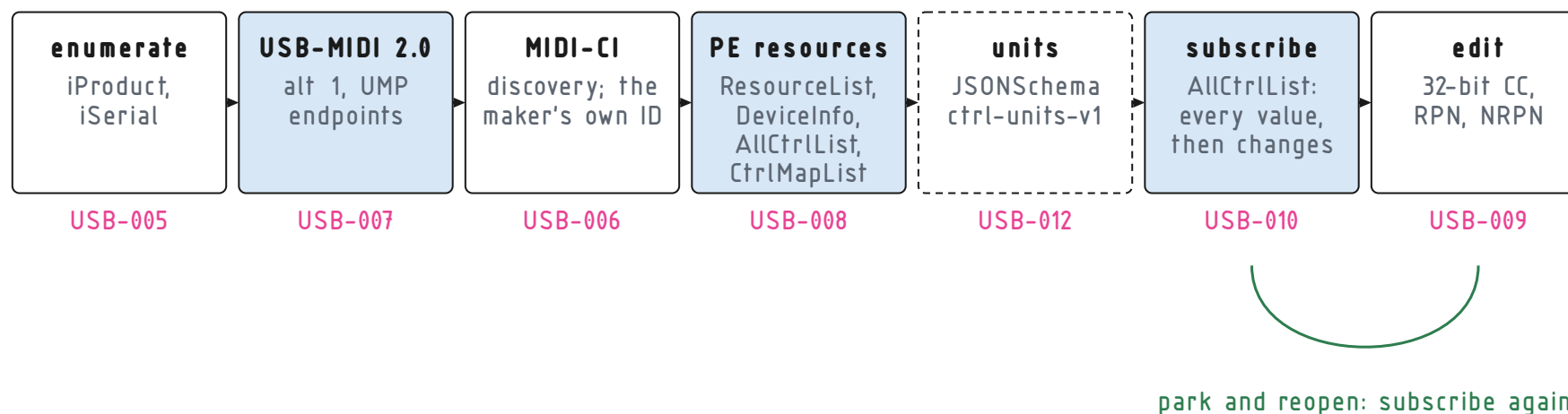


A USB 2.0 full-speed device on USB-PH4 (USB-001), marked and robust (USB-002), drawing ≤ 100 mA from VBUS (USB-003); a straight lead (USB-004).

The host limits and switches each port (USB-013) and numbers it (USB-014).

A case host, its ports, and the CTRL-USB ports of the modules behind the panels (8.1).

EIS · CTRL-USB: what a case host asks a device, from enumeration to edited values



The host knows no product: it lists and sets controls with these standard steps alone (USB-015). Units are optional; without them it shows a percentage, the step, or the map's titles. A device keeps working when parked (USB-011) and the host subscribes again when it reopens it (USB-016).

From enumeration to edited values: the discovery a host makes on a CTRL-USB device (8.1).