

Cisco GainStar 1 GHz Node with 65/87 MHz Split

The Cisco 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 utilizes GaAsFET technology optimized for superior distortion performance.

The GSN provides two higher-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 higher-level RF output ports
- Each higher-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



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Figure 1. Cisco GainStar 1 GHz Node Strand

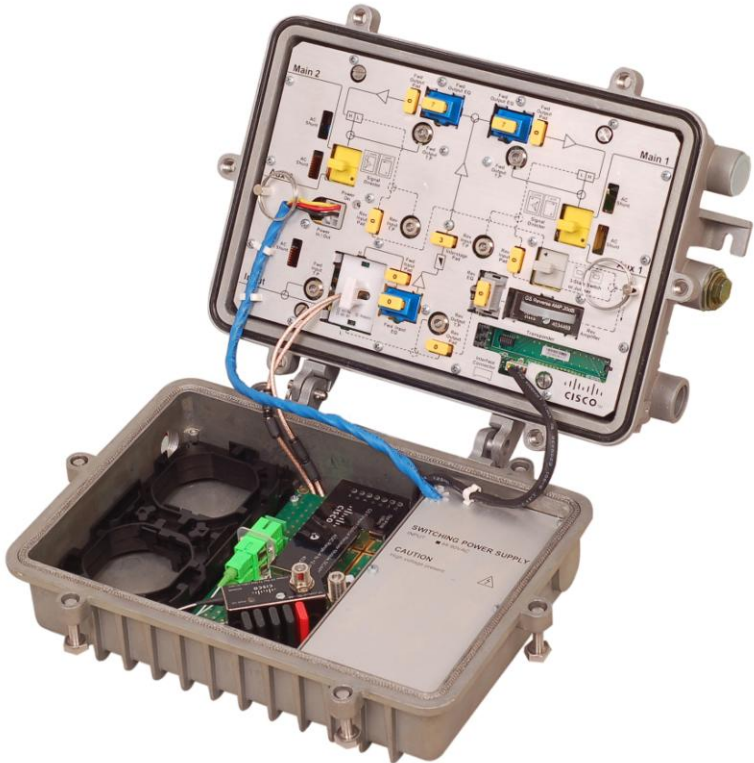


Figure 2. Cisco GainStar 1 GHz Node Pedestal

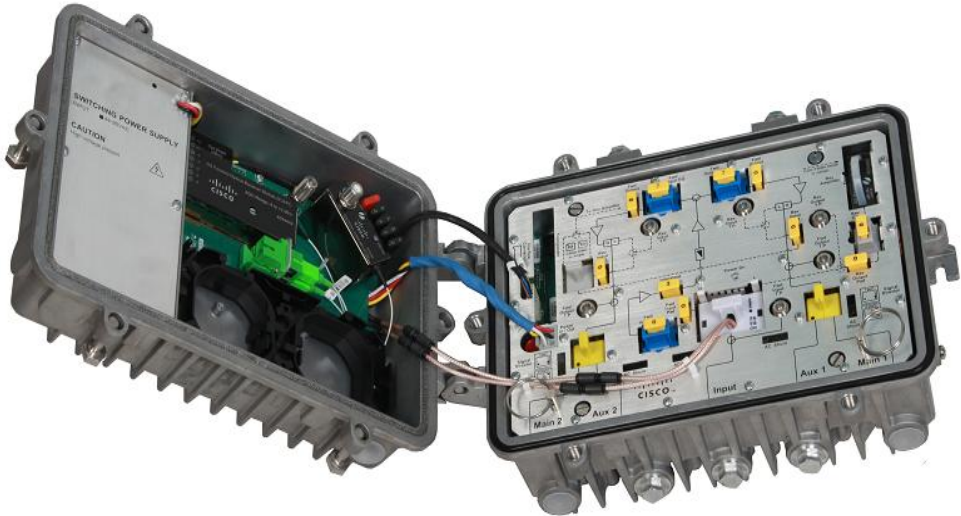
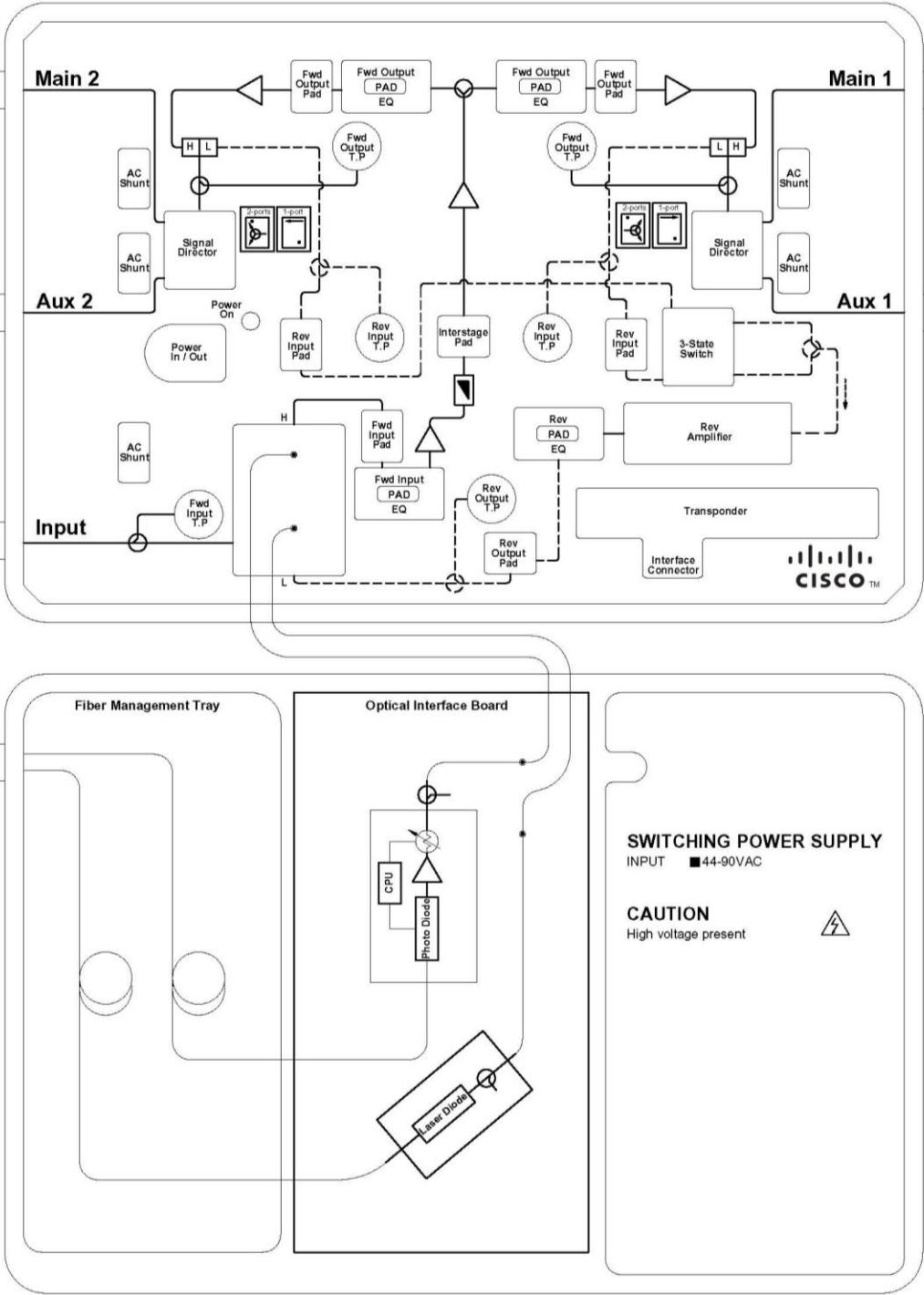


