TELEDYNE
PARADISE DATACOM
A Teledyne Technologies Company

GaN vBUC
VSAT Block Up Converters

80W X-Band GaN vBUC

The next generation of High Power Density Block Up Converters has been unveiled at Teledyne Paradise Datacom!

Powered by GaN technology, these converters are the most efficient in the Satcom Industry. GaN devices pack a high output power capability within a compact physical volume. GaN devices make ideal power amplifiers at microwave frequencies because they can operate at much higher temperatures and work at much higher voltages than GaAs devices. GaN devices also offer higher power efficiency and greater linear power capability.

A wide range of monitor and control is standard and includes Legacy FSK protocol, Standard Paradise Datacom RS-485 and Ethernet support via UDP, SNMP, and an Internal Web Browser.

The vBUC is available in 1:1 redundant configurations, 1:2 redundant configurations with the addition of a RCP2-1200 Redundant System Controller. Chain 1:1 redundancy is available with the use of a RCPD-1100 Dual Redundant Controller.

FEATURES

- Single box BUC output power levels to:
  - 80W C-Band
  - 80W X-Band
  - 40W Ku-Band
- CE Compliance Tested
- Output Isolator for Load VSWR Protection
- Wide Range of Interface Capability including:
  - FSK Control
  - RS 485
  - Ethernet
- Output Power Detection
- Adjustable Gain
- Automatic detection of external reference power and frequency
- Multiple external reference frequency operation including: 5, 10, 20, 25 & 50 MHz

OPTIONS

- 10 Amp External Bias Tee for IFL Bias feed
- High Stability internal 10 MHz reference
- AC Power Supply
- System Options including: 1:1 & 1:2 Systems; 1:1 Chain Redundancy
- TX & RX Reject Filters
- LNB Power & Reference Port

ENVIRONMENTAL LIMITS

- -40 to +60 °C
- Humidity: 100% condensing

C-Band Output Power Levels

PARAMETER	MODEL NUMBER	NOTES	LIMITS	UNITS
Frequency Range		[1]	5.850 to 6.425	GHz
Output Power @: P_{SAT} / Two-Tone P_{LINEAR} (Typical / Guaranteed Minimum)	VBUCC80AAXXWXX	Gain 79 dB	P_{SAT} / Two-Tone P_{LINEAR} 49.0/45.0 (80/32)	dBm (W)
Power Requirements: Typical (Max) 48 VDC Input Current AC Input Power	VBUCC80AA_XWXX	@ Two-Tone P_{LINEAR} 5.7 (6.0) 335 (355)	@ rated P_{SAT} 7.3 (7.9) 430 (465)	 A W

X-Band Output Power Levels

PARAMETER	MODEL NUMBER	NOTES	LIMITS	UNITS
Frequency Range			7.9 to 8.4	GHz
Output Power @: P_{SAT} / Two-Tone P_{LINEAR} (Typical / Guaranteed Minimum)	VBUCX80AAXXWXX	Gain 79 dB	P_{SAT} / Two-Tone P_{LINEAR} 49.0/45.0 (80/32)	dBm (W)
Power Requirements: Typical (Max) 48 VDC Input Current AC Input Power	VBUCX80AA_XWXX	@ Two-Tone P_{LINEAR} 5.7 (6.0) 335 (355)	@ rated P_{SAT} 7.3 (7.9) 430 (465)	 A W

Ku-Band Output Power Levels

PARAMETER	MODEL NUMBER	NOTES	LIMITS	UNITS
Frequency Range		[1]	14.0 to 14.5	GHz
Output Power @: P_{SAT} / Two-Tone P_{LINEAR} (Typical / Guaranteed Minimum)	VBUCK40AAXXWXX	Gain 76 dB	P_{SAT} / Two-Tone P_{LINEAR} 46.0/43.0 (40/20)	dBm (W)
Power Requirements: Typical (Max) 48 VDC Input Current AC Input Power	VBUCK40AA_XWXX	@ Two-Tone P_{LINEAR} 4.3 (4.8) 255 (285)	@ rated P_{SAT} 5.5 (6.0) 325 (355)	 A W

[1] Units available with Extended band frequencies.
For C-Band units, de-rate output power by 1 dB linearly from 6.425 - 6.725 GHz.
For Ku-Band units, de-rate output power by 1 dB linearly from 14.0 - 13.75 GHz.

Physical Specifications

PARAMETER	LIMITS	UNITS
Weight, GaN vBUC, ±3%: Ku-Band Units X-Band Units C-Band Units Optional AC Power Supply	10.0 (4.55) 11.0 (5.00) 11.5 (5.23) +5.0 (+2.27)	lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg)
Finish	Paint	White, powder coat
Cooling System	Integrated, Forced air	110 CFM
Altitude	No temperature de-rating up to 10,000 ft. (3000 m) De-rate maximum temperature by 2 °C per 1,000 ft. (300 m) beyond 10,000 ft.	
Shock	50 g p-p, 11 msec pulses	
Vibration	3g rms 30 min. 5-2000 Hz	

