Battery Selection

The PT2000C and PT5000C are designed to operate with sealed lead acid type batteries also known as Valve Regulated Lead Acid (VRLA) batteries. This type of battery is sealed except for a valve that opens when the internal gas pressure exceeds the design limits. (That is why it is important not to overcharge VRLA batteries). Generally, these batteries can be used in confined areas and can be mounted in any orientation. (see the specific manufacturer's data for details.)

There are two types of VRLA batteries on the market: Absorbent Glass Mat (AGM) and Gel-Cell. This refers to the method used to immobilise the electrolyte in the battery. Either of these two types of battery may be used with these chargers.

In order to select a battery for your application, follow these simple steps:

1. Calculate the Ampere-hours of standby time required, by multiplying the number of hours of standby required by the average standing load in Amps.
2. To take into account deterioration of battery capacity over the life of the battery (20% over 48 months typical), and residual charge remaining at cutoff (20% remaining) multiply this figure by 1.6 (This figure may vary from application to application)
3. If the battery is required to provide full standby time at temperatures lower than 20°C, then increase this capacity by a further 10% for each 10°C below 20°C.
4. An additional factor of 15% may be added to the battery capacity if the recharge time to required capacity from discharged state is an important factor of the design. (see section on Recharge time).
5. This then gives the minimum Ampere-hour capacity battery required for the application. In general, the larger the battery the better in any given application (size and cost being the compromise).

Part Number 8.0101.019
Revision 6

CE

Omniflex

INSTALLATION GUIDE

OMNITERM PT2000C Model C2176B
OMNITERM PT5000C Model C2177B

The PT2000C and PT5000C are combined power supply/battery charger units designed specifically for small uninterruptible instrument supply applications where loss of dc power during ac supply outages cannot be tolerated.
The PT2000C is designed for supply applications up to 1.5 Amps (2.5A on 12V version), while the PT5000C is designed for supply applications up to 4 Amps. Both 12Volt and 24Volt output options are available.

These units incorporate all the functions required for a complete industrial grade uninterruptible dc power system. Minimal knowledge of battery charging and battery protection techniques are required for installation and operation.
Advanced battery management circuitry ensures that batteries are maintained at optimum charge levels over a wide temperature range, and ensures that batteries have the longest possible life.

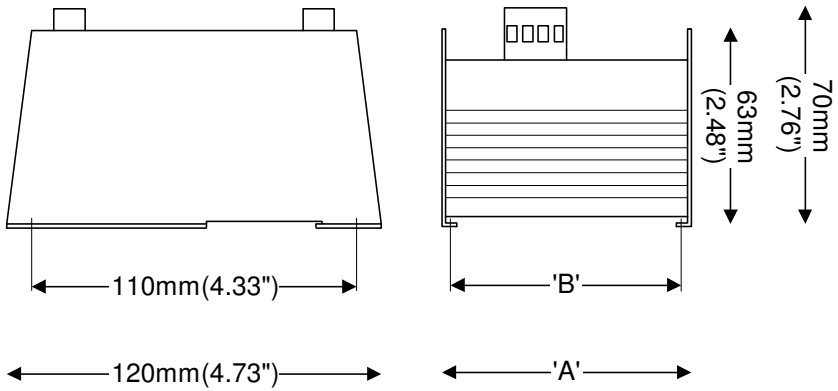
Application Examples

- **Remote Terminal Units**
- **Alarm Systems**
- **Field Instrument Control Loops**
- **Remote Access Systems**

Features

- **DIN Rail (35x7mm) mounting**
- **Available in 12Volt or 24Volt versions**
- **Operates from 110 to 240 Vac 50/60Hz**
- **Operates with a wide range of sealed lead acid battery sizes.**
- **Constant Current charging independent of load current for optimum charge rate**
- **Optional temperature sensor for optimising battery float voltage over . wide temperature swings**
- **Reversed battery protection.**
- **AC detection relay incorporated.**
- **Charger shutdown input for battery testing.**
- **Current limited Battery charger for optimum battery life.**
- **Overload protection to protect wiring against short circuit faults across the battery.**
- **Under-voltage cut-out to protect battery from deep discharge.**
- **Dual mode charger for fast recharge with optimum battery float voltage.**

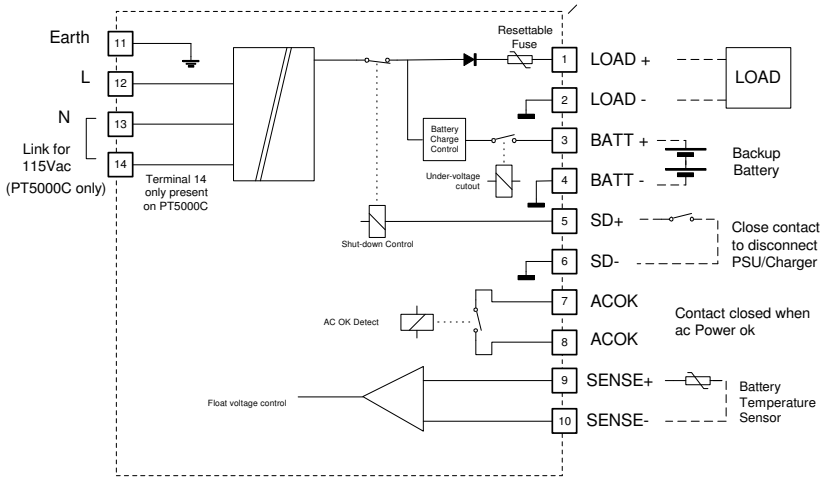
Mechanical Dimensions



DIN Rail mount recess is positioned 19mm from the top edge of the unit.

