RFT-3100 Series Microwave Downconverter

RFT-3170: 500 MHz BW
RFT-3180: 1000 MHz BW
*RFT-3190: 2000 MHz BW*

mercury systems®

Feature Rich, Easily Configurable

Spec it yourself. No two applications are alike. So it follows that no one Microwave Tuner can fit all applications. Understanding this dynamic, we have created the RFT-3100 Series of Downconverters, 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.

Options and Configurations

A Wide Range of Options is available for the RFT-3100 Microwave Tuner, assuring that the solution fits the requirement. Options include Input and Output frequency extensions, high speed search, low phase noise, mulitiple IF's and a host of other configurable attributes. Choose from among these options or inquire with the factory if there's something else not shown here.
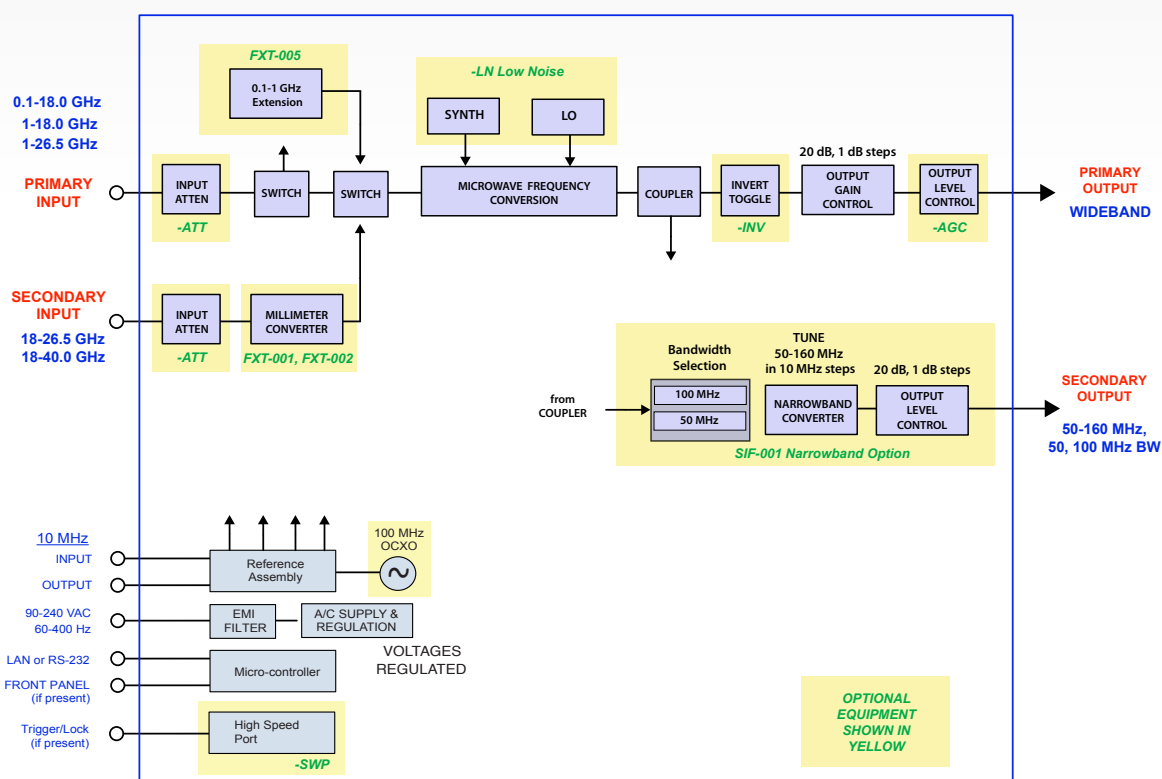
RFT-3180 shown here, with configuration options in yellow

Input Choices

Primary Input

The Primary Input of the RFT-3100 Series Tuner can be configured to start as low as 100 MHz and extend as high as 26.5 GHz.

Secondary Input

The Secondary Input can be configured to extend up to 26.5 or 40.0 GHz and can have a range that overlaps with the primary Input, to support a variety of cabling and other source requirements.

