

Cisco GainMaker Line Extender 1 GHz with 85/102 MHz Split

The Cisco® GainMaker® Broadband Amplifier platform includes a variety of RF amplifiers that address the divergent needs of today's broadband networks. The Cisco GainMaker line extender provides customers with the ability to fine-tune and extend the network more cost effectively than by doing so with system amplifiers alone. The industry-leading gain and distortion performance of Cisco line extenders helps ensure world-class, end-of-line performance.

All Cisco GainMaker amplifiers provide superior two-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 line extenders in this family provide a single forward RF output port while the system amplifiers provide multiple forward RF output ports.

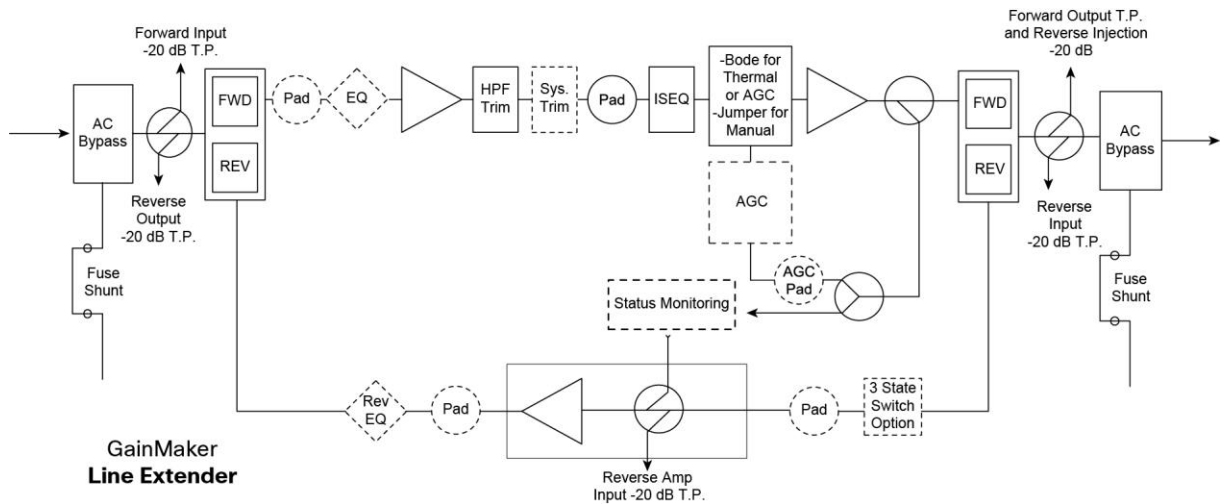
Cisco GainMaker line extender modules have increased gain and are mechanically compatible with previous Cisco GainMaker Line Extender II and III housing bases, often allowing upgrades to higher bandwidth with no respacing or resplicing. The DC power supply is modular and located in an updated housing lid for easy access. All Cisco GainMaker line extender modules are factory configured with reverse amplifier, diplex filters, forward interstage pads, and interstage equalizer to promote optimal performance. For output level control over temperature, optional configurations include either single-pilot Automatic Gain Control (AGC) or a thermal compensation circuit.

The Cisco GainMaker line extender has a single forward RF output port and is ideally suited for providing high (distribution) level RF in the feeder network

Figure 1. Cisco GainMaker Line Extender



Figure 2. Cisco GainMaker Line Extender Block Diagram



Features

- Common RF test points for forward output and reverse injection that simplify reverse balancing
- Increased forward gain
- High-performance GaAsFET gain stage technology
- Fixed-value plug-in accessories
- 60 and 90 volt AC powering capability
- Optional Power Pack kit allows quick field upgrade to 110 VAC powering for indoor use
- 15 A current capacity (steady state) and 25 A 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
- 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 for optimum reverse path design and alignment
- Directional coupler RF test points provide best accuracy
- Surge resistant circuitry facilitates gain-stage protection without fuses or other nuisance failure causing devices

Product Specifications

Table 1. General Station Performance

General Station Performance	Units	Forward	Reverse	Notes
Pass Band	MHz	105-1002	5-85	12
Amplifier Type	-	GaAs FET	PP	
Frequency Response	dB	± 0.5	± 0.4	
Auto Slope and Gain Range	dB	± 5.5	N/A	
Return Loss	dB	16	16	7
Max AC Through Current (continuous)	Amps	15	-	
Max AC Through Current (surge)	Amps	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 870 MHz 750 MHz 650 MHz 550 MHz 105 MHz	dBmV	49.5 47.5 45.7 44.0 42.5 35.8	35 (@ 85 MHz) 35 (@ 5 MHz)	
Reference Output Tilt (105-1002 MHz)	dB	13.7	0	1

