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NCS 1014 Coherent Colorless Multiplexer and Demultiplexer Line Card

Contents

The NCS 1014 Coherent Colorless Multiplexer and Demultiplexer (CCMD) line card provides enhanced add/drop support with NCS 1010 ROADM site deployments.

Product overview

The last few years of optical system deployments have started opening up to the concept of the open line system. This has also brought in the concept of disaggregated optical systems where line systems and transponder systems are being deployed. The key advantage providers are able to reap out of this architecture is to enable multivendor solutions. This allows providers to deploy best in breed at the time of deploying new cards and also have best-in-class network orchestration.

The Cisco® NCS 1010 and NCS 1014 optical platforms provide a best-in-class open DWDM line system that can be managed through a common software layer with the use of standard APIs and data models and fit the disaggregated "open" line system model.

The CCMD line card is an optical line card that provides 16 colorless add/drop ports with an embedded preamplifier and booster amplifier that would allow for the expansion of channels on a reconfigurable optical add-drop multiplexer (ROADM) port. Two variants of the line card are available to operate in the C- and L-band parts of the optical spectrum. The CCMD-16 C- and L-band variants form the node architecture to support colorless and directional modes of deployment providing an overall bandwidth of 30+ Tbps each.

The CCMD line card is embedded with a preamplifier that amplifies the signal coming from the outside fiber plant into the site equipped with transponders. This improves receiver sensitivity at the transponder. The CCMD line card is equipped with a booster amplifier that operates in two gain modes. The first gain range allows low transmit power line cards/transceivers like ZR+ to be amplified in order to attain the required transmit power that goes into the NCS 1010 ROADM ports, which eventually gets into the fiber.

The CCMD line card occupies one slot in NCS 1014 chassis and works in conjunction with the NCS 1010 Open Optical Line Terminal (OLT).
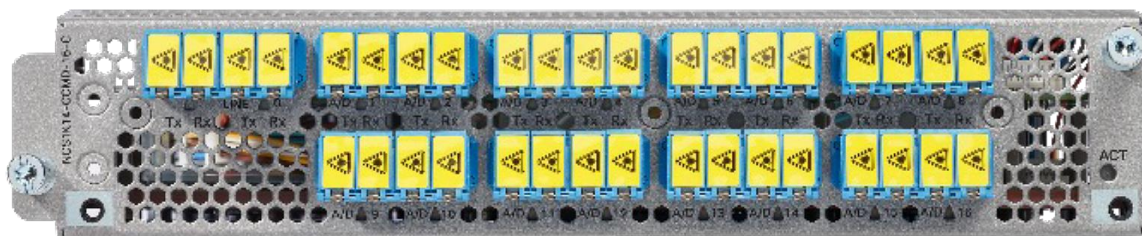

Figure 1.
NCS 1014 16-Port Coherent Colorless Multiplexer Demultiplexer Module–C-Band
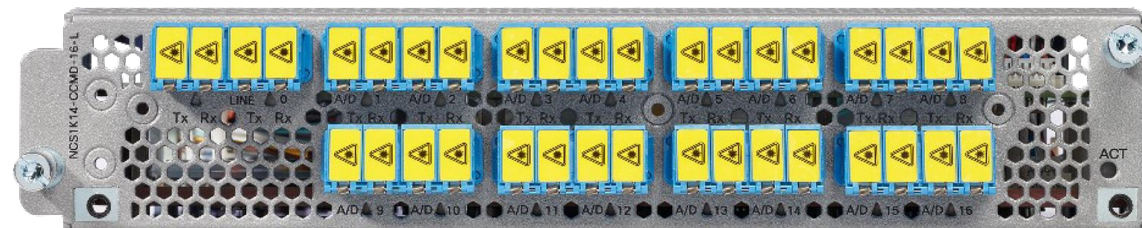

Figure 2.
NCS 1014 16-Port Coherent Colorless Multiplexer Demultiplexer Module–L-Band

Features and benefits

The CCMD line card supports low transmit power ZR+ coherent interfaces to generic line card coherent interfaces, which can be from Bright ZR+ or embedded line ports. This allows providers to deploy interfaces based on their network reach requirements, from metro to long haul, with a simple colorless add/drop architecture.

