DATA SHEET

Optical Node Series (NC)

NC4000S4 Series Nodes

with RD1424-M4 Remote PHY Device (RPD)

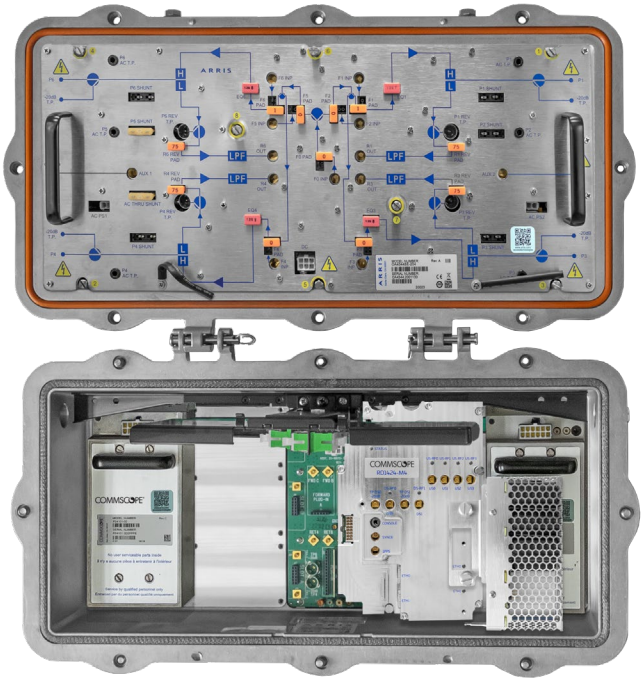
FEATURES

- Compatible with both NC4 standard and deep lid node housings
- 1.2 GHz full featured factory configured for mid-split, high-split, DAA network operation
- Improves headend density and power efficiency by moving PHY functionality out of the headend
- Maximized fiber utilization and reach
- Convenient lid upgrade path from legacy installed base of NC4000® nodes to DAA
- DOCSIS® 3.1 compliant
- Seamlessly upgrade from traditional optics to distributed access architectures
- Configurable as 1x1, 1x2, 2x2 or 2x4 (DS x US) service groups
- Power Hold-Up module for RPD
- Integrated Local Injection Port
- Future PON co-existence

The Remote PHY Device (RPD) is the module in CommScope's Distributed Access Architecture (DAA) portfolio. It offers significant operational benefits—including increased bandwidth capacity, greater fiber efficiencies (wavelengths and distance), simplified plant operations with digital optics, and reduced 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 drop-in design for RPD allows easy installation into existing NC4000 optical nodes with the standard lid, for new node installations both standard and deep lids are available as part of a fully configured NC4000 node. The NC4000 node allows operators to easily convert to mid-split (85/102 MHz) or high-split (204/258 MHz) network operation while also providing operators the opportunity to upgrade legacy NC4000 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 NC4000 node upgrades.*



RD1424-M4 in NC4000 Node

RD1424-M4 RPD Module Operation

The RD1424-M4 takes the place of traditional optics modules, such as downstream receivers and upstream transmitters, inside the node. The RD1424-M4 operates with a standard output level and tilt that can be attenuated by installing RF attenuator pads and equalizers, respectively, in the node's RF modules. Output levels and tilt can also be adjusted remotely from the headend. The RPD module's channel configuration is received from the CCAP Core in the headend; no manual configuration of the module is necessary after it is optically linked to the headend. The RD1424-M4 supports 1 DS-SG* x 1 US-SG, 1 DS-SG x 2 US-SG, 2 DS-SG x 2 US-SG and 2 DS-SG x 4 US-SG configurations for HFC applications. Unlike traditional HFC nodes that use analog RF combiners to configure the node upstream segmentation that incur loss, the RD1424-M4 integrates the upstream segmentation functionality internally in the digital domain with constant gain and without any RF combiner loss.

The HU1424-M4 is the optional external power hold-up module attaching to the RPD and safeguards against RD1424-M4 rebooting due to short-interval network power interruptions. The power hold-up module provides more than 500 msec drop-out tolerance time to sustain the RD1424-M4 during occasional network power disruptions to ensure system reliability.

