



The New Standard in High Power Redundant
Microwave Amplifier Systems Has Arrived



**4kW C Band Solid State High Power Amplifier System
configured with (8) Modules**

FEATURES

- Output Power levels of:
 - 8.0 kW in C-Band
 - 6.6 kW in X-Band
 - 2.5 kW in Ku-Band
- No Active Switching-All Passive Power Combining
- System is 100% field maintainable
- Output Power sized for n+1 Redundancy
- All active modules are hot swappable via the front or rear panels
- System can be configured with any combinations of 4 to 16 modules.
- Hot Swappable Redundant Power Supply Modules
- Hot Swappable SSPA Modules
- Removable Fan Trays
- Removable M&C Card Assembly
- System monitor and control emulates single SSPA Chassis operation
- Ethernet Port with UDP,SNMP, and internal web browser capability
- Legacy RS485 M&C
- Accurate Output Power Measurement
- Reflected Power Monitor
- RF Output Sample Port (-50 dB)
- RF Gain Adjustment (50 dB - 70 dB)
- System is field scalable: i.e., can start out with (4) modules in system and upgrade to (8) or (16) modules.

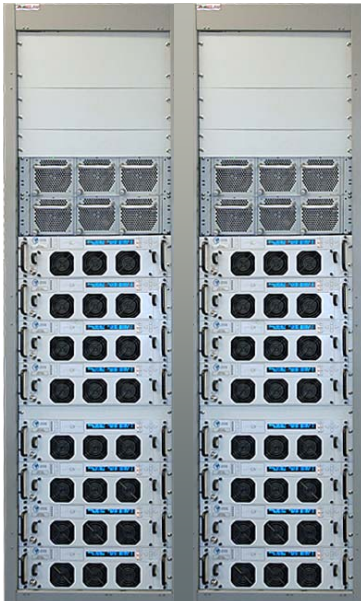
System Configurations and Soft-Fail Output Power



**(8) Module System with 600W C Band Chassis
Single cabinet system [31RU]**

Number of Modules in System	System Output Power, P _{sat} dBm (Watts)	System Output Power, P _{1dB} dBm (Watts)
8	66.0 dBm (4.0 kW)	65.4 dBm (3.5 kW)
7	64.7 dBm (3.0 kW)	64.1 dBm (2.6 kW)
6	63.5 dBm (2.2kW)	63.0 dBm (2.0 kW)
5	61.8 dBm (1.5kW)	61.2 dBm (1.3 kW)
4	60.0 dBm (1.0 kW)	59.3 dBm (850 W)
3	57.2 dBm (525 W)	56.6 dBm (460 W)

(8) Module, 4kW C-Band System comprised of (8) 600W C Band modules



**(16) Module System with 300W C Band Chassis
Dual cabinet system [62RU]**

Number of Modules in System	System Output Power, P _{sat} dBm (Watts)	System Output Power, P _{1dB} dBm (Watts)
16	66.0 dBm (4.0 kW)	65.4 dBm (3.5 kW)
15	65.4 dBm (3.5 kW)	64.8 dBm (3.0 kW)
14	64.7 dBm (3.0 kW)	64.1 dBm (2.6 kW)
13	64.1 dBm (2.6 kW)	63.5 dBm (2.2 kW)
12	63.5 dBm (2.2 kW)	63.0 dBm (2.0 kW)
11	62.7 dBm (1.9 W)	62.1 dBm (1.6 W)

(16) Module, 4kW C-Band System comprised of (16) 300W C-Band modules



System Operation

The PowerMAX system maintains complete parallel redundancy down to the embedded control level. Therefore the loss of an entire HPA chassis will not interrupt remote communications with the system. Remote communications can be either RS485 or Ethernet. The system will automatically correct its gain level in the event of one or more HPA chassis failures.

The sophisticated system monitor and control allows the system to be locally or remotely operated as if it were a “single” chassis amplifier. The system control maintains a hierarchical management that allows the operator to interface to a single chassis of the multi-module array.

Another feature unique to Paradise Datacom’s PowerMAX is the introduction of “true rms” output power measurement. Unlike other amplifier systems that utilize diode detection schemes, the PowerMAX reports the true rms output power of the system independent of the number of carriers and modulation schemes.

