

Solid State Broadband High Power Amplifier

2162
20 – 1000 MHz / 1000 Watts

The 2162 is suitable for multi-octave bandwidth high power CW, modulated, and pulse applications. This amplifier utilizes high power LDMOS devices that provide wide frequency response, high gain, high peak power capability, and low distortions. Exceptional performance, long-term reliability and high efficiency are achieved by employing advanced broadband RF matching networks and combining techniques, EMI/RFI filters, and all qualified components. The amplifier is constructed within a single 5RU drawer including the forced air-cooling. Available operating voltage configurations are single-phase, three-phase AC up to 400Hz and 28 VDC.



The amplifier includes a built in control and monitoring system, with protection functions which preserve high availability. Remote management and diagnostics are via an embedded web server allowing network managed site status and control simply by connecting the unit's Ethernet port to a LAN. Using a web browser and the unit's IP address (IPV4) allows ease of access with the benefit of multi-level security. The control system core runs an embedded OS (Linux), has a built-in non-volatile memory for event recording, and factory setup recovery features. The extended memory option allows storage of control parameters and event logs.

Empower RF's ISO9001 Quality Assurance Program assures consistent performance and the highest reliability.

- Solid-state, Class AB, compact modular design
- Suitable for CW, AM, FM, Pulse and some linear applications (Consult factory for other modulation types)
- Embedded directional coupler – Eliminates the need for external component
- 50 ohm input/output impedance
- Built-in Control, Monitoring and Protection functions
- High reliability and ruggedness

ELECTRICAL SPECIFICATIONS over temperature conditions (-10 to +50°C)

Parameter	Symbol	Min	Typ	Max	Unit
Operating Frequency	BW	20		1000	MHz
Power Output CW <i>(Note 1)</i>	P _{SAT}	1000			Watt
Power Output @ 1dB Gain Compression <i>(Note 2)</i>	P _{1dB}	500			Watt
Power Gain @ 1dB Gain Compression	G _{1dB}	63			dB
Input Power for Rated P _{SAT}	P _{IN}		0		dBm
Input Power Range	P _{IN}	-3.0		+3.0	dBm
Small Signal Gain Flatness / Leveled (ALC)	ΔG			±3.5/±1.0	dB
Gain Adjustment Range	VVA	20			dB
Input Return Loss	S ₁₁			-10	dB
Noise Figure @ maximum gain 20-300MHz/300-1000MHz	NF			20/15	dB
Third Order Intermodulation Distortion 2-Tone @ 54dBm/Tone, 1MHz Spacing	IM3		-20		dBc
Harmonics @ P _{OUT} = 1000W <i>(Note 3)</i>	2 ND			-20	dBc
	3 RD			-10	dBc
Spurious Signals	Spur			-60	dBc
Operating Voltage (1-phase)	V _{AC}	180	220	260	Volt
Operating Voltage (3-phase)	V _{AC}		208		Volt
Power Consumption @ 1000W CW	P _D			6000	VA

- Notes:
1. CW measurement performed in MGC Mode (Manual Gain Control)
 2. P_{1dB} measurements performed with AM 80% depth of modulation, 1 kHz modulation signal
 3. 20-50MHz second harmonic specs is -15dBc max.

MECHANICAL SPECIFICATIONS

Parameter	Value	Unit
Dimensions W x H x D	17.5 x 8.75 x 22	Inch
Weight (Without Harmonic Suppression Filters)	95	Pound
RF Connectors Input/Output	Input: Type-N, Female Output: Type-7/16-DIN, Female (optional Type-SC, Female)	-
RF Sample	Type-SMA, Female	-
Blanking Input	Type-BNC, Female	-
Cooling	Built-in forced-air cooling system	-

Solid State Broadband High Power Amplifier

2162

20 – 1000 MHz / 1000 Watts

ENVIRONMENTAL CHARACTERISTICS (Qualification Data available for review)

Parameter	Symbol	Min	Typ	Max	Unit
Operating Ambient Temperature	T _A	-10		+50	°C
Non-operating Temperature	T _{STG}	-40		+85	°C
Relative Humidity (non-condensing)	RH			95	%
Shock / Vibration - MIL-STD-810F Shock Method 516.5, Vibration Method 514.5	SH / VI				