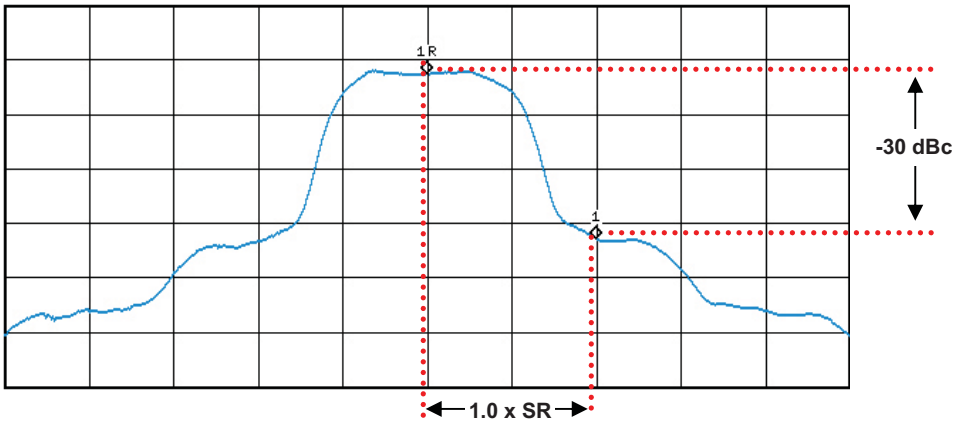
Common Electrical Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain Flatness Gain Slope Gain variation vs. Temperature	full band per 40 MHz	± 2.0 ± 0.75 0 ± 1.0	dB dB dB
Intermodulation Distortion	Measured at Two-Tone P_{LINEAR}	-25	dBc
Spectral Regrowth @ Linear P_{OUT}[1]	Typical	-30	dBc
AM/PM Conversion	@ rated P_{SAT} - 1dB	2.5	°/dB
Spurious	In-Band Signal Related (C-/Ku-Band) (Extended C-Band) Close to Carrier Spurious (≤ 20 MHz) Local Oscillator	-50 -40 -70 -30	dBc dBc dBc dBm
Harmonics	2nd harmonic measured at Two-Tone P_{LINEAR}	-40	dBc
Output Spectrum	Low side Local Oscillator	Non Inverted	
Input VSWR		1.43 : 1	
Output VSWR	Output Isolator	1.25 : 1	
Noise Figure		15	dB
Receive Band Noise Output Power Density (Typical)	C-Band X-Band Ku-Band	-135 -98 -146	dBm/Hz dBm/Hz dBm/Hz
Group Delay (per 40 MHz segment)	Linear Parabolic Ripple	0.02 0.005 1.0	ns/MHz ns/MHz^2 ns p-p
User Adjustable Gain	In 0.1 dB steps	15	dB
Reference Input Frequency	Diplexed on L-Band Input Connector	5, 10, 20, 25, 50 MHz	MHz
Reference Input Power	Diplexed on L-Band Input Connector	-10 to +5	dBm
Input Voltage	+48 VDC nominal	+36 to +60	VDC
FSK Communication[2] Diplexed on L-Band Input	Center Frequency Deviation Locking Range Input Power Range Start Tone Time	650 ±60 ±32.5 -15 to -5 10	KHz KHz KHz dBm msec
Alarm Output	Phase Lock Alarm Internal BUC Voltages BUC Current +48 or +24 VDC Input Voltage Case Temperature LNB Current	Form C Summary Contacts	
Internal Reference Option[3]	Reference Frequency Freq. Stability over temperature range Aging per day Aging per year Frequency Accuracy Warm up time	10 $< \pm 1 \cdot 10^{-8}$ $< \pm 1 \cdot 10^{-9}$ $< \pm 5 \cdot 10^{-8}$ $\pm 1 \cdot 10^{-8}$ 20 minutes	MHz
Internal Reference Phase Noise	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz	-120 -140 -145 -152 -155	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz
LNB Power & Reference Port	Power Output - TNC Reference Output	15 1 +10	VDC A (max) dBm (Nom.)

[1] Linear P_{OUT} varies upon modulation scheme; see Page 4 for more information.
[2] FSK Communication protocol, document # 201410
[3] Internal reference option units will automatically detect and switch to an applied external reference.

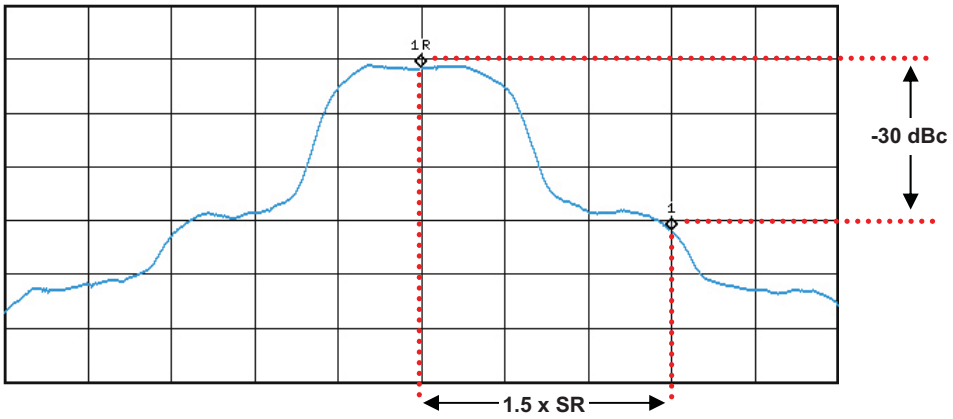
Typical Single Carrier Operation @ Linear P_{OUT}

Spectral Regrowth @ 1.0 x Symbol Rate



PARAMETER	MODULATION	Ku-BAND	X-BAND	C-BAND
Linear P_{OUT}[1] @ 1.0 x Symbol Rate	8PSK, QPSK, OQPSK	44 dBm	47.5 dBm	47.5 dBm
	16QAM	43 dBm	46 dBm	46 dBm