Proprietary waveguide combining techniques are employed so that maximum power combining efficiency is optimized within the operating frequency band.

System Output Power and Configurations

Because the system power combining is purely passive and no switching is used, there is never an interruption in RF output power. The PowerMAX system is typically used as a “self-redundant” system. The output power is sized such that the loss of (1) RF module’s power will still allow the system to maintain its minimum required output power. This type of system architecture is described as n+1 redundant. The system can be configured with any number of modules but best overall efficiency is obtained with the popular binary combinations of 4, 8, or 16 modules. It is very easy to upgrade the PowerMAX system from 4 modules to 8 or 16 modules in the field. It is not necessary to fully populate the system at the time of initial purchase. This provides the user a path to upgrade output power capability as system requirements grow thus keeping the capital investment minimized. For sizing redundant output power capability use the following guideline to determine the output power of the system with the loss of (1) module.

4 Module System - 3 of 4 Modules Operable = 2.4 dB loss in output power capability

8 Module System - 7 of 8 Modules Operable = 1.2 dB loss in output power capability

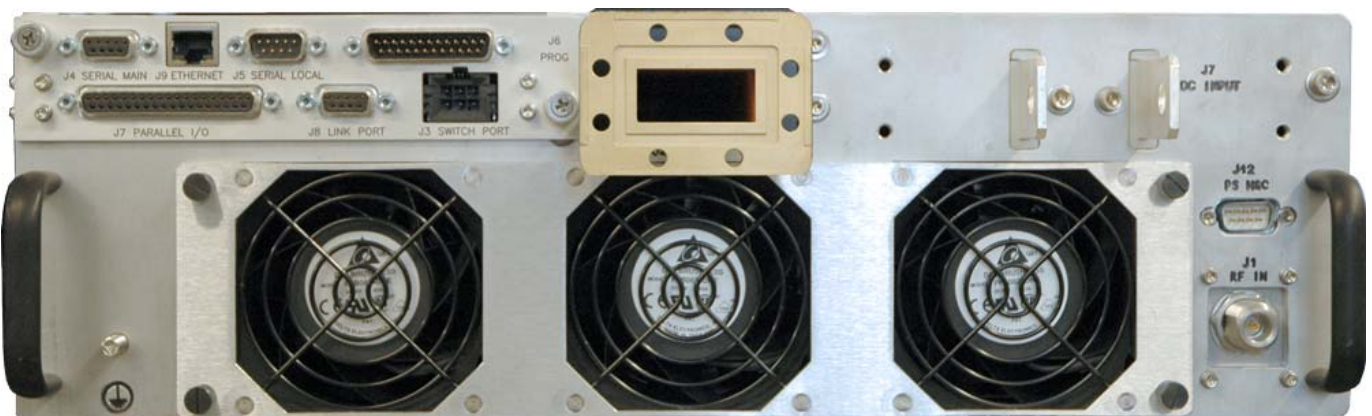
16 Module System - 15 of 16 Modules Operable = 0.6 dB loss in output power capability

RF leakage from an adjacent missing RF module is -90 dBc.

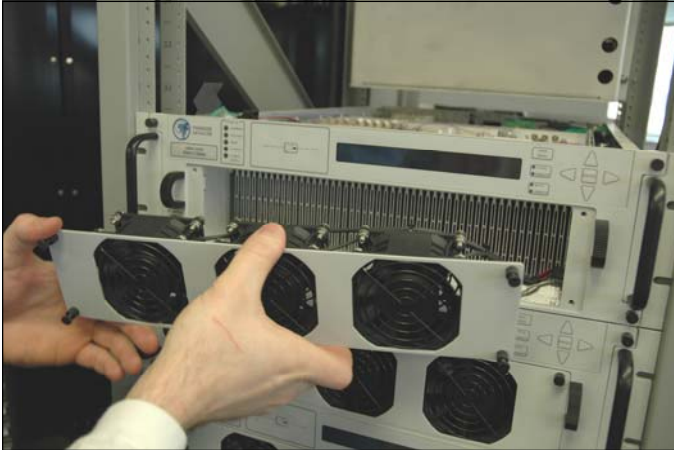
SSPA Chassis Population Options

The PowerMAX system is available in a variety of system output power levels and module configurations. The system is based on Paradise Datacom's 3RU chassis with 100% hot swappable active assemblies. The 3RU chassis can be configured with a wide variety of SSPA frequency bands and power levels. The 3RU chassis can be fitted with the following SSPA modules.

