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Prolegomenon

In order to install and use CEC RL series battery correctly and safely, please read this technical manual and other data together with battery carefully for a comprehensive understanding.

- ★ Pay attention to safety during installation to avoid accident.
- ★ It is required for users to read this manual carefully and keep it well.
- ★ If you have any questions about the Technical Manual or any technical problems, please contact us or our local agent.

Dangerous!				
				
High Voltage— Don't touch any terminals or connectors without insulation to avoid electric shock.	Eyes Protection— Gas from explosion may harm eyes or even cause blindness.	Prohibition— Sparks, fire and smoking.	Vent— May cause blindness or severe burns.	Wash eyes with clean water immediately and go to see a doctor.
Do not loosen the safety valves. Please read carefully the installing and using instructions in this manual.		Keep the battery in a well ventilated environment when in operation. Battery maintenance and repair should be conducted by experienced technicians.		

Application Range

This manual is applied to the following RL series SLA battery (hereafter referred to as battery).

RL Battery Parameters

Model	Voltage (V)	Capacity (AH)			Dimension (mm)			Total Height	Weight (kg)	Terminal	Max. charge current(A)	Internal resistance (mΩ)
		10hr	3hr	1hr	Length	Width	Height					
RL2-100	2	100	81	65	171	72	226	226	6.5	F10	20	1
RL2-150	2	150	122	98	171	101	208	228	8	F10	30	0.85
RL2-200	2	200	162	130	171	106	327	368	14.5	F10	40	0.85
RL2-300	2	300	243	195	171	151	327	368	19	F10	60	0.8
RL2-400	2	400	324	260	171	210	327	368	26	F10	80	0.75
RL2-500	2	500	405	325	171	241	327	368	30.5	F10	100	0.7
RL2-550	2	550	448	368	171	241	327	368	33	F10	110	0.63
RL2-600	2	600	486	390	171	302	327	368	39.5	F10	120	0.65
RL2-800	2	800	648	520	171	411	327	368	55	F10	160	0.62
RL2-1000	2	1000	810	650	171	479	327	368	62	F10	200	0.58
RL2-1500	2	1500	1220	980	352	407	338	383	86	F10	300	0.54
RL2-2000	2	2000	1620	1300	348	490	338	383	126.5	F10	400	0.5
RL2-3000	2	3000	2430	1980	351	712	338	383	193	F10	600	0.39

2 Check

- After receiving the batteries, please check the packing and make sure the batteries are intact. Avoid bumping during carrying, and be careful when open the cartons.
- Please open the cartons near the installation place and check appearance and quantity of the battery accessories after opening.
- It's difficult to detect leakage if there are slight damages on the battery shell. Please check carefully and make sure there is no damage or leakage on the battery shell.
- If the battery falls to the ground or its shell is bumped abnormally, please report the details to our company for confirmation and aftermath arrangement.



Storage before installation

Storage Environment

If the battery is not installed immediately after being received, please store it in a clean, ventilated and dark place at around 5-30°C.

Storage Time

Due to self-discharge, the battery capacity will lose gradually in storage. Do not store the battery for more than 24 months or it will affect the battery performance eternally. After being stored for 24 months, the battery should be charged in voltage of 24V 0.1V for 24 hours and hereafter should be recharged at least once every 6 months. A relatively high temperature will accelerate the battery self-discharge. From 20°C when the temperature increases every 10°C, recharging interval should be reduced half. For example, when the battery is stored at 35°C, its initial charging or recharging interval should be 2 months.

If the battery is not charged properly, its performance and life will be affected and cause the normal guarantee invalid.

Installation Cautions

- Before touching the battery, please wear a rubber apron, rubber gloves, safety goggles or other eyes protection equipments, do not wear metal objects, such as jewelry etc.
- The battery is very heavy. Be careful and do not pump the battery when moving it.
- Smoking or lighting fires are strictly forbidden. Keep the battery away from electric arc.
- Avoid short circuit. The battery has been charged and please prevent battery from short circuit to avoid equipment damage or personal injury.
- Put the battery in a cool and well ventilated place. Do not install the battery in a place that is possible to be immersed by water.
- Fix the bolts and nuts on the connection terminals to the specified torque, otherwise it may cause sparks or damages to the terminals.
- Please clean the battery shell and cover with a wet cloth, to prevent static and spark, do not use a duster or a dry cloth to clean the battery. It's prohibited to use organic solvent such as rubber solution or naphtha, which will cause the battery shell cracking.
- In normal operation, there will be no dissociative electrolyte attached on the shell after battery gets fully sealed. However, if the battery shell is damaged, dissociative vitriol is possible to leak. In case electrolyte splashes onto eyes, skin or clothes, flush it with a large quantity of water. If it splashes into eyes, after rinsing with water, please go to see a doctor promptly.
- Make sure the positive (+/red) and negative (-/black) terminals are connected properly, otherwise it will cause fire or damages to the battery or charger.
-) Please use the following protection equipments when you carry, install and maintain the battery.
 -) Safety goggles or protective face-shield.
 -) Acid-resistant gloves.
 -) Acid-resistant apron, safety shoes.
 -) Proper carrying instruments.
 -) Insulation instruments.

11. Battery posts, terminals and fittings contain lead or lead compound, and other chemical compositions in the battery are harmful to personal health.

Wash your hands after touching the battery!