The CCMD line card supports 16 add/drop ports for TXPs and a composite port that feeds into the ROADM add/drop port. More and more networks are looking for higher degree support, which will limit the number of add/drop ports. The CCMD line card provides 64 channels with just 4 line cards in C-band and 4 line cards in L-band.

The Cisco® IOS XR operating system software that runs on NCS 1010 and NCS 1014 provides a rich suite of automation features that include zero-touch provisioning (ZTP), OpenConfig Yang models with Netconf and gNMI, streaming telemetry, and gNOI support. NCS 1010 is equipped with automated end-to-end turn-up of the network, which includes the embedded control loops within and between the ROADM nodes in the network.

Deployment architecture of NCS 1010 and NCS 1014 CCMD in a C- and L-band node:

NCS 1010 is a 3 RU chassis unit that can be deployed in C-/L-band OLT or ILA configuration. NCS 1014 is a 2 RU chassis consisting of 4 line card slots that can be equipped with transponder/muxponder or CCMD optical line cards. The below picture highlights the node architecture of a colorless directional add/drop architecture for a 2-degree node with C- and L-band support.
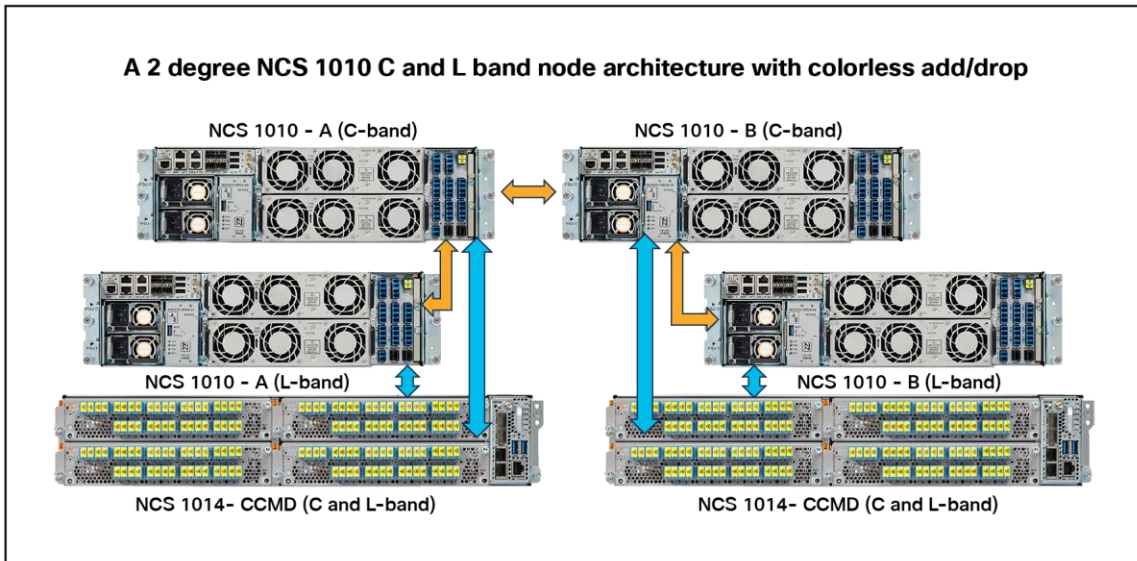

Figure 3.
A 2-degree NCS 1010 C- and L-band node architecture with colorless add/drop

Product specifications

The following table lists out the specifications of the components of the NCS 1014 CCMD line card.

Table 1.   Specifications of the CCMD line card

Parameter	Details
Line card support	NCS 1014
Number of slots	1 slot
Power(typical)	70 Watts

Table 2.   General details of the line card

CCMD-C band	Specifications
Channel grid	64 channels, 75 GHz, spaced
Central wavelength - Channel 64	191.375 GHz (1566.52 nm)
Central wavelength - Channel 1	196.100 GHz (1528.77 nm)
EDFA operating frequency range	From 191.250 GHz to 196.200 GHz

