

# COPLEY MODEL 271 HIGH POWER AMPLIFIER CHARACTERISTICS

Specification typical @25°C. HV=+425V. Current mode load=185μH +60 mΩ. Load capacitor each side to grnd 0.1μF

Current Mode Output				
ON/OFF (ms)	∞ (DC)	Unipolar 100/100	Unipolar 20/40	Symmetrical Burst
A peak	400	600	750	650
A rms	400	424	433	485

## SYMMETRICAL CURRENT BURST

Peak Current Output	±650 A
Burst Waveform	Equal positive and negative pulses
Burst Frequency Range	100 Hz to 800 Hz
Duty Factor During Burst	0.6
Maximum Burst Duration	100 ms

## BID-SPEC MODE

<u>ON TIME</u>	<u>PEAK CURRENT</u>
60ms	850A
50ms	900A
40ms	950A

**OUTPUT VOLTAGE** ±350V

**BANDWIDTH, SMALL SIGNAL** -3dB at 6 kHz

**SETTLING RESPONSE** After output ramp  
Current error < 1% < 100 us  
Current error < 0.5% < 150 us  
Current error < 0.1% < 250 us

## GAIN

Current Mode Adjustment Span	70 to 95 A/V
Factory Set	70A/V ±0.5%

**OUTPUT OFFSET** ±170 mA, adjustable to zero

<u>Stability</u>	
Long Term (>1 year)	<170 mA
Short Term (BW: 0.1 to 1.0Hz)	< 6 mA
Step (popcorn) noise (BW: DC-10Hz)	< 1 mA

**PROPAGATION DELAY** < 70 us, Independent of amplitude  
Difference between channels < 4 us  
Stability <250 ns / 10 s

## DRIFT

<u>Due to Self-Heating @ 240A DC</u>	
Offset	< 10 mA / 15 min
Gain	< 500 ppm / 15 min
<u>Due to Ambient Temperature</u>	
Offset	6 mA/°C
Gain	150 ppm/°C

# COPLEY MODEL 271 HIGH POWER AMPLIFIER CHARACTERISTICS

---

Specification typical @25°C. HV=+425V. Current mode load=185μH +60 mΩ. Load capacitor each side to grnd 0.1μF

## LINEARITY

Integral/Static	< 0.1%
Differential	< 0.6%
Total Harmonic Distortion	< 0.2% @200 Hz, 240A rms or 225 V rms
	< 0.4% @1kHz, 240A rms or 225V rms

## NOISE/RIPPLE

<u>Differential</u>	
0.01Hz to 5 Hz	< 200 uA rms
5Hz to 10 kHz	< 350-30*f uA rms
> 10 Hz	< 5*f uA rms
Common Mode (per axis)	< 30 mA rms
Differential Ripple	< 4 V rms
Ripple re Ground	< 4 V rms, each output terminal

## REPRODUCIBILITY

< 10 uA s

## SIGNAL INPUTS

Input 1	Differential
Impedance	> 20 kΩ
Max Input Voltage	
Common Mode	±20 V
Differential Mode	±10 V
Common Mode Rejection Ratio	80 dB minimum, DC to 360 Hz

## OUTPUT IMPEDANCE

DC	> 200 Ω
4 kHz to 6 kHz	> 6 Ω

## CLOCK

Optional External Clock	5 MHz ±1%, 40%-60% duty factor, TTL compatible into 50 Ω
Input Clock	5 MHz
Effect of clock loss	Amplifier inhibits, low voltage power converters operate

## UPGRADEABILITY

2 parallel power amplifiers

## TUNING & CONTROL

Modes	Functions controlled by commands via the ADCI and RTCI
Short Circuit Load	Software selectable TTL signal
185 uH	
97 uH	
Open Circuit	
Parallel	
Custom Modes can be factory pre-programmed	

## MANUAL CONTROLS

Rack	Power On/Off Switch
Axis	Reset, Inhibit

# COPLEY MODEL 271 HIGH POWER AMPLIFIER CHARACTERISTICS

---

Specification typical @25°C. HV=+425V. Current mode load=185μH +60 mΩ. Load capacitor each side to grnd 0.1μF

## FAULT PROTECTION

Shutdown due to:

Overtemperature (ambient and coolant)  
(Also protects for loss of coolant)  
IGBT failure  
Open connector  
Overload  
Signal error or load fault  
Internal voltages out of tolerance  
Clock loss

Warnings

## CURRENT MONITOR

Sensitivity	± 1 V/70 A ±1%
Range (operational)	± 10 V
Range (max rating)	± 15 V
Accuracy (scale)	< 1%
Bandwidth	> 10kHz
Settling to 0.1%	< 80 μs
Settling to 0.03%	< 250 μs
Stability (time)	0.1% year
Stability (ambient temperature)	40ppm/°C
Output Impedance	< 1kΩ
Offset	<0.1%

