

# GainMaker® Line Extender 1 GHz with 40/52 MHz Split

## 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 Line Extenders in this family provide a single forward RF output port while the System Amplifiers provide multiple forward RF output ports.

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



The GainMaker Line Extender has a single forward RF output port and is ideally suited for providing high (bridger) level RF in the feeder network.

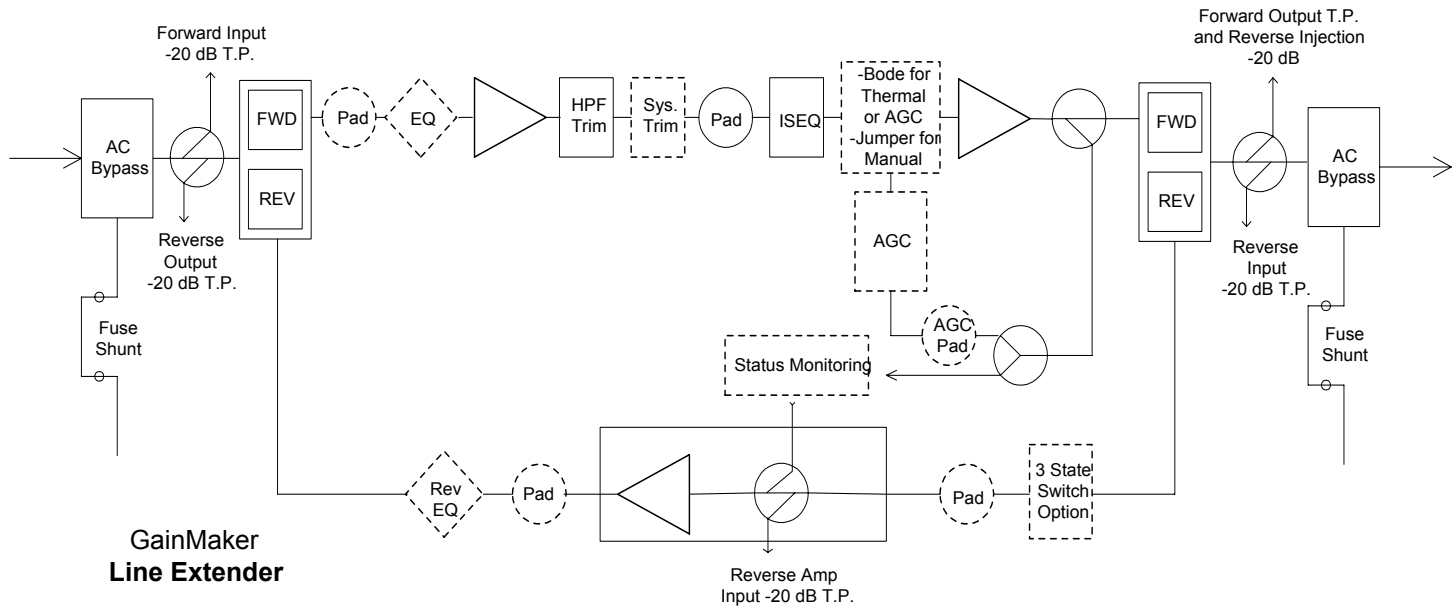
## Features

- Common RF test points for forward output and reverse injection simplify reverse balancing
- Increased forward gain
- GaAsFET gain block technology for improved distortion and lower noise figure
- Fixed value plug-in accessories are common to all GainMaker products
- 60 and 90 volt AC powering capability
- Optional Power Pack kit allows quick field upgrade to 110V AC powering for indoor use
- 15 ampere current capacity (steady state) and 25 ampere surge survivability
- Optional 3-state reverse switch (on/off/-6 dB) allows 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 diplex filters
- Modular high-efficiency power supply allows simplified maintenance
- Reverse input pad and RF test point for the 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

