



## DESCRIPTION

**Teledyne Paradise Datacom's High Power Outdoor (W)** series SSPAs represent the latest in High Power Microwave Amplifier Technology. The SSPA package achieves the highest power density in the industry along with enhanced maintainability.

All subassemblies are accessible and replaceable in the field. Local, front panel, control is available with a user friendly interface. A full compliment of serial and parallel (contact closure) control is also available via circular connectors.

A state of the art thermal platform provides efficient cooling for the amplifier module and power supplies. This ensures the highest possible MTBFs for microwave power amplifiers.

Along with high reliability comes the ultimate in amplifier maintainability. Amplifier modules and power supplies are easily accessed and removed, making this one of the easiest amplifier assemblies to maintain in the field.

## FEATURES

- Extremely High Power Density:
  - 500W X-Band
  - 600W C-Band
  - 250W Ku Band
- Field Replaceable Subassemblies
- RF Output Sample Port
- Ethernet Port
- 20 dB Gain Adjustment
- Built-in 1:1 Redundancy Control
- Built-in Maintenance Switch Controller

## OPTIONS

- RF input sample port
- 48 VDC operation
- L-Band Input operation
- Reflected Power Monitor
- Phase Combined Systems
- Fiber Optic Input
- Antenna Mounting Kit
- Receive Band Reject Filter for S-Band units up to 400W in sub-band A

## SPECIFICATIONS

- Housing:
  - 21.0 X 27.95 X 13.5 in.
  - 533 X 710 X 343 mm
  - 150.0 lbs. / 68 kg;
- White powder coat finish
- Operating temperature:
  - 40 to +60 °C
- Relative Humidity: 100% condensing
- Integrated Forced-Air Cooling

## C-Band Output Power Levels

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	5.850 to 6.425	GHz
Output Power @: Saturation/P <sub>1dB</sub> (Typical/Guaranteed minimum)	HPAC2400AWXXXXXX HPAC2500AWXXXXXX HPAC2600AWXXXXXX	P <sub>sat</sub> / P <sub>1dB</sub> 56.0 (400) / 55.0 (316) 57.0 (500) / 56.0 (400) 57.8 (600) / 57.0 (500)	dBm (W) dBm (W) dBm (W)
Power Requirements Line Voltage Line Frequency Line Power	Power Factor corrected Autoranging HPAC2400AWXXXXXX HPAC2500AWXXXXXX HPAC2600AWXXXXXX	> 0.9 47 - 63 2400 (180 to 265) 2800 (180 to 265) 3700 (180 to 265)	Hz W (VAC) W (VAC) W (VAC)

## X-Band Output Power Levels

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	7.90 to 8.40	GHz
Output Power @: Saturation/P <sub>1dB</sub> (Typical/Guaranteed minimum)	HPAX2350AWXXXXXX HPAX2500AWXXXXXX	P <sub>sat</sub> / P <sub>1dB</sub> 55.5 (354) / 54.5 (282) 57.0 (500) / 55.7 (370)	dBm (W) dBm (W)
Power Requirements Line Voltage Line Frequency Line Power	Power Factor corrected Autoranging HPAX2350AWXXXXXX HPAX2500AWXXXXXX	> 0.94 47 - 63 2700 (180 to 265) 4000 (180 to 265)	Hz W (VAC) W (VAC)

## Ku-Band Output Power Levels

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	14.00 to 14.50	GHz
Output Power @: Saturation/P <sub>1dB</sub> (Typical/Guaranteed minimum)	HPAK2200AWXXXXXX HPAK2250AWXXXXXX	P <sub>sat</sub> / P <sub>1dB</sub> 53.0 (200) / 52.0 (158) 54.0 (250) / 53.0 (200)	dBm (W) dBm (W)
Power Requirements Line Voltage Line Frequency Line Power	Power Factor corrected Autoranging HPAK2200AWXXXXXX HPAK2250AWXXXXXX	> 0.94 47 - 63 2500 (180 to 265) 2800 (180 to 265)	Hz W (VAC) W (VAC)

## Options

Extended C-Band 5.850 to 6.725 GHz 5.750 to 6.670 GHz 6.425 to 7.025 GHz	De-rate power by 1.0dB linearly from 6.425 to 6.725 GHz De-rate power by 1.0dB linearly from 6.425 to 6.725 GHz Available in power levels up to 500W	Model: HPAC2XXXBWXXXXXX HPAC2XXXCWXXXXXX HPAC2XXXE/FWXXXXXX	
Extended X-Band 7.70 to 8.40 GHz	De-rate power by 1.0dB linearly from 7.90 to 7.70 GHz	Model: HPAX2XXXDWXXXXXX	
Extended Ku-Band 13.75 to 14.5 GHz	De-rate power by 1.0dB linearly from 14.0 to 13.75 GHz	Model: HPAK2XXXBWXXXXXX	
Reflected Power Monitor	See the part number configuration to determine Model numbers for this option.		
Receive Band Noise Power Density	Without optional filter With optional filter	-95 -155	dBw/4 KHz dBw/4 KHz

