

## GainMaker High Output High Gain Balanced Triple (HGBT) System Amplifier 5-85/105-1002 MHz

### Description

The GainMaker® Broadband Amplifier Platform includes a variety of RF amplifiers that address the divergent needs of today's broadband networks. All GainMaker amplifiers provide superior 2-way performance and reliability combined with a user-friendly layout. All share common plug-in accessories and perform to 1 GHz in the forward path. The System Amplifiers in this family provide multiple forward RF output ports, while the Line Extenders provide a single forward RF output port.

GainMaker System Amplifiers utilize GaAsFET technology in the interstage and output gain stages for improved distortion performance.

The GainMaker High Output System Amplifier modules are capable of higher output levels than standard GainMaker System Amplifier modules, and are mechanically compatible with previous System Amplifier II, II+, III, and GainMaker housing bases. The DC power supply is modular and located in an updated housing lid for easy access. All GainMaker System Amplifier modules are factory configured with reverse amplifier, diplex filters, thermal compensation circuit, forward interstage pads, and interstage equalizer to ensure optimal performance. Optional single-pilot Automatic Gain Control (AGC) configurations are also available.

The GainMaker High Output HGBT (High Gain Balanced Triple) System Amplifier has three forward outputs and is ideally suited for providing high (bridger) level RF to the feeder network.

**Figure 1.** GainMaker HGBT System Amplifier

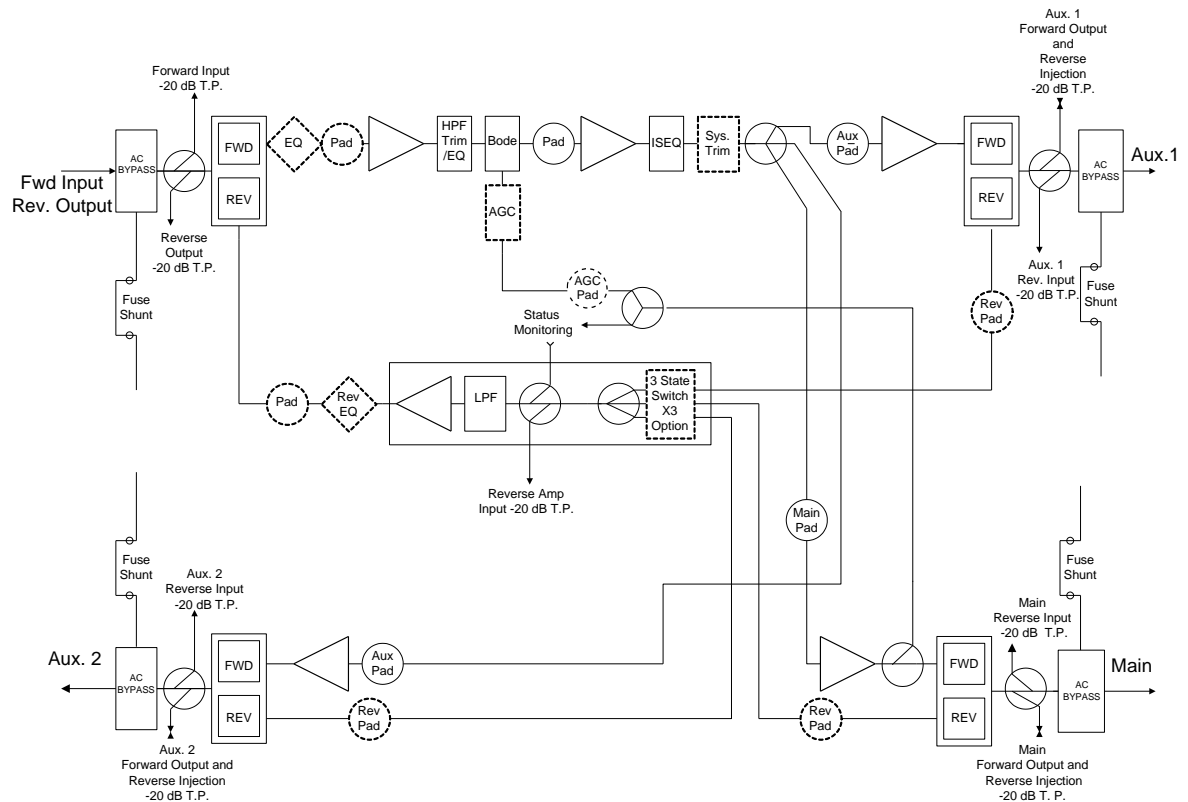


### Features

- Capable of higher output levels than standard GainMaker amplifiers
- Common RF test points for forward output and reverse injection simplify reverse balancing
- Increased forward gain to facilitate drop-in bandwidth extensions without re-spacing
- High-performance GaAsFET gain stage technology
- Fixed-value, plug-in accessories are common to all GainMaker products
- 60 and 90 volt AC powering capability
- 15 ampere current capacity (steady state) and 25 ampere surge survivability

