

FX-102 Frequency Translator



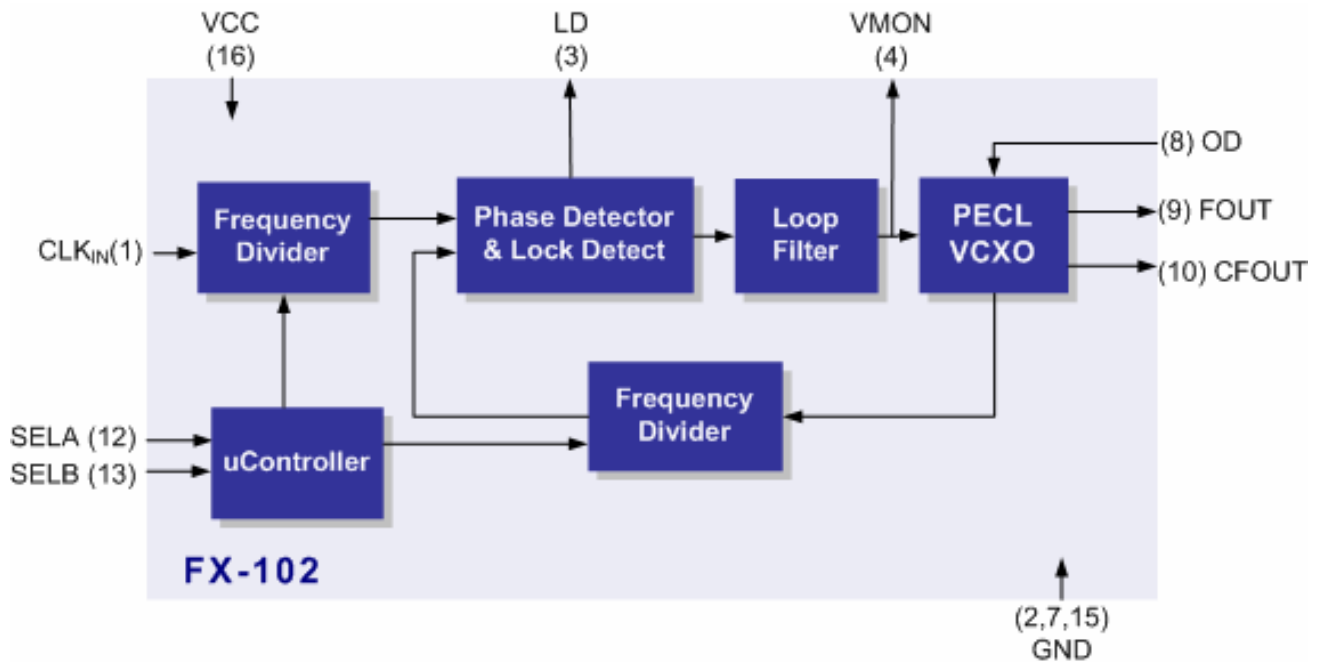
Features

- Output frequencies to 170 MHz
- Jitter Generation OC-192 Compliant
- Jitter Transfer per GR-253-Core
- Single 5V or 3.3V Supply
- Locked to specific input frequency, e.g. 8 kHz
- 1" x 0.8" x 0.25", Surface Mount (FR4 based)
- RoHS/Lead Free Compliant



Applications

- SONET / SDH / ATM
- DWDM / FDM
- DSL – PON Interconnects
- FEC (Forward Error Correction)



FX-102 Frequency Translator

Description

Vectron's FX-102 is a crystal based frequency translator which is used to translate any input frequency such as 8 kHz, 1.544 MHz, 2.048 MHz, 19.440 MHz etc. to any specific frequency from 77.76 to 170 MHz. The input frequency does not have to be a 50/50% duty cycle and as an example can be an 8 kHz signal with a logic high "on time" of only 1us, such as a BITS clock. The FX-102 also has the ability to translate any of 1 to 4 different input frequencies to one common output frequency, such as input frequencies of 8 kHz and 1.544 MHz and 19.44 MHz and any other frequency between 8 kHz and 170 MHz translating them to any specific output frequency from 77.76 MHz to 170 MHz.

