

## TECHNICAL SPECIFICATION

# **GPR250-12A**

Isolated AC-DC Rack-Mount Power Supply

Universal Input; Dual Outputs; 250W@12V/20.9A and 3.3V/2A



## OVERVIEW

The GPR250-12A is an isolated AC-DC converter for POE and Telecom applications. It is packaged in an industry standard mechanical configuration and delivers up to 12A of output current, or 250 Watts of output power with a full load efficiency of typically 94% at Vin of 230Vac. This unit can operate over a universal AC input range, even up to 300Vac, and provides a precisely regulated single output voltage at 12V.

The GPR250-12A features excellent electrical and thermal performance with creative circuit design, self-cooling internal fan, and optimized component placement. With two different LED status signals, I2C/PMbus™ control, and hot plug/parallel operation, the GPR250-12A offers flexibility for various POE and telecom applications. The unit's design integrates protection circuits such as UVP, OVP, OCP, OTP, SCP to assure users highly reliable rack performance. The module complies with UL/EN/IEC62368 safety and additional EN61000 EMC requirements.

## APPLICATIONS

- Telecom Equipment and POE Systems
- Industrial Automation
- Distributed Power Architectures
- Instruments and Test Equipment
- Amplifiers and Base Stations
- LAN/WAN Hardware Racks
- Enterprise Networking Racks



## FEATURES

- Wide input voltage range: Universal AC input up to 300Vac/45-55Hz without damage
- Tightly regulated output voltage
- Hot pluggable with forced current sharing
- Highly efficient from 50% to 100% load
- Delivers up to 11A<sub>dc</sub> current or 616W power with internal cooling fan
- Active PFC (typical:0.99@115Vin, 0.96@230Vin)
- Industry standard mechanical outline
  - 8.70”L x 1.99”W x 1.58”H
  - 221.0 × 50.5mm ×40.2mm
- I2C Communication (PMBus™ compliant)
- Full protection for Input UVP, Output OVP, OCP, SCP, OTP
- 3000Vac/1Min for Pri to Sec and 1500Vac/1Min for Pri to Earth isolation voltage, 500Vdc /1Min for Sec to Earth isolation voltage
- Wide operating temperature range (-10° -70°C). Powers up at -40°C
- ROHS Directive 2002/95/EC Compliant
- UL62368-1 international safety standard approved
- Meets EN61000-x international EMC standards



## SCOPE

This document describes the specifications of GPR250-12A isolated AC/DC power supply.

## ABSOLUTE MAXIMUM RATINGS

Stresses that exceed the specified ratings stated in this datasheet can cause permanent damage to the unit. The ratings are absolute stress ratings; functional operation of the unit is not implied at conditions in excess of those given in the data sheet. Exposure to all absolute maximum ratings simultaneously for extended periods could adversely affect the unit's long term reliability.





## ELECTRICAL SPECIFICATIONS @ 25°C

Parameter	Symbol	Min	Nominal	Max	Unit
<b>Operating Input Voltage</b>	$V_{IN}$	90	—	264	Vac
<b>Operation Transient</b>				300	
<b>Non-operating continuous</b>				315	
<b>Operating Frequency</b>		47	—	63	Hz
<b>Max Input Current</b> ( $V_{IN}=100V$ , $P_O=1110W$ )	$I_{IN,max}$			3.5	A
<b>Input No Load Power</b> ( $V_{IN}$ =Nominal Input, $I_o=0$ , Module enabled)		—	—	8	W
<b>Input Standby Power</b> ( $V_{IN}$ =Nominal Input, Module disabled)		—	4	5	W
<b>Inrush Current with Cold Start</b>	$230V_{IN}$	—	50	—	A
<b>Power Factor</b> (Nominal Input and Full Load)	$\lambda$	0.95	0.98	—	
<b>Leakage Current</b>				3.5	mA
<b>Input Protection</b>	Fuse in Line Input				

**NOTE:** Unless otherwise indicated, specifications apply to overall operating input voltages, resistive loads, and room temperature at 25°C.

