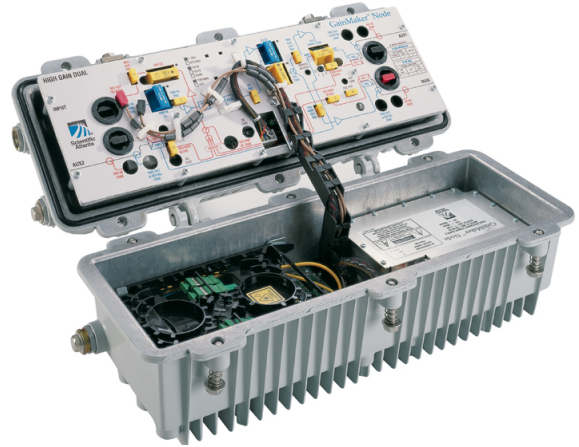


Optoelectronics

GainMaker[®] Optoelectronic Node 1 GHz with 40/52 MHz Split and RF Redundancy

Description

The GainMaker[®] Node is designed to serve as the cornerstone of today's emerging **fiber deeper** network architectures. The GainMaker Node combines the superior proven technologies of both the GainMaker RF Amplifier and Prisma[®] Optical components. Available with three high level RF output ports and RF redundancy, it is the ideal platform for delivering video (digital and analog) as well as high-speed data services over advanced hybrid fiber/coax (HFC) networks. With its modular design of fiber receiver, reverse fiber transmitter and RF amplifier electronics, the GainMaker Node station can provide an extensive complement of functions required by advanced networks. Reverse traffic can be combined and routed to FP, DFB, or CWDM reverse transmitters.



This version of the GainMaker Node is designed with RF redundancy to accommodate forward path and return path redundancy via coax to protect against fiber cuts in the network. This feature is ideal for networks with fiber limitations that still want the protection of redundancy.

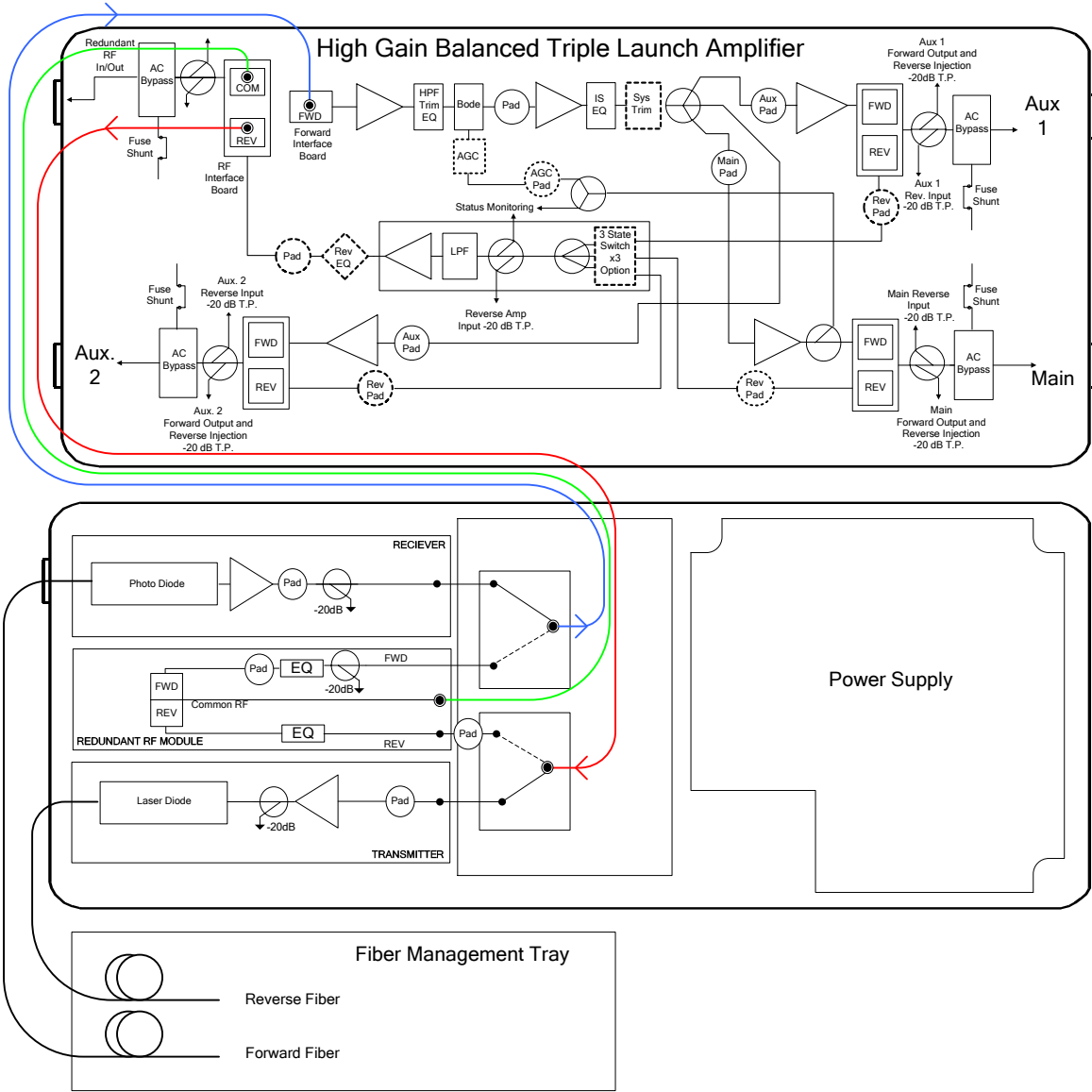
Installation of the GainMaker Node is quick and easy. The fiber receiver is delivered with preconnectorized fiber terminations. The optional preconnectorized cable stub is the ideal method for connecting the GainMaker Node to the fiber network (see cable stubs data sheet). External termination connectors are also available for central strength member and LXE style fiber optic cables. The GainMaker Node includes a 4-fiber handling tray for these cables.

