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TELEDYNE PHILBRICK

AC/DC, DC/DC Regulated, Modular Power Supplies

2200
2300
2400

Teledyne Philbrick's AC/DC and DC/DC modular power supplies are offered to complement our existing product line. Designed for virtually all general purpose, low and medium power supply requirements, they are available in various output ranges and packages.

The 2200 Series of AC/DC converters is available in four output voltage ranges, +5VDC, ±15VDC, ±120VDC, and ±15VDC with +5VDC, with output currents from ±40 to +2000mA. The 2300 Series of DC/DC converters is available in two output voltage ranges, ±15VDC and +15VDC with +5VDC with output currents from ±100mA to ±750mA. The 2400 Series of AC/DC converters is available in two output voltage ranges, +5VDC and ±15VDC with output currents from ±200mA to ±1000mA.

Ensuring reliable operation and prevention of supply or external circuit load damage, each device incorporates one or more of the following types of output protection.

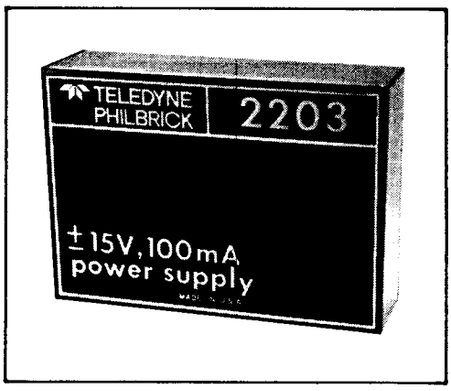
Foldback Current Limit: The maximum short circuit current is approximately 50% of rated load current.

Maximum Current Limit: The maximum output current is limited to approximately 200% of rated load current.

On-Off with Current Limit: In addition to current limiting when the load current reaches about twice the rated value, the output alternately opens and closes for approximately 2 to 4 seconds until the fault is corrected.

Over-Voltage Crowbar: All 5V supplies except the 2206 have "crowbar" circuits on the output to prevent damage to 5V TTL logic circuits. When the output exceeds 6.2V ±0.7V, the "crowbar" trips and takes the output to zero. Input power must be removed to reset supply.

Thermal Shutdown: The 2300 Series have thermal shutdown circuits. Units will survive for approximately 8 hours with all outputs shorted at an ambient temperature of +70°C. At lower temperatures units will have longer survival time periods.



FEATURES

- Single, Dual and Triple Outputs
- Output Protection
- Input/Output Isolation
- Low Ripple and Noise

APPLICATIONS

- Analog to Digital Systems
- Industrial Controls
- Data Acquisition Systems
- Test Equipment

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2200 SERIES / **2400 SERIES** — 50 Hz to 400 Hz, 115 V ±10 V. For optional 230 V ±20 V operation, add −21 to model number. Models 2203, 2204, and 2206 operate from 115 V or 230 Vac.

		Model	Output Voltage	Output Current	Regulation, Max. Line	Regulation, Max. Load	Ripple and Noise	Temperature Coefficient Max.	Limit Current mA (typ)	Derating Curve	Case Size	UL
PC BOARD MOUNTED	5 Volts	~~2200~~	5V DC	500mA	±0.10%	±0.15%	2mV p-p	±0.01%/°C	250	---	C1	
		2213	5V DC	1000mA	±0.6%	±0.1%	1mV p-p	±0.02%/°C	1750	A	C5	★
		2223	5V DC	2000mA	±0.02%	±0.05%	1mV RMS	±0.02%/°C	2700	F	C7	★
	±15 Volts	2203	±15V DC	±100mA	±0.03%	±0.03%	1mV RMS	±0.01%/°C	50	---	C1	
		2204	±15V DC	±50mA	±0.03%	±0.015%	1mV RMS	±0.01%/°C	25	---	C1	
		2208	±15V DC	±100mA	±0.03%	±0.03%	1mV RMS	±0.01%/°C	50	---	C3	
		2209	±15V DC	±50mA	±0.03%	±0.015%	1mV RMS	±0.01%/°C	25	---	C4	
		2215	±15V DC	±200mA	±0.02%	±0.05%	1mV RMS	±0.02%/°C	60	B	C5	
		2218	±15V DC	±350mA	±0.02%	±0.02%	0.5mV RMS	±0.02%/°C	800	G	C7	★
	High Voltage	2217	±120V DC ±2%	±40mA	±0.1%	±0.1%	2mV RMS	±0.05%/°C	60	B	C6	
	Triple Output	2243	±15V 5V	±100mA 500mA	±0.02% ±0.02%	±0.03% ±0.05%	1mV RMS 1mV RMS	±0.02%/°C ±0.02%/°C	175 850	B	C8	
CHASSIS MOUNTED	5 V	2413	+5V DC	+1000mA	±0.5%	±0.15%	2mV RMS	0.02%/°C	1750	A	Z	★
	+15 Volts	2415	±15V DC	±200mA	±0.05%	±0.05%	1mV RMS	0.02%/°C	350	B	Z	★
		2419	±15V DC	±500mA	±0.05%	±0.05%	1mV RMS	0.02%/°C	1100	G	Z	★

