



**1.1 kW C Band, 1:2 Indoor  
Rack Mount Phase Combined  
Amplifier System**



**600W C Band, 1:2 Indoor Rack  
Mount Phase Combined  
Amplifier System**

### DESCRIPTION

**Paradise Datacom's** family of indoor packaged, phase combined solid state power amplifier (SSPA) systems provide the highest degree of redundancy and system reliability. Phase Combined amplifier systems can be configured using any combination of Paradise Datacom's Indoor Packaged amplifiers.

1:1 Phase Combined Systems are an economical solution to providing high output power capability with soft-fail redundancy.

1:2 Phase Combined Systems can provide full output power redundancy to mission critical applications which cannot tolerate any decrease in output power capability.

### FEATURES

- Extremely High Power Density:
  - 2 kW C-Band
  - 1 kW S-Band
  - 600 W X-Band
  - 1 kW Ku-Band
- True Redundant Chassis Architecture
- Universal Power Factor Corrected Power Supply
- System Output Power Monitor
- 1RU FPRC-1100 / FPRC-1200 System Controller

### OPTIONS

- Reflected Power Monitor
- L-Band Input operation
- SSPA and Controller Remote Panels
- Auxiliary / Maintenance Output Switch
- Cold Standby Amplifier Operation for Prime Power Savings
- External Exhaust Air Ducting Kit
- Custom Configurations

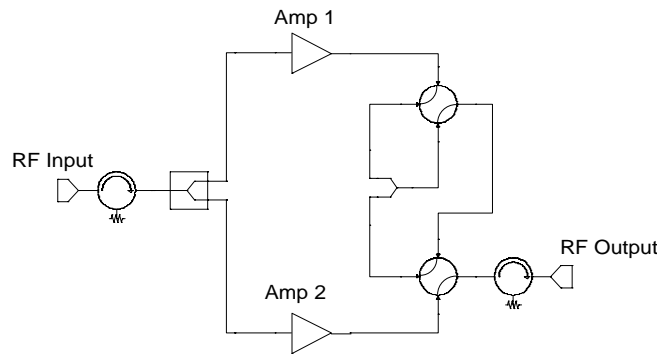
### SPECIFICATIONS

- 4 RU SSPA Chassis:
  - 19.0 X 7.0 X 28.0
  - 483 X 178 X 711
  - 75 lbs (34 kg)  $\leq$  250W
  - 100 lbs (45 kg)  $>$ 250W
- 6 RU SSPA Chassis:
  - 19.0 X 10.47 X 30.0
  - 483 X 266 X 762
  - 180 lbs (82 kg)
- 3 RU Power Supply:
  - 19.0 X 5.25 X 15.44
  - 483 X 134 X 433
  - 50 lbs (23 kg)



### 1:1 Phase Combined / Redundant System

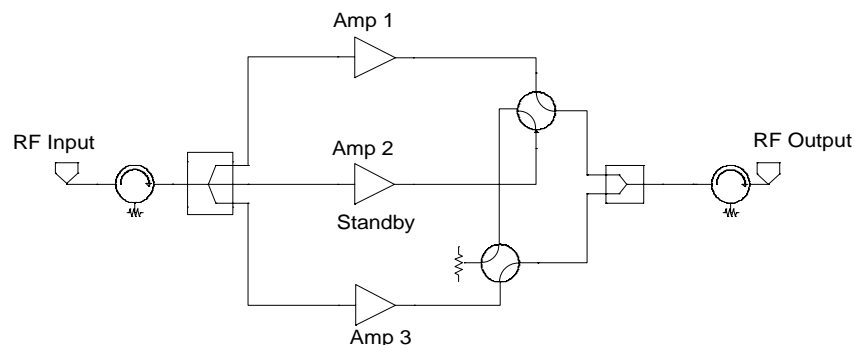
The 1:1 Fixed Phase Combined Redundant System is a popular system architecture that enables two Solid State Power Amplifiers to operate as a normal 1:1 redundant system or a phase combined system. The basic system topology is very similar to a 1:1 redundant system and is shown in the block diagram. An additional switch is included which allows either amplifier to be individually connected to the antenna or connect both amplifiers to a waveguide combiner.



