advanced media technologies®

MODEL

Flex Max® RF AMPLIFIERS

FM901e-T/B
1 GHz TRUNK AND BRIDGER AMPLIFIERS

ARRIS

FEATURES

- Simplify plant upgrades with modular RF design
- Improve amplifier reach with optional GaN technology and increased station tilt
- Maintain current amplifier spacing with high output GaAs technology
- Expand return path bandwidth with plug-in diplex filter support to 85 MHz
- Minimize RF drift over temperature with analog or QAM ALC
- Facilitate underground installation with optional 90° access ports

PRODUCT OVERVIEW

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

The Flex Max® FM901e-T/B 1 GHz Trunk and Bridger Amplifiers enable cable operators to increase forward capacity for high definition television (HDTV) channels, typically allowing a 40% increase over current program offerings.

ARRIS FM901e-T/B Trunk and Bridger Amplifiers are designed to easily and cost effectively increase bandwidth from 750/870 MHz to 1 GHz in legacy C-COR networks. The FM901e-T/B comes in high forward gain and output configurations, which allow operators to overcome the higher insertion losses that result from coaxial cable and passives and support cost-effective new designs. Featuring 1 GHz GaAs technology, the FM901e-T/B is available as a complete unit for greenfield deployments or as a drop-in RF module for economical 1 GHz upgrades of legacy C-COR 750 MHz and 870 MHz FlexNet trunk and bridger amplifiers. In addition, they can be used as spares in existing 750 MHz and 870 MHz systems. Operating specifications, such as gain and tilt, are maintained at 750 MHz and 870 MHz, with extended gain and tilt out to 1002 MHz. These unique design considerations enable operators to reuse their legacy amplifier housings and existing spacing, which in turn eliminates the cost of resplicing.

ARRIS also offers a QAM Channel Automatic Level Control (ALC) Pilot Frequency option, which is available with or without a gain hold feature, for Flex Max Amplifiers. An option with the gain hold feature enables an amplifier to adjust output levels to the mid-range automatically if its pilot level drops by 10 dB or more. The ALC Pilot Frequency option allows operators to choose between 609 MHz or 711 MHz pilot frequencies.

COMPATIBILITY

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

RELATED PRODUCTS

FM601e-T/B	FM321e
FM331	STARLINE RF Amplifiers
Installation Services	

BRIDGER SPECIFICATIONS – GaAs (ALC)

Specifications [15]	Units	Forward	Return
Frequency Split	MHz	54 – 1002 85 –1002 105 –1002[14]	5 – 42 5 – 65 5 – 85
Flatness	dB	± 1.0	± 0.5
Full Gain (without EQ and ALC)	dB	48	19
Operation Gain (-0,+1.0 dB) [1,2]	dB	43	18
ALC Control Range	dB	+4/-5	NA
Noise Figure (without EQ) [3]	dB	8/8/7/9	12
Output Reference Frequency	MHz	1002/870/550/54	$F_{MAXRTN}/5$
Reference Output Level [5,6]	dBmV	52/49.5/44/35	35/35
Operating Cable Loss	dB	23	NA
Carrier to Interference Ratio			
Channels, Number of NTSC [4]		79	6
Composite Triple Beat (CTB)	–dBc	75	80
Cross Modulation (XM)	–dB	67	74
Composite Second Order (CSO)	–dBc	73	82
Carrier to Intermodulation Noise (CIN) [8]	dB	63	—
Channels, Number of 256 QAM [9]		154	—
Carrier to Intermodulation Noise (CIN) [10]	dB	63	—
Test Point Accuracy (-20 dB)	dB		
Input Test Point		± 1.0 (54 – 1002)	± 0.5 (5 – F_{MAXRTN})
Output Test Point		± 0.5 (54 – 550), ± 1.0 (551 – 1002)	± 0.5 (5 – F_{MAXRTN})
Return Loss [11]	dB	16	16
Hum Modulation @ 15A	-dBc		
5 – 10 MHz		—	55
11 – 750 MHz		60	60
751 – 1002 MHz		55	—
DC Voltage	VDC	24 ± 0.5	
Current DC Max/Typical	mA	1650/1475	
Power Consumption Max/Typical	W	45.5/41	
Input Voltage Range	VAC		
90 VAC HFC		45 – 90	
HFC AC Current Draw Max/Typical [13]	A		
@ 90 VAC		0.67/0.63	
@ 60 VAC		0.82/0.74	
AC Bypass Current	A		
Ports 1,3,4,6		15	
Ports 2,5		13	
Chrominance/Luminance Delay	ns/3.58 MHz		
Channel 2		35	—
Channel 3		14	—
Channel 4		7	—
Channel 5		3.6	—
Return Group Delay	ns		
5.5 – 7 MHz		—	52
10 – 11.5 MHz		—	6
35 – 36.5 MHz		—	10
38.5 – 40 MHz		—	19