## VOLTAGE MONITOR

Sensitivity	± 1 V/50 V ±1%
Range (operational)	± 10 V
Range (max rating)	± 15 V
Accuracy (scale)	< 1%
Bandwidth	> 10kHz
Stability (time)	0.1% year
Stability (ambient temperature)	30ppm/°C
Output Impedance	< 1kΩ

## POWER REQUIREMENTS

High Voltage	+425 VDC
--------------	----------

## AMPLIFIER THERMAL REQUIREMENTS

Dissipation	
I <sub>out</sub> = 250 A DC	2900 W
I <sub>out</sub> = 650 A EHC	6600 W
Panel Inlet Air Temperature	10 °C to +35 °C
Storage and Transport	-30 °C to +85 °C

# COPLEY MODEL 271 HIGH POWER AMPLIFIER CHARACTERISTICS

Specification typical @25°C. HV=+425V. Current mode load=185μH +60 mΩ. Load capacitor each side to grnd 0.1μF

## AMPLIFIER COOLING

Air	
Front	Air inlet
Rear	Air outlet
Water	
Max Inlet Temperature	30°C
Min Inlet Temperature	10°C
Coolant Temperature Rise	15 °C max (at nominal flow and max power)
Max. Inlet Pressure	60 psi = 4.2 bar.
Max. flow	3gpm = 11.35 l/min
Min. flow for normal operation	2gpm = 7.58 l/min
Pressure Drop (at normal flow)	35psi max = 2.45 bar
Coolant type	50/50 vol% Water/ Glycol (-30 to 60 °C)
DOWTHERM	SR-1
Connector type/size:	Quick connect Tema IF 3820-001.

## CROSS TALK

Linear:	Receiver channel current waveform has the same shape and less than 1% of source channel waveform amplitude.
Nonlinear:	2ms after a slope, the integral of the part of the current in the receiver channel that remains after the linear crosstalk part has been subtracted will be < 10 μAs.

## DELAY DIFFERENCE

Between Any Two Channels	< 4μs
Delay Variation Between Channels	< 500 ns\10 s

## HIGH VOLTAGE DC SUPPLY

Capacitor Bank	+425 VDC, 100A, 42 kW. 0.1 F plus 0.06 F in 3 axes ≈ 0.17 F total
----------------	--

## MAINS SERVICE REQUIRED

Line Voltage	340VAC to 440VAC
Max Operating Current (RMS)	<100A per phase
Frequency	50 and 60 Hz
Frequency Variations	2%
Allowed Mains Impedance	0.4Ω
Load Current Distribution	<30%
Power Factor	> 0.7%
Allowed voltage between (virtual or real) neutral and gnd	> 10 V rms
Frequency	50 and 60 Hz
Frequency Variations	2%

## SYSTEM THERMAL REQUIREMENTS

Panel Inlet Air Temperature	10 °C to +35 °C
Storage	-30 °C to +85 °C

# COPLEY MODEL 271 HIGH POWER AMPLIFIER CHARACTERISTICS

---

Specification typical @25°C. HV=+425V. Current mode load=185μH +60 mΩ. Load capacitor each side to grnd 0.1μF

## SYSTEM COOLING

Air	
Front	Air inlet
Rear	Air outlet
Water	
Max Inlet Temperature	30°C
Min Inlet Temperature	Ambient temperature + 1°C
Coolant Temperature Rise	15 °C max (at nominal flow and max power in all axes)
Max. Inlet Pressure	60 psi = 4.2 bar.
Max. flow	12gpm = 45.4 l/min
Min. flow for normal operation	8gpm = 30.3 l/min
Pressure Drop (at normal flow)	35psi max = 2.45 bar
Coolant type	50/50 vol% Water/ Glycol (-30 to 60 °C)
DOWTHERM	SR-1
Connector type/size:	Copley Controls Corp P/N 70-00094-000 R-1 Coupling, socket, flatface, stainless steel, ½-14 NPTF.
Coolant System Filtering	
Filter material	Non-absorbent cotton, fiber, or cellulose type media
Maximum filtration rating	25 microns at 0.5 PSI pressure drop required for removal of foreign material.
<b>CABINET</b>	Casters and levelers front and rear
Size	63" H x 28" W x 38" D (157.5 cm H x 71.1 cm W x 99.1 cm D)
Weight	1635 lb (743 kg) max
Doors	Front and rear
Accessibility	All field-replaceable units (FRUs) replaceable via front