



Fast Switching Direct Synthesizers Series DS

Supplying high performing, innovative and sophisticated RF, microwave, millimeter wave components and integrated assemblies worldwide.

Features

- Broadband 0.010 to 40.96 GHz
- Very low phase noise -120 dBc/Hz typical at 10 kHz offset at 10 GHz
- Switching speed 500 nano seconds
- Step sizes from 1 Hz
- Low profile chassis or modular configuration
- Custom bands and step sizes
- Low spurious
- Parallel BCD programming
- Low power consumption, 100 watts from AC mains
- Coax strobe input and selection switch
- RF output mute
- Universal AC power supplied

Overview

Ultra RF microwave series of fast switching direct synthesizers have been designed for use in commercial systems and military systems where demanding performance, high reliability and fast switching are critical.

With switching speeds from 250 nanosecond, the DS delivers ample speed to meet the required response times of EW Simulator, Radar, RCS, ATE and Antenna measurement systems. In addition, the 1 Hz step size capability allows the frequency to be controlled to a high precision.

Custom versions are available with different step sizes and bandwidths. Parallel programming is standard in order to optimize speed. Other interfaces are available as options.

Options

- IEEE-488/GPIB, Ethernet
- Internal 100 MHz reference with sample output
- Phase Coherent switching
- Phase Continuous SwitchinG(bandwidth restricted)
- AM, PM, FM & Pulse Modulation
- Front panel control and display can be custom configured
- Touch Screen Computer (TSC) front panel for rack mount unit
- Digital frequency sweep via TSC
- FM with four operational modes; WBDC, WBAC, NBDC, NBAC
- Modulation bandwidth 10 MHz
- Expanded FM deviations
- Power flatness +/-1dB
- Coherent stepping to 1 Hz
- Downloadable list mode with fast list triggering and ready feedback signal
- Differential interface
- Linear AC power supply
- Binary control
- Harmonic filter banks.
- Switching speeds from 250 nano-seconds (Consult Factory)
- Noise floor -140 dBc/Hz @ 18 GHz

This family of direct synthesizers have been designed for low power consumption and high reliability.

The complete DS synthesizer, with its combination of advanced performance features, is housed in a low profile 5.25" high rack-mountable chassis or optional 1.75" or 3.5" chassis for some models. For specialized applications the DS can be tailored to suit custom bands and physical outlines due to its modular architecture. The touch screen front panel version provides simple control and versatility. SatCom and digital radio equipment, as well as in high-performance frequency-agile surveillance, radar and communications equipment.

Our optional coherent switching synthesizer, unlike other technologies available, can perform coherent switching down to 1 Hz of the synthesizer. Previous to this breakthrough coherent resolutions have been limited to larger steps because switching time performance degraded as resolution is decreased.

The design from Ultra overcomes this limitation and provides a new tool for Signature Measurement Technologists. This new synthesizer can be ordered with many options and can be custom configured to meet your requirements. As an example, an FM modulator can be added to the coherent unit to make it interchangeable between Simulator and Signature Measurement applications.

Typical Performance Specifications

- Frequency range 10 MHz to 20.48 GHz, option to 40.96 GHz
- Custom bandwidths
- Output power +10 dBm \pm 2.5 dB
- Spurious
 - 75 dBc 10 MHz to 5120 MHz
 - 70 dBc 5120 to 10240 MHz
 - 65 dBc 10240 to 20480 MHz
 - 60 dBc 20480 to 40960 MHz
- Harmonics -15 dBc, -50 dBc optional
- External reference 10 MHz or 100 MHz
- Frequency accuracy with internal reference \pm 0.2 ppm over temperature, 1 ppm/year aging
- External reference accuracy required for phase locking internal reference \pm 1 ppm @ +3 \pm -3 dBm power level
- Frequency accuracy with external reference, same as external reference for step sizes 250 kHz to 20 MHz; same as external reference \pm 1 \times 10⁻¹² for 1 Hz step size
- Step size from 1 Hz
- Switching speed 500 ns
- Summary alarm TTL low = alarm for modular configuration, red LED= alarm on front panel for rack configurations

