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Cross Technologies Frequency Converter “Input-Output-Gain Relationship

Cross Technologies Frequency **Upconverters** provide for the ability to set Input Signal Levels to ‘match’ actual Input Signal Levels as closely as possible. [See below for similar information related to Cross Technologies Frequency **DOWNconverters** .] The advantage of this concept is that we are better able to optimize the signal processing circuitry, which minimizes Spurs and facilitates Noise Figure and P1dB Compression specifications.

As such, there is a somewhat linear relationship between Input Level, Gain/Attenuation and Output Levels that needs to be understood. The published specifications for all Cross Technologies Upconverters are contingent upon this relationship being met. If Gain/Attenuation values are set that result in Output Levels outside this valid range, the performance of the unit may no longer meet published specifications.

Example 1:

Output Level Range: -20 dBm to 0 dBm

Gain/Attenuation Range: -10 to +30 dB

Input Signal Level Setting: -30 dBm

In this example the “possible, specified” Gain/Attenuation Range is -10 to +30 dB.

However with the Input Signal Level set to -30 dBm, and understanding that we cannot exceed the Output Level Range (-20 dBm to 0 dBm) the “valid, useable” Gain/Attenuation “range” is only + 10 dB (-30 +10 = -20 dBm Output) to +30 dB (-30 +30 = 0 dBm Output). So, even though the unit has a specified Gain range of -10 to +30 dB, with the Input Signal Level set to -30 dBm, the only valid Gain “range” available is + 10 dB to +30 dB.

Example 2:

Output Level Range: -20 dBm to 0 dBm

Gain/Attenuation Range: 0 to +30 dB

Input Signal Level Setting: -15 dBm

In this example the “possible, specified” Gain/Attenuation Range is 0 to +30 dB.

However with the Input Signal Level set to -15 dBm, and understanding that we cannot exceed the Output Level Range (-20 dBm to 0 dBm) the “valid, useable” Gain/Attenuation “range” is only 0 dB (-15 + 0 = -15 dBm Output) to +15 dB (-15 +15 = 0 dBm Output). So, even though the unit has a specified Gain range of 0 to +30 dB, with the Input Signal Level set to -15 dBm, the only valid Gain “range” available is + 0 dB to +15 dB.

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Front Panel Operation.

Via the Front Panel interface, you ARE PERMITTED to exceed this Gain/Attenuation range recommendation. However, the unit is not guaranteed to meet published specifications if these gain range settings result in the published Output Level range being exceed.

Remote Communications.

Via the Remote Communications interface, you ARE **NOT** PERMITTED to exceed this Gain/Attenuation range recommendation. If a command is received via the Remote interface that attempts to set a Gain/Attenuation value that would exceed the published Output Level range, the command will be rejected and the “Illegal/Out of range parameter” response will be sent via the Remote interface.

Cross Technologies Frequency **DOWNconverters** do not have Input Signal Level settings; however, the same Input-Output-Gain relationship still exists if the published specifications are to be met. The Gain/Attenuation should be set to a value that would ensure that the Output Level range will not be exceeded.

Example:

Output Level Range: -30 dBm to -20 dBm

Gain/Attenuation Range: 0 to +50 dB

Input Signal Level Range: -70 dBm to -20 dBm

The following table shows the relationship that needs to be maintained to ensure the published specifications are always met.

Converter model	Input Level	Valid Gain Values	Output Level Range
2016-25, -225 Downconverter	-70 dB	40 dB to 50 dB	-30 dBm to -20 dBm
	-50 dB	20 dB to 30 dB	
	-45 dB	15 dB to 25 dB	
	-40 dB	10 dB to 20 dB	
	-35 dB	5 dB to 15 dB	
	-30 dB	0 dB to 10 dB	
	-20 dB	0 dB	



NOTE: You may set the Gain to any value from 0 to +50 dB that you would like, but Cross cannot guarantee that the published specifications will be met unless the values are kept within this range. If your application requires slightly exceeding these parameters and the performance remains acceptable for your application, you may do so.

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Gain versus Attenuation.

Cross Technologies Frequency Converters are designed based on GAIN and not ATTENUATION settings. For network applications that are based on Attenuation, the Attenuation value is always equal to Max Gain – (minus) Set Gain Value.

Max Gain is the highest *positive gain value* of the Gain Range for any specific unit. E.g., if the Gain Range of a unit is -40 dB to +20 dB, the Max Gain is +20 dB; and if the Gain Range is 0 dB to +50 dB, the Max Gain is +50 dB.

The Set Gain Value is the value that the Gain is set to on the unit. It is the value that is displayed on the LCD Display on the Front panel. Below is a table that provides examples for calculating Attenuation values for systems that are Attenuation based.

Converter model	Max Gain	(minus) Set Gain Value	(equals) Attenuation
2015-25, -225 Upconverter	30 dB	0 dB	30 dB
		13 dB	17 dB
		20 dB	10 dB
2016-25, -225 Downconverter	50 dB	0 dB	50 dB
		8 dB	42 dB
		24 dB	26 dB
		35 dB	15 dB