PARADISE DATACOM
A Teledyne Technologies Company

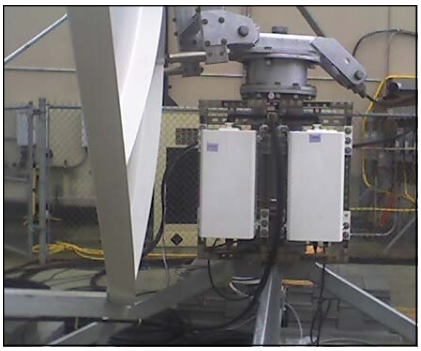
Compact Outdoor
Solid State Power Amplifiers in S-, C-, X-, and Ku-Bands

Description

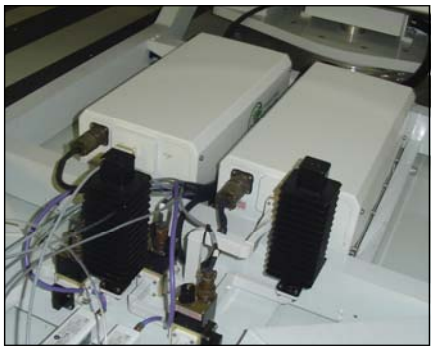
The Paradise Datacom Compact Outdoor Solid State Power Amplifier (SSPA) is built for extreme environmental conditions and high reliability operation. Along with the robust construction exists the highest power density in the industry. This allows solid state technology to be used in applications that have long been reserved for TWTAs.

At less than 40 lbs. (18 kg), and only slightly larger than a shoe box, this family of SSPAs is available in output power levels in the following range:

S-Band: 50W - 300W
C-Band: 30W - 300W
X-Band: 25W - 250W
Ku-Band: 10W - 125W



Antenna-mount 1:1 system w/ mounting frame



SNG-mount 1:1 system w/ side-mount AC input

FEATURES

- Compact size and weight
- CE Compliance Tested
- Integrated forced-air cooling system
- Adjustable RF Gain, 55 dB to 75 dB
- Extreme Environmental Testing
- RF Output Sample Port
- Maintenance Free Operation
- Universal, Power Factor Corrected Power Supply
- Built-in 1:1 Redundancy Control

OPTIONS

- Extended band operation
- Antenna Mounting Kit
- DC Operation (48VDC)
- Remote Control Panel
- L-Band Input
- FSK monitor & control via IFL
- Phase Combined Systems
- Wireless local interface - Bluetooth™ enabled
- Low line voltage operation
- Fiber Optic Input
- Optional side-mount AC input for SNG installations

SPECIFICATIONS

- Compact Outdoor housing
  10.0 X 19.5 X 6.50 in
  254 X 495 X 165 mm
- White powder coat finish
- Operating temperature: -40 to +60 °C