DIM	PT2000C	PT5000C
'A'	100mm	150mm
'B'	90mm	140mm

Electrical Connections



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AC Detect Ouput

Type	Normally open contact – closed when AC power is healthy.
Open circuit voltage	28V dc max.
Closed circuit current	5A max.

Optional Temperature Sensor (Order Model C0003 separately)

Recommended Use	Use when ambient temperature is expected to exceed 35°C
Sensor Type	Thermistor
Accuracy	+-2°C
Compensation	Approx. -20mV/°C for 12V option or –40mV/°C for 24V option
Without sensor	Unit is shipped from factory with fixed resistor across the temperature sensor terminals sized for 25°C operation.

Environment & Safety

Operating Temperature	0°C – 50 °C (+32°F – 140°F) at full load. derate 3%/°C up to 65°C
Storage Temperature	-10°C – 70 °C (+14°F – 158°F)
Insulation Resistance (100% tested)	100Mohm at 500Vdc input to outputs to ground.
Insulation Breakdown (100% tested)	3000Vac input to output for 1 second.
Design Life	50 000 hours at 50°C, full load

Weight	PT2000C	PT5000C
Unpacked	500g approx	900g approx.
Packed	600g approx	1000g approx

Compliance to Standards

Safety	EN 60950:1995
Emissions	EN 55011 and EN50081-2:1994 Group I, Class A
Immunity – ESD	IEC 61000-4-2:1995, level 3
Immunity – RF Fields	IEC 61000-4-3:1995, level 3
Immunity – Fast Transients	IEC 61000-4-4:1995 2 kV – Ac In, Load Out; 1 kV – Shutdown, ACOK.
Supply Variations	IEC 61000-4-11

Ordering Information

ORDER CODE	DESCRIPTION
C2176-1	PT2000C 2.5 Amp PSU/Charger with 12Volt Output
C2176	PT2000C 1.5 Amp PSU/Charger with 24Volt Output
C2177-1	PT5000C 4 Amp PSU/Charger with 12Volt Output
C2177	PT5000C 4 Amp PSU/Charger with 24Volt Output
C0003	Thermistor Temperature Sensor with 500mm lead.

Specifications

	PT2000C (Model C2176B)	PT5000C (Model C2177B)
Input Voltage		
AC Input voltage range	85-264Vac (100-240Vac nominal)	85-132Vac (100-125V nom.) 170-264Vac (200-240V nom.) Link terminals for 85-132V
AC input frequency	47-63 Hz	47-63 Hz
DC Input voltage range	85-264Vdc (derate 1%/V below 110Vdc)	190-264Vdc (derate 1%/V below 220Vdc)
Input current at full load	<1.1A rms at 115Vac <0.5A rms at 230Vac	<3A rms at 115Vac <1.5A rms at 230Vac
Switch-on inrush current	11A for <10ms 80A for < 1ms	22A for <10ms 160A for < 1ms
Surge withstand	2.5kA 8/20microsecond pulse 40 joules max.	
Fast Transients	2 kV	
Output		
Output Voltage (12V)	13.0V – 14V	
Output Voltage (24V)	26.0V-28.0V	
Maximum rated load	1.5A (24V), 2.5A (12V) continuous at 50°C Derate at 3%/°C up to 65°C 2.5 Amp peak (drawn from battery)	4A continuous at 50°C Derate at 3%/°C up to 65°C 6 Amp peak (drawn from battery)
Overload protection	Internal resettable fuse	
AC line regulation	0.5% max over 85-132Vac or 170-264Vac	
Load Regulation	2% max over 10-100% load variation	
Temp. Regulation	0.05%/°C (excluding effect of external temperature sensor)	
Battery Charger		
Charging method	Dual Mode Constant Current/Constant Voltage	
Float Voltage(at 25°C)	13.5V – 14V (12 Volt Option) 27.0V-28V (24V Option)	
Charging Current	0.5Amp Max.	1 Amp Max.
Under-voltage Cutout		
Cut out Voltage	11V+/-0.5 Volt (12 Volt Opt) or 22.2V+/-0.8 Volt (24 Volt Opt)	
Restore Voltage	9-10 Volt (12 Volt Opt.) or 18-20V (24 Volt Opt.) with AC on. <12.55 Volt (12 Volt Opt.) or <25.1V (24 Volt Opt.) with AC off.	
Shutdown Input		
Type	Potential Free Contact (- terminal connected to 0 Volts of dc supply)	
Open circuit voltage	30V dc max.	
Closed circuit current	30mA max.	

