

# Solid State Broadband High Power Amplifier

**2141 – BBS3C8CQR**
**100 – 6000 MHz / 400 Watts**

The 2141 dual controller, dual amplifier system is suitable for ultra broadband high power linear applications, laboratory, and RFI/EMC susceptibility testing and ruggedized communication applications. The amplifiers utilize high power GaN and LD MOS devices that provide wide frequency response and dynamic range, high gain, low distortions, and excellent linearity. Employing advanced broadband RF matching networks and combining techniques, EMI/RFI filters, and all qualified components achieve exceptional performance, and high efficiency. The system includes a universal voltage, single phase, power supply and a built in forced air-cooling system. Empower RF's ISO9001 Quality Assurance Program assures consistent performance and the highest reliability.



- Solid-state Class AB linear design
- Instantaneous ultra broadband
- Small and lightweight
- Remote control via RS422 / 485
- Suitable for CW, AM, and FM (for other modulation types consult factory)
- 50 ohm input/output impedance
- High reliability and ruggedness
- Built in control, monitoring and protection circuits
- Two RF outputs @ 100-1000 MHz and 1000-6000 MHz
- Environmentally qualified

**ELECTRICAL SPECIFICATIONS @ 115 VAC, 3Φ, 25°C, 50 Ω System**

Parameter	Symbol	Min	Typ	Max	Unit
Operating Frequency	BW	100		6000	MHz
Output Power @ Saturation	P <sub>SAT</sub>		500; 100-1000MHz 125; 1000-6000MHz		Watt
Output Power @ 1dB Gain Compression Point	P <sub>1dB</sub>	400; 100-400MHz 300; 400-1000MHz 120; 1000-2000MHz 100 -2000-3000MHz 50; 3000-6000MHz			Watt
Power Gain @ 1dB Gain Compression Point	G <sub>1dB</sub>	56; 100-400MHz 54; 400-1000MHz 51; 1000-3000MHz 50; 1000-3000MHz 47; 3000-6000MHz			dB
Input Power for Nominal P <sub>OUT</sub>	P <sub>IN</sub>		0		dBm
Gain Flatness	ΔG			±1.5; 100-3000MHz ±2.0; 3000-6000MHz	dB
Gain Adjustment Range	VVA	20	25		dB
Input Return Loss	S <sub>11</sub>			-10	dB
Noise Figure	NF			26	dB
Third Order Intercept Point	IP3	+63; 100-1000MHz +59; 1000-3000MHz +52; 3000-6000MHz			dBm
Harmonics @ 1dB Gain Compression Point	H			-45; 100-124MHz -55; 124-18000MHz	dBc
Spurious Signals	Spur			-45; 100-124MHz -55; 124-18000MHz	dBc
Operating Voltage (3 phase 400Hz) Delta Connection Line to Line	V <sub>AC</sub>	180		264	Volt
AC Power Consumption	P <sub>D</sub>			2900; 100-1000MHz 1760; 1-3GHz 1880; 3-6GHz	Watt
Filter Type	LPF	Low-pass			
Low Band Cut off	F <sub>CL</sub>	174, 250, 415, 700, 1000, 1500, 2000, 3000, 4000, 6000			MHz
AUX input Power	P <sub>IN</sub>			400; 100-400MHz 300; 400-1000MHz 120; 1000-3000MHz 50; 3000-6000MHz	Watt

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## MECHANICAL SPECIFICATIONS

Parameter	Value	Units	Limits
Dimensions L x W x H	19 x 22 x 22 (4 unit stack) Depth not includes front handles and rear connectors	Inch	Max
Weight	220	lb.	MAX
RF Connectors: 3 x RF Input 1 x AUX input 3 x RF Output 2 x Load Output	APC-N, Type-N female		
Hardwire Control / Filter interconnect / I/O	DB-15S		
AC Input	Circular Receptacle, Shell Size 20, 4-Pins Male		
Remote Control	DB-9S		
Cooling	Built in internal forced air cooling system		

