



# DC SERIES

AGM Batteries for Deep Cycle service

**Fullriver** Battery

# Product Development...

## A Brief History of Fullriver Battery Mfg. Co., Ltd. Product Development...

**Fullriver Battery Manufacture Co., Ltd.** was founded in **1995** and launched the **HGL series**. The HGL series batteries are mainly for general use purposes, i.e. low power UPS, Security & Alarm Systems, Emergency Lighting, Office machines, etc.

The normal voltages for the HGL series are 6V and 12V; the capacity is ranged from 0.8Ah to 260Ah.

**In 2001**, the **HGXL series** was launched. This series is a 2V stationary maintenance-free battery, designed as high capacity, long life and high power batteries. These are mainly used for high capacity UPS systems, telecommunications and solar battery systems applications. The capacity of this series is ranged from 50 AH to 3000 AH.

**In 2003**, the **HGHL series** was launched. This series performs well in both high rate discharge and float service applications. This series was specially designed for UPS standby power supply. It is also available for other float service applications, such as emergency power supply, communication power supply, etc. the power of this series is ranged from 35W to 910W.

**In 2004**, the **FAT series** and the **DC series** were launched .The **FAT series** also has the characteristics of high rate discharge. They are widely used in UPS systems and telecommunications. The FAT series features front terminal connections for fast and easy installation and maintenance. The monobloc's compact design is suitable for 19", 23"and ETSI racking. The capacity of FAT series is ranged from 55Ah to 175Ah.

The **DC series** is specially designed and used for deep cycle applications, which may require many more cycles. This series also has excellent recovery from deep discharge. The DC series is mainly used in golf trolley, golf caddy, forklift, electric wheelchairs, floor cleaning machines, marine, photovoltaic systems, and more.

**In 2008**, we started research, development, and manufacturing of the **HC series**. This series is especially used for engine starting, which requires superior cranking performance at lower temperatures, for high current discharge. These batteries can also be fitted with the protective steel case and TP brass terminals.

**In 2010**, the **FSG series** was launched, which use revolutionary Super GEL long life plate technology and are designed specifically for solar energy and wind energy applications. The designed life is 20 years in float service at 20 °C. The batteries can be used in a wide operating temperature range from -20°C to 50°C.

### Fullriver Batteries Qualifications, Approvals, and Certifications



- **Network Access License for Telecommunications Equipment**  
(Ministry of information Industry.PRC)
- **DOT 49CFR173.159 (d) (i) and (ii)** (Non-hazardous shipping)
- **IEC 61056-1; 2004** (General purpose lead-acid batteries, valve regulated types)
- **IEC 60896-2: 2004** (Stationary lead-acid batteries, valve regulated types)
- **JIS C8704-2: 2006** (Stationary lead-acid batteries, valve regulated types)
- **JIS C8702-1: 2003** (Small-sized valve regulated lead-acid batteries)



## Key Features

- New High-Density Active Paste Material
- Heavy Duty Thick Grids
- Special Lead-Calcium Alloy Grids
- Tank Formation Activation of Plates
- 10 Day Curing Chamber Process
- Unique Low Resistance Micro-porous Glass Fiber Separators
- Maintenance Free, Spill-Proof/Leak Proof
- Self Regulating Pressure Relief Valves
- Low Self Discharge Rate, Only 3% per month
- Faster Recharging Times
- Excellent Recovery from Deep Discharge

## Benefits

- More Capacity and Longer Cycle Life
- Provides True Deep Cycle Performance
- Superior Corrosion Resistance
- Guarantees Fully Formed Voltage Matched Plates
- Ensures Bonding of Active Material Paste to Plates Resulting in Longer Life
- Enhanced Electrolyte Retention
- DOT,IATA,ICAO,IMDG Approved as Safe for Air & Sea Transportation
- Sure and Safe Operation of Batteries
- Longer Shelf Life , Easy to Inventory
- Hours Less than Flooded Batteries
- Recognized around the world for Quality

## Construction

- Positive and negative plates in lead-tin-calcium alloy
- Separators in low resistance micro-porous glass fiber. The electrolyte is absorbed within this material, preventing acid spill in case of accidental damage
- Case and lid in ABS material, highly resistant to shock and vibration
- Terminal with brass insert for maximum conductivity and with high compression grommet for long life
- Self-regulating pressure relief valve prevents ingress of atmospheric oxygen
- Can be choose to fitted with TP brass automotive terminal

# Applications

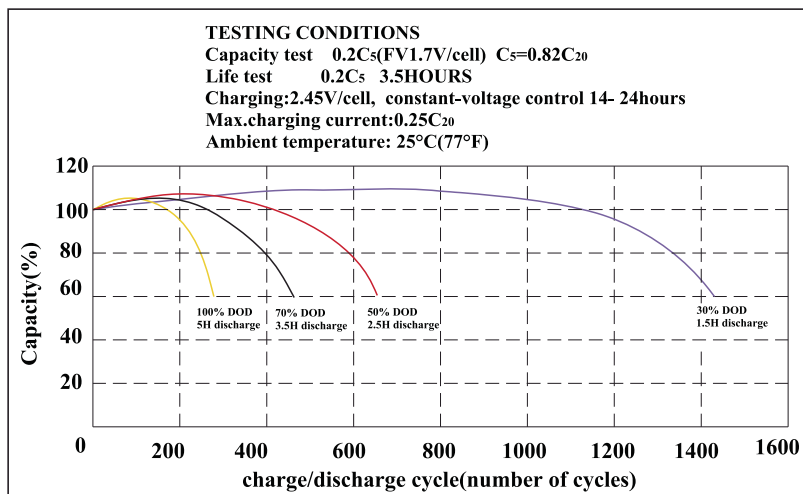
- Renewable Energy Systems
- Golf and Utility Vehicles
- Floor Machines
- Aerial Work Platforms
- Recreational Vehicles
- Medical Mobility
- Neighborhood Electric Vehicles
- Marine Vessels



