FREQUENCY CONVERTERS

9900 SERIES C-, Ku-, AND DBS-BANDS

FEATURES

- Supports expandable NSU 1:N switchover series (D-323)
- Amplitude slope adjust
- 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 alternative interface
  3. 10/100 Base-T Ethernet interface (J6B)
- RF, IF, LO, and 10/100 Base-T monitor ports
- Automatic switching to external 5/10 MHz reference and electronic adjust of internal reference frequency
- Low intermodulation distortion
- Better than IESS-308/IESS-309-compliant phase noise
- 64 programmable memory locations
- 30 dB level control
- External alarm input via contact closure
- Date and time-stamped event log
- CE mark

OPTIONS

- High-stability reference
- Remote RS-232
- 140 MHz IF frequency
- 50 ohm IF impedance
- Type N RF connector

RF FREQUENCY (GHz)	MODEL NUMBER
Upconverters	
5.725 to 6.725	U-9953 - 6-1K
12.75 to 14.5	U-9956 - 7-1K
13.75 to 14.8	U-9956 - 6-1K
17.3 to 18.4	U-9957 - 2-1K
Downconverters	
3.4 to 4.2	D-9901 - 1-1K
10.7 to 12.75	D-9908 - 6-1K

L3 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.

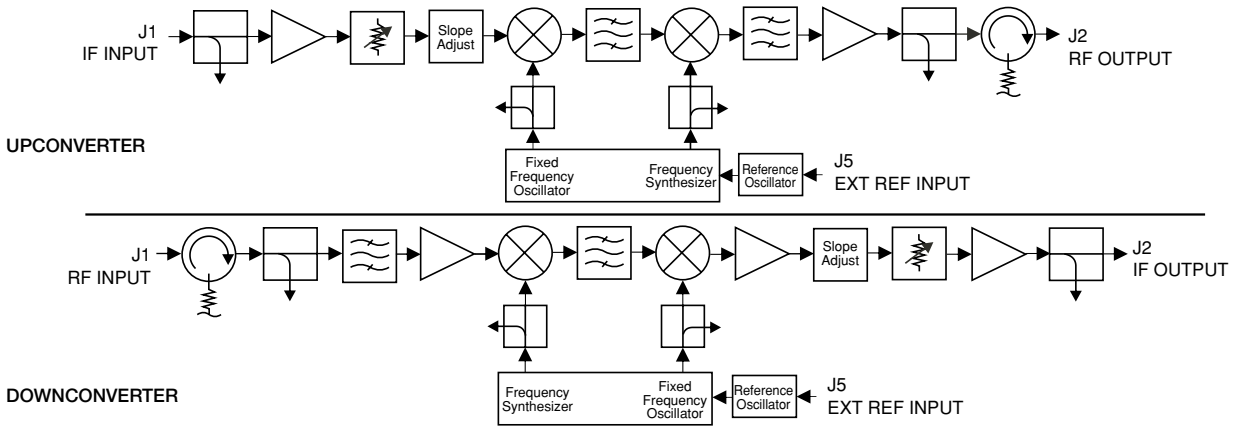
A strong feature set of monitor and control functions supports powerful local and remote control. Among the features are control of frequency, attenuation and 64 memory locations for each converter where various setups can be stored and recalled.

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

SPECIFICATIONS	UPCONVERTERS	DOWNCONVERTERS
Type	Dual conversion	Dual conversion
Frequency step size	1 kHz	1 kHz
Frequency sense	No inversion	No inversion
Input characteristics		
Frequency	70 ±20 MHz (140 ±40 MHz Option 4)	Refer to model number table on page one
Impedance	75 ohms (50 ohms Option 15)	50 ohms
Return loss	26 dB minimum (70 ±20 MHz), 20 dB minimum (140 ±40 MHz)	20 dB minimum
Signal monitor	-20 dBc nominal	-20 dBc nominal
Input level (non-damage)	+15 dBm maximum	+15 dBm maximum
Output characteristics		
Frequency	Refer to model number table on page one	70 ±20 MHz (140 ±40 MHz Option 4)
Impedance	50 ohms	75 ohms (50 ohms Option 15)
Return loss	20 dB minimum	26 dB minimum (70 ±20 MHz), 20 dB minimum (140 ±40 MHz)
Signal monitor	-20 dBc nominal	-20 dBc nominal
Power output (P1 dB)		
C-Band	+16 dBm minimum/17 dBm typical	+16 dBm minimum/17 dBm typical
Ku-Band	+10 dBm minimum/12 dBm typical	+16 dBm minimum/17 dBm typical
Transfer characteristics		
Gain	+31 dB to 34 dB at 23 °C	+44 dB to 48 dB at 23 °C
Noise figure at min attenuation	14 dB maximum	11 dB maximum
Noise power density	-125 dBm/Hz maximum	N/A
Image rejection	N/A	80 dB minimum
Level stability	±0.25 dB/day maximum at constant temperature, ±0.5 dB typical from 0 °C to 50 °C	
Amplitude response	±0.3 dB maximum/40 MHz, ±0.45 dB maximum/80 MHz (140 ±40 MHz Option 4)	
Slope adjust	±1 dB typical in 0.2 dB steps	±1 dB typical in 0.2 dB steps
Group delay (70 ±18 MHz)		
Linear	0.03 ns/MHz maximum (15 °C to 50 °C)	0.03 ns/MHz maximum (15 °C to 50 °C)
Parabolic	0.01 ns/MHz^2 maximum (15 °C to 50 °C)	0.01 ns/MHz^2 maximum (15 °C to 50 °C)
Ripple	1 ns peak-to-peak maximum	1 ns peak-to-peak maximum
Group delay (140 ±36 MHz)		
Linear	0.025 ns/MHz maximum (15 °C to 50 °C)	0.025 ns/MHz maximum (15 °C to 50 °C)
Parabolic	0.0035 ns/MHz^2 maximum (15 °C to 50 °C)	0.0035 ns/MHz^2 maximum (15 °C to 50 °C)
Ripple	1 ns peak-to-peak maximum	1 ns peak-to-peak maximum
Intermodulation distortion (third order)	Two signals each at 0 dBm output,	Two signals each at 0 dBm output,
C-Band	55 dBc minimum (+27.5 dBm OIP^3 pt.)	60 dBc minimum (+30 dBm OIP^3 pt.)
Ku-Band	45 dBc minimum (+22.5 dBm OIP^3 pt.)	60 dBc minimum (+30 dBm OIP^3 pt.)
AM/PM conversion	0.1 °/dB maximum to 0 dBm output	
Gain slope	0.03 dB/MHz typical, 0.05 dB/MHz maximum (10 MHz minimum)	
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 hours on time)	
Frequency accuracy	C-Band: ±10 Hz, Ku-Band: < 1 Hz, maximum using external reference, DBS-Band: < 1 Hz	
Spurious outputs		
Signal-related	65 dBc up to 0 dBm output	65 dBc up to 0 dBm output
Signal-independent	-80 dBm maximum	-80 dBm maximum
LO leakage at RF port	-75 dBm maximum	-80 dBm maximum
Gain adjustment	30 dB in 0.2 dB steps	30 dB in 0.2 dB steps
Upconverter mute	80 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 on page three	See chart on next page three
Remote interface	RS-485/RS-422: two ports user selectable each port (1 port with Option 17C) Ethernet interface: HTTP-based web server, SNMP 1.0 configuration, alarm reporting via SNMP trap, telnet access, password protection	

