

**C/Ku-Band  
Compact Outdoor (-CO)  
Solid State Power Amplifiers**



**HPA-2000-CO series SSPAs**

**DESCRIPTION**

Paradise Datacom's **Compact Outdoor (-CO)** series SSPAs finally bring high power solid state transmit amplifiers right to the antenna's feed. Designed for antenna-mount applications the **-CO** series SSPAs deliver the highest uplink powers available per unit volume and weight offered anywhere in solid state technology. Packaged for outdoor use, these amplifiers are entirely self-contained with on board power supply, cooling and monitor and control systems. Designed for convenient integration and long-term, reliable, uninterrupted service, these units are loaded with innovative engineering. From unique RF power combining techniques and a novel approach for thermal management to a proven robust power supply and comprehensive M&C, the **Compact Outdoor** SSPA offers new utility in the world of transmit amplifiers. Weighing in at just 36 lbs. (16.4 kg), and only slightly larger than a shoe box, the **-CO** series of SSPAs is available in power levels ranging from 10 through 125 watts at Ku-band frequencies and 30 through 250 watts at C-band. Extended frequency band operation and L-band input are supported as well.

**FEATURES**

- Compact size and weight
- CE Compliant Design
- Adjustable RF Gain, 55dB to 75dB
- Accurate RF Power Monitoring
- RF Output Sample Port
- Maintenance Free Operation
- Universal, Power Factor Corrected Power Supply

**OPTIONS**

- Antenna Mounting Kit
- Built-in 1:1 Redundancy Control
- DC Operation (48VDC)
- Remote Control Panel
- S Band & X Band available
- Extended C , Ku - Band Operation
- L-Band Input
- FSK monitor & control via IFL

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**Specifications; HPAC-2000-CO, C-Band SSPA**

PARAMETER	NOTES	LIMITS	UNITS
<b>Electrical</b>			
Frequency Range	(see options for extended band)	5.850 to 6.425	GHz
Output Power @: Saturation/P <sub>1dB</sub> (Typical/Guaranteed minimum)	HPAC2030ACXXXXX HPAC2040ACXXXXX HPAC2050ACXXXXX HPAC2075ACXXXXX HPAC2100ACXXXXX HPAC2140ACXXXXX HPAC2200ACXXXXX HPAC2250ACXXXXX	Psat / P1dB 45.0/44.8 (32/30) 46.0/45.8 (40/38) 47.0/46.8 (50/48) 48.8/48.5 (76/70) 50.0/49.5 (100/89) 51.5/51.2 (141/132) 53.0/52.3 (200/170) 53.9/53.0 (250/200)	dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Gain	range	55-75	dB
Gain Flatness	full band	±1.0	dB
Gain Slope	per 40 MHz	±0.3	dB/40 MHz
Gain Variation vs. Temperature	-40°C TO +55°C	±1.0	dB
Gain Adjustment	0.1 dB resolution adjustable by either serial or analog voltage input: 0.5 to 2.5 VDC	20	dB
Intermodulation Distortion	3dB back off relative to P <sub>1dB</sub>	-25	dBc
AM/PM Conversion	(@ rated P <sub>1dB</sub> )	3.5	°/dB
Spurious Harmonics	(@ rated P <sub>1dB</sub> ) (@ rated P <sub>1dB</sub> -3dB)	-60 -50	dBc dBc
Input/Output VSWR		1.3:1	
Noise Figure	at maximum gain	10	dB
Group Delay (per 40 MHz segment)	Linear Parabolic Ripple	0.01 0.003 1.0	ns/MHz ns/MHz <sup>2</sup> ns p-p
Noise Output	TX Band RX Band	-75 -150	dBW/4 KHz dBW/4 KHz
Residual AM Noise	0 - 10 KHz 10 KHz - 500 KHz 500 KHz - 1 MHz	-45 -20 (1.25 + log F) -80	dBc dBc dBc
Phase Noise		IESS -308/309 -10 dB	
Power Requirements			
Line Voltage	power factor corrected	90 to 265	VAC
Line Frequency		47 to 63	Hz
Line Power	HPAC2030ACXXXXX HPAC2040ACXXXXX HPAC2050ACXXXXX HPAC2075ACXXXXX HPAC2100ACXXXXX HPAC2140ACXXXXX HPAC2200ACXXXXX HPAC2250ACXXXXX	250 300 400 450 700 850 (180-265 VAC only) 1200 (180-265 VAC only) 1500 (180 - 265 VAC only)	W W W W W W W W

