

CRM Series

3RU Rack Mountable Solid State Power Amplifier



125W Ku-Band 3RU SSPA Chassis

Description

Teledyne Paradise Datacom's Indoor, Compact Rack Mount (CRM) series Solid State Power Amplifiers represent the latest in High Power Microwave Amplifier Technology. The SSPA chassis achieves the highest power density in the industry along with enhanced maintainability.

The power supply, fan trays and controller card connector plate are all removable for easy maintenance. At 24" deep, and only 3RU high, this chassis is perfect for SNG applications, or other configurations where rack space is at a premium.

The SSPA front panel features an easy-to-navigate display and menu structure. Dedicated LEDs are provided for alarm condition indication.

Teledyne Paradise Datacom rack mount power amplifiers have a wide range of monitor and control functionality, including:

- RS-232/RS-485 (4-wire) serial communication
- Ethernet port supporting UDP, SNMP and web browser-based control
- Form C contacts for output monitor ports and opto-isolated input ports
- Free Windows M&C software
- Variety of third party M&C drivers available

FEATURES

- Power Levels to:
300W S-Band;
300W C-Band;
200W X-Band;
150W Ku-Band
- Removable Power Supply, Fan Tray and Monitor & Control Assembly
- Ethernet Port
- RF Output Sample Port (-40 dB)
- RF Gain Adjustment 55dB - 75dB
- CE Compliant
- Universal, Power Factor Corrected Power Supply
- Built-in 1:1 Redundancy Control

OPTIONS

- Remote Control Panel
- L-Band Input operation
- Reflected Power Monitor
- Input Sample Port
- 1RU Redundant Power Supply
- Exhaust Duct Adapters
- Redundant Systems
- Phase Combined Systems

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S-Band 3RU SSPA Chassis

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	Band A Band B	2.020 to 2.120 2.200 to 2.300	GHz GHz
Output Power @: Saturation/ P_{1dB} (Typical/Guaranteed minimum)	Band A HPAS3050ARXXXXX (2.020 - 2.120 GHz) HPAS3100ARXXXXX (2.020 - 2.120 GHz) HPAS3200ARXXXXX (2.020 - 2.090 GHz) HPAS3200ARXXXXX (2.095 - 2.120 GHz) HPAS3300ARXXXXX (2.020 - 2.090 GHz) HPAS3300ARXXXXX (2.095 - 2.120 GHz) Band B HPAS3050BRXXXXX (2.200 - 2.300 GHz) HPAS3100BRXXXXX (2.200 - 2.300 GHz) HPAS3200BRXXXXX (2.200 - 2.300 GHz) HPAS3300BRXXXXX (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) dBm (W)
Power Requirements Line Voltage Line Frequency Line Power	power factor corrected 47 to 63 HPAS3050A/BRXXXXX (90 to 265 VAC) HPAS3100A/BRXXXXX (90 to 265 VAC) HPAS3200A/BRXXXXX (180 to 265 VAC) HPAS3300A/BRXXXXX (180 to 265 VAC)	AC input 250 500 1000 1600	VAC Hz W W W W

Receive Band Noise and Filter Option

Receive Band Reject Filter S-Band SSPAs only; External to chassis	Insertion Loss Rx Reject @ 2.200 - 2.300 GHz Rx Reject @ 2.025 - 2.120	- 0.5 -60 -60	dB dBc dBc
Receive Band Noise Power Density For S-Band Amplifiers	Without optional filter With optional external filter	-95 -155	dBW/4 KHz dBW/4 KHz