770-754-4547 www.servsat.com sales@servsat.com

205485 REV M ECO 16205

Specifications, S-Band SSPAs

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	A Series Sub-band B Series Sub-band	2.020 to 2.120 2.200 to 2.300	GHz GHz
Output Power @: Saturation/P_{1dB} (Typical/Guaranteed minimum)	A Series HPAS2050ACXXXXX (2.020 - 2.120 GHz) HPAS2100ACXXXXX (2.020 - 2.120 GHz) HPAS2200ACXXXXX (2.020 - 2.090 GHz) HPAS2200ACXXXXX (2.095 - 2.120 GHz) HPAS2300ACXXXXX (2.020 - 2.090 GHz) HPAS2300ACXXXXX (2.095 - 2.120 GHz) B Series HPAS2050BCXXXXX (2.200 - 2.300 GHz) HPAS2100BCXXXXX (2.200 - 2.300 GHz) HPAS2200BCXXXXX (2.200 - 2.300 GHz) HPAS2300BCXXXXX (2.200 - 2.300 GHz)	P_{sat} / P_{1dB} 47.5/47.0 (56/50) 50.5/50.0 (112/100) 53.5/53.0 (223/200) 53.0/52.5 (200/178) 55.0/54.5 (316/280) 54.4/54.0 (280/250) 47.5/47.0 (56/50) 50.5/50.0 (112/100) 53.5/53.0 (223/200) 55.0/54.5 (316/280)	 dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Power Requirements Line Voltage Line Frequency Line Power	 power factor corrected HPAS2050ACXXXXX HPAS2100ACXXXXX HPAS2200ACXXXXX HPAS2300ACXXXXX	 90 to 265 47 to 63 425 775 1350 (180 - 265 VAC only) 1600 (180 - 265 VAC only)	 VAC Hz W W W W
Receive Band Reject Filter External filter only	 Insertion Loss Rx Reject @ 2.200 - 2.300 GHz Rx Reject @ 2.025 - 2.120 GHz	 - 0.5 -60 -60	 dB dBc dBc
Receive Band Noise Power Density For sub-band A SSPAs only	Without optional filter With optional filter	-95 -155	dBw/4 KHz dBw/4 KHz

Specifications, C-Band SSPAs

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	5.850 to 6.425	GHz
Output Power @: Saturation/P_{1dB} (Typical/Guaranteed minimum)	 HPAC2030ACXXXXX HPAC2040ACXXXXX HPAC2050ACXXXXX HPAC2075ACXXXXX HPAC2100ACXXXXX HPAC2140ACXXXXX HPAC2200ACXXXXX HPAC2250ACXXXXX HPAC2300ACXXXXX	P_{sat} / P_{1dB} 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) 51.5/51.0 (141/126) 53.0/52.3 (200/170) 54.0/53.0 (250/200) 54.7/54.0 (300/251)	 dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Power Requirements Line Voltage Line Frequency Line Power	 power factor corrected HPAC2030ACXXXXX HPAC2040ACXXXXX HPAC2050ACXXXXX HPAC2075ACXXXXX HPAC2100ACXXXXX HPAC2140ACXXXXX HPAC2200ACXXXXX HPAC2250ACXXXXX HPAC2300ACXXXXX	 90 to 265 47 to 63 350 350 425 500 750 875 (180 - 265 VAC)* 1300 (180 - 265 VAC)* 1500 (180 - 265 VAC)* 1675 (180 - 265 VAC)* *90-265 VAC option available	 VAC Hz W W W W W W W W W
Extended C-Band 5.85 to 6.725 GHz 5.75 to 6.67 GHz	De-rate output power by 1.0 dB linearly from 6.425 to 6.725 GHz De-rate output power by 1.0 dB linearly from 6.425 to 6.67 GHz and by 0.5 dB from 5.85 to 5.75 GHz		

Specifications, X-Band SSPAs

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	7.900 to 8.400	GHz
Output Power @: Saturation/P_{1dB} (Typical/Guaranteed minimum)	 HPAX2025ACXXXXX HPAX2030ACXXXXX HPAX2060ACXXXXX HPAX2075ACXXXXX HPAX2100ACXXXXX HPAX2140ACXXXXX HPAX2200ACXXXXX HPAX2250ACXXXXX	P_{sat} / P_{1dB} 44.5 / 44.0 (28 / 25) 45.9 / 45.5 (39 / 35) 47.5 / 47.3 (60 / 54) 48.8 / 48.3 (76 / 68) 50.0 / 49.5 (100 / 89) 51.4 / 50.8 (140 / 120) 53.0 / 51.8 (200 / 170) 54.0 / 53.0 (250 / 200)	 dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Power Requirements Line Voltage Line Frequency Line Power	 power factor corrected HPAX2025ACXXXXX HPAX2030ACXXXXX HPAX2060ACXXXXX HPAX2075ACXXXXX HPAX2100ACXXXXX HPAX2140ACXXXXX HPAX2200ACXXXXX HPAX2250ACXXXXX	 90 to 265 47 to 63 378 461 500 700 850 1125 (180-265 VAC only)* 1425 (180-265 VAC only)* 2000 (180-265 VAC only)* *90-265 VAC option available	 VAC Hz W W W W W W W W
Transmit Band Filter (Option)	Insertion Loss	-0.5	dB
Transmit Band Noise Power Density	Without optional filter With optional filter	-50 -120	dBm/4 KHz dBm/4 KHz
Extended X-Band 7.70 to 8.40 GHz	De-rate output power by 1.0 dB linearly from 7.90 to 7.70 GHz		