## DC OUTPUT SPECIFICATIONS

(Spec is required at +25°C if not specified)

Parameters	Condition & Description	Min	Nominal	Max	Unit
<b>Output Voltage</b>	Half load condition No trim requirement	11.90	12.00	12.10	V
<b>Output Load</b>		0		20.9	A
<b>Load Regulation</b>	From Open to Full (Nominal Input)			$\pm 2\% V_{OUT}$	V
<b>Line Regulation</b>	All Range (50% load)			$\pm 1\% V_{OUT}$	V
<b>Thermal regulation</b>				$\pm 0.03\% V_{OUT}/^{\circ}C$	V
<b>Min Load</b>	No requirement				A
<b>Ripple and Noise</b>	115/230 in Full load (20k-20M bandwidth/10 $\mu$ f Tant-capacitor)			$\pm 1\% V_{OUT}$	V
Parameters	Condition & Description	Min	Nominal	Max	Unit





Parameters	Condition & Description	Min	Nominal	Max	Unit
<b>External Capacitive load</b>	Main Power, full load			4000	μF
<b>Dynamic 1 (1A/us)</b>	25% to 75% to 25% load			±4% V <sub>OUT</sub>	V
<b>Dynamic 2 (1A/S)</b>	5-50% and 50%-100% load			±5% V <sub>OUT</sub>	V
<b>Recovery Time</b>	Back to 1% V <sub>OUT</sub>			500	μS
<b>Turn On Overshoot</b>				3%	V
<b>Delay time</b>	Nominal Input to 90% output			3	s
<b>Rise time</b>	10% output to 90% output, Monotonic. No external capacitor		20	50	mS
<b>Output Indicator</b>	LED and signal Indicator & PMbus				
<b>Efficiency</b>	230V input/50% load (-56 V <sub>OUT</sub> )		92		%
<b>Current Sharing</b>	Forced current sharing@>50%load			5	%
<b>Holdup Time</b>	Nominal Input & Full Load & droop to 90% of output voltage		20		mS

## PROTECTION CIRCUITS

Parameters	Condition & Description	Min	Nominal	Max	Unit
<b>Input Under Voltage (UVP)</b>	Auto-Recovery			85	Vac
<b>Output Over Current (OCP)</b>	Auto-Recovery	120%		145%	A
<b>Output Over Voltage (OVP)</b>	Latch Mode		120%	130%	V
<b>Over Temperature (OTP)</b>	Auto-Recovery		75		°C ambient
<b>Short Circuit (SCP)</b>	All conditions		No damage/smoke/fire		





## ENVIRONMENTAL SPECIFICATIONS

Parameters	Condition & Description	Min	Nominal	Max	Unit
<b>Operating Ambient Temperature</b>		-10	+25	55	°C
<b>Storage Temperature</b>	Tstg	-55		105	°C
<b>Hot Spot Temperature</b>	See application note for hot spot location			115	°C
<b>Airflow</b>	Internal airflow direction from output to input				
<b>Altitude</b>				10000/3048	Ft/m
<b>Humidity</b>		+5%		95%	

## ISOLATION SPECIFICATIONS

Description	
<b>Isolation Voltage from Input to Output</b>	3000Vac@1Min
<b>Isolation Voltage from Input to Earth-Chassis</b>	1500Vac@1Min
<b>Isolation Voltage from Output to Earth</b>	500Vdc@1Min
<b>Isolation Voltage from Signal to Earth</b>	None





## EMC SPECIFICATIONS

EMC Item	Requirement	Criteria	Reference
<b>Conducted Emissions</b>	Class A + system box		EN55022 QP/AV Method
<b>Radiated Emissions</b>	Class A + system box		EN55022/FCC Controlled by system
<b>Conducted Immunity</b>	Level 2		EN55024,EN61000-4-3
<b>SURGE</b>	DM: $\pm 2$ KV CM: $\pm 4$ KV	B	EN61000-4-5, EN 55024 ETSI EN 300 386 V1.3.2
<b>EFT</b>	$\pm 2$ KV (Level 2)	B	EN61000-4-4, EN 55024 ETSI EN 300 386 V1.3.2
<b>ESD</b>	Touch: $\pm 6$ KV Air: $\pm 8$ KV	B	EN61000-4-2, EN 55024 ETSI EN 300 386 V1.3.2
	Touch: $\pm 8$ KV Air: $\pm 15$ KV for Case	R	EN61000-4-2, EN 55024 ETSI EN 300 386 V1.3.2
<b>Harmonic</b>	Class A	NC	EN 61000-3-2 ETSI EN 300 386 V1.3.2
<b>Flicker</b>		NC	EN 61000-3-3 ETSI EN 300 386 V1.3.2
<b>Radiated Susceptibility (RS)</b>	80M~2GHz 10V/m,80% AM (level 3)	A	EN 61000-4-3, EN 55024 ETSI EN 300 386 V1.3.2
<b>Conducted Susceptibility (CS)</b>	150KHz~80MHz 10V, 80% AM	A	EN 61000-4-6, EN 55024 ETSI EN 300 386 V1.3.2
<b>Lightning AC Power Fault</b>			GR-1089 Issue 4
<b>Voltage Dips &amp; Interruptions</b>	See table below		EN 61000-4-11, EN 55024 ETSI EN 300 386 V1.3.2

