

RFT-4100 Series Microwave Upconverter

RFT-4170: 500 MHz BW
RFT-4180: 1000 MHz BW



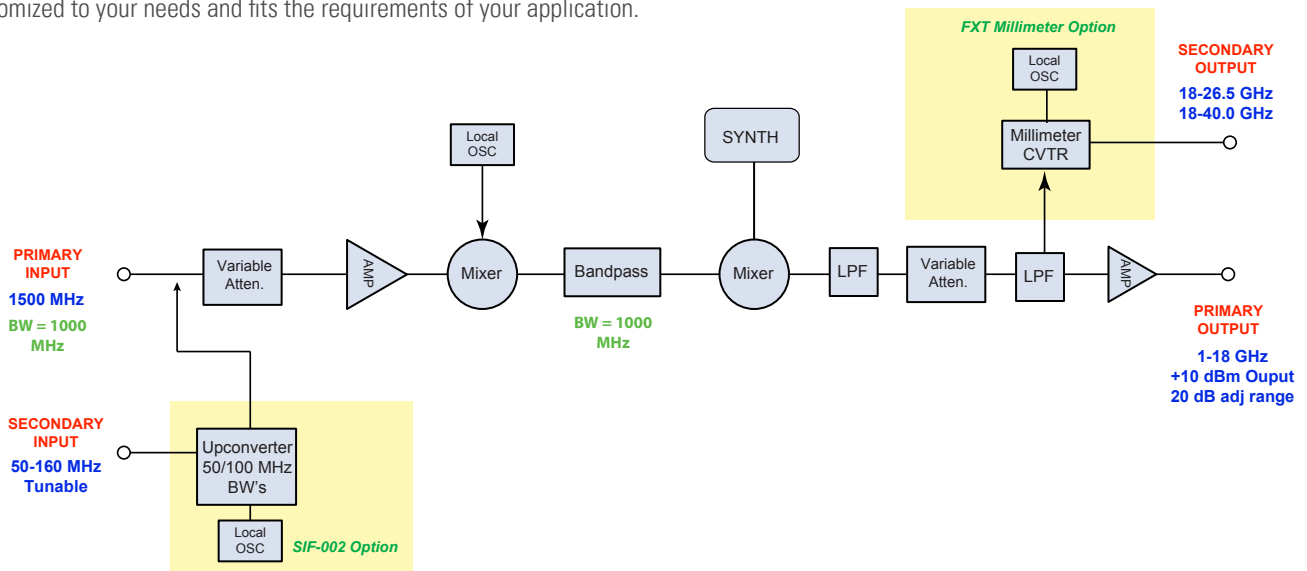
The **RFT-4100** is a microwave upconverter tuning across an output up to 18 GHz, with option choices up to 40 GHz. The RFT-4100 utilizes a fixed wideband IF Input and includes an option for a second, narrowband input. Frequency synthesis provides tuning resolution of 10 kHz. An internal clock oscillator creates a very stable reference for the tuner which may be overridden by a customer-supplied external 10 MHz. The RFT-4100 Series Upconverter is AC powered. The Series RFT-4100 Upconverter is completely interoperable with Mercury's Microwave's Series RFT-3100 Downconverter, sharing a common architecture, interface and SPCI-based command set. Used together, these two products enable complete up and downconversion.

Configure at Order, We Build to Suit

Spec it yourself. No two applications are alike. So it follows that no one Microwave Tuners can fit all applications. Understanding this dynamic, we have created the RFT-4100 Series of Upconverters, which draws from a wide range of user selectable, factory configurable features and options. Working together, we'll specify a Tuner which is customized to your needs and fits the requirements of your application.

Tunable Output Range
Input Range
Phase Noise
Interface

T Choices up to 18, 26.5 and 40 GHz
Wideband and Narrowband (with option)
<0.5 deg RMS
SCPI-Based Command-set and GUI



RF Output Configuration Choices

Primary Output

The Primary Output can be configured to span the basic range covering 1 to 18 GHz, with possible extensions going as high as 26.5 GHz

Secondary Output

The Secondary Output is typically used for millimeter applications, ranging up to 26.5 or 40 GHz. The outputs can be configured with overlap. For instance, the Primary can go as high as 26.5 GHz and the Secondary can start as low as 18 GHz, enabling two sources with overlapping frequency ranges to be supported.