Output Protection

Foldback Current Limit: Models 2203 through 2209 and 2215
Maximum Current Limit: All other 2200 Models, all 2400 Models
On-Off with Current Limit: Models 2218, 2223, 2419
Over-Voltage Crowbar: All 5V Models except 2206

Input-Output Isolation (typical all models): 700V DC or AC peak −700pF −50MΩ

Warm-Up Drift: 50mV typical one hour

Output Impedance: Typical at 10kHz, less than 0.2Ω

Output Voltage Set-Point Accuracy

±2% 2400 Series and 2217, 2243
±1% All other Models, Models 2203 and 2204 may be adjusted ±0.5V

These models recognized under the Component Program of Underwriters' Laboratories, Inc.

2300 SERIES DC to DC Converters

	Model	Output Voltage	Output Current	Input Voltage	Input Current No Load	Input Current Full Load	Regulation, Max. Line	Regulation, Max. Load	Temp. Coef. Max.	Noise Output Voltage Noise, Max.	Noise Reflected Input Ripple Current, Max.	Noise Common Mode Noise Current	Input/Output Isolation 500V	Limit Current mA (typ)	Case Size
PC BOARD MOUNTED	2301	±15V DC	±100mA	+5V DC	200mA	1000mA	±0.07%	±0.07%	±0.005%/°C	1mV RMS	35mA p-p	200µA p-p	10^9Ω/80pF	150	X
	2302	±15V DC	±150mA	+5V DC	200mA	1380mA	±0.07%	±0.07%	±0.005%/°C	1mV RMS	48mA p-p	200µA p-p	10^9Ω/80pF	225	X
	2331	±15V DC +5V DC	±165mA +750mA	+5V DC	500mA	3480mA	±0.1% ±1.0%	±0.1% ±1.0%	±0.015%/°C ±0.05%/°C	1mV RMS	122mA p-p	500µA p-p 700µA p-p	10^9Ω/150pF 10^9Ω/75pF	300 750	Y

Output Setpoint Accuracy: ±0.5% for (2301 and 2302), (2331 ± 15V ±1% Max. (Tracking), +5V ±4% Max.)

Output Protection: Current Limit @ 150% of Rated Load

Load Transient Recovery Time: 25µs

Derating: None Required

Shielding: All six sides

ENVIRONMENTAL REQUIREMENTS

TEMPERATURE RANGE:

Operating Range . . . − 25° to + 70 ° C.
Storage Range . . . . . − 40° to + 125°C.

POWER REQUIREMENTS:

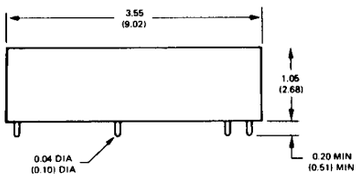
INPUT VOLTAGE RANGES VS. PERCENTAGE OF RATED OUTPUT LOAD:

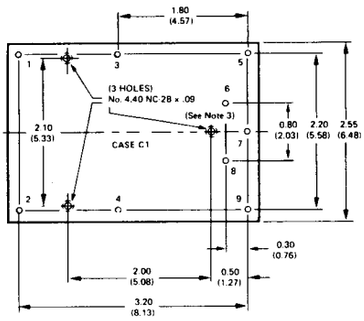
5 V DC Input Models

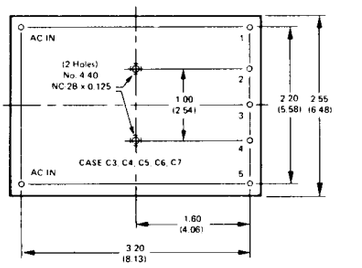
100% Load. . . . . 4.65 to 5.50 V DC
80% Load. . . . . 4.50 to 6.0 V DC
60% Load. . . . . 4.40 to 6.50 V DC

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C





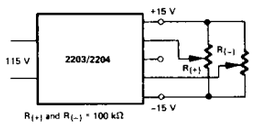


PIN DESIGNATIONS

CASE C1

PIN	2203 2204	2206
1	AC	AC
2	AC	AC
3	AC	AC
4	AC	AC
5	$-V_c$	N.C.
6	TRIM	NO PIN
7	COM	COM
8	TRIM	NO PIN
9	$+V_c$	$+V_c$

NOTES:
1. For 115V AC use, connect Pin 1 to Pin 3, and Pin 2 to Pin 4. Apply 115V AC to Pins 1 and 2.
2. For 230V AC use, connect Pin 2 to Pin 3. Apply 230V AC to Pins 1 and 4.
3. This mounting hole is not included in the 2206.