5 Battery Installation

1. Install the battery according to installation drawing.
 - Please leave at least 1,000mm passageway as maintenance space.
2. Install Connectors
 - Apply the Vaseline onto the battery terminals to prevent large resistance oxide, then install connectors. After installing all the battery connectors, make sure all positive (+/red) and negative (-/black) terminals are connected properly according to the installation figures, then fix the connecting screws in the moment of 8.5Nm with a insulative moment spanner.
3. Measure Voltage
 - After installing the connectors, measure the total voltage of whole string, which should be the total of the cell voltage. If they are inconsistent, please check the battery polarity and recheck the battery connection in a proper moment.
4. Cell Number
 - Stick the self-adhesive labels of cell number and system grade sign on the top of relevant cells.
 - The first cell at the positive connecting terminal should be marked as No.1 and the rest is marked by analogy.
5. Install Battery Shield
 - After checking the voltage and arranging the cell numbers, put the shield at the top of the battery.

6 Installation Demonstration (48V500AH)

1. Fix ground setscrews of the battery shelf rack.
 - 1) Drill screw holes (M8 45mm) on the ground. Make sure the hole location is exact without deviation.
 - 2) Match M8*60 setscrews and M8 hexagon nuts.
 - 3) Fix the setscrews in the ground holes and leave enough length of screw rod for connecting the battery rack foot.
2. Install battery Side Racks
 - Fix the racks into the ground holes.
3. Install beams and batteries of the first shelf.
4. Install beams and batteries of the other shelves.
5. Install connecting wires between batteries and fix all the screws and nuts.
6. Install battery covers and occulating bars.
7. Battery connection
 - 1) If there is oxide on the battery terminals, clean the terminals till they appear metal luster and apply Vaseline evenly on them.
 - 2) Install the connecting strips according to the drawing or under the instruction of technicians. Tighten all the screws and nuts according to the Installation Manual.

7 Battery Features

1. Long Service Life

Heavy duty lead-calcium grids ensure mild corrosion and enable a long designed service life of 18 years standby use under optimal float charge conditions and below optimal operating temperature of 20°C.

2. Excellent and High Efficient Discharge

CEC batteries are equipped with low resistant plates and conducting parts, which decrease the internal resistance and ensure the highest discharging efficiency.

3. Triplex Sealed Construction

Valve regulated sealed construction and triplex strengthened sealing on terminals and posts prevent electrolyte leakage, and guarantee the air tight and liquid tight state of batteries in normal operation and prevent external air from entering battery inner.

4. Low Self Discharge

Because of the use of lead-calcium grids alloy, CEC batteries have low self discharge and reliable performance. In room temperature, self discharge ratio per month of CEC battery is about 3% of the battery capacity.

5. High Security

CEC batteries are equipped with explosion-proof safety valves to prevent production of redundant gas. And the construction is designed to prevent setting fire to the internal battery in case sparkles approach.

6. High Efficiency of Recovery

Unique formulas are used in lead paste of positive post and ensure the battery can be recharged easily to a normal level.

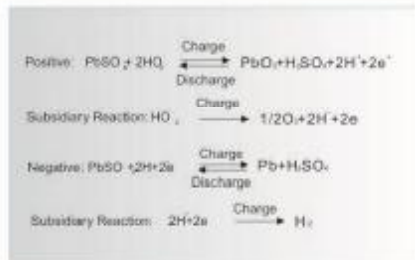
7. No Electrolyte Stratification

Special additives are use in electrolyte to give it a gelatinous consistency without flowing, leaking or stratification, and make all parts of plates react evenly.

8 Operating Principle

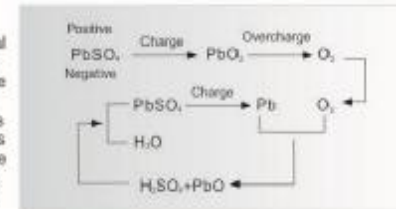
1. Electrochemistry

A lead-acid battery is an electrical storage device that converts electrical energy into potential chemical energy, when needed the stored chemical energy can be converted back into electrical energy again to be supplied to external systems. In the discharge state, part of PbO_2 at the positive turns into $PbSO_4$, and part of Pb at the negative also turns into $PbSO_4$. In this electro-chemical reaction, both positive and negative electrodes generate $PbSO_4$. In the charging state, the lead sulfate ($PbSO_4$) at the positive and negative turns into PbO_2 and Pb , respectively. When in discharging, the concentration and density of electrolyte H_2SO_4 decreases gradually, while in charging, it increases. Battery charging and discharging are realized by electrochemical reactions.



2. Oxygen Combination

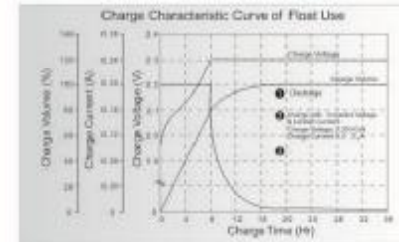
The positive plate generates oxygen gas in the final stage of charging. Under the condition of excessive additives at the negative, oxygen spreads to the negative plates through glass fibre separator and reacts with spongy lead and forms lead oxide and then turns into lead sulfate and water. Keep the negative plates in depolarization or undercharge state so that the battery cannot reach the overpotential of oxygen gassing. Thus the battery avoids oxygen gassing and water loss and is made a maintenance free sealed storage battery.



9 Battery Charge, Discharge & Life

1. Charge Characteristics

Charge condition is one of the important factors in battery use. The battery performance and service life are directly related to its charging methods and charging parameters in using. The battery is recommended to be charged at the temperature range of 5-30°C. At any temperature lower than 5°C or higher than 35°C it will cause undercharge or overheating and then decrease the battery life.



2. Charge Curve of Float Use

3. Relationship between Float Charge Voltage and Environment Temperature

At general temperature (5°C-30°C), float charge voltage is 2.25V-2.30V. The batteries for float charge service adopt the constant voltage but limited current method. The initial current is 0.1 C_{10} A and the maximum current is 0.2 C_{10} A.