Voltage Drop	Duration Time	Criteria
0% Ut	20 ms	B
70% Ut	500 ms	C
40% Ut	200 ms	C
0% Ut	5000 ms	C





## LED INDICATORS

There are two LEDs located in the front panel to indicate input and PSU status. One is INPUT OK to indicate the input status, the other is DC OK to indicate PSU status.

Parameter	LED/Status	Min	Max	Unit
<b>Status Signal Pin</b>	ON/OFF	-0.3	30	Vdc
<b>DC OK</b>	Bi-color LED (Red & Green)	Standalone operation: No AC input: LED off N+1 parallel operation: No AC input: LED red blinking AC input: 1, Main output off, Standby output on: Led green blinking 2, Main output on, Standby output on: Led blue 3, Power fail (No main output, OCP/OTP/Fan fail/OVP)Led red 4, standby output short: LED off 5, Input UVP: Led red blinking		
<b>AC OK</b>	Single-color LED (Green)	<b>Green:</b> Input within defined range <b>Off:</b> Input over define range		

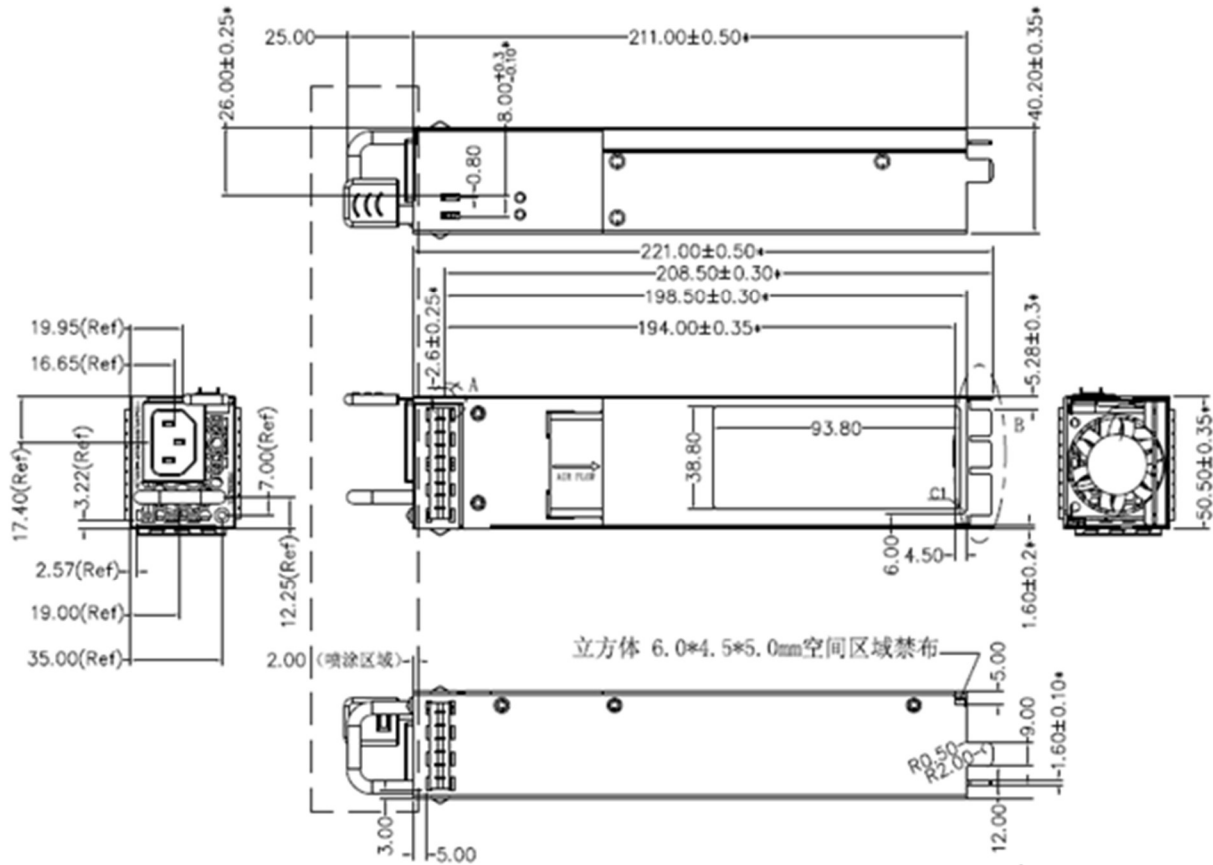
PSU Status	LED Indicator	
	OUT OK	IN OK
Different Cases		
Input normal/Output Normal	Green	Green
No input	Off	Off
No input but with external bias(Vsso)	Red	Off
Input out of range	1Sec red /green alternative	Red
Input UVP	Red	Red
Fault (output SCP/ocp/ovp/otp/fan failure or others)	Red	Green
Early warning for OCP or OTP	1Sec red /green alternative	Green
PS ON(High) or PS-KILL(High) or Off by software	1Sec Green/off alternative	Green





