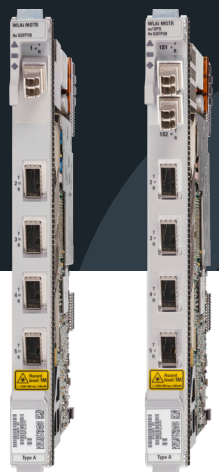
DATA SHEET

400G WaveLogic Ai MOTR Modules

For the 6500 Packet-Optical Platform



Optimized for best-in-class 100G service density and low power consumption, Ciena's WaveLogic Ai MOTRs are optical transponder and service channel interfaces that enable a more scalable and programmable infrastructure.

Ciena's WaveLogic Ai (WLAi) MOTR combines four 100G QSFP28 clients and one programmable 400G coherent line interface in a single-slot form factor. With its pluggable QSFP28 client ports, operators can accommodate high-speed 100GE services or OTU4 connections with an efficient, pay-as-you-grow operational model. One variant of the module includes an Optical Protection Switch (OPS) port directly on the card for integrated optical layer protection without the need to deploy additional hardware. WLAi MOTR operates flexibly in any of the existing 6500 D-Series and S-Series shelf configurations, from the compact 6500-D2 (2RU height) to the half-rack 6500-S32 configuration, so network providers can select the appropriate form factor to match specific capacity and power/space requirements.

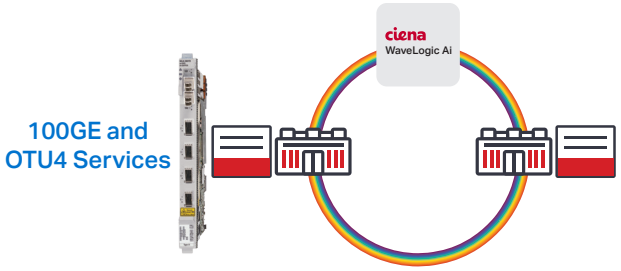


Figure 1. Cost-effective high-speed 100G service delivery scaling up to 400G with WLAi MOTR

The WLAi MOTR interface integrates Ciena's programmable WaveLogic Ai coherent modem technology, which allows users to tune capacity from single wave 100 Gb/s to 400 Gb/s to maximize capacity for any distance. Users can transport twice the capacity per wavelength versus 100G/200G solutions, or extend signals over three times the distance at equivalent capacities to gain significant economic savings. Specifically, 400G can be deployed in metro and Data Center Interconnect (DCI) applications, 300 Gb/s for regional applications, 200 Gb/s for long-haul terrestrial, and 100G for >10,000 km compensated submarine links.

Features and Benefits

- Addresses all application requirements with a single module that leverages a pay-as-you-grow operating model
- Maximizes channel capacity for all applications, with tunability from 100G to 400G in 50G steps
- Increases service availability with a variant that integrates an Optical Protection Switch on the card
- Offers unprecedented, real-time optical networking performance data with the programmability required to make networks more adaptable

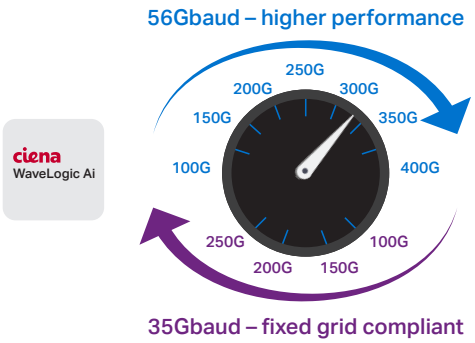


Figure 2. Trade channel throughput for optical performance and spectrum usage

Each WLAi MOTR module cost-efficiently addresses all application requirements and supports a pay-as-you-grow operating model. The user simply selects the maximum reach required and enables client capacity in 100G increments by selecting the appropriate software license. Additional capacity licenses can be remotely transfered to the hardware as bandwidth requirements increase. In this way, users realize lowest cost/bit per kilometer advantages and benefit from simpler forecasting, shorter certification cycles, and reductions in sparing costs.

WLAi MOTR operates at a selectable symbol rate of 35GBaud or 56GBaud, giving users the ability to trade channel throughput for optical performance and spectrum usage while delivering power and space efficiency benefits over both fixed and flexible grid photonic line systems. The full range of capacities is available at 56Gbaud, with 100G to 250G channel capacities available at 35Gbaud.

