DATA SHEET

Flex Max® RF Amplifiers

FM902

1.2 GHz Bridger Amplifier

FEATURES

- Supports 1.2 GHz Downstream and 204 MHz Upstream bandpass for DOCSIS® 3.1 migration
- Modular RF Electronics package with upgradable frequency split options
- Increased gain to allow drop in upgrades for ≥ 750 MHz spacing
- Mechanically compatible with legacy Flex Net 700/800/900 series and Flex Max 900 and 901 series housings
- Expanded return path bandwidth with support up to 204 MHz
- QAM and analog ADU options for automatic level control and gain hold in the event of pilot loss

For cable operators looking to ensure maximum backward compatibility, scalability, and protect network investments, CommScope offers solutions that deliver new services with minimal CAPEX, enhance network efficiency, and increase subscriber satisfaction.

The new CommScope 1.2 GHz Flex Max® FM902 Bridger Amplifier enables cable operators to take advantage of DOCSIS 3.1 efficiencies while maintaining backward compatibility with existing 750 MHz, 870 MHz, and 1 GHz systems.

Downstream

The new FM902 Bridger amplifier is equipped with Gallium Nitride (GaN) technology and two high level driven RF outputs. Each output port can be split with optional plug-in Distribution accessories to enable a total of four ports.

New 1.2 GHz Forward Cable Equalizers (CE-120-*) and Cable Simulators (CS-120-*) are available to optimize system designs. These new plug-ins are in the JXP-style form factor and plug into a carrier board with a backward compatible footprint so that operators who want to use the new amplifiers in older 870 MHz or 1 GHz systems can re-use their SEQ-* equalizers. The FM902 utilizes pluggable diplex filters, which provides operators with the flexibility to change band splits in the future.

The following frequency splits are available:

- 5 to 42 MHz/54 to 1218 MHz (042 split)
- 5 to 85 MHz/102 to 1218 MHz (085 split)
- 5 to 204 MHz/258 to 1218 MHz (204 split)

The FM902 is available pre-configured with multiple Automatic Level Control (ALC) options that include 499.25 MHz for analog pilots or 609 MHz and 711 MHz for QAM pilot frequencies. These new pluggable Drive units are not backward compatible with previous FlexMax amplifiers. All amplifiers feature an Automatic/Manual mode jumper that can be set to enable the amplifier to operate in a Manual Level Control (MLC) or Thermal Gain Control (TGC) mode. The amplifier utilizes a gain hold feature in the event of pilot loss for added system reliability. There is an LED indicator to provide visual confirmation of the selected mode and pilot presence.

Upstream

The FM902 features 27 dB of gain in the upstream to accommodate a variety of network designs including high split. The upstream circuitry includes an attenuator location prior to the input test points that allows operators to achieve the recommended input levels. The return equalizer maintains the legacy MEQ-**-* form factor from the Flex Max series amplifiers and operators can select from a range of values based on their network design. Previous generation MEQT return path equalizers are no longer required because of the FM902's on-board thermal compensation feature, which helps maintain levels over temperature. There is also a new plug-in Low Pass filter to provide additional high frequency signal isolation from the downstream signal path.

Backward Compatibility

The FM902 is available as a complete amplifier station or as a drop-in RF module for economical upgrades of legacy C-COR 750 MHz and 870 MHz FlexNet bridger amplifiers or FM901 1 GHz amplifiers. The FM902 features internal -20 dB test points only; there is no option for external test points. The RF module, however, can be installed into an earlier housing that does support external test points without invoking mechanical interference.