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DC

## Cycle Life Vs. DOD



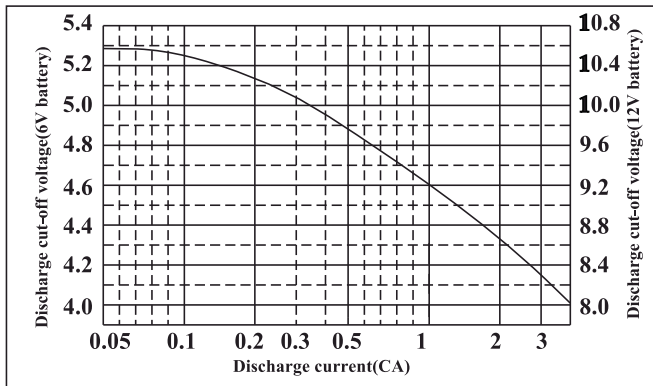
# Characteristics

## Discharge current and discharge cut-off voltage

Recommended cut-off voltages for 6V, 8V and 12V batteries consistent with discharge rates are given in the figure below. With smaller discharge currents, the active materials in the battery work effectively, therefore discharge cut-off voltages are set to the higher side for controlling overdischarge. For larger discharge currents, on the contrary, cut-off voltages are set to the lower side.

(Note) Discharge cut-off voltages given are recommended values.

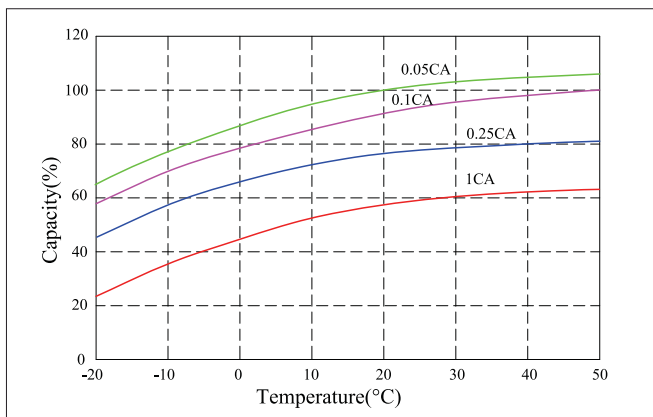
## Discharge Current Vs. Cut of Voltage



## Effect of temperature on discharge characteristics

Available discharge capacity of the battery varies with ambient temperature and discharge current as shown in the figure below.

## Discharge Capacity by temperature and by discharge current

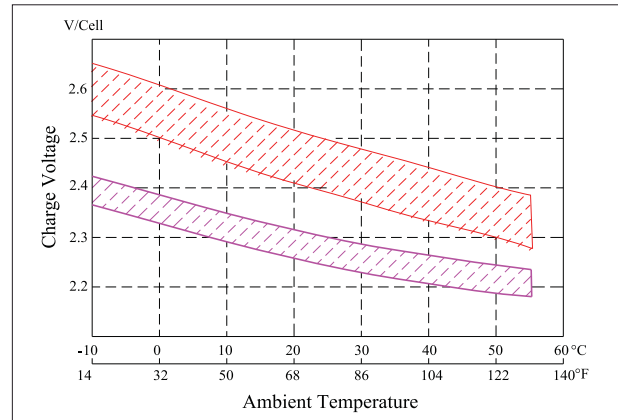


## Temperature conditions

Recommended temperature ranges for charging, discharging and storing the battery are tabulated below.

Charge	32°F (0°C) ~ 104°F (40°C)
Discharge	5°F (-15°C) ~ 122°F (50°C)
Storage	5°F (-15°C) ~ 104°F (40°C)

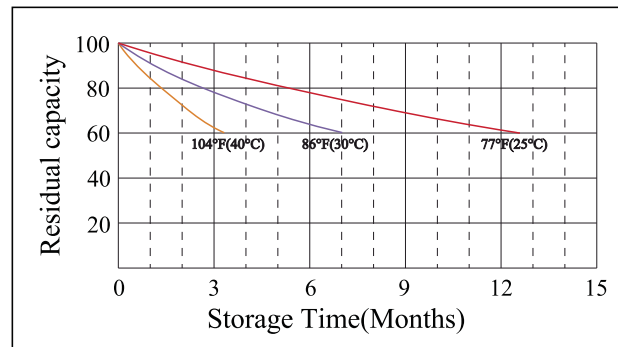
## Charge Voltage Vs. Temperature



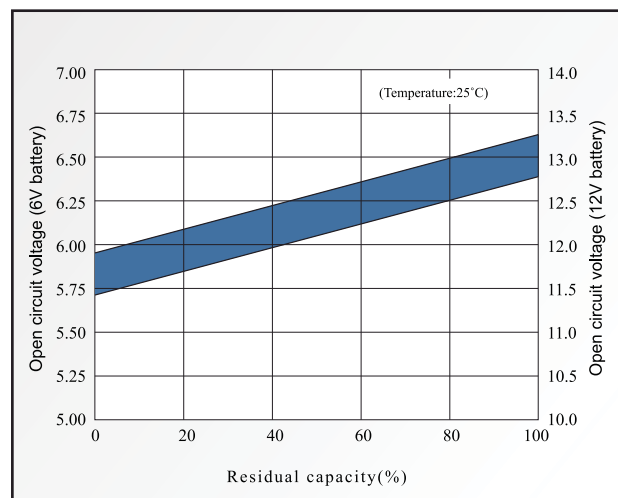
## Residual capacity after storage

The result of testing the residual capacity of the battery which after fully charged, has been left standing in the open-circuit state for a specific period at a specific ambient temperature is shown in the figure below. The self discharge rate is very much dependent on the ambient temperature of storage. The higher the ambient temperature, the less the residual capacity after storage for a specific period. The self discharge rate almost double by each 50°F (10°C) rise of storage temperature.