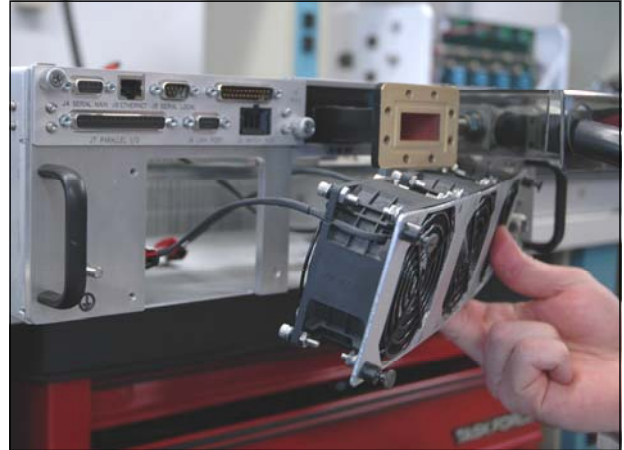
- **C Band:** **100W, 150W, 200W, 250W, 300W,
400W, 500W and 600W**
- **X Band:** **250W and 500W**
- **Ku Band:** **50W, 70W, 100W, 125W, 150W,
200W and 300W**
- **Ka Band:** **40W and 80W**



Hot-Swap Chassis Features



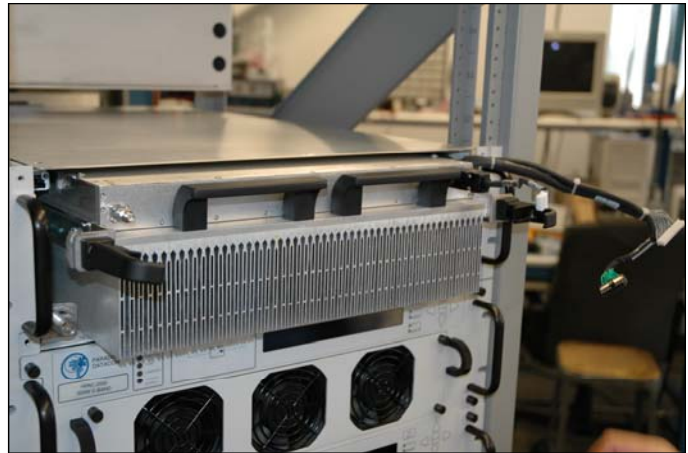
Removable front panel fan tray



Removable rear panel fan tray



Removable rear panel monitor
and control card



SSPA Module Removal via the front panel



System Output & Redundant Power, P_{sat}

SSPA Module Power		4 Module System		8 Module System		16 Module System	
		4 of 4 Modules dBm (Watts)	3 of 4 Modules dBm (Watts)	8 of 8 Modules dBm (Watts)	7 of 8 Modules dBm (Watts)	16 of 16 Modules dBm (Watts)	15 of 16 Modules dBm (Watts)
C-BAND	100W	56.0 (400 W)	53.6 (230 W)	59.0 (800 W)	57.8 (600 W)	62.0 (1.60 kW)	61.4 (1.40 kW)
	150W	57.0 (500 W)	54.6 (290 W)	60.0 (1.00 kW)	58.8 (760 W)	63.0 (2.00 kW)	62.4 (1.74 kW)
	200W	59.0 (800 W)	56.6 (460 W)	62.0 (1.60 kW)	60.8 (1.20 kW)	65.0 (3.20 kW)	64.4 (2.75 kW)
	250W	59.7 (930 W)	57.3 (537 W)	62.6 (1.80 kW)	61.4 (1.38 kW)	65.6 (3.60 kW)	65.0 (3.10 kW)
	300W	60.3 (1.10 kW)	57.9 (620 W)	63.1 (2.00 kW)	61.8 (1.51 kW)	66.0 (4.00 kW)	65.4 (3.50 kW)
	400W	61.6 (1.50 kW)	59.2 (830 W)	64.4 (2.70 kW)	63.2 (2.10 kW)	67.2 (5.20 kW)	66.6 (4.60 kW)
	500W	62.6 (1.80 kW)	60.2 (1.05 kW)	65.4 (3.50 kW)	64.2 (2.63 kW)	68.2 (6.60 kW)	67.6 (5.75 kW)
	600W	63.4 (2.20 kW)	61.0 (1.26 kW)	66.2 (4.10 kW)	65.0 (3.20 kW)	69.0 (8.00 kW)	68.4 (7.00 kW)
X-BAND	250W	59.6 (900 W)	57.2 (525 W)	62.4 (1.70 kW)	61.2 (1.32 kW)	65.2 (3.30 kW)	64.6 (2.90 kW)
	350W	60.5 (1.10 kW)	58.1 (645 W)	63.5 (2.20 kW)	62.3 (1.70 kW)	66.5 (4.47 kW)	65.9 (3.90 kW)
	500W	62.6 (1.80 kW)	60.2 (1.05 kW)	65.5 (3.50 kW)	64.3 (2.70 kW)	68.2 (6.60 kW)	67.6 (5.75 kW)
KU-BAND	50W	52.5 (180 W)	50.1 (102 W)	55.5 (350 W)	54.3 (269 W)	58.5 (708 W)	57.9 (617 W)
	70W	54.0 (250 W)	51.6 (145 W)	57.0 (500 W)	55.8 (380 W)	60.0 (1.00 kW)	59.4 (871 W)