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. When operators are ready to transition to DAA, the node's modular design allows them to upgrade previously deployed NC4000 nodes to support R-PHY functionality by simply removing the node's existing optical modules and replacing with the RD1424-M4 without the need to upgrade the housing. 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 RPD application. These SFP+ modules are carefully chosen by our design teams 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 increased thermal profile of the NC4000 while providing added long-term performance in the field with +95˚C max temperature specification across the family. The modules provide both design flexibility and the ability to maximize wavelength aggregation, making them the ideal choice to guarantee the RPD's link performance across a wide range of outdoor temperatures.

** 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*.

NODE SPECIFICATIONS

Characteristics	Specification
Physical	
Dimensions	NC4 Standard Lid 20.0” L x 9.5” H x 10.75” W (50.8 cm x 24.1 cm x 27.3 cm) NC4 Deep Lid 20.0” L x 11.0” H x 10.75” W (50.8 cm x 28.0 cm x 27.3 cm)
Weight	< 50 lbs (22.7 kg)
Environmental	
Operating Temperature Range	-40°C to +60°C (-40°F to 140°F)
Storage Temperature Range	-40°C to +85°C (-40°F to 185°F)
Humidity	5% to 95% non-condensing
Ingress Protection	IP67
General	
RF Test Points (Forward and Return)	-20 dB
Flatness	± 1 dB
Power Requirements	
Total Power Consumption	• Total 150 W AC typical • RF tray 47 W DC • RD1424-M4 45 W DC
AC Input Voltage	44–95 V_{RMS}
AC Input Frequency Range	47–70 Hz Quasi-Square wave
AC Bypass Current[1]	15 A rms
RF for DAA Applications (Full Node)	
Downstream RF	
Operational Bandwidth[2]	54/85/102/258 to 1218 MHz
Flatness[3]	± 1.0 dB
Output Level[4] (Node)	50 dBmV @ 1218 MHz
Output Linear Tilt[4]	17 dB (54 to 1218 MHz)
RF Port Impedance	75 Ω
RF Return Loss[5]	16 dB
Downstream RF Performance	
Reference Level	50/33 dBmV @ 1218/55 MHz (Actual)
MER	> 40 dB
BER	< $1x10^{-6}$ Error free operation post error correction
Upstream RF	
Operational Bandwidth[2]	5–42 MHz, 5–65 MHz, 5–85 MHz and 5–204 MHz
Nominal Return Input Level[6]	12 dBmV/6 MHz; 5–42 MHz 10 dBmV/6 MHz; 5–65 MHz 8 dBmV/6 MHz; 5–85 MHz 5 dBmV/6 MHz; 5–204 MHz

NOTES:
1. Maximum total current applied to or from any one port.
2. Dependent on the diplex filter option installed.
3. Measured with respect to tilt over the operating passband of the node.
4. For all QAM channel loading up to 1.2 GHz and 17 dB slope, nominal output level @ 1.2 GHz for S4 is 50 dBmV.
5. Measured at the node RF input and output port over the specified passband.
6. Maximum total composite power is 20 dBmV.

RPD SPECIFICATIONS

Characteristics	Specification	
Service Group Configurations	**S4**	**H4**
(DS x US) Service Groups	1x1	1x1
	1x2	1x2
	2x2	2x2
	2x4	
CIN Connectivity	Dual 10 GbE SFP+ Control/Management Plane—IPv4 or IPv6 (RPD) Data Plane/MPEG Video—IPv4 or IPv6	
Security/Encryption	802.1x Authentication & Authorization Secure Boot IPsec, MACsec Encryption	
Proactive Network Management (PNM)	Upstream Receive Modulation Error Ratio (RxMER) per 25 kHz or 50 kHz OFDMA subcarrier Upstream Capture for Active and Quiet Probes (UPC) PNM tests (25 kHz or 50 kHz OFDMA subcarrier spacing) UTSC Free Run Trigger Mode with results over dynamic or static pseudo wires	
Channel Capacity		
Downstream (per downstream service group)	Up to 6x 192 MHz blocks configurable as either OFDM or SC-QAM (160 Annex B or 120 Annex A SCQAM channels) per downstream port	
Upstream (per upstream service group)	Up to 2 OFDMA channels (up to 95 MHz wide each) and 12 SCQAM channels per upstream port	
Set Top Box Out-of-Band (OOB)	SCTE 55-1 SCTE 55-2	
Out-of-Band	Narrowband Digital Forward (NDF)—two NDF channels per downstream service group Narrowband Digital Return (NDR)—two NDR channel per upstream service group Channel Widths: 25.6 MHz (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 (up to 8 dedicated leakage detection and 6 non dedicated tones to be used for alignment, AGC, and legacy leakage tone)	
High Speed Data	DOCSIS 3.0, DOCSIS 3.1	
Video	Broadcast Video, Narrowcast Video	
Designed for Compliance to CableLabs® MHAv2 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	
HU1424-M4-B Power Hold Up		
Input Charging Time	< 2 min	
Hold Up Duration[1]	500 msec	