**1:1 Phase Combined System Simplified Block Diagram**

### 1:2 Phase Combined / Redundant System

The 1:2 Phase Combined Redundant System is a system architecture that enables Solid State Power Amplifiers to achieve higher output power levels while building in a level of redundancy. The basic system topology is similar to a 1:2 redundant system shown in the block diagram below. Amplifiers #1 and #3 are normally online. The outputs of #1 and #3 are directed by the waveguide switches into a low loss power combiner. In the event of a failure of either on line amplifier, the standby amplifier, #2, can be switched in place of either #1 or #3 and the system maintains **full output power**.



**1:2 Phase Combined System Simplified Block Diagram**



**PARADISE  
DATACOM**

## Phase Combined Systems Indoor Packaged SSPAs

Indoor Systems are configured with Paradise Datacom's popular 4 RU chassis ...



### Single Chassis Output Power Levels

S Band: 50W - 600W  
C Band: 50W - 600W  
X Band: 50W - 300W  
Ku Band: 35W - 250W



1 kW S-Band 1:1 Phase  
Combined System



1 kW C Band, 1:2 Phase Combined  
SSPA System



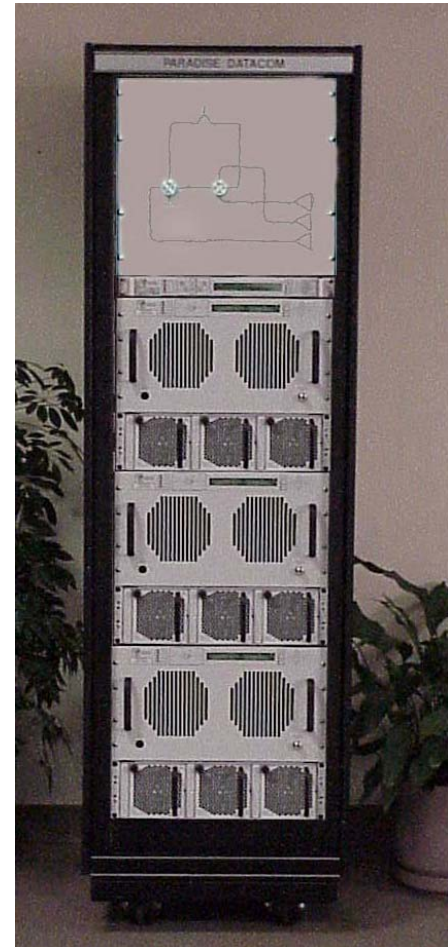


... or with Paradise Datacom's 6 RU chassis and a 3 RU N+1 power supply.



**Single SSPA Chassis  
Output Power Levels:**

S Band: 800W - 1.1kW  
C Band: 750W - 1.1 kW  
X Band: 500W - 700W  
Ku Band: 400W - 500W



**2kW C Band, 1:2 Phase  
Combined SSPA System**

The 6 RU chassis is a truly "parallel" system, comprised of (4) SSPA modules. In the event of one module failure, a 'hitless' reduction of 3 dB output power is realized.

The SSPA is used with a separate 3 RU power supply chassis. The power supply chassis is a redundant power supply comprised of (3) power supply modules.

It is sized such that only two of the three modules are required to operate the amplifier system.

The power supply modules are completely hot swappable. If a power supply module fails, it can be replaced via the front panel without taking the amplifier system off the air.



