

# FREQUENCY CONVERTER



## HIGH-PERFORMANCE RACK-MOUNTED BLOCK CONVERTER



### FEATURES

- Supports expandable NSU 1:N switchable series (D-323)
- Three monitor and control ports:
  1. RS-485/RS-422 remote interface (J6A) changes to RS-232 with Option 17C
  2. RS-485/RS-422 control interface (J7) is provided for use with NSU redundancy system (D-323) or as an alternate remote interface
  3. 10/100 Base-T Ethernet interface (J6B)
- Automatic 5/10 MHz and internal/external reference selection
- RF, IF and LO signal monitor ports
- 30 dB gain control
- Low phase noise
- Low intermodulation distortion
- 64 memory locations
- High-frequency stability
- Summary alarm
- Mute function on alarm or external mute input control
- Date and time-stamped event log
- AC power supply with power factor correction
- CE mark

### OPTIONS

- Higher frequency stability
- RS-232
- Lower phase noise
- LO level alarm
- Amplitude slope control

This equipment is designed for applications where frequency translation is needed between L-Band and transponder frequencies.



# FREQUENCY CONVERTER

## BLOCK UPCONVERTERS

INPUT FREQUENCY (GHz)	OUTPUT FREQUENCY (GHz)	LO FREQUENCY (GHz)	MODEL NUMBER
0.95 to 1.525	5.85 to 6.425	7.375	UPB-1B-6.1-IN*
0.95 to 1.75	5.85 to 6.65	4.9	UPB-1B-6.25
0.95 to 1.35	6.7 to 7.1	5.75	UPB-1B-6.9
0.95 to 1.45	7.9 to 8.4	6.95	UPB-1B-8.15
0.95 to 1.45	12.75 to 13.25	11.8	UPB-1B-13
0.95 to 1.7	13.75 to 14.5	12.8	UPB-1B-14.125
0.95 to 1.45	14 to 14.5	13.05	UPB-1B-14.25
0.95 to 1.75	17.3 to 18.1	16.35	UPB-1B-17.7
0.95 to 2.05	17.3 to 18.4	16.35	UPB-1B-17.85
0.95 to 1.25	18.1 to 18.4	17.15	UPB-1B-18.25

\* Model includes frequency inversion

## Ka-BAND

INPUT FREQUENCY (GHz)	OUTPUT FREQUENCY (GHz)	LO FREQUENCY (GHz)	MODEL NUMBER
0.95 to 1.2	28.35 to 28.6	27.4	UPB-1B-28.475
0.95 to 1.45	29 to 29.5	28.05	UPB-1B-29.25
0.95 to 1.2	29.25 to 29.5	28.3	UPB-1B-29.375
0.95 to 1.7	29.25 to 30	28.3	UPB-1B-29.625
0.95 to 1.95	30 to 31	29.05	UPB-1B-30.5
1 to 2	30 to 31	29	UPB-1B-30.5-1

\* Model includes frequency inversion



## BLOCK DOWNCONVERTERS

INPUT FREQUENCY (GHz)	OUTPUT FREQUENCY (GHz)	LO FREQUENCY (GHz)	MODEL NUMBER
3.4 to 4.2	0.95 to 1.75	5.15	DNB-1B-3.8-IN*
3.4 to 4.2	0.95 to 1.75	8.55/11	DNB-1B-3.8
3.7 to 4.2	0.95 to 1.45	8.55/11.3	DNB-1B-3.95
7.25 to 7.75	0.95 to 1.45	6.3	DNB-1B-7.5
10.7 to 11.7	0.95 to 1.95	9.75	DNB-1B-11.2
10.95 to 11.7	0.95 to 1.7	10	DNB-1B-11.325
11.2 to 12	0.95 to 1.75	10.25	DNB-1B-11.6
11.45 to 12.25	0.95 to 1.75	10.5	DNB-1B-11.85
11.7 to 12.5	0.95 to 1.75	10.75	DNB-1B-12.1
11.7 to 12.75	0.95 to 2	10.75	DNB-1B-12.225
12.2 to 12.75	0.95 to 1.5	11.25	DNB-1B-12.475

