LINK FLAPS IN THE DATA CENTER

CAUSES, LOSS BUDGETS AND TEST INFRASTRUCTURE

W H I T E P A P E R

100G | **400G** | **800G**

MPO-12 · MPO-16 · LC · UPC / APC

OM4 multimode · OS2 single-mode · Patch panels and cassettes

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Why patch panels push 400G and 800G optics past their limits, and how to reproduce each fault in the lab.

Link flaps that appear after a switch is cabled through patch panels usually trace back to one of seven cabling causes. At 400G and 800G, the one to check first is the simplest: too many connections for the optic's loss budget. This guide shows how to count the loss in a path, how to recognize each cause in the switch counters, and how to build a lab test bed that reproduces every one on demand.

Wave2Wave Engineering Team Reviewed by Mark Crandon, CEO Published November 4, 2026

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01 Introduction and terms

A link flap is a link that drops and recovers, often many times an hour. When flaps start after a switch is cabled through patch panels, the cabling is the first place to look, before the optic or the switch.

Higher speeds have made this more common. A 400G-SR8 optic allows 1.9 dB of loss across the whole link, and two standard-grade MPO connections can use 1.5 dB of it.

Term	Meaning
Link flap	A link that goes down and comes back up repeatedly, usually logged as loss of signal, link down or remote fault
Connection (mated pair)	Two connectors joined in an adapter. Every connection loses some light
Patch panel	A rack enclosure of adapters or cassettes, so switches connect to permanent trunk cables instead of to each other
Trunk	The permanent cable between two panels
Patch cord	The short cable from a switch port to a panel, or between two panels
Feedthrough	A panel plate of plain adapters. The cord plugs straight into the trunk: one connection per panel
Cassette	A module that converts an MPO trunk to LC ports. Two connections per panel: MPO at the back, LC at the front
MPO	A multi-fiber connector (12 or 16 fibers; 8-fiber optics use the 12-fiber connector) used by most 400G and 800G optics
LC	A small single-fiber connector, used in duplex pairs by most 10G to 100G optics and by 400G FR4, LR4 and BiDi

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Term	Meaning
UPC and APC	UPC: the fiber end face is polished straight, with a slight dome. APC: it is polished at an 8 degree angle and reflects far less light. The two must never be mated
Pinned and unpinned	MPO connectors align on two guide pins. Every MPO connection needs one pinned side and one unpinned side
Polarity (Type A, B, C)	How fibers are ordered from end to end so that transmit reaches receive
Insertion loss	Light lost along the path, in dB. Each optic has a maximum, its loss budget
Reflectance	Light bounced back toward the transmitter at a connection, in dB. More negative is better
Pre-FEC BER	The bit error rate before forward error correction. It rises before a link fails, so it is the earliest warning

02 Where the loss goes

In a data center link, the connections cost far more light than the cable. A short trunk loses a few hundredths of a dB; each connection can lose up to 0.75 dB. The number of connections between the two switches, and the grade of the parts, decide whether a link has margin.

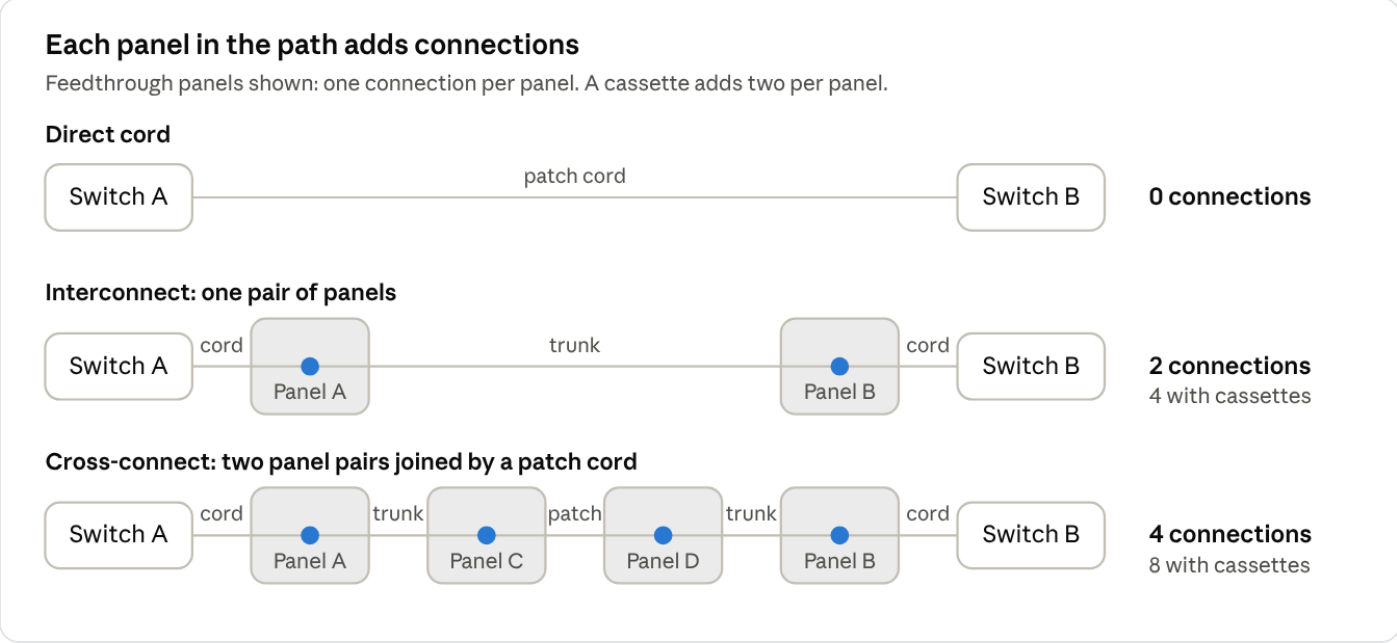


Figure 1. Each panel in the path adds connections. Feedthroughs add one per panel; cassettes add two.