BRIDGER SPECIFICATIONS – GaN (ALC)

Specifications [15]	Units	Forward	Return
Frequency Split	MHz	54 – 1002 85 –1002 105 –1002[14]	5 – 42 5 – 65 5 – 85
Flatness	dB	± 1.0	± 0.5
Full Gain (without EQ and ALC)	dB	48	19
Operation Gain (-0,+1.0 dB) [1,2]	dB	43	18
ALC Control Range	dB	+4/-5	NA
Noise Figure (without EQ) [3]	dB	8/8/7/9	12
Output Reference Frequency	MHz	1002/870/550/54	$F_{MAXRTN}/5$
Reference Output Level [5,6]	dBmV	56/53.5/48/39	35/35
Operating Cable Loss	dB	23	NA
Carrier to Interference Ratio			
Channels, Number of NTSC [4]		79	6
Composite Triple Beat (CTB)	–dBc	71	80
Cross Modulation (XM)	–dB	60	74
Composite Second Order (CSO)	–dBc	70	82
Carrier to Intermodulation Noise (CIN) [8]	dB	60	—
Channels, Number of 256 QAM [9]		154	—
Carrier to Intermodulation Noise (CIN) [10]	dB	59	—
Test Point Accuracy (-20 dB)	dB		
Input Test Point		± 1.0 (54 – 1002)	± 0.5 (5 – F_{MAXRTN})
Output Test Point		± 0.5 (54 – 550), ± 1.0 (551 – 1002)	± 0.5 (5 – F_{MAXRTN})
Return Loss [11]	dB	16	16
Hum Modulation @ 15A	-dBc		
5 – 10 MHz		—	55
11 – 750 MHz		60	60
751 – 1002 MHz		55	—
DC Voltage	VDC	24 ± 0.5	
Current DC Max/Typical	mA	1650/1475	
Power Consumption Max/Typical	W	45.5/41	
Input Voltage Range	VAC		
90 VAC HFC		45 – 90	
HFC AC Current Draw Max/Typical [13]	A		
@ 90 VAC		0.67/0.63	
@ 60 VAC		0.82/0.74	
AC Bypass Current	A		
Ports 1,3,4,6		15	
Ports 2,5		13	
Chrominance/Luminance Delay	ns/3.58 MHz		
Channel 2		35	—
Channel 3		14	—
Channel 4		7	—
Channel 5		3.6	—
Return Group Delay	ns		
5.5 – 7 MHz		—	52
10 – 11.5 MHz		—	6
35 – 36.5 MHz		—	10
38.5 – 40 MHz		—	19

TRUNK SPECIFICATIONS – GaAs (ALC)

Specifications [15]	Units	Forward		Return
		Trunk	Bridger	
Frequency Split	MHz	54 – 1002 85 –1002 105 –1002[14]		5 – 42 5 – 65 5 – 85
Flatness	dB	± 0.75	± 1.5	± 0.5
Full Gain (without EQ and ALC)	dB	38	48	19
Operation Gain (-0,+1.0 dB) [1,2]	dB	33	43	18
ALC Control Range	dB	+4/-5		NA
Noise Figure (without EQ) [3]	dB	8/7/8/10		14
Output Reference Frequency	MHz	1002/870/550/54		$F_{MAXRTN}/5$
Output Reference Level [5,6]	dBmV	42/40.5/37/32	52/49.5/44/35	35/35
Operating Cable Loss	dB	13		NA
Carrier to Interference Ratio				
Channels, Number of NTSC [4]		79	79	6
Composite Triple Beat (CTB)	–dBc	84	75	80
Cross Modulation (XM)	–dB	76	67	74
Composite Second Order (CSO)	–dBc	79	73	82
Carrier to Intermodulation Noise (CIN) [8]	dB	80	63	—
Channels, Number of 256 QAM [9]		154	154	—
Carrier to Intermodulation Noise (CIN) [10]	dB	76	63	—
Test Point Accuracy (-20 dB)	dB			
Input Test Point		± 1.0 (54 – 1002)		± 0.5 (5 – F_{MAXRTN})
Output Test Point		± 0.5 (54 – 550), ± 1.0 (551 – 1002)		± 0.5 (5 – F_{MAXRTN})
Return Loss [11]	dB	16		16
Hum Modulation @ 15A	-dBc			
5 – 10 MHz		—		55
11 – 750 MHz		60		60
751 – 1002 MHz		55		—
DC Voltage	VDC	24 ± 0.5		
Current DC Max/Typical	mA	1955/1775		
Power Consumption Max/Typical	W	53.5/49		
Input Voltage Range	VAC			
90 VAC HFC		45 – 90		
HFC AC Current Draw Max/Typical [13]	A			
@ 90 VAC		0.735/0.70		
@ 60 VAC		0.97/0.88		
AC Bypass Current	A			
Ports 1,3,4,6		15		
Ports 2,5		13		
Chrominance/Luminance Delay	ns/3.58 MHz			
Channel 2		35		—
Channel 3		14		—
Channel 4		7		—
Channel 5		3.6		—
Return Group Delay	ns			
5.5 – 7 MHz		—		52
10 – 11.5 MHz		—		6
35 – 36.5 MHz		—		10
38.5 – 40 MHz		—		19

TRUNK SPECIFICATIONS – GaN (ALC)

Specifications [15]	Units	Forward		Return
		Trunk	Bridger	
Frequency Split	MHz	54 – 1002 85 –1002 105 –1002[14]		5 – 42 5 – 65 5 – 85
Flatness	dB	± 0.75	± 1.5	± 0.5
Full Gain (without EQ and ALC)	dB	38	48	19
Operation Gain (-0,+1.0 dB) [1,2]	dB	33	43	18
ALC Control Range	dB	+4/-5		NA
Noise Figure (without EQ) [3]	dB	8/7/8/10		12
Output Reference Frequency	MHz	1002/870/550/54		$F_{MAXRTN}/5$
Output Reference Level [5,6]	dBmV	46/44.5/41/36	56/53.5/48/39	35/35
Operating Cable Loss	dB	13		NA
Carrier to Interference Ratio				
Channels, Number of NTSC [4]		79	79	6
Composite Triple Beat (CTB)	–dBc	78	71	80
Cross Modulation (XM)	–dB	70	60	74
Composite Second Order (CSO)	–dBc	76	70	82
Carrier to Intermodulation Noise (CIN) [8]	dB	72	60	—
Channels, Number of 256 QAM [9]		154	154	—
Carrier to Intermodulation Noise (CIN) [10]	dB	69	59	—
Test Point Accuracy (-20 dB)	dB			
Input Test Point		± 1.0 (54 – 1002)		± 0.5 (5 – F_{MAXRTN})
Output Test Point		± 0.5 (54 – 550), ± 1.0 (551 – 1002)		± 0.5 (5 – F_{MAXRTN})
Return Loss [11]	dB	16		16
Hum Modulation @ 15A	-dBc			
5 – 10 MHz		—		55
11 – 750 MHz		60		60
751 – 1002 MHz		55		—
DC Voltage	VDC	24 ± 0.5		
Current DC Max/Typical	mA	1955/1775		
Power Consumption Max/Typical	W	53.5/49		
Input Voltage Range	VAC			
90 VAC HFC		45 – 90		
HFC AC Current Draw Max/Typical [13]	A			
@ 90 VAC		0.735/0.70		
@ 60 VAC		0.97/0.88		
AC Bypass Current	A			
Ports 1,3,4,6		15		
Ports 2,5		13		
Chrominance/Luminance Delay	ns/3.58 MHz			
Channel 2		35		—
Channel 3		14		—
Channel 4		7		—
Channel 5		3.6		—
Return Group Delay	ns			
5.5 – 7 MHz		—		52
10 – 11.5 MHz		—		6
35 – 36.5 MHz		—		10
38.5 – 40 MHz		—		19

SPECIFICATIONS – MECHANICAL

Specifications [15]	Units	Forward	Return
Operating Temperature Range	°C °F	–40 to +60 –40 to +140	
Housing Dimensions, L x W x D	inches mm	16.0 L x 10.7 W x 5.35 D 406 L x 272 W x 136 D	
Weight	lb kg	10.14 4.6	

NOTES:

1. Forward spacing at highest frequency with SEQ-1G-xx equalizer installed.
2. Reverse spacing includes losses due to housing, diplex filters, and MEQ-xx-x.
3. The noise figure specification is "Typical" within specified passband.
4. Analog channels occupying the 54 to 550 MHz frequency range with 256-QAM channels to 1002 MHz at –6 dBc below equivalent video channels.
5. Recommended maximum return output level includes loss due to equalizer.
6. At specified operational tilt, maximum equivalent analog output level for 1 GHz loading is 56.5 dBmV @ HF for GaAs.
7. At specified operational tilt, maximum equivalent analog output level for 1 GHz loading is 59 dBmV @ HF for GaN.
8. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 to 550 MHz frequency spectrum.
9. 256-QAM channels occupy 54 to 1002 MHz with 3 channels replaced by analog channels for CCNR measurement.
10. Systems operating with digitally compressed channels from 54 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise relative to any remaining analog channels.
11. Output return loss may derate to 15 dB above 600 MHz.
12. Test point tolerance is with input attenuator position terminated into 75 Ω.
13. The power supply is internal to the RF module. Refer to drawing #333995-32.
    For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required.
    For 90 VAC powering: 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required.
    For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. For frequency split 85/105 MHz roll-off from 105 MHz to 102 MHz < 1.0 dB. Group delay from 103.25 MHz to 105.25 MHz is < 22 ns
15. Full list of specifications available in FM901e Equipment Manual, document number 1502154.

REQUIRED ACCESSORIES

Part Number	Description
SEQ-1G-00	One of the following per FM331 Forward 1002 MHz equalizer (0 dB) -or-
SEQ-1G-xx	Forward 1002 MHz equalizer (values 2 to 20 dB in 1 dB steps) -or-
SCS-1G-xx	Cable simulator (values 2 to 15 dB in 1 dB steps)
MEQ-xx-x	Return equalizer, 5-42 MHz, 5-65 MHz, 5-85 MHz, values 2 to 7 dB in 1 dB steps
NPB-xxxx	Plug-in attenuator/pad (values 0 to 26 dB in 1 dB steps)
NPB-750	Plug-in terminator (75 ohm)

OPTIONAL ACCESSORIES

Part Number	Description
173720-01	Cable adapter from 12 pin connector (PS) to 9 pin connector (FNT/FNB700 RF Module)
173720-02	Cable adapter from 9 pin connector (old PS) to 12 pin connector (RF Module)

Note: Specifications are subject to change without notice.