



RT11-110V/24V/1.2kW-DCDC Converter

The RT11-110VDC/24VDC/1.2kW Converter module takes 110VDC input and delivers 24VDC output at up to 1.2kW. It suits DC input voltages between 90V and 125V.

The RT11-DCDC may be safely hot-plugged into a live system for convenient system expansion or module replacement.

A number of modules (N) are commonly used in parallel to deliver the required power, with one or more additional modules (N+1) providing redundancy.

The small dimensions of the RT11-DCDC allow high power density in 300, 400, or 600mm deep 19-inch or 23-inch racks.

The addition of a MCSU-4 controller and Powershell magazine allows a sophisticated power system to be built with network connectivity and remote asset management features.



Operating characteristics of the RT11-110VDC/24VDC/1.2kW Converter at 25°C, 110VDC input unless otherwise stated:

Input DC

Voltage:

Rated voltage 110VDC;
Rated voltage tolerance: 85 – 125VDC;
Full output power available above 100VDC;
Reduced output power from 85 – 100VDC
(Available power varies from 1000W – 1200W);

Current:

16A maximum;

Inrush Current:

< 5A;

Soft Start:

Output current ramp-up time ~9 seconds to 50A;

Protection:

Fully protected up to 400VDC;

Varistors provide surge protection;
Two internal fuses provided, 125VDC rated;

SMR is turned off if the input voltage exceeds ~275VDC or falls to less than ~63VDC; SMR re-activates when input voltage is within approximately 75 – 256VDC;

Input inrush limiting circuit prevents high surge currents during a hot-plug installation;

Voltage Withstand Test:

1500VAC input to chassis for 1 minute;
(2200VDC 100% testing on production units for 2 seconds);

Efficiency:

> 87% from 50 - 100% output power;





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Output DC

Voltage:

Float: 21.0 – 29.0V
 Equalise: 21.0 – 29.9V

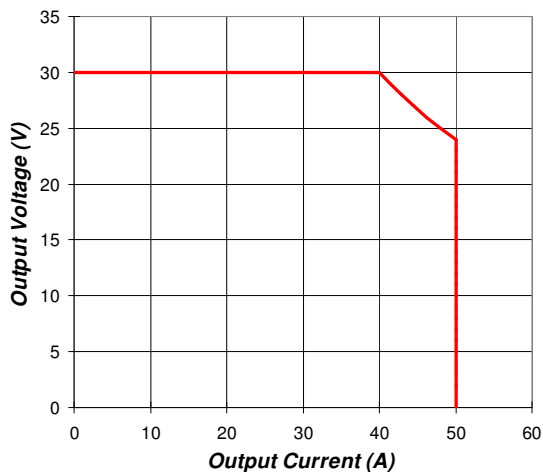
Current Limit:

Range 5 - 50A

Power Limit:

Current limit is automatically reduced in inverse proportion to output voltage above 24VDC to limit output power to 1200W (minimum);

Available current: 50A at 24.0V
 40A at 30.0V



Voltage Withstand Test:

1000VAC output to chassis for 1 minute;
 (1500VDC 100% testing on production units for 2 seconds);

Conversion Frequency:

>110kHz;

Static Regulation:

Line: better than $\pm 0.05\%$;

Load: terminal voltage drops by $0.5V \pm 0.03V$ from zero to 50A load (for passive current sharing) for stand-alone units, or regulates to better than $\pm 0.05\%$ for MCSU-4 controlled units;

Dynamic Regulation:

$\pm 2\%$ for 4A to 40A to 4A step load change;
 $\pm 1\%$ of final value within 1ms of step change;
 $\pm 0.2\%$ for a 25% step change in input voltage;

Noise:

< 0.96mV RMS Psophometrically weighted;
 < 32dBnC
 < 10mV RMS (10kHz - 100MHz);
 < 100mV peak to peak (10kHz - 100MHz);

Load Sharing:

Better than $\pm 5\%$ of full scale with active current sharing from MCSU;

Protection:

Internal fuse at output of RT11;

Overvoltage - only faulty unit shuts down;

Overcurrent - can sustain short circuit at output terminals indefinitely.

Over-temperature - gradual reduction of power limit if heatsink temperature exceeds pre-set limit. Supplementary thermal overload protection is provided.

Reverse battery – internal fuse opens.

