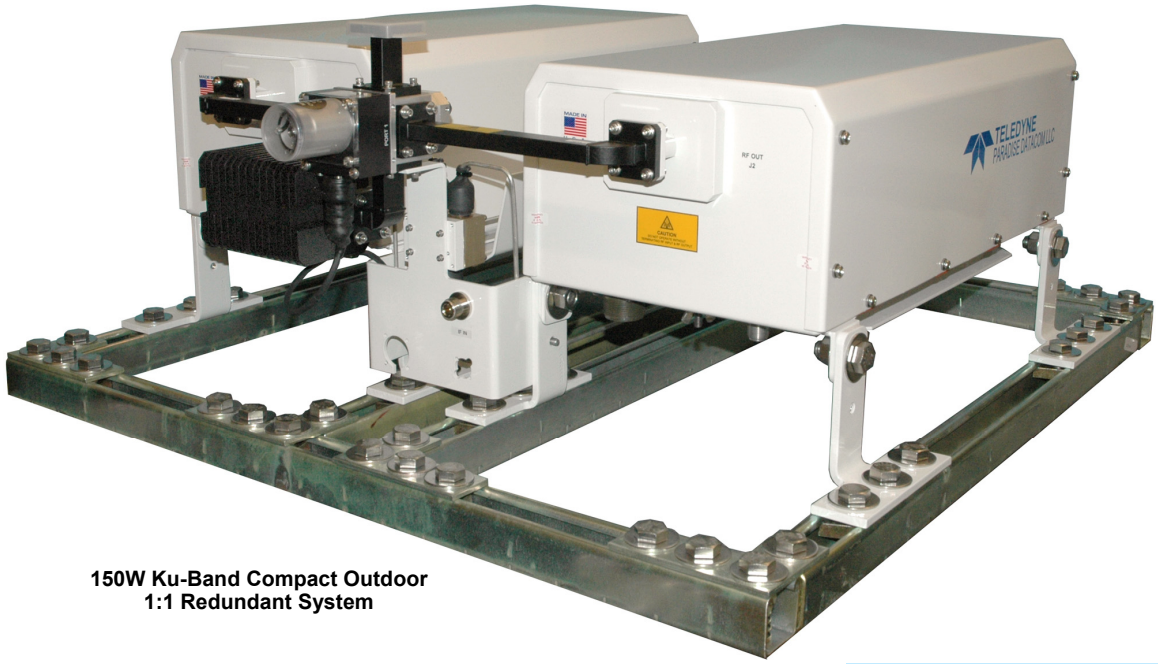
TELEDYNE
PARADISE DATACOM
A Teledyne Technologies Company

Redundant Systems
Outdoor SSPA Packages



150W Ku-Band Compact Outdoor
1:1 Redundant System

DESCRIPTION

Teledyne Paradise Datacom's Outdoor series of redundant amplifier systems provide the highest degree of earth station redundancy and reliability. Based on Teledyne Paradise Datacom's family of rugged and robust SSPAs, these systems provide the highest MTBFs possible.

These systems can be configured in either 1:1 or 1:2 redundant configurations using any of the Teledyne Paradise Datacom family of Outdoor SSPAs. The RCP2-1100/1200 Redundant Controller provides an extremely user-friendly interface for complete monitor and control of the high power amplifiers in either 1:1 or 1:2 configurations.

The RCP front panel mimic display shows the on-line amplifiers and the current switch positions. Dedicated fault lights provide easy indication of system status. All RCP2-1X00 monitor and control is available locally, at the front panel LCD display, as well as remotely by the RS-232 or RS-485 interface ports.

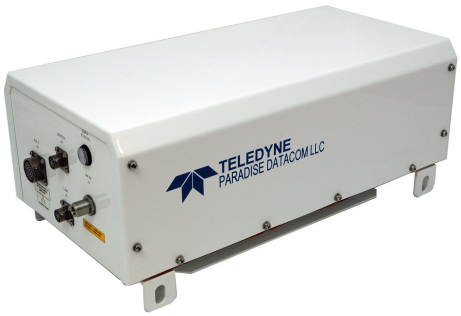
FEATURES

- System Output Power to:
  800W L-Band;
  800W S-Band;
  800W C-Band;
  800W X-Band;
  600W Ku-Band
- Universal Input,
  Power Factor
  Corrected Power Supply
- Output Power Monitoring
- Separate 1RU Redundant Controller or Controller-less configurations
- Hot/Cold Standby operating modes for reduced power consumption

OPTIONS

- System Output Power Monitor
- Reflected Power Alarm
- W/G Arc Protection Kit
- L-Band Input Operation
- Cold Standby Operation
- Custom Configurations

Redundant Systems
Outdoor SSPA Packages



High Power Outdoor Output Power Ranges

Band	GaAs (W)	GaN (W)
L-Band	N/A	600 - 800
S-Band	N/A	600 - 800
C-Band	400 - 500	800
X-Band	N/A	800
Ku-Band	N/A	400 - 600

See document # 214164 for GaAs High Power Outdoor SSPAs, and document # 211669 for GaN High Power Outdoor SSPAs

Compact Outdoor Output Power Ranges

Band	GaAs (W)	GaN (W)
L-Band	N/A	100 - 500
S-Band	N/A	100 - 500
C-Band	100 - 300	300 - 400
X-Band	200	300 - 400
Ku-Band	N/A	200 - 250

See document # 205485 for GaAs Compact Outdoor SSPAs, and document # 209555 for GaN Compact Outdoor SSPAs

System Output Power Capacity

Due to residual losses inherent in redundant system configurations (waveguide bends; switch and coupler losses), reduce the typical output power specification of a single amplifier by approximately 0.2 dB for 1:1 and by 0.4 dB for 1:2 systems.