## Common Specifications; HPA\_2000XW Series

### Electrical Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain	range	55-75	dB
Gain Flatness	full band	± 1.0	dB
	Extended C-Band units	± 1.5	dB
Gain Slope	per 40 MHz	± 0.3	dB/40 MHz
Gain Variation vs. Temperature	-40°C to +60°C	± 1.5	dB
Gain Stability	at constant temperature	± 0.25	dB / 24 hours
Gain Adjustment	0.1 dB resolution	20	dB
Intermodulation Distortion	3 dB back off relative to P <sub>1dB</sub>	-25	dBc
AM/PM Conversion	(@ rated P <sub>1dB</sub> )	3.5	°/dB
	(@P <sub>1dB</sub> - 3 dB)	1.0	°/dB
Spurious Harmonics	(@ rated P <sub>1dB</sub> )	-65	dBc
	(@ rated P <sub>1dB</sub> - 3 dB)	-50	dBc
Input/Output VSWR	Standard Band units	1.30:1	
	Extended Band units	1.50:1	
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 (C- or Ku-Band)	-150	dBW/4 KHz
	RX Band (X-Band)	-100	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	Offset frequency from carrier		
	10 Hz	-90	dBc/Hz
	100 Hz	-100	dBc/Hz
	1 KHz	-110	dBc/Hz
	10 KHz	-120	dBc/Hz
	100 KHz	-125	dBc/Hz
	1 MHz	-130	dBc/Hz