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Path	Panel type	Connections between the switches	Worst-case loss, low-loss parts: MPO 0.35 dB, LC 0.25 dB each (dB)	Worst-case loss, standard parts: MPO 0.75 dB, LC 0.50 dB each (dB)
Direct cord	None	0	0.0	0.0
Interconnect: each switch to its own panel, one trunk between	Feedthrough	2 MPO	0.7	1.5
Interconnect	Cassette	2 MPO + 2 LC	1.2	2.5
Breakout: one MPO optic to 4 or 8 LC ports	Feedthrough, then breakout cassette	2 MPO + 1 LC per lane	0.95	2.0
Cross-connect: two panel pairs joined by a patch cord	Feedthrough	4 MPO	1.4	3.0
Cross-connect	Cassette	4 MPO + 4 LC	2.4	5.0
Out through a cross-connect and back (lab stress test)	Feedthrough	8 MPO	2.8	6.0

The 0.75 dB standard MPO figure is the TIA-568 maximum per mated pair. TIA allows the same for LC; 0.50 dB is typical of standard-grade LC parts. Low-loss figures are typical maximums for premium parts. A standard-grade breakout already exceeds the 1.9 dB budget of a 400G-SR8. Fiber loss is extra: up to 0.35 dB per 100 m of multimode at 850 nm, and 0.5 to 1.0 dB per km of single-mode at 1310 nm (TIA-568 maximums).

> **Rule of thumb**
>
> Count the connections, not the meters. On a 100 m multimode run, the fiber costs up to 0.35 dB; four standard-grade MPO connections cost up to 3.0 dB.

03 Loss budgets, 100G to 800G

Multimode 400G and 800G optics have the least room. Two standard-grade MPO connections leave them 0.2 to 0.4 dB, and a cross-connect puts them over the limit. Values in red mean the path exceeds the optic's budget.

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Optic (reach)	Fiber, connector, polish	Loss budget (dB)	Left after 2 connections, low-loss / standard (dB)	Left after 4 connections, low-loss / standard (dB)	Left after 8 connections, low-loss / standard (dB)	Watch for
800G-VR8 (50 m)	OM4, MPO-16 or 2 x MPO-12, APC	1.7	1.0 / 0.2	0.3 / -1.3	-1.1 / -4.3	Smallest budget of any common optic
400G-SR8 (100 m)	OM4, MPO-16, APC	1.9	1.2 / 0.4	0.5 / -1.1	-0.9 / -4.1	Angled polish on multimode
400G-SR4.2 and 100G-SR4 (100 m)	OM4, MPO-12, UPC	1.9	1.2 / 0.4	0.5 / -1.1	-0.9 / -4.1	UPC, same budget as SR8
400G BiDi, vendor-specific (70 m)	OM4, duplex LC, UPC	1.9	1.4 / 0.9	0.9 / -0.1	-0.1 / -2.1	LC optic on a tight multimode budget
400G-DR4 and 800G-DR8 (500 m)	OS2, MPO-12 (DR4); 2 x MPO-12 or MPO-16 (DR8), APC	3.0	2.3 / 1.5	1.6 / 0.0	0.2 / -3.0	Reflections: each added UPC connection tightens the limits
4×100G-FR (2 km)	OS2, MPO-12, APC	4.0	3.3 / 2.5	2.6 / 1.0	1.2 / -2.0	Reflections; fiber loss at 2 km
4×100G-LR (10 km)	OS2, MPO-12, APC	6.3	5.6 / 4.8	4.9 / 3.3	3.5 / 0.3	Fiber loss at 10 km takes much of the budget
400G-FR4 (2 km)	OS2, duplex LC, UPC	4.0	3.5 / 3.0	3.0 / 2.0	2.0 / 0.0	Reflections; fiber loss at 2 km
400G-LR4 (10 km)	OS2, duplex LC, UPC	6.3	5.8 / 5.3	5.3 / 4.3	4.3 / 2.3	Fiber loss at 10 km takes much of the budget

Connections are counted between the switches, in the optic's own connector type, for short runs. Subtract fiber loss at full length, and use the cassette totals in section 02 for MPO-to-LC paths. Budgets are the maximum channel insertion loss in published data sheets; check the data sheet for the exact optic in use.

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Reflections on single-mode

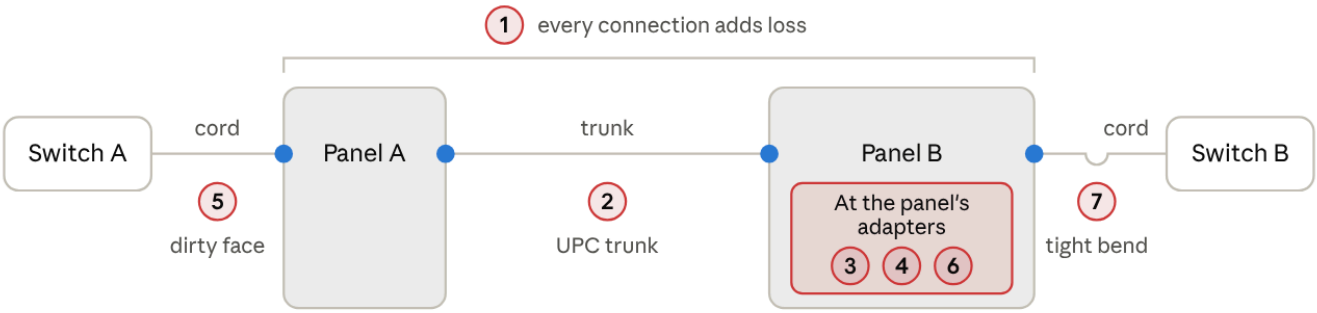
100G-per-lane single-mode optics (DR, FR, LR) are sensitive to light reflected back at UPC connections. IEEE 802.3 limits reflections for these optics, and the limits tighten as reflective connections are added: for 100GBASE-DR, the allowed channel loss falls from 3.0 dB toward 2.6 dB. A path can pass a loss test and still log errors.

