**DATA SHEET**

# Opti Max® Optical Node Series

## RD2322 RxD Remote PHY Device (RPD)/ Remote MACPHY Device (RMD)

### for OM4120® 1.2 GHz Nodes

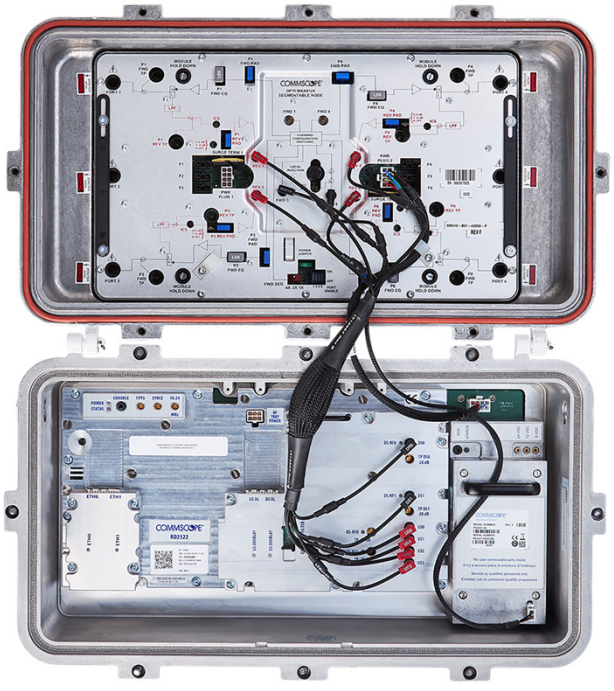
## FEATURES

- 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
- 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<br>1 DS-SG x 2 US-SG<br>2 DS-SG x 2 US-SG |
| CIN Connectivity | Dual 10 GbE SFP+ (RMD and RPD), Path Redundancy (RMD only), LAG (RMD only)<br>Control/Management Plane—IPv4 (RMD only); IPv4 or IPv6 (RPD only)<br>Data Plane/MPEG Video—IPv4 or IPv6 (RMD and RPD) |
| Security/Encryption | 802.1x Authentication & Authorization<br>Secure Boot<br>MACsec Encryption (RMD only)<br>TACACS+ Protocol for Authentication, Authorization, and Accounting (AAA) Services (RMD only)<br>RADIUS Protocol for Authentication (RMD only) |
| Proactive Network Management (PNM) | Upstream Receive Modulation Error Ratio (RxMER) per subcarrier<br>Upstream Capture for Active and Quiet Probes (UPC)<br>Upstream Triggered Spectrum Capture (UTSC) IdleSID Trigger Mode, IdleSID triggering by SC-QAM or OFDMA channel<br>UTSC FreeRun Trigger Mode with Repeat Capture or Continuous Capture |
| High Split Support | OFDMA Upstream Data Profile (OUDP) scheduled grants for high split leakage detection and upstream measurement |
| **Channel Capacity[1]** | |
| Downstream (per downstream service group) | Annex A or B: 6x192 MHz, configurable as SC-QAM or OFDM<br>Annex A:<br>3 OFDM (up to 192 MHz each) with up to 72 Annex A SC-QAM, of which up to 32 may be DOCSIS<br>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<br>Annex B:<br>3 OFDM (up to 192 MHz each) with up to 96 Annex B SC-QAM, of which up to 48 may be DOCSIS<br>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<br>1 OFDM (up to 192 MHz) with up to 123 Annex B SC-QAM, of which up to 63 may be DOCSIS<br>No OFDM with up to 124 Annex B SC-QAM, of which up to 64 may be DOCSIS |
| 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<br>SCTE 55-2 |
| Out-of-Band[2] | Narrowband Digital Forward (NDF)—two NDF channels per downstream service group<br>Narrowband Digital Return (NDR)—one NDR channel per upstream service group<br>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 |
| Video | Broadcast Video, Narrowcast Video<br>Video Sync Mode (RPD and RMD—requires IEEE 1588 Precision Time Protocol (PTP))<br>Video Async Mode (RMD only—does not require PTP)<br>Mixed Annex: Annex A video with Annex B DOCSIS; Annex C video with Annex B DOCSIS |
| Designed for Compliance to CableLabs® MHAv2 Standards | CM-SP-R-PHY Remote PHY Specification<br>CM-SP-R-DEPI Remote Downstream External PHY Interface Specification<br>CM-SP-R-UEPI Remote Upstream External PHY Interface Specification<br>CM-SP-R-GCP Generic Control Plane Specification<br>CM-SP-R-DTI Remote DOCSIS Timing Interface Specification<br>CM-SP-R-OOB Remote Out-of-Band Specification<br>CM-SP-R-OSSI Remote PHY OSS Interface Specification<br>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:**

1. Future software releases will support greater OFDM and OFDMA channel capacity.
2. 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° to +60°C (-40° 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]<br>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]<br>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° to +95°C |
| TTA1310-TL40 | 10 Gbps 40 km 1310 nm/1550 nm Transceiver, -40° to +95°C |
| TTD4540-xx-PI<br>(xx = 20–59) | 10 Gbps 40 km DWDM Transceiver, 40 Wavelengths Supported (ITU Channels 20–59), -40° to +95°C |
| TTD4580-xx-PI<br>(xx = 20–59) | 10 Gbps 80 km DWDM Transceiver, 40 Wavelengths Supported (ITU Channels 20–59), -40° to +95°C |
| TTCxxxx-TL40<br>(xxxx = wavelength) | 10 Gbps 40 km CWDM Transceiver, 8 Wavelengths Supported (1470 nm to 1610 nm), -40° to +95°C |
| TTCxxxx-TL80<br>(xxxx = wavelength) | 10 Gbps 80 km CWDM Transceiver, 8 Wavelengths Supported (1470 nm to 1610 nm), -40° to +95°C |
| TUD4580-xx-PI<br>(xx = 20–61) | 10 Gbps 80 km DWDM Transceiver, 42 Wavelengths Supported (ITU Channels 20–61), -40° 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 |
| | **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 |

Contact Technical Services for product support:

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**Note:** Specifications are subject to change without notice.



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