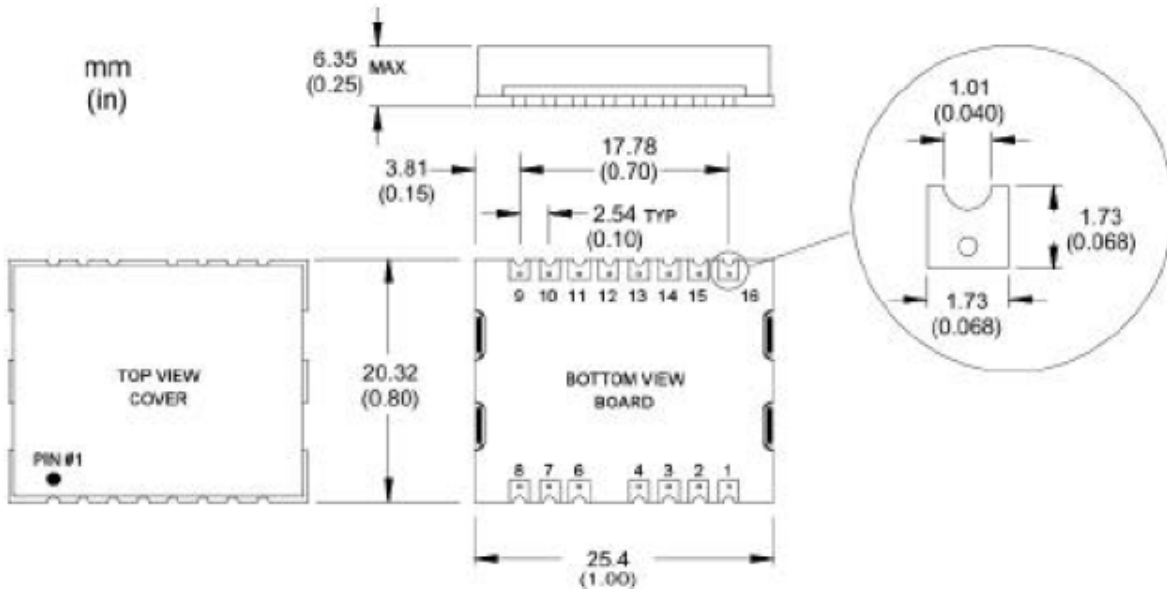
The "Input Frequency tracking capability" is the total amount of input frequency deviation in which the FX-102 is guaranteed to track or translate. As an example, a typical input clock would be 8 kHz \pm 20 ppm. The FX-102 is guaranteed to track at least \pm 40 ppm of error over temperature/ aging/ power supply and is more than twice what most applications require. The PLL control voltage is brought out through a 470K ohm resistor. This would allow for the use of external circuitry (analog comparators or an A/D converter plus a processor) to detect when the control voltage is getting close to the limits of the pull range.

Performance Characteristics

Parameter	Symbol	Min	Typical	Max	Unit
Output Frequencies		77.76		170	MHz
Supply Voltage, C = 5 Vdc D = 3.3 Vdc	V _{cc} V _{cc}	4.75 3.15	5.00 3.30	5.25 3.45	Vdc Vdc
Supply Current	I _{cc}		75	100	mA
Input Signal, A = HCMOS D = PECL	CLKIN CLKIN		HCMOS PECL	---	---
OUTPUT, F = Comp PECL	---	---	PECL	---	---
V _{OH} (Temp Range C = 0°C to +70°C)	V _{OH}	V _{cc} -1.025		V _{cc} -0.880	V
V _{OL} (Temp Range C = 0°C to +70°C)	V _{OL}	V _{cc} -1.810		V _{cc} -1.620	V
V _{OH} (Temp Range F = -40°C to +85°C)	V _{OH}	V _{cc} -1.085		V _{cc} -0.880	V
V _{OL} (Temp Range F = -40°C to +85°C)	V _{OL}	V _{cc} -1.830		V _{cc} -1.555	V
Rise/Fall Time	tr/TF		0.5	1	ns
Output Symmetry	Sym	45		55	%
Jitter Generation, rms (12 kHz to 20 MHz)			<0.5	1	ps
Jitter Generation, rms (cycle to cycle method)			3	5	ps
Jitter Transfer, GR-253-CORE sec 5.6.2.1.2				0.1	dB
Input Frequency Tracking Capability (Can translate a Stratum 1,2,3,E,4 or SONET Min source)	APR	\pm 40			ppm
Operating Temperature		Temp Range C = 0°C to +70°C Temp Range F = -40°C to +85°C			
Size		25.4 x 20.32 x 6.35 mm (1.0" x 0.8" x 0.25")			