04 Seven causes of link flaps

These are the seven cabling causes behind flaps through patch panels. Each leaves a different pattern in the switch counters, which is the fastest way to tell them apart.

Where each cause of a flap occurs in the path

A test bed recreates each one at the same point, one at a time, on red-tagged parts.



1	**Too much loss**	Each connection costs light. 400G and 800G multimode run out of margin first. In the lab: more panels, standard-grade cassettes, attenuators or the customer's own cords
2	**Reflection**	UPC faces reflect light. DR, FR and LR optics can log errors even at low loss. In the lab: run the link over a UPC single-mode trunk and hybrid cords
3	**APC on UPC**	An angled face against a straight one leaves an air gap: high loss, possible damage. In the lab: hybrid cords through a fault plate or an open MPO port
4	**Pin mismatch**	Two unpinned ends drift out of line; two pinned ends will not seat. In the lab: pinned and unpinned test cords through an open MPO port
5	**Dirty face**	One dirty face anywhere in the path. Each MPO has 12 to 16 faces to keep clean. In the lab: a red-tagged contamination cord, inspected before and after
6	**Wrong polarity**	Transmit meets transmit, or lanes land on the wrong ports. Usually a dead link. In the lab: Type A, Type C and A-to-A cords, and a reversed MPO fault plate
7	**Tight bend**	A cord bent sharply at the panel front or in the cable manager leaks light. In the lab: bend a kit cord tightly at the panel front

Figure 2. Where each cause occurs in the path, and how a test bed recreates it.

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#	Cause	What the switch shows (typical)	Most exposed optics	How to confirm
1	Too much loss	Receive power low on every lane, near the optic's minimum. Corrected FEC counts high. Flaps follow temperature changes or cord movement	400G and 800G multimode	Measure end-to-end loss with a light source and power meter; compare with section 03
2	Reflection	Receive power normal, but pre-FEC BER higher than the baseline. Cleaning does not help when the reflection comes from UPC polish	100G-per-lane single-mode (DR, FR, LR)	Count the UPC connections in the path; check reflectance with a high-resolution OTDR or a return loss meter
3	APC mated to UPC	Receive power several dB low on all lanes, or no link at all. End faces may be damaged	Any optic on APC MPO	Check connector housing colors (green is APC) on both sides of each adapter; inspect the end faces with a scope
4	Pin mismatch	Unpinned to unpinned: receive power differs lane to lane and shifts when the cord is touched. Pinned to pinned: the connectors do not seat, so loss is high or there is no link	All MPO optics	Confirm one pinned and one unpinned connector at every MPO adapter
5	Dirty end face	One or a few lanes low or erroring while the rest are normal	MPO optics most often: 12 to 16 faces per connector	Inspect with a fiber scope, clean, and measure again
6	Wrong polarity or lane order	No light received and the link never comes up. On breakouts, ports come up to the wrong neighbor	MPO optics and breakouts	Trace the polarity type (A, B or C) of every cord and trunk; check neighbors with LLDP
7	Tight bend	Receive power drops when a cord is moved or dressed, and recovers when the bend is relaxed	Cords that are not bend-insensitive, multimode or single-mode	Look for kinks at the panel front and in cable managers

Flaps or dead links

Causes 1, 2, 4, 5 and 7 produce true flaps: the link runs near its limit and drops intermittently. Causes 3 and 6 usually stop the link outright, but they turn up in the same support cases.

05 Building a test bed

A test bed recreates a customer's path at the panel level, then adds one fault at a time. It needs configurations that match real paths, panels that hold every connector type, and build rules that keep the normal setups clean. Changing a test means moving patch cords at the panels; the trunks stay in place.

