



High Power Outdoor GaAs Solid State Power Amplifiers



Teledyne Paradise Datacom's newly packaged High Power Outdoor (H) series of Solid State Power Amplifiers represent the latest in High Power Microwave Amplifier Technology. The SSPA package achieves the highest power density in the industry, along with enhanced maintainability.

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.

Teledyne Paradise Datacom amplifiers are optimized for the best wide band intermod performance and linearity possible.

All Teledyne Paradise Datacom SSPAs have a full complement of local and remote control capability. The remote control capabilities include: RS485/RS232 serial control, Ethernet including SNMP, UDP, and internal web browsing. Discrete hardware control, Form C contact alarms and opto isolated inputs are also included.

FEATURES

- Extremely High Power Density:
 - to 500 W X-Band
 - to 600 W C-Band
 - to 250 W Ku-Band
- RF Output Sample Port
- Remote Communication via RS232/485 or Ethernet
- -20 dB Gain Adjustment
- Built-in 1:1 Redundancy Control with 'Cold' Standby capability
- Built-in Maintenance Switch Controller

OPTIONS

- Hand Held Controller
- RF Input Sample Port
- L-Band Input operation
- Reflected Power Monitor
- Phase Combined Systems
- Antenna Mounting Kit

SPECIFICATIONS

- Dimensions & Weight:
 - 16.5 x 27.5 x 9.335 in.
 - 419 x 699 x 238 mm
 - 95.0 lbs. / 43.2 kg

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C-Band Output Power Levels

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	5.850 to 6.425	GHz
Output Power P _{sat} , typical P _{1dB} , guaranteed minimum	HPAC2400AHXXXXXX HPAC2500AHXXXXXX HPAC2600AHXXXXXX	P _{sat} / P _{1dB} 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 Frequency Line Power (Voltage) (typical @ 220 VAC)	Power Factor corrected Autoranging HPAC2400AHXXXXXX HPAC2500AHXXXXXX HPAC2600AHXXXXXX	> 0.9 47 - 63 2400 (90-265) 2800 (90-265) 3700 (180-265)	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 P _{sat} , typical P _{1dB} , guaranteed minimum	HPAX2350AHXXXXXX HPAX2500AHXXXXXX	P _{sat} / P _{1dB} 55.5 (354) / 54.5 (282) 57.0 (500) / 55.7 (370)	dBm (W) dBm (W)
Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC)	Power Factor corrected Autoranging HPAX2350AHXXXXXX HPAX2500AHXXXXXX	> 0.94 47 - 63 2700 (90-265) 4000 (180-265)	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 P _{sat} , typical P _{1dB} , guaranteed minimum	HPAK2200AHXXXXXX HPAK2250AHXXXXXX	P _{sat} / P _{1dB} 53.0 (200) / 52.0 (158) 54.0 (250) / 53.0 (200)	dBm (W) dBm (W)
Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC)	Power Factor corrected Autoranging HPAK2200AHXXXXXX HPAK2250AHXXXXXX	> 0.94 47 - 63 2500 (90-265) 2800 (90-265)	Hz W (VAC) W (VAC)

Options

Extended C-Band 5.850 to 6.725 GHz (Sub-band "B") 5.750 to 6.670 GHz (Sub-band "C") 6.425 to 7.025 GHz (Sub-band "E" or "F")	De-rate power by 1.0 dB linearly from 6.425 to 6.725 GHz De-rate power by 1.0 dB linearly from 5.850 to 5.750 GHz and from 6.425 to 6.670 GHz. Available in power levels up to 500W	Model: HPAC2XXXBHXXXXXX HPAC2XXXCHXXXXXX HPAC2XXXEH/FHXXXXXX
Extended X-Band 7.70 to 8.40 GHz (Sub-band "D")	De-rate power by 1.0 dB linearly from 7.90 to 7.70 GHz	Model: HPAX2XXXDHXXXXXX
Extended Ku-Band 13.75 to 14.5 GHz (Sub-band "B")	De-rate power by 1.0 dB linearly from 14.0 to 13.75 GHz	Model: HPAK2XXXBHXXXXXX

Common Specifications; HPA_2000XH 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	3dB back off relative to P _{1dB}	-25	dBc
AM/PM Conversion	(@ rated P _{1dB})	3.5	°/dB
	(@P _{1dB} - 3 dB)	1.0	°/dB
Spurious	(@ rated P _{1dB})	-65	dBc
Harmonics	(@ rated P _{1dB} - 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	Linear	0.01	ns/MHz
(per 40 MHz segment)	Parabolic	0.003	ns/MHz ²
	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	95 ± 5 (43.2 ± 2)	lbs. (kg)
Finish		powder coat	white

Environmental Specifications

Operating Temperature	Ambient	-40 to +60	°C
Relative Humidity	Condensing	100	%
Cooling System	Integrated	Forced air	
Ingress Protection Rating	With connectors properly sealed	IP54	
Altitude	No temperature de-rating up to 10,000 ft. (3,000 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		

Specifications are subject to change without notice.