For example, a single thread 100W C-Band Compact Outdoor SSPA has a typical saturated output power of 50.0 dB (100W).

Placing two of the above amplifiers in a 1:1 redundant system configuration would reduce the typical system saturated output by 0.2 dB to 49.8 dB (96W).

Placing three of the above amplifiers in a 1:2 redundant system configuration would reduce the typical system saturated output by 0.4 dB to 49.6 dB (91W).

Actual system losses will vary based on the system options.

Continuous operation at saturated power can negatively impact the life of the amplifier and will not be covered by warranty. Normal operating output should be limited to P_{linear} (3dB backed off from the full rated power, P_{sat}) for GaN amplifiers, or limited to P_{1dB} for GaAs amplifiers.

General Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain Gain Flatness Gain Slope Gain Variation vs. Temperature Gain Stability Gain Adjustment	minimum full band full band (Extended C-Band) per 40 MHz (C-, X-, Ku-Bands) per 10 MHz (L-, S-Band) -30 °C to +50 °C at constant temperature 0.1 dB resolution	70 ± 1.0 ± 1.5 ± 0.3 ± 0.2 ± 1.0 ± 0.25 20	dB dB dB dB/40 MHz dB/10 MHz dB dB/24 hours dB
Intermodulation Distortion	@ P_{1dB} - 3 dB	-25	dBc
AM/PM Conversion	@ rated P_{1dB} @P_{1dB} - 3 dB	3.5 1.0	°/dB °/dB
Spurious Harmonics	@ rated P_{1dB} @ rated P_{1dB} - 3 dB (C-,X-,Ku-bands) @ rated P_{1dB} - 3 dB (L-, S-band)	-65 -50 -30	dBc dBc dBc
Input/Output VSWR	 Output VSWR: Ku-Band with bulkhead filter	1.50:1 1.40:1	
Group Delay (per 40 MHz segment)	Linear Parabolic Ripple	0.01 0.003 1.0	ns/MHz ns/MHz^2 ns p-p
Transmit Band Noise Output Power Density	TX Band RX Band (C- or Ku-bands) RX Band (X-Band) RX Band (L-, S-Band)	-75 -150 -100 See options	dBW/4 KHz dBW/4 KHz dBW/4 KHz
Receive Band Noise Output Power Density	L-, S-Band, with optional filter L-, S-Band, without optional filter	-155 -95	dBW/4 KHz dBW/4 KHz
Residual AM Noise	0 - 10 KHz 10 KHz - 500 KHz 500 KHz - 1 MHz	-45 -20 (1.25 + log F) -80	dBc dBc dBc
Phase Noise	Offset frequency from carrier 10 Hz 100 Hz 1 KHz 10 KHz 100 KHz 1 MHz	 -90 -100 -110 -120 -125 -130	 dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz

Environmental

Operating Temperature	Ambient	-40 to +60	°C
Relative Humidity	Condensing	100	%
Cooling System	Integrated	Forced air	

Mechanical

Size, High Power Outdoor, single Size, Compact Outdoor, single	width X length X height width X length X height	16.5 X 27.5 X 9.335 419 X 699 X 238 10.0 X 19.5 X 6.50 254 X 495 X 165	inches mm inches mm
Weight, High Power Outdoor, single Weight, Compact Outdoor, single	Base unit (<200W S/C-bands) Base unit (≥200W S/C-bands; ≥100W Ku) Base unit (≥200W X-Band) With Internal zBUC	100 (45.5) 36 (16.4) ± 3% 44 (20.0) ± 3% 54.9 (25.0) ± 3% +1.7 (0.8)	lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg)
Finish		Paint	White; powder coat

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. Adding a zBUC® converter to an SSPA typically increases the gain by 2-4 dB. In addition:

- Autosensing zBUC includes an internal reference but will switch to an external reference if applied;
- Internal high stability (10 MHz) reference; will lock to externally supplied (10 or 50 MHz) reference;
- 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