Features

- Forward and reverse RF redundancy
- Fiber management tray provides fiber and connector storage for up to 4 connector pairs
- Local test points and LED indicators on optical receivers and transmitters to simplify installation and maintenance
- The GainMaker node uses pug-in accessories common to all GainMaker products
- Reverse input pad and RF test point for each reverse input port on GainMaker launch amplifier allow optimum reverse path design and alignment
- Chromate plated housing to withstand harsh operating environments

Block Diagrams

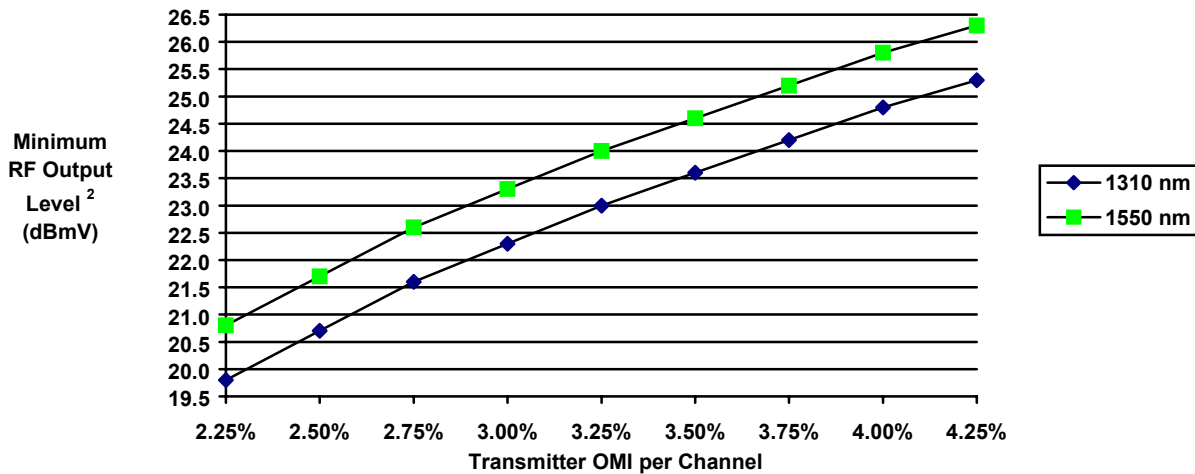
High Gain Balanced Triple (HGBT) with RF Redundancy