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Configurations

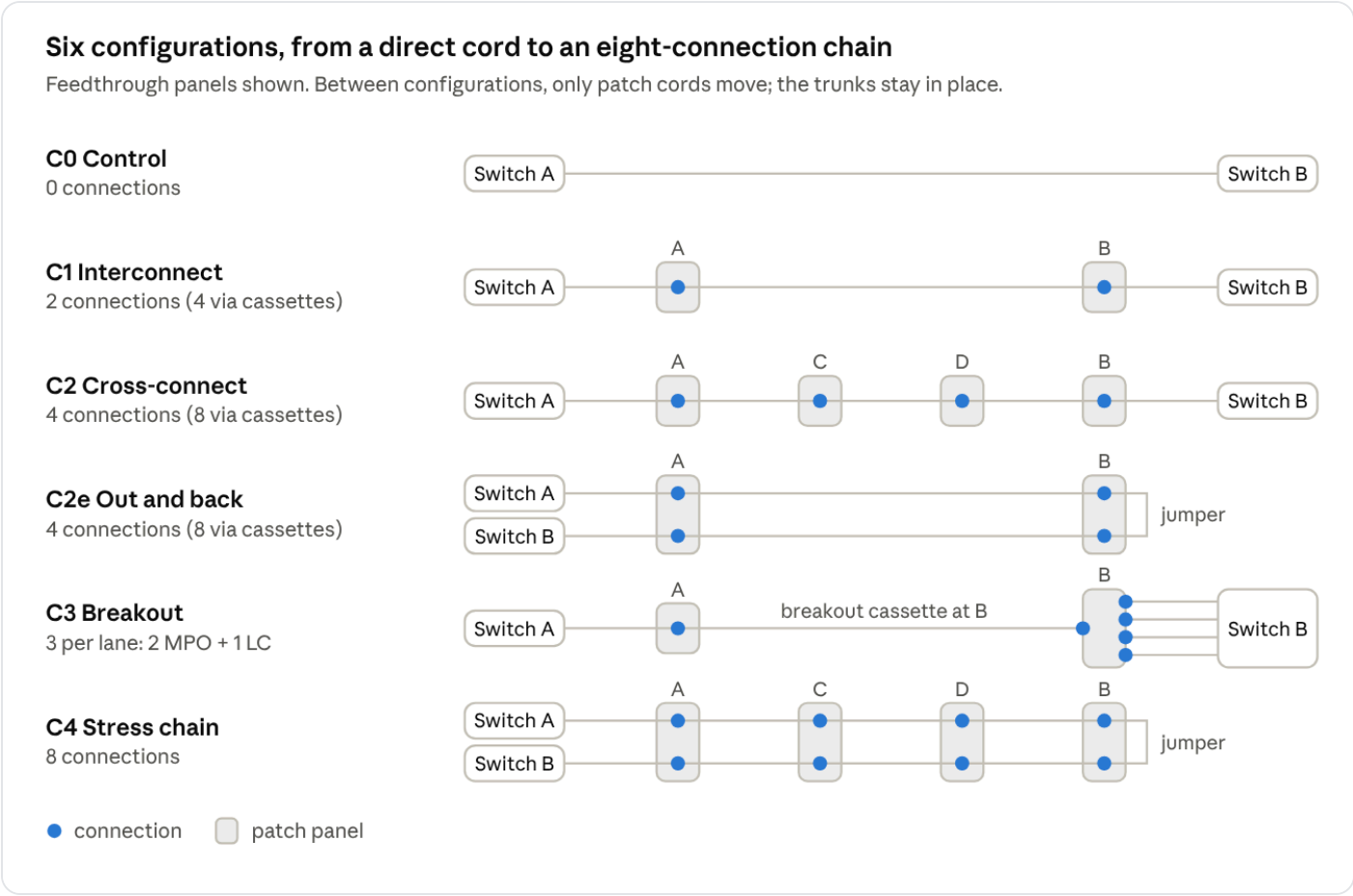


Figure 3. Six configurations, from a direct cord to an eight-connection chain.

Configuration	What it simulates	Connections, feedthrough / cassette	Panels
C0 Control	Switch cabled straight to switch. The reference for every test	0 / 0	0
C1 Interconnect	Each switch to its own panel, one trunk between. The most common layout	2 / 4	2
C2 Cross-connect	Two panel pairs joined by a patch cord, as in a main cross-connect	4 / 8	4
C2e Out and back	C2's connection count on two panels: out to the far panel, through a short jumper, and back	4 / 8	2
C3 Breakout	One 400G or 800G port split into 4 or 8 lower-speed ports on the other switch	3 per lane: 2 MPO + 1 LC	2
C4 Stress chain	Out through the cross-connect and back, on feedthroughs. More connections than most real sites	8 / not used	4

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Cable setups

Four setups on two fiber types (OM4 multimode and OS2 single-mode) give eight cable setups. MPO-MPO covers MPO-12 and MPO-16 and, on multimode, both UPC (SR4.2, SR4) and APC (SR8, VR8) versions, because these cannot be mated to each other.

Cable setup	Optic at Switch A	Panel hardware	Optic at Switch B
MPO-MPO	MPO	MPO feedthrough in each panel	MPO
LC-LC	LC	LC feedthrough in each panel, one for multimode and one for single-mode	LC
MPO-LC (LC optics over an MPO trunk)	LC	MPO-to-LC cassette in each panel	LC
Breakout	MPO, 400G or 800G	MPO feedthrough at the near panel, breakout cassette at the far panel	4 or 8 LC ports

Panels

Every panel uses the same 2U, 12-slot enclosure, with cassettes mounted vertically. A near panel sits beside the switch that holds the optic; a far panel sits at the other end of the trunk. Each module holds one connector type, one polish and one fiber type, so slots 1 to 9 hold the same nine modules in every panel: two MPO-to-LC cassettes, three MPO-12 feedthroughs, two MPO-16 feedthroughs and two LC feedthroughs. Far panels fill slots 10 to 12 with breakout cassettes for multimode UPC, multimode APC and single-mode APC. One near panel holds the fault plates.