1) At 25°C, the float charge voltage of 2V battery is 2.27V per cell.

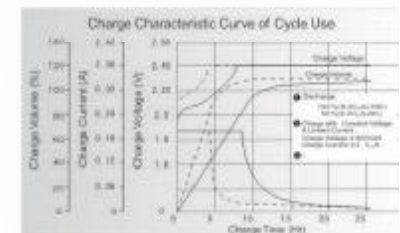
2) When the ambient temperature changes, the float charge voltage should be adjusted. The temperature compensation coefficient is $-3mV/^\circ C$. $U_{float} = (2.25 - 0.003(t-20)) \times n$.

4. Charge Curve of Cycle Use

The batteries for cycle service adopt the constant voltage but limited current method. At 20°C-25°C, the charge voltage of RL series battery is 2.40V per cell, the initial charge current is not larger than 0.2 C_{10} A and the battery fully charges in approximately 24 hours.

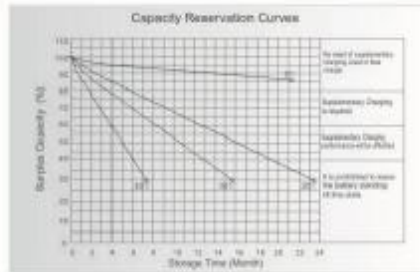
In the final stage of charging, if the charge current value remains unchanged for 3 hours, it indicates that the battery is fully charged.

Charge curves are as right.



Supplementary Charging
 Due to self discharge, battery stocked longtime, the capacity reduce slowly, the relationship between capacity reservation, temperature and stock time as right curves.

Supplementary Charging adopts the constant voltage but limited current method. Initial charging current is 0.05 C₁₀ - 0.1 C₁₀, charging voltage is 2.35 - 2.4V/Cell, generally charge for 36 hours. After longtime storage, before use, battery should be makeup charged.

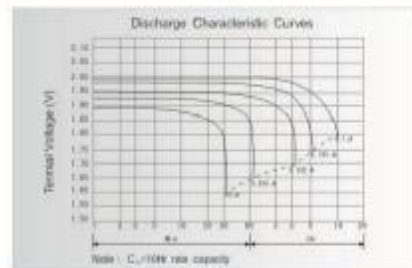


Storage Time vs Charge Voltage and Charge time			
Storage Time (Month)	Charge Voltage (V/Cell)	Maximum Charge Current(A)	Charge Time(Hr)
3 ~ 6	2.35	0.2C ₁₀	36
6 ~ 12	2.40	0.2C ₁₀	48
12 ~ 20	2.40	0.2C ₁₀	60

Discharge Characteristic

Discharge rate is different, the cutoff voltage also different. Higher discharge current, lower cutoff voltage, reversely, lower discharge current, higher cutoff voltage. Normally the battery cutoff voltage set at 1.80 - 1.90V. The discharged capacity is lower with higher discharge current.

Discharge characteristic curves are as right:



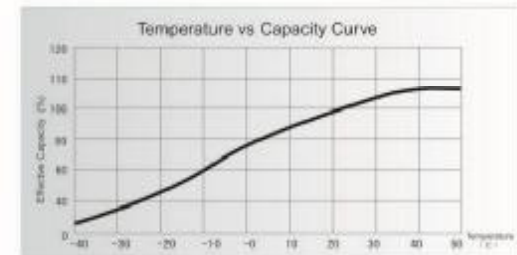
Discharge Capacity vs Temperature

Battery discharge capacity is related with temperature. Lower temperature, lower capacity discharged, higher temperature, higher capacity discharged. But the too high temperature will seriously damage the battery lifetime. The best working temperature for battery is 20- 25 °C. The discharged capacity at different temperature Ct vs Discharged capacity at 25 °C C25 have below relationship-

$$C_{25} = \frac{C_t}{1 + K (t - 25)}$$

C25 Discharged capacity at 25 °C (AH)
 Ct Discharged capacity at t °C (AH)
 t Environment temperature during discharge (°C)
 K Temperature compensation coefficient
 10Hr rate discharge : K=0.006/°C ; 5Hr rate discharge : K=0.007/°C
 3Hr rate discharge : K=0.008/°C ; 1Hr rate discharge : K=0.010/°C

Temperature vs Capacity Curves as below:



7. Float Life Characteristic

At recommended float charging situation at 25 °C, RL series battery design life is over 18 years. Bath usage lifetime is related with ambient temperature, depth of discharge, discharge rate and float charging voltage. In real usage, depth of discharge, frequent of discharge, incommo charging voltage will effect the battery lifetime directly.

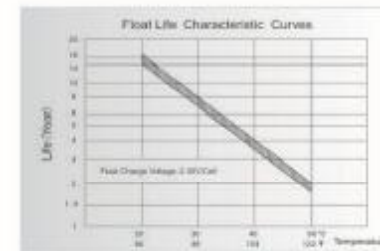
Float Life characteristic curves are as below:

Float Lifetime vs Temperature

According to Arrhenius equation, battery design life fluctuated with temperature, temperature increased every 10degree, the float lifetime cut half.

$$\ln \frac{K_1}{K_2} = \frac{E_a}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$

K1 : Equal constant at T1 temperature
 K2 : 1 (Equal constant at T2 temperature)
 Ea: activation energy
 R: air constant, 8.314J mole K⁻¹
 T1- environment temperature at during discharge, K
 T2: standard temperature 293K



Float Charge Voltage (V)	Battery Actual Float Life at Different Temperature (Year)				
	20C	25C	30C	40C	50C
2.30	15.0	10.8	7.5	3.7	1.8



10 Record

The operating record of fixed batteries is very important for battery maintenance and protection. This information is useful for user to confirm battery life and adjust the longevity.