C-Band 3RU SSPA Chassis

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)	HPAC3050ARXXXXX HPAC3075ARXXXXX HPAC3100ARXXXXX HPAC3140ARXXXXX HPAC3200ARXXXXX HPAC3250ARXXXXX HPAC3300ARXXXXX	P_{sat} / P_{1dB} 47.0/46.8 (50/48) 48.8/48.5 (76/70) 50.0/49.5 (100/89) 51.5/51.0 (141/125) 53.0/52.3 (200/170) 53.9/53.0 (250/200) 54.7/54.0 (300/251)	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 47 to 63 HPAC3050ARXXXXX (90 to 265 VAC) HPAC3075ARXXXXX (90 to 265 VAC) HPAC3100ARXXXXX (90 to 265 VAC) HPAC3140ARXXXXX (90 to 265 VAC) HPAC3200ARXXXXX (180 to 265 VAC) HPAC3250ARXXXXX (180 to 265 VAC) HPAC3300ARXXXXX (180 to 265 VAC)	AC input 400 450 650 850 1000 1300 1700	VAC Hz W W W W W W

Frequency Options

Extended Frequency Bands 5.850 to 6.725 GHz 5.75 to 6.67 GHz	De-rate output power by 1.0dB Linearly from 6.425 to 6.725 GHz De-rate output power by 1.0dB Linearly from 6.425 to 6.67 GHz and by 0.5 dB linearly from 5.85 to 5.75 GHz
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X-Band 3RU SSPA Chassis

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	7.90 to 8.40	GHz
Output Power @: Saturation/ P_{1dB} (Typical/Guaranteed minimum)	HPAX3060ARXXXXXX HPAX3075ARXXXXXX HPAX3100ARXXXXXX HPAX3140ARXXXXXX HPAX3200ARXXXXXX	P_{sat} / P_{1dB} 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)	dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Power Requirements Line Voltage Line Frequency Line Power	power factor corrected 47 to 63 HPAX3060ARXXXXXX (90 to 265 VAC) HPAX3075ARXXXXXX (90 to 265 VAC) HPAX3100ARXXXXXX (90 to 265 VAC) HPAX3140ARXXXXXX (90 to 265 VAC) HPAX3200ARXXXXXX (180 to 265 VAC)	AC input 650 700 750 1225 1370	VAC Hz W W W W

Frequency Options

Extended Frequency Band 7.50 to 8.50 GHz 9.50 to 10.50 GHz 7.70 to 8.40 GHz	De-rate output power by 1.0dB Linearly from 7.90 to 7.70 GHz
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Ku-Band 3RU SSPA Chassis

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)	HPAK3025ARXXXXXX HPAK3035ARXXXXXX HPAK3040ARXXXXXX HPAK3050ARXXXXXX HPAK3070ARXXXXXX HPAK3100ARXXXXXX HPAK3125ARXXXXXX HPAK3150ARXXXXXX	P_{sat} / P_{1dB} 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) 52.0/51.0 (158/125)	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 47 to 63 HPAK3025ARXXXXXX (90 to 265 VAC) HPAK3035ARXXXXXX (90 to 265 VAC) HPAK3040ARXXXXXX (90 to 265 VAC) HPAK3050ARXXXXXX (90 to 265 VAC) HPAK3070ARXXXXXX (90 to 265 VAC) HPAK3100ARXXXXXX (180 to 265 VAC) HPAK3125ARXXXXXX (180 to 265 VAC) HPAK3150ARXXXXXX (180 to 265 VAC)	AC input 320 350 500 500 650 1100 1200 1900	VAC Hz W W W W W W

Frequency Options

Extended Frequency Band 13.75 to 14.50 GHz	De-rate output power by 1.0dB linearly from 14.00 to 13.75 GHz
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3RU Rack Mountable Solid State Power Amplifier