PROTECTIONS

Parameter	Specification	Unit
Input Overdrive	+10 dBm	Max
VSWR Protection	At 3:1 – PA backs-off output power to a safe operating level – no system shutdown, "On Air" time is maximized	-
Thermal – Graceful Degradation	Ambient 50°C	Min
Default Data Recovery	Factory Default Calibration Recovery	

COMMUNICATION INTERFACES

Function	Utility	Connector
Ethernet	Network Management of Device / Web Interface	RJ45
USB	Mass Storage / Expansion Bus	USB 1.x/2.0 compatible
RS-232 (Standard) RS-422 (optional)	Serial Management of Device / Local Operator Access	D-Sub 9-position Male

SYSTEM I/O INTERFACE – 14-Position

Pin #	Description	Specification
1	FWD Test Point	Forward detected power (analog voltage: 0-5 Volt)
2	REV Test Point	Reverse detected power (analog voltage: 0-5 Volt)
3	Summary Fault	Summary Fault: Active TTL Logic Low ($\leq 0.7V$) (Internally Pulled-High)
4	VVA Control (optional)	VVA Control/Monitor: Analog Voltage Range 0-5V
5	Shutdown	Amplifier Disable: TTL Logic Low ($\leq 0.7V$) (Internally Pulled-High)
6	Aux P/S Test Point	+12.0V _{DC} $\pm 2.0V$ (resettable 0.5amp fuse)
7	Main P/S Test Point	+44.0V _{DC} $\pm 4.8V$ (resettable 0.5amp fuse)
8	GND	Ground
9-11	Open drain control	Site management utility (reserved)
12&13	Digital I/O (configurable)	Site management utility (reserved)
14	GND	Ground

Available Options:

2162-xxx

-001 208 VAC, 3-phase-Delta, 47-63 Hz, Rear RF Connectors

-003 180-260 VAC, 1-phase, 47-63 Hz, Rear RF Connectors

-004 28 VDC, Front RF Connectors

-005 28 VDC, Rear RF Connectors

-006 208 VAC, 3-phase-Delta, 47-63 Hz, Front RF Connectors

-007 180-260 VAC, 1-phase, 47-63 Hz, Front RF Connectors

Contact us for other available options; sales@empowerrf.com

Standard Feature:

-LCD Control, Ethernet & Serial Comm

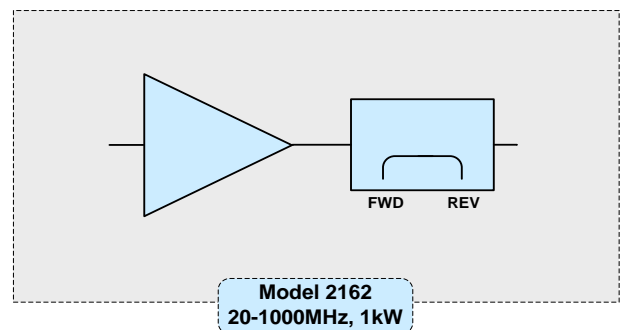
-Main RF Connectors: **Input** [Type-N, F], **Output** [7/16-DIN, F]

-Sample Port: SMA-F [Forward & Reverse]