Battery is allowed to operate at a temperature lower than 25°C, however, the charging time will be relatively long. After installing batteries and a week of float charge, it's required to record the following information:

- 1) Battery terminal voltage
2) Charger voltage
3) Float charging voltage of each battery
4) Internal resistance of each battery. Within the same battery, put the meter that tests internal resistance at the two terminals that is in farthest diagonal position.
5) Environment temperature
6) Check if all the connecting points have been fixed to the proper torque (11.3N.M). Use a milliohmmeter to test internal resistance of each connecting strip.

11 Maintenance

Put mask or protective glass when approach battery, make sure not put battery next to fire/ smoking place.

It can prolong battery life and easy to judge when battery need replacement by proper maintenance. If the maintenance way differs from this manual, users can only make the maintenance method according to battery usage and using reliability. All maintenance needs the professionals to execute.

- 1. Checking
Try to make all checking under float charging conditions. Measurements should be made according to specification from suppliers and keep the records for future collation.
1. 1 Monthly checking
Record for monthly checking:
1. 1. 1 All batteries float charging voltage
1. 1. 2 Current and voltage from charger
1. 1. 3 Temperature, ventilation and monitor equipments situation.
1. 1. 4 Eye check record for battery string:
1) Battery appearance: terminal, connector, any corrosive phenomena with battery rack.
2) The clearance region between batteries and rack
3) Any phenomena of crack or leakage for battery
4) Any phenomena of deformation for battery and rack
1. 2 Quarterly checking
Apart from checking clause of above 1.1 as quarterly checking,
1) Resistance per block
2) Temperature of negative terminal for each battery
3) Check connect resistance at random (at least check 10% or not less than 6 connectors), if resistance is higher than initial resistance, then need to check all connectors' resistance and dig out reason. (Plz check different connectors each time)

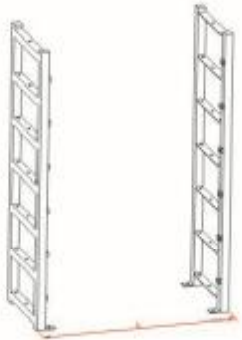
- 1. 3 Yearly checking and initial checking
Apart from checking clause of above 1.1 and 1.2 as yearly checking, plz also checking following issues and keep record (Need to collate with previous records.)
1) Check all connector resistance-
2) Try to check AC current and voltage from rectifier.
1. 4 Special checking
Batteries need inspection to check if they were get damaged in special situation (like over-discharge, abuse charging machine or charging machine can not work properly ect). The inspection includes all yearly checking clause and make records.
2. Ripple Voltage of rectifier
We recommend ripple Voltage of rectifier should not be bigger than 0.5% of charging voltage, and liberating ripple time should be shorter than a millisecond.
3. Battery cleaning
Use water or carbonic acid water to clear battery and cover.
4. Capacity test
If batteries can work properly, no need to check capacity. Only to check capacity when doubt battery capacity. Battery cut voltage after discharge should not be lower than suppliers specification.
Before capacity testing, make sure battery get fully charged for more than 48 hours under float charge, if not, make a equalization charge for 24 hours then let batteries rest for 8-24 hours.

12 Common Faults & Solutions

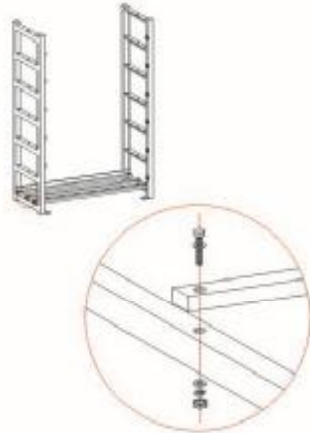
Table with 3 columns: No., Common Fault, Solution. Rows include: 1 Leakage, 2 Crack, 3 Low floating V., 4 Battery less capacity, 5 High temp. round pole, 6 Abnormal Appearance, 7 Grounding Fault, 8 Abnormal connect & inner resistance.



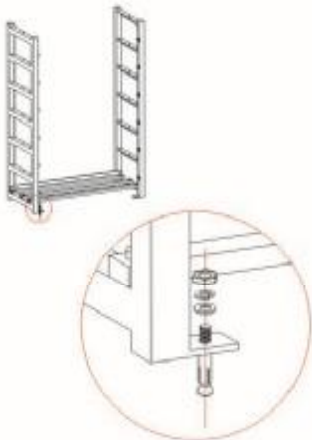
73 Installation Drawing



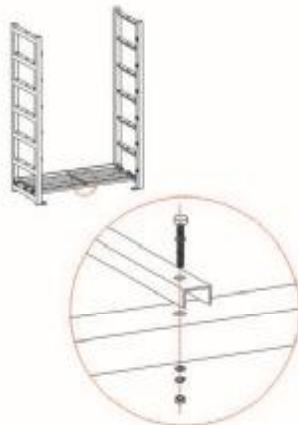
1 Place side Racket I and Racket II in parallel.



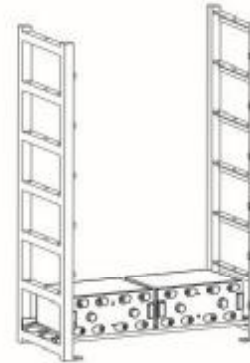
2 Install Crossbeam I, Crossbeam II and Cross beam III, fix with M12 screws.