Table 2. Forward Station Performance

Forward Station Performance	Units	Manual	Thermal	AGC	Notes
Operational Gain (minimum)	dB	39.5	34	33	2, 12
Internal Tilt (± 0.5 dB)	dB	8.4	8.4	8.4	3
Noise Figure @ 86 MHz	dB	6.0	7.5	7.5	2
Noise Figure @ 1 GHz	dB	7.0	7.0	7.0	2
64 PAL B/G channels (CW) with digital					4
Composite Triple Beat	dB	82	80	80	
Cross Modulation	dB	74	74	73	5
Composite Second Order (high side)	dB	75	75	75	
64 PAL I channels (CW) with digital					10
Composite Beat	dB	75	73	73	8
Cross Modulation	dB	76	73	72	5
42 CENELEC channels (CW)					9
Composite Triple Beat	dB	114	113	113.5	
Cross Modulation	dB	112	110.5	111.5	5
Composite Second Order (high side)	dB	115	115	116	

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.

Forward Station Performance	Units	Manual	Thermal	AGC	Notes
73 NTSC channels (CW) with digital					11
Composite Triple Beat	dB	81	79	79	
Cross Modulation	dB	76	73	72	5
Composite Second Order (high side)	dB	76	75	75	

Product Specifications

Table 3. Reverse Station Performance

Reverse Station Performance	Units		Notes
Operational Gain (minimum)	dB	19.5	6, 7
Internal Tilt (± 0.5 dB)	dB	0	3
Noise Figure	dB	12.5	6, 7
CENELEC Distortions			
Discrete Third Order	dB	92	9
Discrete Second Order	dB	80	5, 9
6 NTSC Channels (CW)			
Composite Triple Beat	dB	92	9
Cross Modulation	dB	80	5, 9
Composite Second Order (high side)	dB	82	9

Table 4. RF Delay Specifications

Station Delay Characteristics			
Forward (Chrominance to Luminance Delay)		Reverse (Group Delay in 1.5 MHz BW)	
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	16

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.

Product Specifications

Table 5. Station Powering Data

Station Powering Data															
Cisco GainMaker Line Extender	I DC	Amps		AC Voltage											
	@ 12 V	@ 24 V		90	85	80	75	70	65	60	55	50	45	40	35
Thermal	1.74	0	AC Current (A)	0.45	0.47	0.49	0.51	0.52	0.53	0.62	0.64	0.67	0.70	0.76	0.86
			Power (W)	27.0	27.0	26.9	26.9	26.9	26.9	26.9	26.9	26.9	27.0	27.1	27.2
AGC	1.74	0.1	AC Current (A)	0.48	0.51	0.52	0.54	0.55	0.57	0.66	0.68	0.71	0.75	0.82	0.92
			Power (W)	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.3	29.4
AGC (with Status Monitoring and Reverse Switch)	1.9	0.1	AC Current (A)	0.51	0.54	0.78	0.57	0.59	0.60	0.71	0.73	0.76	0.80	0.88	0.98
			Power (W)	31.5	31.5	50.9	31.4	50.8	31.4	31.6	31.6	31.6	31.6	31.7	31.9

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 standard Cisco GainMaker Line Extender 12/24 V DC power supply, part number 593020.

DC supply has a user configurable 30, 40, or 50 VAC under voltage lockout circuit. Default setting is 30 V. 40 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 (+).
- Loaded with 64 PAL B/G CW carriers from 112 to 600 MHz. "Digital" refers to 600 to 1002 MHz loading with QAM carriers at -6 dB relative to analog CW carrier levels.
- X-mod (at 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 the reverse switch option. If the reverse switch is installed, reduce gain by 0.5 dB, increase Noise Figure by 0.5 dB, and decrease Return Loss by 1 dB.
- Measured and specified as Composite Beat.
- Tested per CENELEC Standard EN50083-3 with reference output tilt. RF output level specified is at 1002 MHz (forward).
- Loaded with 64 PAL I CW carriers from 88 to 600 MHz. "Digital" refers to 600 to 1002 MHz loading with QAM carriers at -6 dB relative to analog CW carrier levels.
- Loaded with 73 NTSC CW carriers from 115 to 550 MHz. "Digital" refers to 550 to 1002 MHz loading with QAM carriers at -6 dB relative to analog video carrier levels.
- The gain at 102 MHz is less than 1.5 dB below the gain at 105 MHz. 102 to 105 MHz is recommended for out of band communication only. No video carriers should be used between 102 and 105 MHz.

