

# Indoor Rack Mount Hot-Swap Modular (7RU GaAs) High Power SSPA Chassis



7RU SSPA Chassis

## DESCRIPTION

Teledyne Paradise Datacom's 7RU Indoor, High Power Rack Mount series of SSPAs represent the industry's highest power density and most reliable high power amplifier systems.

The High Power Rack Mount SSPA employs a modular design, which allows quick and easy replacement in the event of a catastrophic failure of one of the SSPA components. These modular assemblies include: hot-swap SSPA modules, front and rear fan trays; a front panel touchscreen display; and a rear panel controller card. These amplifiers are powered via a separate power supply chassis.

The power supply is configured as a n+1 redundant, hot swappable, power supply comprised of up to four modules. The power supply is configured such that one module is redundant. In the event of a single power supply module failure, the HPA system will not fail. The power supply module can then be changed without ever taking the HPA out of service.

## FEATURES

- Extremely High Power Density:  
to 1.1 kW C-Band;  
to 1000W X-Band;  
to 500W Ku-Band.
- Hot Swap, n+1 Redundant Power Supply
- Power Factor Corrected Power Supply
- Modular (soft-fail) Architecture
- Removable fan assemblies
- Ethernet Port
- RF Output Sample Port
- Built-in 1:1 Redundancy Control
- Built-in Maintenance Switch Controller
- Hot/Cold Standby operating modes for reduced power consumption

## OPTIONS

- Extended Frequency Band
- L-Band Input
- Reflected Power Monitor
- Phase Combined Systems
- Remote Control Panel
- RF Input Sample Port
- Rear Panel Air Intake and Exhaust

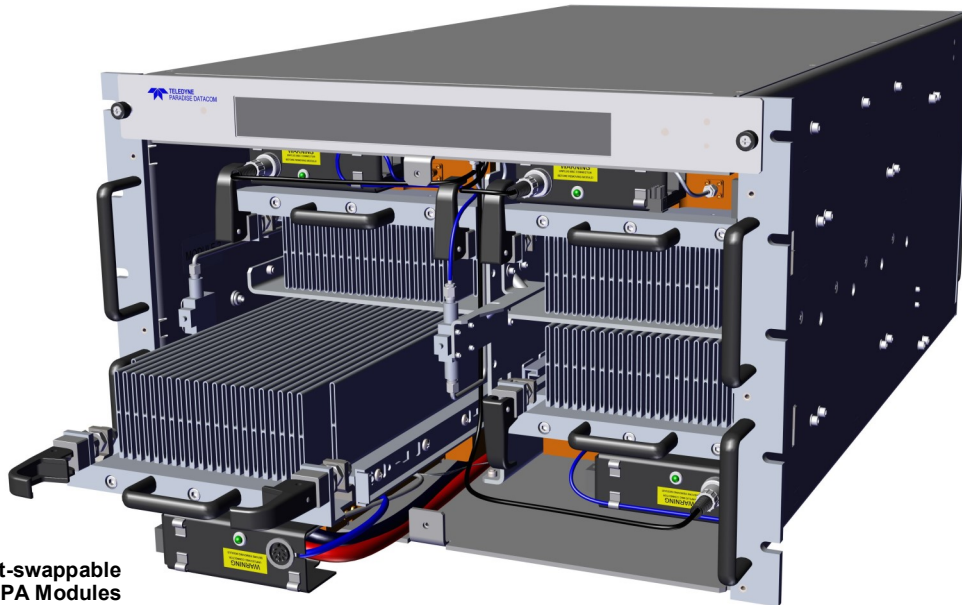
## SPECIFICATIONS

- SSPA Chassis housing:  
7 Rack Units (RU)  
19.0 X 12.22 X 30.0 in  
483 X 310 X 762 mm  
160 lbs / 72.5 kg
- 1RU Power Supply:  
19.0 X 1.75 X 16.1 in  
483 X 44 X 409 mm  
29 lbs / 13 kg
- Gray powder coat finish
- Operating temperature:  
0 to +50 °C

## Modular Design

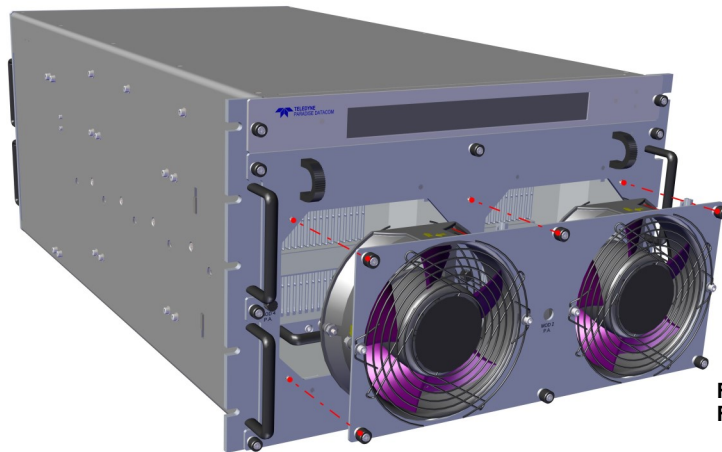
The 7RU Rack Mountable SSPA features a modular design which makes it easy to maintain.