COMPATIBILITY

Platform	FlexNet 700	FlexNet800	FlexNet 900	Flex Max 900	Flex Max 901
Upgrade to Flex Max FM902	Yes	Yes	Yes	Yes	Yes

SPECIFICATIONS

Downstream Parameter		Specification
Frequency Split, MHz[1]	042 Split 085 Split 204 Split	54–1218 102–1218 258–1218
Flatness, dB[2]		± 1.0
Operational Gain, dB[3]		47 min
Internal Slope, dB[4]	042 Split 085 Split 204 Split	21.0 19.4 15.5
Noise Figure, dB		8
Test Points, dB		-20 ± 1.0
Return Loss, dB[5]		16
Hum Modulation @ 15A, dBc[6]	F_{minfwd} to 870 MHz 871 to 1003 MHz 1004 to 1218 MHz	-60 -55 -50
Distortion: 1.2 GHz Analog/Digital, 30 Analog/124 Digital Channels[7]		
Reference Frequency, MHz		1218/258/54
Reference Input Level, dBmV		10/8.2/10 (virtual)
Reference Output Level (21 dB Slope), dBmV		57/39.7/36 (virtual)
Composite Triple Beat (CTB), dBc		-70
Composite Second Order (CSO), dBc		-76
Carrier to Composite Noise (CCN), dB[8]		56
Distortion: 1.2 GHz All Digital, 190 Digital Channels		
Reference Frequency, MHz		1218/258/54
Reference Input Level, dBmV		4/2.2/4 (actual)
Reference Output Level (21 dB Slope), dBmV		51/33.7/30 (actual)
Carrier to Composite Noise (CCN), dB[8]		49
Modulation Error Rate (MER), dB[9]		48 min

NOTES:

1. Downstream bandwidth is determined by the diplex filters, forward flatness correction board, and high pass filter installed in the amplifier.
2. Flatness is measured with respect to slope. Slope is calculated using least squares.
3. Includes forward equalizer loss and gain reserve for proper AGC operation.
4. Specified from 54 to 1218 MHz, 5.0 dB Linear Slope plus 16.0 dB Cable Slope.
5. Measured with jumpers in the Distribution accessory location.
6. Hum modulation is measured at 15 Amps AC current passing through the port under test (13 Amps AC for ports 2 and 5).
7. 30 analog channels from 55.25 MHz to 253.25 MHz, 124 digital QAM channels from 261 MHz to 999 MHz, and a 192 MHz wide OFDM channel centered at 1122 MHz. The digital channels are at a level 6 dB below the analog. The output level is 57 dBmV (virtual) at 1218 MHz, with 21 dB tilt from 54 MHz to 1218 MHz.
8. CCN is measured by turning off the QAM/OFDM channel under test and inserting a CW test signal at the corresponding QAM/OFDM RF level in its place.
9. The MER is calculated from the measured CCN.

SPECIFICATIONS

Upstream Parameter		Specification
Frequency Split, MHz[1]	042 Split 085 Split 204 Split	5–42 5–85 5–204
Flatness, dB[2]		± 0.5
Operational Gain, dB[3]		27
Reference Operating Slope, dB		0 ± 0.75
Noise Figure, dB[4]		8
Test Points, dB		-20 ± 1.0
Return Loss, dB[5,6]		16
Hum Modulation @ 15A, dBc[7]	5 to 10 MHz 11 to $F_{maxreturn}$ MHz	-50 -60
Distortion: All Digital, 6 Digital Channels[8]		
Reference Frequency, MHz		42/5
Reference Input Level, dBmV		13/13
Reference Output Level, dBmV		40/40
NPR Dynamic Range, dB[9]		29
BER Dynamic Range, dB[10]		35
Distortion: All Digital, 13 Digital Channels[8]		
Reference Frequency, MHz		85/5
Reference Input Level, dBmV		9/9
Reference Output Level, dBmV		36/36
NPR Dynamic Range, dB[9]		26
BER Dynamic Range, dB[10]		32
Distortion: All Digital, 33 Digital Channels[8]		
Reference Frequency, MHz		204/5
Reference Input Level, dBmV		6/6
Reference Output Level, dBmV		33/33
NPR Dynamic Range, dB[9]		22
BER Dynamic Range, dB[10]		28