	100W	55.0 (316 W)	52.6 (182 W)	58.0 (630 W)	56.8 (479 W)	61.0 (1.26 kW)	60.4 (1.10 kW)
	125W	56.3 (425 W)	53.9 (245 W)	59.0 (790 W)	57.8 (603 W)	61.7 (1.50 kW)	61.1 (1.30 kW)
	150W	57.2 (525 W)	54.8 (302 W)	60.0 (1.00 kW)	58.8 (759 W)	63.0 (2.00 kW)	62.4 (1.75 kW)
	200W	58.2 (660 W)	55.8 (380 W)	61.0 (1.20 kW)	59.8 (955 W)	64.0 (2.50 kW)	63.4 (2.20 kW)
	300W	60.4 (1.10 kW)	58.0 (630 W)	63.0 (2.00 kW)	61.8 (1.50 kW)	65.8 (3.80 kW)	65.2 (3.30 kW)
KA-BAND	40W	51.2 (130 W)	48.8 (76 W)	54.0 (250 W)	52.8 (190 W)	57.0 (500 W)	56.4 (440 W)
	80W	54.2 (250 W)	51.8 (151 W)	57.0 (500 W)	55.8 (380 W)	60.0 (1.00 kW)	59.4 (870 W)



General Electrical Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain	minimum	50-70	dB
Gain Flatness	full band	±1.0	dB
Gain Slope	per 40 MHz	±0.3	dB/40 MHz
Gain Variation vs. Temperature	0°C to +50°C	±1.0	dB
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} -3dB)	1.0	°/dB
Spurious Harmonics	(@ rated P _{1dB})	-70	dBc
	(@ rated P _{1dB} -3dB)	-50	dBc
Input/Output VSWR		1.30:1	
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	-75	dBW/4 KHz
	RX 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
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	

Environmental Specifications

Operating Temperature	Ambient	0 to +50	°C
Relative Humidity	non-condensing	95	%
Cooling System	Integrated	Forced air	

System Prime Input Power

Proprietary adaptive bias techniques are utilized to achieve an aggressive balance between RF output power and minimized DC input power. System prime input power is achieved via one or two 3RU power supply chassis, each of which houses three (3) 3000W or 5000W power supply modules. The power is distributed to the SSPA modules via a buss rail assembly.

Each of the power supply modules has its own single phase, 180-264 VAC input. This makes it very convenient to parallel the AC inputs of two modules and connect the array to a three phase AC input source.