Remote Controls

Equalise Mode:

Equalise mode is initiated by a signal from the MCSU-4;

RT11-DCDC converter Inhibit:

RT11s can be inhibited by a signal from a remote WinCSU-2 terminal, transmitted via the MCSU-4;

External Digital Voltage Control (EDVC):

The MCSU-4 uses the optically coupled communications lines to digitally control RT11 Float and Equalise voltages over a limited voltage range in order to adjust battery voltage for temperature and voltage drop in DC bus, limit the maximum battery recharging current and to achieve active current sharing;





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RT11 parameters programmed by MCSU-4

In the SMR menu on the MCSU-4:

- Current Limit
- High Voltage Shut-Down (HVSD)
- High Voltage Alarm
- Low Voltage Alarm
- HVSD Reset

In the Battery menu on MCSU-4:

- Float Voltage
- Equalise Voltage

Test Function: (when activated on MCSU-4)

Test function causes all rectifier LEDs to flash.

Alarms and monitoring

Front Panel LED Condition Table:

Green	Yellow	Red	Condition
0	0	0	No input power
F*	0	0	Primary power bad
1	0	0	Normal
1	F*	0	Alarm
1	1	0	Equalise
0	F*	1	Shutdown
F*	F*	F*	Test (MCSU-4 activated)

Note: F* indicates flashing LED.

Primary power bad: Indicates the input is too low or too high, or the primary circuit is faulty;

Alarm: See Alarm table;

Shutdown: RT11 is shut down by remote control, or not fully plugged in, or there is an internal control circuit fault;

Converter Status Monitoring:

MCSU-4 and WinCSU-2 monitor status of the RT11-DCDC converter:

- Output current of RT11;
- Temperature of heatsink of RT11;
- Software version of RT11;

Current:

Monitored on MCSU-4 and WinCSU-2 with 1A resolution; Analog measurement accuracy $\pm 1\%$ at full load;

Voltage:

System voltage normally displayed on MCSU-4 alphanumeric LCD display. Accuracy $\pm 0.5\%$

SMR Address:

DIP switches in the magazine set the RT11 address.

RT11 Alarm Monitoring:

The table shows alarm conditions that are monitored by the RT11 and are displayed on both MCSU-4 and WinCSU-2. The mnemonics listed here appear on WinCSU-2, but full alarm description appears on MCSU-4;

Vh *	Output voltage too high
VI *	Output voltage too low
Il *	Unit is in current limit
Po *	Unit is in power limit
Th *	Heatsink temperature high and thermal limit is active
Nd *	No demand
Lo *	Low output current, less than 1A
Ma *	Operating parameters out of range or internal memory fault
Sd	Unit is shut down by remote command - user shutdown
Mr	Internal voltage reference faulty
No Response	RT11 communication fault. Generated within MiniCSU-3
Vs	High voltage shut down (output), latched alarm. User setting or fault
Off	Unit is shut down due to input out of range or primary circuit fault. (normal operation or fault)
Ts	Temperature sensor fault
Dc	Converter feedback fault, latched alarm
Ff	Fan failure

Note: * indicates flashing of LED on RT11.





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Compliances

Safety: Designed to IEC60950-1:2001; AS/NZS 60950.1:2003; UL60950-1:2003

EMC Emissions and Immunity: ETSI EN 300 386 V1.4.1 (2008); IEC61000-6-2:2005

Environmental: Designed to ETSI EN 300 019

EMC Test Levels

Emissions:

Category:	Tested to comply with:	
Conducted RF	DC input Terminals: CISPR 22	Class B
	DC output Terminals: CISPR 22	Class A
Radiated RF	CISPR 22	Class B

Immunity:

Category:	Tested to comply with:	
Electrostatic Discharge (ESD)	IEC 61000-4-2 (Level 3: Air 8kV, Contact 6kV)	Criterion A
Radiated RF	IEC 61000-4-3 (Level 4: 10V/m, 1kHz 80% AM)	Criterion A
Electrical Fast Transient (EFT)	IEC 61000-4-4 (Level 4: 4kV on DC input lines) (Level 4: 4kV on DC load)	Criterion A Criterion A
Surge Protection	ANSI C62.41-1991 category B3 – DC input lines (Combination Wave 6kV/3kA; Ring Wave 6kV/500A)	Criterion B
	IEC 61000-4-5 (Impulse) (Level X: 6kV/3kA Common Mode [CM] on DC input lines) (Level X: 6kV/3kA Differential Mode [DM] on DC input lines) (Level 2: 1kV CM, 500V DM on DC output lines)	Criterion B Criterion B Criterion B
	IEC 61000-4-12 (Ring Wave) (Level X: 6kV/500A, 100kHz CM & DM on DC input lines) (Level 3: 2kV CM, 1kV DM on DC output lines)	Criterion A Criterion B
Conducted RF	IEC 61000-4-6 (Level 3: 10V on DC input, load and comms lines)	Criterion A
Power–frequency magnetic field	IEC 61000-4-8 (Level 5: 100A/m continuous)	Criterion A