Typical Phase Noise (dBc/Hz)

Offset	10GHz	18GHz	40GHz
100 Hz	-90	-84	-77
1 kHz	-110	-104	-97
10 kHz	-120	-114	-107
100 kHz	-120	-114	-107
1 MHz	-130	-124	-117
10 MHz	-136	-130	-123

Touch Screen Computer Functions

- Frequency entry display
- Reference select
- Local/parallel J1/ GPIB
- Frequency step up or step down
- Alarm indicator
- Power on/off
- Sweep
- Range
- Direction
- Dwell time
- Trigger mode
- Step size
- Stop sweep
- Resume sweep
- Ping-pong
- Jump frequencies
- Dwell time
- Trigger mode
- Stop ping-pong
- Resume ping-pong

FM Deviation Capabilities

Frequency Band (MHz)	\pm 1 V p-p into 50 ohms typical deviation (MHz)	\pm 1 V p-p into 50 ohms expanded deviation (MHz)
10 - 20	\pm 0.234375	n/a
20 - 40	\pm 0.4687	n/a
40 - 80	\pm 0.9375	n/a
80 - 160	\pm 1.875	n/a
160 - 320	\pm 3.75	n/a
320 - 640	\pm 7.5	Consult factory
640 - 1280	\pm 15	Consult factory
1280 - 2560	\pm 30	\pm
2560 - 5120	\pm 60	\pm
5120 - 10240	\pm 120	\pm
10240 - 20480	\pm 240	\pm
20480 - 40960	\pm 480	\pm

List Mode

List	The operator may program a list of from 1 to 48000 random frequencies via an Ethernet, GPIB or CTI custom interface. The frequencies in the list starting at address A and ending at address B can be swept from A to B, B to A or A to B and back to A. Minimum dwell time 10 microseconds typical.
Continuous mode, single or auto	The unit will perform any of the sweep modes as discussed above, that were previously communicated over Ethernet, GPIB or Ultra's custom interface. This mode is triggered by an external single start pulse. The unit will perform one sweep and stop, or will perform continuous sweeps until stopped by an Ethernet, GPIB or Ultra's custom command. For this mode a previously loaded Dwell Time is required.
External Trigger	Same as above but each step through the address list requires an external trigger pulse. No Dwell Time required as external pulses control Dwell Time. Lock Signal provided with each step.
Start, stop, step	Via the Ethernet, GPIB or custom interface a Start address, Stop address, and Step Size is communicated. The unit starts operation at the start frequency and with each "Trigger In" pulse it will step with an increment of "Step Size"

Power, Dimensions and Environmental

- AC input voltage 120 VAC to 240 VAC auto switching, 47-400 Hz
- DC input voltage +10Vdc, +6 Vdc, +15 Vdc, -12 Vdc (measured at synthesizer for modular configuration)
- Ripple on DC 5 mVpp max 50 Hz to 50 kHz, 50 mVpp max 50 kHz to 10 MHz
- Operating temperature 0° to +50° centigrade
- 19 inch rack mount, 2U or 3U high depending on options
- Modular configuration 10.63" x 9.5" x 4.5"
- Approximate weight 36 lbs rack mount, 17 lbs modular configuration

Connectors and Control

- Reference input SMA-F
- RF and reference outputs SMA-F
- 50 pin D-type for frequency control
- Frequency control parallel BCD plus strobe standard, binary control optional

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 ultra.group | sales@ultra-us-gbs.com



Phase Locked Coaxial Resonator Oscillators Series PCRO

Supplying high performing, innovative and sophisticated RF, microwave, millimeter wave components and integrated assemblies worldwide.