## Residual capacity test result



## Open circuit voltage vs. Residual capacity 77°F (25°C)



# DC Battery Specifications

Fullriver Type	BCI Group Size	Trojan Type	CAPACITY Amp-Hours (AH)				Reserve Capacity Minutes		Cranking Performance		Dimension mm (inch)				Weight (Approx.) kg(lbs)	Terminal Type	Pallet QTY
			5HR Rate	20HR Rate	72HR Rate	100HR Rate	@25 Amps	@75 Amps	CCA @0°F	CA @32°F	Length	Width	Height	Total Height			
<b>6V DEEP CYCLE BATTERY</b>																	
DC200-6	N/A	N/A	165	200	214	220	400	100	/	/	306 (12.05)	169 (6.65)	220 (8.66)	226 (8.90)	30.00 (66.14)	M8	36
DC220-6	N/A	N/A	180	220	235	242	425	112	/	/	306 (12.05)	174 (6.85)	220 (8.66)	226 (8.90)	32.70 (72.09)	M8	36
DC224-6A	GC2	T-105	179	224	240	246	441	113	/	/	260 (10.24)	180 (7.09)	245 (9.65)	251 (9.88)	29.8 (65.70)	M8	42
DC224-6B	GC2	T-105	179	224	240	246	441	113	/	/	260 (10.24)	180 (7.09)	263 (10.35)	263 (10.35)	29.9 (65.92)	M8	42
DC245-6	N/A	(DIN)	198	245	262	268	457	120	/	/	244 (9.61)	190 (7.48)	275 (10.83)	275 (10.83)	32.30 (71.21)	AP	30
DC250-6	GC2	T-125	204	250	268	275	531	135	/	/	262 (10.31)	181 (7.13)	266 (10.47)	272 (10.71)	34.50 (76.06)	M8	28
DC335-6	902	J305	274	335	358	369	751	184	/	/	295 (11.61)	178 (7.01)	346 (13.62)	366 (14.41)	47.80 (105.38)	DT	22
DC400-6	903	L16P	340	415	428	440	885	229	/	/	295 (11.61)	178 (7.01)	404 (15.91)	424 (16.69)	56.00 (123.46)	DT	22
<b>8V DEEP CYCLE BATTERY</b>																	
DC160-8A	GC8	T-860	131	160	171	176	315	112@56 Amps	/	/	260 (10.24)	182 (7.17)	268 (10.55)	272 (10.71)	31.7 (69.89)	M8	28
DC160-8B	GC8	T-860	131	160	171	176	315	112@56 Amps	/	/	260 (10.24)	182 (7.17)	288 (11.34)	288 (11.34)	31.8 (70.11)	M8	28
DC180-8A	GC8	T-875	148	180	193	198	335	125@56 Amps	/	/	260 (10.24)	182 (7.17)	268 (10.55)	272 (10.71)	36.6 (80.69)	M8	28
DC180-8B	GC8	T-875	148	180	193	198	335	125@56 Amps	/	/	260 (10.24)	182 (7.17)	288 (11.34)	288 (11.34)	36.7 (80.91)	M8	28
DC200-8	GC8H	T-890	165	200	212	218	390	140@56 Amps	/	/	260 (10.24)	182 (7.17)	295 (11.61)	299 (11.77)	40.00 (88.18)	M8	28
<b>12V DEEP CYCLE BATTERY</b>																	
DC7-12	N/A	N/A	/	7	/	/	/	/	/	/	151 (5.94)	65 (2.56)	95 (3.74)	101 (3.98)	2.73 (6.02)	F1	420
DC10-12	N/A	N/A	/	10	/	/	/	/	/	/	151 (5.94)	65 (2.56)	111 (4.73)	117 (4.61)	3.30 (7.28)	F1	336
DC12-12	N/A	N/A	/	12	/	/	/	/	/	/	151 (5.94)	99 (3.90)	95 (3.74)	101 (3.98)	4.20 (9.26)	F1	264
DC17-12	N/A	N/A	/	17	/	/	/	/	120	148	181 (7.13)	77 (3.03)	167 (6.57)	167 (6.57)	6.22 (13.71)	M5	192
DC20-12	N/A	N/A	16.5	20	/	/	/	/	135	165	181 (7.13)	77 (3.03)	167 (6.57)	167 (6.57)	6.44 (14.20)	M5	192
DC24-12	N/A	N/A	19.8	24	26	26	27	/	160	195	167 (6.57)	175 (6.89)	125 (4.92)	125 (4.92)	9.2 (20.28)	M5	120
DC26-12	N/A	N/A	21.3	26	28	29	30	/	165	200	165 (6.50)	176 (6.93)	125 (4.92)	125 (4.92)	9.8 (21.61)	M6	120
DC35-12A	U1	N/A	29	35	37	38.5	52	/	190	230	196 (7.72)	131 (5.16)	155 (6.10)	167 (6.57)	11.5 (25.35)	M6	108
DC35-12B	U1	N/A	29	35	37	38.5	52	/	190	230	196 (7.72)	131 (5.16)	167 (6.57)	180 (7.09)	11.5 (25.35)	F25	108
DC38-12	U1L	N/A	31	38	41	42	52	/	265	315	198 (7.80)	166 (6.54)	174 (6.85)	174 (6.85)	13.3 (29.32)	M6	96
DC40-12	U1L	N/A	32.8	40	43	44	53	/	275	320	198 (7.80)	166 (6.54)	174 (6.85)	174 (6.85)	13.4 (29.54)	M6	96
DC55-12	22NF	N/A	45	55	59	61	96	21	400	480	229 (9.02)	138 (5.43)	208 (8.19)	212 (8.35)	17.6 (38.8)	M6	63
DC60-12	48	N/A	49.2	60	64	66	95	24	410	485	265 (10.43)	166 (6.54)	188 (7.40)	188 (7.40)	20.7 (45.64)	AP	45
DC65-12	93	N/A	53.3	65	70	72	100	28	430	510	351 (13.82)	167 (6.57)	176 (6.93)	176 (6.93)	23.6 (52.03)	M6	48
DC70-12	24	24TMX	57.5	70	75	77	115	31	450	540	260 (10.24)	169 (6.65)	211 (8.31)	215 (8.46)	23.8 (52.47)	M6	48
DC85-12	24	24TMX	70	85	91	94	148	34	510	600	260 (10.24)	169 (6.65)	211 (8.31)	215 (8.46)	25.10 (55.34)	M6	48
DC90-12	27	27TMX	74	90	96	99	140	38	530	630	307 (12.09)	169 (6.65)	211 (8.31)	215 (8.46)	28.7 (63.27)	M6	36
DC105-12	27	27TMX	86	105	112	116	170	40	550	660	307 (12.09)	169 (6.65)	211 (8.31)	215 (8.46)	30.20 (66.58)	M6	36
DC115-12A	31	31XHS	91	115	123	127	175	43	600	710	328 (12.91)	172 (6.77)	214 (8.43)	220 (8.66)	32.7 (72.09)	M8	36