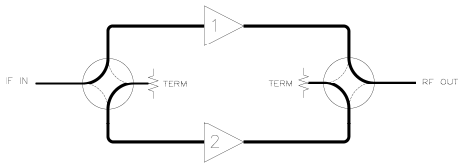
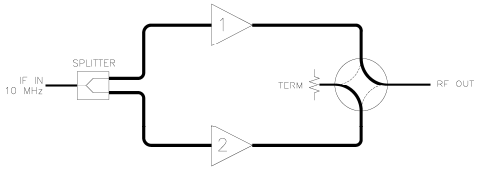
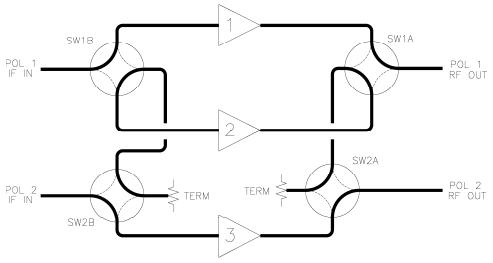
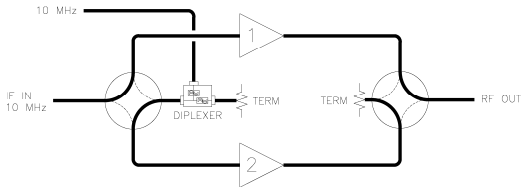
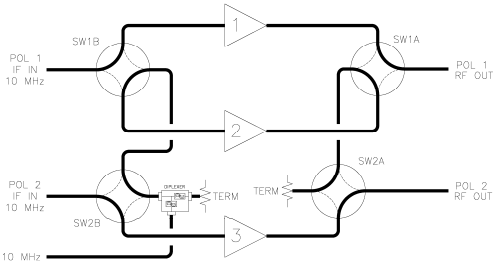
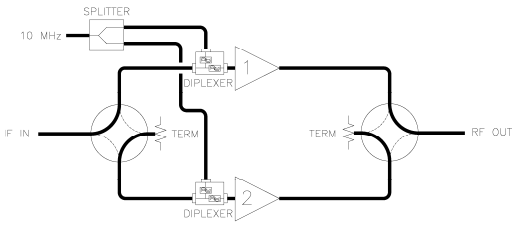
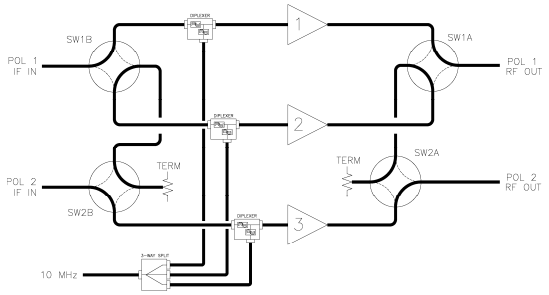
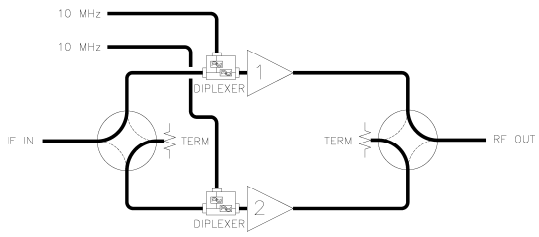
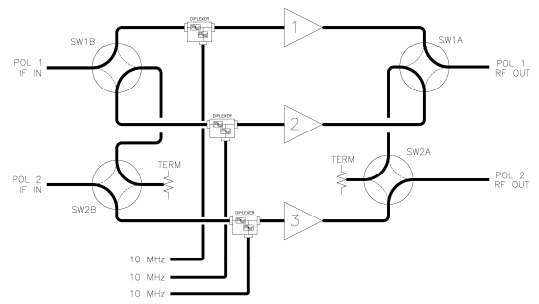
Band	Model Number	IF Input	LO Frequency	RF Output
C	Sub-Band "A"	950 - 1525 MHz	4.900 GHz	5.850 - 6.425 GHz
C	Sub-Band "B"	950 - 1825 MHz	4.900 GHz	5.850 - 6.725 GHz
C	Sub-Band "C"	950 - 1870 MHz	4.800 GHz	5.750 - 6.670 GHz
X	Sub-Band "A"	950 - 1450 MHz	6.950 GHz	7.900 - 8.400 GHz
Ku	Sub-Band "A"	950 - 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

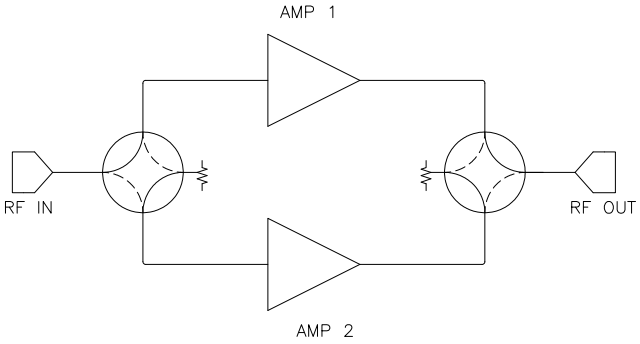
Electrical Specifications for Outdoor SSPA with ZBUC converter