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**Specifications; HPAK-2000-CO, Ku-Band SSPA**

PARAMETER	NOTES	LIMITS	UNITS
<b>Electrical</b>			
Frequency Range	(see options for extended band)	14.00 to 14.50	GHz
Output Power @: Saturation/ $P_{1dB}$ (Typical/Guaranteed minimum)	HPAK2010ACXXXXX HPAK2020ACXXXXX HPAK2025ACXXXXX HPAK2035ACXXXXX HPAK2040ACXXXXX HPAK2050ACXXXXX HPAK2070ACXXXXX HPAK2100ACXXXXX HPAK2125ACXXXXX	$P_{sat} / P_{1dB}$ 40.0/39.0 (10/8) 43.0/42.0 (20/16) 44.0/43.0 (25/20) 45.5/44.5 (35/28) 46.0/45.0 (40/31) 47.0/46.0 (50/40) 48.5/47.5 (70/56) 50.0/49.0 (100/80) 51.0/50.0 (125/100)	dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Gain	range	55-75	dB
Gain Flatness	full band	$\pm 1.0$	dB
Gain Slope	per 40 MHz	$\pm 0.3$	dB/40 MHz
Gain Variation vs. Temperature	-40°C TO +55°C	$\pm 1.0$	dB
Gain Adjustment	0.1 dB resolution adjustable by either serial or analog voltage input: 0.5 to 2.5 VDC	20	dB
Intermodulation Distortion	3dB back off relative to $P_{1dB}$	-25	dBc
AM/PM Conversion	(@ rated $P_{1dB}$ )	3.5	°/dB
Spurious	(@ rated $P_{1dB}$ )	-60	dBc
Harmonics	(@ rated $P_{1dB,3dB}$ )	-50	dBc
Input/Output VSWR		1.3:1	
Noise Figure	at maximum gain	10	dB
Group Delay (per 40 MHz segment)	Linear	0.01	ns/MHz
	Parabolic	0.003	ns/MHz <sup>2</sup>
	Ripple	1.0	ns p-p
Noise Output	TX Band	-75	dBW/4 KHz
	RX Band	-150	dBW/4 KHz
Residual AM Noise	0 - 10 KHz	-45	dBc
	10 KHz - 500 KHz	-20 (1.25 + log F)	dBc
	500 KHz - 1 MHz	-80	dBc
Phase Noise		IESS -308/309 -10 dB	
Power Requirements	power factor	.98	
Line Voltage	Line voltage	90 to 265	VAC
Line Frequency	Line frequency	47 to 63	Hz
Line Power	HPAK2010ACXXXXX	220	W
	HPAK2020ACXXXXX	250	W
	HPAK2025ACXXXXX	320	W
	HPAK2035ACXXXXX	350	W
	HPAK2040ACXXXXX	550	W
	HPAK2050ACXXXXX	600	W
	HPAK2070ACXXXXX	650	W
	HPAK2100ACXXXXX	1000 (180-265 VAC only)	W
	HPAK2125ACXXXXX	1100 (180-265 VAC only)	W

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**M&C Interface; HPAC/K-2000-CO, Compact Outdoor**