RF Input	
Primary Input Ranges (customizeable at order)	0.5-18 GHz (-3170) 1.0-18 GHz (-3180) 1.5-18 GHz (-3180)
Frequency Extensions	up to 26.5 and 40 GHz down to 100 MHz

Output Choices

Primary Output

The Primary Output frequency is determined by the bandwidth of the Tuner, typically. However, a customized IF Output center frequency can be specified at the time of order, to suit the downstream input frequency requirements. Check with the factory for tailoring needs.

Secondary Output

A Secondary Output can be provided. Typically, this is a narrowband IF Output, to complement the Wideband IF Output used for the Primary Output. Our option SIF-001 is such a Narrowband option, providing a tunable output in the range from 50 to 160 MHz, in 10 MHz steps, and with output gain control with 20 dB in range.

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

GUI and SCPI-based Interfaces

All RFT-3100 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.

Frequency In: 10000.00 MHz   New Freq In   Alarm Status:
Frequency Out: 1000.00 MHz   New Freq Out
Gain: 25 dB   New Gain
Output Level: N/A   dBm   New Level
IF BW: 1000.00 MHz   New IFBW#
Mode: MGC   Change Mode
Recall: Reg_0 ▼   Recall Reg#
Save: Reg_1 ▼   Save Reg#

Home   Information   Setup   Alarm Details

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 send 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.
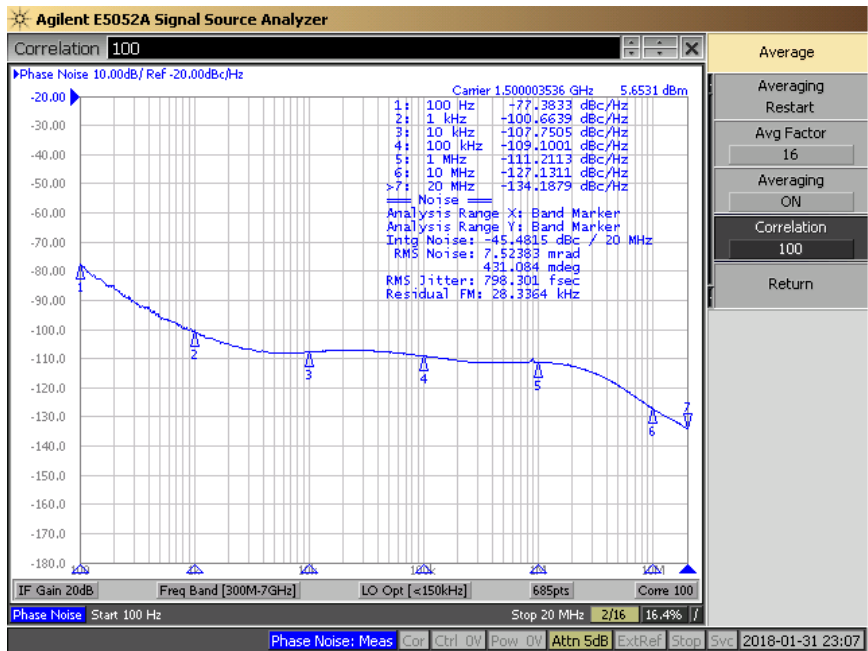
Standard Phase Noise profile

Search - Sweep/Scan Option - SWP

Search Option

Our Microwave RFT-Series Frequency converters can be configured to become Search and Scanning Tuners. With Option -SWP, the RFT-3100 Series downconverter gains two modes for Search: List Mode and Step/Scan. With this option, the tuning speed increases to 100 uSec and a TTL trigger line is brought to the rear panel. Triggered pulses can be used to enable auto-scanning or single, user-actuated individual steps. Controls for search can be configured using SCPI commands or the GUI.

| Search Modes	Description	Programmable	Enable
Step/Scan - Manual	Triggers used to manually/externally step from Start to Stop based on preset step size. Dwell times determined by external control	Start, Stop, Step Size and Direction	HW or SW Trigger
Step/Scan - Auto	Trigger initiates programmed step/scan routine. Used for scans with fixed step size increments and dwell times.	Start, Stop, Step Size, Dwell time, Scan Direction, Number of Cycles	HW or SW Trigger, HW Pause
List Mode - Manual	Preloaded List of up to 1000 entries entered to RFT. Trigger used to take individual step to next entry in List. Dwell times determined by external control	List entry, Scan Direction, Repeat	HW or SW Trigger
List Mode - Auto	Preloaded List of up to 1000 entries entered to RFT. Trigger used to run List. Dwell times determined by List parameters	Start, Stop, Step Size, Dwell time(s), Scan Direction, Repeat	HW or SW Trigger, HW Pause