Table 3.   CCMD-C Add EDFA Gain range 1

Parameter	Condition	Min	Typ	Max	Unit
Per-channel input power range	At CH-RX port	–7.0	4.0	9.0	dBm
Total input power range	After multiplexer	–21.0		7	dBm
Total input power range	At channel Rx port	–7.0		21.0	dBm
Maximum total output power				18.2	dBm
Output power shut-off threshold				18.5	dBm
Signal output power range	Full channel load—see power mask			18.0	dBm
	Single channel—see power mask	0		6.0	dBm
Nominal gain	With 0 dB tilt		2		dB
Gain range	With tilt uncontrolled	–3.0		7.0	dB
Noise figure at nominal gain	G = 2 dB			5.7	dB
Noise figure at minimum gain	G = –3 dB			6.7	dB

Parameter	Condition	Min	Typ	Max	Unit
Noise figure at maximum gain	G = 7 dB			5.4	dB
VOA attenuation range		0		15	dB
DEG-TX to MON-TX relative attenuation		18	20	22	dB
Directivity (optical path loss)	Isolation at EDFA add output	40			dB
Amplifier tilt coefficient	Moving @ 1dB step from maximum flat gain			0.25	dB/THz

Table 4. CCMD-C Add EDFA Gain range 2

Parameter	Condition	Min	Typ	Max	Unit
Per-channel input power range	At CH-RX port	–22.0	–11.0	–6.0	dBm
Total input power range	After multiplexer	–36.0		–8	dBm
Total input power range	At channel Rx port	–22.0		6.0	dBm
Maximum total output power				18.2	dBm
Output power shut-off threshold				18.5	dBm
Signal output power range	Full channel load—see power mask			18.0	dBm
	Single channel—see power mask	0		6.0	dBm
Nominal gain	With 0 dB tilt		17		dB
Gain range	With tilt uncontrolled	12.0		22.0	dB
Noise figure at nominal gain	G = 17 dB			5	dB
Noise figure at minimum gain	G = 12 dB			5.4	dB
Noise figure at maximum gain	G = 22 dB			5	dB
VOA attenuation range		0		15	dB
DEG-TX to MON-TX relative attenuation		18	20	22	dB

Parameter	Condition	Min	Typ	Max	Unit
Directivity (optical path loss)	Isolation at EDFA add output	40			dB
Amplifier tilt coefficient	Moving @ 1dB step from maximum flat gain			0.25	dB/THz

Table 5.   CCMD-C Drop EDFA

Parameter	Condition	Min	Typ	Max	Unit
Per-channel input power range	At DEG-RX port	-19.0	-8.0	-3.0	dBm
Total input power range	At DEG-RX port	-19.0		9	dBm
Maximum total output power				9.2	dBm
Output power shut-off threshold				9.5	dBm
Signal output power range	Full channel load—see power mask			9.0	dBm
	Single channel—see power mask	-9		-3.0	dBm
Nominal gain	With 0 dB tilt		5		dB
Gain range	With tilt uncontrolled	0.0		10.0	dB
Noise figure at nominal gain	G = 5 dB			5.9	dB
Noise figure at minimum gain	G = 0 dB			6.8	dB
Noise figure at maximum gain	G = 10 dB			5.9	dB
TP-C to MON-RX relative attenuation		18	20	22	dB
VOA attenuation range		0		15	dB
Directivity (optical path loss)	Isolation at EDFA drop output	40			dB
Amplifier tilt coefficient	Moving @ 1dB step from maximum flat gain			0.25	dB/THz

CCMD-L band	Specifications
Channel grid	64 channels, 75 GHz, spaced
Central wavelength - Channel 64	186'125 GHz (1610.7 nm)
Central wavelength - Channel 1	190'850 GHz (1570.83 nm)
EDFA operating frequency range	From 186'025 GHz to 191'000 GHz

Table 6. CCMD-L Add EDFA Gain range 1

Parameter	Condition	Min	Typ	Max	Unit
Per-channel input power range	At CH-RX port	–7.0	4.0	9.0	dBm
Total input power range	After multiplexer	–21.0		7	dBm
Total input power range	At channel Rx port	–7.0		21.0	dBm
Maximum total output power				18.2	dBm
Output power shut-off threshold				18.5	dBm
Signal output power range	Full channel load—see power mask			18.0	dBm
	Single channel—see power mask	0		6.0	dBm
Nominal gain	With 0 dB tilt		2		dB
Gain range	With tilt uncontrolled	–3.0		7.0	dB
Noise figure at nominal gain	G = 2 dB			6.4	dB
Noise figure at minimum gain	G = -3 dB			7.5	dB
Noise figure at maximum gain	G = 7 dB			5.9	dB
VOA attenuation range		0		15	dB
DEG-TX to MON-TX relative attenuation		18	20	22	dB
Directivity (optical path loss)	Isolation at EDFA add output	40			dB
Amplifier tilt coefficient	Moving @ 1dB step from maximum flat gain			0.25	dB/THz