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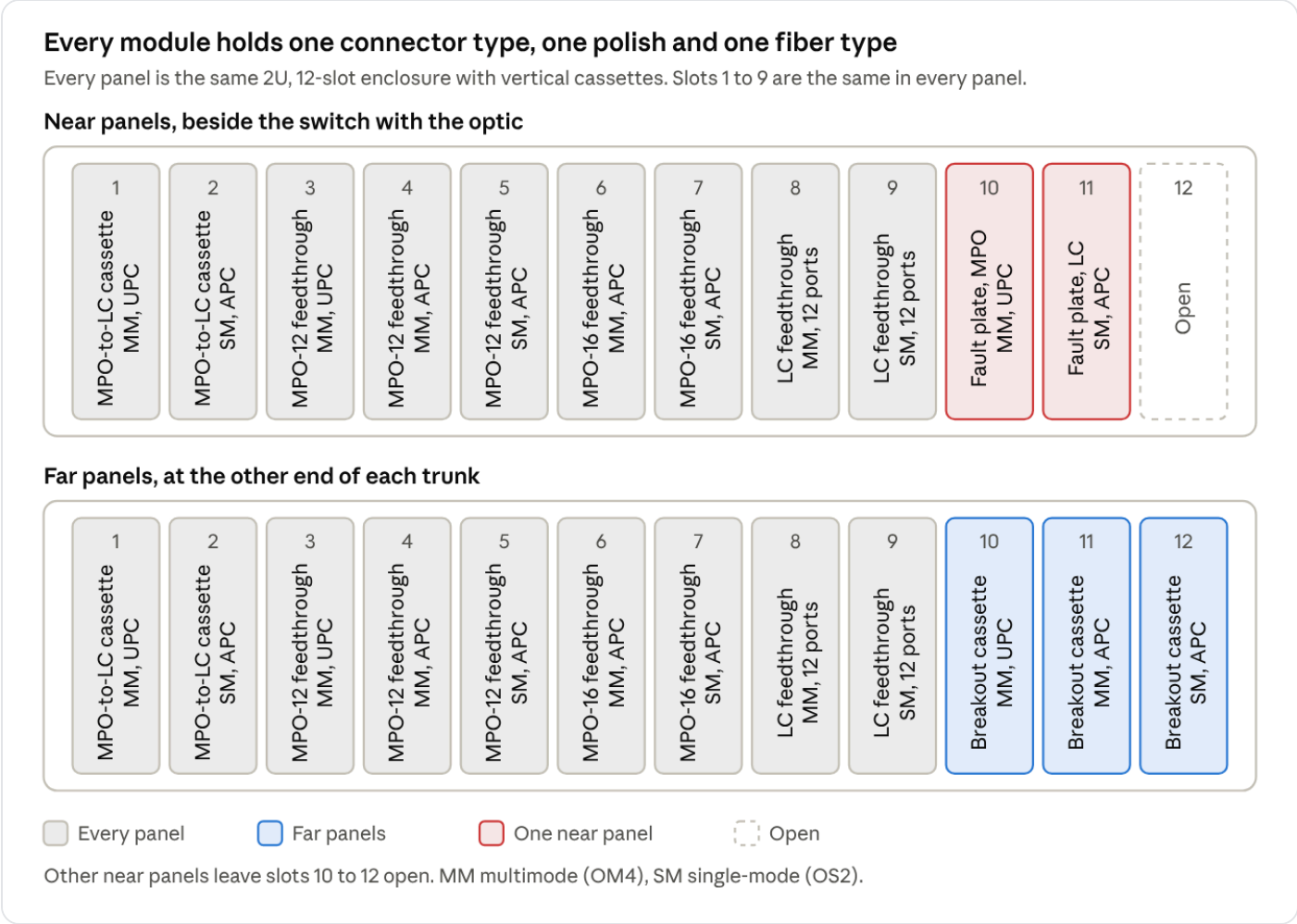


Figure 4. Every module holds one connector type, one polish and one fiber type.

Slots 1 to 9 match on every panel, so any cable setup runs between any near and far panel. In the four-panel kit, Panels A and D are near panels and Panels B and C are far panels.

Build rules

Rule	Specification	Why
MPO pins	Optics and cassettes are pinned. All MPO cords and jumpers are unpinned. Trunks are pinned at feedthrough ends and unpinned at cassette ends, marked on both ends	Two unpinned sides misalign; two pinned sides damage each other
Polarity	One method throughout: Type B MPO trunks and cords, key-up to key-down adapters, reversible LC cords. APC connectors only mate key-up to key-down, so the key-up to key-up fault plate takes UPC cords only	Transmit always reaches receive. Other types belong in the fault kit

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Rule	Specification	Why
Polish	APC on single-mode MPO and on multimode MPO for optics that require it; UPC elsewhere. Angled parts are green. Each feedthrough and cassette holds one connector type, one polish and one fiber type	Matches each optic's requirement and prevents accidental mixing
Part grade	Low-loss parts on the normal setups: at most 0.35 dB per MPO and 0.25 dB per LC connection	Keeps normal setups healthy, so the only change is the fault added
Labels and test data	Every port labeled to TIA-606 and numbered the same on both panels of a pair. Measured loss for every cable and cassette	Engineers can record the exact path and start from a known baseline
Fault isolation	Faults created only on dedicated fault plates and open ports, using red-tagged parts	Protects the cassettes and trunks that carry normal links

Adapters have no polish

The UPC or APC polish is on the connector end face. An MPO adapter only holds two connectors together, and their guide pins do the aligning, so the same adapter works for UPC, APC, multimode and single-mode. Color marks the intended use, with green for APC. The one rule an MPO adapter enforces is key orientation: APC connectors must meet key-up to key-down.

