

Opti Max® Optical Node Series

RD2322 RxD Remote PHY Device (RPD)/ Remote MACPHY Device (RMD) for OM4120® 1.2 GHz Nodes

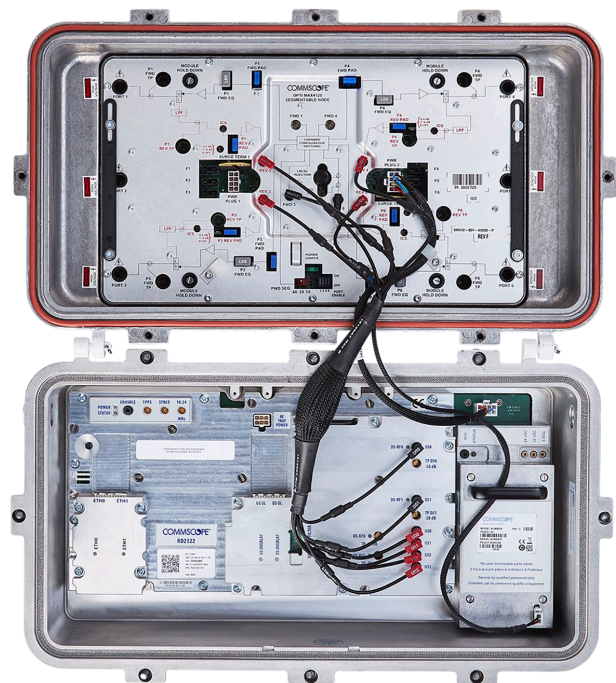
FEATURES

- As an RMD: Simple, all-in-one box distributed CMTS solution that moves both MAC and PHY functionality out of the headend
- As an RPD: Improves headend density and power efficiency by moving PHY functionality out of the headend
- Configurable as 1x1, 1x2, or 2x2 DS-SG x US-SG
- DOCSIS® 3.1 compliant
- Supports D3.1 *Enhanced* channel bonding for up to five (5) OFDM channels (RMD only)
- Supports bonding of more than 32 downstream channels (RMD only)
- Seamlessly upgrade from traditional optics to distributed access architectures
- Leverage installed base of nodes while enhancing plant performance
- Upstream and downstream analog overlay options to utilize legacy analog signals as needed
- Maximized fiber utilization and reach
- Available with or without console port option

The Remote PHY Device (RPD) and Remote MACPHY Device (RMD) are key components in CommScope's Distributed Access Architecture (DAA) portfolio. Both offer significant operational benefits—including increased bandwidth capacity, improved fiber efficiencies (wavelengths and distance), simplified plant operations with digital optics, and decreased loads on facility space and power systems—by extending the digital portion of the headend or hub to the node and placing the digital/RF interface at the optical/coax boundary.

The deep lid RxD option for the OM4120 node allows operators to unlock the performance benefits of DAA by operating the node as either an RPD or RMD. The deep lid option is available as part of a fully configured OM4120 node, for new node installations, or as a lid upgrade kit that includes the RD2322 module, which allows operators to leverage an installed base of OM41 nodes. The lid upgrade not only supports DAA upgrades but also provides operators with an opportunity to upgrade legacy OM4 nodes from 870 MHz or 1.0 GHz to 1.2 GHz at the same time.*

** Requires 1.2 GHz RF Module for 1.2 GHz performance in OM4000 and OM4100® node upgrades.*



OM4120 with Deep Lid Option

RD2322 RxD Module Operation

The RD2322 takes the place of traditional optics modules, such as downstream receivers and upstream transmitters, inside the node. The RD2322 operates in the same manner as a traditional forward receiver, with fine variable output level and tilt adjustments made via the module, and coarse level and tilt adjustments that can be made by installing RF attenuator pads and equalizers, respectively, in the node's RF module. When operating as an RPD, the RD2322's channel configuration is received from the CCAP Core in the headend. When operating as an RMD, the RD2322's service and channel configuration is downloaded from an external server as a configuration file.