Features

- Frequencies from 300 MHz to 3 GHz
- Wide operating temperature
- Ultra low phase noise
- Low power consumption
- Phase lockable to references from 1 MHz to 100 MHz
- Low Spurious
- Low loss high Q circuit

Options

- High stability internal reference
- Field replaceable connectors
- Hermetic seal
- Extended temperature ranges
- Dual loop models

Overview

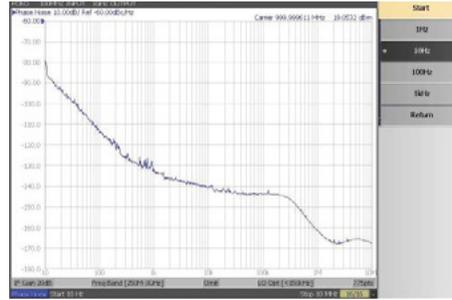
Ultra's series of phase locked coaxial resonator oscillators have been designed for use in commercial and military systems where demanding performance, high reliability and cost are critical.

This family of product takes advantage of low phase noise transistors and a metalized high Q coaxial resonator. When phase locked to an external crystal reference, the low noise characteristics of the high Q resonator are enhanced by the long term stability of the external reference.

The series PCRO can be custom configured to meet the demanding electrical performance and environmental requirements for military airborne, radar and communications applications.

Features such as low phase noise, high power, small size and low cost make Ultra's PCRO product line the best value on the market today.

Contact the factory to discuss your special requirements.



Typical Performance Specifications

- Fixed frequencies from 300 MHz to 3 GHz
- Output power +15 dBm standard
- Power variation ± 2 dBm
- Output impedance 50 ohms
- Load VSWR 1.5:1
- Output impedance 50 ohms
- Spurious -80 dBc
- Harmonics -20 dBc
- Lock alarm TTL high when locked
- Input reference frequency 5 MHz to 100 MHz for single loop models, 1 MHz to 100 MHz for dual loop models
- Input reference power level 0 ± 3 dBm
- Internal reference models frequency stability ± 2.5 ppm standard, ± 1 ppm optional
- External reference models frequency stability same as reference

Connectors and Control

- RF output SMA-F
- Reference input SMA-F
- Reference monitor SMA-F internal reference models only
- Alarm Feed-thru
- Supply voltage Feed-thru
- Ground solder lug

Power, Dimensions and Environmental

- Supply voltage +12V, +15 V and
- 8 VDC on select models
- Current 300 mA for external reference models, 450 mA steady state, 800 mA surge on internal reference models, 450 mA for dual loop models
- Operating temperature -30° to
- 70° centigrade
- Storage temperature -54° to $+85^\circ$ centigrade

Typical Phase Noise

External 100 MHz reference models

Offset	SSB Phase Noise dBc/Hz at		
KHz	0.5 GHz	1 GHz	3 GHz
0.1	-105	-100	-90
1.0	-127	-125	-110
10	-137	-135	-120
100	-143	-140	-125
1,000	-150	-150	-135
10,000	-160	-160	-150

Typical Phase Noise

Internal reference models

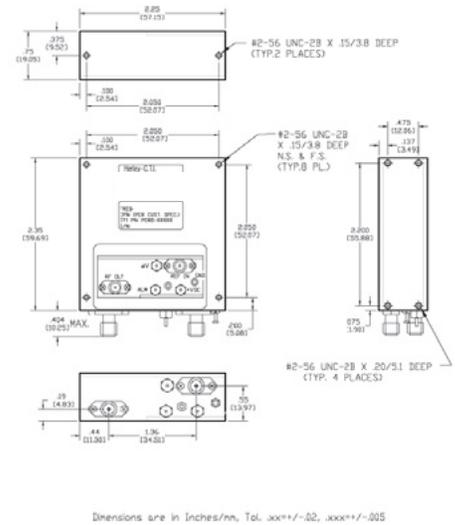
Offset	SSB Phase Noise dBc/Hz at		
KHz	0.5 GHz	1 GHz	3 GHz
0.1	-100	-97	-90
1.0	-125	-123	-110
10	-130	-130	-120
100	-137	-135	-125
1,000	-150	-150	-135
10,000	-160	-160	-145