### Phase Combined System Output Power Capability

Single SSPA Model	1:1 Redundant Output Power		Phase Combined / 1:2 / Redundant Output Power	
	P <sub>sat</sub> dBm (W)	P <sub>1dB</sub> dBm (W)	P <sub>sat</sub> dBm (W)	P <sub>1dB</sub> dBm (W)
HPAC-2100A	49.9 (98)	49.4 (87)	52.8 (191)	52.3 (170)
HPAC-2140A	51.4 (138)	51.1 (129)	54.3 (269)	54.0 (251)
HPAC-2200A	52.9 (195)	52.3 (170)	55.8 (380)	55.1 (323)
HPAC-2250A	53.8 (240)	52.9 (195)	56.7 (468)	55.8 (380)
HPAC-2300A	54.6 (288)	53.9 (245)	57.5 (562)	56.8 (479)
HPAC-2400A	55.9 (389)	54.9 (309)	58.8 (759)	57.8 (603)
HPAC-2500A	56.9 (490)	55.9 (389)	59.8 (955)	58.8 (759)
HPAC-2600A	57.7 (590)	56.9 (490)	60.6 (1148)	59.8 (955)
HPAC-2750A	58.6 (725)	57.8 (603)	61.5 (1413)	60.7 (1175)
HPAC-2900A	59.4 (871)	58.4 (692)	62.3 (1700)	61.3 (1349)
HPAC-21100A	60.3 (1071)	59.4 (871)	63.2 (2089)	62.3 (1700)

### C-Band System Output Power Capability

Single SSPA Model	1:1 Redundant Output Power		Phase Combined / 1:2 Redundant Output Power	
	P <sub>sat</sub> dBm (W)	P <sub>1dB</sub> dBm (W)	P <sub>sat</sub> dBm (W)	P <sub>1dB</sub> dBm (W)
HPAK-2040A	45.9 (39)	44.9 (31)	48.8 (76)	47.8 (60)
HPAK-2050A	46.9 (49)	45.9 (39)	49.8 (96)	48.8 (76)
HPAK-2070A	48.4 (69)	47.4 (55)	51.3 (135)	50.3 (107)
HPAK-2100A	49.9 (98)	48.9 (78)	52.8 (190)	51.8 (151)
HPAK-2125A	50.9 (123)	49.9 (98)	53.8 (240)	52.8 (190)
HPAK-2200A	52.9 (195)	51.9 (155)	55.8 (380)	54.8 (302)
HPAK-2250A	53.9 (246)	52.9 (195)	56.8 (479)	55.8 (380)
HPAK-2400A	55.9 (389)	54.9 (309)	58.8 (760)	57.8 (600)
HPAK-2500A	56.9 (490)	55.9 (390)	59.8 (955)	58.8 (760)

### Ku-Band System Output Power Capability



### General System Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain	Minimum (4 RU / 6 RU)	75 / 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 <sub>1dB</sub>	-25	dBc
AM/PM Conversion	(@ rated P <sub>1dB</sub> )	3.5	°/dB
	(@ P <sub>1dB</sub> -3dB)	0.5	°/dB
Spurious Harmonics	(@ rated P <sub>1dB</sub> )	-60	dBc
	(@ rated P <sub>1dB</sub> -3dB)	-50	dBc
Input/Output VSWR		1.3:1	
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 (4 RU / 6 RU) RX Band (4 RU / 6 RU)	-75 / -70 - 150 / -155	dBW/4 KHz 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

Size 4 RU HPA Chassis	width X height X depth	19.0 X 7.0 X 28.0 483 X 178 X 711	inches mm
Size 6 RU HPA Chassis	width X height X depth	19.0 X 10.47 X 30.0 483 X 266 X 762	inches mm
Size Power Supply Chassis	width X height X depth	19.0 X 5.25 X 15.44 483 X 134 X 433	inches mm
Weight 4 RU HPA Chassis 4 RU HPA Chassis 6 RU HPA Chassis Power Supply Chassis	≤ 250W Chassis > 250W Chassis	75 (34) 100 (45) 180 (82) 50 (23)	lbs.(kg) lbs.(kg) lbs.(kg) lbs.(kg)
Finish		powder coat	Gray

