Advance Datasheet August, 2006

Applications

File servers Routers/switches

Mass storage

Distributed Power

Indoor / Outdoor Wireless

Advanced workstations

Note: Approvals are pending

LAN/WAN/MAN applications

Telecommunications Access equipment



EP0600 Front-End Power Supply

90Vac to 264 Vac Input; 42Vdc to 57Vdc Output; 600W



- Universal AC Input
- Power Factor Correction (meets EN61000)
- Output Power up to 600W
- . Compact Size: 41.2 x 84.6 x 279.4mm (1Ux2U)
- High Efficiency: 90%
- Wide Temperature Range: -33°C to +70°C
- **Redundant Parallel Operation**
- . Hot insertion/removal (hot swap) - Fault Tolerant
- Sophisticated control & communication (RS485)
- Battery float charging (via external control)
- Over voltage and over current protection
- Over temperature protection
- Power fail warning
- Fault alarm
- Over temperature warning
- Front panel LED indicators
- Compliant to RoHS EU Directive 2002/95/EC
- CE mark meeting 73/23/EEC and 93/68/EEC directives
- UL* 60950-1Recognized, CSA[†] C22.2 No. 60950-1-03 Certified, and VDE[‡] 0805:2001-12 (EN60950-1) Licensed

Power Systems

ISO** 9001 and ISO 14001 certified manufacturing facilities

The EP0600 Front-End Power Supplies provide up to 600W of highly reliable DC power packaged in a high power density, 1U x 2U compact format to allow flexible system configurations. Up to 5 modules can be configured in a 1U 19" rack or up to 8 modules in a 2U system.

The EP0600 front-end power supplies can be operated either with a system controller, as an integral part of a complete distributed power system including charging of sealed lead-acid, valve regulated battery strings, or as stand-alone modules.

These modules support parallel, redundant and hot swap installations and feature extensive monitoring and alarm facilities. The flexible and sophisticated feature set makes this front-end power supply an excellent choice for applications requiring modular ac-to-dc bulk intermediate voltages, such as distributed power architectures in demanding telecommunication applications.

UL is a registered trademark of Underwriters Laboratories, Inc.

- CSA is a registered trademark of Canadian Standards Association.
- VDE is a trademark of Verband Deutscher Elektrotechniker e.V.

[§] This product is intended for integration into end-user equipment. All the required procedures for CE marking of end-user equipment should be followed. (The CE mark is placed on selected products.)

** ISO is a registered trademark of the International Organization of Standards.

- Active Load Current Sharing



Electrical Specifications

Input						
Parameter		Min	Тур	Max	Unit	Notes
Normal Oper Range	ating Voltage	90	_	264	Vac	*Unit will operate normally from 150 to 180VAC (Maximum Po = 500W)
	High Line	180*	230	264	Vac	Max P _o rating = 600W
	Low Line	90	115	150*	Vac	Max P_0 rating reduced to 500W
	Excursion	264		290	Vac	Output requirements shall be met but PFC and EMC requirements may be compromised
	No damage	0	—	300	Vac	Shutdown permitted
Input Freque	ncy	47		63	Hz	
				6.5	А	At 90Vac, P _O = 500W
		_	—	3.0	А	At 230Vac, P _o = 600W
Inrush Transi	ent			40	Apk	Measured at 25°C, for all line conditions; does not include X-Capacitors charging
Input Leakag	e Current		1.6	2.5	mA _{rms}	Measured at 250Vac, 60Hz
Power Factor	r	0.93				From 50% to 100% full load @ 230Vac.
Efficiency			88		%	At 115Vac V _{OUT} ≥ 52V, P _{O rated}
Enciency		_	90		%	At 230Vac V _{OUT} ≥ 52V, P _{O rated}
Quiescent Power	O/P OFF		—	30	W	At 230Vac, P _o = n/a
rowei	O/P ON — 50 W		At 230Vac, P ₀ = 0			
Hold Up Time	e	10	_		ms	At 230Vac, P_0 =500W, V_{OUT} = 52V, $T_A \ge -10^{\circ}C$. V_{OUT} may droop from 52V to 45V.