Typical Phase Noise

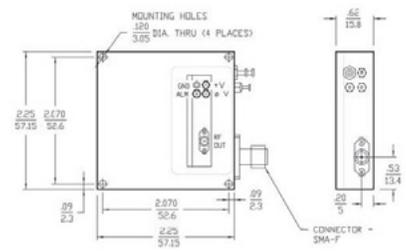
Dual loop models

Offset	SSB Phase Noise dBc/Hz at		
KHz	0.5 GHz	1 GHz	3 GHz
0.1	-95	-90	-80
1.0	-125	-120	-110
10	-130	-125	-115
100	-137	-135	-125
1,000	-150	-150	-135
10,000	-160	-160	-150

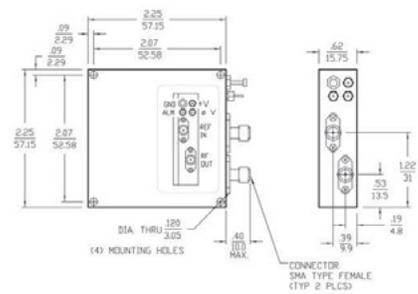
Standard Outline Drawing for External <50 MHz Reference Models



Standard Outline Drawing for Internal Reference Models



Standard Outline Drawing for Dual Loop Models



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Phase Locked Dielectric Resonator Oscillators Series PDRO

Supplying high performing, innovative and sophisticated RF, microwave, millimeter wave components and integrated assemblies worldwide.

Features

- Frequencies from 3 to 45 GHz
- Wide operating temperature
- Ultra low phase noise
- Low power consumption
- Phase lockable to references from 1 MHz to 1 GHz
- Low Spurious
- Fractional reference multiplication in a single loop
- Internal reference and dual loop models in a low profile housing

Options

- +8 VDC supply on certain models
- Field replaceable connectors
- Flush profile tuner
- Hermetic seal
- Extended temperature ranges
- Dual loop models
- Dual output models

Overview

Ultra's series of phase locked dielectric resonator oscillators have been designed for use in commercial and military systems where demanding performance, high reliability and cost are critical.

This family of product takes advantage of the small size, low phase noise and high efficiency offered by fundamental GaAs MESFET and BJT DROs when they are phase locked to an external crystal reference in the 1 MHz to 1 GHz frequency range.

The single loop model when phase locked to an external 100 MHz crystal reference provides exceptionally low phase noise, typically -120 dBc/Hz at 10 kHz offset from the carrier at an output frequency of 10 GHz.

In addition, two reference options are available. The first option offers an integrated, high stability internal crystal oscillator in the 100 MHz range in a slim line package.

The second option offers a dual loop design enabling the output frequency to be phase locked to an integer or fractional multiple of the reference frequency used.

Features such as the low phase noise, high power, small size and low cost make Ultra's PDRO product line the best value on the market today.

Contact the factory to discuss your special requirements.



Typical Performance Specifications

- Fixed frequencies from 3 GHz to 45 GHz
- Output power +15 dBm standard, up to 1 W optional
- Power variation ± 2 dBm
- Load VSWR 2:1
- Output impedance 50 ohms
- Spurious -80 dBc typical, -70 dBc max
- Harmonics -20 dBc
- Lock alarm TTL high when locked
- Input reference frequency 1 MHz to 1 GHz for single loop models, 1 MHz to 100 MHz for dual loop models
- Input reference power level 0 ± 3 dBm
- Internal reference models frequency stability ± 2.5 ppm standard, ± 1 ppm optional
- External reference models frequency stability same as reference

Connectors

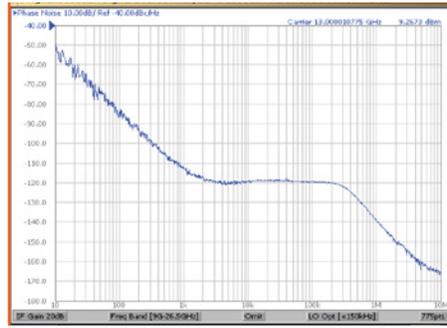
- RF output SMA-F to 26 GHz, 2.92 mm above 26 GHz
- Reference input SMA-F
- Alarm Feed-thru
- Supply voltage Feed-thru
- Ground solder lug

