



MODELS

UP-31695 AND DN-31695

7.25–7.75 GHz (Downconverter)

7.9–8.4 GHz (Upconverter)

Synthesized

1.0 kHz Step Size

X-BAND CONVERTERS 70/700 MHz IF FREQUENCIES



These converters operate at the X-band communication frequencies of 7.25–7.75 GHz (downlink), and 7.9–8.4 GHz (uplink). The converters support the dual IF frequencies of 70 MHz and 700 MHz. 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 a front panel keyboard and remote control is by RS485 input command. Up to 32 discrete frequency/attenuation/IF settings may be programmed into a nonvolatile memory.

OPTIONS

- High frequency stability internal reference
- RS422, RS232, IEEE-488 or contact closure remote interface

FEATURES

- 1.0 kHz frequency step size
- Dual 70 MHz and 700 MHz IF frequency
- Local (keyboard) or remote control (RS485)
- Low intermodulation distortion
- No spectral inversion
- Status monitors
- Summary alarm
- 32 programmable frequency/attenuation/IF settings
- Nonvolatile memory

UPCONVERTER SPECIFICATIONS

| | |
|-------------------------------|---|
| Type..... | Dual conversion for 70 MHz input and single conversion for 700 MHz input |
| Tunability | Second local oscillator only, 1.0 kHz minimum step size |
| Frequency sense | No inversion |
| 70 MHz input characteristics | |
| Frequency | 70 ±20 MHz |
| Impedance | 50 ohms |
| VSWR | 1.3:1 maximum |
| Signal levels | -10 to +10 dBm, +20 dBm minimum non-damage |
| 700 MHz input characteristics | |
| Frequency | 700 ±62.5 MHz |
| Impedance | 50 ohms |
| VSWR | 1.3:1 maximum |
| Signal levels | -10 to ±2 dBm, +20 dBm minimum non-damage |
| Output characteristics | |
| Frequency | 7.9–8.4 GHz |
| Impedance | 50 ohms |
| VSWR | 1.25:1 |
| Signal level | -10 dBm for 70 MHz input of -10 dBm to +10 dBm, +10 dBm for 700 MHz input of -10 ±2 dBm |
| LO leakage (output) | -85 dBc for any gain setting |
| Power output | |
| (0.5 dB compression) | +10 dBm minimum with output level +10 dBm or lower |
| Residual AM | 66 dBc minimum |
| RF output monitor | -16 dBc - RF attenuator setting |
| Output muting..... | 60 dB minimum, output muting initiated upon failure of converter or remote command. |
| Transfer characteristics | |
| Noise figure | 20 dB maximum |
| Gain..... | 20 ±1 dB continually adjustable from 0 to 20 dB (rear panel) |
| RF level control | |
| Range | 0 dB to 60 dB below nominal |
| Settability | ±0.1 dB over 60 dB range |
| Accuracy | ±0.5 dB over 60 dB range |
| Amplitude flatness | |
| 70 MHz IF | ±0.2 dB/10 MHz, ±0.4 dB/40 MHz |
| 700 MHz IF | ±0.5 dB/60 MHz, ±0.70 dB/125 MHz |
| Gain stability..... | ±0.25 dB/24 hours for any 15°C change in temperature from 0 to 50°C, ±0.1 dB/minute |
| Image rejection..... | 75 dBm minimum |
| Spurious outputs | |
| (+10 dBm output) | -83 dBc maximum for f greater than 1 MHz offset from carrier, -60 dBc maximum for f between 300 Hz and 1MHz offset from carrier, -45 dBc maximum for f less than 300 Hz offset from carrier |
| Spurious outputs | |
| (700 MHz only)..... | -35 dBc maximum for f between 5 MHz and 40 MHz offset from carrier |