-Blanking/Gating Port: BNC-F

-Rack Slides, Handles and Rackmount Bracket

NOTIONAL BLOCK DIAGRAM

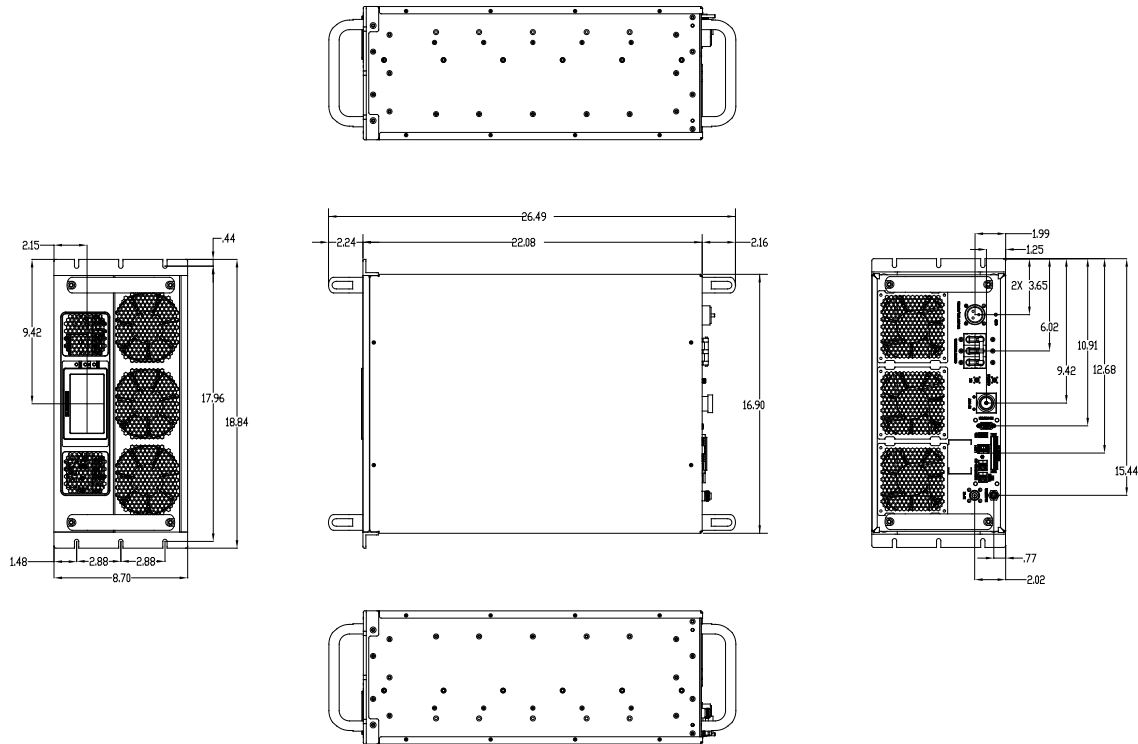


Solid State Broadband High Power Amplifier

2162

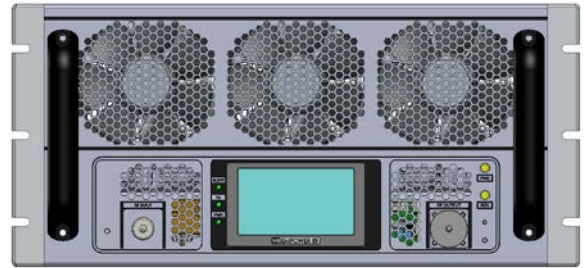
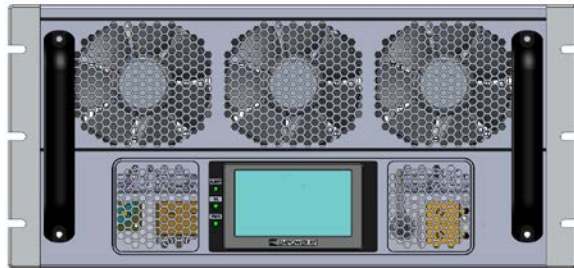
20 – 1000 MHz / 1000 Watts

OUTLINE DRAWING (Configuration 2162-003)