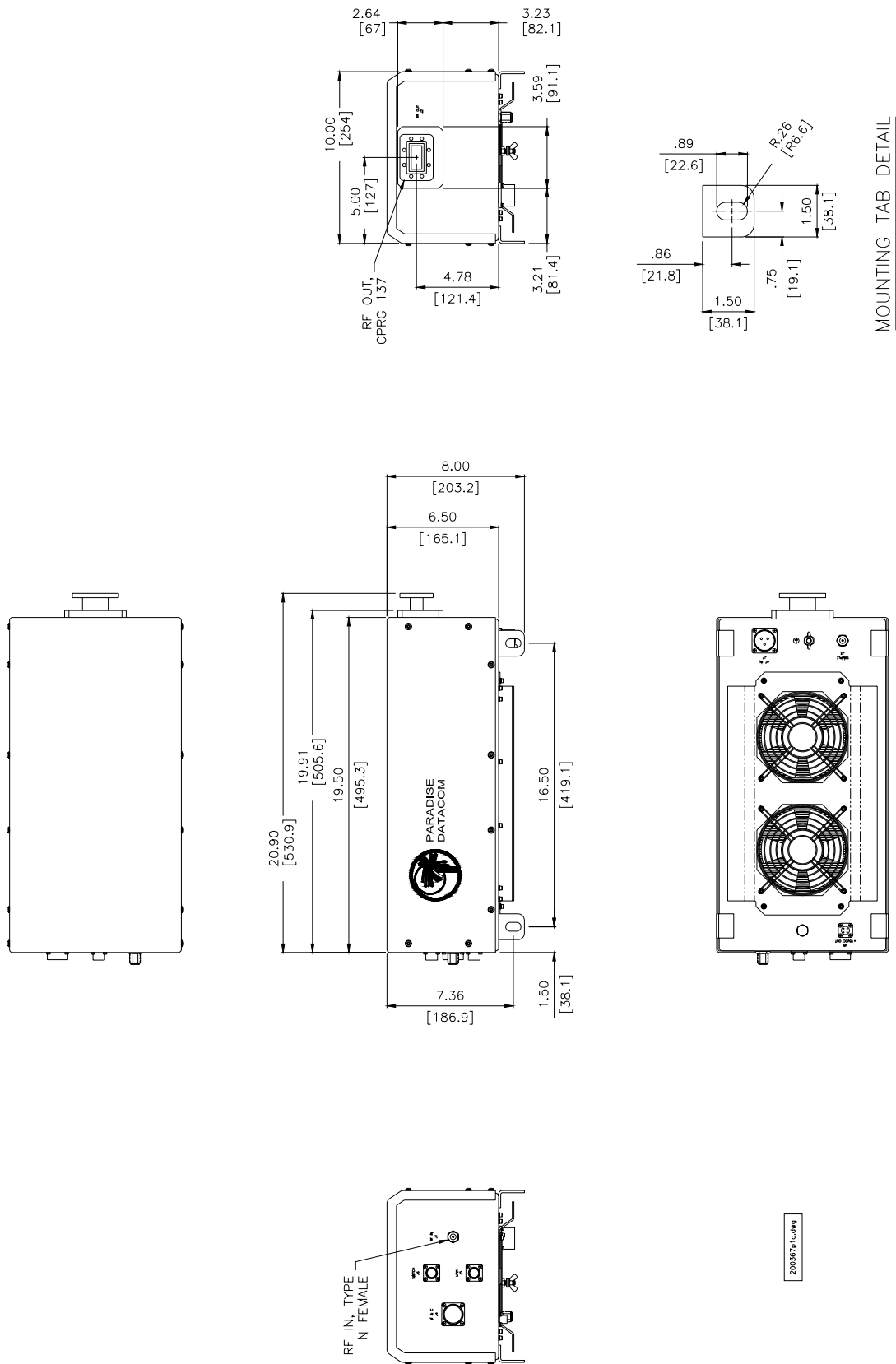
Monitor & Control User Interface	Interface includes:	Summary alarm (out) Auxiliary alarm (out) Summary alarm (out) Auxiliary alarm (out) Voltage alarm (out) Current alarm (out) Temperature alarm (out) Remote mute (in) Auxiliary alarm (in) RF power monitor (out) Analog gain adjustment BUC alarm (option) M&C Host PC Link	Form C relay Form C relay Open collector output Open collector output Open collector output Open collector output Open collector output Closure to ground Closure to ground + 4vdc @ P <sub>sat</sub> 0.5 to 2.5 VDC Open collector output RS232 – RS485
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**Mechanical Specifications; HPAC/K-2000-CO, Compact Outdoor SSPA**