Optical Section Specifications

| Optical Section - Forward Receiver Module | Units | GainMaker Standard RX | Notes |
|---|-----------|-------------------------|-------|
| Wavelength | nm | 1310 and 1550 | |
| Optical Input Range | mW dBm | 0.5 to 1.6 -3 to + 2 | |
| Pass Band | MHz | 52-1002 | |
| Frequency Response | dB | ± 0.75 | 1 |
| Tilt (± 1.0 dB) | dB | 0 | |
| Optical Input Test Point (± 10%) | V DC | 1V/mW | |
| Redundant Optical Rx switching threshold (± 1.0 dB) | dBm | -6 | |
| RF Output Level @ 0 dBm Optical Input | dBmV | Refer to chart (below) | 2 |
| RF Output Test Point (± 1.0 dB) | dB | - 20 | |
| Redundancy | | | |
| Optical Threshold: | | | |
| <i>switch to redundant</i> | dBm | -6.0 +/- 0.4 | |
| <i>switch to primary</i> | dBm | -4.0 +/- 0.4 | |
| Switch Time: | | | |
| <i>switch to redundant (max)</i> | ms | 25 | |
| <i>switch to primary (min)</i> | sec | 10.0 | |

Receiver RF Output Level Vs Transmitter OMI



Notes for Optical Section Specifications:

1. For forward receiver module only. Does not include 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. To determine RF output levels at other optical input power, add (or subtract) 2 dB in RF level for each 1 dB increase (or decrease) in receiver optical input power.

For reverse optical transmitter and link performance, see the “Analog Reverse Optical Transmitters for Model 6940/6944 and GainMaker Optoelectronic Stations” data sheet.

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

RF Section Specifications for Amplifier in Primary Mode

| General Station Performance | Units | Forward | Reverse | Notes |
|-----------------------------|-------|--------------------------------------|---------------------------------|-------|
| Pass Band | MHz | 52-1002 | 5-40 | |
| Return Loss | dB | 16 | 16 | 7 |
| Hum Modulation @ 12 A | dB | 70 (52-870 MHz) 60 (870-1002 MHz) | 60 (5-10 MHz) 70 (11-40 MHz) | |
| Hum Modulation @ 15 A | dB | 65 (52-870 MHz) 60 (870-1002 MHz) | 60 (5-10 MHz) 65 (11-40 MHz) | |
| Test Points (± 0.5 dB) | dB | -20 | -20 | |

| Launch Amplifier Performance - Forward | Units | HGBT | Notes |
|---|----------|-----------|-----------|
| Operational Gain (minimum) | dB | 41 | 2 |
| Frequency Response | dB | ± 0.5 | |
| Internal Tilt (± 1 dB) | dB | 14.5 | 1,3 |
| Noise Figure @... | dB | 8.5 | 2 |
| | 54 MHz | 8.0 | |
| | 1002 MHz | | |
| Reference Output Levels @... | dBmV | 49.5 | |
| | 1002 MHz | 47.5 | |
| | 870 MHz | 45.7 | |
| | 750 MHz | 44.0 | |
| | 650 MHz | 42.5 | |
| | 550 MHz | 35.0 | |
| | 55 MHz | | |
| Reference Output Tilt (55-1002 MHz) | dB | 14.5 | 1,4 |
| 78 NTSC channels (CW) with digital | | | 9 |
| Composite Triple Beat | dB | 78 | 5 |
| Cross Modulation | dB | 69 | 5 |
| Composite Second Order (high side) | dB | 70 | 5 |
| 94 NTSC channels (CW) with digital | | | 10 |
| Composite Triple Beat | dB | 73 | 5 |
| Cross Modulation | dB | 65 | 5 |
| Composite Second Order (high side) | dB | 67 | 5 |

| Forward Insertion Loss | Units | Specification | Notes |
|---|-------|---------------|-------|
| Optical Interface Board and Plug-Ins | | | |
| (Loss from specified optical receiver RF output to launch amplifier RF input) | | | |
| Receiver | dB | 1.5 | 11 |

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

RF Section Specifications for Amplifier in Primary Mode, continued

| Launch Amplifier Performance - Reverse | Units | Reverse | Notes |
|---|--------------|-----------|-------|
| Amplifier Type | - | Push-Pull | |
| Operational Gain (minimum) | dBmV | 19.5 | 7,12 |
| Frequency Response | dB | ±0.5 | |
| Internal Tilt (+/- 1 dB) | dB | -0.5 | |
| Noise Figure | dB | 14.5 | 7,12 |
| Reference Output Levels @ 5 and 42 MHz | dBmV | 35 | 6 |
| 6 NTSC Channels (CW) | | | |
| Composite Triple Beat | dB | 92 | |
| Cross Modulation | dB | 80 | |
| Composite Second Order | dB | 82 | |
| Station Performance – Reverse | | | |
| (Station port input to optical transmitter input) | Units | | |
| Operational Gain (minimum) | dB | 17.5 | 7,8 |