# DC Battery Specifications

Fullriver Type	BCI Group Size	Trojan Type	Capacity				Amp-Hours (AH)		Reserve Capacity Minutes		Cranking Performance		Dimension mm (inch)				Weight (Approx.)	Terminal Type	Pallet QTY
			5HR Rate	20HR Rate	72HR Rate	100HR Rate	@25 Amps	@75 Amps	CCA @0°F	CA @32°F	Length	Width	Height	Total Height	kg(lbs)				
DC115-12B	31	31XHS	91	115	123	127	175	43	605	720	331 (13.03)	175 (6.89)	214 (8.43)	218 (8.58)	32.9 (72.53)	M8	36		
DC120-12A	N/A	N/A	98	120	128	132	223	52	750	900	407 (16.02)	174 (6.85)	210 (8.27)	240 (9.45)	38.2 (84.22)	M8	27		
DC120-12B	31	31XHS	98	120	128	132	230	54	760	910	331 (13.03)	175 (6.89)	214 (8.43)	218 (8.58)	36.5 (80.47)	M8	36		
DC140-12	N/A	(DIN)	115	140	149	154	260	62	795	950	344 (13.54)	172 (6.77)	280 (11.02)	283 (11.14)	43.1 (95.02)	AP	24		
DC145-12	N/A	5SHP	122	145	155	160	279	86	820	975	341 (13.43)	173 (6.81)	281 (11.06)	287 (11.30)	44.3 (97.66)	M8	24		
DC150-12	N/A	N/A	123	150	161	165	285	82	900	1070	484 (19.06)	171 (6.73)	241 (9.49)	241 (9.49)	45.5 (100.31)	M8	24		
DC180-12	4D	N/A	147.5	180	193	198	350	85	/	/	530 (20.87)	209 (8.23)	214 (8.43)	218 (8.58)	56.8 (125.22)	M8	21		
DC210-12	4D	N/A	172	210	224	229	400	105	/	/	530 (20.87)	209 (8.23)	214 (8.43)	218 (8.58)	60.5 (133.38)	M8	21		
DC215-12	921	J185	172	215	228	234	420	110	/	/	381 (15.00)	178 (7.01)	351 (13.82)	371 (14.61)	60 (132.28)	DT	20		
DC220-12	4D	N/A	172	220	233	240	415	110	/	/	522 (20.55)	242 (9.53)	218 (8.58)	222 (8.74)	66.5 (146.61)	M8	18		
DC240-12	8D	N/A	197	240	257	262	520	135	/	/	520 (20.47)	269 (10.59)	204 (8.03)	208 (8.19)	75.2 (165.79)	M8	12		
DC260-12	8D	EV8D-2	213	260	278	285	578	145	/	/	521 (20.51)	269 (10.59)	220 (8.66)	224 (8.82)	78.2 (172.40)	M8	12		

- A. The amount of amp-hours (AH) a battery can deliver when discharged at a constant rate at 80°F (27°C) for the 20 Hr 72Hr and 100 Hr rates and 86°F (30°C) for the 5-Hr rate and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.
- B. RC(Reserve Capacity)- the number of minutes a battery can be discharged at 25 or 75 amps at 27°C(80°F) and maintain a voltage above 1.75 V/cell.
- C. CCA(Cold Cranking Amps) - the discharge load in amperes which a new, fully charged battery can maintained for 30 seconds at 0°F (-17.8°C)at a voltage above 1.2V/cell.
- D. CA(Cranking Amps) - the discharge load in amperes which a new, fully charged battery can maintained for 30 seconds at 32°F (0°C)at a voltage above 1.2V/cell.
- E. Terminal type –Please see our terminal configurations

## Terminal Configurations



M Receptacle Terminal  
(M5, M6 or M8)



Faston Tab 250&187  
F2&F1



AP&Stud Terminal  
(DT)



F Terminal  
(F7&F25)



Automotive Post  
(AP)



Marine Dual Terminal  
(APW)

# Battery Accessories



TP01 (TP02)  
M8 (M6) -AP Terminal



TP04 (TP05)  
M8 (M6) -A01 Terminal



TP07 (TP08)  
M6 (M8) -A01 Terminal  
with knuring



Cross belt  
For DC35-12B, DC17-12&DC20-12



Adapter for DC24-12



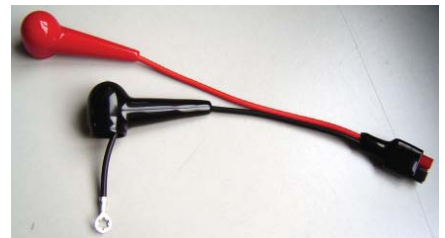
Battery bag  
For DC35-12B, DC17-12&DC20-12



Adapter for DC26-12B



Adapter for DC35-12B



JSTE Cables for DC17-12 & DC20-12



LP100 Terminal Cover



AP400 Terminal Cover



VP100 Terminal Cover



# Charging Instructions

To maximize the life of your Fullriver battery, it is important that it is properly charged. As with all lead-acid batteries, both over- and under-charging a Fullriver battery will result in shortened service life. **The best protection from improper charging is the use of a quality charger and routinely checking that the charger current and voltage settings are maintained.**

Please read the following instructions before using your battery.

## Charger Inspection

The charger cabling should be insulated and free of breaks or cuts. The cable connectors should be clean and properly mate with the battery terminals to ensure a snug connection. The charger's AC cord should be free of breaks or cuts and the wall plug should be clean.

