For Satellite Communications

300 SERIES OUTDOOR COMMUNICATION CONVERTERS

The 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.

The 300 series of synthesized frequency converters is designed for both single and redundant operation in an outdoor environment. An internal synthesizer provides frequency tuning. All units are fully compliant with INTELSAT requirements IESS-308/309.

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

Features

- **Downconverter supply DC for external LNA with current monitoring**
- **Compact outdoor unit**
- **Support external redundancy for 1:1 switch**
- **Dual conversion**
- **No spectral inversion**
- **Remote control via RS485**
- **10/100Base-T Ethernet interface**
- **Automatic switching to external 5/10 MHz reference and electronic frequency adjust of internal reference**
- **Low intermodulation distortion**
- **Better than IESS-308/309 phase noise**
- **Simple installation**
- **Date and time stamped event log**
- **System temperature monitor**
- **CE mark**

PRELIMINARY DATASHEET - CHANGES AND REVISIONS STILL POSSIBLE

Options

- **Higher stability reference**
- **140 MHz IF frequency**
- **Higher gain (downconverter)**
- **Selectable 70/140 MHz IF frequency**
- **50 ohms IF impedance**
- **Selectable 50/75 ohms IF impedance**
- **Multiple IF outputs (downconverter)**
- **Group delay equalization**
- **LO level alarm**

Patent Pending

Specifications

UPCONVERTERS

Output Frequency (GHz)	Model Number
Standard Frequency Band	
5.725-6.725	U-373-6
6.7-7.1	U-373-2
7.9-8.4	U-374
12.75-13.25	U-375-2
12.75-14.5	U-376-7
13.75-14.8	U-376-6
17.3-18.4	U-377-2
Reverse Frequency Band	
3.4 - 4.2	U-321-1R
4.5-4.8	U-322-2R
7.25-7.75	U-325R
10.7-12.75	U-328-6R

DOWNCONVERTERS

Input Frequency (GHz)	Model Number
Standard Frequency Band	
3.4 - 4.2	D-321-1
4.5-4.8	D-322-2
7.25-7.75	D-325
10.7-12.75	D-328-6
Reverse Frequency Band	
5.725-6.725	D-373-6R
6.7-7.1	D-373-2R
7.9-8.4	D-374R
12.75-14.5	D-376-7R
13.75-14.8	D-376-6R
17.3-18.4	D-377-2R

Ka BAND UPCONVERTERS

Output Frequency (GHz)	Model Number
27.5-29.1	U-358
28.3-30.25	U-358-1
29.0-31.0	U-358-2
27.5-31.0	U-358-3

Ka BAND DOWNCONVERTERS

Input Frequency (GHz)	Model Number
18.3-20.2	D-313-2
20.0-21.2	D-313-3
17.7-21.2	D-313-4

SHARED RF LOCAL OSCILLATOR UP/DOWNCONVERTER

Upconverter RF Frequency (GHz)	Downconverter RF Frequency (GHz)	Model Number
5.850-6.425	3.625-4.2	U/D-353
14.0-14.5	11.7-12.2	U/D-356
14.0-14.5	12.25-12.75	U/D-356-2