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.
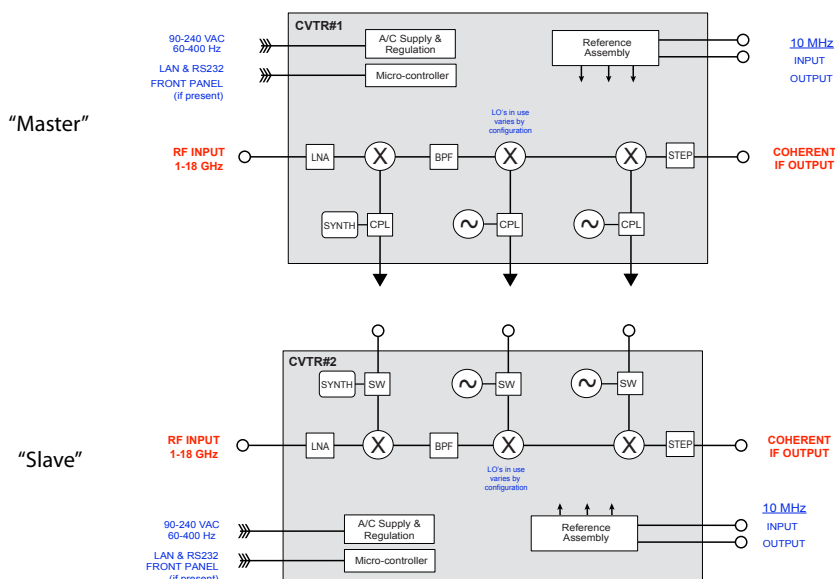
"All-in-One" Configuration

SYNTONIC MICROWAVE
RFT-3184-C
Complete - All in One
SYSTEM OVERVIEW
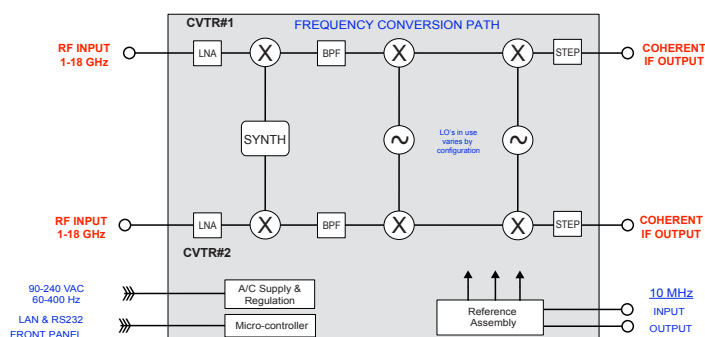
"Master/Slave" Configuration

Downconverter Input Characteristics

Characteristic	Description
Input Tuning Range	**RFT-3170**: 0.5-18 GHz **RFT-3180**: 1.0-18 GHz **RFT-3190**: 1.5-18 GHz
Tuning Resolution	10 kHz (finer resolutions available)
Tuning Speed (standard configuration - use option -SWP for high speed)	2 ms, typ
Input 1 dB Compression Point	-15 dBm, typ
Input iP3	-5 dBm typ
Input VSWR	2.5:1 (50 OHM), max
LO Re-radiation (23-40 GHz)	- 70 dBm, max
Max input level (no damage)	+20 dBm

Option: Input Millimeter Extensions

Provides a secondary Input for millimeter inputs, used to extend the input frequency range up to 40 GHz.

Characteristic	Description
Input Frequency Range	**FXT-32**: 18-26.5 GHz; **FXT-34**: 18-40 GHz
Input Connector	2.92mm female
Spectral Sense	Inverting
Input P1 dB	-10 dBm, typ

Option: 100 MHz Input Extension

Extends the input frequency range of the Primary Input path to provide 100-999 MHz coverage.
Instantaneous Bandwidth of this extended range is limited to 100 MHz.

Characteristic	Description
Extended Input Frequency Range	**FXT-30**: Adds input extension covering 100-999.99 MHz
Input Connection	SMA-Fem
Spectral Sense	Non-Inverting
Input P1 dB	-10 dBm, typ

Primary Output Characteristics

The standard Wideband IF Output of the RFT-3180 and -3190 has an output center frequency of 1500 MHz. The RFT-3170 has an output center frequency of 1000 MHz. This can be customized to other user-specified frequencies at the time of order.

