



# CableOS® Ripple+

REMOTE PHY NODE



## The Harmonic CableOS® Ripple+ Remote PHY node (RPN) is an advanced, hardened outdoor enclosure for networks tasked with delivering video, data and voice services over coax.

Compact and cost-effective, the Ripple+ RPN houses the CableOS Pebble-1 Remote PHY device (RPD), which supports distributed access architectures defined by CableLabs® MHA v2 specification. Two Pebble-1 RPDs can be installed in a single Ripple+ node.

Ripple+ and Pebble-1 are both part of the Harmonic CableOS software-based CCAP system, which also includes CableOS Core vCMTS software and the NSG™ Pro cable access platform. Fundamentally changing the business dynamics of cable delivery, CableOS introduces cable operators to unprecedented scalability, agility and cost savings. The end-to-end solution supports centralized and distributed cable access architectures that enable the fast deployment of IP-based and legacy data, video, and voice services — and sustainable capacity growth. All CableOS components work together to resolve space and power constraints in the headend and hub, eliminate dependence on hardware upgrade cycles, and provide multi-dimensional scaling.

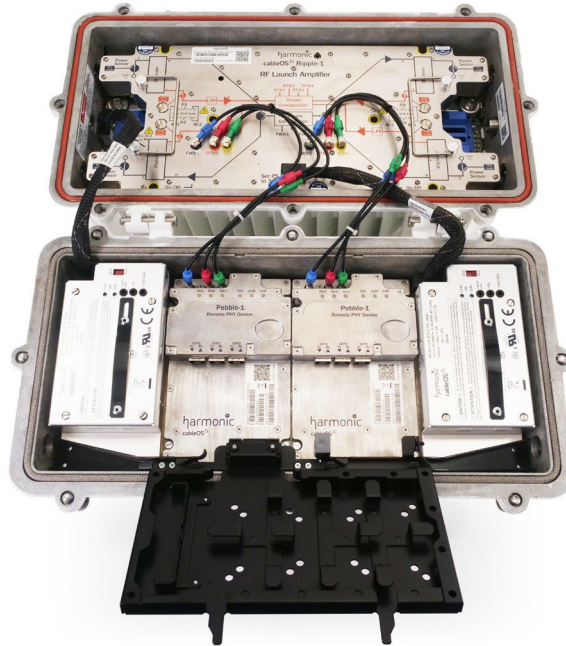
The Ripple+ RPN connects with CableOS Core vCMTS software to support evolving fiber deep deployments with added features, and to allow for future network growth. Multiple configurations of the RPN using one or two Pebble-1 RPDs are available, each with one downstream and one or two upstream ports. Software-controlled DSxUS segmentation allows full flexibility in running the node with any one of the following segmentation options: 1x1, 1x2, 2x2, 2x3 and 2x4 (DSxUS) segments. Added support includes Pebble-1 RPDs that offer local channel insertion and/or analog overlay. Refer to the Pebble-1 data sheet for further details on these modules.

Featured in the RPN is an integrated RF launch amplifier, a modular tray that provides superior RF performance and built-in remote configuration functionality, replacing traditional plug-ins. Remote RF configuration through CableOS Core software includes forward and return segmentation, forward-path gain and tilt, return-path attenuation and mute switches (for troubleshooting ingress problems), and select hybrid enable/disable for turning off unused output ports. This capability simplifies initial installation and RPD replacement, eliminates the need for third-party monitoring solutions, and enables quick remote troubleshooting while reducing truck rolls.

The Ripple+ RPN includes advanced features such as per-port RF output power monitoring and closed-loop output power. For added reliability, the RPN may host the innovative “Buoy” power backup module, which protects against brief power interruptions. Also supported is a “Last Gasp” alarm to indicate failure of AC power feed, and advanced wear-tracking monitoring to indicate when key components approach their life expectancy. The Ripple+ RPN housing also supports AC power feed via a dedicated port.

## HIGHLIGHTS

- Hardened enclosure for one or two CableOS Pebble-1 RPDs
- Supports up to 1218 MHz forward and 204 MHz return bandwidth
- Modular RF launch amplifier with four high-output level ports (64 dBmV/channel)
- Software-controlled output power may be tuned down to support BAU applications
- Remotely configurable forward gain and tilt
- Remote controlled return mute switch/attenuation for ingress control
- Hybrid disable configuration to conserve power on unused ports
- Modular single or dual Remote PHY modules for network growth with automatically configured segmentation
- Fiber entry ports on both sides of the housing, with fiber management tray and channel for easy access
- Innovative “Buoy” power backup module protects against brief power interruption
- Last gasp alarm - Power Supply monitors the AC input voltage and provides status alarm when voltage drops below minimum operating range
- RF Tray provides easy plant upgrades with offering field replaceable Diplex Filters. Diplex Filters can be swapped in the field for plant expansions