Spectral Regrowth @ 1.5 x Symbol Rate

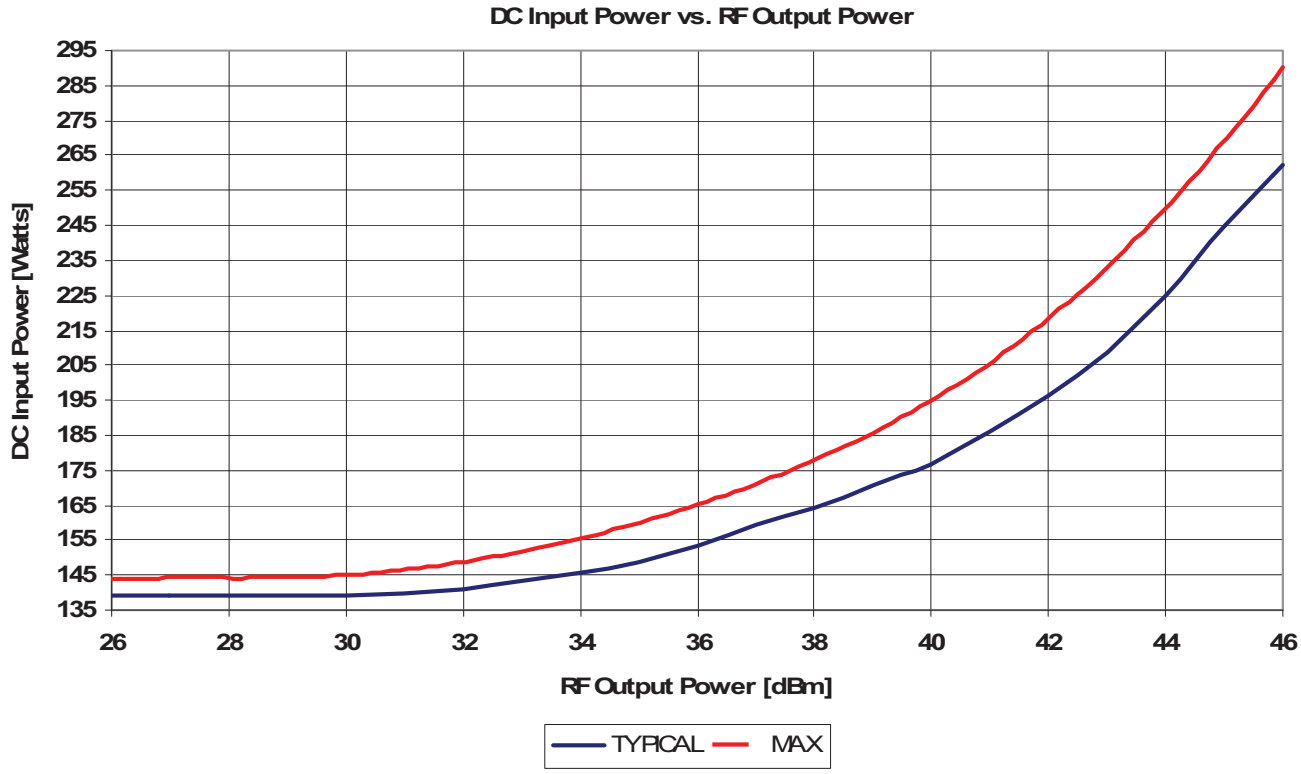


PARAMETER	MODULATION	Ku-BAND	X-BAND	C-BAND
Linear P_{OUT}[1] @ 1.5 x Symbol Rate	8PSK, QPSK, OQPSK	45 dBm	49 dBm	49 dBm
	16QAM	44.5 dBm	48.5 dBm	48.5 dBm

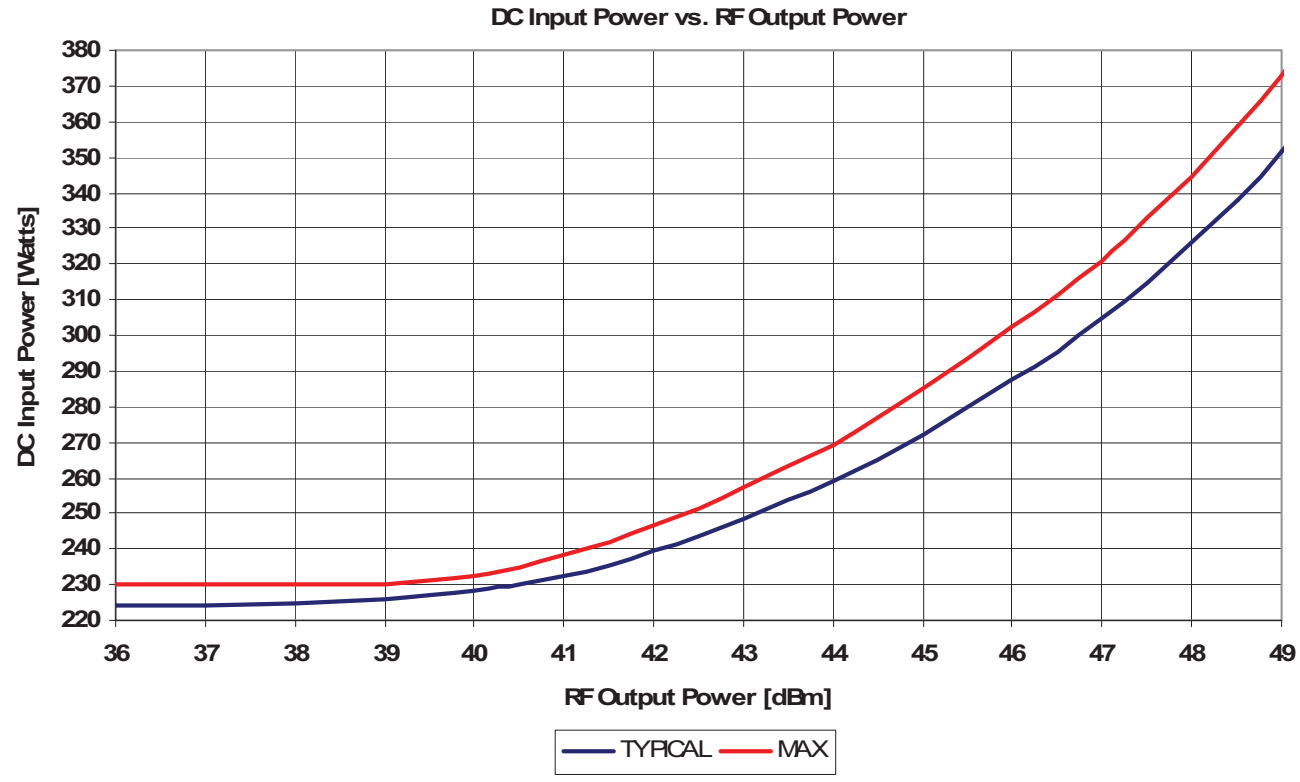
[1] Units available with Extended band frequencies.
For C-Band units, de-rate output power by 1 dB linearly from 6.425 - 6.725 GHz.
For Ku-Band units, de-rate output power by 1 dB linearly from 14.0 - 13.75 GHz.

