Cisco GS7000 1218-MHz 4-Port Fiber Deep Node, 85/102-MHz Split with Cisco Smart PHY Model 120 RPD

Product description

Consumer bandwidth demand continues to grow at a rapid rate every year. As a result, cable operators with devices based on DOCSIS need to prepare their networks for the future. They need to plan for reduced service group sizes and ultimately for double or quadruple (or greater) bandwidth speeds. The Cisco® GS7000 1218-MHz 4-Port Fiber Deep Node coupled with the Cisco Smart PHY Model 120 1x2 RPD (Remote PHY device) module enables them to implement these plans.

An extension of the modular headend architecture, MHAv2 splits CMTS functions so that CCAP core and physical-layer functions can run separately in different locations. CCAP core routing can run out of larger hubs (or even cloud CMTS instances in a data center), while QAM and ODFM modulation gets pushed out to Remote PHY Devices (RPDs) located nearer to subscribers.

Remote PHY is the product of cable operators asking the industry to help them overcome the limitations of analog fiber and break through the HFC bottleneck. In its most basic form, Remote PHY unlocks major bandwidth increases in existing access networks. But it also enables "fiber deep" architectures that push digital fiber out much closer to homes. Ultimately, Remote PHY helps cable operators deliver capacity and gigabit service tiers on par with any pure-fiber competitor, at a fraction of the cost of ripping and replacing the existing HFC plant.

With Remote PHY, you can deploy fewer sophisticated CCAP routing platforms, connected to many smaller-footprint, less expensive RPDs. You don't have to run a large number of full-featured I-CMTS platforms at every hub, consuming huge amounts of space and power as you scale, and requiring advanced onsite expertise to deploy and maintain. You can consolidate CCAP core functions to larger hubs or data centers and push digital fiber deeper into your access network—in some cases, all the way to the node. You only have to worry about converting to analog HFC for the last few hundred feet to the residence. And you can dramatically boost bandwidth to every home.

The Cisco Smart PHY Model 120 RPD has been integrated with the Cisco Smart PHY deployment automation software. Cisco Smart PHY deployment automation software is a microservice-based software tool that enables full automation for provisioning, configuration, and maintenance of standards based RPDs, shelves, and Cisco Remote PHY cores.

GS7000 Fiber Deep Node features

- Highest output capable Gallium nitride (GaN) gain stages
- Easy forward and reverse RF split changes
- Field-accessible plug-in forward interstage linear equalizers
- 1218-MHz accessories in the Cisco GainMaker® style
- Onboard three-state reverse switch (on, off, and 6 dB) allows each reverse input to be isolated for noise and ingress troubleshooting (status monitoring or local control module required)
- Fiber entry ports on both ends of housing lid
- Fiber management tray and track for easy access to fiber connections
- Primary and (optional) redundant power supplies with passive load sharing
- Spring-loaded seizure assemblies to allow coaxial connectors to be installed or removed without removing amplifier chassis
- Dual or split AC power

