

10000 SERIES FREQUENCY CONVERTERS

L, C, X and Ku Bands

SPECIFICATION		
	10000 UPCONVERTER	10000 DOWNCONVERTER
Type	Dual conversion	Dual conversion
Frequency step size	1 kHz	1 kHz
Frequency sense	No inversion	No inversion
Input characteristics		
Input frequency	70 ± 20 MHz (140 ± 40 MHz Option 4)	Refer to model number table
Input impedance	75 ohms (50 ohms Option 15)	50 ohms
Input return Loss	20 dB minimum	18 dB minimum (16 dB minimum L-Band)
Signal monitor	-20 dBc nominal	-20 dBc nominal
Lo leakage at input	N/A	-70 dBm
Input level (non-damage)	+15 dBm maximum	+15 dBm maximum
Output characteristics		
Output frequency	Refer to model number table	70 ± 20 MHz (140 ± 40 MHz Option 4)
Output impedance	50 ohms	75 ohms (50 ohms Option 15)
Output return loss	18 dB minimum (16 dB minimum L-Band)	20 dB minimum
Signal monitor	-20 dBc nominal	-20 dBc nominal
Lo leakage at output	-75 dBm maximum	N/A
Power output (P1 dB)	15 dBm minimum	16 dBm minimum
Transfer characteristics		
Gain at 23°C	+30-35 dB at 23°C	+43-50 dB at 23°C
Noise figure at min. gain	16 dB maximum	14 dB
Noise power density	-123 dBm/Hz maximum	N/A
Image rejection	70 dB minimum (L-Band only)	80 dB
Level stability	±0.25 dB/day maximum/day at constant temperature ±0.5 dB typical from 0°C to 50°C	
Amplitude response		
70 MHz ± 0 MHz	±0.35 dB maximum/40 MHz	±0.35 dB maximum/40 MHz
140 MHz ± 40 MHz (Option 4)	±0.45 dB maximum/80 MHz	±0.45 dB maximum/80 MHz
RF band	N/A	±1 dB maximum/RF band (L-Band only)
Amplitude slope adjust	±1 dB typical in 0.2 dB steps	±1 dB typical in 0.2 dB steps
Group delay (70 ± 18 MHz) at 23 °C		
Linear	0.03 ns/MHz maximum	0.03 ns/MHz maximum
Parabolic	0.01 ns/MHz maximum	0.01 ns/MHz maximum
Ripple	1 ns peak-to-peak maximum	1 ns peak-to-peak maximum
Group delay (140 ± 36 MHz) at 23°C		
Linear	0.025 ns/MHz maximum	0.025 ns/MHz maximum
Parabolic	0.0035 ns/MHz maximum	0.0035 ns/MHz maximum
Ripple	1 ns peak-to-peak maximum	1 ns peak-to-peak maximum
Intermodulation distortion (third order)	52 dBc min. (26 dBm OIP3 pt) 44 dBc min. Ku-Band (22 dBm OIP3 pt)	60 dBc minimum (30 dBm OIP3 pt)
AM/PM conversion	0.1°/dB maximum to 0 dBm output	0.1°/dB maximum to 0 dBm output
Frequency stability	±2 x 10 ⁻⁸ , 0°C to 50°C (higher stability options available), ±5 x 10 ⁻⁹ /day typical (fixed temperature after 24 hour on time)	
Frequency accuracy	±25 Hz max. using external reference	±25 Hz max. using external reference
Spurious output (in band)		
Signal related	-60 dBc maximum up to 0 dBm output	-60 dBc maximum up to 0 dBm output
Signal independent	-70 dBm maximum	-70 dBm maximum
Gain adjustment	30 dB in 0.2 dB steps (55 dB in 0.2 dB steps at L-Band)	30 dB in 0.2 dB steps
Upconverter mute	60 dB minimum	N/A
External reference	5 or 10 MHz, +4 ± 3 dBm unit will automatically switch to internal reference if external reference level falls below +1 dBm nominal	
Phase noise	See chart	See chart



The Narda-MITEQ frequency converters are designed for advanced satellite communication systems and are available for a wide variety of frequency plans. Phase noise, amplitude flatness and spurious outputs have been optimized to provide the user with a transparent frequency conversion for all video and data applications.

