



APPLICATION NOTE

Oracle 170watt Intelligent PSU

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Introduction

The Oracle range of Intelligent Power Supply / Chargers is designed to contain all of the building blocks necessary to produce a 28V output fully backed up by an external battery.

The main 28V output drives the load, whilst a second "Battery Output" allows the charging of an external connected battery. In the event of a mains failure, the battery will supply power to the load via an internal feed forward diode. Sophisticated supervisory and alarm functions are controlled by an on-board micro controller, providing comprehensive fault alarms, signals, and indicators.

Battery protection is provided by a temperature compensated float voltage, current limited maximum charge current, and an under voltage "deep discharge" protection system disconnecting the battery from the intelligent PSU to prevent over discharge.

Over voltage protection is provided on both outputs, causing shutdown of the power supply, which may be reset by cycling the mains.

If higher load currents are required, the battery charging process may be suspended to enable the full 6 amps to be drawn from the main +28V output.

IMPORTANT!

It is important that when installed the power supply is mounted in the correct orientation. Therefore please note the mounting information detailed on the last page (Ref : Final Mounting Panel).

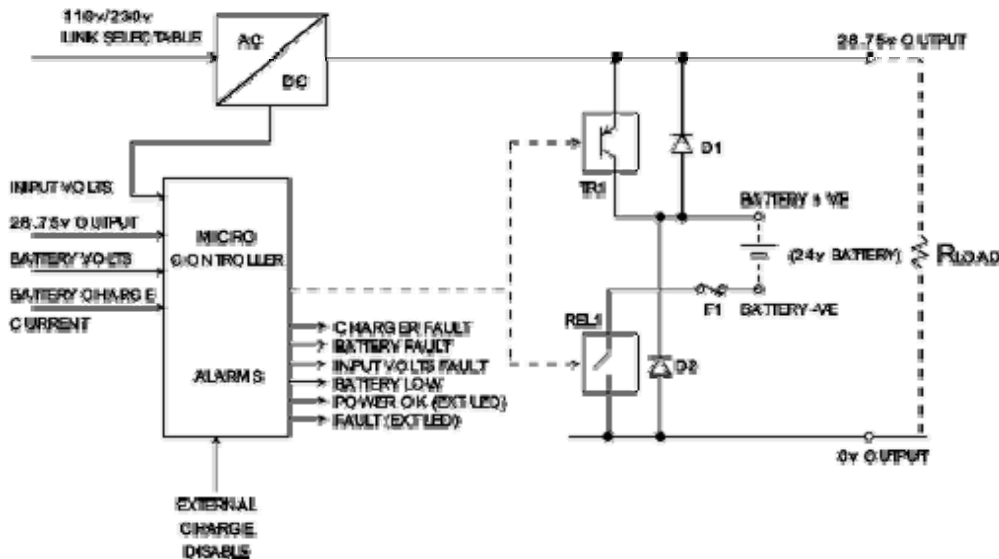


Pin Connections

Batt +ve	Connect to 24V battery positive
Batt -ve	Connect to 24V battery negative
+28V +28V	Main 28.75V nominal output rated at 4 amps if the charger is utilised, or 6 amps if the charger is disabled
0V 0V	Main 0V connection for load
Thermistor Thermistor	Used to connect the optional remote sense if fitted. Note that LK11 must be cut if the remote option is used
Power OK TTL alarm	TTL compatible signal - high for OK, low for a fault. Fault triggered by one or more of the following: Charger Fault Battery Fault Input Fault (Sink / source capability: 5mA)
Batt Defeat Batt Defeat	Connect these two terminals together to operate the unit as a 28.75V at 6 amp PSU without the sophisticated battery monitoring
Ext Charge Disable	Connect to +5V to inhibit the battery charging. This allows the full 6 amps to be drawn from the main output
Serial Data Enable Serial Cloak	(For future use). These will enable the micro-controller software to be checked remotely
Ext OK LED	Connect to the anode of an external 'OK' LED to indicate correct operation of unit (Source capability: 8mA nominal)
Ext Fault LED	Connect to the anode of an external 'fault' LED to indicate that one of the following faults has occurred: Charger Fault Battery Fault Input Fault (Source capability: 8mA nominal)
Battery Low	TTL compatible signal. High when battery volts <21.0V nominal. (Sink/ source capability: 5mA)
0V	Signal 0V used for external LED's, battery low and power share functions
Power Share	(for future use). A module will be available to connect up to four PSU's in parallel, enabling them to equally share current

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Normal operation as PSU with battery backed supply



When connected as shown, the system functions as outlined below:

Mains provided to the unit is converted to 28.75V output by the internal half bridge switch mode converter. Internally this output also drives a linear charging circuit based around TR1, which provides the battery charge current.