Main Output					
Parameter	Min	Тур	Max	Unit	Notes
Maximum Output Bowar	500			W	At V_{AC} from 90 - 150Vac, $T_A \le 70^{\circ}C$
	600			W	At V_{AC} from 180 - 264Vac, $T_A \le 50^{\circ}C$
Voltage Set-Point		52		Vdc	Output floats with respect to Frame GND
Set-Point Accuracy	-1		+1	%	
Overall Regulation	-2		+2	%	All conditions (temp, drift, load, line, life), no thermal probe or battery management control
Output Voltage Range	42		57	Vdc	Set by RS485 or Analogue Margining
Dated Output Current	0	_	12.5	Adc	At 48V DC (T _A ≤ 50°C, V _{AC} ≥ 180V)
Raled Oulput Current	0		10.5	Adc	At 57V DC (T _A ≤ 50°C, V _{AC} ≥ 180V)

Main Output (continue	d)					
Parameter	Min	Тур	Max	Unit	Notes	
Ripple and Noise					$V_{\text{IN}}{=}V_{\text{IN},\text{ nom}}$ and $I_O{=}I_O,_{\text{min}}$ to $I_O,_{FL}$, C_{out} = $33\mu F$ electrolytic and 1.0 μF ceramic	
Peak-to-Peak	—	—	200	mV_{pk-pk}	5Hz to 20MHz bandwidth	
RMS	_		50	mV _{rms}	5Hz to 20MHz bandwidth	
Psophometric Noise			2.0	mV _{rms}	ITU-T O.41, psophometric and C-message weighted	
Permitted External Capacitance	0		10,000	μF		
Turn-ON					Monotonic Turn-ON after detection of valid ac	
Delay		_	3	s	90% of V_0 =42V. Walk-In defined as rise time	
Rise Time	_		200	ms	to output set-point, but not necessarily to the regulated voltage in applications where	
Walk-In	8	—		s	batteries are connected to the bus (since	
Overshoot		_	1	V	batteries may require extended recharging.	
Load Step Response					$\Delta Io/\Delta t = 1A/\mu s$, $I_O \ge 1.5A$ to $I_{O, FL}$,	
(Voltage Mode) ΔI			25	%FL	Cout = 35µF electrolytic and 1.0µF ceramic	
ΔV			2.5	Vdc		
Response Time			5	ms	Settling time to within 10% peak deviation	
Overload						
Power Limit	100		—	%FL	Of maximum output power from 48 to 57Vdc	
Current Limit	100		130	%FL	Between 37Vdc and 48Vdc	
Short Circuit	_	10		%FL	Average current, I _{AVG} ≤ I _{O, FL} (Hiccup)	
Under Voltage Shutdown	24	25	26	V	Indefinite auto-restart (Hiccup)	
Current Monitor		0.1		mA/A	Current Source mA/A of load current (I ₀)	
Current Monitor Accuracy	-5		+5	%	Of full load scale	
Current Share Accuracy	-5		+5	%	Single wire, up to 8 rectifiers. $I_{O} \ge 50\% I_{O, FL}$	
Over-voltage Protection	57	_	60		Short duration transient to 65V is permitted. 3 restarts will be attempted; After 3 rd attempt, unit will latch off.	