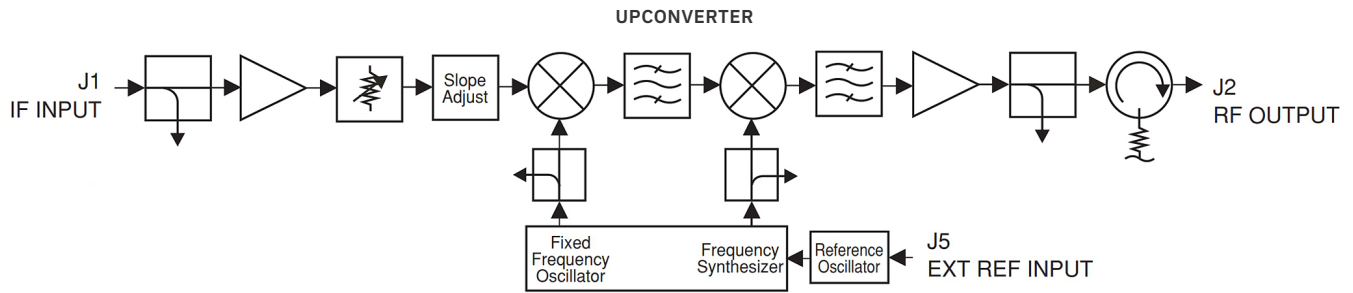
A strong feature set of monitor and control functions supports powerful local and remote control. Among the features are control of frequency, attenuation and 64 memory locations for each converter where various setups can be stored and recalled.

A continuously updated log of time-stamped records of activity is also provided.

UPCONVERTERS	
RF FREQUENCY (GHz)	MODEL NUMBERS
0.95 – 2.15	U-10048-1-1K
2 – 2.4	U-10048-4-1K
5.725 – 6.725	U-10053-6-1K
7.9 – 8.4	U-10054-1K
12.75 – 14.5	U-10056-7-1K
13.75 – 14.8	U-10056-6-1K
10.7 – 12.75	U-10008R-6-1K
17.3 – 18.4	U-10057-2-1K

DOWNCONVERTERS	
RF FREQUENCY (GHz)	MODEL NUMBERS
0.95 – 2.15	D-10000-3-1K
2 – 2.4	D-10000-6-1K
3.4 – 4.2	D-10001-1-1K
7.25 – 7.75	D-10005-1K
10.7 – 12.75	D-10008-6-1K
12.75 – 14.5	D-10056R-7-1K
13.75 – 14.8	D-10056R-6-1K

REPRESENTATIVE BLOCK DIAGRAM



PHASE NOISE SPECIFICATIONS

1. Phase noise (-dBc/Hz) (maximum with internal reference).

UPCONVERTERS							
Model	10Hz	100Hz	1KHz	10KHz	100KHz	300KHz	1MHz
U-10048-1-1K	67	79	100	104	105	113	126
U-10048-4-1K	63	76	97	102	103	112	124
U-10053-6-1K	62	72	94	98	99	106	119
U-10054-1K	59	72	91	97	98	106	118
U-10056-7-1K	56	67	87	93	94	101	113
U-10056-6-1K	56	67	87	93	94	101	113
U-10008R-6-1K	52	66	86	91	92	98	111
U-10057-2-1K	51	65	85	90	91	97	110
DOWNCONVERTERS							
Model	10Hz	100Hz	1KHz	10KHz	100KHz	300KHz	1MHz
D-10000-3-1K	67	79	100	104	105	113	126
D-10000-6-1K	63	76	97	102	103	112	124
D-10001-1-1K	62	72	94	98	99	106	119
D-10005-1K	58	70	91	96	97	105	118
D-10008-6-1K	52	66	86	91	92	98	111
D-10056R-7-1K	56	67	87	93	94	101	113
D-10056R-6-1K	56	67	87	93	94	101	113
Maximum External Reference to Achieve Above Phase Noise with 10 MHz Reference (dBc/Hz)							
	10Hz	100Hz	1KHz	10KHz	100KHz	300KHz	1MHz
Systems without Option 10E, 10F, 10G or 10H	120	150	160	160	160	160	160
Systems with Option 10E, 10F, 10G or 10H	95	130	140	140	140	140	140

OPTIONS

4. 140 MHz IF frequency.

10. Higher frequency stability reference.

C. $\pm 2 \times 10^{-9}$, 0°C to 50°C, 1×10^{-9} /day typical (fixed temperature after 24 hour on time).

E. $\pm 5 \times 10^{-9}$, 0°C to 50°C, 1×10^{-9} /day typical (fixed temperature after 24 hour on time).
See Note 1 below.

F. $\pm 2 \times 10^{-9}$, 0°C to 50°C, 1×10^{-9} /day typical (fixed temperature after 24 hour on time).
See Note 1 below.