Fault kit

Part or method (fault parts are red-tagged)	Reproduces
Standard-grade cassettes, multimode and single-mode	1 Too much loss on MPO-to-LC paths
Single-mode attenuators, LC and MPO, 1 to 7 dB	1 Too much loss on single-mode paths; loss margin test
Added connections in the four-panel stress chain, or cords taken from the customer's site	1 Too much loss on multimode MPO paths
UPC single-mode MPO trunk and APC-to-UPC hybrid cords, run on spare ports of the single-mode APC feedthrough	2 Reflection
APC-to-UPC hybrid cords, LC and MPO	3 APC mated to UPC
Pinned and unpinned MPO test cords	4 Pin mismatch
Contamination test cords, MPO and LC	5 Dirty end face
Type A and Type C MPO cords, LC A-to-A cords, reversed MPO fault plate	6 Wrong polarity or lane order
A kit patch cord bent tightly at the panel front (no extra part)	7 Tight bend

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06 Test procedure

Run the steps in order, one optic type at a time, and take the same readings at every step so each result compares with the baseline.

Step	Configuration	What to do	What it shows
1 Baseline	C0	Run each optic on a direct cord	Reference readings for each optic
2 One pair of panels	C1, each cable setup	Move the cords to the panels	A clean link, with receive power lower by the path loss
3 Cross-connect stress	C2 or C2e, then C4	Run 24 hours and log room temperature	400G and 800G multimode near or past the limit: rising errors, possible flaps
4 Loss margin	C1	Single-mode: add attenuation 1 dB at a time. Multimode: swap in the standard-grade cassette or add connections	How much extra loss each optic tolerates before it flaps
5 Fault scenarios	C1 or C2e	Add one cause from section 04 at a time	How each cause shows in the readings, to match against customer cases
6 Breakout check	C3	Trace each lane to its switch port	Every lane lands on the right port
7 Full reach (optional)	C1 or C2 plus a distance spool (up to 100 m multimode, 2 km single-mode)	Repeat steps 2 and 3	The effect of full cable length on top of the connections

Reading to record at every step	Why it matters
Transmit and receive power, per lane	Shows the loss and which lanes are affected
Pre-FEC BER	The earliest warning: it rises before the link drops
FEC corrected and uncorrected codewords	Uncorrected codewords mean lost frames; a sustained rise usually comes just before the link drops
Link-flap log, with timestamps	The count and timing of drops
Room temperature	Links near their limit often flap as temperature changes

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07 Worked example: reproducing a 400G-SR8 flap

A customer reports a 400G-SR8 link that flaps after it was moved onto a cross-connect. The team runs the same pair of optics through more and more connections, following steps 1 to 3 of the test procedure.

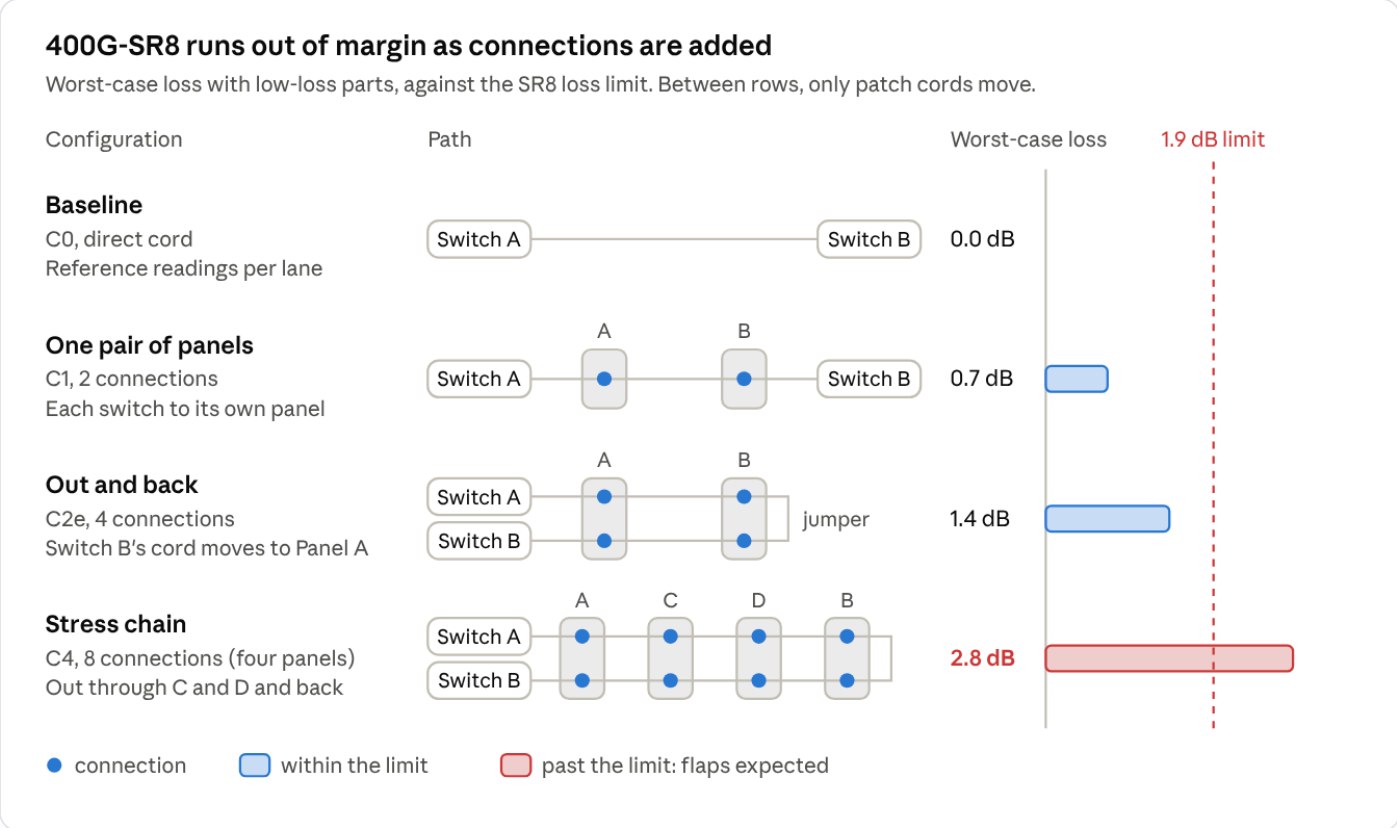


Figure 5. 400G-SR8 runs out of margin as connections are added.