Main Output (continue	ed)				
Parameter	Min	Typ Max Unit		Unit	Notes
Over Temperature					Rectifier will issue an OTW alarm when internal temperature threshold reached. It will then wait minimum initial delay before continuing. If OT condition still present rectifier will set Fault Alarm warning minimum time prior to hardware shutdown. Rectifier
Initial Detect	10	—	—	s	will automatically restart when device
Warning	15		_	ms	acceptable levels.
Reverse Current OR'ing device			5	mA	When reverse biased by up to 60V

Rectifier Bias Output						
Parameter	Min	Тур	Max	Unit	Notes	
Power	1	_	—	W	I_0 = 1mA minimum load during Set-point and	
Set Point	_	11.7		V	Not isolated from Main 52V output.	
Overall Regulation	-10	—	+10	%	Diode OR'ed for redundancy. Sufficient power to power one other rectifier in a shelf.	
Over Voltage protection	Voltage protection —		14.5	V	Overload of the rectifier bias voltage shall not	
Over Current shutdown	110			%FL	operating stand-alone).	

Physical	
Length (in./mm)	10.99 / 279.1
Width (in./mm)	3.31 / 84.0
Height (in./mm)	1.62 / 41.2
Weight (lb / kg)	2.97 / 1.35

Environmental							
Parameter	Min Typ Max Unit Notes						
Operating Temperature	-33	_	50	°C	The rectifier will start-up in the range -33°C to -40°C and be operational.		
Extended Operating Temperature	50	_	70	°C	Derate linearly from 60 $V_0 = 57V$ to approx 48 $V_0 \le 48V$ derate lo line	00W to 500W V, Constant Power. For early from 12.5A to 11A	
Storage Temperature	-40	—	85	°C			
Humidity Operating		—	95	%	Non-condensing		
Storage	5		95	%	Non-condensing		
	-60	—	4000	m	For operation above 2	500m (8200ft),	
Annuae	-200		13000	ft	by 3°C per 305m (100	oft)	
Shock and Vibration Operational test	IEC 6006	IEC 60068-2			Vibration levels:		
	IEC 6072	21-3-2/ETS	S 300 019	-2-3	Amp/Disp	Freq	
l est Levels	Sweep 2	Hz to 500	Hz and do	own to	0.3mm	2 – 9 Hz	
	IEC 6006	38-2-31			- 2g	9 – 200 Hz	
Drop and Tip Over	Drop test	t to be per	formed at	а	4g	200 – 500 Hz	
Earthquake rating	diotarioe	Zone 4			When appropriately in	stalled	
Acoustic Noise	_	_	50	dBA	Fully-populated shelf of 5 rectifiers in an N+1 redundant configuration, $T_A = 25^{\circ}C$, Vac = 230V, V _O = 52V, P _O = 2400W		
Harmonic Emissions	Compliar	nt with EN	/IEC6100	0-3-2, Cla	ss A		
Radiated Emissions	FCC and	I CISPR22	2 (EN5502	2) – Class	s B		
Conducted Emissions ac	FCC and	I CISPR22	2 (EN5502	2) – Class	s B		
Conducted Emissions dc	CISPR22	2 (EN5502	2) Class	٩			
ESD	Error free	e per EN/I	EC 61000	-4-2 Leve	I 3 (6kV Contact, 8kV a	ir discharge)	
Radiated Immunity	Error free	e per EN/I	EC 61000	-4-3 Leve	l 3 (10 V/m)		
Electrical Fast Transient Burst	Error free	e per EN/I	EC 61000	-4-4 Leve	l 4 (±4kV)		
Lightening Surge							
Error Free	EN/IEC 6	31000-4-5	Level 4 (4	4kV comm	on mode, 2kV different	ial mode)	
Damage Free	IEEE C62.41 Level A3 (6kV common) wave 30Ω			common r	mode, 6kV differential m	10de – Sinus Ring	
Conducted Immunity	Error free	Error free per EN/IEC 61000-4-6 Leve			l 3 (10Vrms, 140dB(µV)))	
Reliability Calculated, P_0 =500W, T _A =25°C		TE	3D		In accordance with Te Method 1	Icordia SR332,	
Service Life	-	10		Years	Full Load @ 25°C Ambient, excluding fans		

Isolation					
Parameter	Min	Тур	Max	Unit	Notes
Input to all Outputs	_	_	3000	Vac	
Input to Chassis		_	1500	Vac	
DC Outputs to Frame – includes all DC output side control signals	_		100	Vdc	