DOWNCONVERTER SPECIFICATIONS

| | |
|---------------------------------|--|
| Type..... | Dual conversion for 70 MHz output and single conversion for 700 MHz output |
| Tunability | First local oscillator only, 1.0 kHz minimum step size |
| Frequency sense | No inversion |
| Input characteristics | |
| Frequency | 7.25–7.75 GHz |
| Impedance | 50 ohms |
| VSWR | 1.25:1 |
| Signal level..... | -41 dBm, maximum operating, +10 dBm minimum non-damage |
| LO leakage..... | -80 dBm |
| 70 MHz output characteristics | |
| Frequency | 70 ±20 MHz |
| Impedance | 50 ohms |
| VSWR | 1.3:1 maximum |
| Signal levels | 0 dBm ±1 dB for -45 dBm RF input |
| Power output | |
| (0.5 dB compression)..... | +10 dBm minimum |
| 700 MHz output characteristics | |
| Frequency | 700 ±62.5 MHz |
| Impedance | 50 ohms |
| VSWR | 1.3:1 maximum |
| Signal levels | 0 dBm ±1 dB for -45 dBm RF input |
| Power output | |
| (0.5 dB compression)..... | +10 dBm minimum |
| Transfer characteristics | |
| Noise figure | 16 dB maximum |
| Gain..... | 45 ±1 dB continually adjustable between 25 dB and 45 ±1 dB (rear panel) |
| Gain stability..... | ±0.25 dB/24 hours for any 15°C change in temperature over the operating range, ±0.1 dB/minute |
| Amplitude flatness | |
| 70 MHz IF | ±0.2 dB/10 MHz, ±0.4 dB/40 MHz |
| 700 MHz IF | ±0.5 dB/60 MHz, ±0.70 dB/125 MHz |
| Intermodulation distortion..... | Two -46 dBm input signals, third order intermodulation products 65 dBc minimum |
| Image rejection..... | 75 dBm minimum |
| Spurious outputs | |
| (-41 dBm input) | -83 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

GENERAL SPECIFICATIONS, UPCONVERTER AND DOWNCONVERTER

5 MHz standard input..... +3 dBm to +10 dBm, +16 dBm minimum non-damage

Input impedance 50 ohms unbalanced, 1.5:1 VSWR maximum

Phase linearity

70 MHz IF..... ±0.05 radian/10 MHz, ±0.10 radian/40 MHz

700 MHz IF..... ±0.07 radian/60 MHz, ±0.15 radian/125 MHz

Spectral purity

(total spurious content imparted to carriers including phase noise and discrete spurious signals):

- A.** At least 28.0 dB below the carrier level, integrated over a single-sided bandwidth covering the range of offsets from the carrier of 0.6 Hz to 75 Hz.
- B.** At least 36.0 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 36.0 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 57.0 dB below the carrier level, 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, 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, over any single-sided 3 kHz bandwidth covering the range of offsets from the carrier of 60 kHz to 300 kHz.

Spectral purity will be met with the following 5 MHz spectral purity performance:

| Frequency From Carrier | Phase Noise Single Sideband (dBm/Hz) |
|---------------------------|---|
| 1.0 Hz | -96 |
| 10.0 Hz | -120 |
| 35.0 Hz | -125 |
| 100.0 Hz | -140 |
| 1 kHz | -140 |
| 350 kHz | -140 |
| 1 MHz | -140 |
| 20 MHz | -140 |

PRIMARY POWER REQUIREMENTS

Voltage..... 100, 120, 220, 230/240 VAC rear panel selectable.