During normal operation mains will be present, the PSU will supply the load on the 28V output, and the battery will charge via TR1. Initially the charge current will be limited to 2 Amps max by an internal current limit, but as the external battery becomes fully charged, its terminal voltage approaches the float voltage which is temperature compensated from -5°C to +50°C for lead acid batteries. (See section on temperature compensated charging.).

Whilst mains is applied the micro controller automatically disables the charging circuit for approx 100mS in every ~6secs, and monitors the terminal voltage of the battery. This allows faults such as battery disconnection and battery low to be detected. It will also protect the PSU and battery if a 12V battery is connected in error, since the charging circuitry is inhibited if the terminal voltage is below 18V.

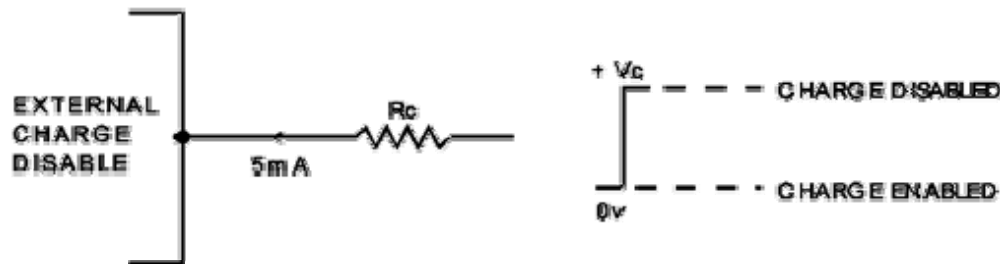
When mains failure occurs, output power to the load is provided by the battery via D1. The micro controller automatically inhibits the charging functions and battery / charger fault diagnosis, but still monitors the condition of the battery. As the battery discharges, Battery Low led will illuminate at ~21V, and also the Battery Low TTL compatible alarm signal will go high. At 18V the micro controller will disconnect the battery from the unit using REL 1. Re-connection of the battery will not occur until the mains is restored, and the terminal voltage of the battery connected is above 18V.

Battery connection reversal is protected by D2 which will blow fuse F1 in the event of a fault

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External Charge Disable

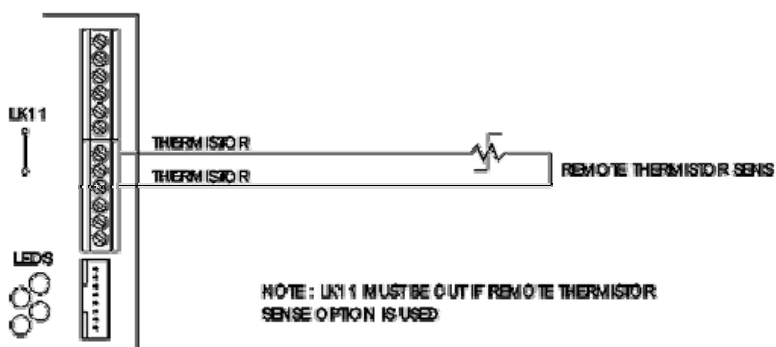
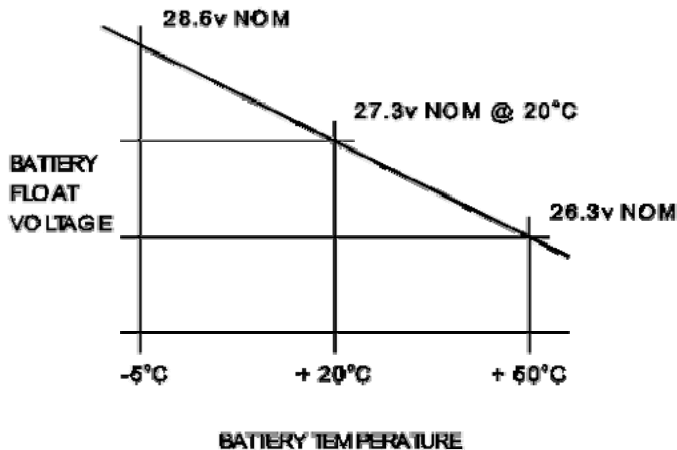
If during normal operation >4 Amps is required to drive the load, the capacity of the main output can be increased to 6 Amps by inhibiting the charging circuit. This is accomplished by applying +5V to the Ext Charge Disable pin, or alternatively via a resistor should a higher voltage be used:



It is also possible to permanently disable the battery charge output by linking together the two 'Batt Defeat' connections, (see example 1 on page 7). This will allow the full 6 amps to be drawn from the main +28V output.