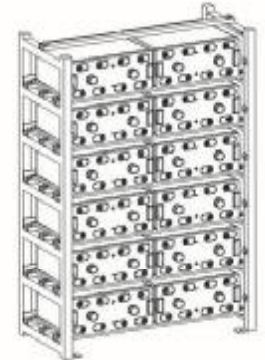
3 Install M8 setscrews.



4 Install deck supports with M5 screws.



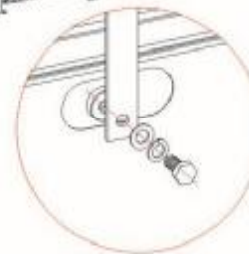
5 Install batteries on the first shelf, after installing crossbeams and supports.



6 Following step 5, install batteries on other shelves from the bottom up.



7 Install the connection copperplate and output wire; check the battery's polarity and direction; and tighten the screws.



8 Install battery covers and external occulting bars in turn.

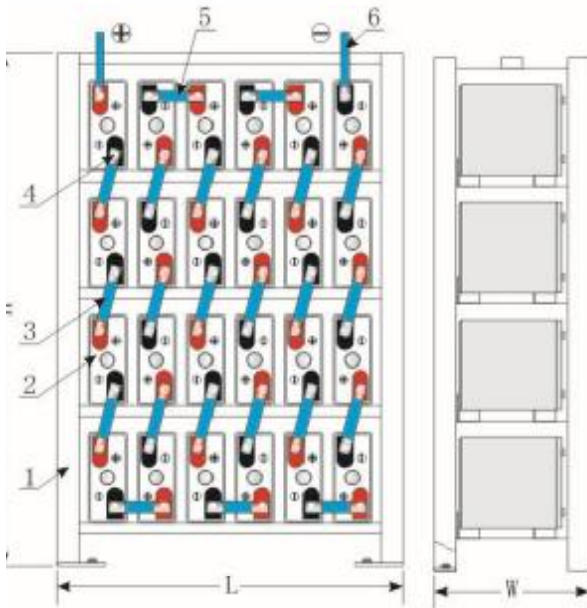
8V 4-Shelf Horizontal Battery Rack

RL2100/RL2150

Note:

- When in installation, please notice the battery positive and negative polarity and place batteries according to the drawing. A space (20mm) should be left between batteries. Make sure the screws are tightened.

- About 5.4N.m torque.



LIST	
Name	Quantity
1. Rack	1
2. Battery	24
3. Connection Copperplate	18
4. Bolt (M8*16)	48 (set)
5. Connection Copperplate	5
6. Output Wire	2

Battery Rack & Accessory Specification

Model	1 Rack(mm)			2 Battery	3 Connection Copperplate	5 Connection Copperplate	4. Output Wire	Battery Ref. WG (kg)	Battery Group Ref. WG (kg)
	L	W	H	(mm)	(mm)	(mm)	(mm ²)		
48V/RL2100	648	300	960	170*72*210	105*20*3	92*20*3	150*50	6.5	190
48V/RL2150	828	304	960	172*102*227	116*20*3	122*20*3	150*50	8	231

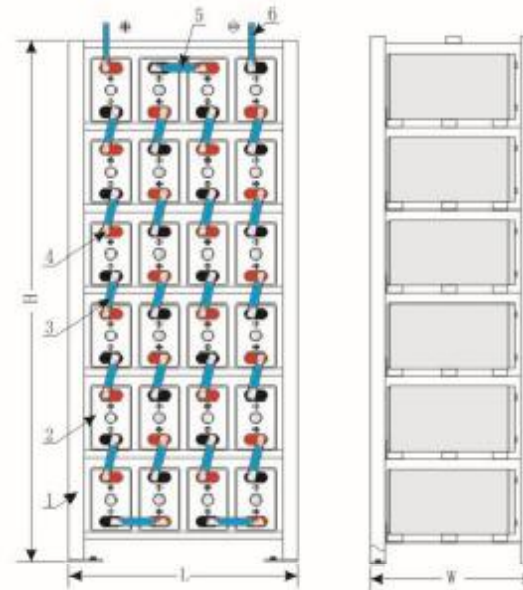
48V 6-Shelf Horizontal Battery Rack

RL2200/RL2300

Note:

- When in installation, please notice the battery positive and negative polarity and place batteries according to the drawing. A space (20mm) should be left between batteries. Make sure the screws are tightened.

- About 15N.m torque.



LIST	
Name	Quantity
1. Rack	1
2. Battery	24
3. Connection Copperplate	20
4. Bolt (M8*16)	48 (set)
5. Connection Copperplate	3
6. Output Wire	2

Battery Rack & Accessory Specification

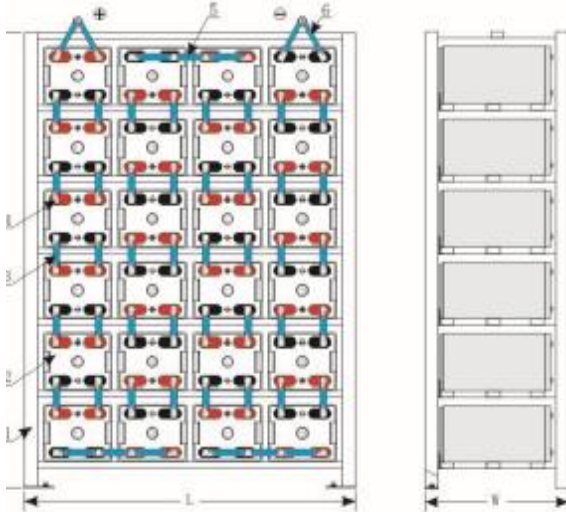
Model	1 Rack(mm)			2 Battery	3 Connection Copperplate	3 Connection Copperplate	4. Output Wire	Battery Ref. WG (kg)	Battery Group Ref. WG (kg)
	L	W	H	(mm)	(mm)	(mm)	(mm ²)		
48V/RL2200	620	440	1400	173*111*365	103*20*3	131*20*3	150*70	14	397
48V/RL2300	776	440	1400	171*150*365	101*20*3	170*20*3	150*70	19	529

18V 6-Shelf Horizontal Battery Rack RL2400/RL2500/RL2600



Note:

- When in installation, please notice the battery positive and negative polarity and place batteries according to the drawing. A space (20mm) should be left between batteries. Make sure the screws are tightened.
- About 15N·m torque.