Best Efficiency of any BUC of Equivalent Output Power Capability

Ku-Band

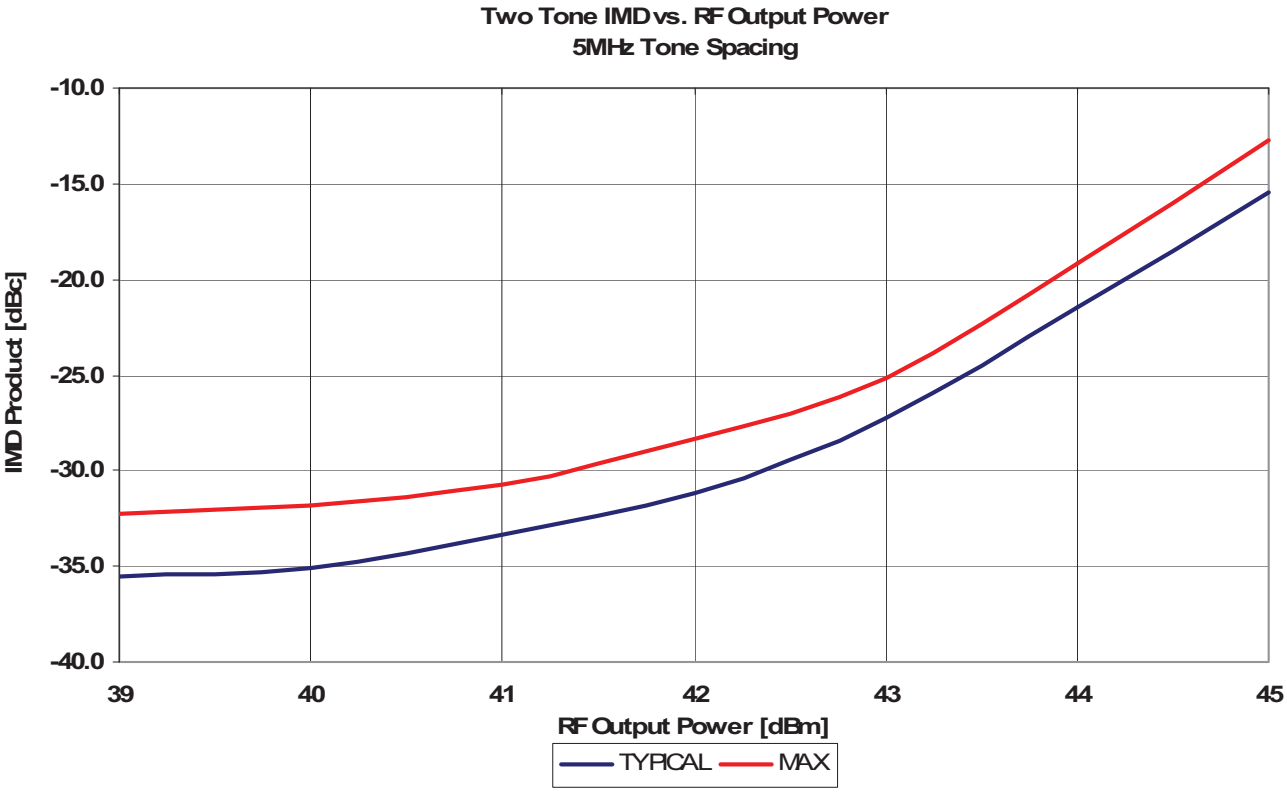


C-Band & X-Band

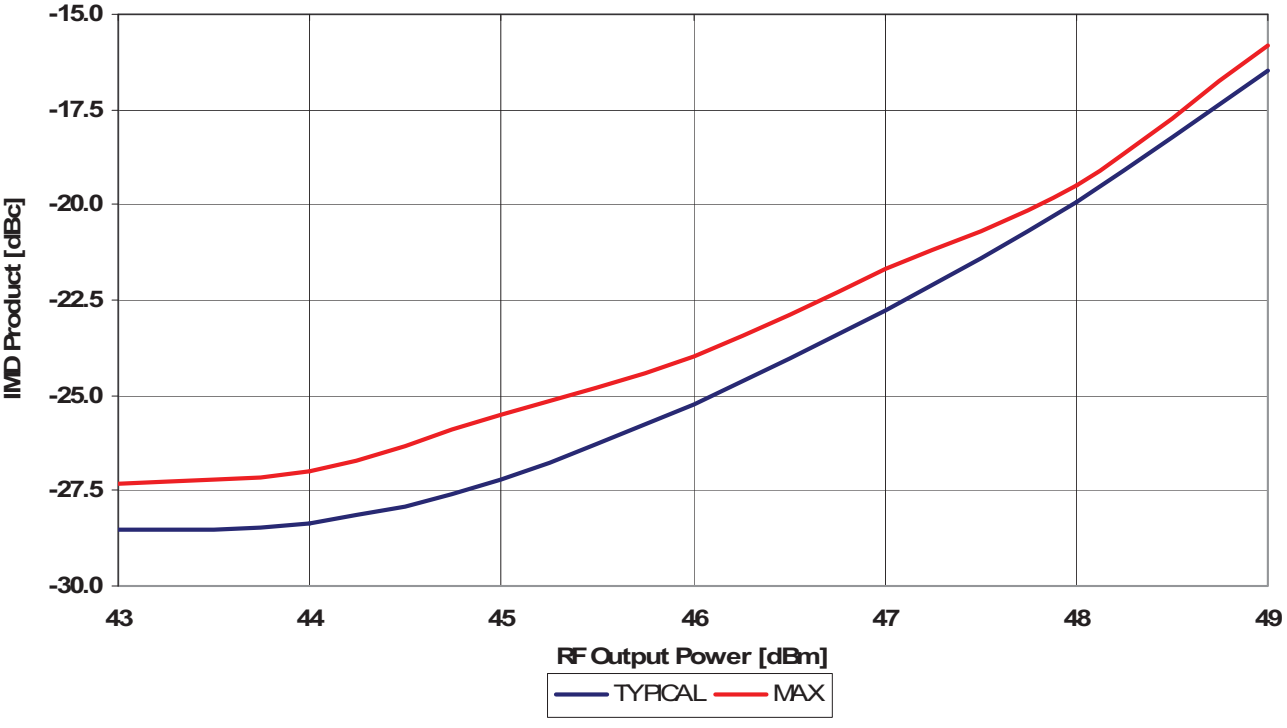


Highest Linear Output Power per Housing Volume in the Industry

Ku-Band



C-Band X-Band



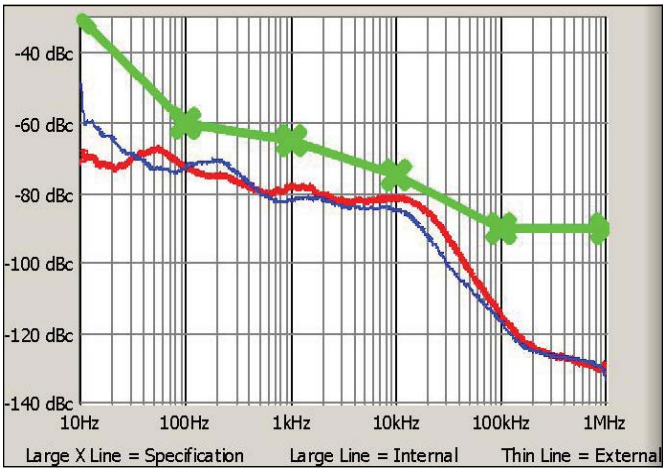
Frequency Bands

Band	Frequency Plan*	IF Input	LO Frequency	RF Output
C	Standard C-Band	950 - 1525 MHz	4.900 GHz	5.850 - 6.425 GHz
C	Extended C-Band	950 - 1825 MHz	4.900 GHz	5.850 - 6.725 GHz
X	Standard X-Band	950 - 1450 MHz	6.950 GHz	7.900 - 8.400 GHz