RF Output	
Primary Output (choose one)	up to 18 GHz up to 26.5 GHz
Secondary Output (options)	18.0-26.5 GHz 26.5-40 GHz 18.0-40 GHz
RF Output Levels	up to +10 dBm

IF Input Configuration Choices

Primary Output

The Primary Input frequency is determined by the bandwidth of the Tuner, typically. However, a customized IF Input center frequency can be specified at the time of order, to suit the downstream output frequency requirements. Check with the factory for tailoring needs. The Input ranges for the Upconverters have been engineered to match the IF Output ranges of the corresponding Downconverters from Mercury, in the RFT-3100 Series.

Secondary Output

A Secondary Input can be provided. Typically, this is a narrowband IF Input, to complement the Wideband IF Input used for the Primary Input. Our option SIF-002 is such a Narrowband option, providing a tunable IF in the range from 50 to 180 MHz, in 10 MHz steps, and with output gain control with 20 dB in range.

IF Input	
Wideband Input center frequencies (customizeable at order)	1.0 GHz (-3170) 1.5 GHz (-3180, -3190)
Narrowband Input (optional)	50-160 MHz Tunable Input, in 10 MHz Steps 50 & 100 MHz select BW's
Level control (customizeable at order)	10-30 dB Gain, 1 dB steps

Bandwidth Choices

Models	Bandwidth
Model RFT-4170	500 MHz
Model RFT-4180	1000 MHz

GUI and SCPI-based Interfaces

All RFT-4100 Series Microwave Converters have a complete SCPI-based command-set accessible over a choice of Ethernet or Serial Ports. GUI solutions are Browser-based and usable on Windows, Mac and Linux platforms.

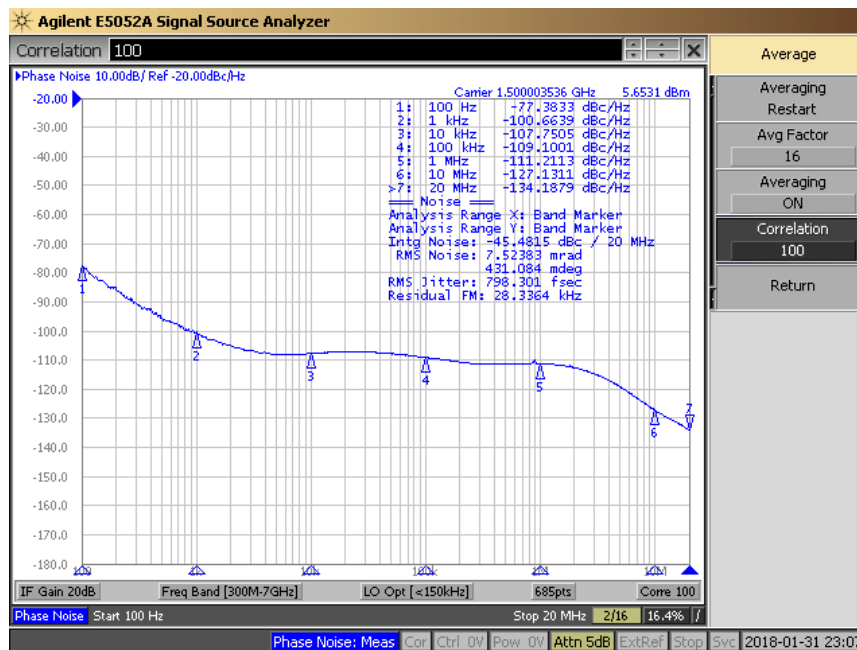


Terminal Support

In addition to the Browser-based GUI, each RFT is equipped with a serial port and can support terminal communications. SCPI-based commands are sent and received, providing another human-readable user interface.

Phase Noise Details

Our standard Microwave RFT-Series Frequency converters have excellent phase noise, as shown below. With option -LN, improvements by as much as 20 dBc/Hz can be obtained, as well as stability within 0.1 ppm.



Standard Phase Noise profile

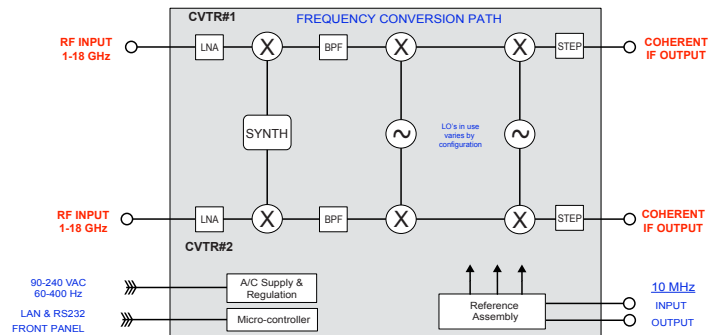
Phase Coherent

Our Microwave RFT-Series Frequency converters are available in a variety of phase-coherent configurations, supports such modes as "shared LO" and "Master/Slave". The phase coherent converters can also be configured for stand-alone or coherent operation, so as needs shift the equipment continues to meet user's needs.