Four SSPA modules are phase combined inside the 7RU Rack Mountable SSPA to produce the amplifier's total output power. Each of the SSPA modules is hot-swappable, allowing the unit to remain in service while a failed SSPA module is replaced.



Hot-swappable  
SSPA Modules

Front and rear fan assemblies are also field replaceable without taking the amplifier offline. The ability to remove the fan trays makes it easy to perform regular inspection and cleaning of the heatsink fins.



Field Replaceable  
Fan Assemblies

In addition, the Monitor and Control circuit card assembly and front display panel may be replaced while the amplifier is operating.

#### Power Specifications

BAND	PARAMETER	NOTES	LIMITS	UNITS
<b>C-BAND</b>	Frequency Range	(see options for extended band)	5.850 to 6.425	GHz
	Output Power @: Saturation/ $P_{1dB}$ (Typical/Guaranteed minimum)	HPAC7800ARXXXXX HPAC7900ARXXXXX HPAC711KARXXXXX	$P_{sat} / P_{1dB}$ 59.0 (800) / 58.0 (630) 59.5 (900) / 58.5 (700) 60.4 (1100) / 60.0 (1000)	dBm (W) dBm (W) dBm (W)
	Power Requirements Line Frequency Power Factor Line Power (Voltage) (typical @ 220 VAC)	HPAC7800ARXXXXX HPAC7900ARXXXXX HPAC711KARXXXXX	47 to 63 .90 4150 (180 to 265) 4850 (180 to 265) 6000 (180 to 265)	Hz W (VAC) W (VAC) W (VAC)
<b>X-BAND</b>	Frequency Range		7.9 to 8.4	GHz
	Output Power @: Saturation/ $P_{1dB}$ (Typical/Guaranteed minimum)	HPAX7700ARXXXXX HPAX710KARXXXXX	$P_{sat} / P_{1dB}$ 58.5 (700) / 58.1 (650) 60.0 (1000) / 59.5 (900)	dBm (W) dBm (W)
	Power Requirements Line Frequency Power Factor Line Power (Voltage) (typical @ 220 VAC)	HPAX7700ARXXXXX HPAX710KARXXXXX	47 to 63 .90 5500 (180 to 265) 6000 (180 to 265)	Hz W (VAC) W (VAC)
<b>KU-BAND</b>	Frequency Range	(see options for extended band)	14.0 to 14.5	GHz
	Output Power @: Saturation/ $P_{1dB}$ (Typical/Guaranteed minimum)	HPAK7250ARXXXXX HPAK7400ARXXXXX HPAK7500ARXXXXX	$P_{sat} / P_{1dB}$ 54.0 (250) / 53.0 (200) 56.0 (400) / 55.0 (300) 57.0 (500) / 56.0 (400)	dBm (W) dBm (W) dBm (W)
	Power Requirements Line Frequency Power Factor Line Power (Voltage) (typical @ 220 VAC)	Power Factor Corrected HPAK7250ARXXXXX HPAK7400ARXXXXX HPAK7500ARXXXXX	47 to 63 .90 2200 (180 to 265) 4600 (180 to 265) 5100 (180 to 265)	Hz W (VAC) W (VAC) W (VAC)

#### Options

Extended C-Band 5.850 to 6.725 GHz 5.750 to 6.670 GHz	De-rate power by 1.0 dB linearly from 6.425 to 6.725 GHz De-rate power by 1.0 dB linearly from 6.425 to 6.670 GHz and by 0.5 dB from 5.750 to 5.850	HPAC7XXXBRXXXXX HPAC7XXXCRXXXXX
Extended Ku-Band 13.75 to 14.5 GHz	De-rate power by 1.0 dB linearly from 13.75 to 14.0 GHz	HPAK7XXXBRXXXXX
Reflected Power Monitor		See Configuration Matrix
RF Input Sample Port (-10 dB)		See Configuration Matrix

## Common Electrical Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain	minimum	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	0 °C to +50 °C	± 1.0	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)	0.5	°/dB
Spurious Harmonics	(@ rated P <sub>1dB</sub> )	-65	dBc
	(@ P <sub>1dB</sub> - 3 dB)	-50	dBc
Input VSWR	(all bands and power levels)	1.30:1	
Output VSWR	(all bands and power levels)	1.50:1	
Noise Figure	at maximum gain	12	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		IESS -308/309 - 10 dB	

## Mechanical Specifications

Size		19.0 X 12.22 X 30.0	inches
HPA Chassis	width X height X depth	483 X 310 X 762	mm
Power Supply Chassis	width X height X depth	19.0 X 1.75 X 16.1	inches
		483 X 44 X 409	mm
RF Output Flanges	C-Band units	CPRG-137	
	X-Band units	CPRG-112	
	Ku-Band units	WR75 (grooved)	
Weight		160 (72.5)	lbs.(kg)
HPA Chassis		29 (13)	lbs.(kg)
Power Supply Chassis (1RU)			
Finish		powder coat	Gray