Ku	Standard Ku-Band	950 - 1450 MHz	13.050 GHz	14.00 - 14.50 GHz
Ku	Extended Ku-Band	950 - 1700 MHz	12.800 GHz	13.75 - 14.50 GHz

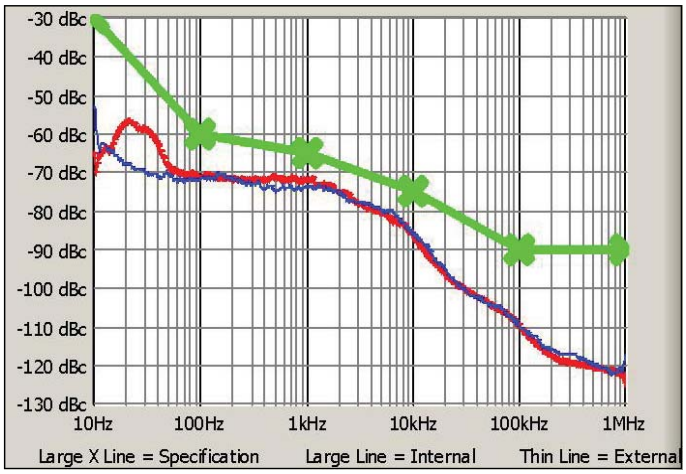
* Custom frequency plans available upon request.

Local Oscillator Phase Noise

Offset	Guaranteed Max.	C-Band *Typical*	X-Band *Typical*	Ku-Band *Typical*	Units
10 Hz	-30	-60	-60	-50	dBc/Hz
100 Hz	-60	-80	-75	-65	dBc/Hz
1 KHz	-65	-80	-75	-72	dBc/Hz
10 KHz	-75	-85	-100	-80	dBc/Hz
100 KHz	-90	-120	-110	-100	dBc/Hz
1 MHz	-90	-125	-122	-115	dBc/Hz