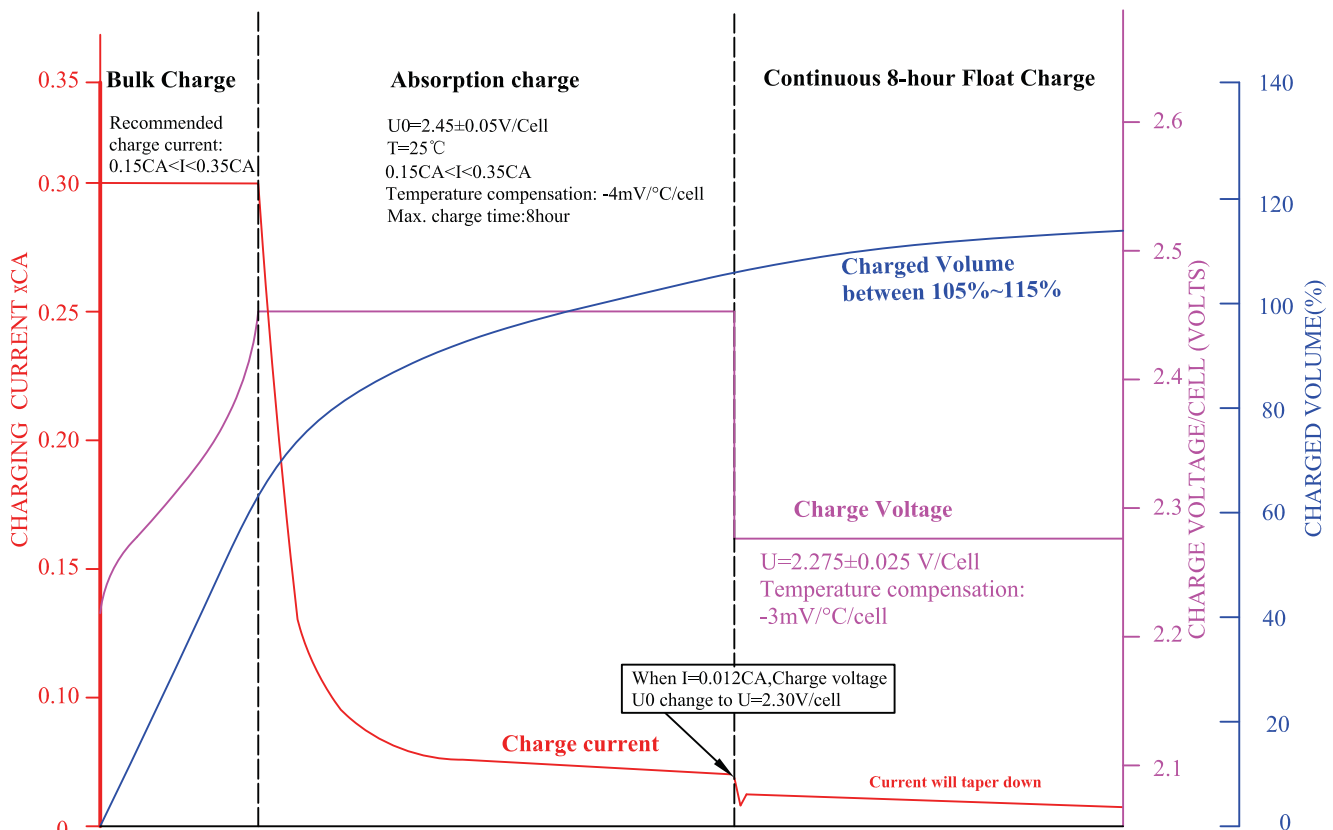
## Charging Guidelines

- Fully charge batteries after each use.
- Charge in a ventilated area as gasses may be released through the pressure relief valve if the batteries are excessively over-charged.
- Never charge a frozen battery.
- Ideal charging temperatures: 32°F-104°F (0°C-40°C).

## Charging Characteristics

If the charger has a setting for AGM, use this setting to charge your Fullriver battery. **To maximize your battery life a voltage regulated charger with temperature compensation is strongly recommended.** See Figure 1 for the recommended voltage regulated charge profile.

### Voltage Regulated Charger-IUU



The initial charge current is recommended to be set at  $I = 0.25 \times C$  ( $I_{max} = 0.35 \times C$ ) in order to fully charge the batteries within a reasonable amount of time. It can be set lower, however please be aware that charge time will increase so make sure the batteries have enough time to fully charge before being put back into service. Fullriver batteries have a low internal resistance allowing them to be charged at a higher current, therefore faster, than conventional flooded/wet batteries.

**Bulk stage** - Set the charger to the initial current  $I$  until the maximum voltage  $U_0$  is reached.

**Absorption stage** - Set the charger to the maximum voltage  $U_0$  until the current tapers to  $I$ .

**Float stage and termination** – Set the charger to the float voltage  $U$  indefinitely or until the charger is shut off or unplugged. This stage is ideal to maintain battery state of charge.

Make sure the temperature compensation is programmed as specified in Figure 1 ( $-4\text{mV}/^\circ\text{C}/\text{cell}$  or  $-2\text{mV}/^\circ\text{F}/\text{cell}$ ) or manually adjust the voltage setting for temperatures varying from  $25^\circ\text{C}$  ( $77^\circ\text{F}$ ). As the temperature decreases, the voltage should be increased and as the temperature increases the voltage should be decreased.

The profile in Figure 1 can be used with or without the float stage. Without the float stage, recharge can be terminated based on time (this will need to be determined as it will vary with depth of discharge and charge current) or percentage recharge ( $\sim 105\%$ - $115\%$ ).

### Charge Voltage Quick Reference

12V Battery	32°F (0°C)	50°F (10°C)	68°F (20°C)	77°F (25°C)	86°F (30°C)	104°F (40°C)
Charge Voltage	15.30	15.06	14.82	14.70	14.58	14.34
Float Voltage	14.25	14.01	13.77	13.65	13.53	13.29

For a 6V battery divide the voltage by 2.

### Refresh Charge

If Fullriver batteries are properly charged they should never require an equalizing charge. If they were not properly charged and there is a decrease in capacity, recharge the batteries and make sure they complete the entire charge cycle. If the batteries are stored for extended periods of time, recharge them as follows:

Storage Temperature	Refresh Charge Interval
Below 68°F (20°C)	9 Months
68°F (20°C) - 86°F (30°C)	6 Months
Higher than 86°F (30°C)	3 Months

### Other Chargers

There are many types of chargers and inverters available for charging lead-acid batteries. If you are not sure if your charger meets the recommended charging characteristics or if you need help programming your charger, please contact your local Fullriver Battery distributor for assistance.

# How to Increase System Power

Now you must decide which batteries to use and how many to provide the system voltage and energy you need to power your equipment. Keep in mind that the size of your battery compartment may limit your options.