Remote PHY Module features

- 1x1 and 1x2 (downstream x upstream)
- Upstream capacity: 12 U.S. channels per port or 2 OFDMA blocks (96 MHz per port)
- Downstream capacity: 160 narrowcast QAMs plus 6 OFDM 192-MHz Orthogonal Frequency-Division Multiplexing (OFDM) blocks per port
- Flexible QAM channel frequency placement
- Broadcast, VOD, and SVD SCTE55-1 and SCTE 55-2 (future) OOB
- PowerKEY, VPME, and DVB
- Dual 10 GbE pluggable SFP+
- Path redundancy (future)
- Daisy chaining (future)
- AGC and leakage detection tone generation
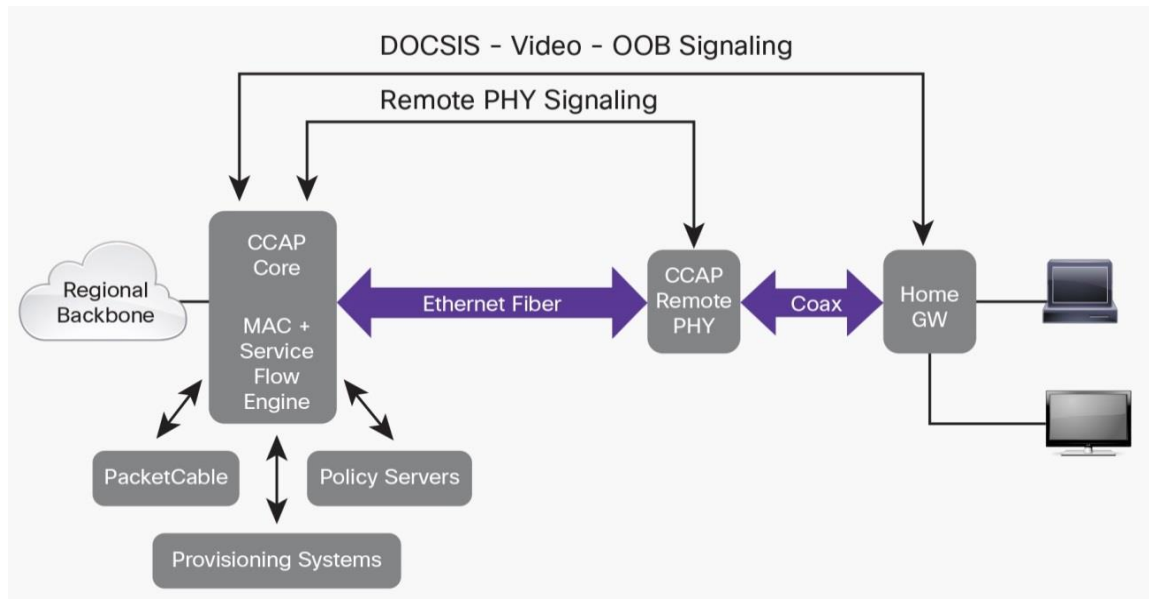- U.S. monitoring

Node block diagram

Figure 1 provides block diagrams of node forward and reverse paths. Figure 2 provides the MHAv2 reference architecture diagram.