FX-102 Frequency Translator

Outline Drawing

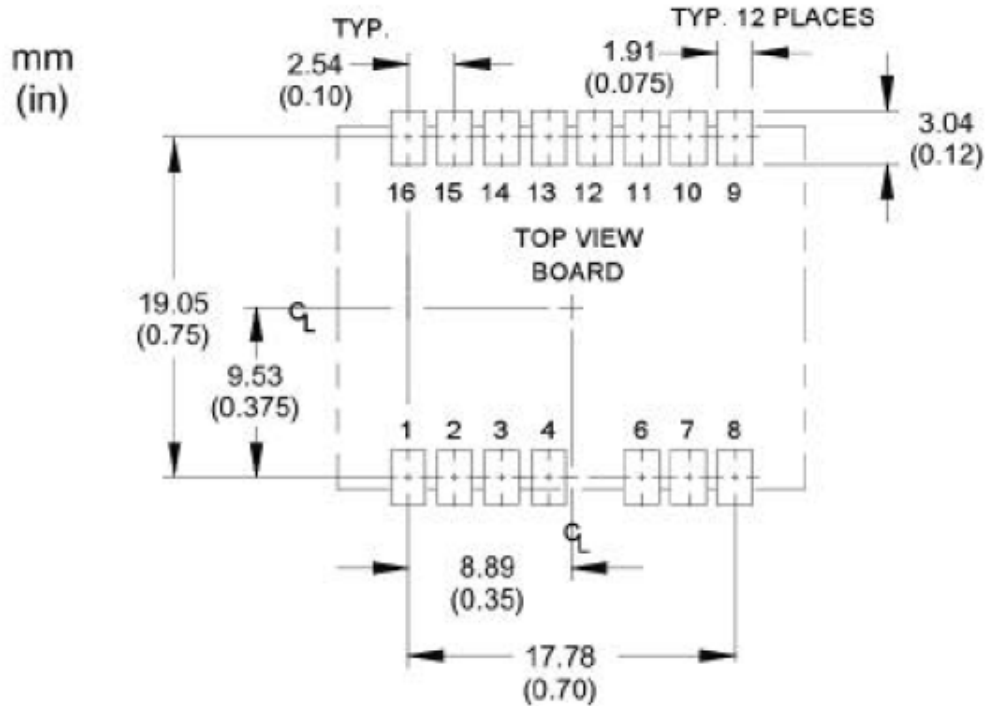


Pin Out

Pin	Symbol	Function
1	CLKIN	Input Frequency - The FX-102 series AC couples the input, this means the unit is capable of handling HCMOS, LvHCMOS, PECL and LvPECL input signals. (For Input Frequencies below 1 MHz only HCMOS and LvHCMOS are supported.)
2	GND	Ground
3	LD (output)	Lock Detect Logic "1" indicates a locked condition Logic "0" indicates that no input signal is present or the input signal has moved out of the lock range.
4	Monitor (Output)	PLL/ VCXO control voltage Under locked conditions, should be >0.3V and <3.0V for the 3.3 volt option or >0.5V and <4.5V for the 5 volt option. Input frequency may be out of range if voltage exceeds these limits.
5	---	Missing
6	NC	No Connection
7	GND	Ground
8	Enable / Disable	Logic "0" (or no connect) = Output Enabled Logic "1" = Output Disabled
9	Out	Output
10	COut	Complementary Output
11	NC	No Connection
12	Select A	Do not Exceed Vcc
13	Select B	Do not Exceed Vcc
14	NC	No Connection
15	GND	Ground
16	Vcc	Power Supply Voltage (5 Vdc or 3.3Vdc)

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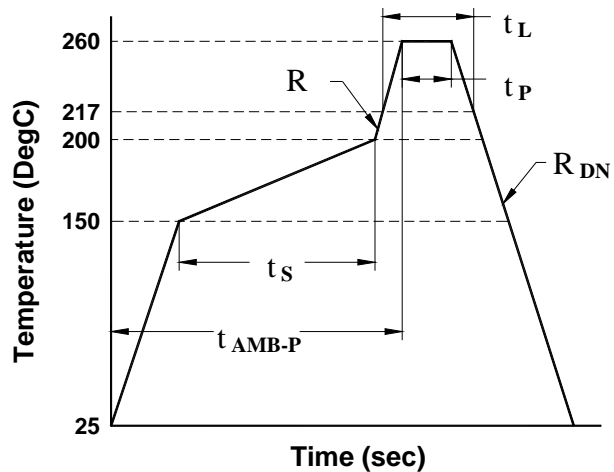
Pad Layout



Reflow Profile (IPC/JEDEC J-STD-020C)

Parameter	Symbol	Value
PreHeat Time	t_s	60 sec Min, 180 sec Max
Ramp Up	R_{UP}	3 °C/sec Max
Time Above 217 °C	t_L	60 sec Min, 150 sec Max
Time To Peak Temperature	t_{AMB-P}	480 sec Max
Time At 260 °C	t_P	20 sec Min, 40 sec Max
Ramp Down	R_{DN}	6 °C/sec Max

The FX-102 is being qualified to meet the JEDEC standard for Pb-Free assembly. The temperatures and time intervals listed are based on the Pb-Free small body requirements. The temperatures refer to the topside of the package, measured on the package body surface. The FX-102 should not be subjected to a wash process that will immerse it in solvents. NO CLEAN is the recommended procedure. The FX-102 has been designed for pick and place reflow soldering. The FX-102 may be reflowed once and should not be reflowed in the inverted position.