- Optional 3-state reverse switch (on/off/-6 dB) allows each reverse input to be isolated for noise and ingress troubleshooting (status monitoring required)
- AGC has Thermal backup, which eliminates disruptive RF output variation in the event of pilot loss
- QAM Pilot AGC now available in addition to existing analog carrier AGCs
- Improved hum modulation
- Plug-in, self-contained duplex filters
- Modular high-efficiency power supply allows simplified maintenance
- Reverse input pad and RF test point for each reverse input port allow optimum reverse path design and alignment
- Directional Coupler RF test points provide best accuracy
- Surge resistant circuitry ensures gain stage protection without fuses or other nuisance failure causing devices

## Block Diagram



## Specifications

General Station Performance		Units	Forward	Reverse	Notes
Pass Band		MHz	105-1002	5-85	
Amplifier Type		---	GaAs FET	PP	
Frequency Response		dB	± 0.5	± 0.5	
Auto Slope and Gain Range		dB	± 5.5	n/a	
Return Loss		dB	16	16	7
Max AC Through Current (continuous)		A	15	-	
Max AC Through Current (surge)		A	25	-	
Hum Modulation @ 12 A (over specified frequency range)		dB	70 (105-870 MHz) 60 (870-1002 MHz)	60 (5-10 MHz) 70 (11-85 MHz)	
Hum Modulation @ 15 A (over specified frequency range)		dB	65 (105-870 MHz) 60 (870-1002 MHz)	60 (5-10 MHz) 65 (11-85 MHz)	
Test Points (± 0.5 dB)		dB	-20	-20	
Reference Output Level @...	1002 MHz	dBmV	56.0	35 (@ 85 MHz)	
	870 MHz		54.0		
	750 MHz		52.2		
	650 MHz		50.5		
	550 MHz		49.0		
	105 MHz		42.3	35 (@ 5 MHz)	
Reference Output Tilt (105-1002 MHz)		dB	13.7	-	1

Forward Station Performance		Units	Auto/Thermal with 10.5 dB I/S EQ	Notes
Operational Gain (minimum)		dB	41	2
Internal Tilt (± 0.5 dB)		dB	13.8	3
Noise Figure @ 54 MHz		dB	8.5	2
Noise Figure @ 1 GHz		dB	8.0	2
<b>73 NTSC Channels (CW) with digital</b>				4
Composite Triple Beat		dB	65	9
Cross Modulation		dB	59	5,9
Composite Second Order (high side)		dB	64	9
Composite Intermodulation Noise (CIN)		dB	57	8,9

Reverse Station Performance		Units		Notes
Operational Gain (minimum)		dB	19.0	6,7
Internal Tilt (± 0.5 dB)		dB	-0.5	3
Noise Figure		dB	12	6,7
<b>6 NTSC Channels (CW)</b>				
Composite Triple Beat		dB	92	9
Cross Modulation		dB	80	5,9
Composite Second Order (high side)		dB	82	9

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.

Station Delay Characteristics			
Forward (Chrominance to Luminance Delay)		Reverse (Group Delay in 1.5 MHz bandwidth)	
Frequency (MHz)	Delay (ns)	Frequency (MHz)	Delay (ns)
109.25 - 112.83	13	5.0 - 6.5	60
115.25 - 118.83	7	6.5 - 8.0	22
121.25 - 124.83	5	8.0 - 9.5	12
		80.5 - 82.0	10
		82.0 - 83.5	13
		83.5 - 85.0	18

Station Powering Data														
GainMaker High Output HGBT	I <sub>DC</sub> (Amps)		AC Voltage											
			90	85	80	75	70	65	60	55	50	45	40	35
Thermal	2.21	AC Current (A)	0.86	0.88	0.88	0.89	0.93	0.98	1.21	1.25	1.37	1.52	1.72	2.01
		Power (W)	59.6	59.6	59.8	59.1	59.2	59.3	59.0	59.1	59.1	59.5	59.6	60.2
AGC	2.27	AC Current (A)	0.87	0.90	0.90	0.92	0.95	1.01	1.24	1.26	1.39	1.54	1.75	2.05
		Power (W)	60.7	61.2	61.2	60.6	60.4	61.2	60.6	60.6	60.7	60.9	61.5	62.0
AGC with Status Mon. & Reverse Switch	2.41	AC Current (A)	0.91	0.94	0.94	0.97	1.01	1.08	1.34	1.38	1.50	1.64	1.90	2.25
		Power (W)	64.7	65.2	64.9	65.0	64.6	64.2	64.7	65.1	65.0	65.2	65.0	65.9

Data is based on stations configured for 2-way operation. AC currents specified are based on measurements made with typical CATV type ferroresonant AC power supply (quasi-square wave), and GainMaker High Output System Amplifier power supply (2.5 A, 24 VDC, pn 4022846).

DC supply has a user configurable 30 V, 40 V, or 50 VAC under voltage lockout circuit. Default setting is 30 V. 40 V or 50 VAC under voltage lockout may be selected by changing the position of the lockout jumper.