Configuration	Connections	Worst-case loss, low-loss parts (dB)	Worst-case loss, standard parts (dB)	Expected result
C0 Baseline	0	0.0	0.0	Clean link; reference readings
C1 One pair of panels	2 MPO	0.7	1.5	Clean link
C2e Out and back	4 MPO	1.4	3.0	Clean on low-loss parts; over the 1.9 dB limit on standard parts
C4 Stress chain	8 MPO	2.8	6.0	Over the limit: rising errors and flaps

A customer site built with standard-grade parts goes past the limit at four connections, where the test bed's low-loss parts still pass. Once the loss pattern is recorded, the team repeats the out-and-back path

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with one fault from the kit at a time and compares each result with the customer's readings. The stress chain needs the four-panel kit. On two panels, low-loss parts keep SR8 within its limit, so the team adds cords taken from the customer's site to reproduce the customer's loss.

08 The Wave2Wave link-flap test bed

Wave2Wave builds this test bed as a kit, in a two-panel and a four-panel version. Every part is built to the rules in section 05 and ships with its measured loss.

	Two-panel kit	Four-panel kit
Panels	Two 2U, 12-slot panels: one near, one far	Four 2U, 12-slot panels: two near, two far
Rack space	4U	8U, across three racks
Configurations	C0, C1, C2e and C3	All six, C0 to C4
Cable setups	All eight: MPO-MPO, LC-LC, MPO-LC and breakout, each on OM4 and OS2	All eight
Links at once	One	Two, so a healthy link can run beside a faulty one
Fault kit	Included	Included
Test data	Measured loss on every cable and cassette, plus reflectance on single-mode	Same
Labels	TIA-606 port labels and a port map	Same
Best for	Reproducing interconnect faults and loss on one panel pair	Adding true cross-connects and stress testing
Price	Request a quote	Request a quote

Open slots in the near panels leave room for newer connector types. Cables ship packed separately from the panels and connect on site using the labeled port map.

Talk to our engineers

Tell us which optics and cabling your customers run, and we will size the kit.
info@wave2wave.io or +1 (866) 473-2701.

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Bill of materials

Quantities for each kit. Part numbers and pricing come with the quote. The short jumpers and the fault kit are one set in either kit.

Line	Part	Two-panel kit	Four-panel kit
Panel hardware			
PH1	2U 12-slot enclosure, all panels	2	4
PH2	MPO-to-LC cassette, MPO-12 UPC to 6 x LC duplex, OM4	2	4
PH3	MPO-to-LC cassette, MPO-12 APC to 6 x LC duplex, OS2	2	4
PH4	MPO-12 feedthrough, OM4, UPC, 12 ports, key up to key down	2	4
PH5	MPO-12 feedthrough, OM4, APC, 12 ports, key up to key down, green	2	4
PH6	MPO-12 feedthrough, OS2, APC, 12 ports, key up to key down, green	2	4
PH7	MPO-16 feedthrough, OM4, APC, 6 ports, key up to key down, green	2	4
PH8	MPO-16 feedthrough, OS2, APC, 6 ports, key up to key down, green	2	4
PH9	LC feedthrough (adapter plate), 12 ports OM4 (aqua)	2	4
PH10	LC feedthrough (adapter plate), 12 ports OS2 (blue)	2	4
PH11	Breakout cassette, 2 x MPO-12 UPC (8 fiber) to 8 x LC duplex, OM4, far panels	1	2
PH12	Breakout cassette, 2 x MPO-12 APC (8 fiber) to 8 x LC duplex, OM4, far panels	1	2
PH13	Breakout cassette, 2 x MPO-12 APC (8 fiber) to 8 x LC duplex, OS2, far panels	1	2
Trunks, 5 m (MPO trunks are Type B)			
TR1	MPO-12 UPC F-F, OM4, 12F, cassette to cassette	1	2
TR2	MPO-12 APC F-F, OS2, 12F, cassette to cassette	1	2
TR3	MPO-12 UPC M-M, OM4, 12F, feedthrough	2	4
TR4	MPO-12 UPC M-M, OS2, 12F, reflection test (red-tagged, uses spare ports on the OS2 APC MPO-12 feedthrough)	1	2
TR5	MPO-12 APC M-M, OS2, 12F, feedthrough	2	4
TR6	MPO-12 APC M-M, OM4, 12F, feedthrough	2	4
TR7	MPO-16 APC M-M, OM4, feedthrough	2	4
TR8	MPO-16 APC M-M, OS2, feedthrough	2	4