300 SERIES OUTDOOR COMMUNICATION CONVERTERS

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)	Refer to model number table
Impedance	75 ohms (50 ohms Option 15)	50 ohms
Return loss	20 dB minimum	18 dB minimum
Signal monitor	-20 dBc nominal	-20 dBc nominal (N/A above 17.7 GHz)
LO leakage	N/A	-80 dBm maximum
Input level (nondamage)	15 dBm maximum	
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	20 dB minimum
Signal monitor	-20 dBc nominal (N/A above 17.7 GHz)	-20 dBc nominal
LO leakage	-75 dBm maxmum	N/A
Power output (P1dB)	15 dBm minimum	20 dBm minimum
Transfer characteristics		
Gain	30-35 dB at 23°C	43-50 dB at 23°C 55-61 dB at 23°C (Option 16C)
Noise figure (min. atten)	15 dB maximum, 18 dB above 22 GHz	12 dB maximum, 15 dB above 22 GHz
Image rejection	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 70 ±20 MHz	±0.25/±20 MHz; ±0.2/±18 MHz	
140±40 MHz	0.75 dB/ ±36 MHz	
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) at 0 dBm output	54 dBc minimum (+27 dBm Ip3 pt.) 50 dBc min. above 22 GHz (+25 dBm Ip3 pt.)	60 dBc minimum (+30 dBm Ip3 pt.)
AM/PM conversion	0.03°/dB maximum to 0 dBm output	
Gain slope 70 ±20 MHz)	0.03 dB/MHz maximum (10 MHz maximum)	
140 ±40 MHz)	0.05 dB/MHz maximum (10 MHz maximum)	
Spurious outputs Signal related	65 dBc up to 0 dBm output, 60 dBc above 22 GHz	
Signal independent	- 70 dBm maximum	-75 dBm maximum -65 dBm maximum (Option 16C)
Gain adjustment	30 dB in 0.2 dB steps	
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
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	
Primary power	90–250 VAC	
Slope adjust	±3 dB typical in 0.2 dB steps	
Noise power density	-124 dBm/Hz maximum (-121 above 22 GHz)	N/A
Remote interface	RS485/RS422: User selectable port Ethernet interface: HTTP based web server, SNMP 1.0 configuration, Alarm reporting via SNMP Trap, Telnet access, Password protection	

Note: Specifications are subject to change without notification.

Phase Noise Specifications

MODEL	10	100	1K	10K	100K	300K	1M
U-373-6	-57	-77	-90	-97	-99	-99	-117
U-373-2	-57	-77	-90	-97	-99	-99	-117
U-374	-57	-77	-90	-97	-99	-99	-117
U-375-2	-51	-69	-87	-91	-93	-93	-111
U-376-7	-50	-66	-85	-90	-93	-93	-111
U-376-6	-50	-66	-87	-91	-93	-93	-111
U-377-2	-50	-66	-85	-90	-93	-93	-111
D-321-1	-57	-77	-93	-97	-99	-99	-117
D-322-2	-57	-77	-93	-97	-99	-99	-117
D-325	-57	-77	-92	-97	-99	-99	-117
D-328-6	-51	-69	-87	-91	-93	-93	-111
D-313-2	-49	-63	-69	-79	-91	-91	-109
D-313-3	-49	-63	-69	-79	-91	-91	-109
D-313-4	-49	-63	-69	-79	-91	-91	-109
U-358	-49	-63	-69	-79	-91	-91	-109
U-358-1	-49	-63	-69	-79	-91	-91	-109
U-358-2	-49	-63	-69	-79	-91	-91	-109
U-358-3	-49	-63	-69	-79	-91	-91	-109
U/D-353	-57	-77	-90	-97	-99	-99	-117
U/D-356	-50	-66	-87	-91	-93	-93	-111
U/D-356-2	-50	-66	-87	-91	-93	-93	-111

OFFSET (Hz)
Maximum Phase Noise (dBc/Hz) (1.0 Hz bandwidth) Straight line curve defined by the points in the table

Reverse Frequency Bands

U-321-1R	-57	-77	-93	-97	-99	-99	-117
U-322-2R	-57	-77	-93	-97	-99	-99	-117
U-325-R	-57	-77	-92	-97	-99	-99	-117
U-328-6R	-51	-69	-87	-91	-93	-93	-111
D-373-6R	-57	-77	-90	-97	-99	-99	-117
D-373-2R	-57	-77	-90	-97	-99	-99	-117
D-374R	-57	-77	-90	-97	-99	-99	-117
D-376-7R	-50	-66	-85	-90	-93	-93	-111
D-376-6R	-50	-66	-85	-90	-93	-93	-111
D-377-2R	-50	-66	-85	-90	-93	-93	-111

Maximum External Reference for 10 MHz

MODEL	10	100	1K	10K	100K	300K	1M
All Systems	-120	-150	-160	-160	-160	-160	-160

Options

1. 45 dB level control.