#### Notes:

- Reference output tilt is specified as "LINEAR" tilt (as opposed to "cable" tilt).
- Forward Gain and Noise Figure measured with 0 dB input EQ and 1 dB input pad.
- Down tilt, the effect of cable, is represented by a (-). Up tilt, the effect of equalization, is represented by a (+).
- 73 CW NTSC channels loaded from 115 to 550 MHz. Digital refers to 550-1002 MHz loading with QAM carriers at -6 dB levels relative to analog video carrier levels.
- X-mod (@ 15.75 kHz) specified using 100% synchronous modulation and frequency selective measurement device.
- Reverse Gain and Noise Figure for station with 0 dB reverse input pad, 0 dB reverse output EQ, and 1 dB output pad.
- 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.
- Composite Intermodulation Noise is a broadband noise-like distortion product associated with QAM loading.
- Distortion performance at reference output levels and tilt. Consult Cisco Systems Engineering for CIN calculation.

Environmental	
Operating Temperature Range	-40 -140°F (-40 - 60°C)
Mechanical	
Housing Dimensions	17.3 in. L x 7.2 in. H x 7.8 in. D 439.4 mm L x 182.9 mm H x 198.1 mm D
Weight	
• Housing with power supply	12 lbs, 5 oz. (5.6 kg)
• Module	5 lbs, 5 oz. (2.4 kg)

## Ordering Information

The **GainMaker Ordering Matrix** provides ordering information for configured amplifier modules or stations. This page contains ordering information for required and optional accessories not included as part of a configured amplifier module or station. Consult your account representative or customer service representative for ordering assistance.

*The following **Required Accessories** must be ordered separately (not included via GainMaker Ordering Matrix):*

Required Accessories	Part Number
Plug-in Pads (attenuators) - Available in 0.5 dB steps from 0 to 20.5 dB <ul style="list-style-type: none"> <li>1 required for forward input</li> <li>1 required for AGC, if applicable*</li> <li>4 required for reverse (3 input, 1 output)</li> </ul> *To determine AGC pad value, subtract 34 dB from the design value main port RF output level at the AGC pilot frequency	589693 (0 dB) sequentially thru 589734 (20.5 dB)
Plug-in Forward Cable Equalizer - Available in 1.5 dB steps from 0 to 30 dB at 1002 MHz <ul style="list-style-type: none"> <li>1 required for forward input</li> </ul>	4007228 (0 dB) sequentially thru 4007248 (30 dB)
Plug-in Reverse Cable Equalizer – Available in 1 dB steps from 0 to 12 dB at 40 MHz <ul style="list-style-type: none"> <li>1 required for reverse output - unless design value is 0 dB (0 dB EQ is provided)</li> </ul>	712719 (0 dB) and 4036769 (1 dB) sequentially thru 4036780 (12 dB)

*The following **Optional Accessories** may be ordered separately:*

Optional Accessories	Part Number
24V Power Supply for GainMaker High Output HGD	4026157
230 V AC Crowbar Surge Protector (plug-in, one per station)	715973
Plug-in Inverse Equalizer. Simulates cable equivalent tilts (creates tilt opposite that of equalizers). Use in place of forward input EQ as needed to maintain proper output tilt in short spaced locations. Available in approx. 1.6 dB "cable equivalent" steps from 1.6 to 16.2 dB.	4007486 (1.6 dB) sequentially thru 4007495 (16.2 dB)
Long Reach Test Point Adapter	562580
Status Monitoring Transponder – * see GainMaker Status Monitoring Transponder Data Sheet	*

The following **Housing Options** may be included with the product if ordered using the GainMaker Ordering Matrix. They may also be ordered separately.

<b>GainMaker System Amplifier Housing – 1 required Housing includes housing base, lid, wiring harness, and 24 V power supply # 4022846. All Housings have 15 amp capacity.</b>	<b>Part Number</b>
▪ Uncoated 4 port housing <i>without</i> external test point access	4026387
▪ Chromate Plated 4 port housing <i>without</i> external test point access	4026388
▪ Uncoated 4 port housing <i>with</i> external test point access	4026385
▪ Chromate Plated 4 port housing <i>with</i> external test point access	4026386
<b>GainMaker System Amplifier Housing Upgrade Kit - 1 required if upgrading an existing SA II, II+, or III housing to allow use of GainMaker System Amplifier modules. Includes a GainMaker System Amplifier housing lid, wiring harness, and 24 V power supply # 4022846.</b>	
▪ Uncoated 4 port housing lid <i>without</i> external test point access	4026389
▪ Painted 4 port housing lid <i>without</i> external test point access	4026390
▪ Uncoated 4 port housing lid <i>with</i> external test point access	4026391
▪ Painted 4 port housing lid <i>with</i> external test point access	4026392
<b>Seizure Upgrade Kit – 1 required if upgrading an existing SAll or SAll+ housing base to allow use of GainMaker System Amplifier Modules. Includes high current (15 amp) rated seizure screws and anvils.</b>	548775



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