| Station Delay Characteristics | | 40 / 52 Split | |
|---|------------|--|------------|
| Forward (Chrominance to Luminance Delay) | | Reverse (Group Delay in 1.5 MHz BW) | |
| Frequency (MHz) | Delay (nS) | Frequency (MHz) | Delay (nS) |
| 55.25 - 58.83 | 17 | 5.0 - 6.5 | 29 |
| 61.25 - 64.83 | 8 | 6.5 - 8.0 | 13 |
| 67.25 - 70.83 | 5 | 8.0 - 9.5 | 8 |
| | | 35.5 - 37.0 | 16 |
| | | 37.0 - 38.5 | 17 |
| | | 38.5 - 40.0 | 29 |

Notes for Primary Mode RF Section Specifications:

- Reference output tilt and internal tilt are both "Linear" tilt.
- Forward Gain and Noise Figure measured with Forward Interface Board installed.
- Forward internal tilt specified is primarily due to an on-board equalizer and a factory configured 7.5 dB linear interstage equalizer (ISEQ).
- The forward reference output tilt specified is achieved via field installation of appropriate input EQ, in conjunction with the internal tilt of the launch amplifier and the tilt associated with the optical link (transmitter/receiver combination).
- Station performance can be determined by combining optic performance and launch amplifier performance. Stated distortion performance is for launch amplifier section operated at reference output levels and tilt.
- Reverse output reference level at the RF output of the launch amplifier.
- Reverse Operational Gain, Noise Figure, and Return Loss are specified without reverse switch option. If switch is installed, reduce Gain by 0.5 dB, increase Noise Figure by 0.5 dB, and decrease Return Loss by 1 dB.
- Station reverse gain from station input(s) to reverse transmitter input. With 0 dB reverse input pad, 1 dB reverse output pad, and 0 dB reverse EQ in launch amplifier. Includes optical interface board losses.
- "Digital" refers to 550 - 1002 MHz loading with QAM carriers at -6 dB relative to analog video carrier levels.
- "Digital" refers to 650 - 1002 MHz loading with QAM carriers at -6 dB relative to analog video carrier levels.
- Insertion loss from optical receiver RF output to launch amplifier RF input, with specified forward plug-in module installed in the optical interface board. Subtract this loss from the launch amplifier operational gain to determine forward station gain from optical receiver output to station output.
- Reverse Gain and Noise Figure for launch amp with 0 dB reverse input pad, 0 dB reverse output EQ, and 1 dB output pad.

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

RF Section Specifications for Amplifier in Redundant Mode

| General Station Performance | Units | Forward | Reverse | Notes |
|-----------------------------|-------|--------------------------------------|---------------------------------|-------|
| Pass Band | MHz | 52-1002 | 5-40 | |
| Return Loss | dB | 15 | 15 | 19 |
| Hum Modulation @ 12 A | dB | 70 (52-870 MHz) 60 (870-1002 MHz) | 60 (5-10 MHz) 70 (11-40 MHz) | |
| Hum Modulation @ 15 A | dB | 65 (52-870 MHz) 60 (870-1002 MHz) | 60 (5-10 MHz) 65 (11-40 MHz) | |
| Test Points (± 1.0 dB) | dB | -20 | -20 | |

| Launch Amplifier Performance - Forward | Units | HGBT | Notes |
|---|-------|------------|-----------|
| Operational Gain (minimum) | dB | 35 | 14 |
| Frequency Response: | | | |
| 52 - 60 MHz | dB | ± 1.25 | |
| 61 - 1002 MHz | dB | ± 0.5 | |
| Internal Tilt (± 2 dB) | dB | 12.5 | 13,15 |
| Noise Figure @... | dB | | 14 |
| 54 MHz | | 10 | |
| 1002 MHz | | 12 | |
| Reference Output Levels @... | dBmV | | |
| 1002 MHz | | 49.5 | |
| 870 MHz | | 47.5 | |
| 750 MHz | | 45.7 | |
| 650 MHz | | 44.0 | |
| 550 MHz | | 42.5 | |
| 55 MHz | | 35.0 | |
| Reference Output Tilt (55-1002 MHz) | dB | 14.5 | 13,16 |
| 78 NTSC channels (CW) with digital | | | 21 |
| Composite Triple Beat | dB | 78 | 17 |
| Cross Modulation | dB | 69 | 17 |
| Composite Second Order (high side) | dB | 70 | 17 |
| 94 NTSC channels (CW) with digital | | | 22 |
| Composite Triple Beat | dB | 73 | 17 |
| Cross Modulation | dB | 65 | 17 |
| Composite Second Order (high side) | dB | 67 | 17 |