The RD2322 supports 1 DS-SG x 1 US-SG, 1 DS-SG x 2 US-SG, and 2 DS-SG x 2 US-SG configurations. It is shipped licensed for 1 DS-SG x 1 US-SG RPD and RMD operation. Additional downstream and/or upstream service groups are activated by installing the corresponding software license. For RMD operation, MAC layer channel capacity is enabled by installing DOCSIS 3.0 and/or DOCSIS 3.1 channel licenses.*

The RD2322 is available in a full, OM4120 factory-configured node or as part of a deep-lid upgrade kit. The upgrade kit allows users to modify existing OM4100 or OM4120 nodes to support Remote PHY or R-MACPHY applications. The deep lid node includes a modified "deep" housing lid that supports the RD2322 form factor, the RD2322, a PS4201 power supply, and interconnecting cables as needed to support 1.2 GHz connections.

Network Flexibility

Today's technologies are developing at a rapid pace, which is why it is more important than ever for products to be flexible enough to support next-generation technologies, such as DAA, without a major forklift. Keeping these concerns in mind, the OM4120 node deep-lid upgrade kit allows operators to transition seamlessly from traditional node-based analog/digital optical delivery to a DAA architecture by using the OM4120 chassis as a base and leveraging their current network assets. When operators are ready to transition to DAA, the node's modular design allows them to upgrade previously deployed OM4120 nodes to support either R-PHY or R-MACPHY functionality by simply removing the node's existing optical modules and housing lid and replacing them with a deep lid upgrade kit. The ease and simplicity of transitioning the OM4120 to support DAA operation provides operators with several benefits, including a cost-effective roadmap for upgrading their current network assets and the ability to future-proof today's purchases for long-term use.

Small Form-Factor Pluggable (SFPs)

CommScope offers temperature-hardened, high-speed 10 Gbps SFP+ modules for the RxD application. These SFP modules are carefully chosen by our design team to ensure end-to-end performance and stability. Available in CWDM and DWDM 40 ITU wavelengths, CommScope SFP+ modules support lengths of up to 80 km. Rigorously tested, SFP+ modules are designed to withstand the thermal profile of the OM4120 while providing added long-term performance in the field with industrial temperature specifications across the family. The modules provide both design flexibility and the ability to maximize wavelength aggregation, making them the ideal choice to guarantee the RD2322's link performance across a wide range of outdoor temperatures.

In addition to these standard SFP options, CommScope also offers downstream analog receivers and upstream analog transmitter SFP+ modules and associated plug-in filters that support RF overlay. These modules are capable of processing and transmitting customized, traditional RF signals in RF overlay scenarios, which allows cable operators to deploy an RD2322 in a Distributed Access Architecture and still process these critical existing signals that the RD2322 would not otherwise be able to support.

** In the configuration options referenced in this paragraph, "SG" refers to "Service Group." This acronym is also used in the Specifications and Ordering Information tables.*