## System Voltage

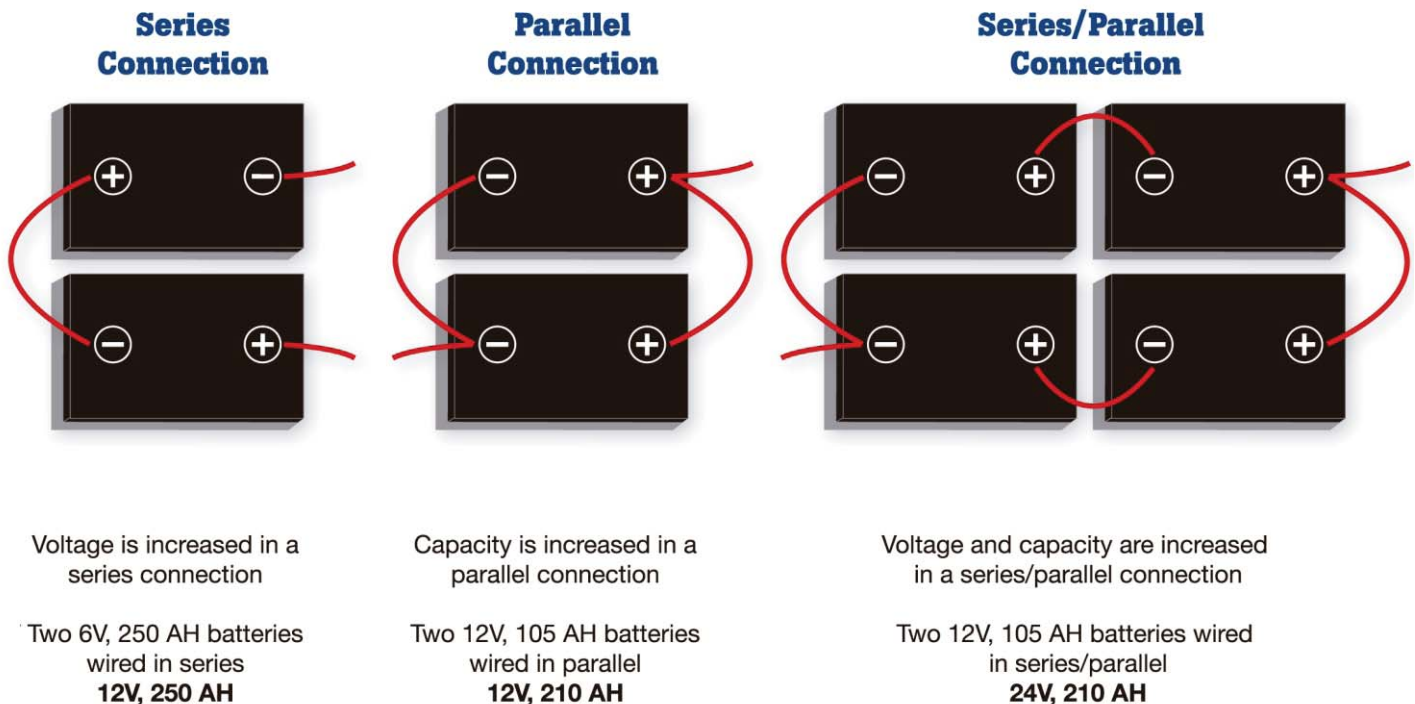
There may be more than one option to meet your voltage requirements. For example, for a 12 Volt system you may use one 12 Volt battery or two 6 Volt batteries wired in series to make up the 12 Volts. You may use as many batteries as you need to make up the system voltage. See the **Series Connection** diagram below.

## Energy Requirements

There may be more than one option to meet your energy requirements. For example, to meet the requirements for a 210 Amp-Hour system you may use one 210 Amp-Hour battery or two 105 Amp-Hour batteries wired in parallel to make up the 210 Amp-Hours. It is advised not to exceed 3 parallel strings in your battery system. See the **Parallel Connection** diagram below.

You may also wire batteries in both series and parallel to attain the desired system voltage and energy requirements. See the **Series/Parallel Connection** diagram below.

Always use the exact same battery model within a battery pack. Do not mix batteries of different capacities.



Note: Leave some space between batteries for airflow and minor battery expansion.

# Test Procedure to Detect Failed Battery

## Preparation for Testing

1. Check that battery cables are in good condition. Replace any damaged or broken cables.
2. Check that all terminal connections are tightened to the proper torque specification.
3. Fully charge the batteries.
4. Let batteries rest for at least 8 hours once the charge is complete.

## Open Circuit Voltage Test

1. Check and record open circuit voltages of each battery.
2. If all the batteries are below 6V (6V battery), 8V (8V battery) or 12V (12V battery), check charger for proper output current and voltage and charge the batteries again with another charger to make sure they are being properly charged.
3. Let batteries rest for at least 8 hours once the charge is complete.
4. Check and record open circuit voltages on each battery.
5. If all the batteries are still below 6V (6V battery), 8V (8V battery) or 12V (12V battery) the set is failed. Replace the entire set of batteries. In this situation the battery set had either provided all its available energy or was severely abused. This would not be covered under warranty unless a manufacturing defect was found in that production run.
6. If all the batteries are above 6V (6V battery), 8V (8V battery) or 12V (12V battery), any battery that is 0.25V lower than the highest battery voltage (6V battery), 0.35V lower than the highest battery voltage (8V battery) or 0.5V lower than the highest battery voltage (12V battery) might have failed. Make note of these batteries.

## Discharge Test

1. Run a discharge test.
2. Record minutes (runtime) when discharge is complete  
Correct runtime minutes for temperature using the following formula:  
(Valid between 24°C (75°F) and 32°C (90°F))  
$$Mc = Mr [1 - 0.009 (T - 27)]$$
 where Mc is the corrected minutes, Mr is the minutes recorded and T is the temperature at the end of discharge in °C
3. If the set runs more than 50% of its rated capacity, the set is considered good and testing is complete.
4. If the set runs less than 50% of its rated capacity, replace the batteries that were noted in Step 6 of the Open Circuit Voltage Test to be low compared to the battery with the highest voltage in the set.

## Replacement Instructions

1. Replace failed batteries with good batteries in another piece of equipment that are around the same age. Try to avoid mixing new batteries in equipment with old batteries.
2. Put all new batteries in the same equipment.