LIST	
Name	Quantity
1. Rack	1
2. Battery	24
3. Connection Copperplate	40
4. Bolt (M4*6)	96 (set)
5. Connection Copperplate	3
6. Output Wire	4

Battery Rack & Accessory Specification

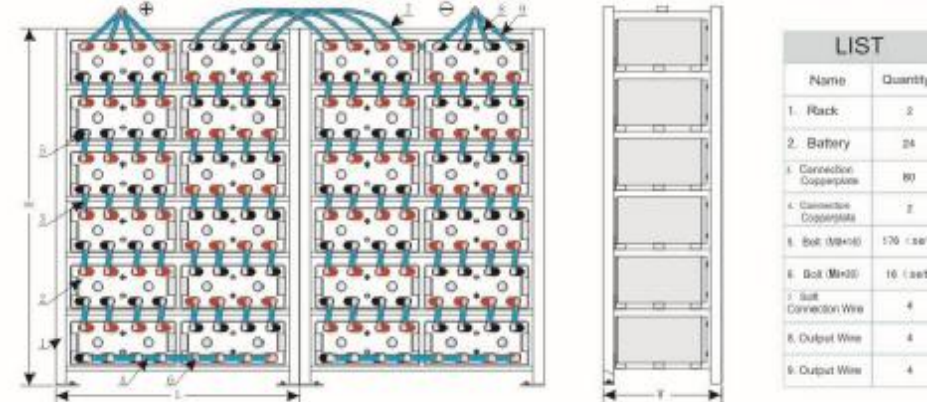
Model	1 Rack(mm)			2 Battery	3 Connection Copperplate	4 Connection Copperplate	5 Output Wire	Battery Ref. WG (kg)	Battery Group Ref. WG (kg)
	L	W	H	(mm)	(mm)	(mm)	(mm ²)		
IV/RL2400	1020	440	1400	211*176*366	102*20*3	362*20*5	200*70	26	708
IV/RL2500	1144	440	1400	242*172*366	102*20*3	394*20*5	200*70	30.5	823
IV/RL2600	1384	440	1400	302*175*366	100*20*3	491*20*5	200*70	37	990

48V 6-Shelf Horizontal Battery Rack RL2800/RL21000



Note:

- When in installation, please notice the battery positive and negative polarity and place batteries according to the drawing. A space (20mm) should be left between batteries. Make sure the screws are tightened.
- About 15N·m torque.



LIST	
Name	Quantity
1. Rack	2
2. Battery	24
3. Connection Copperplate	80
4. Connection Copperplate	2
5. Bolt (M4*6)	170 (set)
6. Bolt (M4*6)	16 (set)
7. Bolt Connection Wire	4
8. Output Wire	4
9. Output Wire	4

Battery Rack & Accessory Specification

Model	1 Rack(mm)			2 Battery	3 Connection Copperplate	4 Connection Copperplate	5 Bolt Connection Wire	6 Output Wire	7 Output Wire	Battery Ref. WG (kg)	Battery Group Ref. WG (kg)
	L	W	H	(mm)	(mm)	(mm)	(mm ²)	(mm ²)	(mm ²)		
48V/RL2800	956	440	1400	410*175*366	102*20*3	732*20*6	800*60	150*70	250*70	50	1364
48V/RL21000	1088	440	1400	475*175*366	101*20*3	845*20*8	850*60	150*70	250*70	62	1664

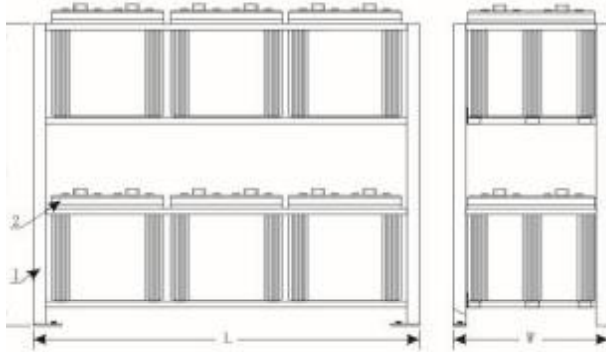
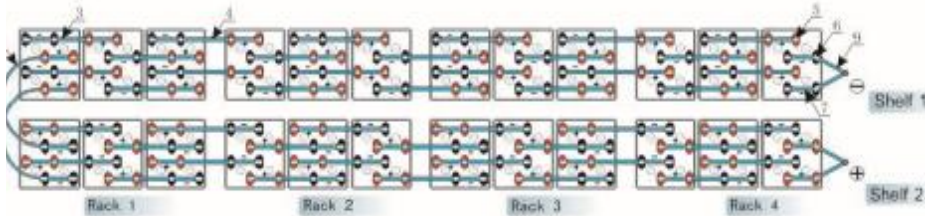
48V 2-Shelf Vertical Battery Rack

RL21500



Note:

- When in installation, please notice the battery positive and negative polarity and place batteries according to the drawing. A space (20mm) should be left between batteries. Make sure the screws are tightened.
- About 19N m torque.