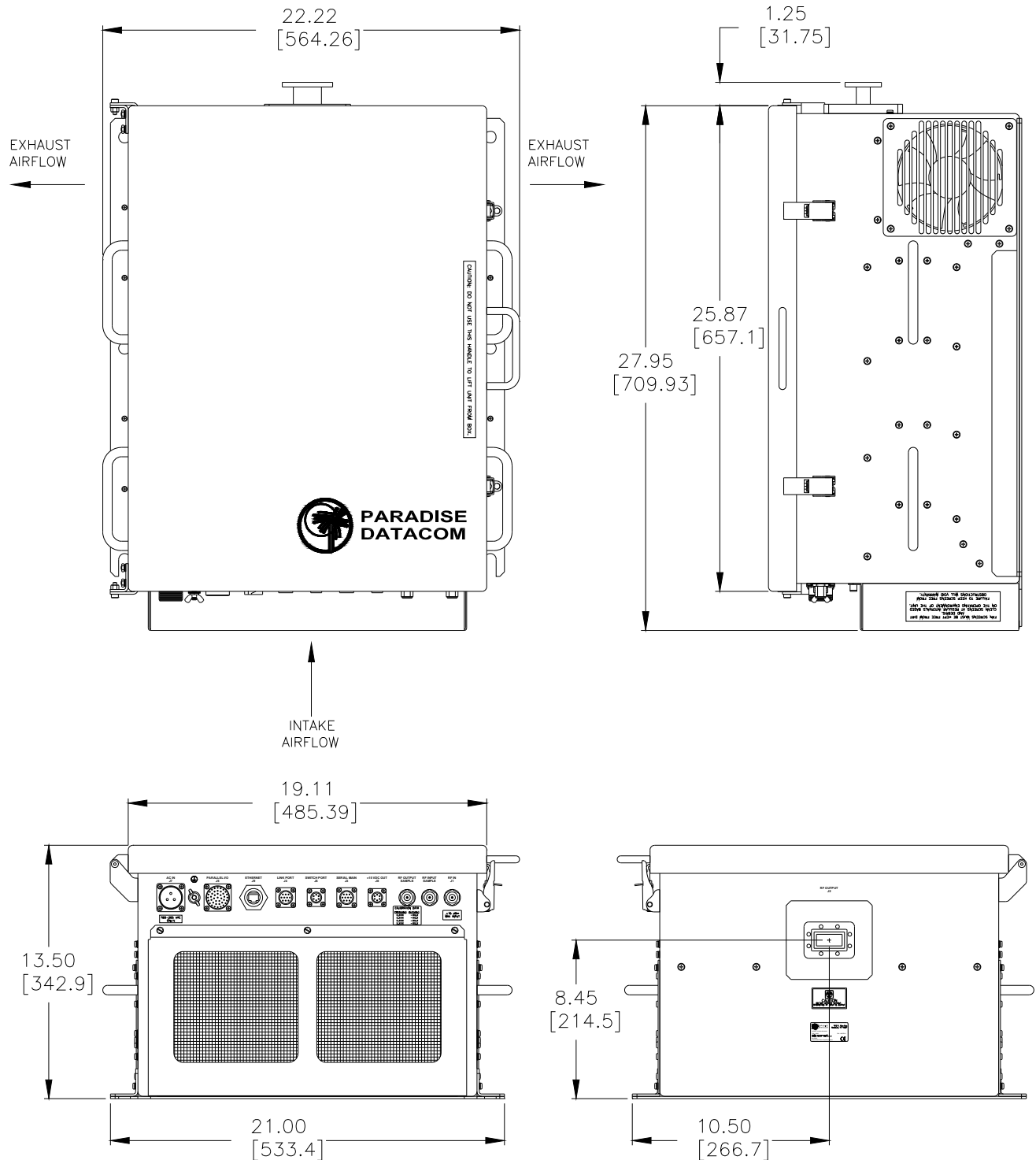
### Mechanical Specifications

Size	width X height X depth	21.0 X 27.95 X 13.5 533 X 710 X 343	inches mm
Weight	typical	150 ± 5 (68 ± 2 )	lbs.(kg)
Finish		powder coat	white

### Environmental Specifications

Operating Temperature	Ambient	-40 to +60	°C
Storage Temperature	Ambient	-50 to +75	°C
Relative Humidity	Condensing	100	%
Cooling System	Integrated	Forced air	

## Outline Drawing, Typical High Power Outdoor SSPA (C-Band shown)



## L-Band Operation

Teledyne Paradise Datacom amplifiers are available with an integrated L-Band Block Up Converter. L-Band units utilize Teledyne Paradise Datacom's proprietary zBUC technology. The addition of a zBUC<sup>®</sup> converter to the SSPA typically increases the gain by 2-4 dB. The advantages of zBUC technology include:

- zBUC converter can detect and switch to an externally supplied reference.
- Optional internal high stability (10MHz) reference.
- zBUC converter can lock to an externally supplied reference of 10 or 50 MHz.
- zBUC converter can accept a wide range of external reference power (-10 to +5 dBm).

### Available Frequency Plans

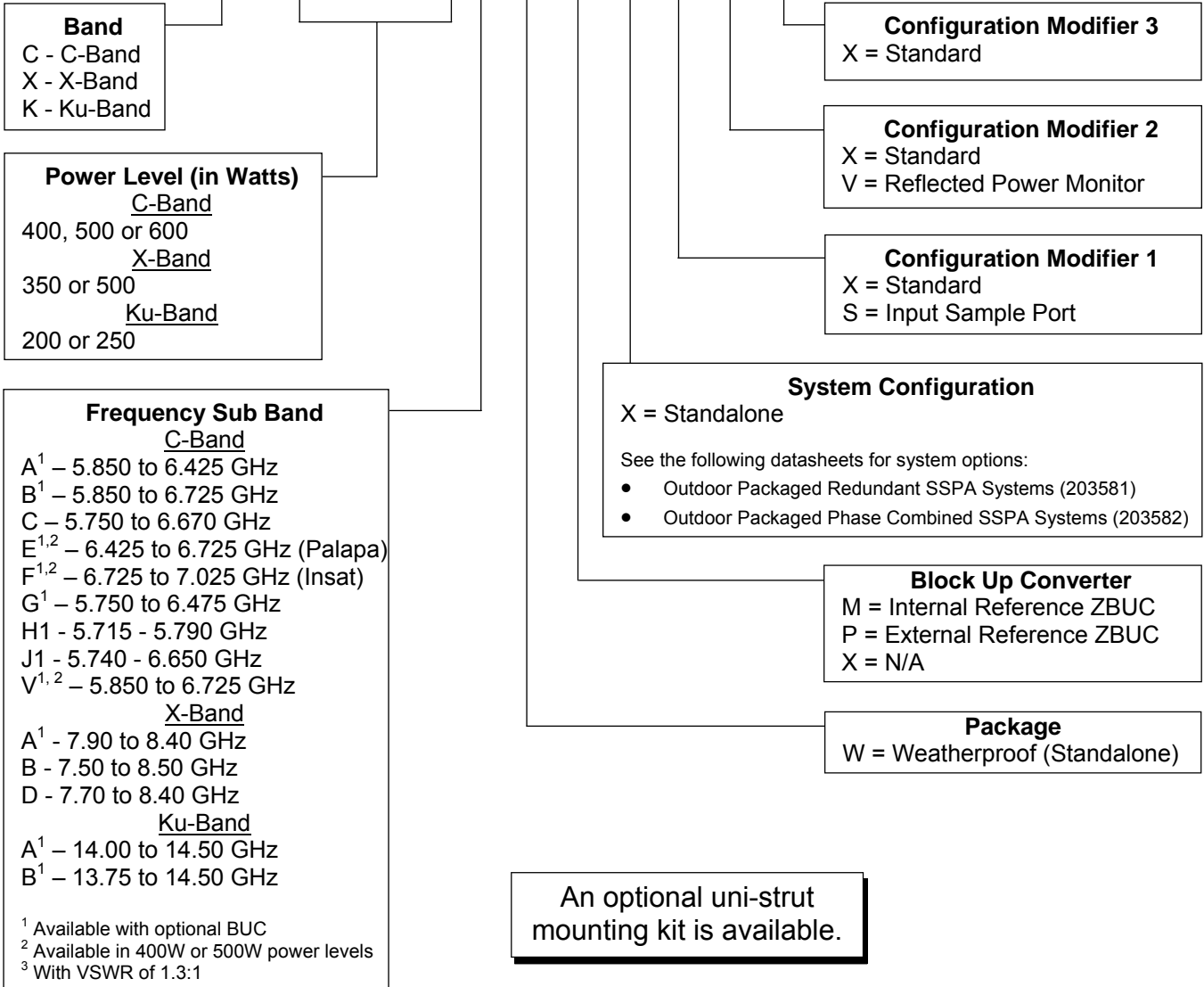
Band	Frequency Band	IF Input	LO Frequency	RF Output	Gain Change
C	Standard C-Band	950 - 1525 MHz	4.900 GHz	5.850 - 6.425 GHz	0-4 dB
C	Extended C-Band	950 - 1825 MHz	4.900 GHz	5.850 - 6.725 GHz	0-4 dB
C	Palapa Band	950 - 1250 MHz	5.475 GHz	6.425 - 6.725 GHz	0-4 dB
C	Insat Band	950 - 1250 MHz	5.775 GHz	6.725 - 7.025 GHz	0-4 dB
C	Extended C-Band 2	950 - 1675 MHz	4.800 GHz	5.750 - 6.475 GHz	0-4 dB
C	Low C-Band	840 - 1000 MHz	4.250 GHz	5.090 - 5.250 GHz	0-4 dB
X	Standard X-Band	950 - 1450 MHz	6.950 GHz	7.900 - 8.400 GHz	0-2 dB
Ku	Standard Ku-Band	950 - 1450 MHz	13.050 GHz	14.00 - 14.50 GHz	0-2 dB
Ku	Extended Ku-Band	950 - 1700 MHz	12.800 GHz	13.75 - 14.50 GHz	0-2 dB