Temperature Compensated Charging:

Compensation is either achieved through use of the internal thermistor mounted on the PSU PCB, or if the battery temperature is different to the PSU temperature, via a remote sense thermistor. When using a remote sense, LK11 on the PCB must be cut to disconnect the internal thermistor.



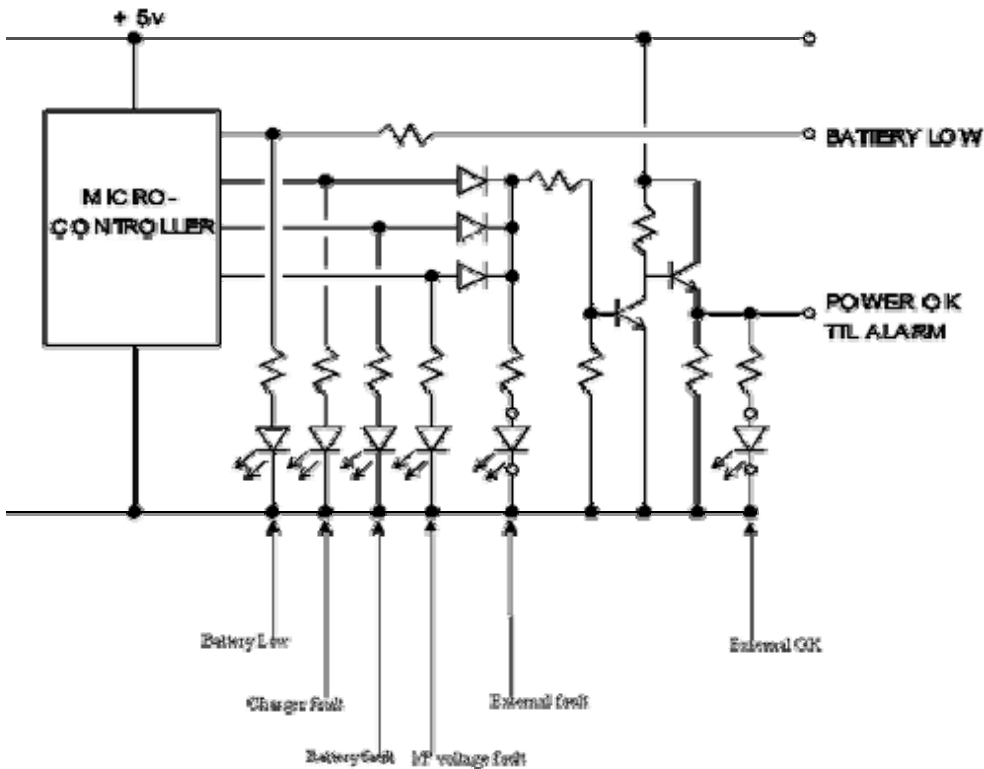
Thermistor: NTC 15KE nominal Philips part No: 2322 640 63153

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Alarms

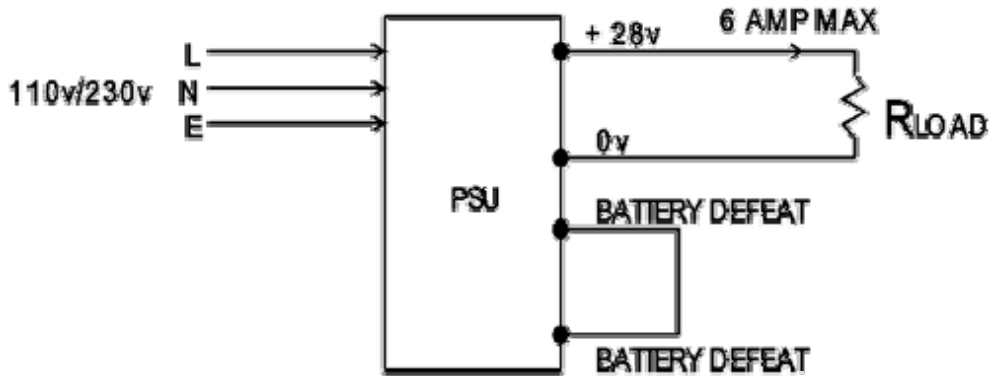
During normal operation the micro-controller constantly monitors various parameters within the PSU and signals faults as they occur.