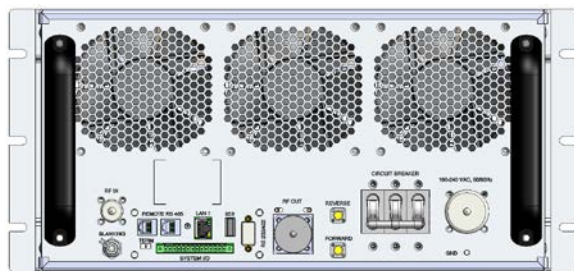


2162-003 – Front and Rear View

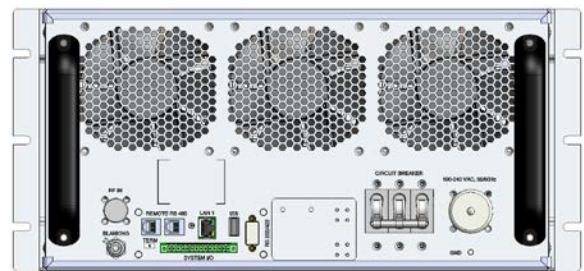
2162-007 Front and Rear View



With Front RF Connectors



With Rear RF Connectors



Solid State Broadband High Power Amplifier

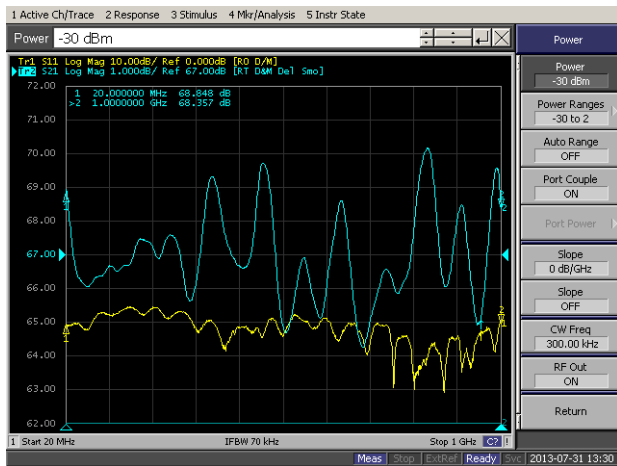
2162

20 – 1000 MHz / 1000 Watts

TYPICAL PERFORMANCE

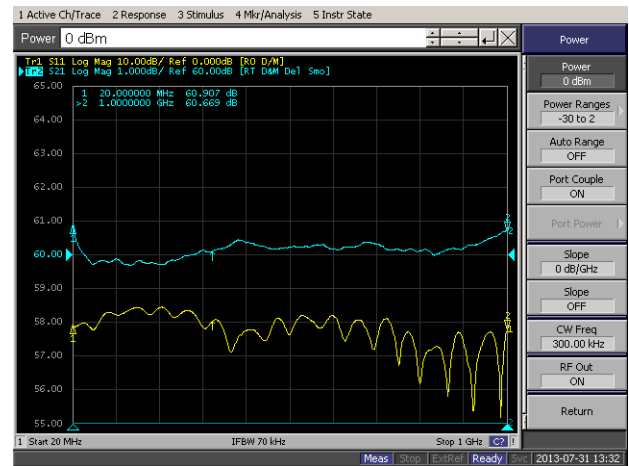
Plot 1 – Small Signal Gain and Flatness

Top Curve: Small Signal Gain @ $P_{IN} = -30\text{dBm}$
 Reference: 67dB, 1dB/div.
 Bottom Curve: Input Return Loss
 Reference: 0dB, 10dB/div.



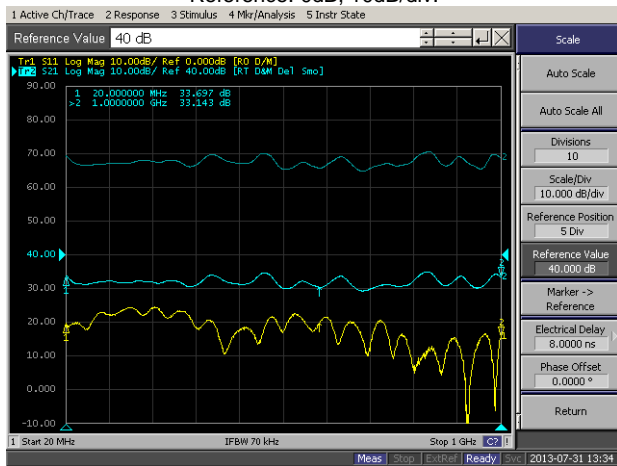
Plot 2 – Output Power @ 1000W ALC Mode

Top Curve: Mode ALC @ 60dBm, $P_{IN} = 0\text{dBm}$
 Reference: 60dB, 1dB/div.
 Bottom Curve: Input Return Loss
 Reference: 0dB, 10dB/div.



Plot 3 – Gain Adjustment Range @ $P_{IN} = -30\text{dBm}$

Top Curve: Maximum Gain
 Middle Curve: Minimum Gain
 Reference: 40dB, 10dB/div.
 Bottom Curve: Input Return Loss @ Minimum Gain
 Reference: 0dB, 10dB/div.



POWER_OUT vs. LOAD VSWR