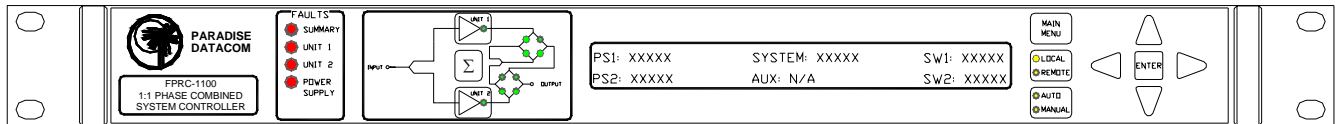
### Environmental

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

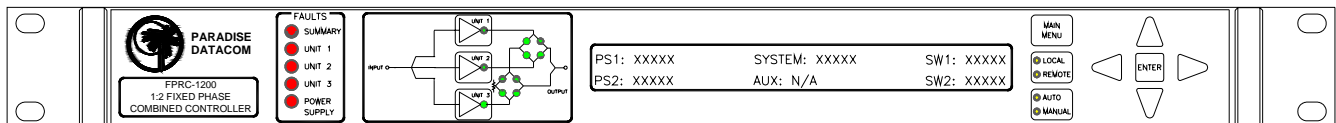
Specifications are subject to change.



### System Controllers



**FPRC-1100 1:1 Phase Combined System Controller**



**FPRC-1200 1:2 Phase Combined System Controller**

The FPRC-1X00 is the heart of the Redundant System. It provides an extremely user friendly interface for complete monitor and control of the high power amplifiers.

The front panel mimic display shows the on-line amplifiers and the current switch positions. Dedicated fault lights are provided for easy indication of system status.

All FPRC-1X00 monitor and control is available locally, at the front panel LCD display, as well as remotely by the RS232 , RS485, or Ethernet interface ports.

Audible alarms and a full compliment of parallel I/O signal are available at the rear panel of the FPRC-1X00.

The FPRC-1X00 System Controller allows the Phase Combined System of amplifiers be controlled as if it were a single SSPA. The FPRC is the single point of interface for either local, front panel, or remote control.

System monitor and control capability include gain adjustment, output power monitoring (dBm or Watts), and alarms.

The FPRC-1X00 is a 1 RU indoor control unit that contains its own internal redundant components including fully redundant power supplies.

**Note:** Systems can be configured without the use of a system controller. Consult the factory for operation of phase combined systems without a system controller.



### Part Number Configuration, 6 RU Chassis

Part Number Configuration, 6 RU Chassis									
HPA		2							
<b>Band</b> S - S-Band C - C-Band X - X-Band K - Ku-Band									
<b>Power Level (in Watts)</b> S-Band 800, 900, 1100 (11K) C-Band 750, 900, 1100 (11K) X-Band 500, 700 Ku-Band 400, 500									
<b>Frequency Sub Band</b> S-Band A - 2.02 to 2.12 GHz B - 2.20 to 2.30 GHz C-Band A* - 5.85 - 6.425 GHz B* - 5.85 - 6.725 GHz C - 5.750 - 6.670 GHz D* - 6.425 - 7.025 GHz X-Band A* - 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 A* - 14.00 - 14.50 GHz B* - 13.75 - 14.50 GHz <small>* Available with optional BUC</small>									
<b>Package</b> R = Rack Mount (Standalone) S = Rack Mount, Top Mounted Waveguide Switching, with Cabinet T = Rack Mount, Top Mounted Waveguide Switching, without Cabinet Y = Rack Mount, Rear Mounted Waveguide Switching, with Cabinet Z = Rack Mount, Rear Mounted Waveguide Switching, without Cabinet									
		<b>Configuration Modifier</b> XXX = Standard SXX = Input Sample DXX = Non-redundant 1RU Power Supply EXX = Non-redundant 1RU Power Supply & Input Sample XCX = Reflected Power Monitor & Ethernet Port XNX = Ethernet Port XVX = Reflected Power Monitor XXE = Rear Panel Exhaust Adapters XXL <sup>†</sup> = External 1RU N+1 Power Supply & Rear Panel Exhaust Adapters <small><sup>†</sup> Not available with Package options Y or Z.</small>							
		<b>System Configuration</b> S = Custom E = 1:2 Fixed Phase Combined System, Input Splitter, FPRC-1200* G = 1:1 Fixed Phase Combined System, Input Splitter, FPRC-1100* J = 1:2 Fixed Phase Combined System, Input Splitter, Internal Redundancy Control <small>* Standard location of FPRC is above HPA1</small>							
		<b>Block Up Converter</b> B = BUC (Custom) C = 10 MHz Ext. Ref. Std. LO D = 50 MHz Ext. Ref. Std. LO E = 10 MHz Int. Ref. Std. LO F = 50 MHz Int. Ref. Std. LO M = Internal Reference ZBUC P = External Reference ZBUC X = N/A							

**Example** - An in-cabinet 1100 Watt C-Band 1:2 Fixed Phase Combined Chassis System with input splitter, FPRC-1200 controller, and rear mounted waveguide switch configuration is part number: **HPAC211KAYEXXX**.