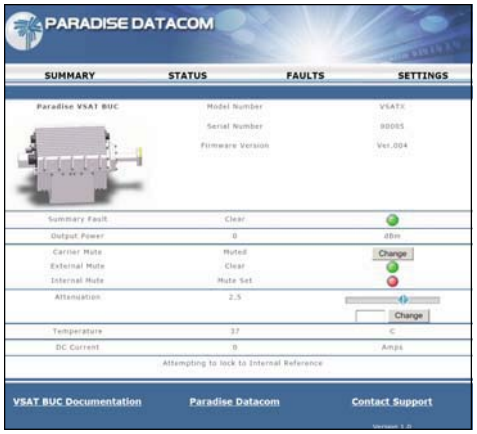
Typical C-Band Phase Noise Plot



Typical Ku-Band Phase Noise Plot

Interfaces

Port	Connector	Description	Details	
J1	L Band Input	IF, 10 MHz, FSK Input DC must be tapped off using external Bias Tee	Type N	female
J7	DC Input MS3102R18-4P	+48 VDC	A B C D	+ VDC + VDC - VDC - VDC
J4	Monitor & Control MS3112E14-18S	Serial Communication Serial Communication Serial Communication Summary Alarm Contacts Summary Alarm Contacts Summary Alarm Contacts TX Inhibit Ethernet Ethernet Ethernet Ethernet Ground Ground Ground Serial Override Ethernet Override	U R L B F D J H G C A E K M S N	RS-485 (-) RS-485 (+) Isolated Ground Form C - Closed on Fault Form C - Common Form C - Open on Fault Ground Enable TX TX - TX + RX - RX + Chassis Ground Chassis Ground Chassis Ground Ground resets to Serial Comms Ground resets to Ethernet Comms
J5	Link Connector MS3112E12-10S	Reserved Ground Ground +15 VDC for LNB Reserved Redundancy Switch Drive Link In Link Out Redundancy Switch Common	J C H A B G E F K	Closure to Ground Ground Ground Current Sensed +15 VDC +15 VDC @ 1A +48 Current Sink +48 VDC (Vin+)
J8	Fan Voltage MS3112E8-3S	V+ V-	A B	+48 VDC Return

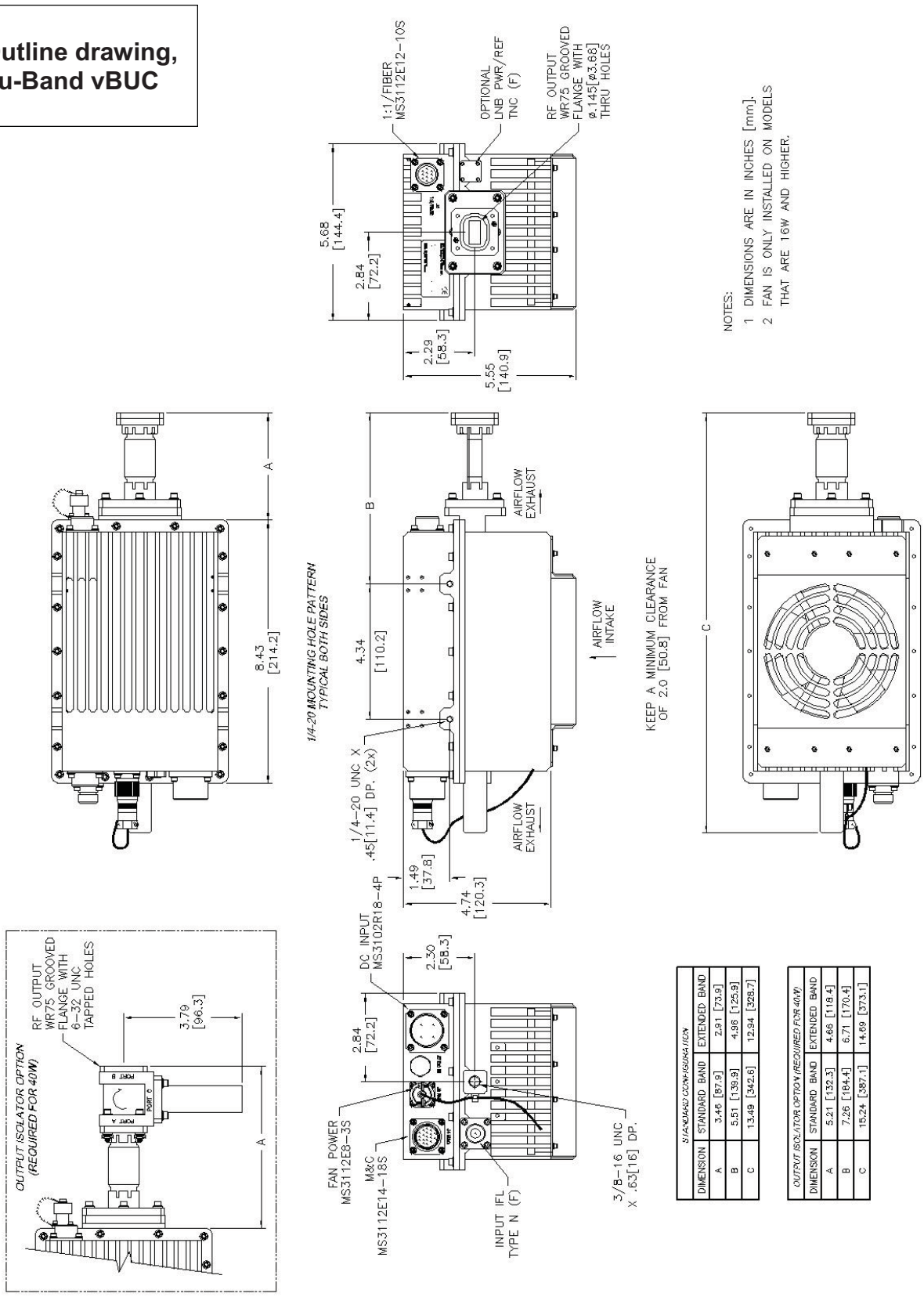


Universal M&C Software

The Teledyne Paradise Datacom Universal Monitor & Control software provides a remote view of the state of the vBUC via a web browser.

The user may adjust the attenuation of the vBUC and mute/unmute the unit. In addition, the web-based status screen shows the fault condition, mute state, current and temperature.

