



Synthesized or
Crystal Controlled

INMARSAT C- AND L-BAND CONVERTERS



FEATURES

- External 5 MHz reference
- Low intermodulation distortion
- Low phase noise
- Summary alarm

This series of converters is designed to operate in INMARSAT satellite communication terminals.

SYNTHESIZED CONVERTER FEATURES

- Dual conversion
- Local and remote control
- Digital attenuation control
- Nonvolatile memory

C-BAND CONVERTERS

SYNTHESIZED UPCONVERTERS

Model Number	Frequency Step Size	AFC Capability
U-94-INMST	125 kHz	No
U-94-INMST-1K	1 kHz	No
U-94-INMST-AFC	125 kHz	Yes
U-94-INMST-1K-AFC	1 kHz	Yes

SYNTHESIZED DOWNCONVERTERS

Model Number	Frequency Step Size	AFC Capability
D-94-INMST	125 kHz	No
D-94-INMST-1K	1 kHz	No
D-94-INMST-AFC	125 kHz	Yes
D-94-INMST-1K-AFC	1 kHz	Yes

L-BAND CONVERTERS

SYNTHESIZED UPCONVERTERS

Model Number	Frequency Step Size	Frequency Conversion Scheme
U-9448-2 (see note)	125 kHz	Dual
U-9448-2-1K (see note)	1 kHz	Dual

CRYSTAL-CONTROLLED UPCONVERTERS

Model Number	Frequency Step Size	Frequency Conversion Scheme
U-90-INMST	None	Single

SYNTHESIZED DOWNCONVERTERS

Model Number	Frequency Step Size	Frequency Conversion Scheme
D-9400-2 (see note)	125 kHz	Dual
D-9400-2-1K (see note)	1 kHz	Dual

CRYSTAL-CONTROLLED DOWNCONVERTERS

Model Number	Frequency Step Size	Frequency Conversion Scheme
D-90-INMST	None	Single

Note: Please refer to 9400 Series data sheet D-148 for complete specifications for these converters. To ensure that these converters will meet the INMARSAT phase noise profile, the converters should be ordered with the following statement: "Option: INMARSAT phase noise."

C-BAND DOWNCONVERTER SPECIFICATIONS

Type	Dual conversion
Tunability	First local oscillator only
Frequency sense	No inversion
Input characteristics	
Frequency	3.575–4.225 GHz
Note: For crystal controlled units, frequency of operation must be supplied at time of order.	
Impedance	50 ohms
Return loss	20 dB minimum
LO leakage	-80 dBm maximum
Output characteristics	
Frequency	70 ±20 MHz
Impedance	75 ohms (50 ohms optional)
Return loss	26 dB minimum
Power output (1 dB compr.)	+15 dBm typical, +10 dBm minimum
Signal monitor	-20 dBc nominal
Transfer characteristics	
Noise figure.....	10 dB typical, 12 dB maximum
Gain	30 dB nominal (higher gain optional)
Image rejection	80 dB minimum
Level stability	±0.25 dB/day maximum at constant temperature
Amplitude response.....	±0.25 dB/±20 MHz, ±0.20 dB/±18 MHz
Group delay (±18 MHz).....	0.03 ns/MHz maximum linear, 0.01 ns/MHz maximum parabolic, 1 ns peak-to-peak maximum ripple
Intermodulation distortion (third order)	With two -10 dBm output signals, 60 dBc minimum
AM/PM conversion.....	0.1°/dB maximum to +5 dBm output
Gain slope	0.02 dB/MHz maximum
Spurious outputs	
Signal related	65 dBc minimum
Signal independent	-90 dBm maximum
Gain adjustment	30 dB
Gain adjustment step size	0.2 dB (synthesized converters), continuous adjust (crystal controlled converters)
External reference	5 MHz, +4 ±3 dBm
AFC input (AFC capable units only)	5 MHz ±57.5 kHz, 0 ±3 dBm
IF output mute	60 dB (AFC capable units only. IF monitor output is not muted)

C-BAND UPCONVERTER SPECIFICATIONS

Type	Dual conversion
Tunability	Second local oscillator only
Frequency sense	No inversion
Input characteristics	
Frequency	70 ±20 MHz
Impedance	75 ohms (50 ohms optional)
Return loss	26 dB minimum
Signal monitor	-20 dBc nominal
Output characteristics	
Frequency	5.925–6.475 GHz
Note: For crystal controlled units, frequency of operation must be supplied at time of order.	
Impedance	50 ohms
Return loss	20 dB minimum
Power output (1 dB compr.)	-5 dBm nominal (up to +20 dBm with optional output amplifiers, refer to options)

C-BAND UPCONVERTER SPECIFICATIONS (CONT.)