## QUALIFIED ENVIRONMENTAL CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature (MIL-STD-810F Method 502.4 Proc I & II)	Tc	0		+55	°C
Non-operating Temperature (MIL-STD-810F Method 502.4 Proc I & II)	Tstg	-40		+85	°C
Relative Humidity (non-condensing) (MIL-STD-810F Method 507.4)	RH			95	%
Altitude (MIL-STD-810F Method 500.4 Proc I, II)	ALT	11,000 feet operational and 30,000 feet non-operational			Feet
Vibration (MIL-STD-810F Method 514.5 Proc I)	VI	Category 13			
Shock	SH	Operational: Acceleration (A) of 10.0 g +/- 1.5 g with Duration of 11.0 ms +/- 1.0 ms shock pulse Non-operational: impact shocks of 20g +/- 3.0g with Duration of 11.0 ms +/- 1.0 ms shock pulse			
EMI/EMC (MIL-STD-461D)	CE-102, CE-106, CS-101, CS-114, CS-115, CS-116, RE-102, RE-103, RS-103				
Endurance Vibration	2 Hrs per Axis, 3.64 G <sub>RMS</sub>				

## PROTECTIONS

Input Overdrive	+10 dBm	Max
Load VSWR @ rated P1 dB	∞ @ all load phase & amplitude for duration of 1 minute 3:1 @ all load phase & amplitude continuous	Nom
Thermal Overload	Graceful power reduction	Max

## AC Power CONNECTOR

Pin #	Description	Specifications
	Phase 1	208 V <sub>AC</sub>
	Phase 2	208 V <sub>AC</sub>
	Phase 3	208 V <sub>AC</sub>
	GND	Ground

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**Discrete Signals I/O CONNECTOR, D-Sub, -15 Pin Female (J2-23)**

Pin #	Description	Specifications
1	Forward Power voltage (Test Point)	Analog Voltage 0-5 V Test Point relative to Forward Power Output
2	Reversed Power voltage (Test Point)	Analog Voltage 0-5 V Test Point relative to Reverse Power
3	GND	Ground return
4	External Shutdown – control PA to shutdown	Control PA to shutdown (+5 V max)
5	+5V (Test Point)	5V from PA
6	Load input (Ground Sense enable discrete) (RF to load if grounded)	RF output routed to load if grounded
7	D_0 – Band select Filter LSB bit (Test Point)	Band Select Filter LSB Bit
8	D_1- Band select Filter bit (Test Point)	Band Select Filter Bit
9	D_2 – Band Select Filter MSB bit (Test Point)	Band Select Filter MSB
10	A_1 - Antenna Select LSB bit (Test Point)	Antenna 1 Select LSB Bit
11	A_2 - Antenna Select MSB bit (Test Point)	Antenna 2 Select MSB Bit
12	ANT1-S (Right antenna select J2-7) (Test Point)	Antenna 1 Relay 100-500MHz (Right)
13	ANT2-S (Left antenna select J2-5) (Test Point)	Antenna 2 Relay 500-1000MHz (Left)
14	TX Active Low Band (Ground when transmit)	Transmit Active “Low” Band
15	Safety Enable input discrete	When active (ground) the PA will be in transmit mode