PIN DESIGNATIONS

CASE C3 THROUGH C7

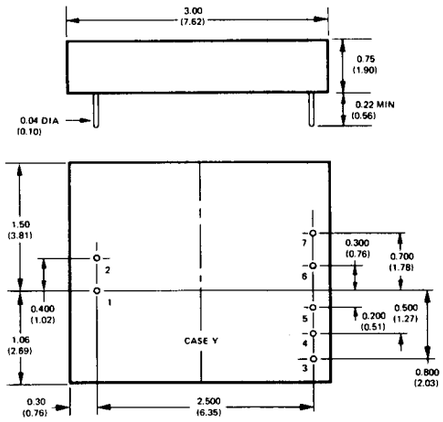
MODEL	1	2	3	4	5
2208 2209 2215 2217 2218	$-V_{cc}$ OUT	NO PIN	COM	NO PIN	$+V_{cc}$ OUT
2213 2223	NC	NO PIN	V_{cc} COM	NO PIN	5V +OUT
2243	$-V_{cc}$ OUT	5V -OUT	V_{cc} COM	5V +OUT	$+V_{cc}$ OUT

NOTE: 5V Output is isolated from ±15V Output

TRIMMING DIAGRAM

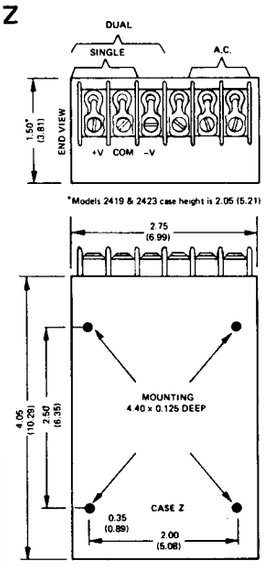
Models 2203 and 2204 have trim terminals which allow adjustment of the output voltage from ±14.5 to ±15.5 VDC. The trimming hookup is given in the illustration below.

Y

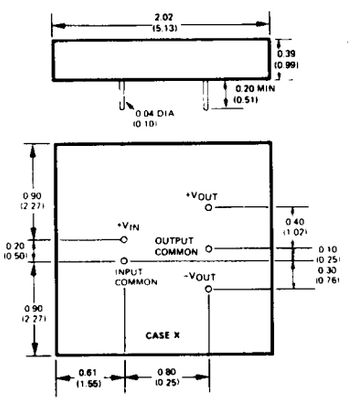


PIN	FUNCTION	4	± 15 V COMMON
1	5 V + INPUT	5	-15 V OUTPUT
2	5 V COMMON	6	5 V + OUTPUT
3	+15 V OUTPUT	7	5 V COMMON

Z



X

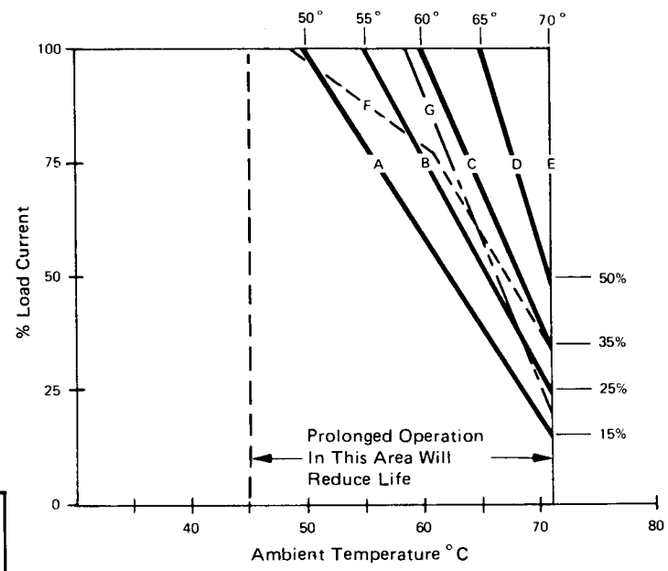


CASE SIZES:

C1 = 3.55 x. 2.5 x 1.05 (9.02 x 6.48 x 2.68)
C3 = 3.55 x 2.55 x 1.00 (9.02 x 6.48 x 2.54)
C4 = 3.55 x 2.55 x 0.88 (9.02 x 6.48 x 2.23)
C5 = 3.55 x 2.55 x 1.25 (9.02 x 6.48 x 3.17)
C6 = 3.55 x 2.55 x 2.00 (9.02 x 6.48 x 5.08)
C7 = 3.55 x 2.55 x 1.62 (9.02 x 6.48 x 4.11)
C8 = 3.55 x 2.55 x 1.88 (9.02 x 6.48 x 4.77)

X = 2 x 2 x 0.39 (5.13 x 5.13 x 0.99)
Y = 3 x 2.5 x 0.75 (7.62 x 6.50 x 1.90)
Z = 4.05 x 2.75 x 1.50 (10.29 x 6.99 x 3.81)

NOTES:
Recommended Sockets: Case C-6036, Case X-NSK20
All units are shown from VIEW TOWARD PINS.
Dimensions in parentheses are expressed in centimeters.



SERIES 2200 AND 2400 THERMAL DERATING CURVES

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