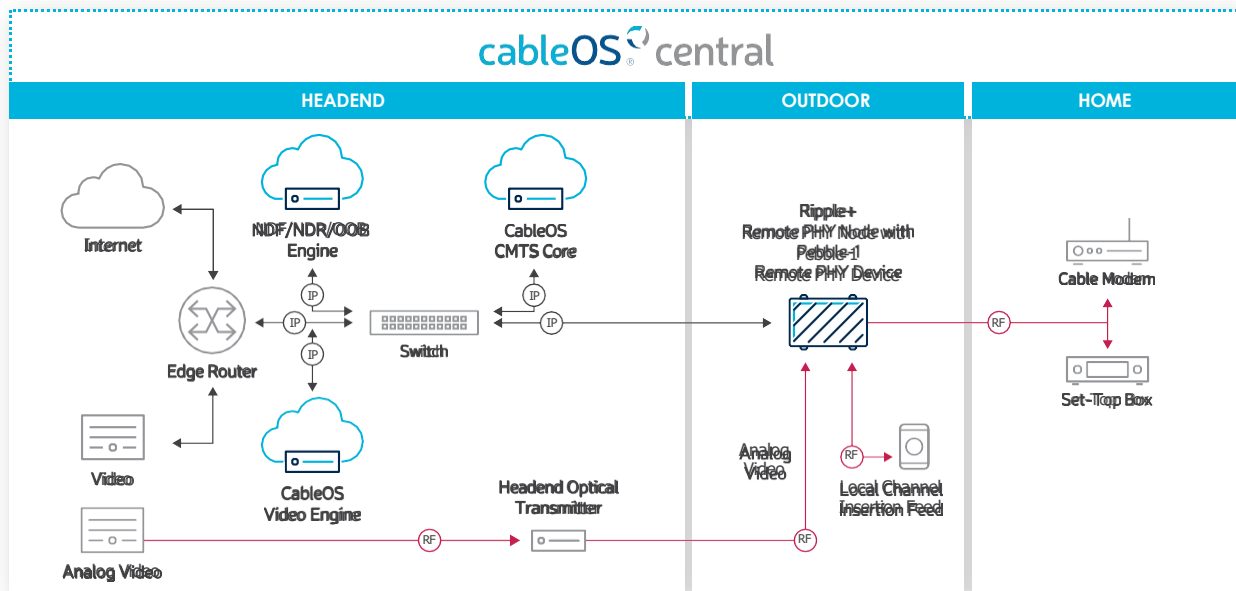
Each Ripple+ node can house up to two Pebble-1RPDs, two PSUs and an RF launch amplifier.

All controls and settings on Ripple+ are performed remotely using the CableOS CLI. Remote control functionality and minimal plug-ins allow for simplified setup and removes the need for technician guesswork for forward- and return-path segmentation settings. All configuration settings are stored in non-volatile memory in the RPN itself. Upon replacement of any modular RPN component, the new component automatically receives the replaced component configuration.

The RF launch amplifier is capable of supporting today and tomorrow's ever-changing optical networks. Two fiber entry ports on the tray allow for ease of use and provide ample storage for future growth.

### World-Class Service and Support

With thousands of successful installations, Harmonic possesses unique, extensive knowledge of the cable edge environment and unsurpassed expertise in managing live production networks. Harmonic technical support and field engineers possess decades of collective experience in the cable industry and have the ability to go far beyond optimal deployment strategies and troubleshooting. The Harmonic Global Service and Support organization also understands the intricacies of every ancillary system touched by the edge network, from back-office video control planes to IP backbones to deep-fiber HFC nodes.



CableOS Virtualized Cable Access Solution



## SPECIFICATIONS

### FORWARD-PATH

Operational Bandwidth	Pluggable duplex filters, supporting 3 DS frequency ranges: 54-1218 MHz (low split), 102-1218 MHz (mid split), 246-1218 MHz (high split)
Flatness	+/- 0.75 dB
Linear Tilt	21.0 dB (nominal) configurable
RF Test Points	-20.0 +/- 1.0 dB
RF Impedance	75 Ω
RF Return Loss	-16 dB
Port-to-Port Isolation	70 dB
Output Level @ 1218MHz	58 dBmV (nominal QAM actual) with forward spectrum loaded with QAM and/or OFDM channels and 21 dB of tilt, configurable
DS MER	41 dB (typical)

### RETURN-PATH

Operational Bandwidth	Pluggable duplex filters, supporting 3 US frequency ranges: 5-42 MHz (low split), 5-85 MHz (mid split), 5-204 MHz (high split)
Flatness	+/- 0.75 dB
Linear Tilt	0.0 dB
RF Test Points	-20.0 +/- 1.0 dB
RF Return Loss	-16 dB
RF Attenuation	Self-optimizing
Port-to-Port Isolation	70 dB
Nominal Return Input Level	8 dBmV per 6.4 MHz channel (nominal); configurable
US MER	37 dB (typical)

### POWER

Power Supplies	One or two
Input Voltage Range	45 - 95 Vrms (QSW)
Line Frequency	47 - 70 Hz
Power Supply Rated Maximum Output Power	180 W ( 2A@5Vdc & 5A@34Vdc or 7A@24Vdc)
Power Consumption	130 W (Typical with single 1DSx2US RPD)
Resilience to AC power interruption	Up to 4 sec (with Buoy installed)

### PHYSICAL

Mounting	Strand and wall
Enclosure	IP67
Dimensions (HxWxD)	115 in x 22 in x 115 in 29.2 cm x 55.8 cm x 29.2 cm
Weight	~48 lbs/21.7 kg Fully configured
External RF Ports	4 (2 per side)
Dedicated powering ports	2 (one on each side)
RF Test Points	4 FWD Path TPs (2 per side External) 4 RET Path TPs (Internal)
External Fiber Ports	2 (1 per side)
Operating Temperature	-40° to 140° F / -40° to +60° C

### SUPPORTED 'PEBBLE-1' RPD OPTIONS (UP TO 2 PER NODE)

COS-PBL1-1US-HR01:	1DSx1US RPD module
COS-PBL1-2US-HR01:	1DSx2US RPD module
COS-PBL1-AO-2US-HR01:	1DSx2US RPD module, with Analog Overlay option
COS-PBL1-CI-2US-HR01:	1DSx2US RPD module, with local RF channel insertion option