LIST

Name	Quantity
1. Rack	4
2. Battery	24
3. Connection Copperplate	32
4. Connection Copperplate	12
5. Bolt (M8*16)	194 (set)
6. Bolt (M8*20)	8 (set)
7. Connection Copperplate	8
8. Self Connection Wire	2
9. Output Wire	4

Battery Rack & Accessory Specification

Model	1 Rack(mm)			2 Battery	3 Connection Copperplate	4 Connection Copperplate	5 Connection Copperplate	6 Self Connection Wire	7 Output Wire	Battery Ref. WG (kg)	Battery Group Ref. WG (kg)
	L	W	H	(mm)	(mm)	(mm)	(mm ²)	(mm ²)			
48V/RL21500	1206	465	990	401*350*383	538*20*5	635*20*5	168*20*5	1000*70	150*70	96	2495

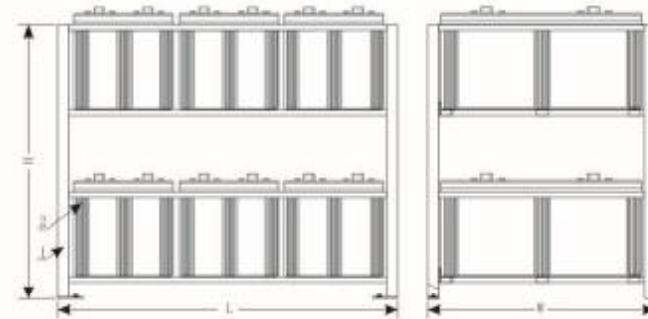
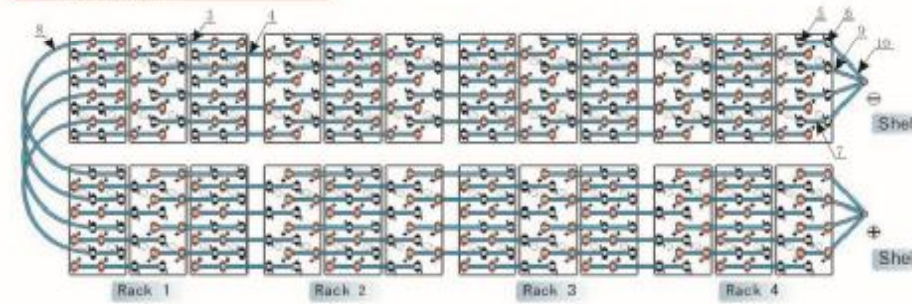
48V 2-Shelf Vertical Battery Rack

RL22000/RL22500/RL23000



Note:

- When in installation, please notice the battery positive and negative polarity and place batteries according to the drawing. A space (20mm) should be left between batteries. Make sure the screws are tightened.
- About 19N m torque.



LIST

Name	Quantity
1. Rack	4
2. Battery	24
3. Connection Copperplate	64
4. Connection Copperplate	24
5. Bolt (M8*16)	388 (set)
6. Bolt (M8*20)	16 (set)
7. Connection Copperplate	16
8. Self Connection Wire	4
9. Output Wire	4
10. Output Wire	4

Battery Rack & Accessory Specification

Model	1 Rack(mm)			2 Battery	3 Connection Copperplate	4 Connection Copperplate	5 Connection Copperplate	6 Self Connection Wire	7 Output Wire	8 Output Wire	Battery Ref. WG (kg)	Battery Gr. Ref. WG (kg)
	L	W	H	(mm)	(mm)	(mm)	(mm ²)	(mm ²)	(mm ²)			
48V/RL22000	1246	618	970	490*350*383	532*20*5	668*20*5	162*20*5	1000*70	150*70	250*70	126.5	3288
48V/RL22500	1255	838	970	712*352*383	543*20*5	680*20*5	170*20*5	1000*70	150*70	300*70	171	4428
48V/RL23000	1255	838	970	712*352*383	543*20*5	680*20*5	170*20*5	1000*70	150*70	300*70	193	4956

4 SLA BATTERY CONSTRUCTION

Figure 1 - Construction of 2V Series

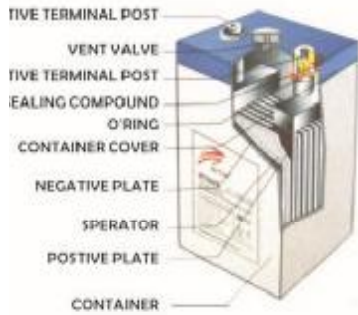


Figure 2 - Construction of 12V Series

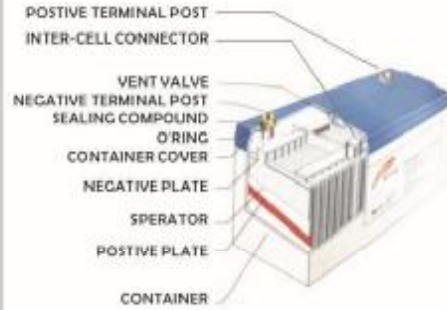
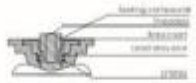