Common Electrical Specifications, 3RU SSPA Chassis

PARAMETER	NOTES	LIMITS	UNITS
Gain	Adjustable range	55-75	dB
Gain Flatness	full band (All except Extended C-Band)	± 1.0	dB
	Extended C-Band units	± 1.5	dB
Gain Slope	per 40 MHz (C, X, Ku)	± 0.3	dB/40 MHz
	per 10 MHz (S-band)	± 0.2	dB/10 MHz
Gain Variation vs. Temperature	0°C to +50°C	± 1.0	dB
Gain Adjustment Resolution	in 0.1 dB steps	20	dB
Intermodulation Distortion	3dB back off relative to P_{1dB}	-25	dBc
AM/PM Conversion	(@ rated P_{1dB})	3.5	°/dB
	(@ $P_{1dB}-3dB$)	1.0	°/dB
Spurious Harmonics	(@ rated P_{1dB})	-70	dBc
	(@ rated $P_{1dB}-3dB$) (C-,X-,Ku-bands)	-50	dBc
	(@ rated $P_{1dB}-3dB$) (S-Band)	-40	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	12	dB
Group Delay	Linear	0.01	ns/MHz
	Parabolic	0.003	ns/MHz ²
	Ripple	1.0	ns p-p
Noise Output	TX Band (S, C-, X- or Ku-Band)	-75	dBW/4 KHz
	RX Band (C- or Ku-Band)	-150	dBW/4 KHz
	RX Band (X-Band)	-100	dBW/4 KHz
	RX S-Band see page 2		
Residual AM Noise	0 - 10 KHz	-45	dBc
	10 KHz - 500 KHz	-20 (1.25 + log F)	dBc
	500 KHz - 1 MHz	-80	dBc
Residual 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

Size	width X height X depth	19.0 X 5.22 X 24.13 483 X 133 X 613	inches mm
Weight		66 (30) 77 (35)	lbs. (kg) lbs. (kg)
Finish		powder coat	Gray

Environmental

Operating Temperature	Ambient	0 to +50	°C
Relative Humidity	non-condensing	95	%
Cooling System	Forced Convection Air Cooling	Front Panel - Intake Rear Panel - Exhaust	

Specifications are subject to change.



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L-Band Operation

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

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

Available Frequency Plans

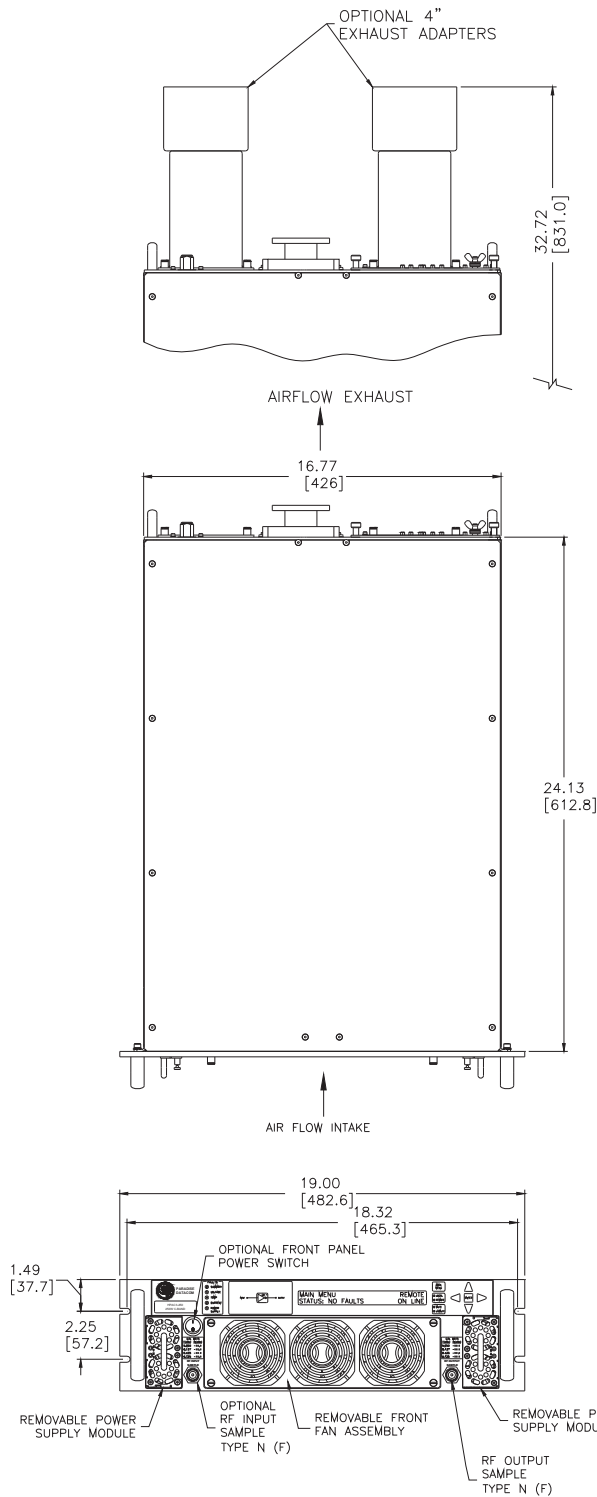
Band	Frequency Band	IF Input	LO Frequency	RF Output	Gain Change
C	Standard C-Band	950 - 1525 MHz	4.900 GHz	5.850 - 6.425 GHz	0-4 dB
C	Extended C-Band	950 - 1825 MHz	4.900 GHz	5.850 - 6.725 GHz	0-4 dB
C	Palapa Band	950 - 1250 MHz	5.475 GHz	6.425 - 6.725 GHz	0-4 dB
C	Insat Band	950 - 1250 MHz	5.775 GHz	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 3RU RM SSPA with ZBUC converter

