



## Flex Max321 1GHz Line Extender Technical Specification

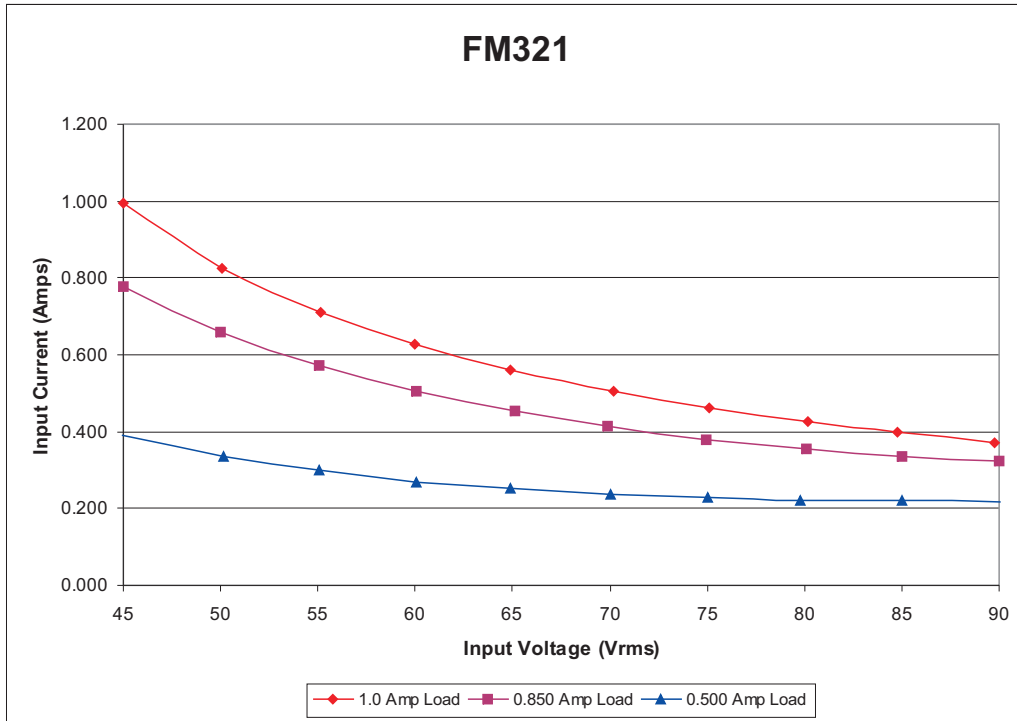
### Power Supply Specifications

Characteristic	Specification
Input Voltage Range	45 to 90VAC (Quasi-squarewave)
Input Frequency	50/60Hz
Output Voltage	24 $\pm$ 0.5 VDC
Output Voltage Protection	33VDC MAX.
Output Voltage Ripple	8mVRMS, 0 to 100kHz
Output Voltage Ripple	64mVp-p, 100MHz
DC Output Current	1.00 Amp max.
Short Circuit Current	1.6ADC MAX.
Efficiency	85% typ.
Hold up Time @ 1.0ADC 44V	8msec min.
Hold up Time @ 1.0ADC 60V	25msec min.
Continuous Operation Minimum Input Voltage	44VRMS
Minimum Re-start Voltage	43VRMS
Low Voltage Turn Off Voltage	20VRMS
Operating Temperature <sup>1</sup>	-40 to 60 °C