## MECHANICAL PACKAGE

Description	
<b>Dimensions</b> – L x W x H in/mm	8.7" x 1.99" x 1.58" / 221mm x 50.5mm x 40.2mm <b>Note:</b> Height measured from seating plane
<b>Weight</b> g / oz	30 / 1.06, typical
<b>Vibration</b>	0.75 mm, 10Hz-55Hz, 20 minutes



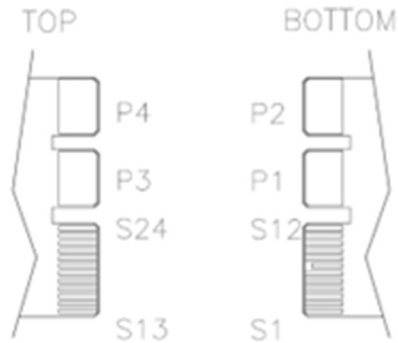
## INPUT/OUTPUT CONNECTOR AND PIN ASSIGNMENT

Inside of the Power supply, IEC320-C14 was used. Please use safety compliance input cable. The right cable thickness should be considered to match the rated input current

The power use Gold finder PCB output. The system output connector should be GPCETR44042400313HR from Amphenol or C21421-XXXXX-X from Alltop



## OUTPUT PIN ASSIGNMENTS



Power Pin		Signal Pin					
P1	GND	S1	+12VS	S9	PW OK	S17	NC
P2	+12V	S2	+12VRS	S10	A1	S18	EEPROM_WP
P3	GND	S3	+12VBUS	S11	+3.3VSB	S19	NC
P4	+12V	S4	NC	S12	+3.3VSB	S20	NC
		S5	SDA	S13	NC	S21	NC
		S6	SCL	S14	PRESENT	S22	NC
		S7	PS-KILL	S15	A0	S23	+3.3VSB
		S8	PS ON	S16	NC	S24	+3.3VSB

S7-PS\_KILL is short ping  
 NC is no connection





## PIN DESCRIPTIONS

Signal Definition	Logic High		Logic Low		Unit
	Low limit	Up limit	Low limit	Up limit	
SDA	3.0	3.4	0	0.8	V
SCL	3.0	3.4	0	0.8	V
PS-KILL	2.5	3.4	0	1.0	V
PS ON	2.5	3.4	0	1.0	V
PW OK	3.0	3.4	0	0.4	V
A1	2.5	3.4	0	0.8	V
A0	2.5	3.4	0	0.8	V
PRESENT	3.0	3.4	0	0.4	V

All signal pin is referred to power return (P1 and P3)

P2 and P4 (+12V) /P1 and P3 (+12V return)

P1, P2, P3, and P4 are for main outputs. P2 and P4 are for +12V output, P1 and P3 are for power ground (+12V return). All the signal pins should be based on power return (P1 and P3)