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Environmental

Environmental Class (ETSI EN 300 019):

Operational: Class 3.4
(Stationary Use at Sites with Heat-Trap)

Transport: Class 2.3
(Public Transportation)

Storage: Class 1.2
(Weather Protected Non-Temperature-Controlled Locations)

Cooling:

Forced convection cooling using two 40mm fans with variable speed temperature control and finger guards. The RT11 draws cool air from the front and exhausts warmed air to the back. Fans stop if input power fails or Converter inhibited remotely.

Temperature:

Operating range: -40 °C to +70 °C
 Full power range: -40 °C to +50 °C
 Derated operation: >25% power at +70 °C
 >50% power at +60 °C
 Storage: -40 °C to +70 °C
 Transport: -40 °C to +70 °C

The RT11 senses its internal heat-sink temperature and, if necessary, adjusts power limit in order to protect itself against over-heating;

Humidity:

0 to 100% RH condensing including dripping water and icing conditions.

Altitude:

Operational to 4000m (Consult factory above 4km)
 Derate maximum ambient temperature by 5 °C per 1000m above sea level.

Vibration:

Operational: (Class 3M5) 3.0mm displacement 2-9Hz,
 10m/s² acceleration 9-200Hz,
 Continuous, any direction.

Transport: (packaged) 3.5mm displacement 2-9Hz,
 10m/s² acceleration 9-200Hz,
 15m/s² acceleration 200-500Hz,
 One hour, any direction.

Shocks:

Operational: (Class 3M5) 50m/s² half sine, 11ms duration,
 Any direction

Transport: (packaged) 180m/s² half sine, 6ms duration,
 Any direction

Drop Test:

Transport: 1.2m drop when packaged

Mechanical

Module Size:

Width: 216mm (8.5")
 Height: 43mm (1U) (1.7")
 Depth: 255mm (10")
 Mass: < 2.5kg (5.5 lb)

Acoustic Noise:

≤ 55dB (A Weighted) typical

Powershell Magazine Size:

The Powershell magazine may be installed in 400 or 600mm deep 19-inch or 23-inch racks and takes up 2, 3, or 4U of height while accommodating 2, 4, or 6 RT11-DCDC converters. (Special magazine required for 300mm racks). In most cases no additional height needs to be left at the top and bottom of the magazine.

Connections

Input, Output, and Communications:

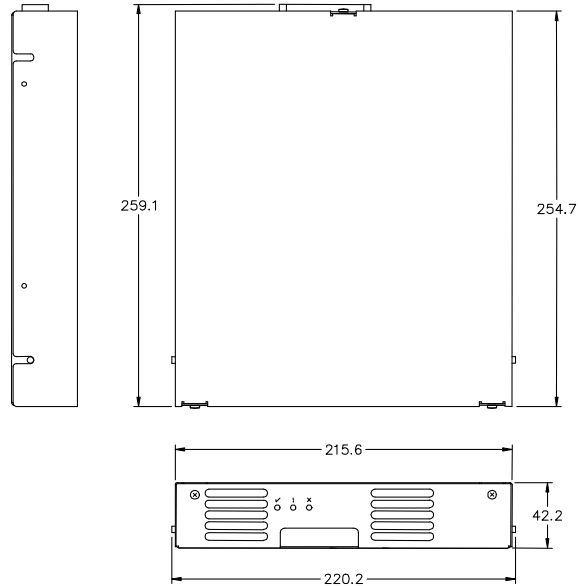
A multifunction hot-plug connector is mounted on the back of the RT11 module that carries the Input DC, Output DC and communications lines. A matching connector is located at the back of the magazine. Reliable mating is ensured by a spring latch in the magazine that mechanically secures the RT11.





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RT11-110V/24V/1.2kW-DCDC dimensions:



4U Powershell magazine dimensions:

