GainStar 1 GHz Node with 42/54 MHz Split

The 1 GHz GainStar Node (GSN) is specifically designed to serve in HFC networks. With its modular design of Optics and RF amplifier electronics, the GSN can provide a full complement of functions required by advanced networks.

The GSN provides excellent forward and reverse path performance combined with high reliability and a user-friendly layout. All new GainStar products share common plug-in accessories and perform to 1 GHz in the forward path. The GSN utilize GaAsFET technology optimized for superior distortion performance.

The GSN provides two high-level RF output ports or four lower-level RF output ports in a strand or pedestal mount configuration. The GSN can be field-upgradable from a forward only configuration to a forward and reverse path configuration.

The optical receiver module with a built-in AGC covers a wide optical input range. The AGC increases reliability and decreases nonlinear distortion. Standard plug-in attenuators can be used to adjust gain and equalization. Reverse traffic can be combined and routed to an FP, DFB or CWDM reverse optical transmitter.

Installation of the node is quick and easy. The GSN can be ordered as a complete node or as an upgrade kit for new 1 GHz GainStar amplifiers.

Features

- Can be set up for 862 MHz or 1 GHz performance
- Modular design for ease of service and maintenance
- Dual high-level RF output ports
- Each high-level RF output port is configurable with an onboard signal director to create two lower-level output ports
- AGC optical input range of –4 to +2 dBm
- Standard plug-in attenuators are used to adjust the gain and equalization
- FP, DFB or CWDM transmitter as an available option
- Surge-resistant circuitry ensures resistance to high voltage transients (6kV)
- Thermal RF control minimizes gain movement over temperature
- 10 A current capacity (steady state) and 15 A surge survivability
- Supports ROSA® network management system with an optional HMS transponder
- Outdoor housing is IP68 dustproof and watertight
- Strand and pedestal mount housing configurations are available
- All ports are PG11 or 5/8″ with included adapter
- RoHS 6 of 6

Figure 1. GainStar 1 GHz Node Strand

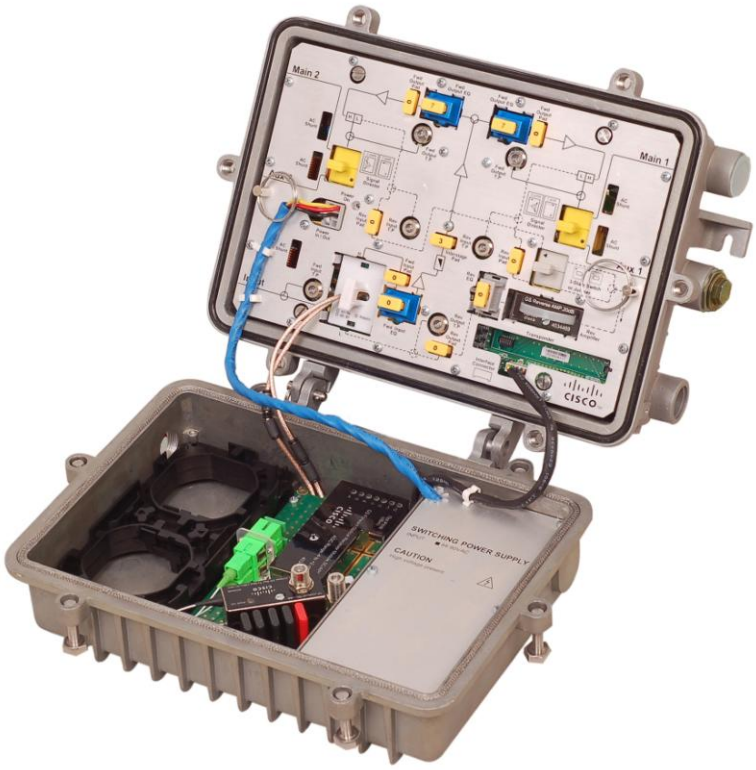


Figure 2. GainStar 1 GHz Node Pedestal

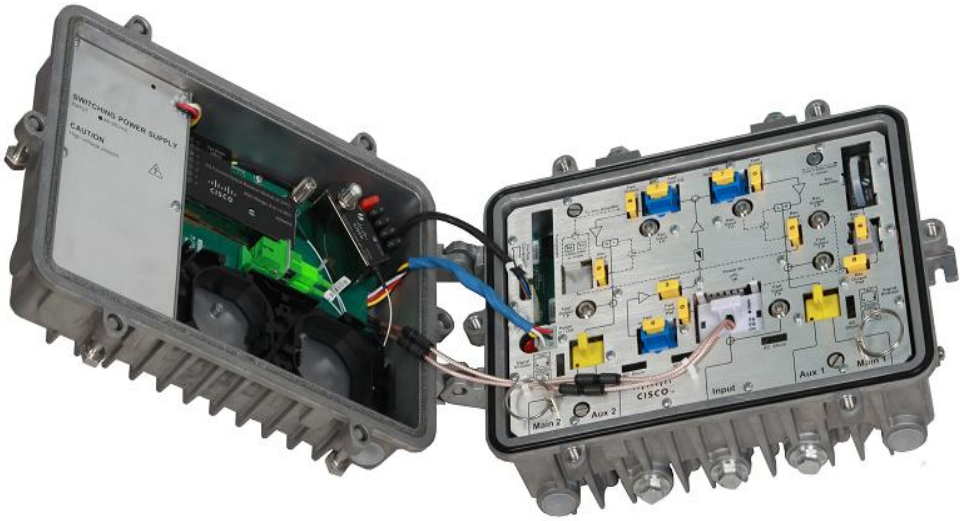
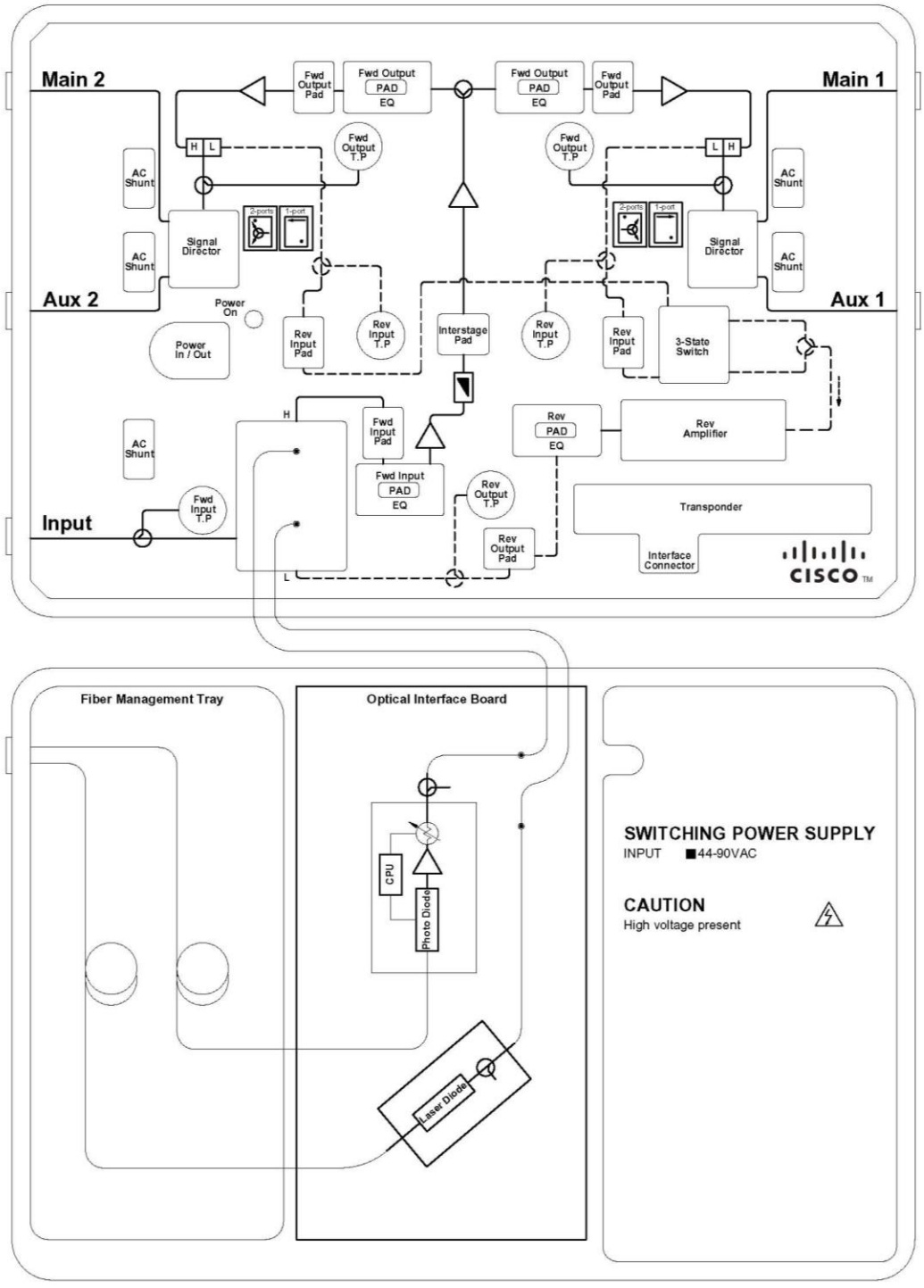