S1--- +12VS, S2---+12VRS

To offset the voltage drop due to high current output trace, S1--- +12VS and S2---+12VRS can be used to keep output voltage stable at the load side. S1--- +12VS is connected to P2/P4 for output compensation. S2--- +12VRS is connected to P1/P3 for return compensation. The max compensation voltage is 0.35V for one trace. One 0.47uF ceramic capacitor between S1 and P2/P4 and between S2 and P1/P3 can be used . If not used, the S1 should be connected to P2/P4 directly, S2 to P1/P3

S3---+12Vbus

This pin can be used for current sharing. When system need 1+1 or more parallel configuration, all S3 will be connected together.

S5--- SDA

I2C data wire by I2C standard

S6--- SCL

I2C clock wire by I2C standard. 100Khz Max

S7---PS-KILL (short pin)

When S7---PS-KILL is logic low (<1V), the main power can be on.

When S7---PS-KILL is logic high (>2.5V), the main power can be off

S8---PS-ON

When PS-ON is logic low (<1V), the main power can be on.

When PS-ON is logic high (>2.5V), the main power can be off.

S9---PW OK

When PSU is on at normal operation, S9---PW OK is logic high (>3V),

When PSU shut down due to some reason, S9---PW OK is logic low (<0.4V),

S10---A1 and S15---A0

I2C address

When S10-A1 is <1V, it is logic "low", When S10-A1 is >3V, it is logic "high",





When S15-A0 is <1V, it is logic "low", When S15-A0 is >3V, it is logic "high",

**S14-PRESENT**

When the power was inserted into system with good connection, the S14-PRESENT will send one signal to system.  
Logic low is good connection, Logic high is not good connection  
Inside of PSU, it has 100ohm pull down resistor, suggest 5K pull up resistor in the system side.

**S18--EEPROM\_WP**

When S18--EEPROM\_WP is logic high, EEPROM cannot be written (protection mode)  
When S18--EEPROM\_WP is logic low, EEPROM can be written and read.

**S11/S12/S23/S24--+3.3V standby power**

It is 3.3V standby output





## PMBus™ AND EEPROM

The PSU has 8Kbytes of EEPROM and can communicate with a Host system controller via I2C using the PMBus1.2 standard.

The addresses for the internal MCU and EEPROM are:

Device	Address	Address Allocation (From high bit to low bit)							
<b>MCU</b>	0xBx	1	0	1	1	A2	A1	A0	R/W
<b>EEPROM</b>	0xAx	1	0	1	0	A2	A1	A0	R/W

A0 is the D3 of output connector, which can connect to logic high or low by system application  
 A1 is logic high, connect to 3.3V in PSU. Option for low by connecting resistor to signal grounding.  
 A2 is logic low, connect to signal grounding. Option for high by connecting resistor to 3.3V.

## DEFINITION FOR EEPROM

Byte address (decimal)	Byte address (hex)	Item	Format	Value
<b>00-01</b>	00-01	Block signal	uint16	0XABAB
<b>02</b>	02	Block version	uint8	1
<b>03</b>	03	Block length	uint8	114
<b>04-05</b>	04-05	Block checksum	uint16	Checksum of block contents, excluding checksum word
<b>06-07</b>	06-07	Eeprom_size	uint16	40h (16Kbit)
<b>08-09</b>	08-09	Block_count	uint16	2
<b>10-29</b>	0A-1D	OEM_string	Char*20	GIP
<b>30-49</b>	1E-31	Product_number	Char*20	PSR360-56A
<b>50-79</b>	32-4F	Serial_number	Char*30	Manufacture Series Number
<b>80-95</b>	50-5F	Part_number	Char*16	0213XX
<b>96-99</b>	60-63	Part_version	Char*4	PSU version
<b>100-119</b>	64-77	Mfg_deviation	Char*20	Manufacture
<b>120-121</b>	78-79	Power_consumption	Int16	168h
<b>122-125</b>	7A-7D	Power_Type	Char*4	AC00
<b>126-133</b>	7E-85	Air_flow_direction	Char*8	OUT00000





## COMMANDS FOR GPR250-12A UNIT

Data in linear format:  $x = y * 2^n$

(For reference only)

\*\*\* The PMBus address is 0xB4 for power supply-1 and address 0xB6 for power supply-2.