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AC Detect Output

A contact output across terminals 7 and 8 is provided to detect the presence/absence of the AC supply.

This contact monitors the Power Supply output (on the DC side). A closed contact confirms that the Power Supply is healthy and that the AC supply is present. The contact will open when the AC supply fails or when the Shut Down Test input is activated.

A green light labelled ‘AC’ on the front of the PT2000C/PT5000C is a visual indication of the state of this contact and the AC supply. When this light is on, then the AC Supply is present, and the contact is closed.

It is normal for this contact to open then close again momentarily during a power failure as the battery takes over from the Power Supply.

Shut Down Test Input

Connecting terminals 5 and 6 together will lower the charger output for the purpose of testing the battery (battery takes over the load).

By monitoring the battery voltage over a short time interval, while holding the charger output low, the state of the battery can be determined. This will enable the health of the battery to be checked even when the AC supply is present. This can be used, for example, in remote RTU applications where regular system checks are necessary.

Low-voltage Cut-out

When the battery voltage drops during discharge to a preset cut-off point, a cut-off relay in the PT2000C/PT5000C will disconnect the battery from the load. This prevents the battery from entering into a state of deep-discharge, protecting it from permanent damage.

When the AC supply returns, the cut-out relay will automatically reconnect the battery to the charger and load only if the battery is above the (lower) restore voltage point. This protects against danger or damage from reverse connected or dead batteries.

A red lamp labelled ‘DC’ on the front of the PT2000C/PT5000C when on, indicates that there is DC supply to the load. During battery backup, the Green lamp will be off and the Red lamp will be on. After the battery has been disconnected by the cut-out, both lamps will be off.

Charging Time

The PT2000C and PT5000C are dual-mode chargers. This means that the battery is charged in two phases. When the AC power returns after the battery has been on load, and requires recharging, the charger will enter into “bulk” mode charging. In this mode the battery will be charged with a constant current until the battery reaches its bulk charge voltage. The charger then switches into “float” charge mode, and the voltage is reduced to its “float” voltage, where the battery can remain indefinitely.

The bulk mode charge rate is chosen to ensure that the battery reaches 85-95% charge in the shortest possible time within the constraints of the battery specifications. The remaining 5-15% charge is then topped up more slowly during the float charge cycle.

If it is important in the application that the battery be at design capacity within the ‘bulk’ charge phase, then it is wise to over-rate the battery by up to 15%, and to consider the battery fully charged when it reaches this 85-95% capacity.

As a rough working guide, the following table gives average standby and recharge times at 20°C for a range of popular battery sizes. The discharge times have been derated by 15% for reasons stated above and exclude the effect of battery ageing or temperature on the capacity of the battery.

It is recommended that you stay within the battery size limits as defined in the table.

	PT2000C		**PT5000C**	
Battery Size in AH	**Charge Time at 0.5A**	**Discharge Time at 1.5A**	**Charge Time at 1A**	**Discharge Time at 4A**
2 Ah	4 hrs	1.1 hrs		
4 Ah	8 hrs	2.3 hrs	4 hrs	.8 hr
7 Ah	14 hrs	4.0 hrs	7 hrs	1.5 hrs
12 Ah	24 hrs	6.8 hrs	12 hrs	2.5 hrs
17 Ah			17 hrs	3.6 hrs
24 Ah			24 hrs	5.1 hrs

Use of Temperature Compensation

A Lead Acid Battery is constructed of a series string of cells of approx. 2.3 volts each when fully charged. A 12 Volt battery has 6 such cells. This fully charged voltage varies by approximately –3.3mV/°C per cell. This does not sound much but, over 12 cells in a 24Volt application, this amounts to a change of 0.4V over a 10°C temperature swing.

If the float voltage of the charger does not compensate for this change, then it is possible to over-charge the battery at high temperatures and under-charge the battery at low temperatures.

These PSU/Chargers are supplied from the factory with a resistor fitted to the temperature sensor terminals to set the float voltage for 25°C operation. Over a normal ambient working range of 15 to 35°C this is considered quite satisfactory, and no further temperature compensation is required.

If the average ambient temperature is likely to be outside of this range, then this resistor may be changed to simulate this environment. If the ambient temperature is likely to swing by more than about 15 to 20°C then it is advisable to fit the external temperature sensor. This sensor is fitted with a 500mm extension lead to allow it to be mounted with the battery, avoiding the possibility of erroneous temperature readings possible with chargers with integrated temperature compensation.

The following table gives the resistor values to be used to set the float voltage to the optimum setting for other ambient temperatures:

Temperature	Resistor	Float (12V)	Float(24)	Tolerance
0°C	33k	14.25V	28.5V	+/- 250mV
5°C	27k	14.22V	28.45V	
10°C	22k	14.18V	28.35V	
15°C	15k	14.05V	28.10V	
20°C	12k	13.97V	27.95V	
25°C	10k	13.90V	27.80V	(default)
30°C	8.2k	13.80V	27.60V	
35°C	6.8k	13.70V	27.40V	
40°C	5.6k	13.60V	27.20V	
45°C	4.7k	13.50V	27.00V	
50°C	3.9k	13.36V	26.72V	