SPECIFICATIONS

Characteristics	Specification
Service Group Configurations	1 DS-SG x 1 US-SG 1 DS-SG x 2 US-SG 2 DS-SG x 2 US-SG
CIN Connectivity	Dual 10 GbE SFP+ (RMD and RPD), Path Redundancy (RMD only), LAG (RMD only) Control/Management Plane—IPv4 (RMD only); IPv4 or IPv6 (RPD only) Data Plane/MPEG Video—IPv4 or IPv6 (RMD and RPD)
Security/Encryption	802.1x Authentication & Authorization Secure Boot MACsec Encryption (RMD only) TACACS+ Protocol for Authentication, Authorization, and Accounting (AAA) Services (RMD only) RADIUS Protocol for Authentication (RMD only)
Proactive Network Management (PNM)	Upstream Receive Modulation Error Ratio (RxMER) per subcarrier Upstream Capture for Active and Quiet Probes (UPC) Upstream Triggered Spectrum Capture (UTSC) IdleSID Trigger Mode, IdleSID triggering by SC-QAM or OFDMA channel UTSC FreeRun Trigger Mode with Repeat Capture or Continuous Capture Bulk File Transfer to PNM data files (RMD only)
High Split Support	OFDMA Upstream Data Profile (OUDP) scheduled grants for high split leakage detection and upstream measurement
Channel Capacity¹	
Downstream (per downstream service group)	Annex A or B: 6x192 MHz, configurable as SC-QAM or OFDM Annex A: 3 OFDM (up to 192 MHz each) with up to 72 Annex A SC-QAM, of which up to 32 may be DOCSIS Up to 2 OFDM (up to 192 MHz each) with up to 96 Annex A SC-QAM, of which up to 32 may be DOCSIS Annex B: 5 OFDM (up to 192 MHz each) with up to 20 video channels (RMD only) 4 OFDM (up to 192 MHz each) with up to 32 Annex B SC-QAM and up to 20 video channels (RMD only) 3 OFDM (up to 192 MHz each) with up to 96 Annex B SC-QAM, of which up to 48 may be DOCSIS Up to 2 OFDM (up to 192 MHz each) with up to 128 Annex B SC-QAM, of which up to 48 may be DOCSIS 1 OFDM (up to 192 MHz) with up to 123 Annex B SC-QAM, of which up to 63 may be DOCSIS No OFDM with up to 124 Annex B SC-QAM, of which up to 64 may be DOCSIS
Channel Bonding	D3.1 <i>Enhanced</i> channel bonding for up to five (5) OFDM channels (RMD only) ¹ More than 32 downstream channels (RMD only)
Upstream (per upstream service group)	12 SC-QAM and 2 OFDMA (up to 95 MHz each)
Set Top Box Out-of-Band (OOB)	SCTE 55-1 SCTE 55-2
Out-of-Band ²	Narrowband Digital Forward (NDF)—two NDF channels per downstream service group (with up to 3 OFDM channels) Narrowband Digital Forward (NDF)—one NDF channel (with 4 or 5 OFDM channels) Narrowband Digital Return (NDR)—one NDR channel per upstream service group Channel Widths: 25.6 (NDF only), 1.28, 2.56, or 5.12 MHz (NDF and NDR); 160, 320, or 640 kHz (NDR only)
CW Tone Generation	AGC, Alignment, Leakage Detection
High Speed Data	DOCSIS 3.0, DOCSIS 3.1/3.1 <i>Enhanced</i>
Video	Broadcast Video, Narrowcast Video Video Sync Mode (RPD and RMD—requires IEEE 1588 Precision Time Protocol (PTP)) Video Async Mode (RMD only—does not require PTP) Mixed Annex: Annex A video with Annex B DOCSIS; Annex C video with Annex B DOCSIS
Designed for Compliance to CableLabs [®] MHA v2 Standards	CM-SP-R-PHY Remote PHY Specification CM-SP-R-DEPI Remote Downstream External PHY Interface Specification CM-SP-R-UEPI Remote Upstream External PHY Interface Specification CM-SP-R-GCP Generic Control Plane Specification CM-SP-R-DTI Remote DOCSIS Timing Interface Specification CM-SP-R-OOB Remote Out-of-Band Specification CM-SP-R-OSSI Remote PHY OSS Interface Specification CM-SP-DRFI Appendix D
RF (Node with RPD)	
Downstream Operational Bandwidth	54–1218 MHz/85–1218 MHz/102–1218 MHz/258–1218 MHz
Upstream Operational Bandwidth	5–42 MHz/5–65 MHz/5–85 MHz/5–204 MHz
RF Port Impedance	75 Ω
RF Return Loss	15 dB
Actual Output Level	51/33 dBmV @ 1218/54 MHz
Actual Output Level (RPD module only)	32.5/22.5 dBmV @ 1218/54 MHz
Virtual Output Level	57/39 dBmV @ 1218/54 MHz
Virtual Output Level (RPD module only)	38.5/28.5 dBmV @ 1218/54 MHz
Output Linear Tilt	18 dB (54 to 1218 MHz)

NOTES:

- Requires a software license to support channel bonding greater than two (2) OFDM channels.
- Hardware is capable of up to 3 NDF channels per DS-SG and up to 3 NDR channels per US-SG. Listed channel values are currently enabled in software.

