BuTiS Reference Generator

Application

The BuTiS Reference Generator is a high precision Timing Generator with 2 output frequencies 10 MHz and 200 MHz. The phase of the 200 MHz RF signal can be switched in steps of 0.5° relative to the 10 MHz reference. In addition, the 200 MHz RF signal can be phase-modulated (BPSK).

Reference frequency 10 MHz

For the frequency reference a high precision oven controlled crystal oscillator (OCXO) is used with a frequency of 10 MHz.

This 10 MHz OCXO can be fine tuned via an external tuning voltage. Normally, this tuning voltage is a constant voltage supplied from a D/A converter and is set at factory to zero offset.

The 10 MHz OCXO can also be locked to an external reference via a digital PLL. That reference must have a frequency of 10 MHz. At the input for the external reference a level detector checks a sufficient input level and enables the digital PLL when in use.

Additionally, the digital PLL can switch the loop bandwidth. This is useful to lock to high stable reference frequencies, such as rubidium standards. In this case, the loop bandwidth would be switched to low values to get the good phase noise of the internal OCXO and the high precision of the external frequency standard.

The output signal of the 10 MHz OCXO is also available at the connector “ref out” at the rear panel.

Phase locked oscillator (PLO) 800 MHz

The low noise phase locked oscillator is built from a 100 MHz OCXO and an analogue frequency multiplier. The frequency of the PLO is 4 times the rf output frequency to generate a BPSK modulated RF signal. This 800 MHz signal is used as the clock for the FPGA.

The 800 MHz PLO is locked by an analogue PLL to the 10 MHz reference.

D/A-converter and phase modulator

The DA converter is working with a clock frequency of 800 MHz. In CW operation, the bitsequence 0, 1, 0, -1 is sent periodically. After a lowpass filter the 200 MHz RF signal becomes available.

For BPSK modulation, the phase has to shift between 0° and 180°. As well, the inverted bitsequence 0, -1, 0, 1 is sent.

DDS with phase control

A second DDS is used for generating a 10 MHz signal. With this signal the 800 MHz PLO is locked to the 10 MHz reference.

Via this DDS, the phase can be shifted in 0.5° steps controlled by the internal microcontroller.

Microcontroller and interface

An internal embedded controller is used for controlling the generator and for the digital PLL.

The configuration of the generator can be controlled via the front panel or the remote interface.

Circuit

The 200 MHz RF signal is digitally generated in a Virtex 4 FPGA.

Housing options

The generator is delivered in a 19" 1HE case with the dimensions 483x44x260mm (excluding the connectors).

Order information

Model: 83801.000.00 B

Open questions, demo units

If you need more information about BuTiS Reference Generators from WORK Microwave or if you would like to have demo unit, please contact us via e-mail: sales@work-microwave.de or call us on + 49 8024 6408 0. We are glad to assist you.

Technical Data

10 MHz OCXO		
OCXO type	MTI 270-0269 or MV180	
stability:	5.0E-10 (0 .. 75 °C)	
aging	5.0E-10/Tag; 5.0E-8/year	
phase noise	offset Hz	dBc/Hz
	1	-90
	10	-120
	100	-140
	1k	-150
	10k	-155
	100k	-155
short term stability (1 s)	7E-12	
10 MHz reference input		
level	0 .. 10 dBm	
connector	SMA female	
modes	Internal, External, Automatic	
10 MHz output		
level	10 ± 3 dBm	
phase noise	offset Hz	dBc/Hz
	1	-90
	10	-120
	100	-140
	1k	-150
	10k	-150
	100k	-155
connector	SMA female	
10 MHz monitor output		
level	0 ± 3 dBm	
connector	SMA female	
200 MHz rf output		
level	10 ± 3 dBm	
phase noise	offset Hz	dBc/Hz
	1	-63
	10	-92
	100	-111
	1k	-123
	10k	-130
	100k	-140
connector	SMA female	
200 MHz monitor output		
level	0 ± 3 dBm	
connector	SMA female	
Phase adjustment at 200 MHz		
range	-360° .. 360°	
resolution	0.5°	
accuracy	± 1°	
aging	tbd	
Phase modulation at 200 MHz		

modulation	BPSK
bit length	100ns, bit clock locked to 200 MHz rf signal
modulation data	free programmable bitsequence up to 1024 bits
trigger output	TTL (50R)
trigger input	TTL (50R)
Temperature regulation	
temperature	60°C for reference board with analogue PLL circuits
Alarms	
temperature regulation	± 1°C
PLLs	unlocked
Control	
front panel	keyboard , LCD display
remote control	Ethernet
Case	
dimension	19" , 1HE, 483x44x260mm (except connectors)
Power Supply	
voltage	85-264 VAC
connector	iec power connector
fuse	3,15A time lag
Options	
frequency	243 MHz without BPSK modulation
frequency	155.52 MHz without BPSK modulation