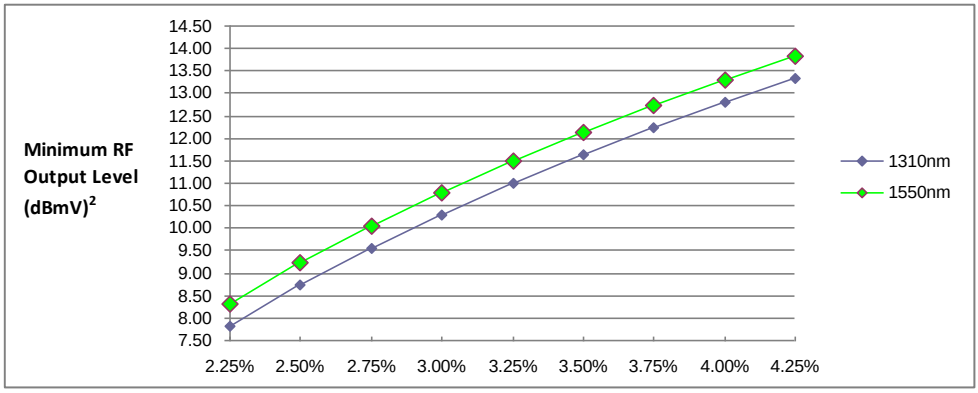
Figure 3. Block Diagram



Specifications

Table 1. Optical Section Specifications

Item	Units	Value
Forward Receiver Module		
Wavelength	nm	1310 and 1550
Optical AGC Range	dBm	–4 to +2
Optical AGC Control Stability	dB	±1.0
Pass Band	MHz	50–1000
Frequency Response[1]	dB	±0.5
Tilt (±1.0 dB)	dB	0
Equivalent Input Noise	$pA/\sqrt{Hz}$	≤ 8
RF Output Level @ 0 dBm Optical Input[2]	dBmV	Refer to chart below



Notes:

1. For forward receiver module only. Does not include the frequency response contributions from forward optical transmitter.
2. Minimum receiver RF output level for the stated transmitter percent OMI/ch (Optical modulation index per channel), with receiver optical input power of 0 dBm.

Table 2. Forward RF Section Specifications

Item	Units	Value			
Forward RF					
Frequency Range	MHz	54–862		54–1000	
RF Reference Output Level @...	dBmV	2 ports	4 ports	2 ports	4 ports
1000 MHz				50.0	46.5
862 MHz		50.0	46.5	48.0	44.5
750 MHz		48.3	44.8	46.3	42.8
650 MHz		46.9	43.4	44.8	41.3
550 MHz		45.4	41.9	43.3	39.8
54 MHz		38.0	34.5	36.0	32.5
Internal Tilt[1]	dB	12 ±1 @ 862 MHz		14 ±1 @ 1 GHz	
Gain[2,3]	dB	40, 2 ports 36.5, 4 ports			
Frequency Response	dB	±0.75			
Output Return Loss	dB	≥ 16			
RF Output Test Point	dB	–20 ±1, 2 ports –16.5 ±1, 4 ports			
Hum	dB	65 @10 A			
Noise Figure[2,3]	dB	< 9			
Distortion @ 79 NTSC + Digitial[3,4,5]	dB				
CTB		72			
CSO		65			
XMOD		66			
Distortion @ 64 PAL B/G + Digital[3,4,5]	dB				
CTB		75			
CSO		72			
Distortion @ 42 Cenelec[3,4]	dBµV				
CTB ≥ 66 dB		110			
CSO ≥ 60 dB		109			