\* Model includes frequency inversion

## Ka-BAND

INPUT FREQUENCY (GHz)	OUTPUT FREQUENCY (GHz)	LO FREQUENCY (GHz)	MODEL NUMBER
18.3 to 18.8	0.95 to 1.45	17.35	DNB-1B-18.55
19.7 to 20.2	0.95 to 1.45	18.75	DNB-1B-19.95
20.2 to 21.2	0.95 to 1.95	19.25	DNB-1B-20.7
20.2 to 21.2	1 to 2	19.2	DNB-1B-20.7-1
28.3 to 28.8	0.95 to 1.45	27.35	DNB-1B-28.55
29.25 to 29.5	0.95 to 1.2	28.3	DNB-1B-29.375
29.25 to 30	0.95 to 1.7	28.3	DNB-1B-29.625

\* Model includes frequency inversion

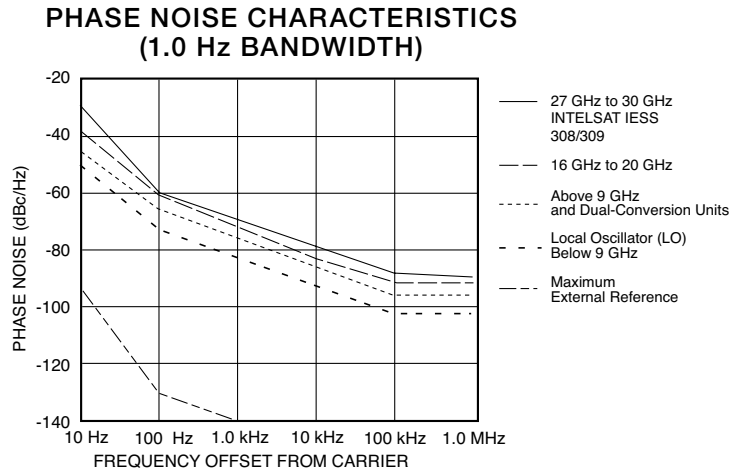
# FREQUENCY CONVERTER

SPECIFICATIONS	UPCONVERTERS	DOWNCONVERTERS
Input characteristics		
Return loss (50 ohms)	18 dB minimum	20 dB minimum, 18 dB above 22 GHz
LO leakage	N/A	-80 dBm maximum
Signal monitor	-20 dBc nominal	-20 dBc nominal
Output characteristics		
Return loss	20 dB minimum, 18 dB above 22 GHz	18 dB minimum
Power output (P1 dB)	+20 dBm minimum, +15 dBm above 22 GHz	+20 dBm minimum
Signal monitor	-20 dBc nominal	-20 dBc nominal
Transfer characteristics		
Gain at minimum attenuation	33 dB, $\pm 3$ dB at 23 °C	38 dB, $\pm 3$ dB at 23 °C
Gain slope	0.03 dB/MHz any 10 MHz	0.03 dB/MHz any 10 MHz
Gain control	30 dB in 0.2 dB steps	30 dB in 0.2 dB steps
Gain stability	$\pm 0.25$ dB/day maximum at constant temperature	
Amplitude response	$\pm 0.25$ dB/40 MHz maximum, $\pm 1$ dB maximum over RF frequency band	
Image rejection	80 dB minimum	80 dB minimum
Noise figure at min attenuation	15 dB maximum	15 dB maximum
Intermodulation distortion (third-order)	With two in-band signals at 0 dBm output, third-order intermodulation products are less than 60 dBc minimum (50 dBc above 22 GHz)	With two in-band signals at 0 dBm output, third-order intermodulation products are less than 60 dBc minimum
Group delay	1 ns peak-to-peak maximum	1 ns peak-to-peak maximum
Spurious outputs (in-band)		
Signal-related	65 dBc minimum at 0 dBm output (including 2 x 1 spurs on 1 GHz IF BW units)	
Signal-independent	-75 dBm maximum	-75 dBm maximum
Harmonics	N/A	55 dBc up to 0 dBm output
Phase noise	See graph on next page	See graph on next page
Noise spectral density	-87 dBm/4 kHz maximum	-82 dBm/4 kHz maximum
AM/PM conversion (at 0 dBm output)	0.1 °/dB maximum	0.05 °/dB maximum
Frequency stability	$\pm 2 \times 10^{-8}$ , 0 °C to 50 °C (higher stability options available), $\pm 5 \times 10^{-9}$ /day typical (fixed temperature after 24 hours on time)	
Automatic reference configuration	External 5 MHz 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.	
Upconverter mute	80 dB minimum on summary alarm, external mute input control or remote command	
Remote interface	10/100 Base-T Ethernet interface providing: HTTP-based web server SNMP 1.0 configuration Alarm reporting via SNMP trap Telnet access Password protection and selectable RS-485/RS-422	

Note: All specifications guaranteed at maximum gain unless otherwise noted.