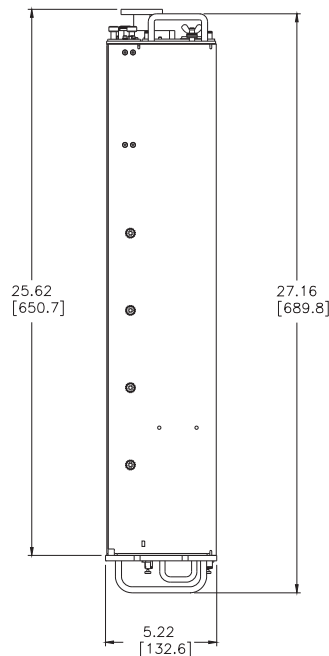
PARAMETER	NOTES	LIMITS				UNITS
Gain	Nominal setting	75				dB
Gain Flatness	full band (C-,X-,Ku-bands)	±2.0				dB
Gain Slope	per 40 MHz (C-,X-,Ku-bands)	±0.5				dB/40 MHz
Gain Adjusted Range	Typical C-Band Adj. Range	20				dB
	Typical Ku-Band Adj. Range	60 - 80				dB
Gain Stability	0 to +50 °C	57 - 77				dB
		±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) (Extended C-Band)	-50				dBc
	Close to Carrier Spurious (≤ 20 MHz)	-40				dBc
	Local Oscillator	-50				dBm
		-30				dBm
Noise Figure	At 75 dB gain setting	20				dB
Input VSWR	L-Band	1.5 : 1				
Internal Reference Option	Reference accuracy @ 25 °C	±1 • 10 ⁻⁷				
	Reference Stability over Temperature (-40 to +90 °C)	±1 • 10 ⁻⁸				

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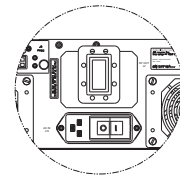
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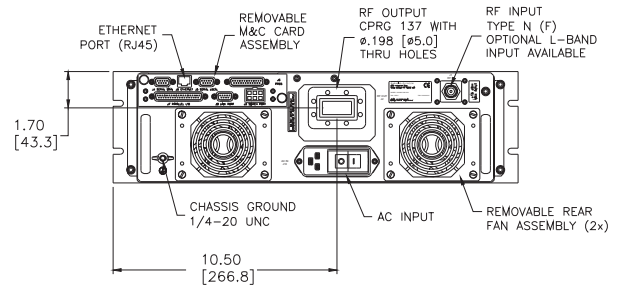
Direct heat generated by the SSPA away from the unit with the optional 4.0" exhaust adapters.



The output waveguide configuration may be rotated by 90° to conform to your system's polarity.