Table: Show the battery parts and special function

Part	Material used	Special Function
Positive and negative plates	Heavy duty anti-corrosive lead-calcium alloy grids pasted with active material	1. Retain high capacity 2. Maintain capacity performance throughout service life 3. Minimize self-discharge
Separator	High density glass fiber	1. Prevents short-circuit between (+) and (-) plates 2. Prevents active material from shedding 3. Retains electrolyte
Vent valve	Synthetic rubber cap	Release gas if internal pressure rises too high; Operate at 0.07-0.43Kgf/cm ²
Electrolyte	Dilute sulphuric acid fully absorbed by plates & separator	Conduct electro-chemical reaction in (+) and (-) plates
Sealing epoxy	Acid-resistant epoxy resin from Japan	1. Sealed construction allow the gas recombination system which transforms the generated gas into water, thus no topping-up is required throughout battery life and is maintenance free 2. Leak-proof from terminal of case 3. Ensure safety
Injection-molded components: Container cover, Top lid	Injection-molded made of ABS plastics resin with UL94HB grade and optionally with UL94V0 grade	1. Provides heat-sealed compartment for 2V cell/gel groups 2. Withstands thermal and mechanical shock 3. Integral handle incorporated into lid for easy lifting
Terminal Construction		1. Threaded insert terminal provides maximum conductivity and enhance high rate of discharge characteristics

15 MATERIAL SAFETY DATA SHEET

Product Identity: Sealed Maintenance Free Lead-Acid Batteries

Hazardous Components

Component	Volume	TLV	LC50	LC50	LC50
Lead (Pb) (PbSO ₄)	67.7%	N/A	Dust	Inhalation	Ingested
Sulfuric Acid	15%	Ingested	LD50 (g/kg)	N/A	N/A
Fiberglass Separator	15%	N/A	N/A	N/A	N/A
ABS	67.7%	N/A	N/A	N/A	N/A
Other plastic safety valve	2%	N/A	N/A	N/A	N/A

Physical Data

Component	Density	Melting Point	Sublimation (g/20)	Color	Appearance
Lead	11.34 g/cm ³	327.4 °C (621°F)	None	None	Silver-Grey Metal
Lead Sulfate	4.89 g/cm ³	1083 °C (2000°F)	4000 g/20 l	None	White Powder
Lead Dioxide	9.49 g/cm ³	397 °C (747°F)	None	None	Brown Powder
Sulfuric Acid	About 1.8	10 °C (50 °F)	100%	Azule	Clear Colorless Liquid
Fiberglass (FR)	2.55 g/cm ³	1100 °C	Slight	None	White Fibrous Glass
ABS	1.04 g/cm ³	220 °C (428 °F)	None	Brown Granules	Plastic

Flammability Data

Component	Flammability	Flash Point	Notes
Lead	None	None	
Sulfuric Acid	None	None	
Hydrogen	None	4% - 75.4%	Sealed batteries can emit hydrogen only if over-charged (float voltage > 48PC)
Fiberglass Sep.	N/A	N/A	
ABS	None	176 °F (80 °C)	Flammable Vapors may be released
(Acrylonitrile-butadiene)	None	50-64 °F (10-15 °C)	In case of fire water will contribute to swelling appearance

First Aid (Sulfuric Acid Precautions)

Skin Contact	Flush with water, use abundance of contact clean large or if clothes form
Eye Contact	Call physician immediately and flush with water until physical relief
Ingestion	Call physician if patient is conscious; flush mouth with water; have patient drink milk or sodium bicarbonate solution

Reactivity Data

Component	Reactivity
Sulfuric Acid	Stable at all temperatures
Stability	Stable at all temperatures
Polymerization	Not polymerizable
Unstable Peroxides	Explosive materials form from organic compounds
Decomposition Products	Sulfur dioxide, hydrogen sulfide, hydrogen
Conditions to Avoid	Prohibit smoking, open flames, heat, sparks, electrical equipment, acid mixing and with other chemicals

Spill or Leak Procedures

Steps to take in case of leak or spill	Wear acid-resistant clothing and eye protection; flush spill with water; contain spill with absorbent material; do not allow spill to reach drains or water supply
Waste Disposal Method	Neutralized acid may be flushed down the drain. Spent batteries must be treated as hazardous waste and disposed of according to local and federal guidelines. A copy of this MSDS must be supplied to any crop dealer or secondary lead smelter with battery.

Protection

Exposure Route	Prevention	Comments
Skin	Rubber gloves, Apron	Protective equipment must be worn if the battery is tracked or otherwise damaged. A respirator should be worn during recharging operations if the SO ₂ is released.
Respiratory	Respirator (for lead)	
Eyes	Safety goggles, Face Shield	

Electrical Safety

Due to the battery's low internal resistance and high power density, high levels of short circuit current can be developed across the battery terminals. Do not rest back or cables on the battery. Use insulated tools only. Follow all installation instructions and diagrams when installing or maintaining battery systems.

Health Hazard Data

Lead	The toxic effects of lead are cumulative and slow to appear. It affects the kidneys, reproductive, and central nervous systems. The symptoms of lead poisoning are anemia, vomiting, headache, stomach pain (lead colic), dizziness, loss of appetite and muscle and joint pain. Exposure to lead from a battery used after correct lead recharging operations through the breathing or ingestion of lead dust/fumes.
Sulfuric Acid	Sulfuric acid is strong corrosive. Contact with acid can cause severe burns on the skin and in eyes. Ingestion of sulfuric acid will cause GI tract burns. Acid can be released if the battery case is damaged or if vents are tampered with.
Fiberglass Separator	Fiberglass glass is an irritant of the upper respiratory tract, skin and eyes. For exposure up to 100% use MSHA certified type III filter. Above 100% use up to 200% use Ultra-Tech type III filter. This product is not considered. Copyright by HDSO USA, Inc.

Technical Manual

RL SERIES VALVE REGULATED LEAD-ACID BATTERY



Address: No10 Orion Cres. Richmond Hill
ON, CANADA. L4C6S5
Tel: 416 897 2784 Fax: 289 597 0861
www.cecpower.ca Info@cecpower.ca



ISO9001



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