Transfer characteristics

Gain	11 dB nominal (at minimum attenuation)
Image rejection	80 dB minimum
Level stability	±0.25 dB/day maximum at constant temperature
Noise figure.....	20 dB typical, 25 dB maximum
Amplitude response.....	±0.25 dB/±20 MHz, ±0.20 dB/±18 MHz
Group delay (±18 MHz).....	0.03 ns/MHz maximum linear, 0.01 ns/MHz maximum parabolic, 1 ns peak-to-peak maximum ripple
Intermodulation distortion	
(third order).....	At -20 dBm output, 50 dBc minimum
AM/PM conversion.....	0.1°/dB maximum to -15 dBm output
Gain slope.....	0.02 dB/MHz maximum

Spurious outputs

Signal related	65 dBc minimum
Signal independent	-90 dBm maximum (synthesized converters), -80 dBm maximum (crystal controlled converters)

Gain adjustment

30 dB

Gain adjustment step size

0.2 dB (synthesized models),
continuous adjust (crystal controlled converters)

Upconverter mute

60 dB

External reference

5 MHz, +4 ±3 dBm

AFC input (AFC capable units only)

5 MHz ±57.5 kHz, 0 ±3 dBm

L-BAND UPCONVERTER SPECIFICATIONS

Type Single conversion

Frequency sense No inversion

Input characteristics

Frequency	70 ±20 MHz
Impedance	75 ohms (50 ohms optional)
Return loss	26 dB minimum

Output characteristics

Frequency	1.61–1.67 GHz
Note: For crystal controlled units, frequency of operation must be supplied at time of order.	
Impedance	50 ohms
Return loss	20 dB minimum
Power output (1 dB compr.)	+10 dBm minimum

Transfer characteristics

Gain	30 dB nominal (at minimum attenuation)
Image rejection	80 dB minimum
Level stability	±0.25 dB/day maximum at constant temperature
Amplitude response.....	±0.25 dB/±20 MHz, ±0.20 dB/±18 MHz
Group delay (±18 MHz).....	0.03 ns/MHz maximum linear, 0.01 ns/MHz maximum parabolic, 1 ns peak-to-peak maximum ripple
Intermodulation distortion	
(third order).....	At -10 dBm output, 60 dBc minimum
AM/PM conversion.....	0.1°/dB maximum to +5 dBm output
Gain slope.....	0.02 dB/MHz maximum