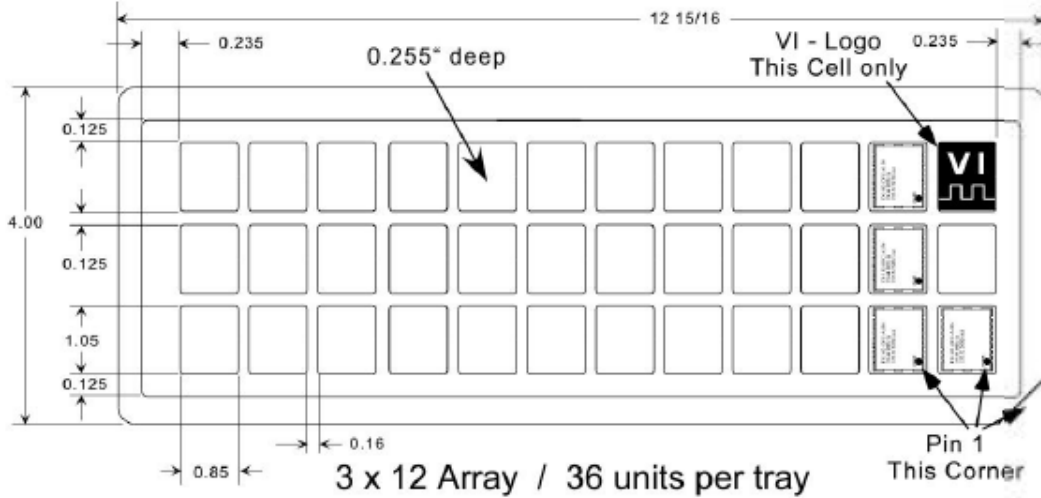


FX-102 Frequency Translator

Standard Shipping Method

The Standard ship method for volume production of the FX-100 series is in a matrix tray. These trays are 100% recyclable. The trays also offer the added feature that

they can be continuously feed into a pick-n-place machine eliminating the down time required with tape-reel.



Handling Precautions

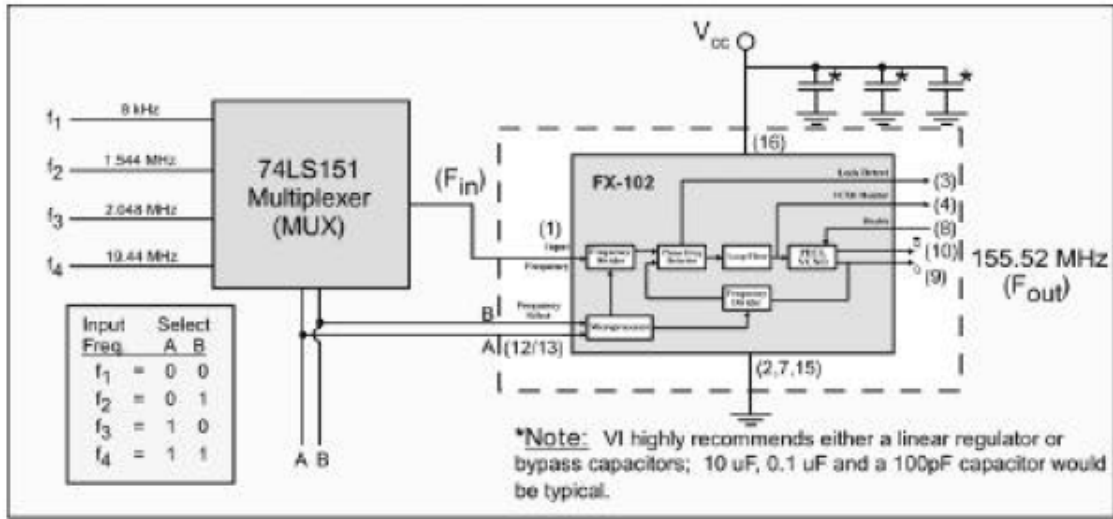
Although protection circuitry has been designed into this device, proper precautions should be taken to avoid exposure to electrostatic discharge (ESD) during handling and mounting. VI employs a human-body model (HBM) for ESD-susceptibility testing and protection design evaluation.