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	Absolute max.	C-band (typ.)	X-band (typ.)	Ku-band (typ.)	
	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)	-50				dBc
	(Extended C-Band)	-40				dBc
	Close to Carrier Spurious (≤ 20 MHz)	-50				dBc
	Local Oscillator	-30				dBm
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)	$\pm 1 \cdot 10^{-8}$				
	Aging per day (after 30 days)	$\pm 1 \cdot 10^{-9}$				
	Aging per year (after 30 days)	$\pm 6 \cdot 10^{-8}$				
	Reference Stability over Temperature (-40 to +40 °C, ambient)	$\pm 1 \cdot 10^{-8}$				

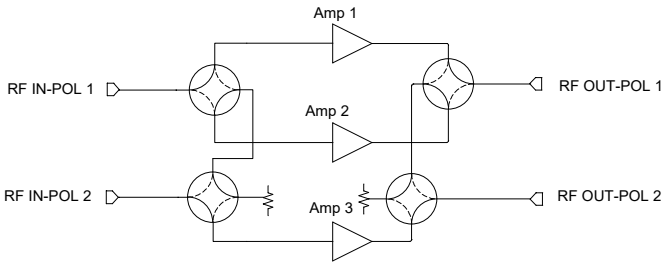
Reference Options in Redundant Systems with L-Band Input

See below for BUC configurations in which the 10 MHz reference can be distributed to units in redundant systems. Converters with internal reference oscillators automatically switch to an externally applied reference.

1:1 Redundant Systems	Ref. Option	1:2 Redundant Systems
Internal Reference Standard for BUC option 'M' with input switching  **Internal/External Reference** Standard for BUC option 'M' with input splitting  	**Option 1**	**Internal Reference** Standard for BUC option 'M' 
External 10 MHz Diplexed to Standby Unit  	**Option 2**	**External 10 MHz Diplexed to Standby Unit** 
Single External 10 MHz Diplexed to Each Unit  	**Option 3**	**Single External 10 MHz Diplexed to Each Unit** 
Separate External 10 MHz Diplexed to Each Unit  	**Option 4**	**Separate External 10 MHz Diplexed to Each Unit** 



1:1 Redundant HPA System



1:2 Redundant HPA System

Teledyne Paradise Datacom's Outdoor Packaged Redundant Systems are designed with built-in redundancy for 1:1 systems. All system-level monitor and control is internal and no separate controller is required, although an optional RCP2-1100 1:1 Redundant System Controller is available. Either Ethernet or RS-485 communications are selectable for user monitor and control. All 1:2 redundant systems require a separate RCP2-1200 Redundant System Controller.

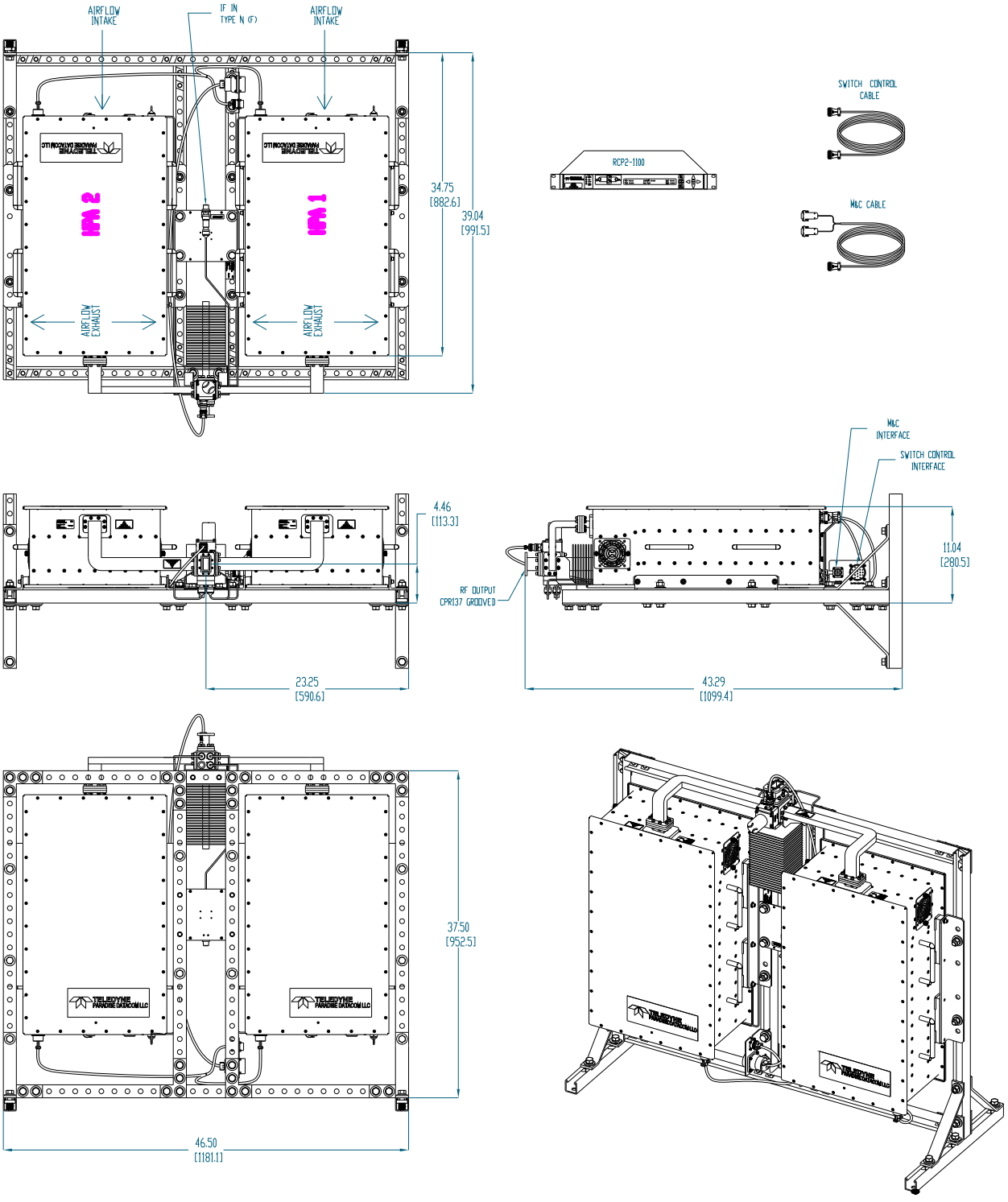
RCP2-1100 1:1 Redundant System Controller

