TELEDYNE
PARADISE DATACOM
A Teledyne Technologies Company

Compact Outdoor
GaAs Solid State Power Amplifiers

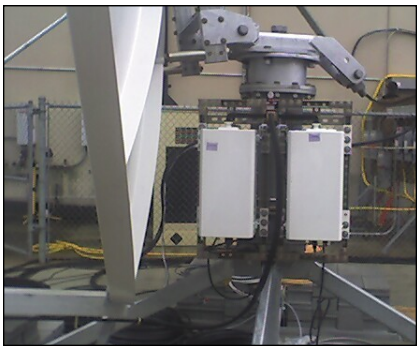
125W Ku-Band
Compact Outdoor SSPA

Description

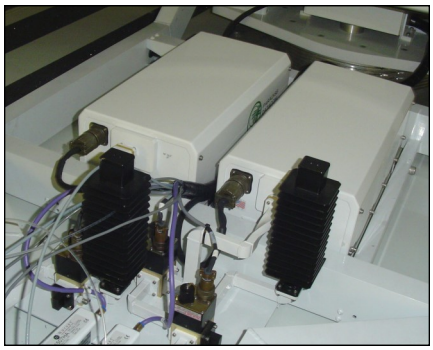
The Teledyne Paradise Datacom Compact Outdoor Solid State Power Amplifier (SSPA) is built for extreme environmental conditions and high reliability operation. Along with the robust construction exists the highest power density in the industry. This allows solid state technology to be used in applications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

C-Band: 30W - 300W
X-Band: 25W - 250W
Ku-Band: 40W - 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 & MIL-STD-461 Compliant
- 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
- Built-in Maintenance Switch Controller

OPTIONS

- Extended band operation
- Antenna Mounting Kit
- DC Operation (48VDC)
- Remote Control Panel
- L-Band Input
- Phase Combined Systems
- Reflected Power Monitor
- 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

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Specifications, C-Band SSPAs

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(See options for extended bands) Insat Band	5.850 to 6.425 6.725 to 7.025	GHz GHz
Output Power @: Saturation/P_{1dB} (Typical/Guaranteed minimum)		P_{sat} / P_{1dB}	
	HPAC2030ACXXXXX	45.0 (32) / 44.8 (30)	dBm (W)
	HPAC2040ACXXXXX	46.0 (40) / 45.8 (38)	dBm (W)
	HPAC2050ACXXXXX	47.0 (50) / 46.8 (48)	dBm (W)
	HPAC2075ACXXXXX	48.8 (76) / 48.5 (70)	dBm (W)
	HPAC2100ACXXXXX	50.0 (100) / 49.5 (89)	dBm (W)
	HPAC2140ACXXXXX	51.5 (141) / 51.0 (126)	dBm (W)
	HPAC2200ACXXXXX	53.0 (200) / 52.3 (170)	dBm (W)
	HPAC2250ACXXXXX	54.0 (250) / 53.0 (200)	dBm (W)
	HPAC2300ACXXXXX	54.7 (300) / 54.0 (251)	dBm (W)
Power Requirements	power factor corrected		
Line Frequency		47 to 63	Hz
Line Power (Voltage) (typical @ 220 VAC)	HPAC2030ACXXXXX	350 (90-265)	W (VAC)
	HPAC2040ACXXXXX	350 (90-265)	W (VAC)
	HPAC2050ACXXXXX	425 (90-265)	W (VAC)
	HPAC2075ACXXXXX	500 (90-265)	W (VAC)
	HPAC2100ACXXXXX	750 (90-265)	W (VAC)
	HPAC2140ACXXXXX	875 (180-265)[1]	W (VAC)
	HPAC2200ACXXXXX	1300 (180-265)[1]	W (VAC)
	HPAC2250ACXXXXX	1500 (180-265)[1]	W (VAC)
	HPAC2300ACXXXXX	1675 (180-265)[1]	W (VAC)
Receive Band Noise Power Density	without filter	- 155	dBW / 4 KHz
Frequency Sub-Band Power De-rating 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		

Note 1: Available with low line voltage option, 90 to 265 VAC.