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

REPRESENTATIVE BLOCK DIAGRAMS



PHASE NOISE SPECIFICATIONS - OFFSET [Hz]

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

UPCONVERTERS							
MODEL NUMBER	10	100	1K	10K	100K	300K	1M
U-9953-6-1K	63/69	80/85	95/97	97/100	97/104	97/106	115/123
U-9956-6-1K	50/71	66/85	87/93	91/96	93/98	93/104	111/122
U-9956-7-1K	50/70	66/84	85/93	90/95	93/96	93/102	111/122
U-9957-2-1K	50/70	66/83	85/91	90/93	93/96	93/101	111/120
DOWNCONVERTERS							
D-9901-1-1K	63/69	80/83	95/97	97/99	97/103	97/106	115/123
D-9908-6-1K	51/68	69/82	87/92	91/96	93/97	93/106	111/122
MAXIMUM EXTERNAL REFERENCE TO ACHIEVE ABOVE PHASE NOISE WITH 10 MHz REFERENCE (dBc/Hz)							
	10	100	1K	10K	100K	300K	1M
Systems without Option 31, 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

Missing option numbers are not applicable for this product.

6. 140 MHz IF frequency
10. High-frequency stability reference
    C. ±2 x 10^{-9}, 0 °C to 50 °C, 1 x 10^{-9}/day typical (fixed temperature after 24 hours on time)
    E. ±5 x 10^{-9}, 0 °C to 50 °C, 1 x 10^{-9}/day typical (fixed temperature after 24 hours on time). See Note 1 below.
    F. ±2 x 10^{-9}, 0 °C to 50 °C, 1 x 10^{-9}/day typical (fixed temperature after 24 hours on time). See Note 1 below.

Note 1: Analog reference phase lock: external 5 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: ±5 x 10^{-8}, 0 °C to 50 °C, 1 x 10^{-9}/day typical (fixed temperature after 72 hours on time).
5 x 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: ±2 x 10^{-9}, 0 °C to 50 °C, 1 x 10^{-9}/day typical (fixed temperature after 72 hours on time).
5 x 10^{-8}/year typical

OPTIONS (CONT.)

Missing option numbers are not applicable for this product.

15. 50 ohm IF impedance

17. Remote control

    C. RS-232 remote interface

NRF. Type N female RF connector (Note: monitor remains SMA female). RF return loss: 18 dB

Notes: For literature describing Local control (front panel) and remote control (bus protocols), refer to L3 Narda-MITEQ Technical Note 25T063.
Protocols are backwards-compatible with L3 Narda-MITEQ Technical Notes 25T010 and 25T009.

GENERAL SPECIFICATIONS

PRIMARY POWER REQUIREMENTS

Voltage	100 VAC to 240 VAC (-10%, +6%)
Frequency	47 Hz to 63 Hz
Consumption	55 W typical, 65 W maximum

PHYSICAL

Weight	12 lb. [5.4 kg] nominal
Chassis dimensions	19” [482.6 mm] x 1.75” [44.45 mm] panel height x 22” [560 mm] 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 RS-485, RS-422 and RS-232, 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

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)

The material presented in this datasheet was current at the time of publication. L3 Narda-MITEQ’s continuing product improvement program makes it necessary to reserve the right to change our mechanical and electrical specifications without notice. If either of these parameters is critical, please contact the factory to verify that the information is current.

This material consists of L3 Narda-MITEQ general capabilities information and does not contain controlled technical data as defined within the International Traffic in Arms (ITAR) Part 120.10 or Export Administration Regulations (EAR) Part 734.7-11.

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narda MITEQ

435 Moreland Road

Hauppauge, NY 11788

Tel: 631-231-1700

Fax: 631-231-1711

Email: nardaMITEQ@L3T.com

www.nardamiteq.com