NOTE 1: Analog reference Phase Lock: External 5 or 10 MHz at $+4 \pm 3$ dBm. If external reference is below +1 dBm nominal, the converter will automatically lock to the internal reference. Reference oscillator acts as an analog phase lock with a 0.1 Hz nominal loop bandwidth. Typical loop suppression of the external reference is as follows: 28 dB at 1 Hz offset; 65 dB at 10 Hz offset and 100 dB at 100 Hz offset.

G. Self calibrating tracking reference with controlled slew rate. Internal reference tracks external reference and uses external reference to correct for aging of the internal reference. The internal reference changes frequency at a maximum rate of 0.06 ppm/second. When external reference is lost, the reference frequency is held at the previous value. Frequency stability on internal reference: $\pm 5 \times 10^{-8}$, 0°C to 50°C, 1×10^{-9} /day typical (fixed temperature after 72 hour on time).
 5×10^{-8} /year typical.

H. Self calibrating tracking reference with controlled slew rate. Internal reference tracks external reference and uses external reference to correct for aging of the internal reference. The internal reference changes frequency at a maximum rate of 0.06 ppm/second. When external reference is lost, the reference frequency is held at the previous value. Frequency stability on internal reference: $\pm 2 \times 10^{-9}$, 0°C to 50°C, 1×10^{-9} /day typical (fixed temperature after 72 hour on time).
 5×10^{-8} /year typical.

15. 50 ohm IF impedance.

17. Remote control.

C. RS232 remote interface.

NRF. Type N-female RF connector (Note: Monitor remains SMA female). RF return loss: 16 dB.

Notes: Missing option numbers are not applicable for this product. For literature describing Local control (front panel) and remote control (bus protocols), refer to Narda-MITEQ's Technical Note 25T063.

Protocols are backwards compatible with Technical Notes 25T010 and 25T009.

KEY FEATURES

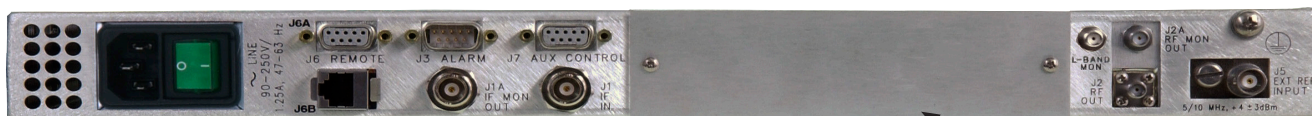
- > Supports expandable NSU 1:N Switchover Series (D-323)
- > Amplitude slope adjust
- > Three monitor and control ports:
 1. RS485/RS422 remote interface (J6A) changes to RS232 with Option 17C
 2. RS485/RS422 control interface (J7) is provided for use with NSU redundancy system (D-323) or as an alternative interface
 3. 10/100Base-T Ethernet interface (J6B)
- > RF, IF and LO monitor ports
- > Automatic switching to external 5/10 MHz reference and electronic adjust of internal reference frequency
- > Low intermodulation distortion
- > Better than IESS-308/309 compliant phase noise
- > 64 programmable memory locations
- > 30 dB level control
- > External alarm input via contact closure
- > Date and time-stamped event log

OPTIONS

- > Higher Stability Reference
- > Remote RS232
- > 140 MHz IF Frequency
- > 50 ohm IF Impedance
- > Type "N" RF Connector

GENERAL SPECIFICATIONS	
PRIMARY POWER REQUIREMENTS	
Voltage	100-240 VAC (-10%, +6%)
Frequency	47 – 63 Hz
Consumption	55 W typical, 65 W maximum
PHYSICAL	
Weight	12 pounds (5.4 kg) nominal
Chassis Dimensions	19" [482.6mm] x 175" [44.45mm] panel height x 22" [560mm] maximum (including connectors)
Connectors	
RF	SMA female (N female, Option NRF)
RF Monitor	SMA female
IF	BNC female
IF Monitor	BNC female
LO Monitors	SMA female
Alarm	DE-9P
External Reference	BNC female
Remote Interface	DE-9S for RS485, RS422 and RS232, RJ-45 female for Ethernet
Primary Power Input	IEC-320
Auxiliary Control Interface	DE-9S
ENVIRONMENTAL	
Operating	
Ambient Temperature	0°C to +50°C
Relative Humidity	Up to 95% at 30°C
Atmospheric Pressure	Up to 10,000 feet
Non-Operating	
Ambient Temperature	-50°C to +70°C
Relative Humidity	Up to 95% at 40°C
Atmospheric Pressure	Up to 40,000 feet
Shock and Vibration	Normal handling by commercial carriers

TYPICAL REAR PANEL VIEW



RSM Switch Module Location
(see D323 for more information)

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Narda-MITEQ is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains.

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