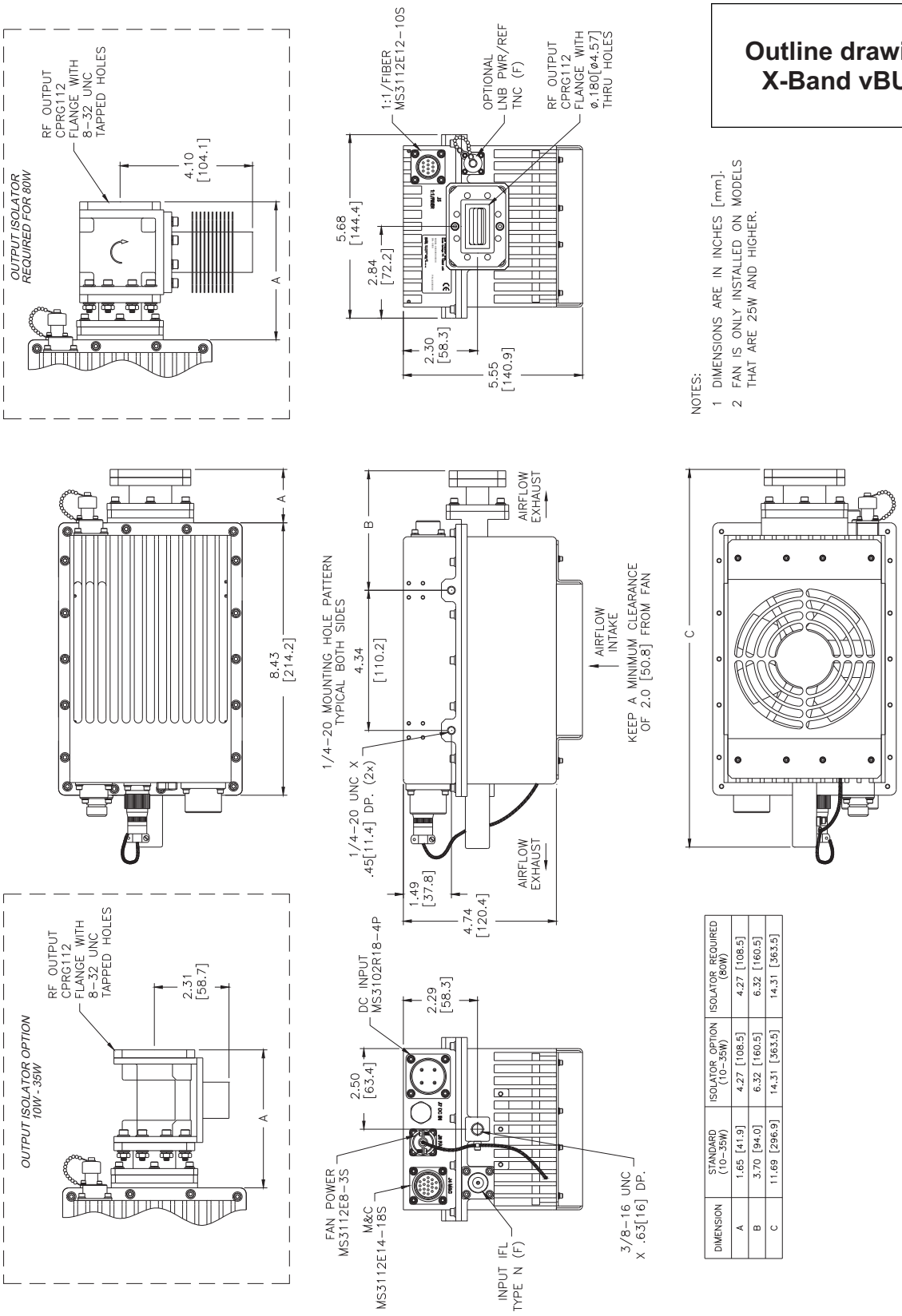
Outline drawing, Ku-Band vBUC



STANDARD CONFIGURATION		
DIMENSION	STANDARD BAND	EXTENDED BAND
A	3.46 [87.9]	2.91 [73.9]
B	5.51 [139.9]	4.96 [125.9]
C	13.49 [342.6]	12.94 [328.7]

OUTPUT ISOLATOR OPTION (REQUIRED FOR 40W)		
DIMENSION	STANDARD BAND	EXTENDED BAND
A	5.21 [132.3]	4.66 [118.4]
B	7.26 [184.4]	6.71 [170.4]
C	15.24 [387.1]	14.69 [373.1]

Outline drawing, X-Band vBUC



DIMENSION	STANDARD (10-35W)	ISOLATOR OPTION (10-35W)	ISOLATOR REQUIRED (80W)
A	1.65 [41.9]	4.27 [108.5]	4.27 [108.5]
B	3.70 [94.0]	6.32 [160.5]	6.32 [160.5]
C	11.69 [296.9]	14.31 [363.5]	14.31 [363.5]