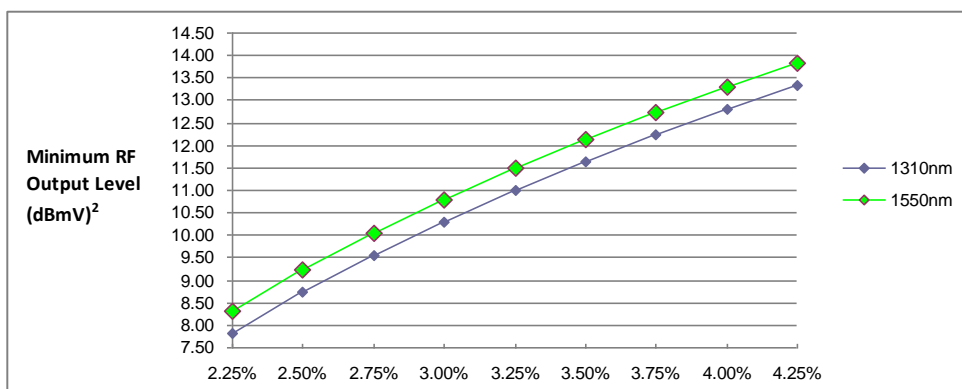
Figure 3. Block Diagram



Specifications

Table 1. Optical Section Specifications

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



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 | Value | | | |
|---|--|--|---|---|
| Forward RF | | | | |
| Frequency Range | 87–862 MHz | | 87–1000 MHz | |
| RF Reference Output Level @... 1000 MHz 862 MHz 750 MHz 650 MHz 550 MHz 87 MHz | 2 ports 50.0 dBmV 48.3 dBmV 46.7 dBmV 45.2 dBmV 38.0 dBmV | 4 ports 46.5 dBmV 44.8 dBmV 43.2 dBmV 41.7 dBmV 34.5 dBmV | 2 ports 50.0 dBmV 47.9 dBmV 46.2 dBmV 44.6 dBmV 43.0 dBmV 36.0 dBmV | 4 ports 46.5 dBmV 44.4 dBmV 42.7 dBmV 41.1 dBmV 39.5 dBmV 32.5 dBmV |
| Internal Tilt ¹ | 12 ±1 dB @ 862 MHz | | 14 ±1 dB @ 1 GHz | |
| Gain ^{2,3} | 40 dB, 2 ports 36.5 dB, 4 ports | | | |
| Frequency Response | ±0.75 dB | | | |
| Output Return Loss | ≥ 16 dB | | | |
| RF Output Test Point | –20 ±1 dB, 2 ports –16.5 ±1 dB, 4 ports | | | |
| Hum | 65 dB @10 A | | | |
| Noise Figure ^{2,3} | < 9 dB | | | |
| Distortion @ 79 NTSC + Digital ^{3,4,5} CTB CSO XMOD | 72 dB 65 dB 66 dB | | | |
| Distortion @ 59 PAL D/K + Digital ^{3,4,5} CTB CSO | 68 dB 64 dB | | | |
| Distortion @ 42 CENELEC ^{3,4} CTB ≥ 66 dB CSO ≥ 60 dB | 110 dBμV 109 dBμV | | | |
| Notes: 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 | Value |
|---|--------|
| Optical Interface Board Forward Insertion Loss* (not including diplexer filter unit Insertion Loss) | 1.0 dB |
| *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 | Value |
|--|--|
| Reverse RF | |
| Frequency Range | 5–65 MHz |
| Frequency Response | ±0.75 dB |
| Gain ^{1,3} | 20 dB, 2 ports 16.5 dB, 4 ports |
| Hum | 65 dB @ 10 A |
| Input Return Loss | ≥ 16 dB |
| Test Point | –20 ±1 dB, 2 ports –23.5 ±1 dB, 4 ports |
| Noise Figure ^{1,3} | < 9 dB |
| Optional Reverse 3-state Switch ² | 0, –6 dB, Off |
| Notes: Unless otherwise noted, specifications reflect typical performance and are referenced to 20°C. 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 | FP Laser | DFB Laser | CWDM Laser |
|---|---------------|---------------|--|
| Wavelength | 1310 nm | 1310 nm | 1470 nm, 1490 nm, 1510 nm, 1530 nm, 1550 nm, 1570 nm, 1590 nm, 1610 nm. |
| Pass Band | 5–100 MHz | 5–100 MHz | 5–200 MHz |
| Frequency Response ¹ | ±0.5 dB | ±0.5 dB | ±0.5 dB |
| Input Return Loss | ≥ 16 dB | ≥ 16 dB | ≥ 16 dB |
| Output Optical Power | 2.0 dBm | 3.0 dBm | 3.0 dBm |
| NPR ² | 15 dB @ 30 dB | 20 dB @ 30 dB | 25 dB @ 30 dB |
| RF Test Point relative to transmitter RF input (±1 dB) | –20 dB | –20 dB | –20 dB 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) |
| 112.25–116.68 | 3 | 5.0–6.5 | 35 |
| 119.25–123.68 | 2 | 6.5–8.0 | 15 |
| 126.25–130.68 | 2 | 8.0–9.5 | 7 |
| | | 60.5– 62.0 | 9 |
| | | 62.0–63.5 | 12 |
| | | 63.5–65.0 | 15 |

Table 7. Electrical Specifications

| Item | Value |
|--------------------------------------|-------|
| Electrical | |
| Max. AC Through Current (continuous) | 10 A |
| Max. AC Through Current (surge) | 15 A |

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 | 32.1 | 32.3 |
| *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 | Value |
|---------------------------|--|
| Mechanical | |
| Water/Dust Ingress Rating | IP68 |
| Dimensions (H x W x D) | Strand |
| | 132 x 292 x 225 mm 5.2 x 11.5 x 8.9 in. |
| Weight | Pedestal |
| | 132 x 306 x 212 mm 5.2 x 12.1 x 8.4 in. |
| Environmental | |
| Operating Temperature | −40 to +60 °C −40 to +140 °F |
| Storage Temperature | −40 to +85 °C −40 to +185 °F |
| 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, Subpart 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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 1 required for forward input; 1 Pad also required and plugged into EQ <ul style="list-style-type: none"> 862 MHz platform: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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, 20dB 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 (4034462) and 0 dB Pad (4036021) are provided—Other values must be ordered. | |
| <ul style="list-style-type: none"> 1 required for reverse input; 1 Pad also required and plugged into EQ | |
| 65 MHz platform: | |
| GainStar Reverse Cable Equalizer 0 to 5 dB | 4034462 |
| GainStar Reverse Cable Equalizer 6 to 10 dB | 4034463 |
| 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.



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