RCP2-1200 1:2 Redundant System Controller

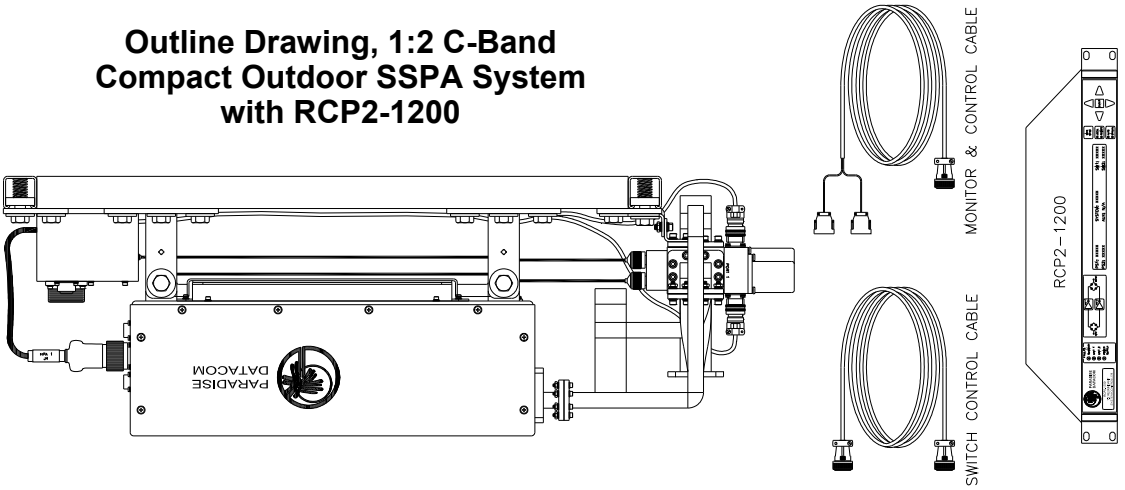
The RCP2-1200 1:2 Redundant System Controller is the heart of the 1:2 redundant system. It provides an extremely user friendly interface for complete monitor and control of the high power amplifiers. The front panel mimic display shows the on-line amplifiers and the current switch positions. Dedicated fault lights are provided for easy indication of system status.