Prime Input Power

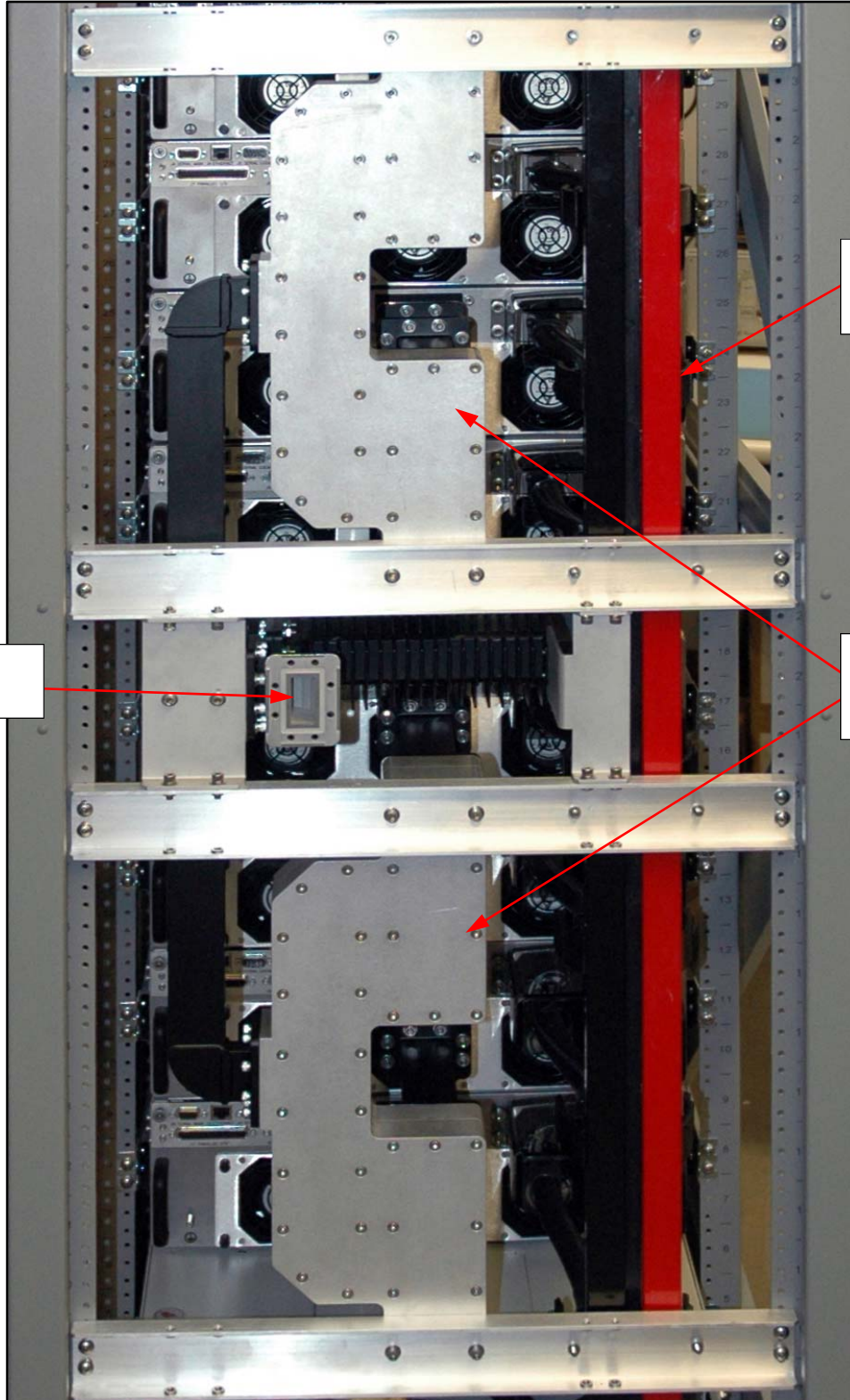
SSPA Module Power		4 Chassis System		8 Chassis System		16 Chassis System	
		Required Input Power	# Power Supply Modules	Required Input Power	# Power Supply Modules	Required Input Power	# Power Supply Modules
C-Band	100W	2400 W	[2] 3kW	5000 W	[3] kW	10000 W	[6] kW
	150W	3300 W	[3] 3kW	6500 W	[3] kW	13000 W	[6] kW
	200W	3750 W	[3] 3kW	7500 W	[3] kW	15000 W	[6] kW
	250W	5524 W	[3] 3kW	11050 W	[6] 3kW	22100 W	[12] 3kW
	300W	6200 W	[3] 5kW	12400 W	[6] 3kW	24800 W	[12] 3kW
	400W	11280 W	[6] 3kW	22560 W	[6] 5kW	45120 W	[12] 5kW
	500W	14720 W	[6] 3kW	29400 W	[6] 5kW	58800 W	[12] 5kW
	600W	15200 W	[6] 3kW	30400 W	[6] 5kW	60800 W	[12] 5kW
X-Band	250W	8000 W	[3] 5kW	16000 W	[6] 5kW	32000 W	[12] 5kW
	350W	10000 W	[3] 5kW	20000 W	[6] 5kW	40000 W	[12] 5kW
	500W	15000 W	[6] 3kW	30000 W	[6] 5kW	60000 W	[12] 5kW
Ku-Band	50W	3376 W	[3] 3kW	6752 W	[6] 3kW	13504 W	[12] 3kW
	70W	3840 W	[3] 3kW	7680 W	[6] 3kW	15360 W	[12] 3kW
	100W	5400 W	[3] 3kW	10800 W	[6] 3kW	21600 W	[12] 3kW
	125W	5520 W	[3] 3kW	11040 W	[6] 3kW	22080 W	[12] 3kW
	150W	9025 W	[3] 5kW	18048 W	[6] 5kW	36096 W	[12] 5kW
	200W	9600 W	[3] 5kW	19200 W	[6] 5kW	38400 W	[12] 5kW
	300W	10000 W	[3] 5kW	20000 W	[6] 5kW	40000 W	[12] 5kW
Ka-Band	40W	2800 W	[3] 3kW	5600 W	[3] 3kW	11200 W	[6] 3kW
	80W	5600 W	[3] 3kW	11200 W	[6] 3kW	22400 W	[12] 3kW