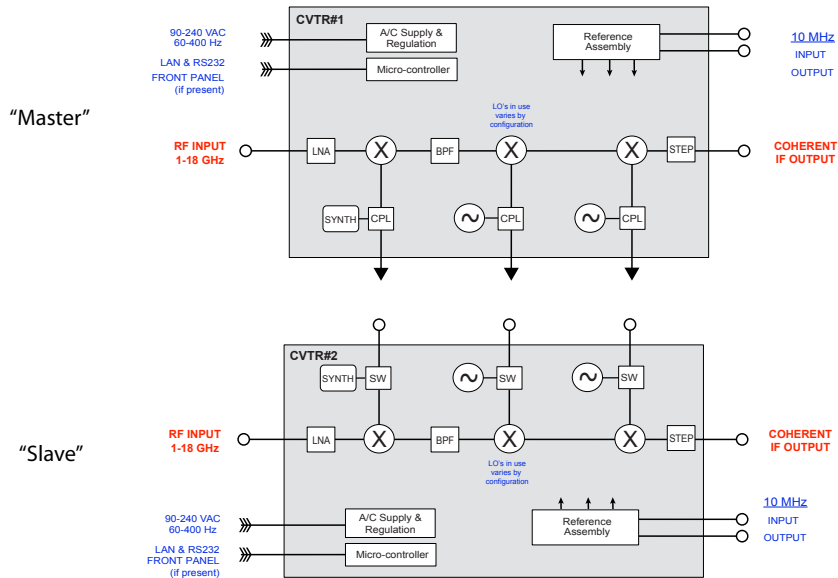


"All-in-One" Configuration

SYNTONIC MICROWAVE
RFT-3184-C
 Complete - All in One
 SYSTEM OVERVIEW



"Master/Slave" Configuration



Upconverter Input Characteristics

The RFT-4100 Upconverters have a standard output Frequency range starting at 1 GHz (500 MHz FOR RFT-4170). The Primary output range can also be extended up to 26.5 GHz with option FXT-003.

Characteristic	Description
Tuning Range	RFT-4170 0.5-18 GHz, RFT-4180 1.0-18 GHz
Tuning Resolution	10 kHz (finer resolutions available)
Tuning Speed	2 ms, typ
Spectral Sense	Non-Inverting
IF to RF Gain	10-30 dB, typ, in 1 dB steps
RF Gain Variation	+/-2 dB typ, across output frequency range
Linear Dynamic Range, P1 dB, (1 MHz BW)	85 dB, typ
3rd Order Dynamic Range (1 MHz BW)	>60 dB, typ
1 dB Compression Point	+10 dBm, typ +7 dBm min
Spurious	<-50 dBm, typ
Harmonics	-25 dBc typ at 0 dBm output
VSWR	2.5:1 (50 OHM), max

Option: Output Millimeter Extensions

This option extends the output range of the RFT. The FXT is brought out on a second RF connector and the RF output becomes active when the output frequency enters the relevant range of the option.

Characteristic	Description
Additional Output Frequency	FXT-003 18-26.5 GHz, FXT-004 18-40 GHz
Output Connector	2.9mm
Conversion sense	inverted
Gain @ 25 C, at minimum attenuation	30 dB typical, 25 dB min
Gain Adjustment range (same as 1-18 GHz path)	20 dB min, 1 dB steps
1 dB Compression Point, at max gain	+10 dBm typ, +7 min

100 MHz Output Extension

This option extends the frequency range of the Primary Output path to provide 100-999 MHz coverage. Instantaneous Bandwidth of this extended range is limited to 100 MHz.

Characteristic	Description
Additional Output Frequency	FXT-006 0.1 to 18 GHz
Conversion sense	inverted
1 dB Compression Point, at max gain	+10 dBm typ, +7 min

Wideband Input

The standard Wideband IF Input of the RFT-4180 has an input center frequency of 1500 MHz. The RFT-4170 has an input center frequency of 1000 MHz. This can be customized to other user- specified frequencies at the time of order.