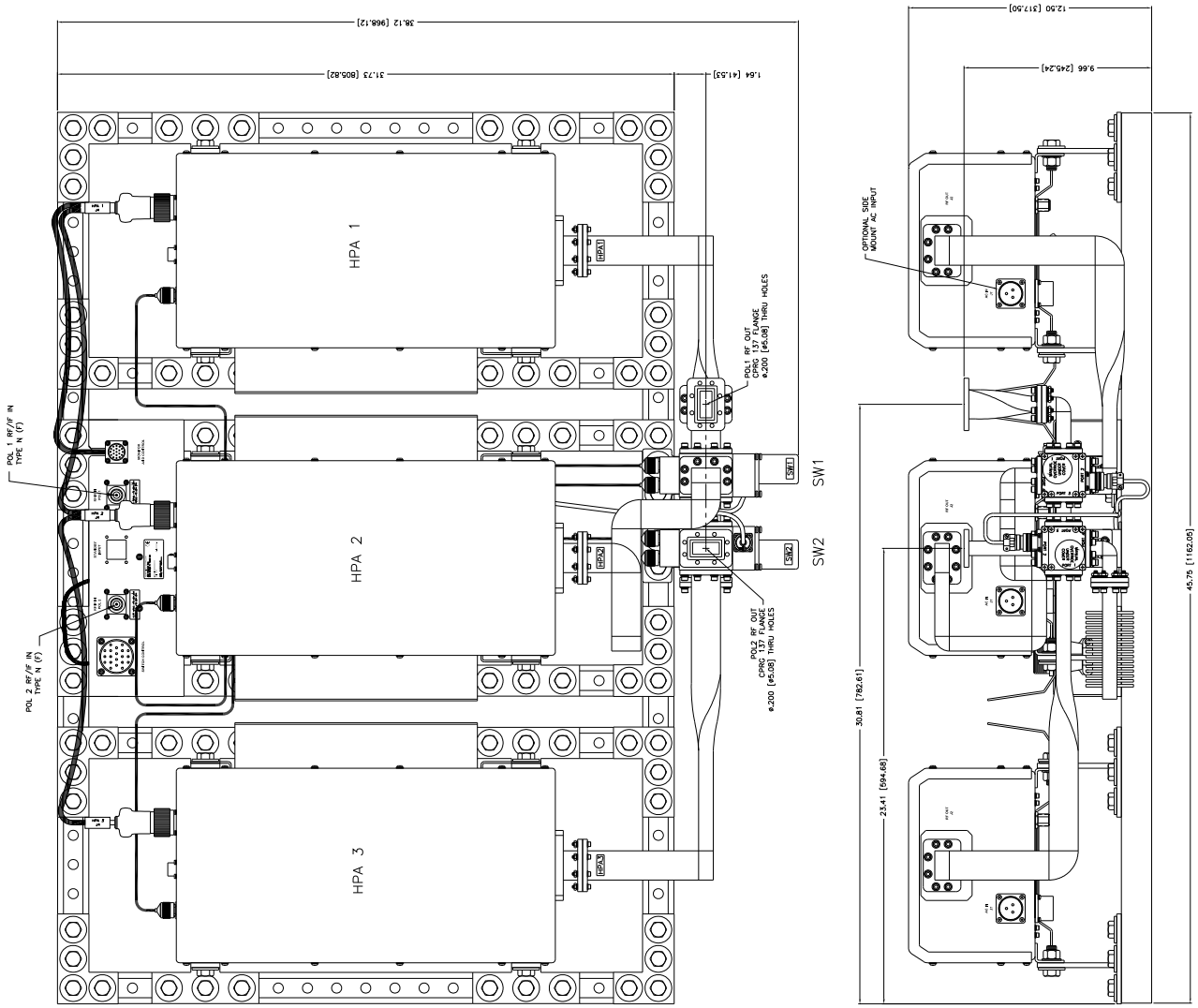
All Redundant System Controller monitor and control is available locally, at the front panel LCD display, as well as remotely by the RS-232, RS-485 or Ethernet interface ports. Audible alarms and a full compliment of parallel I/O signal are available at the rear panel.

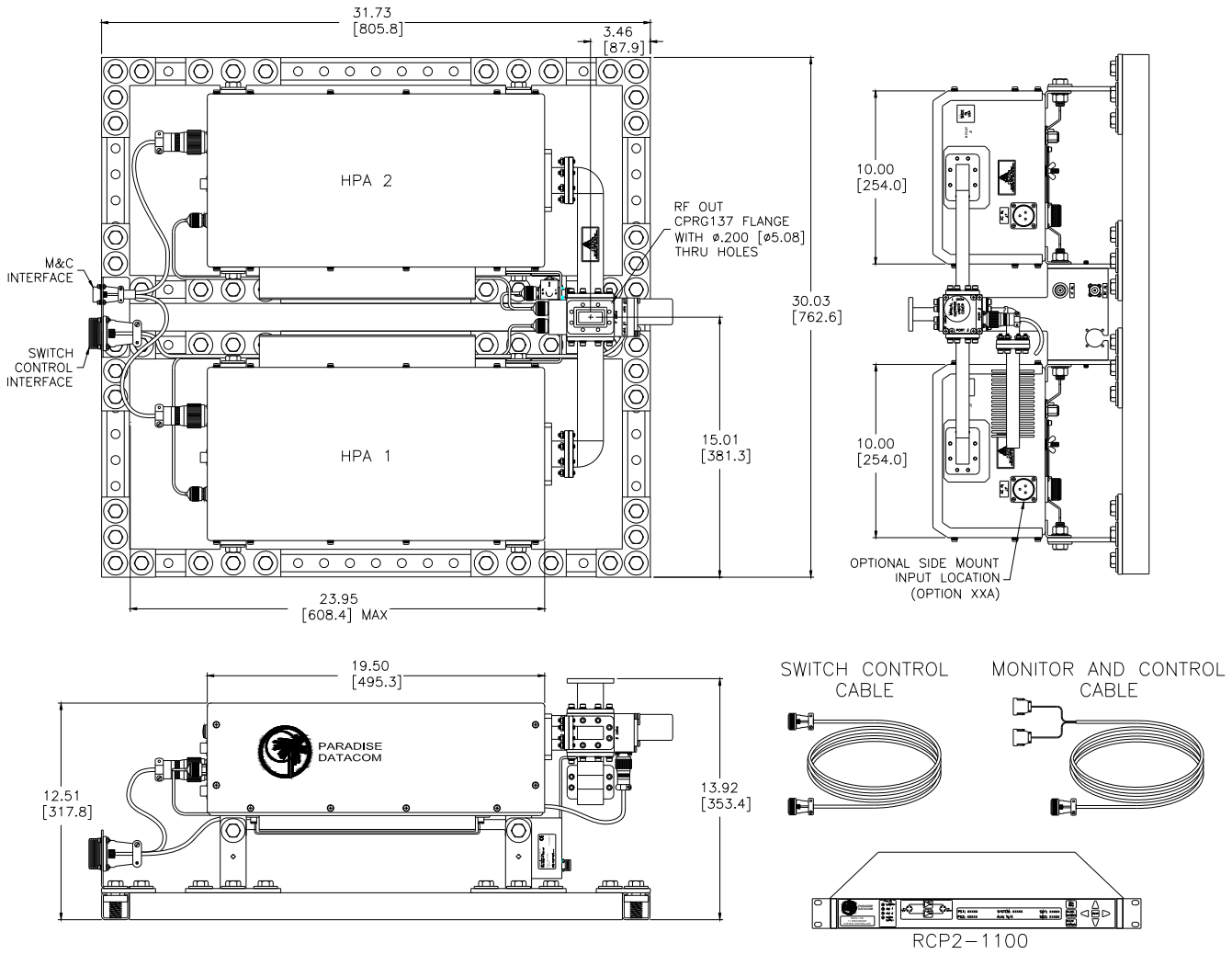
Outline Drawing, 1:1 C-Band High Power Outdoor SSPA System with RCP2-1100