2. RF Signal Monitor (RF connector (2.92 mm) with -20 dBc nominal level - for units about 17.7 GHz).
Noise figure in downconverter: 20 dB maximum

4. 140 MHz IF frequency.
Bandwidth: 80 MHz minimum
Flatness: 0.75 dB/76 MHz
Group delay (±36 MHz)
Linear: 0.025 ns/MHz
Parabolic: 0.0035 ns/MHz^2
Ripple: 1 ns peak-to-peak
IF return loss (140 ±40 MHz): 20 dB minimum
Gain slope: 0.04 dB/MHz maximum (10 MHz minimum)

5. Group delay equalization
1.0 ns p-p maximum/70 ± 18 MHz IF output
2.0 ns p-p maximum/140 ± 36 MHz IF output

8. LO level detect
Summary alarm is generated for loss of power in any of the required local oscillators

10. Higher frequency stability reference.
B. ±1 x 10^{-8}, -40 to +60°C,
1 x 10^{-9}/day typical (fixed temperature after 24 hour on time).
C. ±5 x 10^{-9}, -40 to +60°C,
1 x 10^{-9}/day typical (fixed temperature after 24 hour on time).

14. Remote selectable 50/75 ohms IF impedance.

15. 50 ohm IF impedance.

16. Higher gain option (downconverters only).
C. 55 dB nominal RF/IF gain.
Specification of signal independent spurious increases with increase in IF/RF gain (e.g., if without option, specification is -90 dBm maximum, an increase of 10 dB in gain will result in signal independent spurious of -80 dBm maximum).

18. Multiple IF output module (downconverter only)
-4. Four IF outputs
Output 1 dB compression point: +10 dBm
Intermodulation distortion at 0 dBm output: 40 dBc minimum (+20 dBm IP3)

20. Selectable 70 MHz and 140 MHz IF frequencies
One IF connector provided at rear panel (N female). Selection of IF frequency is available from the front panel and over the remote bus.

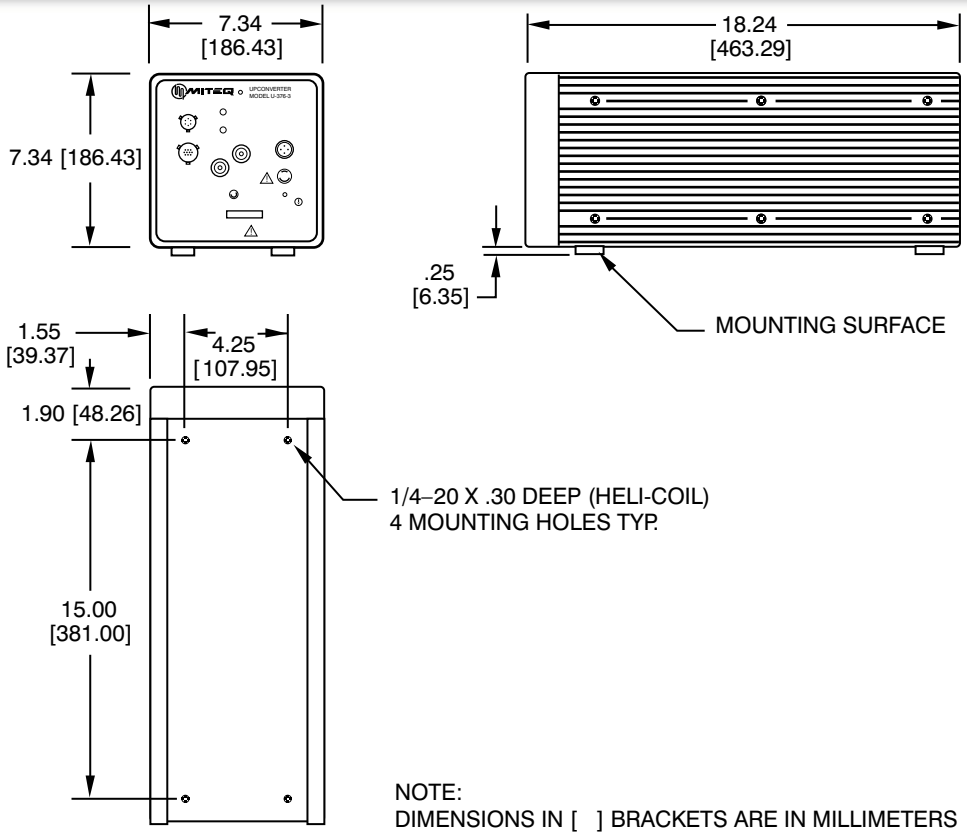
26. Pressurization of enclosure
Converter enclosures capable of 0.5 PSI.
Leak rate 3.0 standard cubic feet per hour maximum.
3/8" NPT thread with 1/4: hose barb supplied.
Note: Waveguide units capable of waveguide pressurization (standard) 10 cm^3/min leak rate.