Specifications, Ku-Band SSPAs

PARAMETER	NOTES	LIMITS	UNITS
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)
Power Requirements Line Voltage Line Frequency Line Power	power factor Line voltage Line frequency HPAK2010ACXXXXX HPAK2020ACXXXXX HPAK2025ACXXXXX HPAK2035ACXXXXX HPAK2040ACXXXXX HPAK2050ACXXXXX HPAK2070ACXXXXX HPAK2100ACXXXXX HPAK2125ACXXXXX	.98 90 to 265 47 to 63 275 375 400 425 550 650 750 1200 (180-265 VAC)* 1250 (180-265 VAC)* *90-265 VAC option available	 VAC Hz W W W W W W W W W
Extended Ku-Band 13.75 to 14.50 GHz	De-rate output power by 1.0 dB linearly from 14.00 to 13.75 GHz		

Common Electrical Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain	range	55-75	dB
Gain Flatness	full band (C-,X-,Ku-bands)	±1.0	dB
	full band (Extended C-Band)	±1.5	dB
	full band (S-band)	±0.5	dB
Gain Slope	per 40 MHz (C-,X-,Ku-bands)	±0.3	dB/40 MHz
	Per 10 MHz (S-band)	±0.1	dB/10 MHz
Gain Variation vs. Temperature	-40°C to +60°C	±1.5	dB
Gain Adjustment	0.1 dB resolution	20	dB
Intermodulation Distortion	Two-Tone 3 dB back off from P_{1dB}	-25	dBc
AM/PM Conversion	@ rated P_{1dB}	3.5	°/dB
	@ P_{1dB} - 1 dB	1.5	°/dB
	@ P_{1dB} - 2 dB	1.0	°/dB
Spurious Harmonics (SSPA only)	(@ rated P_{1dB})	-60	dBc
	(@ rated $P_{1dB-3dB}$) (C-,X-,Ku-bands)	-50	dBc
	(@ rated $P_{1dB-3dB}$) (S-band)	-30	dBc
Input/Output VSWR	All units except Extended C-Band	1.30:1	
	Extended C-Band units	1.50:1	
Noise Figure	at maximum gain (C-,X-,Ku-bands)	10	dB
	at maximum gain (S-band)	8	dB
Group Delay (per 40 MHz segment)	Linear	0.01	ns/MHz
	Parabolic	0.003	ns/MHz^2
	Ripple	1.0	ns p-p
Transmit Band Noise Output Power Density	TX Band	-75	dBW/4 KHz
	RX Band (C-,X-,Ku-bands)	-150	dBW/4 KHz
	RX Band (S-band)	See options	
Receive Band Noise Output Power Density	S-Band, with optional filter	-155	dBW/4 KHz
	S-Band, without optional filter	-95	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 (SSPA only)	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
RF Power Detector	P_{sat} to (P_{sat}-20 dBm)	20 ± 1.0	dBm

Environmental Specifications

PARAMETER	NOTES	LIMITS	UNITS
Operating Temperature	Ambient	-40 to +60	°C
Relative Humidity	Condensing	100	%
Cooling System	Integrated	Forced air	
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		

L-Band Operation

Paradise Datacom offers C-, X-, and Ku-Band amplifiers with an integrated L-Band Block Up Converter. The L-Band units utilize Paradise Datacom's proprietary ZBUC™ technology. The addition of a ZBUC™ to a Compact Outdoor SSPA typically increases the gain by 2-4 dB. The advantages of ZBUC™ technology include:

- ZBUC™ can detect and switch to an extenally supplied reference.
- Optional internal high stability (10MHz) reference.
- ZBUC™ can lock to an externally supplied reference of 5, 10, 20, 25, or 50 MHz without modification.
- ZBUC™ can accept a wide range of external reference power (-10dBm to +5 dBm)
- ZBUC™ can accept FSK monitor and control signal via the IFL for complete amplifer remote control.