Alarm Signals and Standby Input										
Parameter	Min	Тур	Max	Unit	Notes					
Sink current capability	1.0	_		mA	V _{CE} ≤ 0.8V					
Output LO voltage			0.8	Vdc	When sinking 1mA external load current					
Leakage current			10	μA	V _{CE} ≤ 10V					
Standby Input			1.0	mA	Current source feeding opto isolator diode and 511R series resistor					

Feature Descriptions

Power Factor Correction

All EPS-Series power supplies comply with the specifications set forth in IEC61000-3-2

Cooling

Integral fan cooled, with variable speed, airflow is from front to back

Input Over Current Protection

Internal fuses provide input protection, for single phase or bi-phase operation, in compliance with regulatory safety agency requirements.

Over Current Protection

In the event of an output overload, the power supply limits the output current.

OR-ing Function

A power FET, configured as a diode, at the output of the power unit protects the DC bus in the event of an internal power failure or hot plugging of the power unit.

Over Voltage Protection

The power unit turns itself off after the output voltage reaches the specified threshold.

Over Temperature Protection

In the event of an over temperature condition, the power unit protects itself by shutting off. The power unit will then attempt a restart. If the fault persists, this cycle will be repeated.

Analogue / RS485 (A/RS485)

This pin allows the rectifier to be commanded to Analogue mode rather than RS485. To command the rectifier into analogue mode this pin must be connected to SGND.

Voltage Margining / Programming (MARGIN)

Set-point of the rectifier can be altered via the Margin pin when the rectifier is commanded in Analogue Mode. Programming can be either a voltage source or a resistor divider. The Margin pin is connected to an internal 5V reference via $28.7 k\Omega$ and down to SGND by $47.5 k\Omega$.

0V on the Margin pins sets the rectifier output to 42Vdc. 5V sets the rectifier output to 58Vdc. Note that the output will be limited via software to the maximum 57V set-point.



Current Share (I_SHARE)

A single wire interface between each of the power units is used to force them to share load current. Referenced to SGND.

Address Lines (A0, A1, A2)

Three unit address lines are provided to allow for up to 8 rectifiers to be uniquely identified. All lines are reference to SGND.

RS485 Communication Lines (RS485_A, _B)

Two serial pins RS485_A and RS485_B provide connection to the RS485 serial communications interface. Both lines are referenced to SGND.

Programming (VPP)

A programming pin is provided for the secondary side main processor IC. In normal operation this pin should not need to be accessed and must be left unconnected.

Output Current Monitor (IMON)

The current monitor function is a current source that provides 0.1mA/1A of load current. If this current is fed into a resistor referenced to SGND then a voltage proportional to the load current is produced. This voltage must be limited to 5Vdc.

Rectifier Bias Voltage (RECT_BIAS)

An auxiliary supply Rect_Bias is provided by each rectifier. This is a diode OR'ed redundant, fault tolerant supply that can source at least 1W of output power. Rect_Bias is referenced to SGND.

Reset

Toggle the Standby pin to accomplish reset.

Signal Ground (SGND)

Signal Ground pin is the common return pin for most of the DC output control signals. It provides a quiet return connection for these signals.

Status and Control Signals

Power Fail Warning (PFW)

This communicates imminent loss of output power. In normal operation a logic HI on the PFW pin indicates that output power is present. In the event of a power fail the PFW shall transition LO and remain LO for at least 5msec before the DC output voltage falls below 45.0Vdc.

If the power fail continues and the DC output voltage falls further it will eventually switch off under its own control. At this point the PFW signal may return HI.

This warning is opto-isolated and pulled to Logic GND when active. Sink current capability is 1mA.

Standby

The rectifier can be commanded on and off using this pin. In either Analogue or RS485 Mode a default logic level LO on this pin turns the unit on. Applying a current source of \ge 1mA inhibits the DC output. Standby pin function is referenced to Logic GND.