# GainMaker® - Line Extender - 5-40/52-1002 MHz



## Block Diagram



# GainMaker® - Line Extender - 5-40/52-1002 MHz



## Specifications

| General Station Performance                                                                   | Units | Forward                                      | Reverse                                     | Notes |
|-----------------------------------------------------------------------------------------------|-------|----------------------------------------------|---------------------------------------------|-------|
| Pass Band                                                                                     | MHz   | 52-1002                                      | 5-40                                        |       |
| 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)                                                           | Amps  | 15                                           | -                                           |       |
| Max AC Through Current (surge)                                                                | Amps  | 25                                           | -                                           |       |
| Hum Modulation @ 12 A<br>(over specified frequency range)                                     | dB    | 70 (52-870 MHz)<br>60 (870-1002 MHz)         | 60 (5-10 MHz)<br>70 (11-40 MHz)             |       |
| Hum Modulation @ 15 A<br>(over specified frequency range)                                     | dB    | 65 (52-870 MHz)<br>60 (870-1002 MHz)         | 60 (5-10 MHz)<br>65 (11-40 MHz)             |       |
| Test Points (± 0.5 dB)                                                                        | dB    | -20                                          | -20                                         |       |
| Reference Output Level @...<br>1002 MHz<br>870 MHz<br>750 MHz<br>650 MHz<br>550 MHz<br>55 MHz | dBmV  | 49.5<br>47.5<br>45.7<br>44.0<br>42.5<br>35.0 | 35 (@40 MHz)<br><br><br><br><br>35 (@5 MHz) |       |
| Reference Output Tilt (55-1002 MHz)                                                           | dB    | 14.5                                         | -                                           | 1     |

| Forward Station Performance               | Units | Manual<br>9 dB ISEQ | Thermal<br>7.5 dB ISEQ | AGC<br>9 dB ISEQ | Notes |
|-------------------------------------------|-------|---------------------|------------------------|------------------|-------|
| Operational Gain                          | dB    | 39.5                | 34                     | 33               | 2     |
| Internal Tilt (± 0.5 dB)                  | dB    | 9.5                 | 9.5                    | 9.5              | 3     |
| Noise Figure @ 54 MHz                     | dB    | 6.0                 | 7.5                    | 7.5              | 2     |
| Noise Figure @ 1 GHz                      | dB    | 7.0                 | 7.0                    | 7.0              | 2     |
| <b>78 NTSC Channels (CW) with digital</b> |       |                     |                        |                  | 4     |
| Composite Triple Beat                     | dB    | 81                  | 79                     | 79               | 9     |
| Cross Modulation                          | dB    | 76                  | 73                     | 72               | 5,9   |
| Composite Second Order (high side)        | dB    | 76                  | 75                     | 75               | 9     |
| <b>94 NTSC Channels (CW) with digital</b> |       |                     |                        |                  | 8     |
| Composite Triple Beat                     | dB    | 76                  | 74                     | 74               | 9     |
| Cross Modulation                          | dB    | 73                  | 70                     | 69               | 5,9   |
| Composite Second Order (high side)        | dB    | 72                  | 71                     | 71               | 9     |

| Reverse Station Performance        | Units |      | Notes |
|------------------------------------|-------|------|-------|
| Operational Gain                   | dB    | 19.5 | 6,7   |
| Internal Tilt (± 0.5 dB)           | dB    | 0    | 3     |
| Noise Figure                       | dB    | 7.5  | 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.

# GainMaker® - Line Extender - 5-40/52-1002 MHz



## Specifications, continued

| Station Delay Characteristics               |            |                                               |            |
|---------------------------------------------|------------|-----------------------------------------------|------------|
| Forward<br>(Chrominance to Luminance Delay) |            | Reverse<br>(Group Delay in 1.5 MHz bandwidth) |            |
| 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                                     | 22         |
| 67.25 - 70.83                               | 8          | 8.0 - 9.5                                     | 12         |
| 77.25 - 80.83                               | 4          | 35.5 - 37.0                                   | 14         |
|                                             |            | 37.0 - 38.5                                   | 18         |
|                                             |            | 38.5 - 40.0                                   | 30         |

| Station Powering Data                 |                        |       |                |            |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------------------------|-------|----------------|------------|------|------|------|------|------|------|------|------|------|------|------|
| GainMaker<br>Line Extender            | I <sub>DC</sub> (Amps) |       |                | AC Voltage |      |      |      |      |      |      |      |      |      |      |      |
|                                       | @ 12V                  | @ 24V |                | 90         | 85   | 80   | 75   | 70   | 65   | 60   | 55   | 50   | 45   | 40   | 35   |
| Manual and 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 | 27.0 | 27.1 | 27.2 | 27.4 |
| 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 Mon. & Reverse Switch | 1.9                    | 0.1   | AC Current (A) | 0.51       | 0.54 | 0.56 | 0.57 | 0.59 | 0.60 | 0.71 | 0.73 | 0.76 | 0.80 | 0.88 | 0.98 |
|                                       |                        |       | Power (W)      | 31.5       | 31.5 | 31.5 | 31.5 | 31.4 | 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 ferro-resonant AC power supply (quasi-square wave), and standard GainMaker Line Extender power supply (12/24 V DC, pn 593020).

