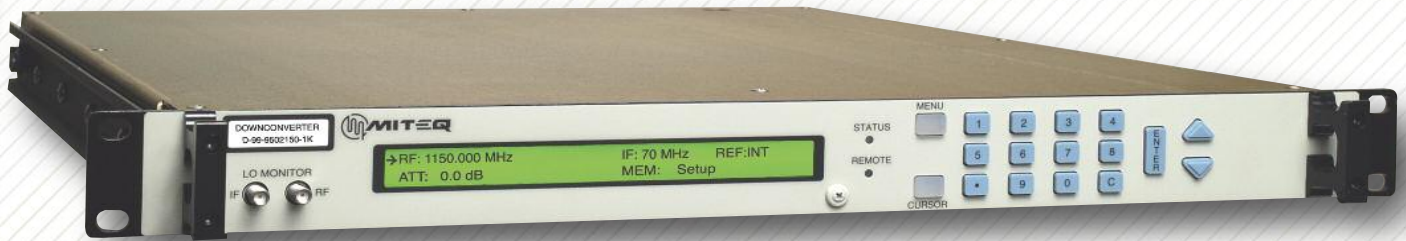


High Performance Extended L-Band Frequency Converters



The MITEQ frequency converters are designed for advanced satellite communication systems. 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 slope 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.

RF Frequency (MHz)	Model Number
Upconverter	
950 - 2150	U-99-9502150-1K
Downconverter	
950 - 2150	D-99-9502150-1K

Features

- Complete 950-2150 MHz RF Band
- MIL-STD-188-164A compliant
 - Phase perturbation (external reference)
 - Harmonics (upconverter)
- Supports expandable NSUN 1:N Switchover Series (D-323)
- 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)
- Automatic 5/10 MHz internal/external reference selection
- Low intermodulation distortion
- IESS-308/309 compliant phase noise
- 64 programmable memory locations
- 30 dB RF input level control (downconverter)
- 55 dB RF output level control (upconverter)
- External alarm input via contact closure
- CE Mark

Options

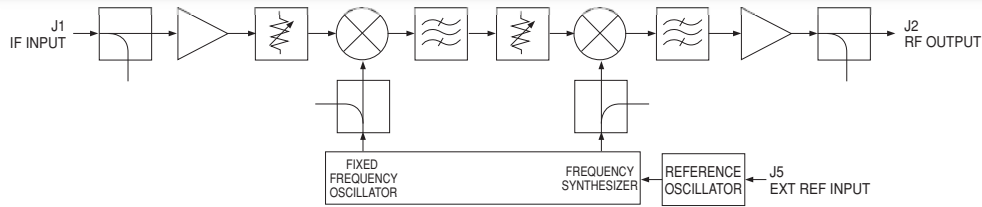
- Higher stability reference
- Remote RS232
- 140 MHz IF frequency
- Fiber optic L-band interface
- LNB/BUC DC power and 10 MHz located on RF center conductor
- 50 ohm IF impedance
- Selectable 70/140 MHz IF frequency
- Type "N" RF connector
- Type "TNC" IF or RF connector
- High dynamic range (upconverter)
- Amplitude slope adjust