## PHASE NOISE SPECIFICATIONS



## OPTIONS

Missing option numbers are not applicable for this product.

- High performance phase noise (dBc/Hz) (maximum/typical)

LO Frequency	OFFSET [Hz]					
	10	100	1K	10K	100K/300K	1M
Up to 6.7 GHz	54/56	78/82	108/114	116/121	119/127	136/145
6.7 ≤ LO ≤ 8 GHz	53/55	77/80	107/112	114/119	117/125	134/143
8 ≤ LO ≤ 12 GHz	48/50	73/77	103/110	112/117	115/123	132/141
12 ≤ LO ≤ 13.4 GHz	48/50	72/76	102/108	110/115	113/121	130/139
13.4 ≤ LO ≤ 16 GHz	47/49	70/74	100/106	108/113	111/119	128/137
16 ≤ LO ≤ 24 GHz	42/44	67/71	97/104	106/111	109/117	126/135
24 ≤ LO ≤ 29.05 GHz	41/43	64/68	94/100	102/107	107/116	124/133

- LO level detect

Summary alarm is generated for loss of power in any of the required local oscillators

- High-frequency stability reference

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

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

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

Note 1: Analog reference phase lock: external 5 MHz or 10 MHz at +4 ±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,  $1 \times 10^{-9}$ /day typical (fixed temperature after 72 hours on time).  $5 \times 10^{-8}$ /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,  $1 \times 10^{-9}$ /day typical (fixed temperature after 72 hours on time).  $5 \times 10^{-8}$ /year typical

- Remote control

C. RS-232

# FREQUENCY CONVERTER

## OPTIONS (CONTINUED)

Missing option numbers are not applicable for this product.

- \*21-1. Amplitude slope control..... Front panel and remote control of amplitude slope.  
Control range: 0 dB to 1 dB minimum 500 MHz IF BW, 0 dB to 1.5 dB minimum 800 MHz IF BW, 0 dB to 2 dB minimum 1000 MHz IF BW, 0 dB to 3 dB minimum 1500 MHz IF BW, control step size: 0.2 dB
- \*21-2. Amplitude slope control..... Front panel and remote control of amplitude slope.  
Control range: 0 dB to 2 dB minimum 500 MHz IF BW, 0 dB to 3 dB minimum 800 MHz IF BW, 0 dB to 4 dB minimum 1000 MHz IF BW, 0 dB to 6 dB minimum 1500 MHz IF BW, control step size: 0.2 dB

Notes: Amplitude response specifications are measure with linear components of slope equalization removed. Units are calibrated outside minimum range, however, minimum slope range provided as listed above. For Options 21-1 and 21-2, amplitude slope may be flat for 0 dB slope value.

Note: For literature describing local control (front panel) and remote control (bus protocols), refer to L3 Narda-MITEQ Technical Note 25T055.

## GENERAL SPECIFICATIONS

### PRIMARY POWER REQUIREMENTS

- Voltage..... 100 VAC to 240 VAC (-10%, +6%)
- Frequency ..... 47 Hz to 63 Hz
- Power consumption ..... 30 W typical
- Power factor ..... 0.85 minimum, 0.95 typical

### PHYSICAL

- Weight..... 15 lb. [6.08 kg] nominal
- Overall dimensions ..... 19" [482.6 mm] x 1.75" [44.45 mm] x 20" [508 mm] (excluding connectors)

### Connectors

- RF ..... SMA female
- L-Band ..... N female
- RF monitor ..... SMA female
- L-Band monitor ..... SMA female
- External reference input ..... BNC female
- Summary alarm ..... DE-9P
- Test points ..... SMA female for LO frequency
- Remote interface ..... DEM-9S for RS-485, RS-422 and RS-232, RJ-45 female for Ethernet
- Primary power input..... IEC-320

### ENVIRONMENTAL

#### Operating

- Ambient temperature..... 0 °C to 50 °C
- Relative humidity..... Up to 95% at 30 °C
- Atmospheric pressure ..... Up to 10,000 feet

#### Nonoperating

- 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 D-323 FOR MORE INFORMATION)

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