Figure 1. Node block diagram
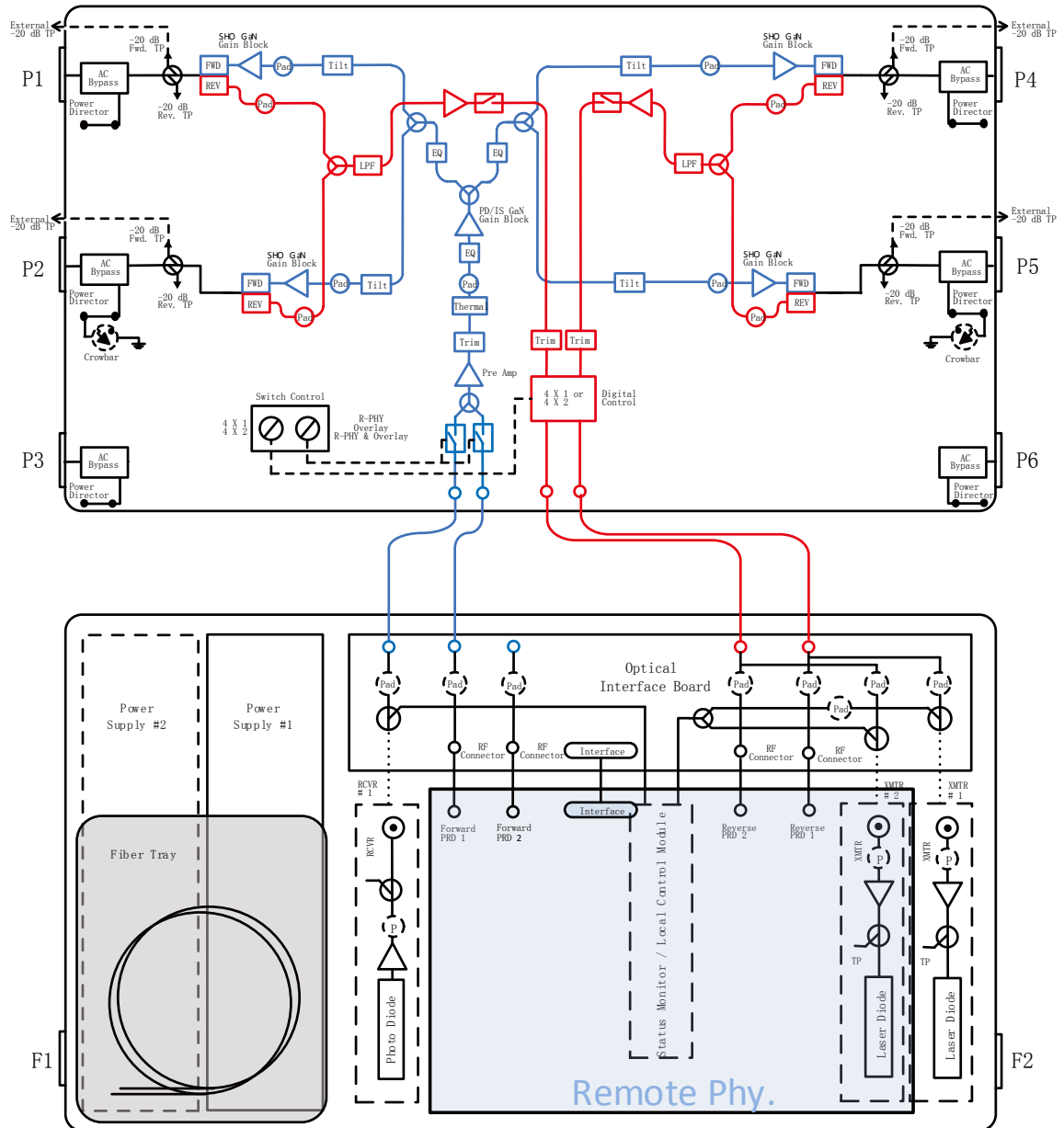
Figure 2. MHAv2 reference architecture

RPD and RF performance specifications

Table 1 provides specifications for the Remote PHY Module. Tables 2 and 3 summarize RF station performance characteristics for the GS7000 SHO node.

Table 1. Specifications for Remote PHY Module

Description	Specification
Design to be compliant with Cablelabs Remote PHY specifications	• CM-SP-R-PHY-I07-170524 Remote PHY Specification • CM-SP-R-DEPI-I07-170524 Remote Downstream External PHY Interface Specification • CM-SP-R-UEPI-I07-170524 Remote Upstream External PHY Interface Specification • CM-SP-GCP-I03-170524 Generic Control Plane Specification • CM-SP-R-DTI-I05-170524 Remote DOCSIS Timing Interface Specification • CM-SP-R-OOB-I05-170908 Remote Out-of-Band Specification • CM-SP-R-OSSI-I07-170908 Remote PHY OSS Interface Specification • CM-SP-DRFI-I16-170111
Power requirements	
Power consumption	45W typical
Environmental specifications	
Operating temperature range	–40 to 140°F (–40 to 60°C)
Operating humidity range	5 to 95%
Mechanical specifications	
Dimensions	L x H x D: 10.0 x 3.0 x 5.75 in (254 x 76 x 146mm)
Weight	3.1 lbs (1.4kg)
RF connectors	F connector

Unless otherwise noted, specifications reflect typical performance and are referenced to 68°F (20°C). Specifications are based on measurements made in accordance with SCTE and ANSI standards (where applicable), using standard frequency assignments.