Specifications	Upconverter	Downconverter
Type	Dual conversion	
Frequency step size	1 kHz	
Frequency sense	No inversion	
Input characteristics		
Frequency	70 ±20 MHz (140 ±40 MHz Option 4)	950–2150 MHz
Impedance	75 ohms (50 ohms Option 15)	50 ohms
Return loss	26 dB minimum (70 ±20 MHz), 20 dB minimum (140 ±40 MHz)	16 dB minimum
Signal monitor	-20 dBc nominal	-20 dBc nominal
LO leakage (re-radiation)	N/A	-80 dBm maximum
Input level (nondamage)	+15 dBm maximum	
Output characteristics		
Frequency	950–2150 MHz	70 ±20 MHz (140 ±40 MHz Option 4)
Impedance	50 ohms	75 ohms (50 ohms Option 15)
Return loss	16 dB minimum	26 dB minimum (70 ±20 MHz), 20 dB minimum (140 ±40 MHz)
LO leakage	-70 dBm	N/A
Signal monitor	-20 dBc nominal	
Power output (P1dB)	+15 dBm minimum	+16 dBm minimum
Transfer characteristics		
Gain at 23°C	31–34 dB	44–49 dB
Noise figure at maximum gain	17 dB maximum	14 dB maximum
Image rejection	80 dB minimum	
Level stability	0.5 dB peak-to-peak maximum/day/10°C, 1 dB peak-to-peak typical/0 to 50°C	
Amplitude response	±0.35 dB maximum/40 MHz, ±0.45 dB maximum/80 MHz, ±1 dB maximum/RF band	
Amplitude slope adjust (optional)	±2 dB in 0.2 dB steps	
Group delay (70 ±18 MHz)		
Linear	0.03 ns/MHz maximum	
Parabolic	0.01 ns/MHz ² maximum	
Ripple	1 ns peak-to-peak maximum	
Group delay (140 ±36 MHz)		
Linear	0.025 ns/MHz maximum	
Parabolic	0.0035 ns/MHz ² maximum	
Ripple	1 ns peak-to-peak maximum	
Intermodulation distortion (third order)	Two signals each at 0 dBm output, 55 dBc minimum (+27.5 dBm IP3 pt.)	Two signals each at 0 dBm output, 60 dBc minimum (+30 dBm IP3 pt.)
Gain slope	0.05 dB/MHz maximum (10 MHz minimum)	
Frequency Stability	±2 x 10 ⁻⁸ , 0 to 50°C (higher stability options available), ±5 x 10 ⁻⁹ /day typical (fixed temperature after 24 hour on time)	
Spurious outputs (inband)		
Signal related	65 dBc up to 0 dBm output	
Signal independent	-70 dBm maximum	
Harmonic emissions	-60 dBm maximum up to 0 dBm output	N/A
Gain adjustment	55 dB in 0.2 dB steps	30 dB in 0.2 dB steps
Frequency accuracy	±25 Hz maximum using external reference	
Noise power density	-123 dBm/Hz maximum at all gain settings	N/A
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 table	
Remote interface	RS485/RS422: 2 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	
MTBF	100,000 hours minimum calculated per Telcordia, Issue 1	

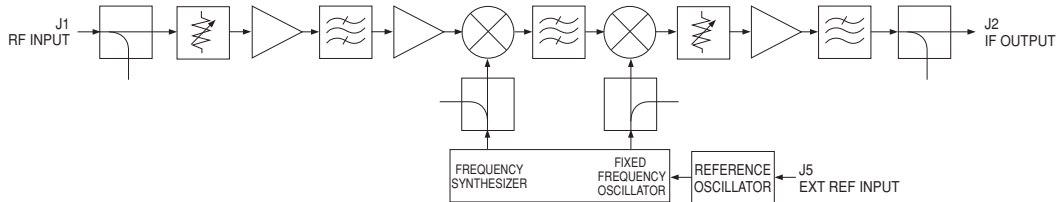
Note: All specifications guaranteed at maximum gain unless otherwise noted.

Representative Block Diagrams

Upconverter



Downconverter



Options

- 4.** 140 MHz IF frequency.
- 10.** Higher frequency stability reference.
 - B.** $\pm 5 \times 10^{-9}$, 0 to 50°C, 1×10^{-9} /day typical (fixed temperature after 24 hour on time).
 - C.** $\pm 2 \times 10^{-9}$, 0 to 50°C, 1×10^{-9} /day typical (fixed temperature after 24 hour on time).
 - E.** $\pm 5 \times 10^{-9}$, 0 to 50°C, 1×10^{-9} /day typical (fixed temperature after 24 hour on time).
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.
 - F.** $\pm 5 \times 10^{-9}$, -40 to +60°C, 1×10^{-9} /day typical (fixed temperature after 24 hour on time).
Higher frequency stability reference with direct phase lock to external reference input. No phase noise suppression on external reference input inside 100 kHz (inside 100 Hz with Option 1).
- 15.** 50 ohm IF impedance.
- 17.** Remote control.
 - C.** RS232 remote interface.
- 18.** External block converter reference and DC power on RF center conductor (not compatible with NSU or NRF Option).
DC power: 15 \pm 1 VDC at 400 mA maximum (downconverter)
22 \pm 2 VDC at 2A maximum (upconverter)
Reference: 10 MHz at +2 \pm 3 dBm
Reference phase noise:

Offset (Hz)	Level (dBc/Hz)
10	-120
100	-150
1K	-160
- 19.** L-band fiber optic interface (not compatible with NSU).
 - A.** Upconverter output transmitter.
Fiber: 9/125 (single mode fiber), Wavelength: 1540–1560 nm, Optical power in fiber: 4 mW typical, Connector: FC/APC
 - B.** Downconverter input receiver.
Fiber: 9/125 (single mode fiber), Wavelength: 1300–1560 nm nominal, Connector: FC/APC
- 20.** Selectable 70 MHz and 140 MHz frequencies.
One IF connector provided at rear panel (BNC female).
Selection of IF frequency is available from the front panel and over the remote bus.
- 31.** Ultra-low phase noise with <1Hz frequency error. See phase noise data on following page.
- 32.** Amplitude slope adjust ± 2 dB in 0.2 dB steps.
- TNCIF.** Type TNC female IF connector and IF monitor.
- NRF.** Type N female RF connector (Note: Monitor remains SMA female).
- TNCRF.** Type TNC female RF connector (Note: Monitor remains SMA female).
- HD.** High dynamic range input: 65 dBc minimum signal related spurious with -20 dBm input and 0 dBm output.

Notes: Missing option numbers are not applicable for this product. For literature describing local control (front panel) and remote control (bus protocols), refer to MITEQ Technical Note 25T063.
Protocols are backwards compatible with Technical Notes 25T010 and 25T009.

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Phase Noise Specifications

Model	10	100	1K	10K	100K	1M	10M	Offset (Hz)
U-99-9502150-1K	-70	-83	-88	-92	-102	-120	-135	Maximum Phase Noise (dBc/Hz) (1.0 Hz bandwidth)
D-99-9502150-1K	-70	-83	-88	-92	-102	-120	-135	
Option 31	-75	-90	-97	-100	-106	-125	-140	Straight line curve defined by the points in the table
Maximum External Reference to achieve above phase noise								
All Systems	-120	-150	-160	-160	-160	-160	-160	

General Specifications

Primary Power Requirements

Voltage..... 90–250 VAC
 Frequency..... 47–63 Hz
 Consumption..... 50 W typical

Physical

Weight..... 12 pounds (5.4 kg) nominal
 Chassis dimensions..... 19" [482.6mm] x 1.75" [44.45mm] panel height x 20" [508mm] maximum
 Connectors
 RF SMA female
 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 interface..... DE-9S

Environmental

Operating
 Ambient temperature..... 0 to 50°C
 Relative humidity..... Up to 95% at 30°C
 Atmospheric pressure Up to 10,000 feet
 Nonoperating
 Ambient temperature..... -50 to +70°C
 Relative humidity..... Up to 95% at 40°C
 Atmospheric pressure Up to 40,000 feet
 Bench handling shock MIL-STD-801E, Method 516.4, Procedure VI, Bench handling
 Packaged shock 20g, 11ms nominal duration tested, MIL-STD-801E, Method 516.4,
 Procedure I, functional shock
 Vibration..... 1.6 Grms/7–200 Hz

Rear Panel View



Option 18 or RSM Switch Module Location
 (see D-323 for more information)



100 Davids Drive, Hauppauge, NY 11788
 TEL.: +1-631-436-7400 • FAX: +1-631-436-7430
 www.miteq.com