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)		P_{sat} / P_{1dB}	
	HPAX2025ACXXXXX	44.5 (28) / 44.0 (25)	dBm (W)
	HPAX2030ACXXXXX	45.9 (39) / 45.5 (35)	dBm (W)
	HPAX2060ACXXXXX	47.5 (60) / 47.3 (54)	dBm (W)
	HPAX2075ACXXXXX	48.8 (76) / 48.3 (68)	dBm (W)
	HPAX2100ACXXXXX	50.0 (100) / 49.5 (89)	dBm (W)
	HPAX2140ACXXXXX	51.4 (140) / 50.8 (120)	dBm (W)
	HPAX2200ACXXXXX	53.0 (200) / 51.8 (170)	dBm (W)
	HPAX2250ACXXXXX	54.0 (250) / 53.0 (200)	dBm (W)
Power Requirements	power factor corrected		
Line Frequency		47 to 63	Hz
Line Power (Voltage) (typical @ 220 VAC)	HPAX2025ACXXXXX	378 (90-265)	W (VAC)
	HPAX2030ACXXXXX	461 (90-265)	W (VAC)
	HPAX2060ACXXXXX	500 (90-265)	W (VAC)
	HPAX2075ACXXXXX	700 (90-265)	W (VAC)
	HPAX2100ACXXXXX	850 (90-265)	W (VAC)
	HPAX2140ACXXXXX	1125 (180-265)[1]	W (VAC)
	HPAX2200ACXXXXX	1425 (180-265)[1]	W (VAC)
	HPAX2250ACXXXXX	2000 (180-265)[1]	W (VAC)
Receive Band Noise Power Density	without optional filter with optional filter	- 85 - 155	dBW / 4 KHz dBW / 4 KHz
Frequency Sub-Band Power De-rating 7.70 to 8.40 GHz	 De-rate output power by 1.0 dB linearly from 7.90 to 7.70 GHz		

Note 1: Available with low line voltage option, 90 to 265 VAC.

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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)		P_{sat} / P_{1dB}	
	HPAK2040ACXXXXX	46.0 (40) / 45.0 (31)	dBm (W)
	HPAK2050ACXXXXX	47.0 (50) / 46.0 (40)	dBm (W)
	HPAK2070ACXXXXX	48.5 (70) / 47.5 (56)	dBm (W)
	HPAK2100ACXXXXX	50.0 (100) / 49.0 (80)	dBm (W)
	HPAK2125ACXXXXX	51.0 (125) / 50.0 (100)	dBm (W)
Power Requirements	power factor	.98	
Line Frequency	Line frequency	47 to 63	Hz
Line Power (Voltage) (typical @ 220 VAC)	HPAK2040ACXXXXX	550 (90-265)	W (VAC)
	HPAK2050ACXXXXX	650 (90-265)	W (VAC)
	HPAK2070ACXXXXX	750 (90-265)	W (VAC)
	HPAK2100ACXXXXX	1200 (180-265)[1]	W (VAC)
	HPAK2125ACXXXXX	1250 (180-265)[1]	W (VAC)
Receive Band Noise Power Density[2]		- 155	dBW / 4 KHz
Frequency Sub-Band Power De-rating 13.75 to 14.50 GHz	De-rate output power by 1.0 dB linearly from 14.00 to 13.75 GHz		

Note 1: Available with low line voltage option, 90 to 265 VAC.
Note 2: All Ku-Band SSPAs are fitted with a receive band reject bulkhead filter, standard.

Common Electrical Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain Gain Flatness Gain Slope Gain Variation vs. Temperature Gain Stability Gain Adjustment	range full band full band (Extended C-Band) per 40 MHz -40 °C to +55 °C at constant temperature 0.1 dB resolution	55 - 75 ± 1.0 ± 1.5 ± 0.3 ± 1.5 ± 0.25 20	dB dB dB dB/40 MHz dB dB/24 hours dB
Intermodulation Distortion	Two-Tone 3 dB back off from P_{1dB}	-25	dBc
AM/PM Conversion	@ rated P_{1dB} @ P_{1dB} - 1 dB @ P_{1dB} - 2 dB	3.5 1.5 1.0	°/dB °/dB °/dB
Spurious Harmonics (SSPA only)	(@ rated P_{1dB}) (@ rated P_{1dB} - 3 dB)	-65 -50	dBc dBc
Input/Output VSWR	Extended C-Band Output VSWR: Ku-Band with bulkhead filter	1.30:1 1.50:1 1.40:1	
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^2 ns p-p
Transmit Band Noise Output Power Density	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 (SSPA only)	Offset frequency from carrier 10 Hz 100 Hz 1 KHz 10 KHz 100 KHz 1 MHz	 -90 -100 -110 -120 -125 -130	 dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz 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	103	CFM
Ingress Protection Rating	With connectors properly sealed	IP54	
Audible Noise	Measured 1m from unit, at P_{sat}	74	dBA
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		

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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® 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 extenally 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)
- zBUC converter can accept FSK monitor and control signal via the IFL for complete amplifer remote control.