Outline Drawing, 1:2 C-Band Compact Outdoor SSPA System with RCP2-1200







Outline Drawing, 1:1 C-Band Compact Outdoor SSPA System with RCP2-1100

Part Number Configuration Matrix, GaAs High Power Outdoor Systems

HPA	C	2	4	0	0	A	H	M	B	S	X	X

Band	
C-Band	**C**

Generation	
Second	**2**

Power Level (Watts)	
C-Band	**400, 500**

Frequency Sub Band	
C-Band	
A[1]	5.850 to 6.425 GHz
B[1]	5.850 to 6.725 GHz
C[1]	5.750 to 6.670 GHz

[1] Available with optional BUC

Package	
H	High Power Outdoor SSPA

Configuration Modifier 3	
X	None (Standard)

Configuration Modifier 2	
X	Standard
V	Reflected Power Monitor

Configuration Modifier 1	
X	Standard
S	Input Sample Port

System Configuration	
A	1:1 System, Input Switching, Internal control
B	1:1 System, Input Splitter, Internal control
C	1:2 System, Input Switching, RCP2-1200[1]
F	1:1 System, Input Splitter, RCP2-1100[1]
H	1:1 System, Input Switching, RCP2-1100[1]

[1] Standard cable length of 100 ft. (30m) with RCP unit.

Block Up Converter	
M	Autosensing BUC
X	No BUC

See page 5 for BUC reference configuration options.
Option 1 is standard for all 1:1 and 1:2 systems using BUC option 'M'.

Example — A 1:1 Redundant System with Input Splitting and Internal Redundancy Control, using two (2) 400W GaAs C-Band High Power Outdoor SSPAs with optional input sample ports and optional internal reference block up converters is part number: **HPAC2400AHMBSXX**.

For standalone SSPA specifications, refer to document 214164.

COMMENTS:

Part Number Configuration Matrix, GaN High Power Outdoor Systems

HPA	C	2	8	0	0	A	H	M	B	X	X	X	G

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

Generation	
Second	2

Power Level (Watts)	
L-Band	600, 800
S-Band	600, 800
C-Band	800
X-Band	800
Ku-Band	400, 500, 600

Frequency Sub Band	
L-Band	
A	1.75 to 1.85 GHz
S-Band	
A B G	2.02 to 2.12 GHz 2.20 to 2.30 GHz 1.75 to 2.12 GHz
C-Band	
A[1] B[1] C[1]	5.850 to 6.425 GHz 5.850 to 6.725 GHz 5.750 to 6.670 GHz
X-Band	
A[1] F	7.90 to 8.40 GHz 7.10 to 7.40 GHz
Ku-Band	
A[1] B[1]	14.00 to 14.50 GHz 13.75 to 14.50 GHz

[1] Available with optional BUC

GaN Device Designator	
G	GaN Technology

Configuration Modifier 3	
X	None (Standard)

Configuration Modifier 2	
X	Standard
R[1]	Receive Band Reject Filter
V	Reflected Power Monitor
Y[1]	R + V (see above)

[1] S-Band and X-Band only

Configuration Modifier 1	
X	Standard
S	Input Sample Port

System Configuration	
A	1:1 System, Input Switching, Internal control
B	1:1 System, Input Splitter, Internal control
C	1:2 System, Input Switching, RCP2-1200[1]
F	1:1 System, Input Splitter, RCP2-1100[1]
H	1:1 System, Input Switching, RCP2-1100[1]

[1] Standard cable length of 100 ft. (30m) with RCP unit.