ESD voltage thresholds are dependent on the circuit parameters used to define the mode. The HBM ESD threshold presented here was obtained by using parameters where resistance = 1500 ohms, capacitance = 100pf

ESD Threshold Voltage		
Model	Threshold	Unit
Human Body (HBM)	500	V min

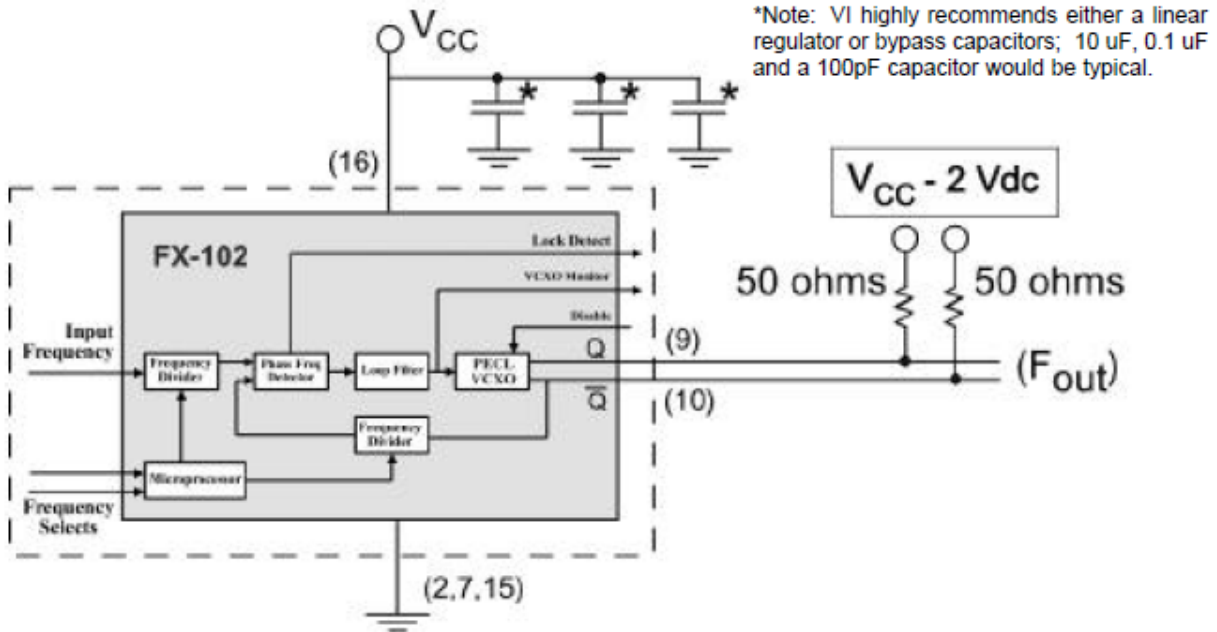
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Typical Application



All components outside the dotted line box are user supplied components. This is just one possible configuration of the FX-102. For additional information about your specific needs, please contact our factory.