The power supply chassis is configured as a n+1 redundant, hot swappable power. In the event of a power supply module failure, the amplifier system will not fail. The failed module can be changed without ever taking the HPA out of service. The microwave amplifier architecture is also designed for maximum soft fail redundancy





Waveguide Output Configuration & Primary Power Distribution



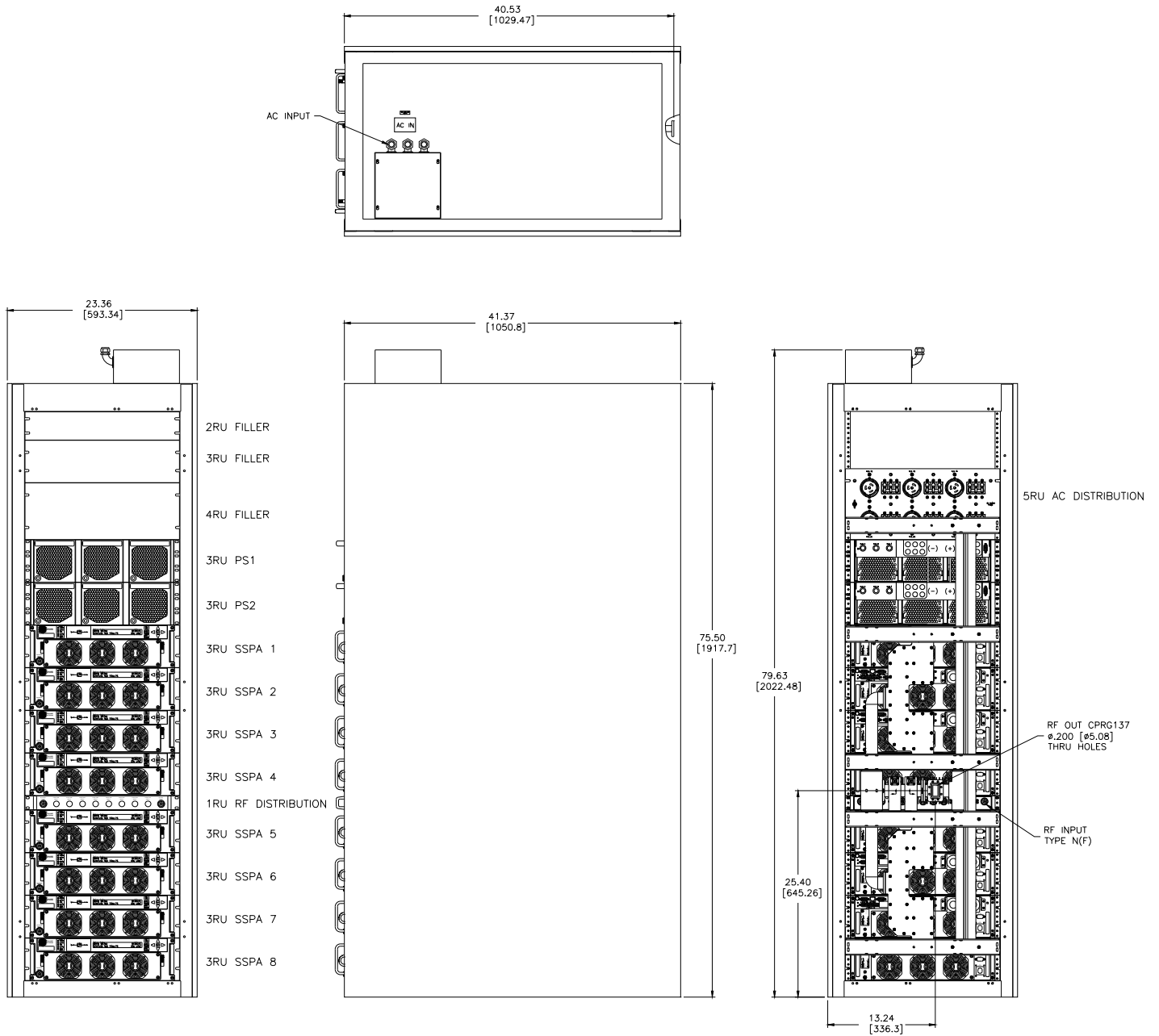
**Plug-in
Buss Rail**

**Passive Power
Combiners**

RF Output



System Outline Drawing





Spare Module/Chassis Part Number Configuration

P	M	A	X							X	X	X	X	X
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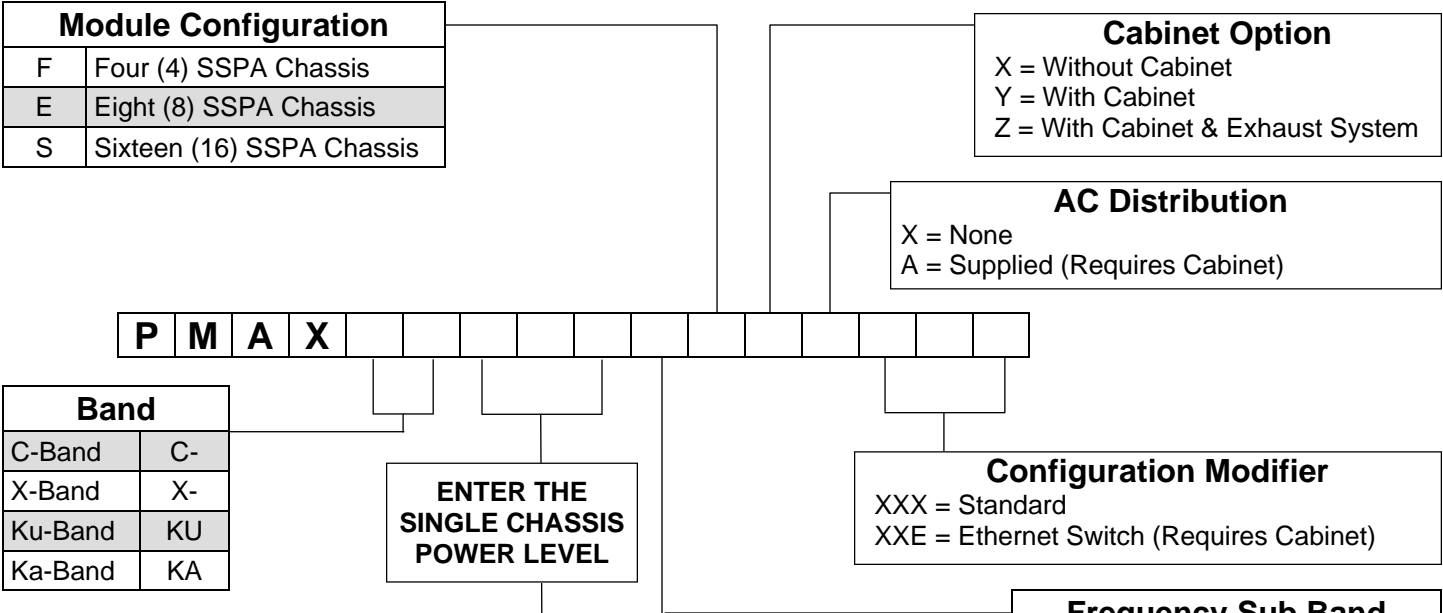
Band	
C-Band	C-
X-Band	X-
Ku-Band	KU
Ka-Band	KA