Characteristic	Description
Output Frequency, Fixed	1500 MHz for RFT-3180 and RFT-3190 1000 MHz for RFT-3170
Output BW (3 dB)	500 MHz for RFT-3170 1000 MHz for RFT-3180 2000 MHz for RFT-3190
Spectral Sense	Non-Inverting
RF Gain Variation	+/- 2 dB, typ, across the input range
Gain	30 dB typ, 25 dB min
Gain Adjustment Range	20 dB, in 1 dB steps
Linear Dynamic Range, P1 dB (1 MHz BW)	85 dB, typ
Output Compression at max gain	+10 dBm, min
Output Third Order Intercept, at max gain	+20 dBm, typ
Spurious, carrier related, at +10 dBm output, in band	<-70 dBc, typ
Spurious, internally generated (input referenced)	<-90 dBm, typ
SFDR, 3rd Order	>60 dB, typ
Image Rejection	60 dB min, 70 dB typ
Noise Figure, at max gain	12 dB typ, 17 dB max
Output VSWR	2:1 max, 50 ohms

Narrowband IF Output Characteristics - Option SIF-001

The Secondary IF Output path runs independent from the Primary Output path.
Theis Narrowband Option provides an agile output frequency and selectable BW's.

Characteristic	Description
Output Frequency (user settable)	50-160 MHz, in 10 MHz steps
Output BW (3 dB) (user settable)	50 & 100 MHz
Spectral Sense	Non-Inverting
Gain	30 dB typ, 25 dB min
Gain Adjustment Range	20 dB, in 1 dB steps

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	<+/- 0.1ppm
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 (can vary based on options installed)	-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)
A/C Connector	Standard
Size, inches	EIA 19" 1RU Chassis: 24" deep max

Tuning and Control

|	Standard configuration	With option - SWP High Speed
Interfaces	Ethernet	Ethernet & RS-422
Ethernet Connector	RJ-45	RJ-45
Interface Connector	DB-9	DB-9
Remote Control	SCPI-type commandset and Browser-based GUI	SCPI-type commandset and Browser-based GUI
SWP Connections (TTL)		Trigger IN Trigger Enable All settled indicator OUT
Tuning Speed (settling time)	<2 ms	<100 usec
Search Types	SCPI-based	SCPI-based HW Triggered Step/Scan SW Triggered Step/Scan HW Triggered List SW Triggered List
List Size		up to 1000 entries
IP Parameters	Set IP Mode (DHCP or Static IP) Set IP Address, Gateway, Subnet Mask Read MAC Address	Set IP Mode (DHCP or Static IP) Set IP Address, Gateway, Subnet Mask Read MAC Address

Ordering Information

Model	Name	Features
RFT-3170	Base Unit, 500 MHz BW	Tuner, 0.5 to 18 GHz
RFT-3180	Base Unit, 1000 MHz BW	Tuner, 1.0 to 18 GHz
RFT-3190	Base Unit, 2000 MHz BW	Tuner, 1.5 to 18 GHz
Options: Input Extensions		
FXT-32	For Primary or Second. Input	Extends input to 26.5 GHz
FXT-34		Extends input to 40.0 GHz
FXT-30		Extends input down t o 100 MHz
Options: Output Extensions		
SIF-001	Add Narrowband secondary IF output	70, 140, & 160 MHz, Selectable bandwidths of 50 & 100 MHz; 30 dB Gain
Other Factory Options		
-ATT	Adds Input attenuator	0-30 dB of input attenuation, in 1 dB steps. Can be added to Primary or Secondary inputs, or both, impacts tuner NF by 3 dB, typ
-LN	Improves Phase Noise	Up to 20 dB improvement in near-in phase noise, and increases stability to 0.1ppm
-INV	Inversion Toggle	Enables user to switch between inverted and upright output spectral sense
-SWP	Adds Search capability	Includes HW trigger line to enable fast stepping scanning routine and TTL Status indicator
-AA	Anti-Aliasing	Adds anti-aliasing filter to IF Output
-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.

Dual Channel Phase Coherent Configuration

Dual channel, coherent operations are supported within the RFT-3100 Series. In this configuration, two sets of side-by-side converters share a common set of local oscillators and system reference to enable phase coherent frequency conversion paths.