SPECIFICATIONS CONTINUED

Characteristics	Specification
RF Overlay (Optional)	
Connectivity	1 Forward SFP Receiver and 1 Return SFP Transmitter
Forward Rx	54–550 MHz or 54–750 MHz
Return Tx	Dependent on the node split's upstream bandwidth (5–42 MHz, 5–65 MHz, 5–85 MHz, or 5–204 MHz)
Powering (Node with RPD)	
Power	< 150 W AC
AC Input Voltage	44–90 V AC
AC Bypass Current	15 A
Environmental/Mechanical (Node with RPD)	
Dimensions	20 in L x 11.4 in W x 11.7 in H (50.8 cm x 29.0 cm x 29.7 cm)
Weight	< 50 lb
Operating Temperature	-40°C to +60°C (-40°F to +140°F)
Operating Humidity	5%–95% non-condensing



RELATED PRODUCTS

E6000® CCAP Core	CHP Max5000® Optics
OM4100 Node	Headend and Field Passives
10G SFP+ Options	Installation Services

ORDERING INFORMATION

Part Number	Description
Factory Configured Deep Lid Options	
OM41XDU100E2XR2X232A	1 GHz lid upgrade kit for OM4100 nodes. Includes “Deep” housing lid, enhanced PS4201 Power Supply, RD2322 module without Console Port licensed for 1 DS-SG x 1 US-SG, powering cable, and 1 GHz RF cable bundle
OM41XDU100E2XR2X232B	1 GHz lid upgrade kit for OM4100. Includes “Deep” housing lid, enhanced PS4201 Power Supply, RD2322 module with Console Port licensed for 1 DS-SG x 1 US-SG, powering cable, and 1 GHz RF cable bundle
OM41XDU200E2XR2X232A	1.2 GHz lid upgrade kit. Includes “Deep” housing lid, enhanced PS4201 Power Supply, RD2322 module without Console Port licensed for 1 DS-SG x 1 US-SG, powering cable, and 1.2 GHz RF cable bundle
OM41XDU200E2XR2X232B	1.2 GHz lid upgrade kit. Includes “Deep” housing lid, enhanced PS4201 Power Supply, RD2322 module with Console Port licensed for 1 DS-SG x 1 US-SG, powering cable, and 1.2 GHz RF cable bundle
OM412DxxYAE2XR2X232A ¹ xx = frequency split	1.2 GHz Segmentable Node, 6 Port Housing, Internal Test Points, PS4201 Power Supply, RD2322 module without Console Port licensed for 1 DS-SG x 1 US-SG
OM412DxxYAE2XR2X232B ¹ xx = frequency split	1.2 GHz Segmentable Node, 6 Port Housing, Internal Test Points, PS4201 Power Supply, RD2322 module with Console Port licensed for 1 DS-SG x 1 US-SG
1.2 GHz OM4120 RF Modules	
OM4120-RF-42-ICS	OM4120 1.2 GHz GaN RF Module, 42/54 MHz split with reverse switches
OM4120-RF-65-ICS	OM4120 1.2 GHz GaN RF Module, 65/85 MHz split with reverse switches
