These converters operate at the standard X-band military communication frequencies of 7.25–7.75 GHz (downlink), and 7.9–8.4 GHz (uplink). The converters have been designed for exceptionally low phase noise and spectral purity. An internal microwave synthesizer provides frequency tuning in 1.0 kHz minimum frequency steps over the RF frequency band. Local control is with front panel keyboard and remote control is by RS485 input command. Up to 30 discrete frequencies may be programmed into a nonvolatile memory.

**FEATURES**

- Dual conversion with 1.0 kHz frequency step size
- Local (keyboard) or remote control (RS485)
- Low intermodulation distortion
- No spectral inversion
- Low phase noise
- Status monitors
- Summary alarm
- 30 programmable frequencies
- Nonvolatile memory
UPCONVERTER SPECIFICATIONS

Type ........................................................ Dual conversion
Tunability................................................. Second local oscillator only, 1.0 kHz minimum frequency step size
Frequency sense .................................... No inversion
Input characteristics
  Frequency........................................ 70 ±20 MHz
  Impedance ....................................... 75 ohms (50 ohms optional)
  Return loss ...................................... 26 dB minimum
  Signal levels .................................... -10 dBm maximum for +10 dBm output, +20 dBm minimum non-damage
Output characteristics
  Frequency........................................ 7.9–8.4 GHz
  Impedance ....................................... 50 ohms
  Signal level .................................... +10 dBm for 70 MHz input of -10 dBm to +10 dBm
  LO leakage (output) ......................... -85 dBc minimum at any setting of upconverter gain
  Power output
    (1 dB compression) .................... +10 dBm minimum for any gain setting from 0 dB to 20 dB
    Residual AM .................................. 66 dBc minimum
    RF output monitor ......................... -10 dBc nominal, not affected by mute control
    Output muting (see note) ............... 60 dB minimum
    Return loss .................................. 20 dB minimum
Transfer characteristics
  Noise figure ..................................... 20 dB maximum
  Gain ............................................. 20 dB minimum, 25 dB maximum
  Gain adjustment range ................. 0 dB to 20 dB in 0.2 dB steps
  Amplitude flatness ......................... ±0.15 dB over any 12 MHz segment, ±0.20 dB/20 MHz, ±0.25 dB/40 MHz
  Gain stability ................................ +0.25 dB/24 hours for any 15°C change in temperature from 0–50°C,
                                           ±0.1 dB/minute
  Spurious outputs
    (+10 dBm carrier output) ......... -80 dBc maximum for f greater than 1 MHz offset from carrier,
                                           -60 dBc maximum for f between 300 Hz and 1 MHz offset from carrier,
                                           -45 dBc maximum for f less than 300 Hz offset from carrier

DOWNCONVERTER SPECIFICATIONS

Type ........................................................ Dual conversion
Tunability................................................. First local oscillator only, 1.0 kHz minimum frequency step size
Frequency sense .................................... No inversion
Input characteristics
  Frequency......................................... 7.25–7.75 GHz
  Impedance ........................................ 50 ohms
  Return loss ....................................... 20 dB minimum
  Signal level ...................................... -41 dBm maximum operating, +10 dBm maximum non-damage
  LO leakage (input) ......................... -80 dBm maximum
  RF test input ..................................... -10 dB nominal, not affected by mute command
  Input mute (see note) ....................... 60 dBc minimum
Output characteristics
  Frequency......................................... 70 ±20 MHz
  Impedance ....................................... 75 ohms (50 ohms optional)
  Return loss ....................................... 26 dB minimum
  Signal level ...................................... 0 dBm ±1 dB, for -45 dBm RF input
  Power output
    (1 dB compression) .................... +10 dBm minimum for any gain setting from 25 dB to 45 dB
Transfer characteristics
  Noise figure ..................................... 16 dB maximum
  Gain .................................................. 45 dB minimum, 50 dB maximum
  Gain adjustment range ................. 25 dB to 45 dB in 0.2 dB steps
  Amplitude flatness ......................... ±0.15 dB over any 12 MHz segment, ±0.20 dB/20 MHz, ±0.25 dB/40 MHz
  Gain stability ................................ +0.35 dB/24 hours for any 15°C change in temperature from 0–50°C,
                                           ±0.1 dB/minute
  Image rejection ......................... 80 dB minimum
  Third order intermodulation .......... With two -46 dBm in-band input signals, 65 dBc minimum
  Spurious outputs
    (input signal -41 dBm) .............. -80 dBc maximum for f greater than 1 MHz offset from carrier,
                                           -60 dBc maximum for f between 300 Hz and 1 MHz offset from carrier,
                                           -45 dBc maximum for f less than 300 Hz offset from carrier
**GENERAL SPECIFICATIONS, UPCONVERTER AND DOWNCONVERTER**