OPTIONAL 90° OUTPUT W/G



Outline Drawing, 250W C-Band 3RU SSPA Chassis

Redundant Power Supply Option

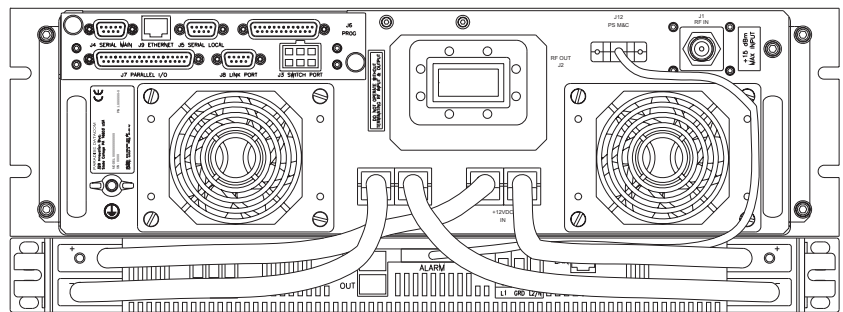


The combination of a separate +12 VDC output, fully redundant power supply is an excellent means of obtaining the ultimate system reliability.

The power supply is an N+1 redundant configuration meaning that there is one more power supply module available than is required to operate the SSPA. A failure of one power supply module will not take the amplifier off-the-air.

In addition, the power supply modules are removable from the front panel while in operation. There is never a need to remove the power supply chassis from the equipment rack.

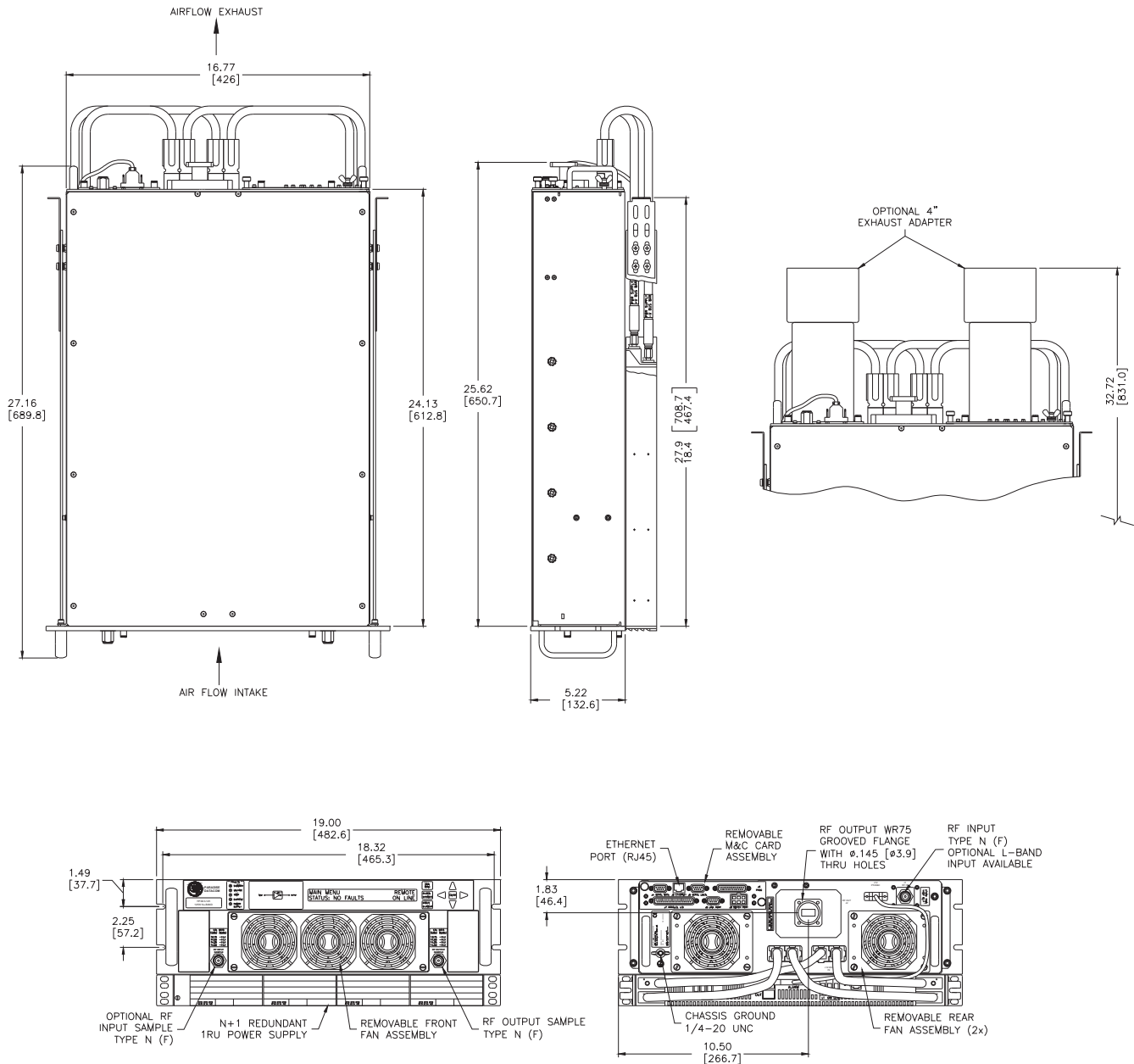
Weighing only 9 lbs. (4 kg.) and only 1 rack unit of cabinet space, the redundant power supply chassis is an excellent companion to the SSPA chassis.