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

RF Section Specifications for Amplifier in Redundant Mode, continued

| Launch Amplifier Performance - Reverse | Units | Reverse | Notes |
|---|--------------|-----------|-------|
| Amplifier Type | - | Push-Pull | |
| Operational Gain (minimum) | dBmV | 19.5 | 19,23 |
| Frequency Response | dB | ±0.5 | |
| Internal Tilt (+/- 1 dB) | dB | -0.5 | |
| Noise Figure | dB | 12 | 19,23 |
| Reference Output Levels @ 5 and 42 MHz | dBmV | 35 | 18 |
| 6 NTSC Channels (CW) | | | |
| Composite Triple Beat | dB | 92 | |
| Cross Modulation | dB | 80 | |
| Composite Second Order | dB | 82 | |
| Station Performance – Reverse | | | |
| (Station port input to optical transmitter input) | Units | | |
| Operational Gain (minimum) | dB | 17.5 | 19,20 |

| Station Delay Characteristics | | | | 40 / 52 Split | |
|---|------------|--|------------|---------------|--|
| Forward (Chrominance to Luminance Delay) | | Reverse (Group Delay in 1.5 MHz BW) | | | |
| Frequency (MHz) | Delay (nS) | Frequency (MHz) | Delay (nS) | | |
| 55.25 - 58.83 | 26 | 5.0 - 6.5 | 60 | | |
| 61.25 - 64.83 | 12 | 6.5 - 8.0 | 21 | | |
| 67.25 - 70.83 | 8 | 8.0 - 9.5 | 12 | | |
| 77.25 - 80.23 | 4 | 35.5 - 37.0 | 17 | | |
| | | 37.0 - 38.5 | 23 | | |
| | | 38.5 - 40.0 | 42 | | |

Notes for Redundant Mode RF Section Specifications:

13. Reference output tilt and internal tilt are both "Linear" tilt.
14. Forward Gain and Noise Figure measured with a 0 dB EQ and 0 dB pad in the RF Redundancy module located in the housing lid.
15. Forward internal tilt specified is primarily due to an on-board equalizer and a factory configured 8.5 dB linear interstage equalizer (ISEQ).
16. The forward reference output tilt specified is achieved via field installation of appropriate input EQ, in conjunction with the internal tilt of the launch amplifier.
17. Stated distortion performance is for launch amplifier section operated at reference output levels and tilt.
18. Reverse output reference level at the RF output of the launch amplifier.
19. Reverse Operational Gain, Noise Figure, and Return Loss are specified without reverse switch option. Reverse Switch option will not work in this configuration.
20. Station reverse gain from station input(s) to redundant RF output. With 0 dB reverse input pad, 1 dB reverse output pad, and 0 dB reverse EQ in launch amplifier. Includes optical interface board and redundant module losses.
21. "Digital" refers to 550 - 1002 MHz loading with QAM carriers at -6 dB relative to analog video carrier levels.
22. "Digital" refers to 650 - 1002 MHz loading with QAM carriers at -6 dB relative to analog video carrier levels.
23. Reverse Gain and Noise Figure for launch amp with 0 dB reverse input pad, 0 dB reverse output EQ, and 1 dB output pad.

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

Specifications, continued

| Electrical | Units | | | | Notes |
|---|-------|------------------|------------------|-----------------|----------|
| Max. AC Through Current (continuous) | Amps | 15 | | | |
| Max. AC Through Current (surge) | Amps | 25 | | | |
| Component DC Power Consumption (typical) | | @ +24 VDC | @ +15 VDC | @ -6 VDC | 1 |
| Launch Amplifier HGBT (thermal) | Amps | 1.51 | - | - | |
| Standard Optical Receiver | Amps | 0.25 | 0.01 | 0.035 | |
| Reverse Transmitter – Standard FP | Amps | 0.14 | - | 0.07 | |
| Reverse Transmitter – Standard DFB | Amps | 0.14 | - | 0.09 | |
| | | | | | |
| Power Supply DC Current Rating | Amps | 3.0 | 0.05 | 0.3 | 1 |