Notes: Unless otherwise noted, specifications reflect typical performance and are referenced to 20ºC

1. Forward internal tilt specified is primarily due to an on-board equalizer 6 dB (862 MHz band) or 7 dB (1 GHz band) and a factory configured 6 dB (862 MHz band) or 7 dB (1GHz band) linear output equalizer.
2. Forward Gain measured with 0 dB input EQ and 0 dB input pad.
3. With 3 dB interstage Pad installed for 1 GHz, 2 dB interstage Pad installed for 862 MHz.
4. Tilt 12 dB @ 862 MHz and 14 dB @ 1 GHz.
5. Distortion performance reference output level is 50 dBmV (2 ports). Digital refers to 550 MHz to 862 MHz or 1 GHz loading with QAM carriers at -6 dB relative to analog CW carrier levels.

Table 3. Forward Insertion Loss

Item	Units	Value
Optical Interface Board Forward Insertion Loss* (not including diplexer filter unit Insertion Loss)	dB	1.0

*Note: Insertion loss from optical receiver RF output to launch amplifier RF input. Subtract this loss from the launch amplifier operational gain to determine forward station gain from optical receiver output to station output.

Table 4. Reverse RF Section Specifications

Item	Units	Value
Reverse RF		
Frequency Range	MHz	5–42
Frequency Response	dB	±0.75
Gain[1,3]	dB	20, 2 ports 16.5, 4 ports
Hum	dB	65 @ 10 A
Input Return Loss	dB	≥ 16
Test Point	dB	–20 ±1, 2 ports –23.5 ±1, 4 ports
Noise Figure[1,3]	dB	< 9
Optional Reverse 3-state Switch[2]	dB	0, –6, Off

Notes: Unless otherwise noted, specifications reflect typical performance and are referenced to 20ºC.

1. Reverse Gain and Noise Figure measured with 0 dB EQ, 0 dB input pad, and 0 dB output pad.
2. Controlled by HMS Transponder
3. If 3-state switch is installed, reduce Gain by 2 dB, and increase Noise Figure by 2 dB.

Table 5. Reverse Transmitter Module Specifications

Transmitter Module	Units	FP Laser	DFB Laser	CWDM Laser
Wavelength	nm	1310	1310	1470, 1490, 1510, 1530 1550, 1570, 1590, 1610
Pass Band	MHz	5–100	5–100	5–200
Frequency Response[1]	dB	±0.5	±0.5	±0.5
Input Return Loss	dB	≥ 16	≥ 16	≥ 16
Output Optical Power	dBm	2.0	3.0	3.0
NPR[2]	dB	15 @ 30 dB	20 @ 30 dB	25 @ 30 dB
RF Test Point relative to transmitter RF input (±1 dB)	dB	–20	–20	–20[3]

Notes:

1. Frequency response for transmitter module only. Does not include the frequency response contribution of an optical receiver.
2. NPR test condition: 7 dB Optic Link (15 km fiber, plus passive loss).
3. 10% OMI when 20 dBmV is detected.

Table 6. Station Delay Characteristics

Station Delay Characteristics			
Forward (Chrominance to Luminance)		**Reverse (Group Delay in 1.5 MHz BW)**	
Frequency (MHz)	Delay (ns)	Frequency (MHz)	Delay (ns)
55.25–58.83	20	5.0–6.5	35
61.25–64.83	8	6.5–8.0	15
67.25–70.83	5	8.0–9.5	7
		37.5–39.0	18
		39.0–40.5	20
		40.5–42.0	38

Table 7. Electrical Specifications

Item	Units	Value
Electrical		
Max. AC Through Current (continuous)	Amps	10
Max. AC Through Current (surge)	Amps	15

Table 8. Station Powering Data

Station Powering Data												
	I_{DC} *		AC Voltage									
			90	85	80	75	70	65	60	55	50	45	40
1 RX & 1 TX	1.79	AC Current (A)	0.59	0.62	0.65	0.68	0.71	0.76	0.81	0.86	0.93	1.02	1.13
		Power (W)	32.3	32.2	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.3	32.7

*Data is based on stations configured for 2-way operation. AC currents specified are based on measurements made with typical CATV type ferro-resonant AC power supply (quasi-square wave),