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Line	Part	Two-panel kit	Four-panel kit
TR9	MPO-12 UPC M-F, OM4, 8F, feedthrough to breakout cassette	2	4
TR10	MPO-12 APC M-F, OS2, 8F, feedthrough to breakout cassette	2	4
TR11	MPO-12 APC M-F, OM4, 8F, feedthrough to breakout cassette	2	4
TR12	LC to LC trunk, OM4, 12F	1	2
TR13	LC to LC trunk, OS2, 12F	1	2
Patch cords, 2 m (MPO cords are unpinned, Type B)			
CD1	LC duplex uniboot, reversible, OM4	16	24
CD2	LC duplex uniboot, reversible, OS2	16	24
CD3	MPO-12 UPC, OM4	2	3
CD4	MPO-12 APC, OM4	4	6
CD5	MPO-16 APC, OM4	2	3
CD6	MPO-12 APC, OS2	4	6
CD7	MPO-16 APC, OS2	2	3
Breakout harnesses and conversion cords			
BH1	Harness, MPO-16 APC to 8 x LC duplex, OM4, 2 m, for breakout of MPO-16 multimode optics such as 400G-SR8	1	2
BH2	Harness, MPO-12 APC (8F) to 4 x LC duplex, OM4, 2 m, for breakout of 8-fiber APC multimode optics	2	4
BH3	Conversion cord, MPO-16 APC to 2 x MPO-12 APC (8F), OS2, 1 m, connects MPO-16 single-mode optics to the breakout cassette	1	2
Short jumpers, 0.5 m, for out-and-back tests			
JP1	LC duplex, OM4	4	4
JP2	LC duplex, OS2	4	4
JP3	MPO-12 UPC, OM4	2	2
JP4	MPO-12 APC, OS2	2	2
JP5	MPO-16 APC, OM4	1	1
JP6	MPO-16 APC, OS2	1	1

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Line	Part	Two-panel kit	Four-panel kit
Fault-injection kit, red-tagged			
FK1	Fault plate, MPO-12, OM4, UPC, key up to key up, 6 ports (near panel, slot 10)	1	1
FK2	Fault plate, LC APC duplex, OS2, 12 ports, green (near panel, slot 11)	1	1
FK3	Standard-grade cassette, MPO-12 UPC to 6 x LC, OM4	2	2
FK4	Standard-grade cassette, MPO-12 APC to 6 x LC, OS2	2	2
FK5	LC UPC attenuator, single-mode: 1, 2, 3, 5, 7 dB, 2 each	10	10
FK6	MPO-12 APC in-line attenuator, single-mode: 1 dB and 3 dB	2	2
FK7	LC APC to LC UPC hybrid duplex cord, OS2, 2 m	2	2
FK8	MPO-12 APC to MPO-12 UPC hybrid cord, OS2, 2 m	2	2
FK9	MPO-12 Type A cord, 2 m (1 OM4 UPC, 1 OS2 APC)	2	2
FK10	MPO-12 Type C cord, 2 m (1 OM4 UPC, 1 OS2 APC)	2	2
FK11	LC duplex A-to-A cord, 2 m (2 OM4, 2 OS2)	4	4
FK12	MPO-12 pinned-to-unpinned cord, 2 m (1 OM4 UPC, 1 OS2 APC)	2	2
FK13	Contamination test cords, red-tagged, 2 m: 2 MPO-12 and 2 LC (set)	1	1

Optional distance kit

Fiber spools for full-reach tests. Each spool works with either kit.

Line	Part	Qty
DK1	Distance spool, OM4, MPO-12 UPC, 100 m	1
DK2	Distance spool, OM4, MPO-12 APC, 50 m	1
DK3	Distance spool, OM4, MPO-16 APC, 100 m	1
DK4	Distance spool, OS2, MPO-12 APC, 500 m	1
DK5	Distance spool, OS2, LC UPC duplex, 2 km	1

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09 Frequently asked questions

▼ What causes a link to flap after it is cabled through a patch panel?

Usually the cabling: too much loss for the optic's budget, reflections at UPC connections on single-mode, an APC connector mated to a UPC connector, an MPO pin mismatch, a dirty end face, wrong polarity, or a tight bend. At 400G and 800G, check total loss first.

▼ How many patch panel connections can a 400G-SR8 link tolerate?

A 400G-SR8 allows 1.9 dB of channel loss. Two low-loss MPO connections use up to 0.7 dB and two standard-grade connections up to 1.5 dB. A four-connection cross-connect fits with low-loss parts (1.4 dB) but not with standard-grade parts (3.0 dB).

▼ Do 400G and 800G optics need APC connectors?

Many do. In published data sheets, 400G-SR8, 400G-DR4, 800G-VR8 and 800G-DR8 require angled (APC) MPO connectors, while 400G-SR4.2 and LC optics such as 400G-FR4 use UPC. Check the data sheet for the exact optic in use.

▼ What is the difference between a feedthrough and a cassette?

A feedthrough is a panel plate of plain adapters, so it adds one connection per panel. A cassette converts an MPO trunk to LC ports and adds two connections per panel, so it uses more of the loss budget.

Sources

- Cisco OSFP 800G Transceiver Modules Data Sheet: loss budgets and APC requirements for 800G-VR8 and 800G-DR8
- Cisco 400G QSFP-DD Cable and Transceiver Modules Data Sheet: loss budgets and connector polish for 400G-SR8, SR4.2, BiDi, DR4, 2×100G-SR4, 4×100G-FR and LR, FR4 and LR4
- IEEE P802.3cd, channel insertion loss vs. discrete reflectances (Dawe, July 2017): how reflective connections lower the allowed loss for 100GBASE-DR
- Fiber Optic Association: TIA-568 fiber optic requirements: 0.75 dB maximum per mated connector pair; 3.5 dB/km multimode attenuation at 850 nm; 0.5 to 1.0 dB/km single-mode at 1310 nm
- Fluke Networks: Getting 12- and 8-fiber MPO polarity right: APC MPO connectors must mate key-up to key-down

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