A simplified block diagram is shown below for the RFT-3174-C, the 500 MHz BW system.
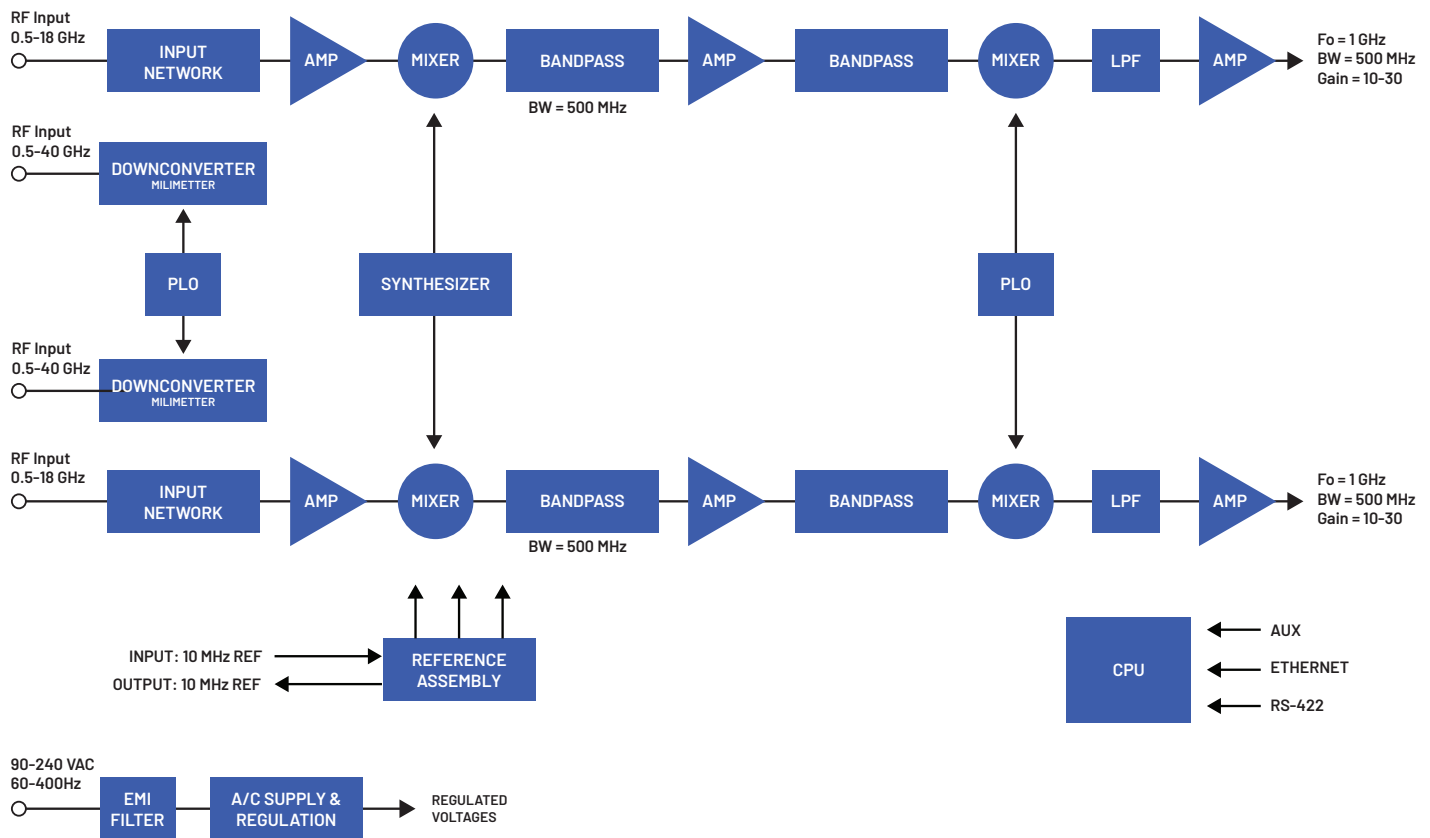
Models

RFT-3174-C: Dual Channel Coherent, with 500 MHz BW
RFT-3184-C: Dual Channel Coherent, with 1000 MHz BW
RFT-3194-C: Dual Channel Coherent, with 2000 MHz BW

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