**Part Number Configuration, 4 RU Chassis**

HPA  2

**Band**

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

**Power Level (in Watts)**

S-Band  
050, 100, 200, 300, 400, 500 or 600  
C-Band  
050, 075, 100, 140, 200, 250, 300,  
400, 500 or 600  
X-Band  
060, 075, 100, 140, 200, 250 or 350  
Ku-Band  
025, 035, 040, 050, 070, 100, 125,  
200 or 250

**Frequency Sub Band**

<u>S-Band</u>	<u>X-Band</u>
A - 2.02 to 2.12 GHz	A* - 7.90 to 8.40 GHz
B - 2.20 to 2.30 GHz	B - 7.50 to 8.50 GHz
<u>C-Band</u>	<u>D - 7.70 to 8.40 GHz</u>
A* - 5.85 - 6.425 GHz	C - 9.50 to 10.50 GHz
B* - 5.85 - 6.725 GHz	D - 7.70 to 8.40 GHz
<u>Ku-Band</u>	A* - 14.00 - 14.50 GHz
C - 5.750 - 6.670 GHz	B* - 13.75 - 14.50 GHz
D* - 6.425 - 7.025 GHz	

\* Available with optional BUC

**Package**

R = Rack Mount (Standalone)  
S = Rack Mount, Top Mounted Waveguide  
Switching, with Cabinet  
T = Rack Mount, Top Mounted Waveguide  
Switching, without Cabinet  
Y = Rack Mount, Rear Mounted Waveguide  
Switching, with Cabinet  
Z = Rack Mount, Rear Mounted Waveguide  
Switching, without Cabinet

**Configuration Modifier**

XXX = Standard  
KXX\* = 110/220 VAC Operation  
SXX = Input Sample  
CXX\* = Input Sample & 110/220 VAC  
Operation  
XCX = Reflected Power Monitor & Ethernet  
XNX = Ethernet Port  
XVX = Reflected Power Monitor  
XXD = 48V Input  
XXE<sup>†</sup> = Rear Panel Exhaust Adapters  
XXP = External 1RU N+1 Power Supply  
XXR\*\* = Receive Band Reject Filter  
XXJ<sup>†</sup> = 48V Input & Rear Panel Exhaust  
Adapters  
XXH\*\* = 48V Input & Receive Band Reject  
Filter  
XXK\*\*<sup>†</sup> = Rear Panel Exhaust Adapters &  
Receive Band Reject Filter  
XXL<sup>†</sup> = External 1RU N+1 Power Supply &  
Rear Panel Exhaust Adapters  
XXM\*\* = External 1RU N+1 Power Supply &  
Receive Band Reject Filter  
\* 100-125W Ku- & 200-300W C-band only;  
Consult factory for S- & X-bands.  
\*\* S-Band Sub Band 'A' only; 400W max.  
<sup>†</sup> Not available with Package options Y or Z.

**System Configuration**

S = Custom  
E = 1:2 Fixed Phase Combined System,  
Input Splitter, FPRC-1200\*  
G = 1:1 Fixed Phase Combined System,  
Input Splitter, FPRC-1100\*  
J = 1:2 Fixed Phase Combined System,  
Input Splitter, Internal Redundancy  
Control  
\* Standard location of FPRC is above HPA1

**Block Up Converter**

B = BUC (Custom)  
C = 10 MHz Ext. Ref. Std. LO  
D = 50 MHz Ext. Ref. Std. LO  
E = 10 MHz Int. Ref. Std. LO  
F = 50 MHz Int. Ref. Std. LO  
M = Internal Reference ZBUC  
P = External Reference ZBUC  
X = N/A