Table 2.   GS7000 RF section general station performance

GS7000 general station performance 5-85/102 split	Units	Forward	Reverse	Notes
Pass band	MHz	105 to 1218	5 to 85	
Input and output port return loss	dB	16	16	
Hum modulation at 12A	dB	70 (54 to 870 MHz) 60 (871 to 1218 MHz)	60 (5 to 25 MHz) 70 (26 to 42 MHz)	
Hum modulation at 15A	dB	65 (54 to 870 MHz) 60 (871 to 1218 MHz)	60 (5 to 25 MHz) 65 (26 to 42 MHz)	
Test points (±1.0 dB)	dB	−20	−20	

Unless otherwise noted, specifications reflect typical performance and are referenced to 68°F (20°C). Specifications are based on measurements made in accordance with SCTE and ANSI standards (where applicable), using standard frequency assignments.

Table 3.   Forward and reverse station performance

Forward station performance 5-85/102 split		Units		Notes
Amplifier type		–	GaN	
Operational gain (minimum)		dB	42	1
Frequency response				1
	105 to 1002 MHz	dB	±0.5	
	1003 to 1218 MHz	dB	±0.7	
Internal tilt (±1 dB)		dB	21	1, 2
Port-to-port isolation with full segmentation		dB	–	1, 5
Port-to-port isolation with left and right segmentation		dB	–	1, 5
Noise at:	105 MHz	dB	14.0	1
	1218 MHz		13.0	
Reference output levels at (analog equivalent):	1218 MHz		64	
	1002 MHz		59.9	
	870 MHz		57.4	
	750 MHz	dBmV	55.2	
	650 MHz		53.3	
	550 MHz		51.4	
	105 MHz		43	
Reference output tilt (105 to 1218 MHz)		dB	21	2, 3

Reverse station performance (all splits)	Units	Reverse	Notes
Amplifier type	–	GaAs FET	
Operational gain (minimum)	dB	2	4
Frequency response	dB	±0.5	4
Internal tilt (+/-1 dB)	dB	0	4
Path-to-path isolation	dB	70 (5 to 85 MHz) 60 (86 to 204 MHz)	4
Noise	dB	7.5 (5 to 85 MHz) 7.7 (86 to 204 MHz)	4

Unless otherwise noted, specifications reflect typical performance and are referenced to 68°F (20°C). Specifications are based on measurements made in accordance with SCTE/ANSI standards (where applicable), using standard frequency assignments.

Notes:

1. Forward performance is for the station from the output of the optical receiver to the node RF output port, with 0 dB pad in the Optical Interface Board (OIB), any forward configuration module, 0.5 dB interstage (I/S) pad, 18 dB linear I/S equalization factory-selected output pad, and signal director jumper. This specification includes OIB losses.

2. The reference output tilt and internal tilt are both linear tilt.

3. The forward reference output tilt specified is achieved through field installation of appropriate linear I/S equalization, in conjunction with the internal tilt of the launch amplifier and the tilt associated with the optical link (transmitter and receiver combination).

4. Reverse performance is for the station from the reverse input port to the input of the reverse optical transmitter module, with 0 dB reverse input pad.

5. Forward path port-to-port isolation as not specified due to the 1x only downstream configuration for the 4-port fiber deep GS7000 node.

Other specifications

Tables 4 through 7 list other specifications for the GS7000 SHO node.

Table 4.   Station delay characteristics

Station delay characteristics 85/102 split			
Forward (group delay)		**Reverse (group delay in 1.5-MHz bandwidth)**	
Frequency (MHz)	**Delay (nS)**	**Frequency (MHz)**	**Delay (nS)**
55.25 to 58.83	18	5.0 to 6.5	35
61.25 to 64.83	8	6.5 to 8.0	15
67.25 to 70.83	5	8.0 to 9.5	7.5
		37.5 to 39.0	11
		39.0 to 40.5	14
		40.5 to 42.0	20