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

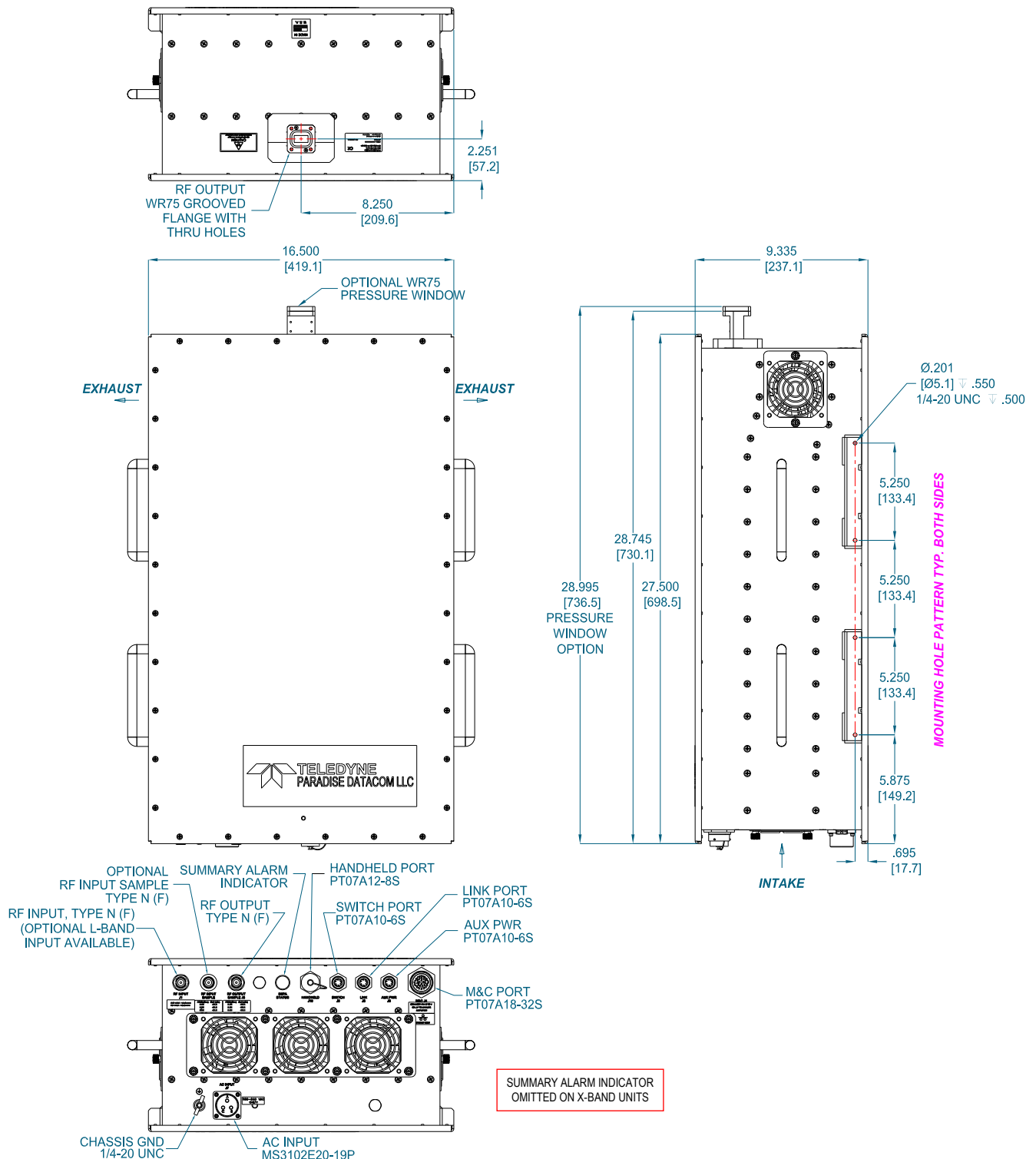
Available Frequency Plans

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
Ku	Sub-Band "F"	950 - 1450 MHz	11.800 GHz	12.75 - 13.25 GHz

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
	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	<u>Absolute max.</u>	<u>C-band (typ.)</u>	<u>X-band (typ.)</u>	<u>Ku-band (typ.)</u>	
	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) (Extended C-Band)	-50				dBc
	Close to Carrier Spurious (≤ 20 MHz)	-40				dBc
	Local Oscillator	-50				dBm
		-30				
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)	± 1 • 10 ⁻⁸				
	Aging per day (after 30 days)	± 1 • 10 ⁻⁹				
	Aging per year (after 30 days)	± 6 • 10 ⁻⁸				
	Reference Stability over Temperature (-40 to +40 °C, ambient)	± 1 • 10 ⁻⁸				

Outline Drawing, Ku-Band High Power Outdoor SSPA (typical)



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Optional Accessories

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, 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.