Spurious outputs

Signal related	65 dBc minimum
Signal independent	-60 dBm maximum

Gain adjustment

30 dB continuously variable

Upconverter mute

60 dB

External reference

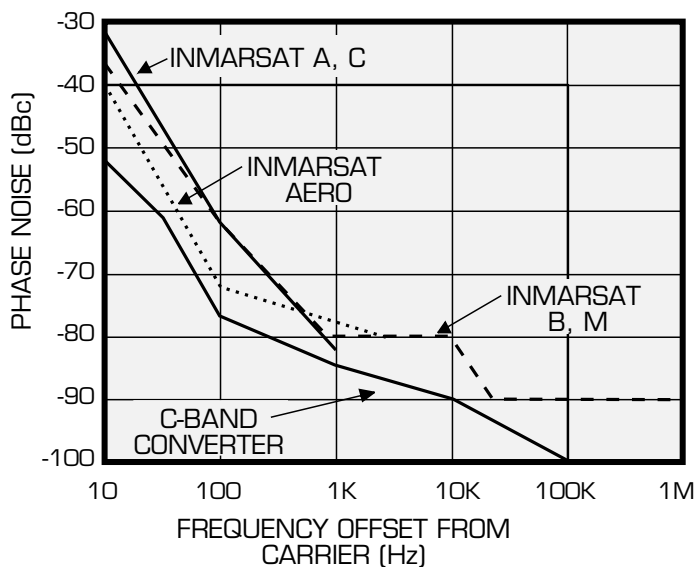
5 MHz, +4 ±3 dBm

L-BAND DOWNCONVERTER SPECIFICATIONS

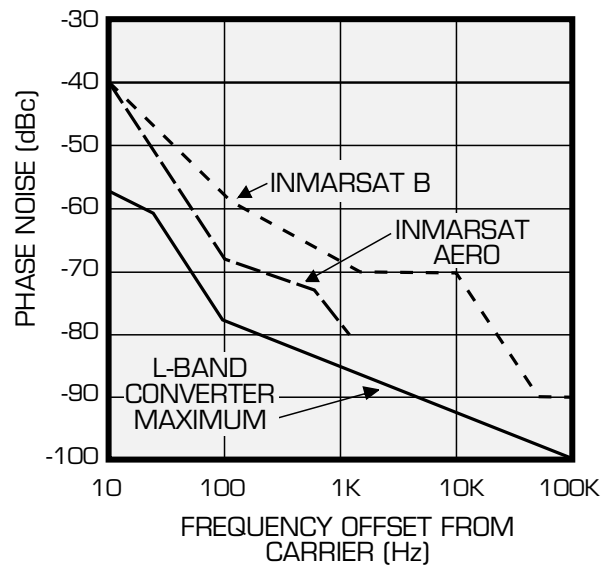
Type	Single conversion
Frequency sense	No inversion
Input characteristics	
Frequency	1.50–1.58 GHz
Note: For crystal controlled units, frequency of operation must be supplied at time of order.	
Impedance	50 ohms
Return loss	20 dB minimum
Output characteristics	
Frequency	70 ±20 MHz
Impedance	75 ohms (50 ohms optional)
Return loss	26 dB minimum
Power output (1 dB compr.)	+15 dBm typical, +10 dBm minimum
Transfer characteristics	
Noise figure	12 dB maximum
Gain	30 dB nominal (higher gain optional)
Image rejection	80 dB minimum
Level stability	±0.25 dB/day maximum at constant temperature
Amplitude response	±0.25 dB/±20 MHz, ±0.20 dB/±18 MHz
Group delay (±18 MHz)	0.03 ns/MHz maximum linear, 0.01 ns/MHz maximum parabolic, 1 ns peak-to-peak maximum ripple
Intermodulation distortion	
(third order)	At -10 dBm output, 60 dBc minimum
AM/PM conversion	0.1°/dB maximum to +5 dBm output
Gain slope	0.02 dB/MHz maximum
Spurious outputs	
Signal related	65 dBc minimum
Signal independent	-60 dBm maximum
Gain adjustment	30 dB continuously variable
External reference	5 MHz, +0 ±3 dBm

PHASE NOISE CHARTS

C-BAND PHASE NOISE CHARACTERISTICS (1.0 Hz BANDWIDTH)



L-BAND PHASE NOISE CHARACTERISTICS (1.0 Hz BANDWIDTH)



OPTIONS

- 2. A.** RF signal monitor.
Rear panel RF connector (SMA) with -20 dBc nominal level.
- 8.** LO level alarm.
Summary alarm is generated for loss of power in any of the required local oscillators.
- 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).
- 11.** Increased output power (C-band upconverters).
 - A.** +5 dBm minimum power output, (1 dB compression).
 - B.** +10 dBm minimum power output, (1 dB compression).
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).
- 15.** 50 ohm IF impedance.
- 16.** Higher gain option (downconverters).
 - A.** 45 dB nominal RF/IF gain.
 - C.** 55 dB nominal RF/IF gain.
- 17.** Remote control (synthesized converters only).
 - A.** RS422.
 - B.** RS485 (supplied as standard).
 - C.** RS232.
 - D.** Contact closure selection of up to sixteen preprogrammed frequencies.
 - F.** IEEE-488.
 - G.** BCD contact closure.
- 19.** Input prime voltage -48 VDC.
Connector MS3102E10SL-3P
Pin A: -48 VDC
Pin B: Common
Pin C: Chassis ground

OPTIONS (CONT.)

- 22.** Dedicated remote control panel.
Provides remote control and status over a dedicated RS485 bus.
Option 17B (RS485 remote bus) must be ordered.
- 23.** 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 (+4 \pm 3 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 (+4 \pm 3 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 (+4 \pm 3 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 to this product.

For literature describing the synthesized converters local control (front panel) and remote control (bus protocols), refer to MITEQ's Technical Note 25TO10 (9400 Series). For literature describing the AFC capable synthesized converters local control (front panel) and remote control (bus protocols), refer to MITEQ's Technical Note 25TO15.

INMARSAT C- AND L-BAND CONVERTERS

PRIMARY POWER REQUIREMENTS

Voltage	100, 120, 220, 230/240 VAC +10%, -13% (rear panel selectable), 250 VAC maximum
Frequency	47-63 Hz
Power consumption	160 W maximum

SUMMARY ALARM

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

PHYSICAL

Weight	20 pounds nominal, 30 pounds nominal (C-band crystal controlled converters)
Overall dimensions.....	19" x 3.5" panel height x 22" maximum (chassis depth 20")
Rear panel connectors	
RF	N female
IF	BNC female
IF signal monitor	BNC female
RF signal monitor.....	SMA female
External reference input.....	BNC female
AFC input	BNC female (AFC capable units only)
Remote interface (synthesized converters only).....	DEM-9S for RS485 and RS422, DB-25P for RS232, DB-25S for contact closure, IEEE-488 receptacle for GPIB
Summary alarm.....	DE-9P
Redundancy alarm	DE-9P
External mute control	DE-9P (AFC capable units only)
LO phase voltage	Jack (front panel display for synthesized converters)
LO frequency power monitor.....	SMA female (front panel for synthesized converters)

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



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