Available Frequency Plans

Band	Frequency Plan	IF Input	LO Frequency	RF Output
C	Sub-Band "A"	950 - 1525 MHz	4.900 GHz	5.850 - 6.425 GHz
C	Sub-Band "B"	950 - 1825 MHz	4.900 GHz	5.850 - 6.725 GHz
C	Sub-Band "C"	950 - 1870 MHz	4.800 GHz	5.750 - 6.670 GHz
C	Sub-Band "E"	950 - 1250 MHz	5.475 GHz	6.425 - 6.725 GHz
C	Sub-Band "F"	950 - 1250 MHz	5.775 GHz	6.725 - 7.025 GHz
C	Sub-Band "G"	950 - 1675 MHz	4.800 GHz	5.750 - 6.475 GHz
X	Sub-Band "A"	950 - 1450 MHz	6.950 GHz	7.900 - 8.400 GHz
Ku	Sub-Band "A"	950 - 1450 MHz	13.050 GHz	14.00 - 14.50 GHz
Ku	Sub-Band "B"	950 - 1700 MHz	12.800 GHz	13.75 - 14.50 GHz

Electrical Specifications for Compact 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
	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	-58	-56	dBc/Hz
	100 Hz	-60	-74	-70	-67	dBc/Hz
	1 KHz	-70	-84	-80	-78	dBc/Hz
	10 KHz	-80	-100	-94	-91	dBc/Hz
	100 KHz	-90	-105	-97	-94	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 Maximum gain	20				dB
Transmit Band Noise Output Power Density	Tx Band at Maximum gain	-65				dBW/4kHz
Input VSWR	L-Band	1.5 : 1				
Internal Reference Option	Reference Accuracy (initial)	$\pm 1 \cdot 10^{-8}$				
	Aging per day (after 30 days)	$\pm 1 \cdot 10^{-9}$				
	Aging per year (after 30 days)	$\pm 6 \cdot 10^{-8}$				
	Reference Stability over Temperature (-40 to +40 °C, ambient)	$\pm 1 \cdot 10^{-8}$				

Optional Accessories

Remote Control Panel (RCP2-1000-CO)

The RCP2-1000-CO is a Remote Control Panel for the Compact Outdoor SSPA. It requires 1RU of cabinet space and provides a similar local interface as exists on Teledyne Paradise Datacom Indoor Rack Mount amplifiers. Reference specification sheet **209728**.

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

Universal Handheld Controller (RCH-1000)

The Universal Handheld Controller (RCH-1000) is a versatile device used to interface with a variety of Teledyne Paradise Datacom amplifiers, including Compact Outdoor SSPA, Mini Compact Outdoor SSPA, or H-Series High Power Outdoor SSPA. Reference specification sheet **211667**.

The device is housed in a ruggedized enclosure that is environmentally sealed to IP65 levels. This allows the Universal Handheld Controller (RCH-1000) to be used in most outdoor environments. The rugged construction of the device enclosure provides protection from impact and vibration.

This device allows the operator to adjust the attenuation of the connected unit, and control the mute/unmute selection, as well as monitor the status, conditions and settings of the connected unit via a serial RS-485 connection. Fault conditions and other events are tracked in the controller's internal log.

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 C-Band; < 100W Ku-Band) Base unit (≥ 200W C-Band; ≥ 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 - 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 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 Grooved flange (PBR-120) CPR137G flange (PDR-70) CPR112G flange (PDR-84) Female Plug Socket Socket Socket Socket

Outline Drawing, Compact Outdoor SSPA (typical)