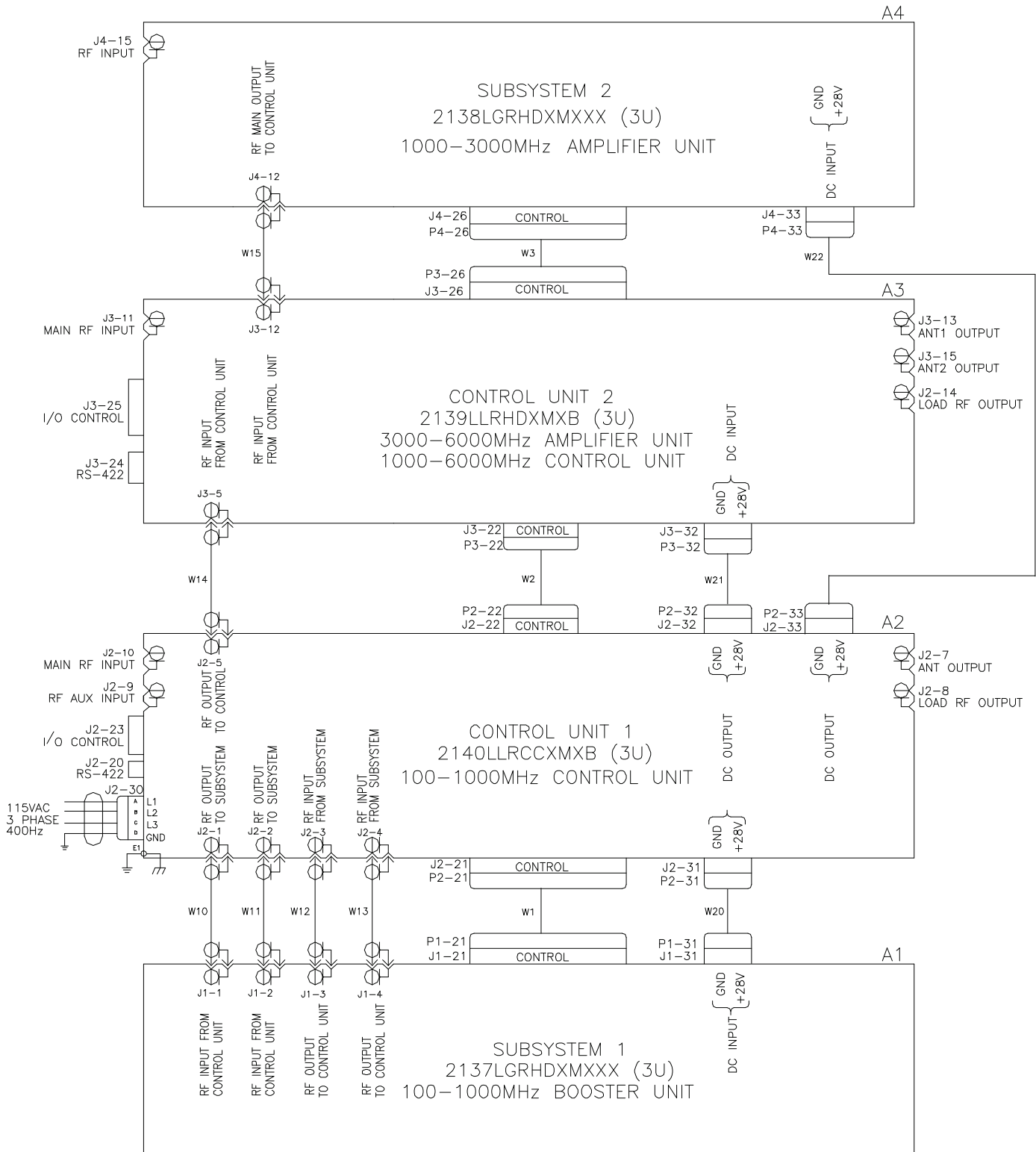
**Discrete Signals I/O CONNECTOR, D-Sub, -15 Pin Female ( J3-25)**

Pin #	Description	Specifications
1	Forward Power voltage (Test Point)	Analog Voltage 0-5 V Test Point relative to Forward Power Output
2	Reversed Power voltage (Test Point)	Analog Voltage 0-5 V Test Point relative to Reverse Power
3	GND	Ground Return
4	External Shutdown (+5V max) – control PA to shutdown	Control PA to shutdown (+5V max)
5	+5V (Test Point)	5V from PA
6	Load input (Ground Sense enable discrete) (RF to load if grounded)	RF output routed to load if grounded
7	D_0 – Band select Filter LSB bit (Test Point)	Band Select Filter LSB Bit
8	D_1- Band select Filter bit (Test Point)	Band Select Filter Bit
9	D_2 – Band Select Filter MSB bit (Test Point)	Band Select Filter MSB
10	A_1 - Antenna Select LSB bit (Test Point)	Antenna 1 Select LSB Bit
11	A_2 - Antenna Select MSB bit (Test Point)	Antenna 2 Select MSB Bit
12	ANT1-S (Right antenna select J3-13) (Test Point)	Antenna 1 Relay 100-500MHz (Right)
13	ANT2-S (Left antenna select J3-15) (Test Point)	Antenna 2 Relay 500-1000MHz (Left)
14	TX Active High Band (Ground when transmit)	Transmit Active “High” Band
15	Safety Enable input discrete	When active (ground) the PA will be in transmit mode