Non-damage for transients of ±20% maximum for durations of one minute maximum

Frequency..... 50 to 60 Hz ±5%. Non-damage for transients of ±10% maximum for durations of one minute maximum

Power consumption 150 W maximum

SUMMARY ALARM

Contact closure/open for DC voltage alarm

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

OPTIONS

- 10.** Internal 5 MHz crystal oscillator reference.
- A.** $\pm 2 \times 10^{-8}$, 0 to 50°C,
 $\pm 5 \times 10^{-9}$ / day typical (fixed temperature after 24 hour on time).
 - B.** $\pm 1 \times 10^{-8}$, 0 to 50°C,
 5×10^{-9} / day typical (fixed temperature after 24 hour on time).
 - C.** $\pm 5 \times 10^{-9}$, 0 to 50°C,
 1×10^{-9} / day typical (fixed temperature after 24 hour on time).
 - D.** $\pm 2 \times 10^{-9}$, 0 to 50°C,
 1×10^{-9} / day typical (fixed temperature after 24 hour on time).
- 17.** Remote control.
- A.** RS422.
 - B.** RS485 (supplied as standard).
 - C.** RS232.
 - D.** Contact closure selection of up to sixteen preprogrammed steps.
 - F.** IEEE-488.
- 23.** 5 MHz reference configuration (must be ordered with Option 10).
- B.** An internal 5 MHz reference is provided. The internal 5 MHz reference is brought out of and back into the rear panel with a “U-link” coaxial cable (BNC connectors). This allows, after “U-link” removal, insertion of an external 5 MHz reference input (+3 to +10 dBm).
 - C.** Internal/external reference selection.
An SPDT switch is used to select either the internal 5 MHz reference or an external 5 MHz reference. External 5 MHz reference input is through a rear panel BNC female connector (+3 to +10 dBm). Reference selection is controlled from a rear panel toggle switch.
 - D.** Automatic reference switchover.
An internal 5 MHz reference and rear panel connector for external reference input (+3 to +10 dBm) is provided. The converter oscillators will lock to the external reference. If external reference is not present, the converter oscillators will automatically lock to the internal reference.

Note: Missing option numbers are not applicable for these systems.

X-BAND UP CONVERTERS 70/700 MHz IF FREQUENCIES

PHYSICAL

| | |
|------------------------------------|--|
| Weight | 45 pounds nominal |
| Overall dimensions | 19" x 3.5" panel x 22" maximum (chassis depth 20") |
| Connectors (rear panel) | |
| RF | N female |
| IF | BNC female |
| 5 MHz input | BNC female |
| RF test output (upconverter) | N female |
| Remote interface | DE-9S for RS485 and RS422, DB-25P for RS232, DB-25S for contact closure, IEEE-488 receptacle for GPIB |
| Summary alarm | DE-9P |
| Test points (rear panel) | LO phase-lock voltage (jack), DC voltage (jack) |
| Test points (front panel) | LO frequency/power (SMA female) |

ENVIRONMENTAL

| | |
|---------------------------------|---|
| Operating | |
| Continuous | 24 hours per day |
| Temperature | 0 to +50°C, per MIL-STD-810E, method 502.3, procedure I; method 501.3, procedure I |
| Relative humidity | Down to 10% at 45°C and up to 90% from 0 to +37.8°C, per MIL-STD-810E, method 507.3, procedure I |
| Altitude | Up to 10,000 feet above sea level |
| Electromagnetic radiation | MIL-STD-461C Part 4 for EMI |
| Nonoperating | |
| Temperature | -40 to +52°C, per MIL-STD-810E, method 502.3, procedure I; method 501.3, procedure I |
| Relative humidity | Down to 10% at +52°C and up to 90% from -31 to +37.8°C, per MIL-STD-810E, method 507.3, procedure I |
| Altitude | Up to 40,000 feet per MIL-STD-810E, method 500.3, procedure I |
| Shock | Rail impact test for equipment transferred by rail per MIL-STD-810E, method 516.4, procedure VIII |
| Vibration | Subjected to the vibration extreme for equipment transported by common carrier as secured cargo by land, sea or air per MIL-STD-810E, method 514.4, procedure I |

Note: For literature describing local control (front panel) and remote control (bus protocols), refer to MITEQ's Technical Note 25T013.



100 Davids Drive, Hauppauge, NY 11788
TEL.: (631) 436-7400 • FAX: (631) 436-7431/436-7430
www.miteq.com