9000 Series Communication Converters

Single Conversion Crystal Oscillator Reference

This series of single-conversion converters operates in the standard L and S communication bands.

Input Frequency (GHz)	Output Frequency (GHz)	Model Number
Upconverters		
-	0.95 - 1.75	U-9068-1
-	2.2 - 2.3	U-9069
Downconverters		
0.95 - 1.75	-	D-9020-3
1.5 - 1.8	-	D-9020-2
2.2 - 2.3	-	D-9020

Features

- **Single conversion with phase-locked oscillator**
- **Low intermodulation distortion**
- **No spectral inversion**
- **Low phase noise**
- **Status monitors**
- **Summary alarm**
- **Remote mute via contact closure (upconverters only)**
- **Gain control, 30 dB**
- **IF signal monitor**
- **Automatic switching to external 5/10 MHz reference**

Options

- **Output amplifier for increased dynamic range (upconverters)**
- **Higher frequency stability reference**
- **Fully redundant operation**
- **RF signal monitor**
- **Increased RF/IF gain (downconverters)**

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-	2.2 - 2.3	U-9069
Downconverters		
0.95 - 1.75	-	D-9020-3
1.5 - 1.8	-	D-9020-2
2.2 - 2.3	-	D-9020

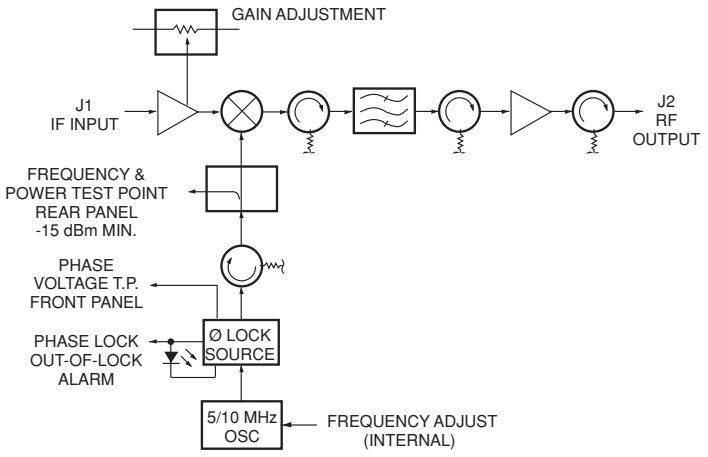
Note: Frequency of operation must be specified at time of order. The operational bandwidth of the unit is 40 MHz (80 MHz optional). Downconverter example, if model number D-9020 is ordered with a 2.295 GHz frequency of operation, the operating bandwidth will be 2.295 GHz ±20 MHz (or 2.295 GHz ±40 MHz with Option 4). There is no frequency tuning in this series of converters. Upconverter example, if model number U-9068-1 is ordered with a 1.425 GHz frequency of operation, the operating bandwidth will be 1.425 GHz ±20 MHz (or 1.425 GHz ±40 MHz with Option 4). There is no frequency tuning in this series of converters.

Specifications	Upconverters	Downconverters
Type	Single conversion	
Tunability	None	
Frequency sense	No inversion	
Input characteristics		
Frequency	70 ±20 MHz (140 ±40 MHz, Option 4)	Refer to model number table
Impedance	75 ohms (50 ohms, Option 15)	50 ohms
Return loss	26 dB minimum (20 dB minimum, 140 ±40 MHz)	18 dB minimum
Output characteristics		
Frequency	Refer to model number table	70 ±20 MHz (140 ±40 MHz, Option 4)
Impedance	50 ohms	75 ohms (50 ohms, Option 15)
Return loss	18 dB minimum	26 dB minimum (20 dB minimum, 140 ±40 MHz)
Power output (1 dB compression)	-5 dBm nominal (up to +10 dBm with optional output amplifiers, refer to options)	+15 dBm typical, +10 dBm minimum
Transfer characteristics		
Noise figure	N/A	15 dB maximum
Gain	11 dB nominal (at minimum attenuation)	30 dB nominal (higher gain optional)
Image rejection	70 dB minimum	
Level stability	±0.25 dB/day maximum at constant temperature	
Bandwidth (0.5 dB)	40 MHz minimum (25°C ±10°C), 10 MHz minimum (0 to 50°C)	
(0.75 dB)	80 MHz minimum (25°C ±10°C, Option 4)	
Intermodulation distortion (third order)	At -20 dBm output, 50 dBc minimum	With two -10 dBm output signals, 60 dBc minimum
AM/PM conversion	0.1°/dB maximum to -15 dBm output	0.1°/dB maximum to +5 dBm output
Gain slope	0.02 dB/MHz maximum	0.02 dB/MHz maximum
LO radiation	-60 dBm maximum (output)	-60 dBm maximum (input)
Gain adjustment	30 dB minimum, continuously variable	
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)	
Upconverter mute	60 dB minimum	N/A
Automatic reference option	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.	