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
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 Compact Outdoor with ZBUC™

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
	Typical C-Band Adj. Range	60 - 80				dB
	Typical Ku-Band Adj. Range	57 - 77				dB
Gain Stability	-40 to +60 °C	±1.5				dB
Phase Noise	Offset frequency from carrier	Absolute max.	C-band (typ.)	X-band (typ.)	Ku-band (typ.)	
	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
	Non-Signal Related			-40		dBm
Noise Figure	At 75 dB gain setting			20		dB
Input VSWR	L-Band			1.5 : 1		
Internal Reference Option	Reference accuracy @ 25 °C			$\pm 1 \cdot 10^{-8}$		
	Reference Stability over Temperature (-40 to +40 °C)			$\pm 1 \cdot 10^{-9}$		

Remote Control Panel - Ethernet Interface for the Compact Outdoor SSPA

The RCP2-1000 is a Remote Control Panel for the Compact Outdoor SSPA. It only requires 1RU of cabinet space and provides and identical local interface as exists on Paradise Datacom Indoor Rack Mount amplifiers.

The controller communicates with the outdoor amplifier via a RS485 link. The controller then provides a wide range of interface capability including Ethernet communications. The following communication links are available at the Remote Control Panel:

- RS232 or Addressable RS485 Serial Data
- Discrete (Parallel) Interface - Form C contact outputs & Opto Isolated Inputs
- Ethernet Interface - A full compliment of Ethernet Communications including UDP, SNMP, and an internal web browser.
- Local (Manual) interface via front panel LCD display

Fiber Optic Interface

Paradise Datacom offers an Outdoor Fiber Optic Converter Module (OFM-1000) for the Compact Outdoor SSPA which interfaces with a rack mountable Fiber Optic to L Band Transceiver (RCPF-1000).

The 1RU Indoor Fiber Optic to L Band Transceiver complements the Compact Outdoor Amplifier for a complete Optical interface for the amplifier.

What distinguishes the Paradise Datacom Fiber Optic solution is the ability to transmit and receive not only the L -Band IFL, but also a 10 MHz reference signal and an FSK signal that provides complete remote control of the amplifier. When equipped with a Paradise Datacom PD25 L-Band modem, a complete base-band to optical interface is realized.

A system utilizing a Fiber Optic link can have an IFL length in excess of 1km. An optical link is also desirable in areas in which L-Band interference can degrade the system's performance.

PD25 SATELLITE MODEM (top)
RCPF-1000 FIBER-OPTIC CONTROLLER

OFM-1000
EXTERNAL FIBER MODULE

COMPACT OUTDOOR SSPA

Mechanical Specifications

PARAMETER	NOTES	LIMITS	UNITS/DETAILS
Size	width X length X height	10.0 X 19.5 X 6.50 254 X 495 X 165	inches mm
Weight	Base unit (<200W S/C-bands; <100W Ku-Band) Base unit (≥200W S/C-bands; ≥100W Ku-Band) Base unit (<200W X-Band) Base unit (≥200W X-Band) With Internal zBUC With 110 VAC Option With optional Tx Filter or Rx Reject Filter	36 (16.4) ± 3% 44 (20.0) ± 3% 46.7 (21.1) ± 3% 54.9 (25.0) ± 3% +1.7 (0.8) + 1.2 (0.6) + 1.0 (0.5) ea.	lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg)
Finish		Paint	White; powder coat
Connectors	RF Input RF Output - S-Band RF Output - Ku-Band RF Output - C-Band RF Output - X-Band RF Output Sample Line Power Monitor and Control Link Port Redundancy Switch Auxiliary +15VDC LNB Power (500 mA)	Type N Type N WR75 Waveguide WR137 Waveguide WR112 Waveguide Type N 3-pin MS-type 32-pin MS-type 6-pin MS type 6-pin MS-type 6-pin MS-type	Female Female Grooved flange (PBR-120) CPR137G flange (PDR-70) CPR112G flange (PDR-84) Female Plug Socket Socket Socket Socket