SUMMARY ALARM INDICATOR OMITTED ON X-BAND UNITS

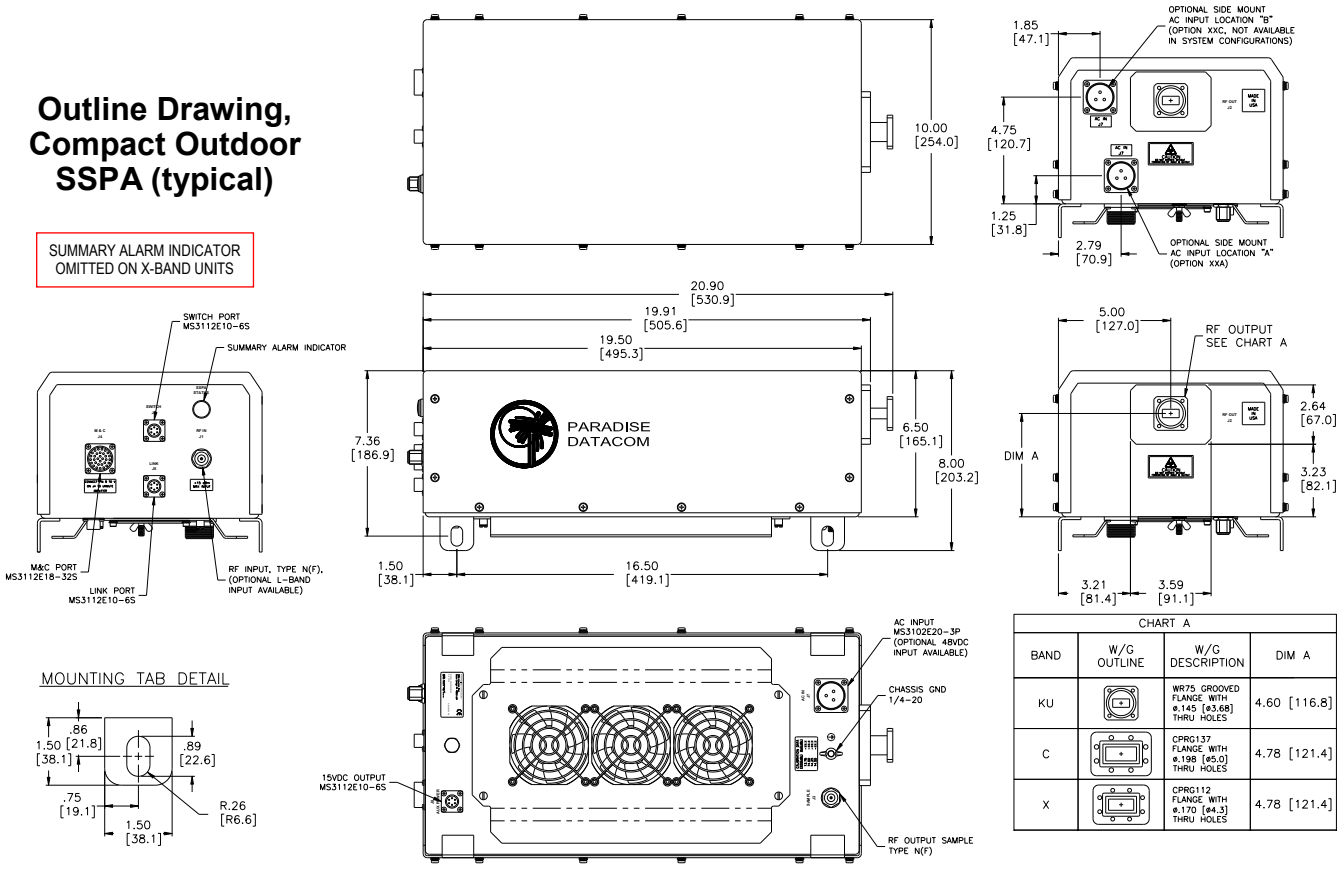

CHART A

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]

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Part Number Configuration Matrix

HPA	C	2	2	0	0	A	C	M	X	X	X	X

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

Generation	
Second	2

Power Level (Watts)	
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	040, 050, 070, 100, or 125

Frequency Sub Band	
C-Band	
A[1]	5.850 to 6.425 GHz
B[1]	5.850 to 6.725 GHz
C[1]	5.750 to 6.670 GHz
E[1]	6.425 to 6.725 GHz (Palapa)
F[1]	6.725 to 7.025 GHz (Insat)
G[1]	5.750 to 6.475 Ghz
H	5.715 to 5.790 GHz
J	5.740 to 6.650 GHz
X-Band	
A[1]	7.90 to 8.40 GHz
B	7.50 to 8.50 GHz
D	7.70 to 8.40 GHz
Ku-Band	
A[1]	14.00 to 14.50 GHz
B[1]	13.75 to 14.50 GHz

[1] Available with optional BUC

Package	
C	Standalone amplifier

Configuration Modifier 3	
X	None (Standard)
A	Side-Mount AC Input, Location 'A'
C [1]	Side-Mount AC Input, Location 'B'
D	48 VDC Input
F	Side-mount 48V Input, Location 'A'
G [1]	Side-mount 48V Input, Location 'B'

[1] Standalone units only

Configuration Modifier 2	
X	Standard
M	MS-Connector Covers
R[1]	Receive Band Reject Filter
S[1]	M + R (see above)

[1] X-Band only

Configuration Modifier 1	
X	Standard
K[1]	110 VAC Input Power

[1] Available on C- and X-Band units ≥ 140W and Ku-Band units ≥ 100W

System Configuration	
X	Standalone amplifier

Refer to the following specification sheets:

- 203581 for Redundant Systems
- 203582 for Phase Combined Systems

Block Up Converter	
M	Internal Reference BUC
P	External Reference BUC
X	No BUC

Example - A standalone 200W GaAs C-Band Compact Outdoor SSPA with an optional internal reference block up converter is part number: **HPAC2200ACMXXXX**.

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