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.

Product Specifications

Table 6. Environmental Specifications

Environmental	Units	Value
Operating Temperature Range	°F/°C	-40 to +140°F (-40 to +60°C)
Relative Humidity Range	%	5 to 95%
Mechanical		
Housing Dimensions (L x H x D)	in./mm	11.7 in. L x 9.8 in. H x 6.7 in. D (297.2 mm L x 248.9 mm H x 170.2 mm D)
Weight	lb/kg	3 lbs, 12 oz. (1.7 kg)
<ul style="list-style-type: none"> Housing with power supply 		9 lbs, 4 oz. (4.2 kg)

Ordering Information

The Cisco GainMaker Line Extender is available in a wide variety of configurations. The desired configuration is “built” by accessing the Cisco Commerce Workspace tool at <https://cisco-apps.cisco.com/cisco/psn/commerce>. The user specifies the new Assemble To Order (ATO) Product ID for the Cisco GainMaker Line Extender “GM-LE” and the tool steps through the available options, from which to choose. Services may also be selected during this process. Once all the desired options are selected, the configuration and price are displayed. When the “Done” radio button is clicked, the configuration can be exported and saved for future use or immediate ordering.

This page contains ordering information for required and optional accessories. Please consult with your Account Representative, Customer Service Representative, or System Engineer to determine the best configuration for your particular application.

Table 7. Required Accessories - Must be Ordered Separately

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"> 1 required for forward input 1 required for AGC, if applicable* 2 required for reverse (1 input, 1 output) <small>* To determine AGC pad value, subtract 29 dB from the design value main port RF output level at the AGC pilot frequency (applies to line extender only).</small>	589693 (0 dB) sequentially through 589734 (20.5 dB)
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 forward input 	4007228 (0 dB) sequentially thru 4007248 (30 dB)
Plug-in Reverse Equalizer - Available in 1 dB steps from 0 to 12 dB at 65 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 4036769 (1 dB) sequentially through 4036780 (12 dB)

Table 8. Optional Accessories (May be Ordered Separately)

Optional Accessories	Part Number
230 VAC Crowbar Surge Protector (plug-in, one per station)	4007682
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 1.6 dB cable equivalent steps from 1.6 to 16.2 dB.	4007486 (1.6 dB) sequentially through 4007495 (16.2 dB)
Long Reach Test Point Adapter	562580
Status Monitoring Transponder	Refer to the Cisco GainMaker Status Monitoring Transponder Data Sheet. http://www.cisco.com/c/en/us/products/video/transponders/index.html

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Table 9. Housing Options - The Following Housing Options May be Included with the Product If Ordered Using the Cisco Commerce Workspace tool. They May Also Be Ordered Separately.

Cisco GainMaker System Amplifier Housing - One required. Housing includes housing base, lid, wiring harness, and 12/24 V power supply, part number 593020. All housings have 15 A capacity.	Part Number
Uncoated housing without external test point access	593095
Chromate Plated housing without external test point access	593093
Uncoated housing with external test point access	593094
Chromate Plated housing without external test point access	593092
Cisco GainMaker Line Extender Housing Upgrade Kit - 1 required if upgrading an existing LE I, LE II or LE III housing to allow use of Cisco GainMaker Line Extender modules. Includes a Cisco GainMaker Line Extender housing lid, wiring harness, and 12/24 V power supply # 593020.	
Uncoated housing lid without external test point access	593087
Painted housing lid without external test point access	593085
Uncoated housing lid with external test point access	593086
Painted housing lid with external test point access	593084
Power Pack Kit (for indoor 110 V AC powering) - Includes LE wall mount bracket, power supply with indicator light, power supply bracket, housing base, lid, wiring harness, power cord strain relief.	748997
Seizure Upgrade Kit - 1 required if upgrading an existing SA II or SA II+ housing base to allow use of Cisco GainMaker System Amplifier modules. Includes high current (15 A) rated seizure screws and anvils.	548774

Cisco Systems, Inc.
 1 800 722-2009 or 678 277-1120
<http://www.cisco.com>



Americas Headquarters
 Cisco Systems, Inc.
 San Jose, CA

Asia Pacific Headquarters
 Cisco Systems (USA) Pte. Ltd.
 Singapore

Europe Headquarters
 Cisco Systems International BV Amsterdam,
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