Table 5.   Electrical data

Electrical	Units					Notes
Maximum AC through current (continuous)	Amps	15				
Maximum AC through current (surge)	Amps	25				
Component DC power consumption (typical)		**At +24.5 VDC**	**At +8.5 VDC**	**At +5.5 VDC**	**At −6 VDC**	
Launch amplifier with reverse amplifier	Amps	3.73	0.14	–	–	
Remote PHY Module	Amps	1.81	–	0.02	–	
Power supply DC current rating	Amps	6.2	1.0	1.3	0.8	

Table 6.   Station powering data

Station powering data													
GS7000 node	**I DC (Amps at 24 VDC)**		**AC voltage**										
			90	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**	**45**
Launch amp with Remote PHY Module	7.54	AC current (A)	2.17	2.20	2.19	2.27	2.38	2.54	2.74	3.00	3.30	3.65
		Power (W)	156.1	155.8	155.3	155.3	155.2	155.3	155.4	155.7	156.3	156.8

AC currents specified are based on measurements made with a typical CATV type ferro-resonant AC power supply (quasi-square wave).

The DC supply has a fixed undervoltage lockout of 33V AC.

Table 7. Environmental and mechanical specifications

Environmental	Units	
Operating temperature range	Degrees	–40 to 140°F (–40 to 60°C)
Relative humidity range	Percent	5 to 95%
Mechanical		
Housing dimensions	**Weight**	
L x H x D: 21.3 x 11.6 x 11.1 in. (541 x 295 x 282 mm)	Station with 1 Remote PHY module, 1 power supply: 49.8 lb. (22.6 kg)	

Ordering information

The GS7000 node is available in a variety of configurations, shown in Table 8. Table 9 lists optical SFP+ module options. You can also select other components during the ordering process (Table 10). Consult with your account representative, customer service representative, or system engineer to determine the best configuration for your particular application.

Table 8. Cisco GS7000 1.2-GHz node configurations

Cisco GS7000 1.2-GHz node configurations	Part number for ordering
85/102 MHz split	
GS7K 1.2GHz SHO 85/102, TPA, STDFBRTRY, 1 PS, no Rx	GS7KH811X13XXXXXXX
Smart PHY 120 RPD with SCTE 55-1 OOB	RPD-1X2=
Smart PHY 120 RPD with SCTE 55-2 OOB	RPD-1X2-PKY=

Table 9. Optical SFP+ module options

80 KM SFP+ PIDs 1600 ps/nm/km dispersion
RPHY-S10G-80K-210=
RPHY-S10G-80K-230=
RPHY-S10G-80K-250=
RPHY-S10G-80K-270=
RPHY-S10G-80K-290=
RPHY-S10G-80K-310=
RPHY-S10G-80K-330=
RPHY-S10G-80K-350=
RPHY-S10G-80K-370=
RPHY-S10G-80K-390=

Table 10. Cisco GS7000 additional components

Cisco GS7000 additional components	Part number for ordering
Housing and OIB	
GS7K 1.2 GHz Housing with OIB and Standard Fiber Tray	GS7K-SHO-HSG-1.2G=
GS7K 1.2 GHz LID with OIB and Standard Fiber Tray	GS7K-SHO-LID=

Cisco GS7000 additional components	Part number for ordering
GS7K 1.2 GHz OIB	GS7K-SHO-OIB=
Optical fiber tray kit	
Brackets for passives used in Expanded Fiber Tray	4027000
Expanded Fiber Tray, without brackets, SCA	4057377
SC APC bulkheads (PKG of 10)	4027740
Power supply	
GS7000 1.2 GHz Power Supply	GS7K-PS-1.2G=
Test point cable kit	
Test Point Cable Kit, (includes the 6 cables required to enable GS7000 housing external test points)	4016084
Test Probe-Long Reach	562580
GS7000 Forward Cable Kit (Kit of 5 Cables)	4019114
GS7000 Reverse Cable Kit (Kit of 5 Cables)	4019115
Frequency split kit	
GS7K 1.2 GHz SHO Split Kit 42/54 MHz (QTY=10)	GS7K-SKT-SHO-42=

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