Input voltage fault	If the main 28V output falls outside the range 26.8V - 32V then 'input voltage fault' will illuminate.
Battery fault	Should the battery become disconnected for any reason this LED will illuminate.
Charger fault	Should charging not be possible, ie the mains has failed or the battery is not receiving a charge, then 'charger fault' will illuminate.
Battery low	This will illuminate if the terminal voltage of the external battery, (measured within the PSU), falls below 21V nominal.



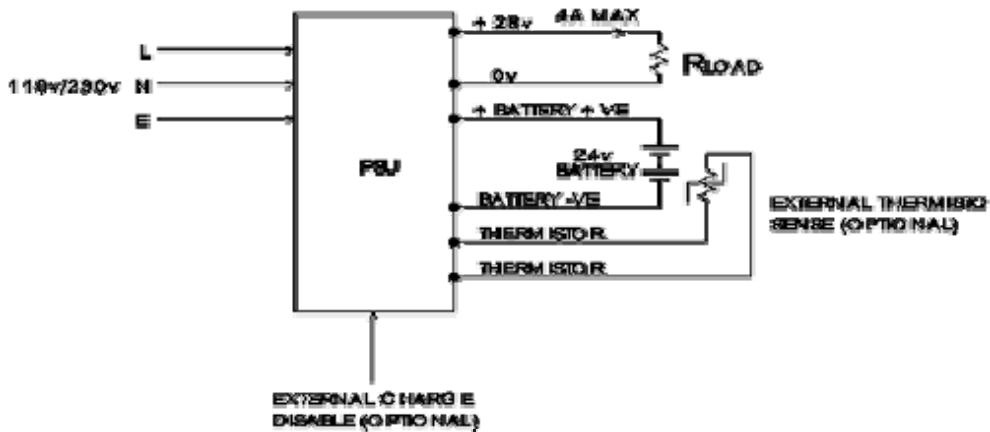
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Example 1: 6 Amp PSU



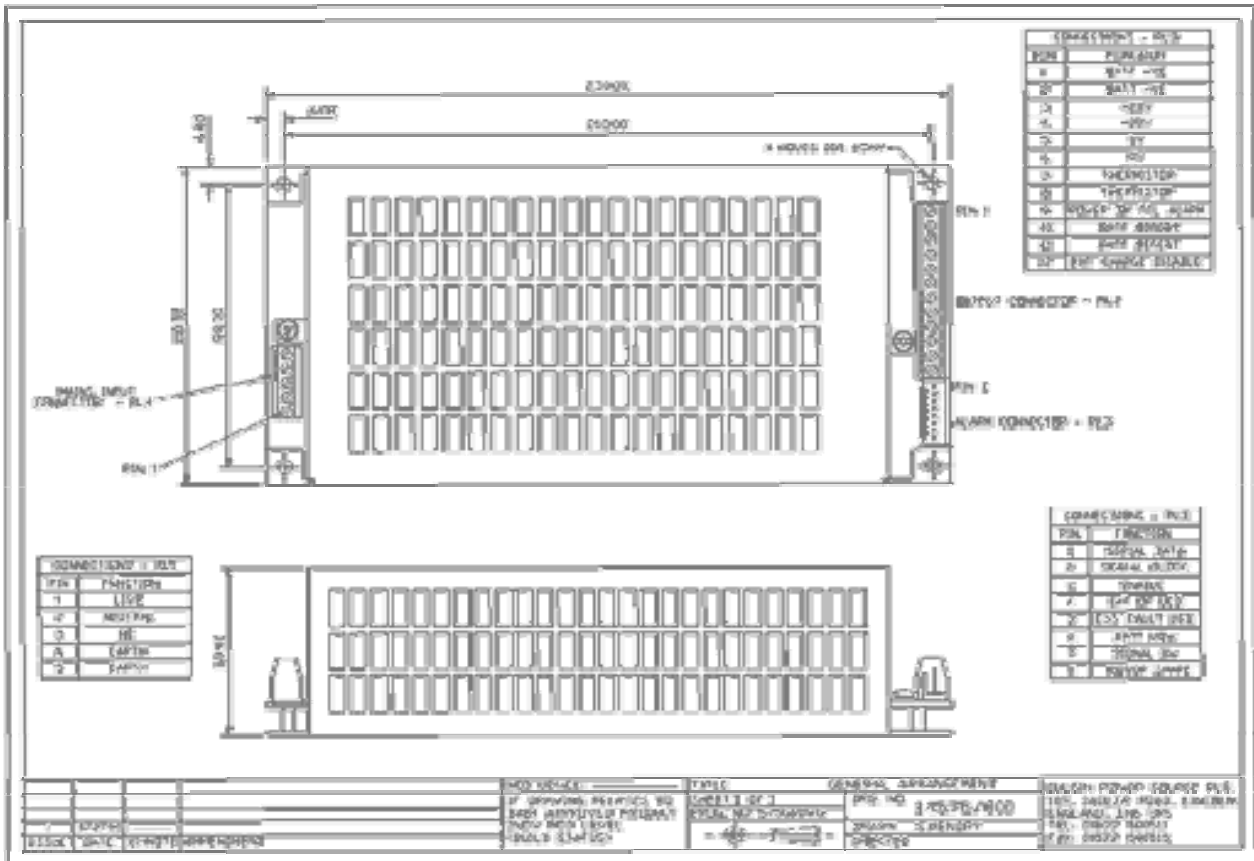
Linking the two battery defeat terminals inhibits all of the battery monitoring software and charging functions, and allows the unit to be used as a 28v @ 6 Amp PSU with no unnecessary false alarm signals.