NOTE:
1. Provides a minimum of 500 msec drop-out tolerance time over 10-year lifespan of the RPD module

RD1424-M4 RPD Module

ORDERING INFORMATION

Part Number	Description
	RPD Deep Lid Option
NC4 RD1424-Kit-E	RD1424-M4 kit for NC4 nodes, includes RD1424-M4 without console port, HU1424-M4 power hold up module, WH4624-M4 2x4 wiring harness
NC4 RD1424-Kit-F	RD1424-M4 kit for NC4 nodes, includes RD1424-M4 with console port, HU1424-M4 power hold up module, WH4624-M4 2x4 wiring harness
	NC4000 RF Modules with RD1424-M4 Installed (Contact CommScope for additional configurations)
NC449RPS4L0-143E00	NC4000 S4 1.2 GHz node, Standard Housing 1x PS4101 PSU, 85/102 MHz bandsplit, with OA4344SE RF module, Output 56 dBmV at 1.2 GHz 17 dB slope, with RD1424-M4 1.2 GHz RPD, no console port, includes HU1424-M4 Power Hold up module
NC44ARPS4L0-143E00	NC4000 S4 1.2 GHz node, Standard Housing 1x PS4101 PSU, 204/258 MHz bandsplit, with OA4344SE RF module, Output 56 dBmV at 1.2 GHz 17 dB slope, with RD1424-M4 1.2 GHz RPD, no console port, includes HU1424-M4 Power Hold up module
NC469RPS4L0-143E00	NC4000 S4 1.2 GHz node, Extended housing 1x PS4201 PSU, 85/102 MHz bandsplit, with OA4344SE RF module, Output 56 dBmV at 1.2 GHz 17 dB slope, with RD1424-M4 1.2 GHz RPD, no console port, includes HU1424-M4 Power Hold up module
NC46ARPS4L0-143E00	NC4000 S4 1.2 GHz node, Extended housing 1x PS4201 PSU, 204/258 MHz bandsplit, with OA4344SE RF module, Output 56 dBmV at 1.2 GHz 17 dB slope, with RD1424-M4 1.2 GHz RPD, no console port, includes HU1424-M4 Power Hold up module
	Ethernet SFP+ Optical Transceiver Modules
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
TTCxxxx-TL40 (xxxx = wavelength)	10 Gbps 40 km CWDM Transceiver, 8 Wavelengths Supported (1470 nm to 1610 nm), -40°C to +95°C
TTCxxxx-TL80 (xxxx = wavelength)	10 Gbps 80 km CWDM Transceiver, 8 Wavelengths Supported (1470 nm to 1610 nm), -40°C to +95°C
	Accessories
HU1424-M4-B	Power Hold Up module with minimum 500 msec drop out tolerance time
WH4624-M4	NC4000 RxD Wiring harness for use with M4 RPD modules includes DC connections, 2x forward and 4x return RF cables with 90 degree SMB connectors.
1001670	3 meters (~10 feet) Console Cable, USB Type-A Male to RS232 Serial 3.5mm Stereo Audio Plug
	RD1424-M4 Modules
RD1424-M4-N	RD1424-M4 module without console port for NC4-S4/H4 Series and OM4 Series. Node and transceivers not included.
RD1424-M4-C	RD1424-M4 module with console port for NC4-S4/H4 Series and OM4 Series. Node and transceivers not included.

RELATED PRODUCTS

E6000® CCAP Core	Virtual CCAP Core
STARLINE® Amplifiers	10G SFP+ Options
Headend & Field Passives	Professional Services

Contact Technical Services for product support:

- United States: +1-888-944-4357
- International: +1-215-323-2345

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Note: Specifications are subject to change without notice.

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