Fault

This warning alarm indicates that an internal fault exists in the rectifier. It is opto-isolated and pulled to Logic GND when active. Sink current capability is 1mA.

Logic GND

This is the common return path for all the Optoisolated control signals including Power Fail Warning, Fault and Standby.

Front Panel LEDs

Based on Telcordia guidelines, the alarms and indicators are separated into the following categories:

- major alarms with accompanying red indicators,
- normal green indicators depicting normal equipment or system operation.

AC OK (green): The unit has input ac in the correct range

DC OK (green): The unit is powered up and the output is in regulation

Fault (red): The unit has detected an internal fault.

LED Truth Table

Condition	AC OK (Green)	DC OK (Green)	Alarm (Red)
Normal	1	1	0
HVSD	1	0	1
Thermal Alarm	1	0	1
AC Low/PFC Fail	0	0	0
Hiccup	1	0	1
Over current	1	blinks	0
Remote Standby	1	0	0
Communications Fault (RS485 mode)	1	1	blinks

Status Signals

The following are the optically isolated open collector signals (minimum 1mA sink capability)

Fault: The unit has detected an internal fault

Power Fail warning: Warning that the output of the power unit will fail in >5 ms.

Rectifier Connectors

AC Input, DC Output and Signals Connector

A single connector carries input and output power and all interface signals. The connector type is AMP Multibeam XL1450130-2.

		INPUT A	C POWER				SIGNAL				DC OUTPU	JT POWER
ROWS	P1	P2	P3	P4	1	2	3	4	5	6	P5	P6
D	AC LINE 1	AC EARTH	AC LINE 2	NO CONTACT	NC	NC		I_SHARE	RS485_B	VPP	VOUT-	VOUT+
С	AC LINE 1	AC EARTH	AC LINE 2	NO CONTACT	PFW	NC		A0/PGM	RS485_A	SGND	VOUT-	VOUT+
В	AC LINE 1	AC EARTH	AC LINE 2	NO CONTACT	FAULT	NC		A1/PGC	MARGIN	IMON	VOUT-	VOUT+
Α	AC LINE 1	AC EARTH	AC LINE 2	NO CONTACT	STANDBY	LOGIC_GND		A2/PGD	A/RS485	RECT_BIAS	VOUT-	VOUT+
CODE	AC (hot)	SAFETY FARTH	AC (neutral)		SYSTEM SIG	CONTROL NALS	100V	DC OUTPU DC TO FRAME	T SIGNALS	GNALS	DC PO 100VDC T	OWER O FRAME

Grounding

The Frame ground can be connected such that the output may have either a positive or negative ground, that is the rectifier can be configured to be -48V or +48V power source.

Physical Specification for EP0600 Rectifier

Dimensions are in millimetres.

Tolerances: x.x mm \pm 0.5 mm [unless otherwise indicated]





Physical Specification for EPS 1U CDM (Control & Distribution) Shelf



The **EPS 1U CDM Shelf** includes System Controller, LCD Display, Keypad, one LVBD contactor, 6 DC circuit breakers, 2 configurable as battery breakers (50A each) and 4 configured for DC loads (30A each), and slots for up to 3 EP0600 rectifiers



Physical Specification for EPS 1U PO (Power Only) Shelf



The EPS 1U PO Shelf has slots for up to 5 EP0600 rectifiers

Ordering Information

The EP0600 Front-End Power Supply is intended for use with the EPS3000 system shelves but can be ordered individually. Please note that EPS 1U CDM and PO shelf order codes below do not include any EP0600 power supplies.

Table 1. Product Codes

Product	Description	Comcode
EP0600	Front-End Power Supply	108993382
EPS 1U CDM	Shelf, Controller & Distribution	108995420
EPS 1U PO	Shelf, for up to 5 EP0600	108995924

Please contact your Tyco Electronics' Sales Representative for pricing, availability and optional features.



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