Example 2: 4A + 2A battery backed supply



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Outline drawing / connection details





Installation / safety instruction sheet

SAFETY INSTRUCTIONS

If the primary earth of the end use application is connected directly to the earth terminal of the PSU the customer shall affix a label showing the protective earth symbol (IEC415 No.5017) adjacent to the earth terminal. If however the primary earth is connected to a stud prior to connecting to the PSU earth terminal the label shall be placed adjacent to the stud.

The PSU is considered to be Class 1 and must be reliably connected to earth.

For continued compliance to EN60950 the PSU shall be installed in compliance with the enclosure mounting, creepage, clearance, marking and segregation requirements of the end use application.

A suitable primary disconnect device shall be provided by the end use application.

The secondary outputs are considered for connection to SELV circuits only.

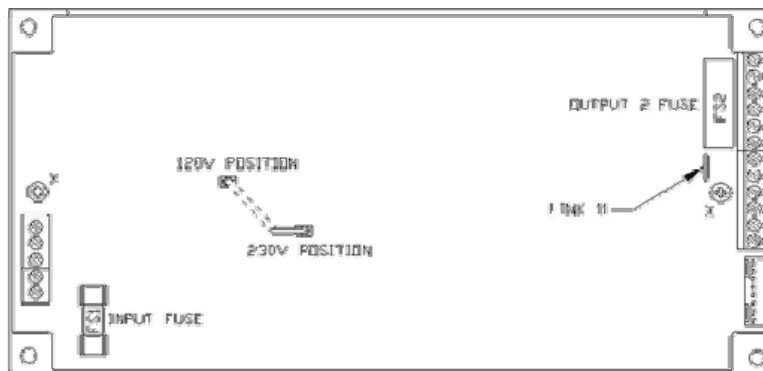
The maximum leakage current of the final equipment should not exceed 3.5mA under normal operating conditions.

INPUT VOLTAGE SELECTION AND FUSING

The PSU operates from two user configurable supply voltages 120/230Vac 50/60Hz, with a maximum tolerance range of 108-132Vac and 207-253Vac.

The PSU is configured by removing the cover (held in place by screws 'x'). The link is moved to the 230 or 120V connection as required.

The input fuse is also accessed by removing the cover, as above. The battery reverse connection fuse is accessible without removing the cover. Both fuses must be replaced by fuses with the same type and rating.



OUTPUT VOLTAGES AND POWER RATING

OUTPUT	VOLTAGE	CURRENT (MAX.)
1	28.75V	4A
2	27.3V	2A

The maximum power output from the PSU is 170W. Any combination of currents can be taken from each output (up to their respective maxima) provided that this be $\leq 170W$.

Do not operate the PSU above its maximum rated power.

The PSU is for use in a maximum ambient of 40°C.

Output 2 is temperature compensated to provide a variable float voltage when charging sealed lead acid batteries. The temperature is sensed by a thermistor incorporated into the PSU. If an external thermistor is to be used via the connections provided the internal thermistor must be disabled. This is done by removing the cover and cutting link 11.

FINAL MOUNTING PANEL

The Power Supply Unit can be mounted via its chassis in two positions:

Vertically as in position 'A' with the corner of the Chassis facing downwards.

Or flat to the mounting surface as in position 'B'.