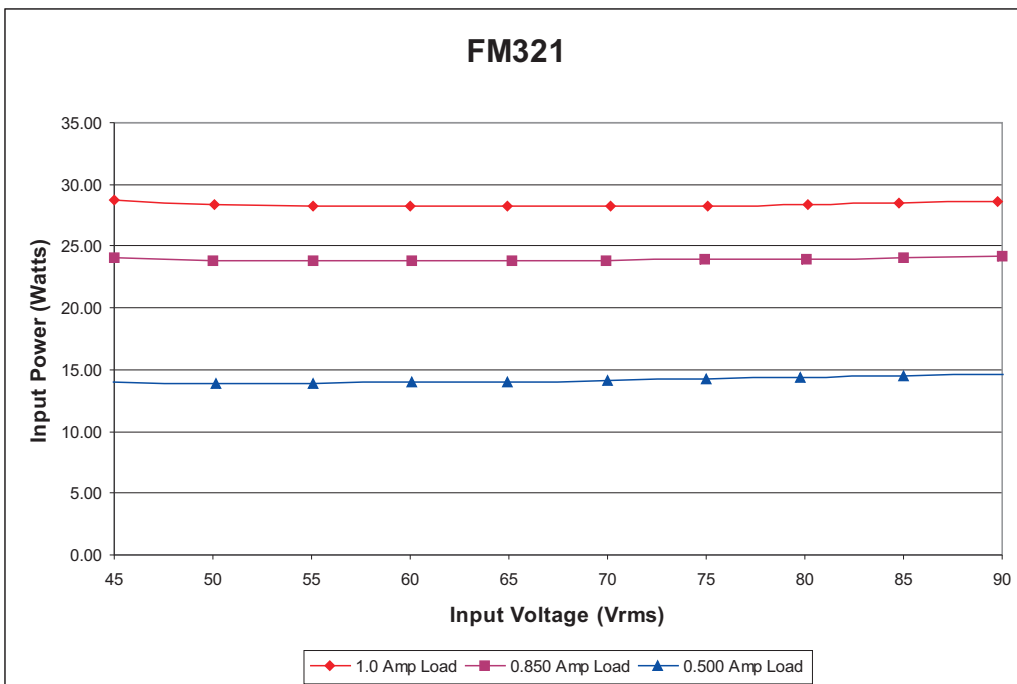
Specification Document Number 601286 Rev B

1. Reflects an external ambient temperature range.

Specifications subject to change without notice



**FM321 Power Supply — Input Current vs. Input Voltage**



**FM321 Power Supply — Input Power vs. Input Voltage**

## Flex Max321 Thermal Level Control Specifications

Characteristic	Forward Specifications	Return
Pass Band, MHz	54 to 1002	5 to 42
Housing, MHz	1002	—
AC Current Passing, Amps	15	15
<b>Typical Operating Conditions</b>		
Operating Ambient Temperature	-40 to 60°C (-40 to 140°F)	
Operational Gain, dB Manual/Thermal/ALC <sup>1</sup>	37	20
Full Gain, dB (without EQ and thermal)	41	20
Operating Levels, Recommended		
Frequency, MHz	1002/870/750/550/54	42/5
Input, dBmV min. Thermal <sup>2</sup>	15/13/11.5/9/8	17/17
Output, dBmV <sup>3,4</sup>	52/49.5/47.5/44/35	37/37
<b>Performance Characteristics @ Recommended Levels (Temperature Range: -40 to 60°C)</b>		
Channels, Number of NTSC <sup>5</sup>	79	6
Carrier-to-Interference Ratio, dB <sup>6</sup>		
Composite Triple Beat	75	80
Cross Modulation (per NCTA standard) <sup>7</sup>	67	70
Composite 2IM	73	78
Composite Intermodulation Distortion Noise (CIN) <sup>8</sup>	76	—
Composite Intermodulation Noise (CIN) <sup>9</sup>	73	—
<b>Noise Figure (Without EQ)<sup>10</sup></b>		
Frequency, MHz	1002/870/750/550/54	42
Noise Figure, dB	10/9.5/9/9/10	6.5
Noise, 4MHz, 75Ω	63/61/60/58/56	69.5
<b>Factory Alignment, without EQ</b>		
		Return
Cable Loss, dB @ 1002MHz	13	—
Flat Loss, dB	25	20
Gain Slope, dB <sup>11</sup>	±1.0	—
Flatness, ±dB	±0.8	±0.9
Return Loss, dB minimum. All entry ports <sup>12</sup>	16	16
<b>Powering Requirements, Max./Typ.<sup>13</sup></b>		
AC Voltage, 60Hz	@60V    @90V	—
AC Power, Watts	27/23    27/23	—
AC Current, mA	610/520    375/320	—
DC Current, mA @ 24V±0.5V	865/800	—
<b>Testpoints</b>		
Forward Input, dB (Resistive Type) <sup>14</sup>	-20±1.25	—
Forward Output, dB (Directional Coupler Type)	-20±0.5 (54 – 550MHz) -20±1.0 (550 – 1002MHz)	—
Return Input, dB (Directional Coupler Type)	—	-20±0.5
Return Output, dB (Resistive Type)	—	-20±1.5
<b>Gain Control</b>		
Plug-in PAD	10-A-WC <sup>15</sup>	10-A-WC <sup>15</sup>
<b>Equalization to compensate for cable loss</b>		

# Flex Max321 1GHz Line Extender Technical Specifications

Characteristic	Forward Specifications	Return
Plug-in Equalizers for additional equalization	PEQ-1G-xx (1 GHz) 7-2E862Cx-WC (862MHz) 7-2E750Cx-WC (750MHz)	10-A-WC <sup>15</sup>
<b>Chrominance/Luminance Delay, Max.</b>		
Channel 2, ns/3.58MHz	28	—
Channel 3, ns/3.58MHz	12	—
Channel 4, ns/3.58MHz	7	—
Channel 5, ns/3.58MHz	4	—
<b>Return Group Delay, Max.</b>		
5.5 – 7 MHz, ns	—	52
10 – 11.5 MHz, ns	—	13
35 – 36.5 MHz, ns	—	10
38.5 – 40 MHz, ns	—	28
<b>Hum Modulation (Time Domain @ 15A)</b>		
5 – 10MHz, –dBc	—	55
11 – 42MHz, –dBc	—	60
54 – 1002MHz, –dBc	60	—

Specification Document Number 1505305 Rev A

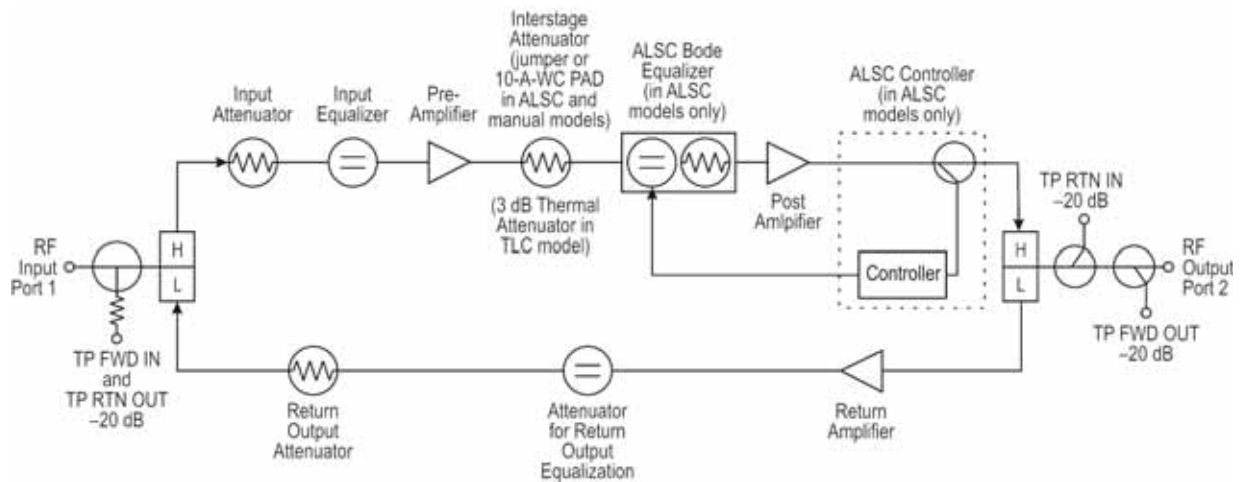
- Forward spacing at highest frequency with PEQ-1G-xx equalizer installed. Return spacing is with a 0dB attenuator installed in the return EQ location. As the attenuator value increases, the return equalization insertion loss at 42MHz also increases.
- Recommended minimum forward input level includes loss due to equalizer.
- Recommended maximum return output level at 42MHz.
- At specified operational tilt, maximum output level for 1 GHz or 870MHz loading is 56.5dBmV @ HF.
- NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
- Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6dB below equivalent video channels.
- Cross Modulation specification number indicates typical cascade performance.
- Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862MHz at levels 6dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550MHz frequency spectrum.
- Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002MHz at levels 6dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550MHz frequency spectrum.
- The Noise Figure and CNR specification are "Typical" within specified passband where  $CNR = \text{Input Level (dBmV)} + 59 - \text{Noise Figure}$ .
- Return spacing is with a 0dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 42MHz also increases. See Return Equalization Losses chart below (Table 1) for insertion loss values with different attenuator values installed.
- The Return Loss from 5 to 7MHz may be as low as 14dB.
- The power supply is internal to the RF module. Refer to drawing 333995-32. For 60VAC powering; AC power consumption in Watts divided by a factor of 43 = Amps required. For 67 to 90Vac, AC power consumption in Watts divided by 65 = Amps required.
- Testpoint tolerance is with input attenuator position terminated into 75 ohms.
- 9-A-WC series PADs are compatible with 10-A-WC series PADs.

Specifications subject to change without notice.

**Table 1**

Typical Return Equalization Losses				
Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	42 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

**Functional Block Diagram**



## Accessories

Plug-ins for a Flex Max321	Plug-in Series
Factory-Installed Plug-Ins	
Circuits or jumpers are factory-installed in these positions according to customer or product requirements.	
Surge Terminator (Model FM321Gxx-xx4ASRxN only)	BOM1504928-001
3dB Thermal PAD (Model FM321G3x-A14AxRxN or FM321G7x-A14AxRxN)	0707424-804
Bode PIN Diode (Model FM321G3x-(KL/K0/L0/MB/SD/RM)4AxRxN)	BOM1503447-001
ALC Controller 711.00MHz QAM (Model FM321G3x-RM4AxRxN)	BOM1503428-001
ALC Controller 499.25MHz (Model FM321G3x-L04AxRxN)	BOM1503428-002
ALC Controller 427.25MHz (Model FM321G3x-K04AxRxN)	BOM1503428-003
ALC Controller 609.00MHz QAM (Model FM321G3x-SD4AxRxN)	BOM1503428-004
ALC Controller 645.00MHz QAM (Model FM321G3x-MB4AxRxN)	BOM1503428-005
ALC Controller 423.25MHz (Model FM321G3x-KL4AxRxN)	BOM1503428-006
Required Plug-Ins	
The Flex Max321 is shipped with these positions empty. Install values based on the station's location.	
Forward Input Attenuator	10-A-WC <sup>1</sup>
Return Output Attenuator	10-A-WC <sup>1</sup>
Optional Plug-Ins	
Jumpers, or "zero" value circuits, may be shipped in these positions. Install different values based on system design.	
Forward Input Equalizer	7-2E-WC <sup>2</sup> or PEQ-1G <sup>3</sup>
Return Output Attenuator for Equalization	10-A-WC <sup>1</sup>

1. 9-A-WC series PADs are compatible with 10-A-WC series PADs.
2. 6-2E series equalizers are compatible with 7-2E-WC series equalizers for 750 or 862MHz systems.
3. PEQ-1G series equalizers are used for 1GHz systems.

## Ordering Information

To configure a product that meets your specific needs, or for any questions, please contact your ARRIS Sales Professional. You may also use our Product Wizard, located at [support.arrisi.com](http://support.arrisi.com) (User ID and password required). If you do not have a user ID and password or have forgotten your password, please use the Sign In Help section indicated.