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

For literature describing local control and remote control (bus protocols), refer to MITEQ's Technical Note 25T074. Protocol backward compatible with 25T032 (with minor exceptions). Please consult factory for compatibility chart.

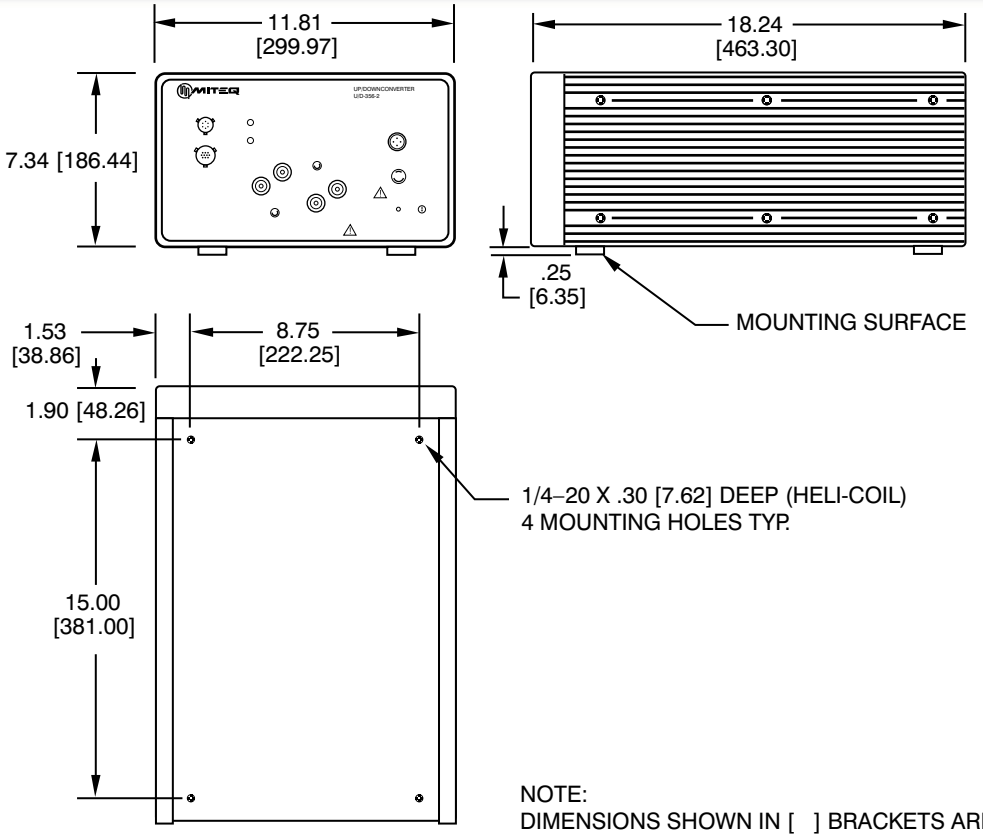
For SATCOM low-noise amplifiers, refer to MITEQ's Catalog C-39.