Remote Control Panel (RCP2-1000)

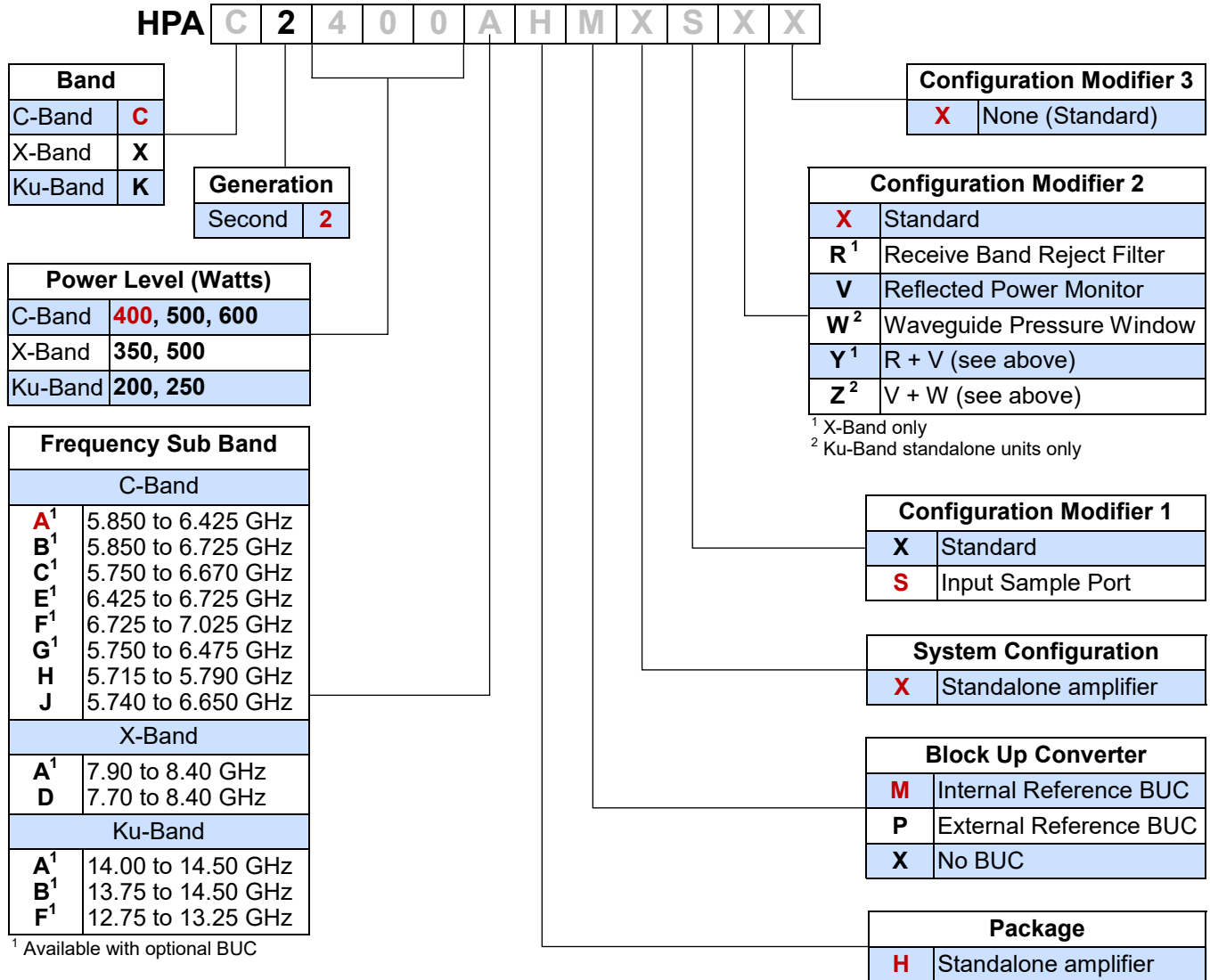


The RCP2-1000 is a Remote Control Panel for the High Power Outdoor SSPA. It requires only 1RU of cabinet space and provides an identical local interface as exists on Teledyne Paradise Datacom Indoor Rack Mount amplifiers.

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

Part Number Configuration Matrix



Example - A standalone 400W GaAs C-Band High Power Outdoor SSPA an optional input sample port and optional internal reference block up converter is part number: **HPAC2400AHMXSXX**.

An optional mounting kit is available.

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