Table 9. Mechanical, Environmental and Other Specifications

Item	Units	Value	
Mechanical			
Water/Dust Ingress Rating	–	IP68	
Dimensions (H x W x D)	mm in.	Strand 132 x 292 x 225 5.2 x 11.5 x 8.9	Pedestal 132 x 306 x 212 5.2 x 12.1 x 8.4
Weight	kg lb	6 13.2	
Environmental			
Operating Temperature	°C °F	–40 to +60 –40 to +140	
Storage Temperature	°C °F	–40 to +85 –40 to +185	
Others			
Element Management	–	ROSA	
Compliance	–	EU RoHS 6/6, IEC/EN 60728-11, IEC/EN 60065, EN60825-1:2007, EN 50083-2, FCC Part 76, Subpark K, CB Scheme Certification w/All National Deviation & CENELEC Common Mods	

Ordering Information

The GainStar Node is available in a wide variety of configurations. This section contains ordering information for required and optional accessories. Consult your Customer Service Representative or Applications Engineer to determine the best configuration for your particular application.

Table 10. Ordering Information—Required Accessories

Required Accessories for RF Module	Part Number
Plug-in Pads (attenuators)—Available in 1 dB steps from 0 to 20 dB • 1 required for forward input • 2 required for reverse inputs (Not required for forward only configuration) • 1 required for reverse output (Not required for forward only configuration)	4036021 (0 dB) sequentially through 4036041 (20 dB)
Plug-in Forward Equalizer—Available from 0 to 14 dB • 1 required for forward input; 1 Pad also required and plugged into EQ 862 MHz platform: GainStar Forward Linear Equalizer 0 to 4 dB GainStar Forward Linear Equalizer 5 to 9 dB GainStar Forward Linear Equalizer 10 to 14 dB 1000 MHz platform: GainStar Forward Linear Equalizer 0 to 4 dB GainStar Forward Linear Equalizer 5 to 9 dB GainStar Forward Linear Equalizer 10 to 14 dB	 4034456 4034457 4034458 4034459 4034460 4034461

Table 11. Ordering Information—Optional Accessories

Optional Accessories	Part Number
Optical Transmitter	
GainStar 1310 nm FP Optical Transmitter 2 dBm, with SC/APC	4034446
GainStar 1310 nm FP Optical Transmitter 2 dBm, with FC/APC	4034448
GainStar 1310 nm DFB Optical Transmitter 3 dBm, with SC/APC	4034447
GainStar 1310 nm DFB Optical Transmitter 3 dBm, with FC/APC	4034449
GainStar 1470 nm CWDM Optical Transmitter 3 dBm, with SC/APC	4039243
GainStar 1490 nm CWDM Optical Transmitter 3 dBm, with SC/APC	4039244
GainStar 1510 nm CWDM Optical Transmitter 3 dBm, with SC/APC	4039245
GainStar 1530 nm CWDM Optical Transmitter 3 dBm, with SC/APC	4039246
GainStar 1550 nm CWDM Optical Transmitter 3 dBm, with SC/APC	4039247
GainStar 1570 nm CWDM Optical Transmitter 3 dBm, with SC/APC	4039248
GainStar 1590 nm CWDM Optical Transmitter 3 dBm, with SC/APC	4039249
GainStar 1610 nm CWDM Optical Transmitter 3 dBm, with SC/APC	4039250
Reverse Amplifier Module	
GainStar Reverse Amplifier Module, 20 dB Gain	4034469
Reverse Equalizer	
Plug-in Reverse Equalizer—Available from 0 to 10 dB (Not required for forward only configuration) 0 to 5 dB EQ (4034465) and 0 dB Pad (4036021) are provided—Other values must be ordered. • 1 Equalizer required; 1 Pad also required and plugged into EQ 42 MHz platform: GainStar Reverse Cable Equalizer 0 to 5 dB GainStar Reverse Cable Equalizer 6 to 10 dB	 4034465 4034466
Related Equipment	
GainStar 3-state Switch	4034472
GainStar HMS Transponder	4034731
RF Test Probe	1010409
Plug-in 75 ohm Pad	4036140

When upgrading from forward only to a forward and reverse, the Reverse Optical Transmitter, Reverse Amplifier Module, Reverse Equalizer with PAD, Reverse input PAD, and Reverse output PAD accessories are required.

Cisco Systems, Inc.
800 722-2009 or 678 277-1120
www.cisco.com

Part Number 7018908 Rev D
December 2010