OM4120-RF-85-ICS	OM4120 1.2 GHz GaN RF Module, 85/102 MHz split with reverse switches
OM4120-RF-204-ICS	OM4120 1.2 GHz GaN RF Module, 204/258 MHz split with reverse switches
Ethernet SFP+ Optical Transceiver Modules	
TTA1310-TL10	10 Gbps 10 km 1310 nm/1550 nm Transceiver, -40°C to +95°C
TTA1310-TL40	10 Gbps 40 km 1310 nm/1550 nm Transceiver, -40°C to +95°C
TTD4540-xx-PI (xx = 20–61)	10 Gbps 40 km DWDM Transceiver, 40 Wavelengths Supported (ITU Channels 20–61), -40°C to +95°C
TTD4580-xx-PI (xx = 20–61)	10 Gbps 80 km DWDM Transceiver, 40 Wavelengths Supported (ITU Channels 20–61), -40°C to +95°C
TTCxxx-TL40 (xxxx = wavelength)	10 Gbps 40 km CWDM Transceiver, 8 Wavelengths Supported (1470 nm to 1610 nm), -40°C to +95°C
TTCxxx-TL80 (xxxx = wavelength)	10 Gbps 80 km CWDM Transceiver, 8 Wavelengths Supported (1470 nm to 1610 nm), -40°C to +95°C
TUD4580-xx-PI (xx = 20–61)	10 Gbps 80 km DWDM Transceiver, 42 Wavelengths Supported (ITU Channels 20–61), -40°C to +85°C
Analog RF Overlay Filters	
1513948*	RF Overlay Plug-in Low-pass Filter, 54–550 MHz
1513949*	RF Overlay Plug-in Low-pass Filter, 54–750 MHz
* A Plug-in Low-pass Filter is required for downstream analog overlay functionality.	
Analog RF Overlay SFP+ Modules	
1511835	Analog Forward Receiver, 1260–1620 nm, 54–750 MHz
1511837-0061	Analog Return Transmitter, 1611 nm, 5–204 MHz
Accessories	
1504945	Test Point Adapter Cable Assembly F-Male to SMB-Female 75-Ohm RG-179 6-L
1001670	3 meters (~10 feet) Console Cable, USB Type-A Male to RS232 Serial 3.5 mm Stereo Audio Plug
RD2322 Modules	
1001523	RD2322 module without console port licensed for 1 DS-SG x 1 US-SG; 2 SFP+ cages; HW capable of 2 DS-SG x 2 US-SG with additional DS-SG and US-SG licenses. For NC4-H3/H4/HG/S Series and OM4 Series. Node and transceivers not included, priced separately.
Z1001524	RD2322 module with console port licensed for 1 DS-SG x 1 US-SG; 2 SFP+ cages; HW capable of 2 DS-SG x 2 US-SG with additional DS-SG and US-SG licenses. For NC4-H3/H4/HG/S Series and OM4 Series. Node and transceivers not included, priced separately.

NOTE:

1. Available frequency splits are: 42 (42–54 MHz split); 65 (65–85 MHz split); 85 (85–102 MHz split); and HS (204–258 MHz Split)