Up or Downconverter Outline Drawing



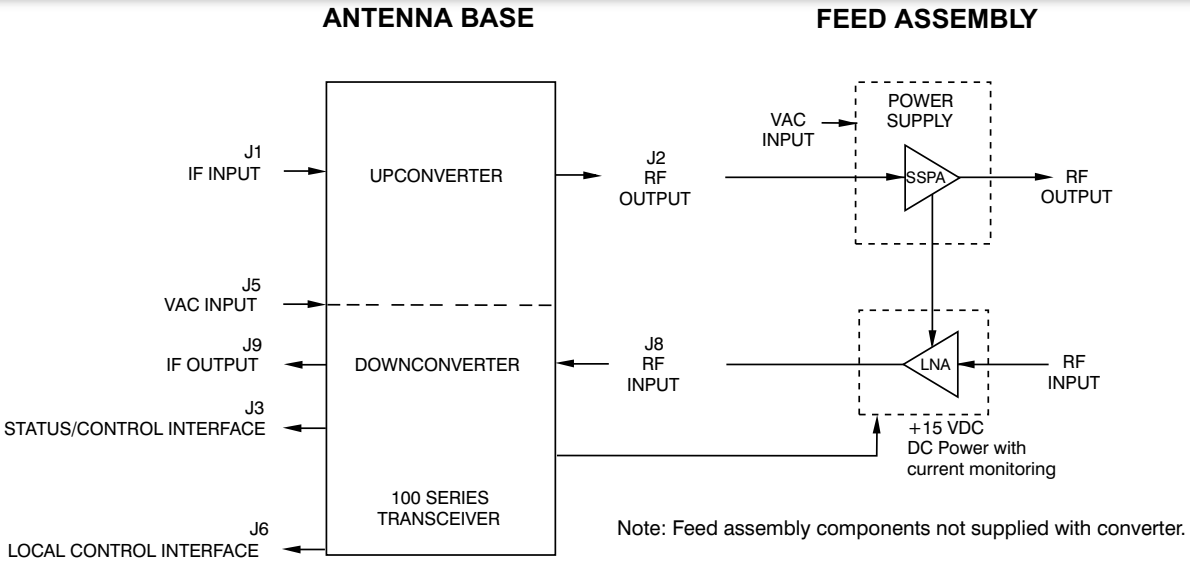
NOTE:
DIMENSIONS IN [ ] BRACKETS ARE IN MILLIMETERS

Up/Downconverter Outline Drawing



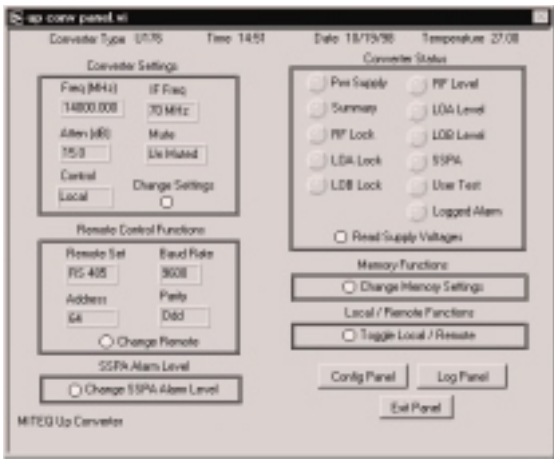
NOTE:
DIMENSIONS SHOWN IN [ ] BRACKETS ARE IN MILLIMETERS.

Typical System Diagram

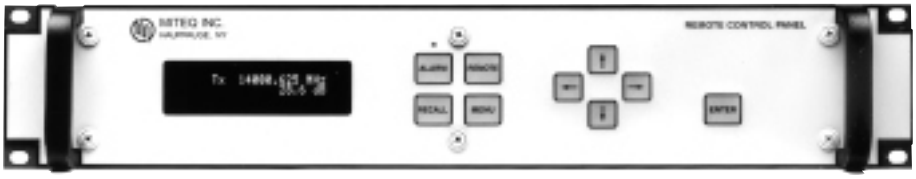


Note: Feed assembly components not supplied with converter.

Control Options



Robust software feature set
(supplied as standard)



19" Rack-mount control unit, 2 RU
MITEQ Model Number RCT-300
(sold separately)

General Specifications

PRIMARY POWER REQUIREMENTS

Voltage	90-250 VAC
Frequency	47-63 Hz
Power consumption	
Up or downconverter units	60 W typical
Combined up/downconverters	120 W typical

SUMMARY ALARM

Contact closure/open for DC voltage and/or LO alarm
Status alarm readout on remote control bus

PHYSICAL

Converter enclosure	Refer to outline drawing
Connectors	
RF	SMA female (WR-28 above 26 GHz; 2.92 mm optional)
RF monitor	SMA female (N/A above 17.7 GHz)
IF	N female
External reference	BNC female
Redundancy interface mating	MS3116F14-18P*
Ethernet interface	RJ-45 female
AC input	FCI Clipper series CL1M1102 (Clipper series is interchangable with MIL-C-5015 and AMP CPC product)

*Note: Unit supplied with mating connector

Converter enclosure weight	
Up or downconverter units	22 pounds typical
Combined up/downconverters	30 pounds typical

ENVIRONMENTAL

Operating	
Ambient temperature	-40 to +60 °C
Atmospheric pressure	Up to 10,000 feet
Non-operating	
Ambient temperature	-50 to +70°C
Atmospheric pressure	Up to 40,000 feet
Shock and vibration	Normal handling By commercial carriers

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