\*\*\* All data is transmitted and received least significant byte (LSB) first.

CODE	COMMAND	R/W	TYPE	UNITS	SCALING	EXAMPLE	COMMENTS
3B	FAN_COMMAND_1	R/W	WORD	Percent	N=0	(100 = 100%)	data commanded in duty cycle (%)
46	IOUT_OC_FAULT_LIMIT	R	WORD	Amps	N=-4	(416 = 26.00A)	
4A	IOUT_OC_WARN_LIMIT	R	WORD	Amps	N=-4	(288 = 18.00A)	
4F	OT_FAULT_LIMIT	R	WORD	°C	N=0	(105 = 90 °C)	
51	OT_WARN_LIMIT	R	WORD	°C	N=0	( 95 = 80 °C)	
58	VIN_UV_WARN_LIMIT	R	WORD	Volts	N=-1	(160 = 80V)	
59	VIN_UV_FALT_LIMIT	R	WORD	Volts	N=-1	(140 = 70V)	
5D	IIN_OC_WARN_LIMIT	R	WORD	Amps	N=-4	(160 = 5.00A)	
5E	POWER_GOOD_ON	R	WORD	Volts	N=-5	(768 = 24.00V)	
5F	POWER_GOOD_OFF	R	WORD	Volts	N=-5	(692 = 21.63V)	
68	POUT_OP_FAULT_LIMIT	R	WORD	Watts	N=0	(624 = 624W)	
6A	POUT_OP_WARN_LIMIT	R	WORD	Watts	N=1	(864 = 432W)	
6B	PIN_OP_WARN_LIMIT	R	WORD	Watts	N=1	(940 = 470W)	
79	STATUS_WORD	R	WORD				
7A	STATUS_VOUT	R	BYTE				
7B	STATUS_IOUT	R	BYTE				
7C	STATUS_INPUT	R	BYTE				
7D	STATUS_TEMPERATURE	R	BYTE				
7E	STATUS_CML	R	BYTE				
7F	STATUS_OTHER	R	BYTE				
80	STATUS_MFG_SPECIFIC	R	BYTE				
81	STATUS_FAN_1_2	R	BYTE				
88	READ_VIN	R	WORD	Volts	N=-1	(481 = 240.5V)	
89	READ_IIN	R	WORD	Amps	N=-4	(180 = 11.25A)	
8B	READ_VOUT	R	WORD	Volts	N=-4	(384 = 24.00V)	
8C	READ_IOUT	R	WORD	Amps	N=-4	(316 = 19.75A)	
8D	READ_TEMPERATURE1	R	WORD	°C	N=0	(105 = 105 °C)	inlet temperature
8F	READ_TEMPERATURE3	R	WORD	°C	N=0	( 85 = 85 °C)	hot spot temperature
90	READ_FAN_SPEED_1	R	WORD	RPM	N=5	(225 = 7200 RPM)	
96	READ_POUT	R	WORD	Watts	N=1	(100 = 200W)	
97	READ_PIN	R	WORD	Watts	N=1	(200 = 400W)	
98	PMBUS_REVISION	R	BYTE				
EA	WRITE_PROTECT (EEPROM)	R/W	BYTE				
							56h=Write Disabled, 9Ah=Write Enabled
EB	FIRMWARE REVISION	R	WORD				010Ch = Revision 1.12
EC	SCRATCHPAD	R/W	WORD				

--- [NOTES] ---

SCALING N=-4:  $2^{-4} = 1/16$  unit resolution  
 SCALING N=-1:  $2^{-1} = 1/2$  unit resolution  
 SCALING N=0 :  $2^0 = 1$  unit resolution  
 SCALING N=1 :  $2^1 = 2$  unit resolution  
 SCALING N=5 :  $2^5 = 32$  unit resolution





## ORDERING INFORMATION

Input Voltage	Output Voltage	Output Current	Aux Power Voltage	Aux Power Current	Model Number	Note
100VAC-240VAC	12V	20.9A	3.3V	2A	GPR250-12A	Base Model

**All specifications are typical at nominal input, full load, at 25°C ambient unless otherwise noted. Specifications are subject to change without notice. Please consult our Applications Engineering office at 858-275-6423 for additional technical data and support or email us at [info@brightworks-usa.com](mailto:info@brightworks-usa.com).**

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