Note: All batteries in a good set should be above 6.4V (6V battery), 8.5V (8V battery) and 12.7V (12V battery) when fully charged after at least 8 hours of rest.



## **Why Fullriver Battery?** *We have the answer...*

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At Fullriver Battery we care about meeting our customer's needs. That means we have to provide you with the best battery for your application. Let's tell you how we do that.

Many manufacturers offer several battery technologies but specialize in none. Fullriver Battery specializes in manufacturing only sealed, maintenance-free batteries. Also, many manufacturers of conventional wet batteries do not actually produce their sealed products but rather source from another manufacturer. Fullriver manufactures the entire battery from grid casting through final assembly. This means we control the entire manufacturing process to ensure that we consistently produce to our design specifications. Our batteries are designed to provide a number of essential benefits and we use the highest quality raw materials to make sure we succeed. There is no compromise with Fullriver Battery.

### **Fullriver Battery provides the Benefits that you need and deserve.**

**High Capacity Cycling** – Designed to provide the runtime you need every time you use your equipment

**High Capacity Starting** – Our HC line is designed with the power to start any size engine

**Deep Discharge Recovery** – Optimum grid alloys for deep discharge recovery

**Long Life** – Engineered and manufactured for long life in deep cycling applications

**Durable** – Shock and vibration resistance with design features such as over-the-partition inter-cell welds

**High Quality Product** – Manufactured with the highest quality raw materials including de-ionized water

**Fast Recharge** – Low internal resistance allows for high rate charge currents compared to wet or gel batteries

**Easy Installation** – Most batteries are equipped with carrying handles for safe and easy placement

**Easy Connection** – Most batteries are equipped with terminal options for AP or Stud type connections

**Superior Conductivity** – Brass terminals provide superior conductivity and corrosion resistance

**Safe Operation** – UL recognized pressure relief valves to keep oxygen contamination out and safely release gas if over-charged.

**Long Shelf Life** – Only 1% self discharge per month

**Large Product Portfolio:** Deep Cycle and Starting/Dual Purpose lines available in all the industry standard sizes and capacities – we have the battery for your application

**High Standard Quality Assurance Processes** – ISO9001 Certification

**Maintenance-Free** – Valve Regulated Lead-Acid sealed construction does not require addition of water

**NON-SPILLABLE** – Can operate upright or on its side

**Non-Hazardous** – Can be used near sensitive equipment and in proximity of people

**Transportable** - Certified safe for land, sea or air transport by DOT, IATA, IMDG, ICAO

**Environmentally Friendly** – Non-Hazardous and Recyclable – Your Clean-Green Energy Solution

**Outstanding customer service from Fullriver Battery Company and our World-Wide Distributors**

## The Truth about Wet batteries and why Fullriver AGM batteries are your best choice

Wet battery manufacturers claim that wet batteries provide more cycle life than sealed batteries. However, the two leading causes of premature battery failure in conventional wet batteries are improper watering (either over- or under- watering) and improper charging (either over- or under-charging). Wet batteries often have a lower price tag which is enticing; it's the hidden costs that will surprise you. Wet batteries require regular maintenance. They need to be watered every 2-4 weeks depending on usage. Each cell needs water so if you have a 48 Volt system you will have 24 cells to water. If you have an entire fleet of vehicles, the maintenance can be very time consuming. For example for a fleet of 50 golf cars you would have to water 1200 cells. Not only do you have a big job to do, but you have to do it perfectly. Even one incident of over- or under-watering your wet battery can significantly reduce its capacity and life. Why take the chance with your investment.

Wet batteries release acid mist onto the top of the batteries and the environment. This acid residue not only corrodes the battery terminals, which can lead to loose connections and ultimately terminal melting, but can also corrode the battery compartment, vehicle chassis and even the floor. Without regularly cleaning the connections and the battery compartment, the cables will eventually need replacing and there may be very high damage repair costs. If you do a great job cleaning, you can save on cable replacements and damage repair costs but of course you have increased that unavoidable maintenance cost. It seems that no matter how you approach this issue, owning wet batteries is a costly investment.

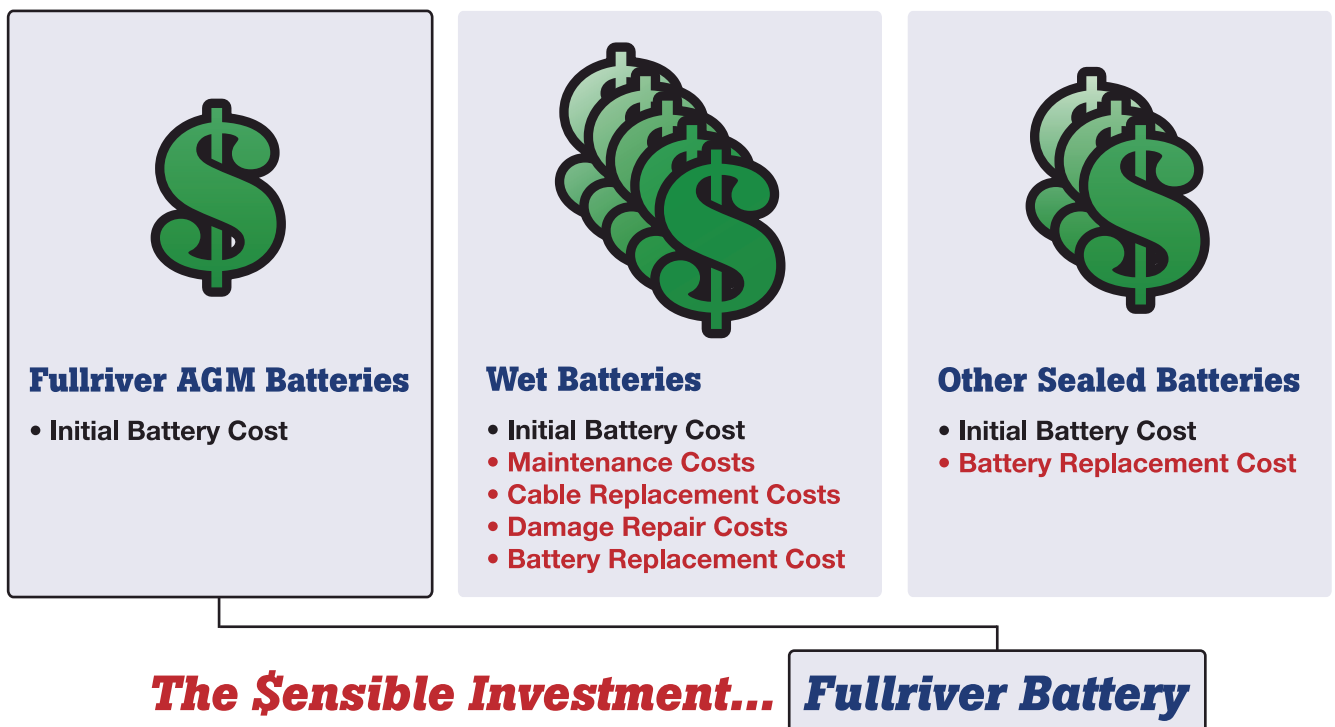
Unless wet batteries are maintained perfectly, they will fail prematurely and need replacing long before a Fullriver AGM battery.