Outline Drawing, Compact Outdoor SSPA (typical)

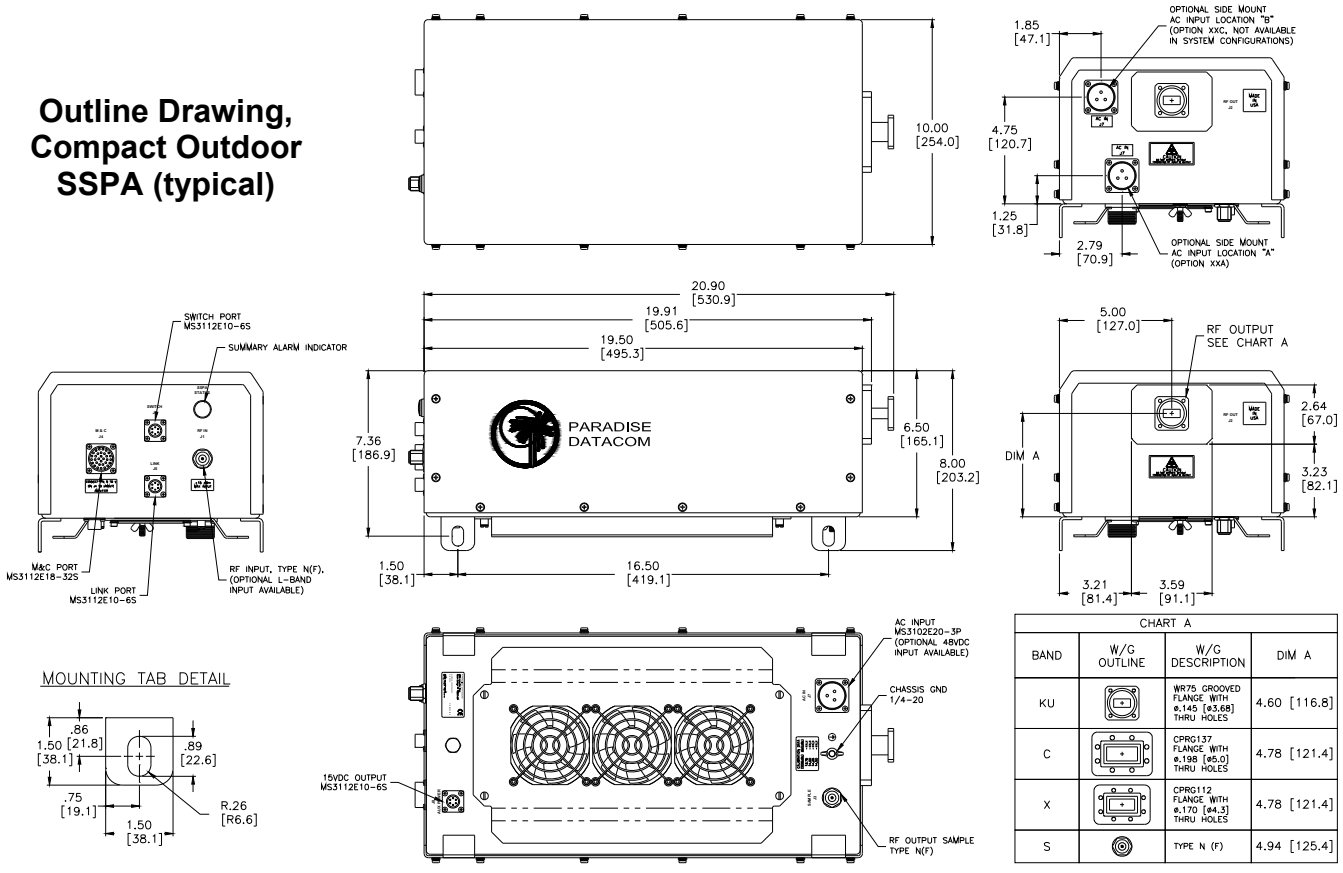


CHART A

BAND	W/G OUTLINE	W/G DESCRIPTION	DIM A
KU		WR75 GROOVED FLANGE WITH ø.145 [ø3.68] THRU HOLES	4.60 [116.8]
C		CPRG137 FLANGE WITH ø.198 [ø5.0] THRU HOLES	4.78 [121.4]
X		CPRG112 FLANGE WITH ø.170 [ø4.3] THRU HOLES	4.78 [121.4]
S		TYPE N (F)	4.94 [125.4]

Part Number Configuration

HPA [ ] 2 [ ][ ][ ][ ] C [ ] X [ ][ ][ ]

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

Power Level (in Watts)
S-Band
050, 100, 200 or 300
C-Band
030, 040, 050, 075, 100, 140, 200, 250 or 300
X-Band
025, 030, 060, 075, 100, 140, 200, or 250
Ku-Band
010, 020, 025, 035, 040, 050, 070, 100, or 125

Frequency Sub Band
S-Band
A - 2.020 - 2.120 GHz
B - 2.200 - 2.300 GHz
C-Band
A[1] - 5.850 - 6.425 GHz
B[1] - 5.850 - 6.725 GHz
C - 5.750 - 6.670 GHz
E[1] - 6.425 - 6.725 GHz (Palapa)
F[1] - 6.725 - 7.025 GHz (Insat)
G[1] - 5.750 - 6.475 GHz
H[1] - 5.715 - 5.790 GHz
J[1] - 5.740 - 6.650 GHz
V[1,2] - 5.850 - 6.725 GHz
X-Band
A[1] - 7.90 - 8.40 GHz
B - 7.50 - 8.50 GHz
D - 7.70 - 8.40 GHz
E - 7.75 - 8.50 GHz
Ku-Band
A[1] - 14.00 - 14.50 GHz
B[1] - 13.75 - 14.50 GHz
C[1] - 14.50 - 14.70 GHz
D[1] - 15.10 - 15.40 GHz