5 MHz reference input......................... 3 dBm to +10 dBm, +16 dBm minimum non-damage
Input impedance (5 MHz)........................ 50 ohms unbalanced, 1.5:1 VSWR maximum
Phase linearity ....................................... ±0.025 radian in any 12 MHz segment, ±0.05 radian ±10 MHz,
                                           ±0.10 radian ±20 MHz

Spectral purity (total spurious content imparted to carriers including phase noise and discrete spurious signals):
A. At least 28 dB below the carrier level, integrated over a single-sided bandwidth covering the range of offsets from
   the carrier of 0.6 to 75 Hz.
B. At least 36 dB below the carrier level, integrated over a single-sided bandwidth covering the range of offsets from
   the carrier of 10 Hz to 5 MHz.
C. At least 36 dB below the carrier level, integrated over a single-sided bandwidth covering the range of offsets from
   the carrier of 5 MHz to 20 MHz.
D. At least 57 dB below the carrier level, integrated over any single-sided 3 kHz bandwidth covering the range of
   offsets from the carrier of 12 kHz to 20 kHz.
E. At least 63 dB below the carrier level, integrated over any single-sided 3 kHz bandwidth covering the range of
   offsets from the carrier of 20 kHz to 60 kHz.
F. At least 71 dB below the carrier level, integrated over any single-sided 3 kHz bandwidth covering the range of
   offsets from the carrier of 60 kHz to 300 kHz.

<table>
<thead>
<tr>
<th>Offset (Hz)</th>
<th>SSB Phase Noise in 1 Hz BW</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>-72 dB, maximum</td>
</tr>
<tr>
<td>1.0</td>
<td>-93 dB, maximum</td>
</tr>
<tr>
<td>10.0</td>
<td>-120 dB, maximum</td>
</tr>
<tr>
<td>100.0</td>
<td>-126 dB, maximum</td>
</tr>
<tr>
<td>1000.0</td>
<td>-140 dB, maximum</td>
</tr>
</tbody>
</table>

Remote control bus.......................... RS485 (other remote bus configurations available)
MTBF .................................................. 10,000 hours minimum
MTR ................................................... 20 minutes maximum

Notes: Muting will occur for failure of converter or remote mute command on RS485 bus.
Test and monitor points are not affected by mute control.

**OPTIONS**

2. LO level alarm. Summary alarm (contact closure) is generated for loss of power in any of the required local oscillators.

   A. ±2 x 10⁻⁸, 0 to 50°C; ±5 x 10⁻⁹/day typical (fixed temperature after 24 hour on time).
   B. ±1 x 10⁻⁸, 0 to 50°C; 5 x 10⁻⁹/day typical (fixed temperature after 24 hour on time).
   C. ±5 x 10⁻⁹, 0 to 50°C; 1 x 10⁻⁹/day typical (fixed temperature after 24 hour on time).
   D. ±2 x 10⁻⁹, 0 to 50°C; 1 x 10⁻⁹/day typical (fixed temperature after 24 hour on time).

15. 50 ohm IF impedance.

17. Remote control. RS485 is supplied as standard.
   A. RS422.
   C. RS232.
   D. Contact closure selection of up to sixteen pre-programmed frequencies.
   F. IEEE 488.

24. 10 MHz reference frequency.

Note: Missing option numbers are not applicable to this product.
**X-BAND UPCONVERTER AND DOWNCONVERTER**

**PRIMARY POWER REQUIREMENTS**

- Voltage: ........................................... 100, 120, 220, 230/240 VAC +10%, -13% (rear panel selectable)
  250 VAC maximum
- Frequency: ........................................ 45–65 Hz
- Power consumption: ............................ 175 W maximum

**SUMMARY ALARM**

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

**PHYSICAL**

- Weight: ........................................... 30 pounds nominal
- Overall dimensions: ............................ 19" x 3.5" panel x 22" maximum (chassis depth 20")
- Connectors (rear panel):
  - RF: Type N female
  - IF: Type BNC female
  - Reference input: Type BNC female
  - RF test input (downconverter): Type N female
  - RF test output (upconverter): Type N female
- Summary alarm: .................................. DE-9P
- Redundancy alarm: ............................... DE-9P
- LO frequency/power monitor: ............. SMA female (front panel)

**ENVIRONMENTAL**

- Operating:
  - Operation: Continuous (24 hours per day)
  - Temperature: 3 to 50°C
  - Relative humidity: Up to 100%, noncondensing
  - Altitude: Elevations up to 13,500 feet above sea level
- Nonoperating:
  - Temperature: -40 to +60°C
  - Relative humidity: Up to 90% at air temperature below 0°C, up to 100% at air temperature above 0°C
  - Elevation: Up to 40,000 feet above sea level

Note: For literature describing local control (front panel) and remote control (bus protocols), refer to MITEQ’s Technical Note 25T010.