### Other Sealed Batteries

Well they just aren't made the same, so they will definitely need replacing long before a Fullriver AGM battery. At Fullriver we use the highest quality materials and adhere to the highest quality production standards to ensure every battery performs to its specification. Fullriver batteries are designed and manufactured to outlast the competition.

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# Fullriver Battery is Your Clean-Green Energy Solution

At Fullriver Battery we are committed to providing you energy while protecting the environment.

## Our Products

Fullriver Battery produces sealed, maintenance-free batteries that are non-hazardous and non-spillable and are made from ~80% recycled materials. During normal operation our batteries will not release any harmful gasses and will not leak any acidic electrolyte into the environment.

Fullriver batteries are classified as safe for air, sea and ground transportation as they meet the requirements of: the International Air Transport Association (IATA), the International Civil Aviation Organization (ICAO), the International Maritime Dangerous Goods (IMDG) and the Department of Transportation (DOT).

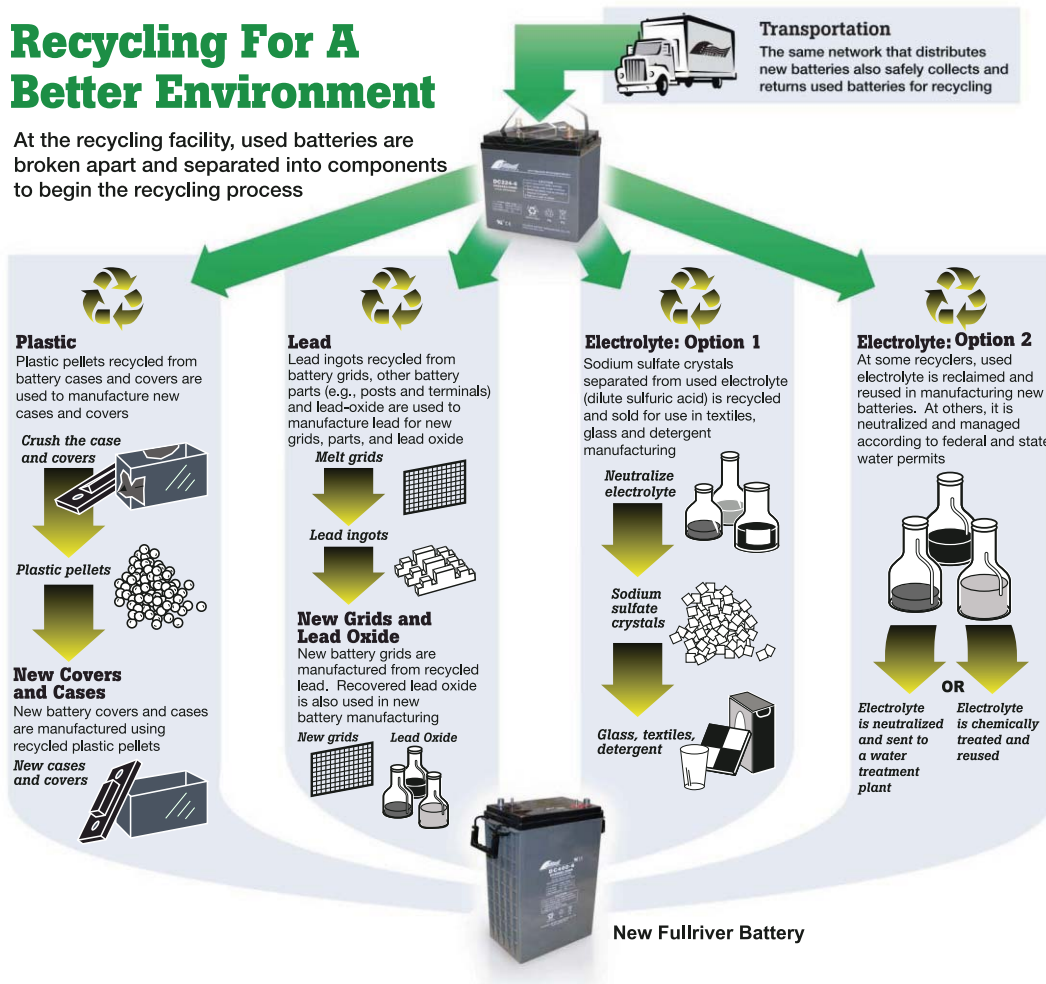
More than 98% of the lead in batteries is recycled, placing lead-acid batteries at the top of the list of the most highly recycled consumer product. The recycling loop of a lead-acid battery goes on indefinitely. See Recycling Diagram below.

## Our Manufacturing

Fullriver Battery manufactures batteries in accordance with international environmental regulations. We continually improve our processes in order to minimize waste, recycle all waste that is recyclable and discard waste that is not recyclable in accordance with local disposal regulations. We strictly enforce the use of proper ventilation and protective gear to minimize exposure of lead to our employees well below the suggested levels.

## Recycling For A Better Environment

At the recycling facility, used batteries are broken apart and separated into components to begin the recycling process



[www.fullriver.com](http://www.fullriver.com)



[HTTP://WWW.FULLRIVER.COM](http://www.fullriver.com)



FULLRIVER BATTERY MANUFACTURE CO.,LTD.