Power, Dimensions and Environmental

- Supply voltage +12V, +15 V and +8 VDC on select models
- Current 300 mA to 450 mA depending on model
- Operating temperature -40° to $+70^\circ$ centigrade
- Storage temperature -54° to $+85^\circ$ centigrade

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Typical Phase Noise

External reference models

Offset	SSB Phase Noise dBc/Hz at		
KHz	10 GHz	14 GHz	26 GHz
0.1	-85	-82	-76
1.0	-110	-107	-101
10	-120	-117	-107
100	-120	-117	-110
1,000	-135	-135	-125
10,000	-160	-160	-150

Typical Phase Noise

Internal reference models

Offset	SSB Phase Noise dBc/Hz at		
KHz	10 GHz	14 GHz	26 GHz
0.1	-75	-72	-66
1.0	-105	-92	-96
10	-120	-116	-107
100	-120	-116	-110
1,000	-135	-135	-125

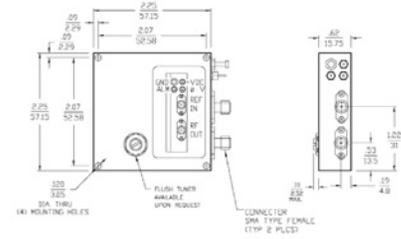
Typical Phase Noise

Dual loop models

Offset	SSB Phase Noise dBc/Hz at		
KHz	10 GHz	14 GHz	26 GHz
0.1	-70	-67	-61
1.0	-100	-97	-91
10	-120	-116	-107
100	-120	-116	-110
1,000	-135	-135	-125
10,000	-160	-160	-150

Standard Outline Drawing for External Reference Models up to 18 GHz

Note: For frequencies <4 GHz height will be 0.82 inches/20.82 mm.

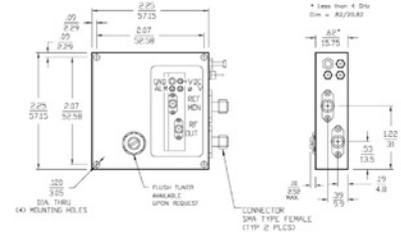


Dimensions are in inches/mm. Tol. xxxx+/-02, xxxxx+/-005

Standard Outline Drawing for Internal Reference and Dual Loop Models up to 18 GHz

Note 1: For frequencies <4 GHz height will be 0.82 inches/20.82 mm.

Note 2: REF MON connector becomes REF IN on dual loop models

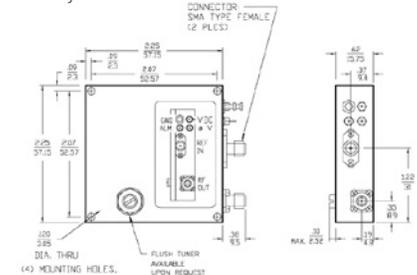


Dimensions are in inches/mm. Tol. xxxx+/-02, xxxxx+/-005

Standard Outline Drawing for Frequencies from 18 GHz to 45 GHz

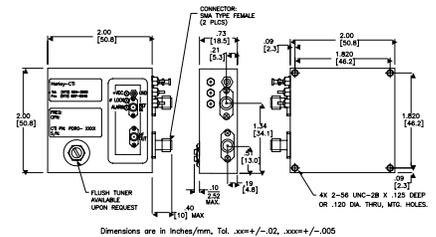
Note 1: Output connector will be 2.92 mm female for frequencies above 26 GHz

Note 2: REF IN connector becomes REF MON on internal reference models



Dimensions are in inches/mm. Tol. xxxx+/-02, xxxxx+/-005

Miniature Outline Drawing for Frequencies from 8 GHz to 18 GHz



Dimensions are in inches/mm. Tol. xxxx+/-02, xxxxx+/-005

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