Block Up Converter	
M	Autosensing BUC
X	No BUC

See page 5 for BUC reference configuration options. **Option 1** is standard for all 1:1 and 1:2 systems using BUC option 'M'.

Package	
H	High Power Outdoor SSPA

Example — A 800W GaN C-Band (5.85 to 6.425 GHz) 1:1 Redundant High Power Outdoor SSPA System with input splitting, an internal reference block up converter and internal redundancy control is model number: **HPAC2800AHMBXXXG**.

For standalone SSPA specifications, refer to document 211669.

COMMENTS:

Part Number Configuration Matrix, GaAs Compact Outdoor Systems

HPA	C	2	2	0	0	A	C	M	B	X	X	X

Band	
C-Band	C
X-Band	X

Generation	
Second	2

Power Level (Watts)	
C-Band	100, 140, 200, 250, 300
X-Band	200

Frequency Sub Band	
C-Band	
A[1]	5.850 to 6.425 GHz
B[1]	5.850 to 6.725 GHz
C[1]	5.750 to 6.670 GHz
X-Band	
A[1]	7.90 to 8.40 GHz

[1] Available with optional BUC

Package	
C	Compact Outdoor SSPA

Block Up Converter	
M	Autosensing BUC
X	No BUC

See page 5 for BUC reference configuration options. **Option 1** is standard for all 1:1 and 1:2 systems using BUC option 'M'.

System Configuration	
A	1:1 System, Input Switching, Internal control
B	1:1 System, Input Splitter, Internal control
C	1:2 System, Input Switching, RCP2-1200[1]
F	1:1 System, Input Splitter, RCP2-1100[1]
H	1:1 System, Input Switching, RCP2-1100[1]

[1] Standard cable length of 100 ft. (30m) with RCP unit.

Configuration Modifier 1	
X	Standard
K[1]	110 VAC Input

[1] Available in C- and X-Band models ≥ 140W

Configuration Modifier 2	
X	Standard
M	MS-Connector Covers
R[1]	Receive Band Reject Filter
Y[1]	M + R (see above)

[1] X-Band only

Configuration Modifier 3	
X	None (Standard)
A	Side-mount AC Input, Location 'A'
D	48 VDC Input
F	Side-mount 48 VDC Input, Location 'A'

Example — A 200W GaAs C-Band (5.850 to 6.425 GHz) 1:1 Redundant Compact Outdoor SSPA System with input splitting, an internal reference block up converter, and internal redundancy control is model number: **HPAC2200ACMBXXX**.

For standalone SSPA specifications, refer to document 205485.

COMMENTS:

Part Number Configuration Matrix, GaN Compact Outdoor Systems

HPA	X	2	3	0	0	A	C	M	B	X	X	X	G

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

Generation	
Second	2

Power Level (Watts)	
L-Band	100, 200, 300, 400, 500
S-Band	100, 200, 300, 400, 500
C-Band	300, 400
X-Band	300, 400
Ku-Band	200, 250

Frequency Sub Band	
L-Band	
A	1.75 to 1.85 GHz
S-Band	
A B G	2.02 to 2.12 GHz 2.20 to 2.30 GHz 1.75 to 2.12 GHz
C-Band	
A[1] B[1] C[1]	5.850 to 6.425 GHz 5.850 to 6.725 GHz 5.750 to 6.670 GHz
X-Band	
A[1]	7.90 to 8.40 GHz
Ku-Band	
A[1] B[1]	14.00 to 14.50 GHz 13.75 to 14.50 GHz

[1] Available with optional BUC

Package	
C	Compact Outdoor SSPA

GaN Device Designator	
G	GaN Technology

Configuration Modifier 3	
X	None (Standard)
A	Side-mount AC Input, Location 'A'

Configuration Modifier 2	
X	Standard
M	MS-Connector Covers
R[1]	Receive Band Reject Filter
Y[1]	M + R (see above)

[1] S-Band and X-Band only

Configuration Modifier 1	
X	Standard
K[1]	110 VAC Input Power

[1] Available on all C-Band units, all X-Band units, Ku-Band units > 150W

System Configuration	
A	1:1 System, Input Switching, Internal control
B	1:1 System, Input Splitter, Internal control
C	1:2 System, Input Switching, RCP2-1200[1]
F	1:1 System, Input Splitter, RCP2-1100[1]
H	1:1 System, Input Switching, RCP2-1100[1]

[1] Standard cable length of 100 ft. (30m) with RCP unit.

Block Up Converter	
M	Autosensing BUC
X	No BUC

See page 5 for BUC reference configuration options.
Option 1 is standard for all 1:1 and 1:2 systems using BUC option 'M'.

For standalone SSPA specifications, refer to document 209555.

COMMENTS:

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Data Security: Teledyne Paradise Datacom amplifiers and controllers do not inherently provide encryption to transmitted data, and have limited security measures to protect it. If the unit will be accessible over the Internet, exercise appropriate data security protocols. Teledyne Paradise Datacom strongly recommends placing the equipment behind a protective Firewall or setting up a VPN link with dual authentication for remote access.

Specifications are subject to change without notice.