Size	width X length X height	10.0 X 19.5 X 6.50 254 X 495 X 165	inches mm
Weight	C-Band to 200W / Ku-Band to 70W 250W C-Band / 100, 125 W Ku-Band	36 (16.4) 44 (20)	lbs.(kg) lbs.(kg)
Finish		Paint	White; powder coat
Connectors	RF Input RF Output HPAK-2XXX-CO HPAC-2XXX-CO RF Output Sample Line Power Monitor and Control Link Port Redundancy Switch	Type N  WR75 Waveguide WR137 Waveguide Type N 3-pin MS-type 32-pin MS-type 6-pin MS type 6-pin MS-type	Female  Grooved flange CPR137G flange Female Plug Socket Socket Socket
<b>Environmental</b>			
Operating Temperature	Ambient	-40 to +55	°C
Relative Humidity	Condensing	100	%
Cooling System	Integrated	Forced air	
<b>Options</b>			
Extended Frequency Band 13.75 to 14.50 GHz	Option –1	De-rate power by 1.0dB linearly from 14.00 to 13.75 GHz	Model: HPAK2XXXBCXXXXX
5.850 to 6.725 GHz	Option –1	De-rate power by 1.0dB linearly from 6.425 to 6.725 GHz	Model: HPAC2XXXBCXXXXX
5.750 to 6.670 GHz	Option – 3	De-rate power by 1.0 dB linearly from 6.425 to 6.670 GHz and by 0.5 dB from 5.850 to 5.750 GHz	Model: HPAC2XXXCCXXXXX
48 VDC operation	Option -2	42-60	VDC

Specifications are subject to change.

# C/Ku-Band Compact Outdoor (-CO) Solid State Power Amplifiers



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**Operation with optional Block Upconverter**

An L-band block upconverter can be integrated into the Compact Outdoor SSPA assembly to permit operation directly from a modem. Both C & Ku Band SSPAs may be fitted with an appropriate converter module.

The block upconverter adds no additional gain to the Compact Outdoor SSPA's nominal gain setting. The only specification deviation is the obvious input frequency band and the full-band gain flatness, which becomes  $\pm 1.5$  dB. The reference input is diplexed onto the L-Band input. The block upconverter's local oscillator is phase locked to the 10 MHz or 50 MHz reference signal.

The SSPB local oscillator's phase noise is Intelsat/ Eutelsat compliant when locked to an appropriate reference signal. The local oscillator phase noise and required reference signal phase noise is given in Tables 2 and 3.

BUC Option	Input Frequency	Output Frequency	LO Frequency	Ref. Frequency
Freq. Plan 1	950 to 1525 MHz	5.850 to 6.425 GHz	4.90 GHz	10 MHz
Freq. Plan 2	950 to 1525 MHz	5.850 to 6.425 GHz	4.90 GHz	50 MHz
Freq. Plan 5	950 to 1450 MHz	14.00 to 14.50 GHz	13.05 GHz	10 MHz
Freq. Plan 6	950 to 1450 MHz	14.00 to 14.50 GHz	13.05 GHz	50 MHz
Freq. Plan 7	950 to 1700 MHz	13.75 to 14.50 GHz	12.80 GHz	10 MHz
Freq. Plan 8	950 to 1700 MHz	13.75 to 14.50 GHz	12.80 GHz	50 MHz
Freq. Plan 9	950 to 1825 MHz	5.850 to 6.725 GHz	4.9 GHz	10 MHz
Freq. Plan 10	950 to 1825 MHz	5.850 to 6.725 GHz	4.9 GHz	50 MHz

**Table 1. Standard SSPB Frequency Plan Options to the Compact Outdoor SSPA**

Parameter	Specification		Units
Frequency	50	10	MHz
Power	0 dBm +/- 5.0		dB
Output Impedance	50		Ohms
Phase Noise			
10 Hz	-110	-124	dBc/Hz
100 Hz	-131	-145	dBc/Hz
1 KHz	-146	-160	dBc/Hz
10 KHz	-151	-165	dBc/Hz
100 KHz	-151	-165	dBc/Hz