| Station Powering Data | | | | | | | | | | | | | |
|------------------------|--------------------------------------|----------------|------------|------|------|------|------|------|------|------|------|------|------|
| GainMaker HGBT Node | I _{DC} (Amps at 24 V DC) | | AC Voltage | | | | | | | | | | |
| | | | 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 |
| 1 RX, 1 TX, & Stat Mon | 2.5 | AC Current (A) | 0.98 | 1.02 | 1.01 | 1.05 | 1.09 | 1.16 | 1.32 | 1.41 | 1.54 | 1.71 | 1.93 |
| | | Power (W) | 70.8 | 70.7 | 70.5 | 70.4 | 70.2 | 70.2 | 70.4 | 70.4 | 70.4 | 70.4 | 70.6 |

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

DC supply has a user configurable 40 V or 50 V AC under-voltage lockout circuit.

Note:

1. The total DC Power consumption of installed components should not exceed the power supply DC current rating.

| Environmental | Units | |
|--|--|--------------------------------|
| Operating Temperature Range | degrees | -40°F to 140°F (-40°C to 60°C) |
| Relative Humidity Range | percent | 5% to 95% |
| Mechanical | | |
| Housing Dimensions | Weight | |
| 17.5 in. L x 7.3 in. H x 7.5 in. D (445 mm L x 185 mm H x 191 mm D) | Station with 1 RX, 1 TX, & power supply: 22 lbs (9.9 kg) | |

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

Ordering Information

The GainMaker Node is available in a wide variety of configurations. The GainMaker Ordering Matrix provides ordering information for configured node stations, existing amp to node upgrade kits, and launch amplifiers. This page contains ordering information for required and optional accessories. Please consult with your Account Representative, Customer Service Representative, or Applications Engineer to determine the best configuration for your particular application.

| Required Accessories for RF Module | Part Number |
|--|--|
| Plug-in Pads (attenuators) - Available in 0.5 dB steps from 0 to 20 dB <ul style="list-style-type: none"> • 1 required for AGC, if applicable* • 4 required for reverse (3 input, 1 output) *To determine AGC pad value, subtract 34dB from the design value main port RF output level at the AGC pilot frequency. | 589693 (0 dB) sequentially thru 589734 (20.5dB) |
| Plug-in Forward Equalizer - Available in 1.5 dB steps from 0 to 30 dB at 1002 MHz <ul style="list-style-type: none"> • 1 required for RF redundant module | 4007228 (0 dB) sequentially thru 4007248 (30 dB) |
| Plug-in Reverse Equalizer – Available in 1 dB steps from 0 to 12 dB at 40 MHz <ul style="list-style-type: none"> • 1 required for reverse output - unless design value is 0 dB (0 dB EQ is provided) | 712719 (0 dB) and 589628 (1 dB) sequentially thru 589639 (12 dB) |
| Plug-in Forward Equalizer for RF redundant module - Available in 1 dB steps from 0 to 12 dB at 40 MHz <ul style="list-style-type: none"> • 1 required for RF redundant module (unless design value is 0 dB which is provided) | 4009826 (0 dB) and 545107 (1 dB) sequentially thru 545118 (12 dB) |

| Required Accessories for Optical Components | Part Number |
|---|--|
| Plug-in Pads (attenuators) - Available in 0.5 dB steps from 0 to 20.5 dB <ul style="list-style-type: none"> • 1 ea required for Transmitter and Receiver(s). • 1 ea required for RF Redundant Mode – redundant forward path • 1 ea required for Optical Interface Board – redundant reverse path | 279500 (0 dB) sequentially thru 279513 (13 dB) in 1 dB steps |
| | 504151 (14 dB) sequentially thru 504157 (20 dB) in 1 dB steps |
| | 565231 (0.5 dB) sequentially thru 565251 (20.5 dB) in 1 dB steps |