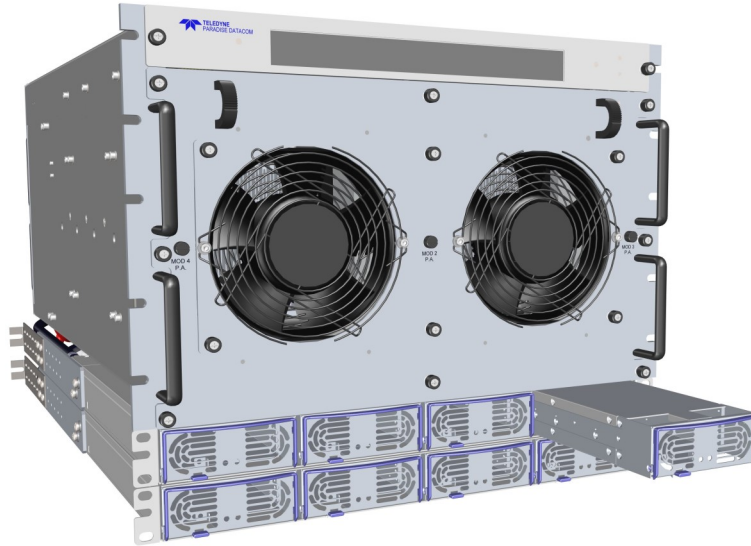
## Environmental Specifications

Operating Temperature	Ambient	0 to +50	°C
Storage Temperature	Ambient	-20 to +75	°C
Operating Relative Humidity	Non-condensing	95	%
Storage Relative Humidity	Non-condensing	90	%
Cooling System	Integrated	Forced air	
Operational Altitude	From sea level	+10,000 (+3,048)	ft. (m)

Specifications are subject to change without notice.

## External N+1 Power Supply

Power to the 7RU SSPA is provided by one or two 1RU power supply chassis, depending on the power requirements of the amplifier, with up to four power supply modules per chassis. One extra power supply module is included to provide n+1 power to the amplifier.



## 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 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 7RU RM 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)					dBc
	(Extended C-Band)					dBc
	Close to Carrier Spurious (≤ 20 MHz)					dBc
	Local Oscillator					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)	± 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 Matrix

Power Level (Watts)	
C-Band	800, 900, 1100 (11K)
X-Band	700, 1000 (10K)
Ku-Band	250, 400, 500

Band	
C-Band	<b>C</b>
X-Band	<b>X</b>
Ku-Band	<b>K</b>

Rack Height	
7RU	<b>7</b>

System Configuration	
<b>R</b>	Standalone amplifier

See the following datasheets for system options:

- Indoor Rack Mount Redundant SSPA Systems (203583)
- Indoor Rack Mount Phase Combined SSPA Systems (203584)

Block Up Converter	
<b>M</b>	Internal Reference BUC
<b>P</b>	External Reference BUC
<b>X</b>	No BUC

**MODEL:** HPA **C** **7** **8** **0** **0** **A** **R** **M** **X** **X** **X** **P** **2** 2nd Generation

Frequency Sub Band			
C-Band		X-Band	
<b>A</b> <sup>1</sup>	5.850 to 6.425 GHz	<b>A</b> <sup>1</sup>	7.90 to 8.40 GHz
<b>B</b> <sup>1</sup>	5.850 to 6.725 GHz	<b>D</b>	7.70 to 8.40 GHz
<b>C</b> <sup>1</sup>	5.750 to 6.670 GHz	<b>F</b>	7.10 to 7.40 GHz
<b>E</b> <sup>1</sup>	6.425 to 6.725 GHz	Ku-Band	
<b>F</b> <sup>1</sup>	6.725 to 7.025 GHz	<b>A</b> <sup>1</sup>	14.00 to 14.50 GHz
<b>H</b>	5.715 to 5.790 GHz	<b>B</b> <sup>1</sup>	13.75 to 14.50 GHz
<b>L</b> <sup>1</sup>	4.400 to 5.000 GHz	<b>F</b> <sup>1</sup>	12.75 to 13.25 GHz
		<b>G</b>	14.75 to 15.25 GHz

<sup>1</sup> Available with optional BUC

Configuration Modifier 3	
<b>P</b>	Standard (N+1 Power Supply)
<b>L</b>	N+1 P.S. + Rear Exhaust Adapters

Configuration Modifier 2	
<b>X</b>	Standard
<b>R</b> <sup>1</sup>	Rx Band Reject Filter
<b>V</b>	Reflected Power Monitor
<b>C</b> <sup>1</sup>	R + V (see above)

<sup>1</sup> X-Band units only

Standalone Unit	
<b>X</b>	Standalone amplifier

Configuration Modifier 1	
<b>X</b>	Standard
<b>S</b>	Input Sample Port

**Example** - A standalone 800W GaAs C-Band 7RU Rack Mount SSPA with standard N+1 external power supply and an optional internal reference block up converter is part number: **HPAC7800ARMXXXP2**.

**COMMENTS:**

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Specifications are subject to change without notice.