ORDERING INFORMATION CONTINUED

Part Number	Description
RD2322 Licenses for RPD or RMD Operation	
Z1001515	RD2322 RxD Initial DS and US Port License Bundle – Must purchase on same PO as the RxD or Node+RxD (one per RxD). Licenses "1x1 Capable" operation to "2x2 Capable"
1001516	RD2322 RxD Initial US Port License — Must purchase on the same PO as the RxD or the Node + RxD (one per RxD). Licenses "1x1 Capable" operation to "1x2 Capable"
1001525	RD2322 RxD Downstream Port License — Enable second DS port on the "2x2 Capable" RD2322 RxD previously licensed for 1 DS Port operation
1001526	RD2322 Upstream Port License — Enable second US port on the "2x2 Capable" RD2322 RxD previously licensed for 1 US Port operation
RD2322 Licenses for RMD Operation	
1001546	RMD System Legal Intercept License
1001547	RMD System LAES License
Z1001548	RMD System CALEA License
Z1001549	RMD MAC DOCSIS 3.0 Downstream Annex A SC-QAM Channel
Z1001550	RMD MAC DOCSIS 3.0 Downstream Annex B SC-QAM Channel
1001551	RMD MAC DOCSIS 3.0 Upstream SC-QAM Channel
Z1001552	RMD MAC DOCSIS 3.1 Downstream OFDM Spectrum — Enable 1 MHz OF OFDM Spectrum per License
1001553K	RMD MAC DOCSIS 3.1 Upstream OFDMA Spectrum — Enable 1 MHz OF OFDMA Spectrum per License
1001639	RMD Service Group Capacity License 1 DS x 2 US — Licenses the RMD Capacity to Full DOCSIS Spectrum (D3.0/D3.1 to 1.2 GHz DS and 204 MHz US — 1 DS by up to 2 US operation)
1001640	RMD Service Group Capacity License 1 DS x 1 US — Licenses the RMD Capacity to Full DOCSIS Spectrum (D3.0/D3.1 to 1.2 GHz DS and 204 MHz US — 1 DS by up to 1 US operation)
1001641	RMD Service Group License Upgrade Upstream — Adds one US Service Group Capacity License to an RMD for Full DOCSIS Upstream Spectrum (up to 204 MHz upstream)
1001662	Initial License Bundle: RMD SG Capacity License 1 DS x 1 US — Licenses Full DOCSIS Spectrum (D3.0/D3.1, 1.2 GHz DS & 204 MHz US); includes Port & HLX Domain Management License
Z1001663	Initial License Bundle: RMD SG Capacity License 1 DS x 2 US — Licenses Full DOCSIS Spectrum (D3.0/D3.1, 1.2 GHz DS & 204 MHz US); includes Port & HLX Domain Management License
1001664	Initial License Bundle: RMD SG Capacity License 2 DS x 2 US — Licenses Full DOCSIS Spectrum (D3.0/D3.1, 1.2 GHz DS & 204 MHz US); includes Port & HLX Domain Management License
Z1001665	Upgrade: RMD SG Capacity License 1 DS (upgrade from 1x2 to 2x2) — Licenses Full DOCSIS Spectrum (D3.0/D3.1, 1.2 GHz DS) to 2 DS; includes Port & HLX Domain Management License
1001666	Upgrade: RMD SG Capacity License 1 US (upgrade from 1x1 to 1x2) — Licenses Full DOCSIS Spectrum (204 MHz US) to 2 US; includes Port & HLX Domain Management License
1001700	Initial License Bundle: RMD SG Capacity License 1 DS X 2 US – Licenses Full DOCSIS Spectrum (D3.0/D3.1 to 1.2 GHz DS and 204 MHz US) – 1 DS by up to 2 US Operation; includes Port Licenses
1001702	Upgrade: RMD SG Capacity License 1 DS (from 1x1 to 2x2) – Licenses Full DOCSIS Spectrum (D3.0/D3.1 to 1.2 GHz DS) to 2 DS; includes Applicable Port Licenses
1001705	Initial License Bundle: RMD Service Group Capacity License 1 DS x 1 US – Licenses the RMD Capacity to Full DOCSIS Spectrum (D3.0/D3.1 to 1.2 GHz DS and 204 MHz US) – 1 DS by 1 US Operation; includes Applicable Port Licenses
1001706	Initial License Bundle: RMD SG Capacity License 2 DS x 2 US – Licenses Full DOCSIS Spectrum (D3.0/D3.1 to 1.2 GHz DS and 204 MHz US) – 2 DS by up to 2 US Operation; includes Port Licenses
1001707	Upgrade: RMD SG Capacity License 1 US (from 1x1 to 1x2) – Licenses the RMD Capacity to Full DOCSIS Spectrum (204 MHz US) to 2 US; includes Applicable Port Licenses
100159600	DOCSIS 3.1E RMD System License: Enables bonding of greater than two (2) OFDM channels; applies per RMD

Contact Technical Services for product support:

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Note: Specifications are subject to change without notice.

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