To provide previously unattainable network monitoring and efficiencies, WLAi MOTR offers unique, real-time link monitoring capabilities, enabling operators to extract the most efficiency out of their network at any point in the network's life. With these embedded link measurement capabilities, operators can determine exactly how much margin is currently present in the network, as well as the optimal capacity they can deploy. Combined with Liquid Spectrum analytics, applications such as predictive link failure now become possible, allowing operators to preempt outages with scheduled maintenance activities. Users can access the following critical real-time link measurements:

- Pre-FEC BER, Pre-FEC Q (average, max)
- Tx power level
- Rx total power and channel power
- Maximum, average, and real-time DGD
- PDL (average, max)
- Total Rx and total Tx link dispersion
- Estimated fiber length
- Estimated unidirectional latency
- Effective Signal-to-Noise Ratio (ESNR)

In addition to these new levels of intelligence and programmability, WLAi MOTR provides features that facilitate and accelerate operational tasks. These capabilities include topology discovery, facility/terminal loopbacks, an independent integrated test set per client port, and 15-minute interval line performance monitoring data, providing users with quick visibility into data and signal integrity. Various client and line protection options offer the ability to implement the level of resiliency needed for the network.

With Ciena's 400G WLAi MOTR modules, operators can evolve to a more scalable and programmable network and radically drive down networking costs for high-speed 100G service delivery, leveraging industry-leading multi-rate coherent optics.

WaveLogic Ai MOTR Module Specifications

Module Description	WaveLogic Ai MOTR	WaveLogic Ai MOTR w/OPS
Number of line ports	Line: 1 x WLAi line port (up to 400Gb/s)	
Number of client ports	Clients (4 ports total): 4 x QSFP28	
Integrated Optical Protection	N/A	1+1 Line Protection
Weight	1.7 kg (3.7 lb)	
Tunable frequency	191.3425 to 196.1075 THz, 0.0001THz tuning precision	
Tx output power	-9 to +4 dBm	-9 to -0.3 dBm
Rx back-back sensitivity	-20 dBm (per channel)	-18.2 dBm (per channel)
Rx overload	+5 dBm (per channel) +11 dBm (total power)	+5.7 dBm (per channel) +11.7dBm (total power)
Rx damage level	+14 dBm (total power)	+14.7 dBm (total power)
PMD tolerance	For 35Gbaud: 80 ps mean, 240 ps peak For 56Gbaud: 50 ps mean, 150 ps peak	
Line rates	• 100 Gb/s, 150 Gb/s, 200 Gb/s (at 35.5Gbaud) • 100 Gb/s, 150 Gb/s, 200 Gb/s, 250 Gb/s, 300 Gb/s, 400 Gb/s (at 56.80Gbaud)	
PDL tolerance	For 35Gbaud, all line rates: 2.5 dB For 56Gbaud, line rate dependent: • 100G line rate: 3.0 dB • 150G line rate: 2.8 dB • 200G line rate: 2.5 dB • 250G line rate: 2.5 dB • 300G line rate: 2.0 dB • 400G line rate: 1.5 dB	
Chromatic dispersion tolerance	• For 35Gbaud: -89000 to +579000 ps/nm • For 56Gbaud, 100G, 150G, 200G, 250G line rate: -35000 to +435500 ps/nm for both terrestrial and submarine applications • For 56Gbaud, 300G line rate: -35000 ps/nm to +35000 ps/nm for terrestrial applications and -35000 to +435500 ps/nm for submarine applications • For 56Gbaud, 400G line rate: -17500 ps/nm to +17500 ps/nm for both terrestrial and submarine applications	
WaveLogic Ai link performance monitoring	• Pre-FEC BER, Pre-FEC Q (average, max) • Post-FEC Error Count • Tx power level • Rx total power and channel power • Maximum, average, and real-time DGD • PDL (average, max) • Total Rx and total Tx link dispersion • Estimated fiber length • Estimated unidirectional latency • Effective Signal-to-Noise Ratio (ESNR)	
Client Protocols (Mappings)	• 100GbE (GMP) • OTU4 (none)	
Topology Discovery	• 10GE and 100GE LLDP Ingress Monitoring (LLDP snooping) • Network Discovery Protocol (NDP) Adjacencies for photonic layer discovery	

WaveLogic Ai MOTR Module Specifications continued

Loopback support	• Line: facility and terminal loopbacks supported • Client: facility and terminal loopbacks supported
Integrated Test Set (ITS)	• 4 independent 100GbE/OTU4 ITS per card, 1 per port • Test patterns: 100GE 802.3ba, OPU4 (PRBS31) • Ability to test full traffic path across the DWDM line, as well as subtending equipment from client port
Protection	• 1+1 OPS client-layer optical path protection • 1+1 OPS optical channel path protection • 1+1 OPS optical trunk protection • Layer 0 Control Plane restoration
Shelf capacity	• 6500-D2: 800 Gb/s • 6500-D7: 2.8 Tb/s • 6500-S8: 2.4 Tb/s • 6500-S14: 5.6 Tb/s • 6500-S32: 12.8 Tb/s
ROADM support	• Up to 16 cascaded ROADMs
Channel plan support	• 35Gbaud: 50GHz fixed, 75GHz fixed, 100GHz fixed, flexible grid • 56Gbaud: 75GHz fixed, 100GHz fixed, flexible grid

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