**Table 2. Reference Oscillator Requirements**

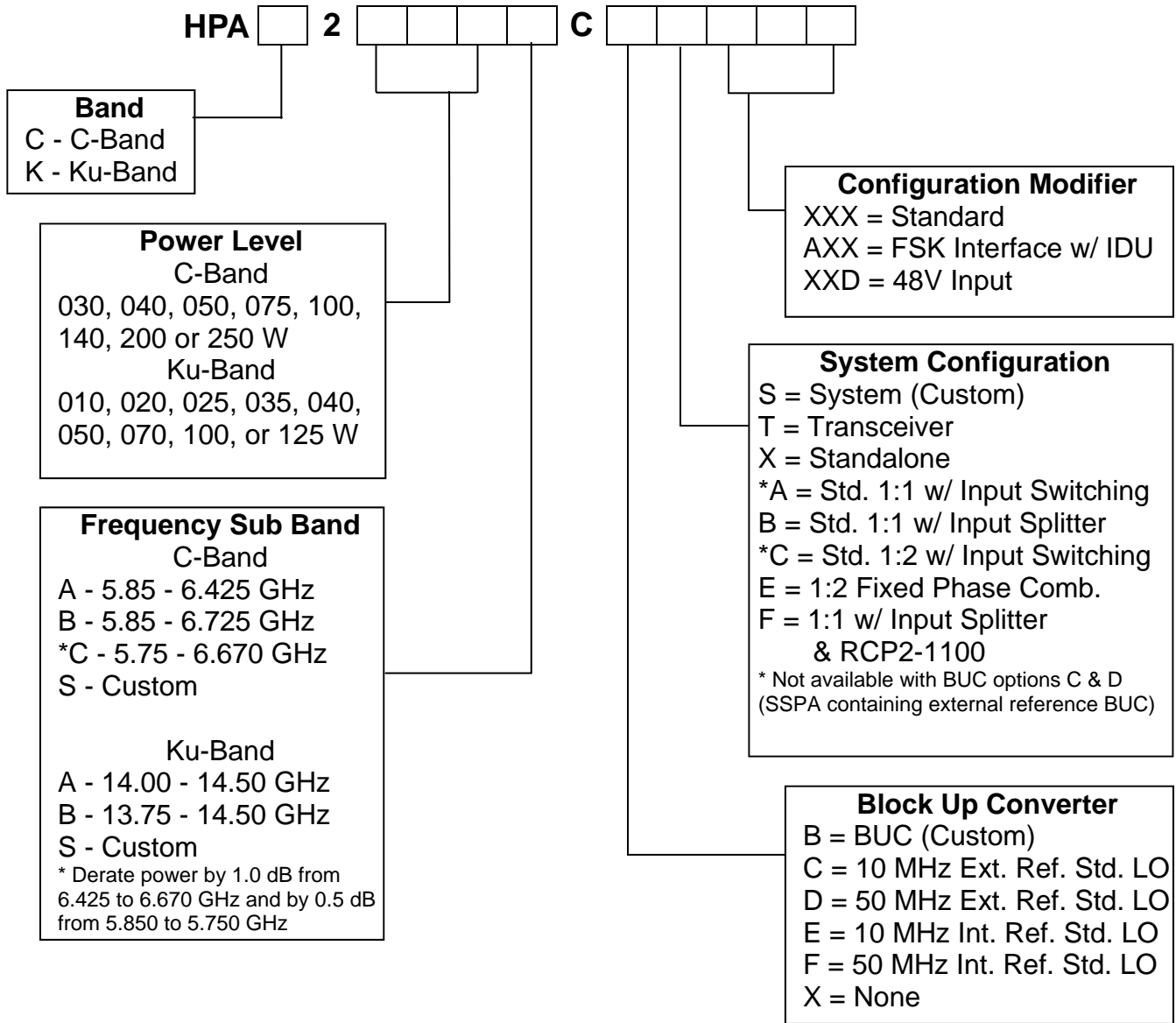
Offset	Phase Noise	Units
10 Hz	-45	dBc/Hz
100 Hz	-70	dBc/Hz
1 KHz	-82	dBc/Hz
10 KHz	-88	dBc/Hz
100 KHz	-94	dBc/Hz
1 MHz	-110	dBc/Hz

**Table 3. Local Oscillator Phase Noise**

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**Part Number Configuration**



**Example** - A standalone 70W Extended Ku-Band Compact Outdoor SSPA with an optional 48 VDC input and no block up converter is part number: **HPAK2070BCXXXXD**.