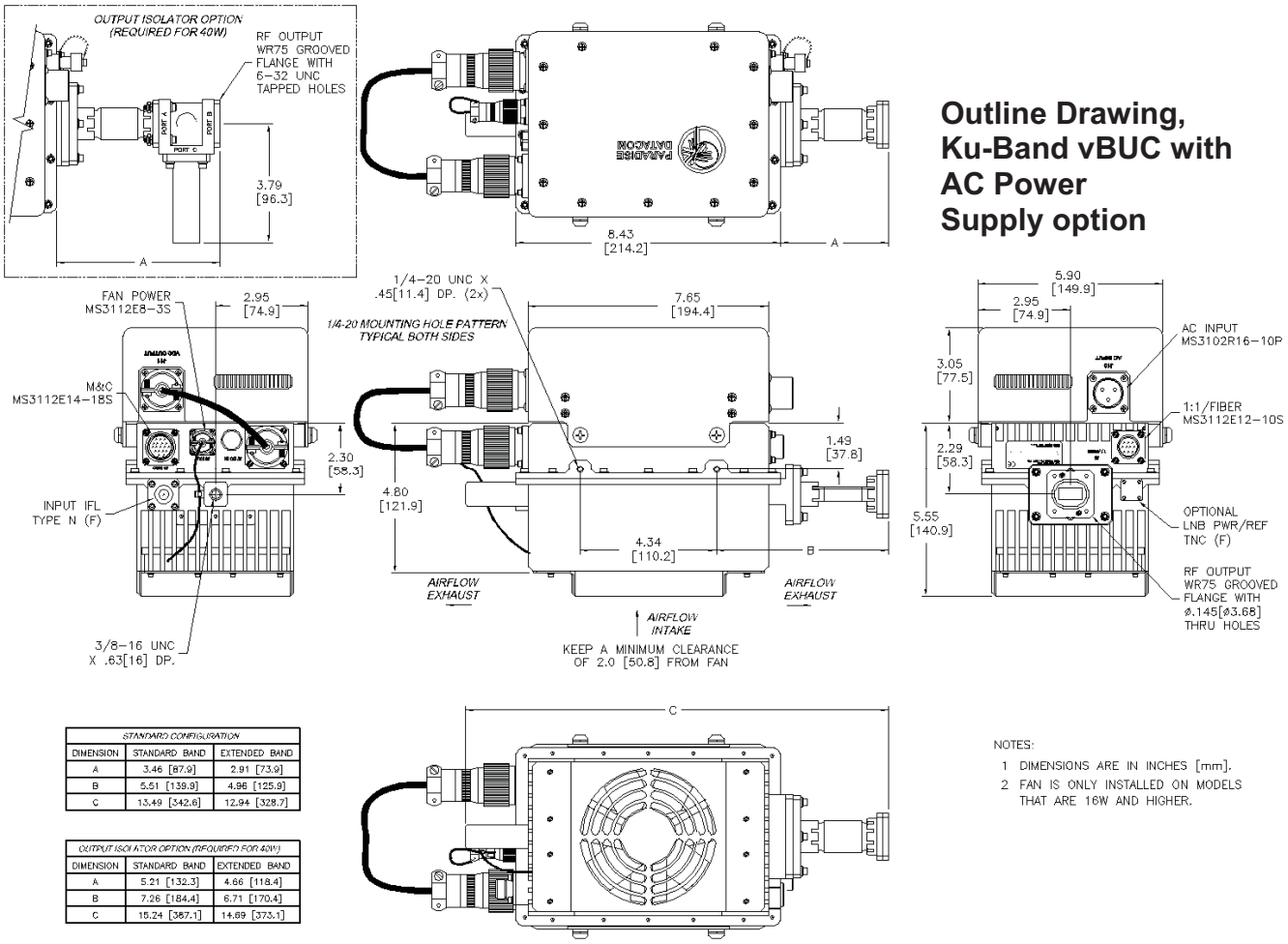
AC Power Supply option

The vBUC is available with an optional AC Power Supply, which attaches to the top of the BUC, opposite the fan. An optional stand-alone mounting assembly is also available.

The AC Power Supply is CE Compliance tested and provides up to 500 Watts of power at 48 VDC output. The AC Power Supply adds 5 lbs. (2.27 kg) to the overall weight of the unit.

Input power requirements: 90-265 VAC, 47-63Hz.

	Pin-outs			
	A	B	C	D
AC Input	Line	GND	Neutral	--
DC Output	+48V	+48V	48V Return	48V Return



Outline Drawing, Ku-Band vBUC with AC Power Supply option

STANDARD CONFIGURATION		
DIMENSION	STANDARD BAND	EXTENDED BAND
A	3.46 [87.9]	2.91 [73.9]
B	5.51 [139.9]	4.96 [125.9]
C	13.49 [342.6]	12.94 [328.7]

OUTPUT ISOLATOR OPTION (REQUIRED FOR 40W)		
DIMENSION	STANDARD BAND	EXTENDED BAND
A	5.21 [132.3]	4.66 [118.4]
B	7.26 [184.4]	6.71 [170.4]
C	15.24 [387.1]	14.69 [373.1]

NOTES:
1. DIMENSIONS ARE IN INCHES [mm].
2. FAN IS ONLY INSTALLED ON MODELS THAT ARE 16W AND HIGHER.

Part Number Configuration

V	B	U	C											

Band

C - C-Band
X - X-Band
K - Ku-Band

Power Level (in Watts)

C-Band
80

X-Band
80

Ku-Band
40

Frequency Sub Band

C-Band
A - 5.85 - 6.425 GHz
B - 5.85 - 6.725 GHz

X-Band
A - 7.90 - 8.40 GHz

Ku-Band
A - 14.00 - 14.50 GHz
B - 13.75 - 14.50 GHz

Input Voltage

A = +48 V

Configuration Modifier

WXX = Standard Waveguide Isolator
WAX = LNB Power & Reference Port & Waveguide Isolator

System Configuration Options

X = Single Thread (Stand Alone)

See Drawing Numbers 208798 and 208799 for redundant system configurations.

Block Up Converter

X = Standard External Reference
R = Internal 10 MHz Reference Oscillator

Input Power Configuration

X = Input Voltage on Circular Connector (Standard)
A = AC Power Supply mounted to BUC
B = AC Power Supply with DC connectors only
C = AC Power Supply with custom-length DC cable
T = External IFL Bias Tee

Specifications listed in this document are subject to change without notice.
X-band products may be subject to ITAR restrictions and should not be exported from the US without obtaining proper licensing from the appropriate government agencies.