### Electrical Specifications for High Power Outdoor SSPA with ZBUC converter

PARAMETER	NOTES	LIMITS				UNITS	
Gain	Nominal setting	75				dB	
Gain Flatness	full band (C-,X-,Ku-bands)	± 2.0				dB	
Gain Slope	per 40 MHz (C-,X-,Ku-bands)	± 0.5				dB/40 MHz	
Gain Adjusted Range		20				dB	
Gain Stability	Typical C-Band Adj. Range	60 - 80				dB	
	Typical Ku-Band Adj. Range	57 - 77				dB	
	-40 to +60 °C	± 1.5				dB	
Phase Noise	Offset frequency from carrier	<u>Absolute max.</u>	<u>C-band (typ.)</u>	<u>X-band (typ.)</u>	<u>Ku-band (typ.)</u>		
	10 Hz	-30	-60	-60	-50	dBc/Hz	
	100 Hz	-60	-80	-75	-65	dBc/Hz	
	1 KHz	-70	-80	-75	-72	dBc/Hz	
	10 KHz	-80	-85	-100	-90	dBc/Hz	
	100 KHz	-90	-120	-110	-110	dBc/Hz	
	1 MHz	-90	-125	-122	-120	dBc/Hz	
Spurious	In-Band Signal Related (C-/Ku-Band)					-50	dBc
	(Extended C-Band)					-40	dBc
	Close to Carrier Spurious (≤ 20 MHz)					-50	dBc
	Local Oscillator					-30	dBm
Noise Figure	At 75 dB gain setting	20				dB	
Input VSWR	L-Band	1.5 : 1					
Internal Reference Option	Reference Accuracy (initial)	± 1 • 10 <sup>-8</sup>					
	Aging per day (after 30 days)	± 1 • 10 <sup>-9</sup>					
	Aging per year (after 30 days)	± 6 • 10 <sup>-8</sup>					
	Reference Stability over Temperature (-40 to +40 °C, ambient)	± 1 • 10 <sup>-8</sup>					

## Part Number Configuration

HPA **C** 2 **5 0 0 B W M X S X X**



**Example** - A standalone 500W Extended C-Band High Power Outdoor SSPA with an optional input sample port and block up converter using an external reference is part number: **HPAC2500BWPXXX**.

### Use and Disclosure of Data

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