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

### Notes:

1. Reference output tilt is specified as "LINEAR" tilt (as opposed to "cable" tilt).
2. Forward Gain and Noise Figure measured with 0 dB input EQ and 1 dB input pad.
3. Down tilt, the effect of cable, is represented by a (-). Up tilt, the effect of equalization, is represented by a (+).
4. 78 CW NTSC channels loaded from 55 to 550 MHz. Digital refers to 550-1002 MHz loading with QAM carriers at -6 dB levels relative to analog video carrier levels.
5. X-mod (@ 15.75 kHz) specified using 100% synchronous modulation and frequency selective measurement device.
6. Reverse Gain and Noise Figure for station with 0 dB reverse input pad, 0 dB reverse output EQ, and 1 dB output pad.
7. 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.
8. 94 CW NTSC channels loaded from 55 to 650 MHz. Digital refers to 650-1002 MHz loading with QAM carriers at -6 dB levels relative to analog video carrier levels.
9. Distortion performance at reference output levels and tilt.

| Environmental               |                                                                            |
|-----------------------------|----------------------------------------------------------------------------|
| Operating Temperature Range | -40 to +140°F (-40 to +60°C)                                               |
| Mechanical                  |                                                                            |
| Housing Dimensions          | 11.7 in. L x 9.8 in. H x 6.7 in. D<br>297.2 mm L x 248.9 mm H x 170.2 mm D |
| Weight                      |                                                                            |
| • Housing with power supply | 9 lbs, 4 oz. (4.2 kg)                                                      |
| • Module                    | 3 lbs, 12 oz. (1.7 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.

# GainMaker® - Line Extender - 5-40/52-1002 MHz



## 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 that are 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 dB <ul style="list-style-type: none"> <li>1 required for forward input</li> <li>1 required for AGC, if applicable*</li> <li>2 required for reverse (1 input, 1 output)</li> </ul> *To determine AGC pad value, subtract 29 dB from the design value station RF output level at the AGC pilot frequency (applies to Line Extender only) | 589693 (0 dB)<br>sequentially thru<br>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"> <li>1 required for forward input</li> </ul>                                                                                                                                                                                                                                           | 4007228 (0 dB)<br>sequentially thru<br>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"> <li>1 required for reverse output - unless design value is 0 dB (0 dB EQ is provided)</li> </ul>                                                                                                                                                                                          | 712719 (0 dB) and<br>589628 (1 dB)<br>sequentially thru<br>589639 (12 dB) |

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

| Optional Accessories                                                                                                                                                                                                                                                           | Part Number                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| 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 1.6 dB "cable equivalent" steps from 1.6 to 16.2 dB. | 4007486 (1.6 dB)<br>sequentially thru<br>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.

| GainMaker Line Extender Housing - 1 required. Housing includes housing base, lid, wiring harness, and 12/24 V power supply #593020. All Housings have 15 amp capacity.                                                                                                          | Part Number |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| • Uncoated housing <i>without</i> external test point access                                                                                                                                                                                                                    | 593095      |
| • Chromate Plated housing <i>without</i> external test point access                                                                                                                                                                                                             | 593093      |
| • Uncoated housing <i>with</i> external test point access                                                                                                                                                                                                                       | 593094      |
| • Chromate Plated housing <i>with</i> external test point access                                                                                                                                                                                                                | 593092      |
| <b>GainMaker Line Extender Housing Upgrade Kit</b> - 1 required <u>if upgrading</u> an existing LEI, LEII, or LE III housing to allow use of GainMaker Line Extender modules. Includes a GainMaker Line Extender housing lid, wiring harness, and 12/24 V power supply #593020. |             |
| • Uncoated housing lid <i>without</i> external test point access                                                                                                                                                                                                                | 593087      |
| • Painted housing lid <i>without</i> external test point access                                                                                                                                                                                                                 | 593085      |
| • Uncoated housing lid <i>with</i> external test point access                                                                                                                                                                                                                   | 593086      |
| • Painted housing lid <i>with</i> external test point access                                                                                                                                                                                                                    | 593084      |
| <b>Power Pack Kit</b> (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 - * see GainMaker Power Pack Data Sheet                             | 748997      |
| <b>Seizure Upgrade Kit</b> - 1 required if upgrading an existing LEI or LEII housing base to allow use of GainMaker Line Extender Modules. Includes high current (15 amp) rated seizure screws and anvils.                                                                      | 548774      |



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