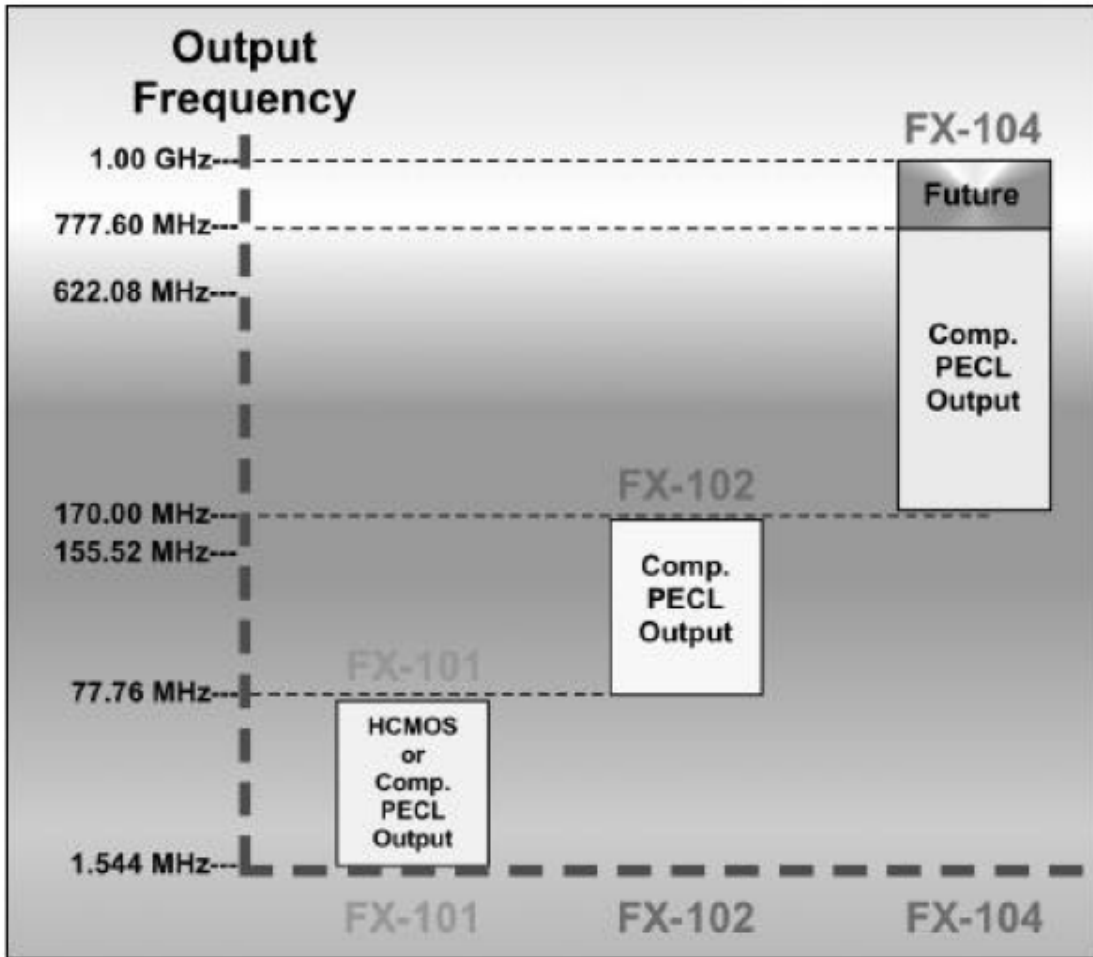
Output Load Configuration



All components outside the dotted line box are user supplied components and/or connections. This is just one possible configuration of the FX-102. For additional information about your specific needs please contact our Factory.

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FX-100 Series Selection Guide



FITS / MTBF Calculations

Per Bellcore TR-NWT-000332, GF @ +50°C.

Typical - FX-102-DFC-A1P6

FITs = 485.63

MTBF (Hours) = 2,059,202

FX-102 Frequency Translator

FAQ's

Q: What are the different input frequencies that are available?

A: The FX-100 series is able to handle any input frequency between 8 kHz and 170 MHz.
(A list of standard frequencies is available on pages 9 & 10.)

Q: How many different input frequencies can a specific FX-102 accept?

A: Each FX-102 can be programmed to accept up to 4 different frequencies.

Q: If there is only one input pin, how can your unit accept 4 different frequencies?

A: The user is required to supply a multiplexer which would switch between the different input frequencies. The multiplexers' select pins would need to be sync'd to the select pins of the FX-102.
(See The Typical Application illustrated on page 6.)

Q: Can a single FX-102 handle an application for 4 input frequencies of 8 kHz, 19.44, 77.76 and 155.52 MHz all being translated to 155.52 MHz, with the 155.52 MHz input being LvPECL and the others HCMOS?

A: Yes; since the FX-102 AC couples the input signal, this combination can be supported.

Q: What is the lock time for the FX-102?

A: The exact lock time will depend on the specific input frequency. It should be noted that in all cases the lock time will be significantly less than 1 second.

Q: I asked for a FX-102-DFC-A2S6 with 19.44 and 155.52 MHz for the input frequencies and was given a Source Control Drawing (SCD) number of FX-102-DFC-S5999. Why was a new number assigned?

A: Whenever there are multiple input frequencies, we need to assign a SCD for the unit so that we can include a table indicating what the logic levels need to be on pins 12 and 13 to control the unit per the correct input frequency.

Q: What are the exact jitter transfer specs that the FX-102 series meets?

A: The FX-102 meets the stringent jitter transfer specs in GR-253 for Category II jitter (Section 5.6.2.1.2) for all OC-n levels.

Q: My circuit card is already laid out for the FX-104, Is the FX-102 footprint compatible?