Chassis Power Level (in Watts)	
Band	Output Power
C	100, 150, 200 250, 300, 400, 500, 600
X	250, 350, 500
Ku	050, 070, 100, 125, 150, 200,300
Ka	040, 080

Module Configuration	
M	SSPA Module
C	Single SSPA Chassis

Frequency Sub Band	
C-Band	
5.850 - 6.425 GHz	A
5.850 - 6.725 GHz	B
5.750 - 6.670 GHz	C
6.425 - 6.725 GHz (Palapa)	E
6.725 - 7.025 GHz (Insat)	F
5.750 - 6.475 GHz	G
X-Band	
7.90 - 8.40 GHz	A
7.50 - 8.50 GHz	B
7.70 - 8.40 GHz	D
7.75 - 8.50 GHz	E
Ku-Band	
14.00 - 14.50 GHz	A
13.75 - 14.50 GHz	B
14.50 - 14.70 GHz	C
15.10 - 15.40 GHz	D
Ka-Band	
30.00 - 31.00 GHz	A

!	<p>Use this page if ordering a spare SSPA module or single SSPA Chassis for a PowerMAX System.</p>
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System Part Number Configuration


Chassis Power Level (in Watts)				
Band	System Total Power (# chassis)			Single Chassis
	(4) - "F"	(8) - "E"	(16) - "S"	
C	400 W	800 W	1600 W	100
	500 W	1000 W	2000 W	150
	800 W	1600 W	3200 W	200
	930 W	1800 W	3600 W	250
	1100 W	2000 W	4000 W	300
	1500 W	2700 W	5200 W	400
	1800 W	3500 W	6600 W	500
	2200 W	4100 W	8000 W	600
X	900 W	1700 W	3300 W	250
	1100 W	2200 W	4470 W	350
	1800 W	3500 W	6600 W	500
Ku	180 W	350 W	708 W	050
	250 W	550 W	1000 W	070
	316 W	630 W	1260 W	100
	425 W	790 W	1500 W	125
	525 W	1000 W	2000 W	150
	660 W	1200 W	2500 W	200
	1100 W	2000 W	3800 W	300
Ka	130 W	250 W	500 W	040
	250 W	500 W	1000 W	080

Frequency Sub Band	
C-Band	
5.850 - 6.425 GHz	A
5.850 - 6.725 GHz	B
5.750 - 6.670 GHz	C
6.425 - 6.725 GHz (Palapa)	E
6.725 - 7.025 GHz (Insat)	F
5.750 - 6.475 GHz	G
X-Band	
7.90 - 8.40 GHz	A
7.50 - 8.50 GHz	B
7.70 - 8.40 GHz	D
7.75 - 8.50 GHz	E
Ku-Band	
14.00 - 14.50 GHz	A
13.75 - 14.50 GHz	B
14.50 - 14.70 GHz	C
15.10 - 15.40 GHz	D
Ka-Band	
30.00 - 31.00 GHz	A

EXAMPLES:

250W C-Band PowerMAX Spare SSPA Module:
 250W C-Band PowerMAX Spare Single Chassis:
 250W C-Band PowerMAX System - 8 Chassis, with cabinet:

PMAXC-250AMXXXXX
 PMAXC-250ACXXXXX
 PMAXC-250AEYXXXX