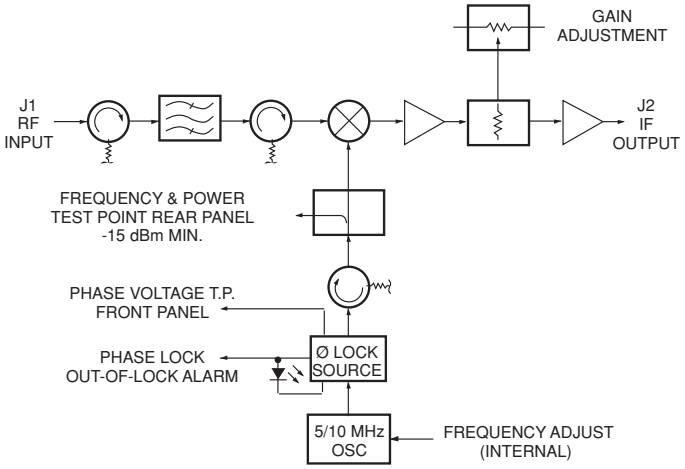
Note: Local oscillator frequency is 70 MHz below output carrier frequency (upconverter only).

Representative Block Diagrams

Upconverter



Downconverter



Options

1. High performance phase noise (dBc/Hz) (maximum/typical).

	Offset [Hz]					
LO Frequency	**10**	**100**	**1K**	**10K**	**100/300K**	**1M**
Below 2.0 GHz, Level (dBc/Hz)	-67	-97	-117	-125	-125	-145
Above 2.0 GHz, Level (dBc/Hz)	-54	-78	-108	-116	-119	-136
External Reference	-120	-150	-160	-160	-160	-160

2. **A.** RF Signal monitor.

4. 140 MHz IF frequency.
Return loss (140 ±40 MHz): 20 dB minimum

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).

11. Increased output power (upconverters).
A. +5 dBm minimum power output (1 dB compression).
B. +10 dBm minimum power output (1 dB compression).

15. 50 ohm IF impedance.

16. Higher gain option (downconverters).
A. 40 dB RF/IF gain.
C. 50 dB RF/IF gain.

Notes: Missing option numbers are not applicable for this product.

General Specifications

Primary Power Requirements

Voltage ..... 90–250 VAC
Frequency ..... 47–63 Hz
Power consumption ..... 25 W typical

Summary Alarm

Contact closure/open for DC voltage alarm
Contact closure/open for DC voltage and/or LO alarm

Physical

Weight ..... 25 pounds nominal
Overall dimensions ..... 19" x 1.75" panel height x 22" maximum (chassis depth 20")
Rear panel connectors
- RF ..... N female
- IF ..... BNC female
- External reference input ..... BNC female
- Summary alarm DE-9P
- Redundancy alarm DE-9P
- Test points ..... LO frequency/power monitor (SMA female), LO phase-lock voltage (jack), DC voltage (jack)
- Remote mute (upconverters only) DE-9P

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
- Shock and vibration ..... Normal handling by commercial carriers

MITEQ®
100 Davids Drive, Hauppauge, NY 11788
TEL.: +1-631-436-7400 • FAX: +1-631-436-7431
www.miteq.com