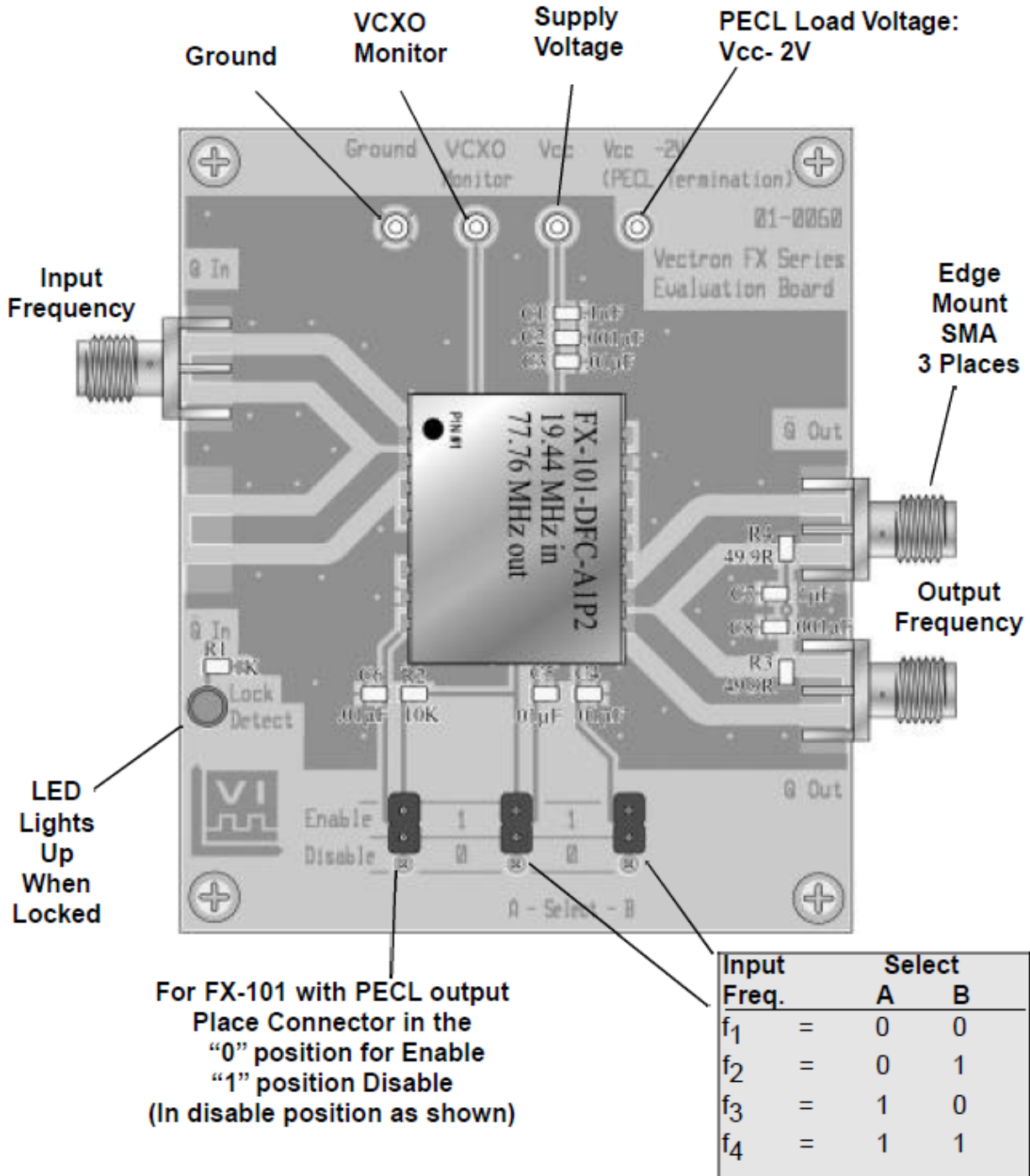
A: Yes; The FX-102 package is a drop in replacement for the FX-104 package. The only difference is in the logic level for the Output Disable/Enable pin. They are opposite between the FX-102 and FX-104. However letting pin 8 float will allow both units to be enabled.

Q: What type of noise on the supply line can the FX-102 suppress?

A: The FX-102 is designed to clean up noise on the Input Clock Signal, it is not designed to clean up noisy power supplies. If excessive noise is present on the supply line it may degrade the output jitter performance. Additional external filtering may be required. Please consult with your power supply vendor on the best way to filter noise on your supply line.

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Evaluation Board



Evaluation boards are available upon request.

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Other Standard Input / Output Combinations

Input 1	Input 2	Input 3	Input 4	Output
16 kHz	----	----	----	77.76 MHz
77.76 MHz	155.52 MHz	----	----	77.76 MHz
29.4912 MHz	----	----	----	78.6432 MHz
99.84	----	----	----	99.84 MHz
55 MHz	110 MHz	----	----	110 MHz
20.48 MHz	----	----	----	112 MHz
19.44 MHz	----	----	----	114 MHz
8 kHz	16.384 MHz	----	----	125 MHz
62.5 MHz	125 MHz	----	----	125 MHz
125 MHz	----	----	----	125 MHz
8 kHz	1.544 MHz	2.048 MHz	19.44 MHz	155.52 MHz
8 kHz	19.44 MHz	77.76 MHz	155.52 MHz	155.52 MHz
6.48 MHz	19.44 MHz	32.768 MHz	51.84 MHz	155.52 MHz
19.44 MHz	38.88 MHz	77.76 MHz	155.52 MHz	155.52 MHz
166.6286 MHz	----	----	----	155.52 MHz
155.52 MHz	----	----	----	166.6286 MHz
19.44 MHz	----	----	----	168.0407 MHz

The combinations above are just a small sample of what is possible with the FX-102 series.