**Remote CONNECTOR, D-Sub, 9-Pin Female (J2-20, J3-24)**

Pin #	Description	Specifications
1	RX -	Receive to Remote Host Differential RS-422 Line
2	TX +	Transmit from Remote Host Differential RS-422 Line
3	TX -	Transmit from Remote Host Differential RS-422 Line
4	N/C	Spare
5	GND	Ground
6	N/C	Spare
7	N/C	Spare
8	N/C	Spare
9	RX +	Receive to Remote Host Differential RS-422 Line

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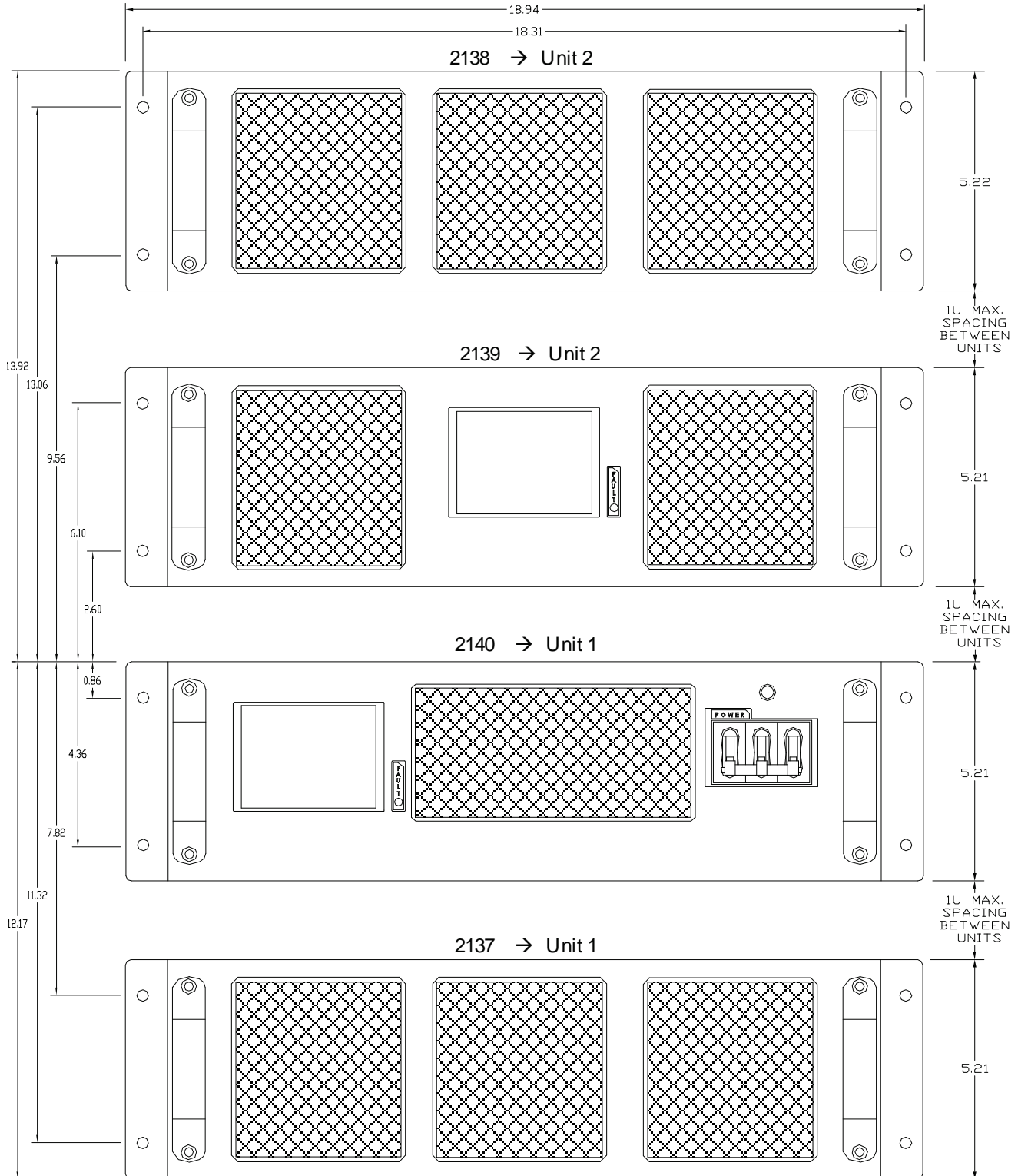
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**TYPICAL Block Diagram**