Table 7. CCMD-L Add EDFA Gain range 2

Parameter	Condition	Min	Typ	Max	Unit
Per-channel input power range	At CH-RX port	–22.0	–11.0	–6.0	dBm
Total input power range	After multiplexer	–36.0		–8	dBm
Total input power range	At channel Rx port	–22.0		6.0	dBm
Maximum total output power				18.2	dBm
Output power shut-off threshold				18.5	dBm
Signal output power range	Full channel load–see power mask			18.0	dBm
	Single channel–see power mask	0		6.0	dBm
Nominal gain	With 0 dB tilt		17		dB
Gain range	With tilt uncontrolled	12.0		22.0	dB
Noise figure at nominal gain	G = 17 dB			5.8	dB
Noise figure at minimum gain	G = 12 dB			5.9	dB
Noise figure at maximum gain	G = 22 dB			5.8	dB
VOA attenuation range		0		15	dB
DEG-TX to MON-TX relative attenuation		18	20	22	dB
Directivity (optical path loss)	Isolation at EDFA add output	40			dB
Amplifier tilt coefficient	Moving @ 1dB step from maximum flat gain			0.25	dB/THz

Table 8.   CCMD-L Drop EDFA

Parameter	Condition	Min	Typ	Max	Unit
Per-channel input power range	At DEG-RX port	−19.0	−8.0	−3.0	dBm
Total input power range	At DEG-RX port	−19.0		9	dBm
Maximum total output power				9.2	dBm
Output power shut-off threshold				9.5	dBm
Signal output power range	Full channel load—see power mask			9.0	dBm
	Single channel—see power mask	−9		−3.0	dBm
Nominal gain	With 0 dB tilt		5		dB
Gain range	With tilt uncontrolled	0.0		10.0	dB
Noise figure at nominal gain	G = 5 dB			7.4	dB
Noise figure at minimum gain	G = 0 dB			8.6	dB
Noise figure at maximum gain	G = 10 dB			6.9	dB
TP-C to MON-RX relative attenuation		18	20	22	dB
VOA attenuation range		0		15	dB
Directivity (optical path loss)	Isolation at EDFA drop output	40			dB
Amplifier tilt coefficient	Moving @ 1dB step from maximum flat gain			0.25	dB/THz

Ordering information

Table 9. List of orderable PIDs

Product ID	Product description
NCS1K14-CCMD-16-C=	NCS 1000 16-port Colorless Direct attach LC with EDFA C-band
NCS1K14-CCMD-16-L=	NCS 1000 16-port Colorless Direct attach LC with EDFA L-band
ESS-CCMD-RTU=	NCS 1014 CCMD16 Essentials RTU
ESS-CCMD-SIA3=	NCS 1014 CCMD16 Essentials SIA for 3 years

Product sustainability

Information about Cisco's Environmental, Social, and Governance (ESG) initiatives and performance is provided in Cisco's CSR and sustainability reporting.

Table 10. Cisco environmental sustainability information

Sustainability topic		Reference
General	Information on product-material-content laws and regulations	Materials
	Information on electronic waste laws and regulations, including our products, batteries, and packaging	WEEE Compliance
	Information on product takeback and reuse program	Cisco Takeback and Reuse Program
	Sustainability inquiries	Contact: csr_inquiries@cisco.com
Material	Product packaging weight and materials	Contact: environment@cisco.com

Warranty information

Product warranty terms and other information applicable to Cisco products are available at www.cisco.com/go/warranty.

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For more information

Add: www.cisco.com/go/ron

NCS 1000 datasheets: https://www.cisco.com/c/en/us/products/optical-networking/network-convergence-system-1000-series/datasheet-listing.html.

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