NOTES:

1. Upstream bandwidth is determined by the diplex filters, low pass filter (RPLPF), and upstream equalizer (MEQ) installed in the amplifier.
2. Flatness is measured with respect to slope. Slope is calculated using Least Squares.
3. Includes return equalizer loss and gain reserve for proper AGC operation.
4. Noise figure is at T_a = 25 ± 5°C. The noise figure may degrade by up to 1 dB over the operating temperature range and will degrade by 3 dB typical when a Splitter is installed in the Distribution accessory location.
5. The return loss from 5–15 MHz may degrade by up to 1 dB over the operating temperature range.
6. Measured with jumpers in the Distribution accessory location.
7. Hum modulation is measured with 15 Amps AC current passing through the port under test (13 Amps AC current for ports 2 and 5). Hum mode can degrade by up to 5 dB from 5–10 MHz at -40°C.
8. The QAM load is 256 QAM, J.83 Annex B, 5.360537 MS/s; 6 MHz/channel.
9. The NPR dynamic range is specified for an NPR greater than or equal to 40 dB.
10. The BER dynamic range is specified for an uncorrected (Pre-FEC) BER less than or equal to 1.0×10^{-6}.

SPECIFICATIONS

Powering	Specification
AC Input Current (Typical)	1.0 A/36 W @ 45 V 0.8 A/36 W @ 60 V 0.7 A/37 W @ 90 V
AC Input Voltage Range, VAC	40–90
AC Bypass Current, A	15 13 (Port 2 and Port 5)
General	**Specification**
Operating Temperature Range	-40° to +60°C -40° to +140°F
Housing Dimensions, L x W x D	16.0 L x 10.7 W x 5.35 D inches 406 L x 272 W x 136 D mm
Weight	16 lbs 7.3 kg

1.2 GHz FM902 BRIDGER AMPLIFIER ORDERING GUIDE

In the example below, part number FMB12X085-SHG6C1N corresponds to the shaded rows in the Key Guide.

F	M	B	1	2	X	0	8	5	—	S	H	G	6	C	1	N

Key	Technology
FMB12	1.2 GHz GaN Output

Key	Reference Slope
X	21.1 dB (54–1218 MHz)

Key	Bandpass Split
042	42/54 MHz
085	85/102 MHz
204	204/258 MHz

Key	Level Control
X	Manual Level Control (MLC)
A	499.25 MHz ALC
Q	609.00 MHz QAM ALC
S	711.00 MHz QAM ALC

Key	Upstream Gain
H	27 dB

Key	Output Configuration
G	Two bridger outputs—user-configurable to four outputs

Key	Powering
1	None (RF Module Only)
6	2.3A, 90V, 50/60 Hz, High Efficiency

Key	Housing
A	None (RF Module Only)
C	6-port Flex Max, - 20 dB internal test points

Key	Housing Finish
1	Standard

Key	Options
N	N/A

REQUIRED ACCESSORIES

Model Name	Description
CE-120-* CS-120-*	Forward 1.2 GHz Cable Equalizer 2 to 20 dB in 1 dB steps -or- Forward 1.2 GHz Cable Simulator 1 to 10 dB in 1 dB steps
MEQ-**-*	Return Equalizer, 5–42 MHz (042 Split), 5–85 MHz (085 Split), 5–204 MHz (204 Split)
NPB-* NPB-750	Plug-in attenuator/pad (values 0 to 26 dB in 1 dB steps) Plug-in terminator (75 ohm)

RELATED PRODUCTS

ADU/QADU	SS-1218-2 Splitters
FM332 1.2 GHz Line Extender	Installation Services
SDC-1218-* Directional Couplers	Forward Signal Correction Plug-in Accessories

Contact Technical Services for product support:

- United States: +1-888-944-4357
- International: +1-215-323-2345

COMMSCOPE®

Note: Specifications are subject to change without notice.

1513822_FM902 Bridger_RevC