Characteristic	Description
Frequency, Fixed	RFT-4170 1000 MHz RFT-4180 1500 MHz
Instantaneous BW (3 dB)	RFT-4170 500 MHz RFT-4180 1000 MHz
VSWR (in band)	2.0:1 max (50 ohm)
RF Connectors	SMA-F
Input level	up to -10 dBm

Optional Second IF (Narrowband) Input (SIF-002)

This option provides a second IF Input, enabling sources with a narrowband IF to be cabled into the upconverter, while wideband sources can remain cabled into the primary wideband input port.

Characteristic	Description
Input Frequency, selectable	50-160 MHz, in 10 MHz steps
Input Bandwidth, selectable	50 and 100 MHz
VSWR (in band)	2.5:1 max (50 ohm)
RF Connector	SMA-female
Gain	20 dB min
Gain Adjustment Range	0 to 20 dB in 1 dB steps
Conversion sense	Non-inverting

Reference and Local Oscillators

The LO system includes an internal reference that is used for all phase-locked and synthesized sources.

The system is auto-sensing and will become phase locked to an external reference if one is detected.

	Standard configuration	Changes with option -LN
Reference Select	Auto-select. Locks to external if present	
Aging, Internal Reference	<2 ppm/yr	<1 ppm/yr
Internal Reference Stability	<+/- 0.5 ppm	<+/- 0.1 ppm
External Reference	10 MHz @ 0 dBm +/- 6 dB	
Lock-in Range of External Reference	+/- 3 ppm	+/- 0.5 ppm
Reference Connectors	BNC, Female (input and output)	
Reference Output	10 MHz @ 0 dBm, min, locked to ref in use	
Phase noise, typ (10 GHz input), at 100 Hz offset	-76 dBc/Hz	-90 dBc/Hz
at 1 kHz offset	-100 dBc/Hz	-105 dBc/Hz
at 10 kHz offset	-107 dBc/Hz	-107 dBc/Hz
at 100 kHz offset	-109 dBc/Hz	
at 1 MHz offset	-111 dBc/Hz	
at 10 MHz offset	-127 dBc/Hz	
System Phase Noise	0.5 deg RMS, typ (100 Hz to 10 MHz)	0.4 deg RMS, typ

General Characteristics

Characteristic	Description
Operating Temperature	0-50 deg C ambient
Humidity	Up to 95% non-condensing
Power Requirement	90-240VAC, 60-400 Hz; 35 Watts typ (1-18 GHz), 50 Watts typ (1-40 GHz)
Size, inches	EIA 19" 1RU Chassis: 24" deep max
IP Parameters	Set IP Mode (DHCP or Static IP) Set IP Address, Gateway, Subnet Mask Read MAC Address
Remote Access	Ethernet & RS-232
Remote Control	SCPI-type commandset and Browser-based GUI

Ordering Information

Model	Name	Features
RFT-4170	Base Unit, 500 MHz BW	Tuner, 0.5 to 18 GHz
RFT-4180	Base Unit, 1000 MHz BW	Tuner, 1.0 to 18 GHz
Options: Output Extensions		
FXT-42	Output Extensions	Extends Output to 26.5 GHz
FXT-44		Extends Output to 40.0 GHz
FXT-40		Extends Output down to 100 MHz
Options: Output Extensions		
SIF-002	Add Narrowband secondary IF Input	70, 140, & 160 MHz, Selectable bandwidths of 50 & 100 MHz; 30 dB Gain
Other Factory Options		
-LN	Improves Phase Noise	Up to 20 dB improvement in near-in phase noise, and increases stability to 0.1ppm
-MS	Master/Slave Option	Adds internal components to enable the converter to be used either as an independent, stand-alone converter, or paired into a Master/ Slave configuration, in which the Master controls the Slave, and LOs and Reference from the Master are shared with the Slave. Requires two converters.

Need a matching Upconverter

Our RFT-3100 Series Downconverters match the RFT-4100 Series Upconverters, with

- Input/Output frequencies
- Bandwidths
- Common command-sets.



Under the Hood

At the heart of every tuner and downconverter you'll find our world-class microwave synthesizer, the DS-3000.

- Tunes to 20 GHz
- Steps in 1 Hz
- Switches as fast as 200 uSec
- Offers extremely low phase noise, with <math><-116\text{ dBc/Hz}</math> at 10 kHz when tuned to 10 GHz



Need More Help? Need a Variant of This Product?

Contact Mercury's RF & Microwave engineering team at rf.microwave@mercy.com or visit www.mercy.com/rf for a detailed listing of RF and Microwave products.

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