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SYSTEM OUTLINE – FRONT



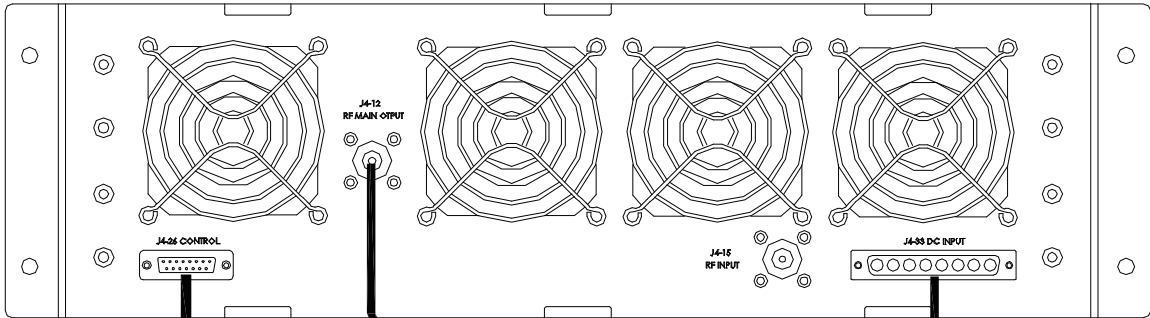
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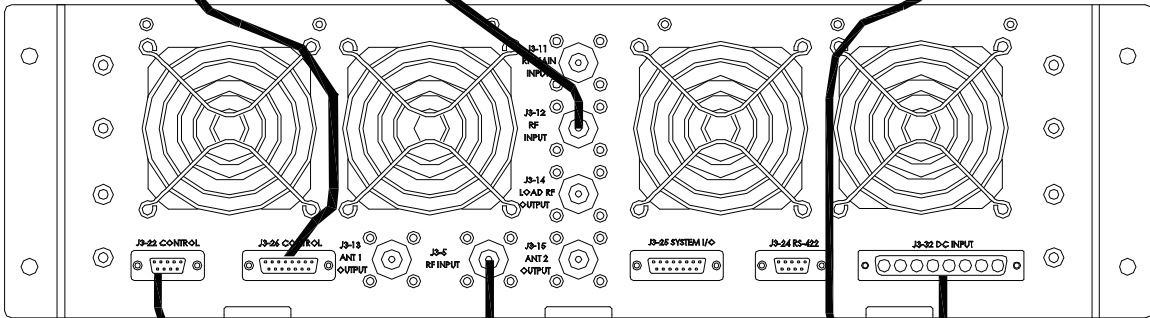
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## SYSTEM OUTLINE – REAR

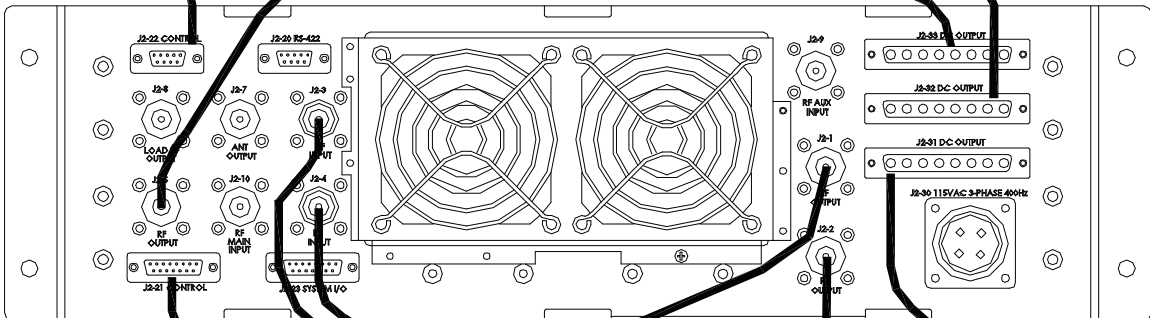
2138  
Unit 2



2139  
Unit 2



2140  
Unit 1



2137  
Unit 1