The power supply has a single phase, universal AC input rating from 90-265 VAC, 46-63 Hz. It is power factor corrected to 0.99. Depending on the power requirements of the SSPA, the power supply is configured with two, three or four 1200W hot-swappable modules, each of which weighs 5 lbs. (2.3 kg).

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Outline Drawing, 125W Ku-Band 3RU SSPA Chassis with 1RU N+1 Power Supply

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3RU Rack Mountable Solid State Power Amplifier

Part Number Configuration

HPA 3 R

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
050, 075, 100, 140, 200, 250 or 300
X-Band
060, 075, 100, 140 or 200
Ku-Band
025, 035, 040, 050, 070, 100, 125 or 150

Frequency Sub Band
S-Band
A - 2.02 to 2.12 GHz
B - 2.20 to 2.30 GHz
C-Band
A¹ - 5.850 to 6.425 GHz
B¹ - 5.850 to 6.725 GHz
C - 5.750 to 6.670 GHz
E¹ - 6.425 to 6.725 GHz (Palapa)
F¹ - 6.725 to 7.025 GHz (Insat)
G¹ - 5.750 to 6.475 GHz
V^{1,2} - 5.850 to 6.725 GHz
X-Band
A¹ - 7.90 to 8.40 GHz
B - 7.50 to 8.50 GHz
C - 9.50 to 10.50 GHz
D - 7.70 to 8.40 GHz
Ku-Band
A¹ - 14.00 to 14.50 GHz
B¹ - 13.75 to 14.50 GHz

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

Package
R = Rack Mount (Standalone)

Configuration Modifier
XXX = Standard
RXX¹ = 90° Output W/G Flange
SXX = Input Sample Port
TXX¹ = 90° Output W/G Flange with Input Sample Port
VXX = Reflected Power Monitor
XPX² = Front Panel Power Switch
XRX² = Reflected Power Monitor & Front Panel Power Switch
XXE = Rear Panel Exhaust Adapters
XXP = External 1RU N+1 Redundant Power Supply
XXR³ = Receive Band Reject Filter
XXK³ = Rear Panel Exhaust Adapters & Receive Band Reject Filter
XXL = External 1RU N+1 Power Supply & Rear Panel Exhaust Adapters
XXM³ = External 1RU N+1 Power Supply & Receive Band Reject Filter

¹ Not available in S-Band units.
² Not available with External 1RU N+1 Redundant Power Supply.
³ S-Band only.

System Configuration
X = Standalone

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 = BUC (Custom)
M = Internal Reference
P = External Reference
X = N/A

Specifications listed in this document are subject to change without notice.