[1] Available with optional BUC.
[2] With 1.3:1 VSWR.

Package
C = Standard Compact Outdoor

Refer to specification sheet 205489 for Fiber options.

Configuration Modifier
XXX = Standard
KXX[1] = 110 VAC Option
XMX = MS-Connector Covers
XRX[2] = Receive Band Reject Filter
XSX[2] = MS-Connector Covers & Receive Band Reject Filter
XTX[3] = Transmit Band Filter
XUX[3] = MS-Connector Covers & Transmit Band Filter
XXA = Side-mount AC Input, Location 'A'
XXC[4] = Side-mount AC Input, Location 'B'
XXD = 48 VDC Input
XXF = Side-mount 48V Input, Location 'A'
XXG[4] = Side-mount 48V Input, Location 'B'

[1] Available in C- and X-Band models ≥140W and Ku-band models ≥100W.
[2] S-Band only.
[3] X-Band only.
[4] Not available with System Configurations.

System Configuration
X = Standalone

Refer to the following specification sheets:
- 203581 for Redundant Systems;
- 203582 for Phase Combined Systems.

Block Up Converter
B = BUC (Custom)
M = Internal Reference ZBUC
P = External Reference ZBUC
X = None

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.

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 U.S. without obtaining proper licensing from the appropriate government agencies.