Ordering Information, continued

| Optical Receivers (available as part of configuration or separately) | Part Number on Module | Part Number for Ordering |
|--|-------------------------------|----------------------------------|
| GainMaker Node Optical Receiver with SC/APC Connector | 4007501 | 4007671 |
| GainMaker Node Optical Receiver with SC/UPC Connector | 4007502 | 4007672 |
| GainMaker Node Optical Receiver with FC/APC Connector | 4007503 | 4007673 |
| Optical Transmitters (available as part of configuration or separately) | Part Number on Module* | Part Number for Ordering* |
| <i>All listed below are Thermally Compensated Transmitters</i> | | |
| GainMaker Node FP Optical Transmitter with SC/APC Connector | 717904 | 590930 |
| GainMaker Node FP Optical Transmitter with SC/UPC Connector | 717905 | 590931 |
| GainMaker Node FP Optical Transmitter with FC/APC Connector | 717902 | 590928 |
| 1310 nm DFB Optical Transmitter – Standard Gain, with SC/APC connector | 4013903.1310 | 590934 |
| 1310 nm DFB Optical Transmitter – Standard Gain, with SC/UPC connector | 4013904.1310 | 590935 |
| 1310 nm DFB Optical Transmitter – Standard Gain, with FC/APC connector | 4013905.1310 | 590932 |
| | | |
| 1470 nm CWDM DFB Optical Transmitter – Standard Gain with SC/APC connector | 4013903.1470 | 4006971 |
| 1490 nm CWDM DFB Optical Transmitter – Standard Gain with SC/APC connector | 4013903.1490 | 4006972 |
| 1510 nm CWDM DFB Optical Transmitter – Standard Gain with SC/APC connector | 4013903.1510 | 4006973 |
| 1530 nm CWDM DFB Optical Transmitter – Standard Gain with SC/APC connector | 4013903.1530 | 4006974 |
| 1550 nm CWDM DFB Optical Transmitter – Standard Gain with SC/APC connector | 4013903.1550 | 4006975 |
| 1570 nm CWDM DFB Optical Transmitter – Standard Gain with SC/APC connector | 4013903.1570 | 4006976 |
| 1590 nm CWDM DFB Optical Transmitter – Standard Gain with SC/APC connector | 4013903.1590 | 4006977 |
| 1610 nm CWDM DFB Optical Transmitter – Standard Gain with SC/APC connector | 4013903.1610 | 4006978 |
| | | |
| 1470 nm CWDM DFB Optical Transmitter – Standard Gain with SC/UPC connector | 4013904.1470 | 4006979 |
| 1490 nm CWDM DFB Optical Transmitter – Standard Gain with SC/UPC connector | 4013904.1490 | 4006980 |
| 1510 nm CWDM DFB Optical Transmitter – Standard Gain with SC/UPC connector | 4013904.1510 | 4006981 |
| 1530 nm CWDM DFB Optical Transmitter – Standard Gain with SC/UPC connector | 4013904.1530 | 4006982 |
| 1550 nm CWDM DFB Optical Transmitter – Standard Gain with SC/UPC connector | 4013904.1550 | 4006983 |
| 1570 nm CWDM DFB Optical Transmitter – Standard Gain with SC/UPC connector | 4013904.1570 | 4006984 |
| 1590 nm CWDM DFB Optical Transmitter – Standard Gain with SC/UPC connector | 4013904.1590 | 4006985 |
| 1610 nm CWDM DFB Optical Transmitter – Standard Gain with SC/UPC connector | 4013904.1610 | 4006986 |
| | | |
| 1470 nm CWDM DFB Optical Transmitter – Standard Gain with FC/APC connector | 4013905.1470 | 4006987 |
| 1490 nm CWDM DFB Optical Transmitter – Standard Gain with FC/APC connector | 4013905.1490 | 4006988 |
| 1510 nm CWDM DFB Optical Transmitter – Standard Gain with FC/APC connector | 4013905.1510 | 4006989 |
| 1530 nm CWDM DFB Optical Transmitter – Standard Gain with FC/APC connector | 4013905.1530 | 4006990 |
| 1550 nm CWDM DFB Optical Transmitter – Standard Gain with FC/APC connector | 4013905.1550 | 4006991 |
| 1570 nm CWDM DFB Optical Transmitter – Standard Gain with FC/APC connector | 4013905.1570 | 4006992 |
| 1590 nm CWDM DFB Optical Transmitter – Standard Gain with FC/APC connector | 4013905.1590 | 4006993 |
| 1610 nm CWDM DFB Optical Transmitter – Standard Gain with FC/APC connector | 4013905.1610 | 4006994 |

| Related Equipment (available as part of configuration or separately) | Part Number on Module | Part Number for Ordering |
|---|------------------------------|---------------------------------|
| GainMaker Node - Standard DC Power Supply 40 - 90 V AC | 744160 | 4018686 |
| GainMaker - Crowbar Surge Protector | 715973 | 4007682 |



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