This series is capable of translating up and down in frequency. Virtually all input frequencies between 8 kHz and 170 MHz can be supported.

The FX-102 uses Vectron International's J-type VCXO and as such can support any output frequency that is available with the J-Type.

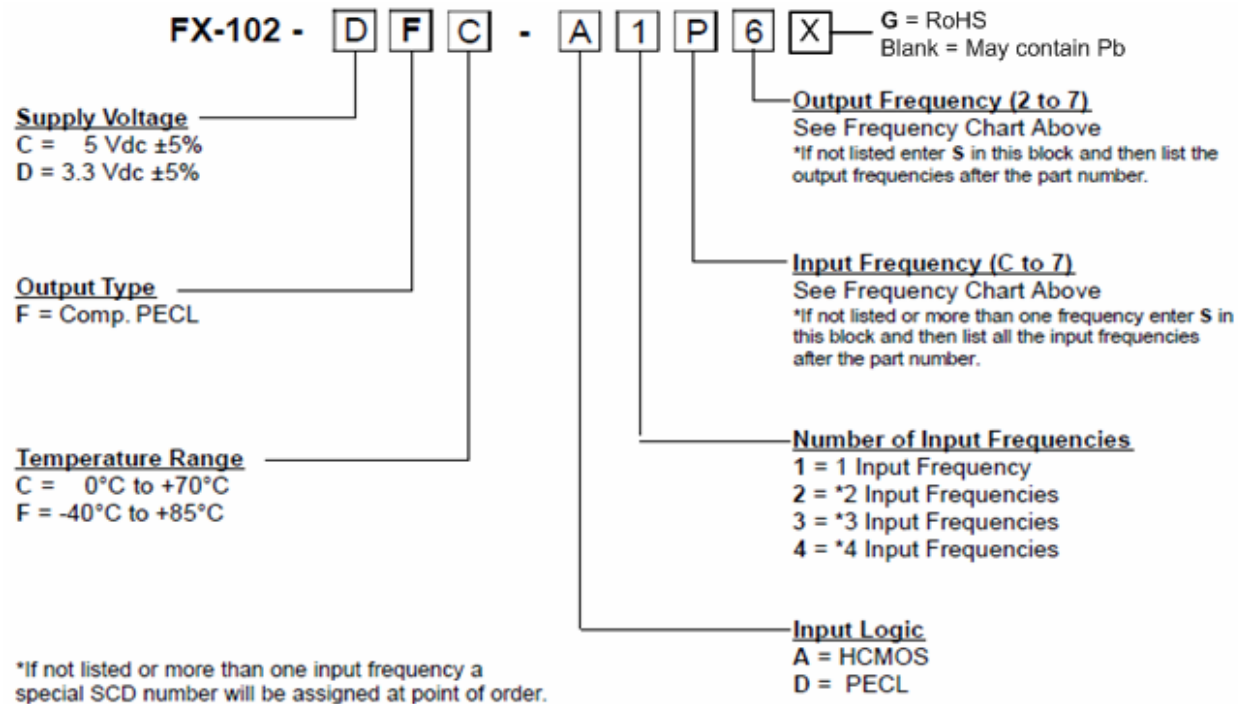
Vectron International will support all FEC rates for SONET, 10 GigE and 10.3125 GigE applications. If you do not see a frequency option listed that you need please contact the factory.

When ordering FEC rates, we ask that you also include the FEC ratio (e.g. 255/237 x OC-3, 237/236 x OC-3, etc....) for both the input and output frequencies.

FX-102 Frequency Translator

Standard Frequencies					
8 kHz	C	16.384 MHz	N	77.76 MHz	2
16 kHz	D	19.44 MHz	P	82.944 MHz	3
64 kHz	E	20.48 MHz	R	112 MHz	4
1.024 MHz	F	26.00 MHz	T	139.264 MHz	5
1.544 MHz	H	27.00 MHz	W	155.52 MHz	6
2.048 MHz	J	38.88 MHz	X	166.6286 MHz	7
4.096 MHz	K	44.736 MHz	Y		
8.192 MHz	L	51.84 MHz	0		
13.00 MHz	M	61.44 MHz	1	Special SCD	S

How to Order



Part Number Examples:

- FX-102-DFC-D1P6
- *FX-102-DFF-A4S6, S = 8 kHz, 1.544 MHz, 2.048 MHz, 19.44 MHz
- *FX-102-DFC-D16S, S = 166.6286 MHz

For Additional Information, Please Contact:



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