FORKLIFT BATTERIES

THINGS YOU NEED TO KNOW BEFORE YOU BUY

TOYOTA MATERIAL HANDLING PENNWEST

Forklift Battery Charging Methods

The Discovery Process

Before you buy consider

- **The age of your forklift, is the forklift operating correctly?**
- **Why did the battery Fail: Age, Poor Quality, Lack of Maintenance?**
- **Does your forklift still meet your needs or have they changed?**
- **The Battery Charger: Is it sized correct, is it operating correctly?**
- **If your battery has poor performance and is less than 5 years old then one or several of the above will apply to your situation**
- **Think long term 5 years out.**
- **Consider Pennwest, We want you to keep your battery performing well And we can help you with a solution.**

Forklift Battery Charging Methods

Forklift charging methods are always being improved. Blossoming technologies in both batteries and chargers give us the opportunity to tailor charging techniques to suit regular day to day operations and also fluctuations. Businesses need to evaluate their fleet and the power usage that drives it. Do you have enough power or do you have too much power and is it managed correctly?

There are several questions. Single shift, or round the clock operations. Peak operating periods and periods of lower activity.

Conventional charging… Fast charging… Opportunity charging… What do they all mean? What is the difference? Does it really matter which battery charging method you choose?

Don't sweat it; choosing a battery charging method is easy enough as long as you know a few basic distinctions… and you may just discover decent operational savings if you choose wisely.

Keeping your Business on The Go.

The batteries in the electric vehicles in your facility are the engines that keep your business moving. Your job is to find the best battery, with the best warranty get it and move on. That's only part of the project. You have addressed the immediate problem but another could be looming. Pennwest's goal is to increase the efficiency of your forklift fleet. Finding inefficiencies and usage characteristics that is individual to your company. Match the power storage and charging system to what you use. Keep costs down, maximize the life of your batteries and maximize your productivity.

Let Pennwest review, assess, install and assist your company. When it comes to motive power we've got it covered from new batteries and chargers, Battery & Charger Maintenance, Repair Service and more.

- Fleet assessments and power studies.
- Engineered Solutions.
- Installation Services.
- Equipment repairs and maintenance.
- Planned Maintenance Programs

The Answer is easy and it's FREE

Crown Battery can conduct a power study that will give you a sample of the amount of power consumption per day. You can review peak periods and drive the power to areas of demand without any ill affects to your battery fleet. Our goal is to increase the productivity of your forklift fleet. Important questions need to be reviewed before a recommendation can be made. Our objective is to see the amount of power that is consumed during a normal day and customize a charger along with intermittent time frames to return some power to the battery.

Questions to consider in the operation. **Where are you now?**

- Do you operate a two or three shift operation using battery change out equipment?
- Can the forklift battery perform an entire shift?
- Do you have more than two batteries for each lift truck in order to keep your operation running?
- Are you experiencing frequent battery repairs?
- Is battery performance negatively impacting your efficiency?

Pennwest can custom design a battery and charger program for you. Whether it means using multiple batteri=es in a forklift or one battery per lift. We consider all the scenarios. The Pros and the Cons, expenses and savings. Not just for today but for many years to come

Conventional Charging

Run Time: 8 Hour Shift, Charge Time 8-10 Hours + 8 Hour Cool Down.

The first charging method you ought to know (and perhaps already do) is **conventional charging**. Conventional charging is fairly straightforward—you provide your batteries with a standard charge for 8–10 hours, usually overnight. The battery charges to 100% of its capacity, with a quicker charge rate in the first few hours that lowers as the battery nears a full charge. Because batteries heat up during charging, they will need to cool for another 6-8 hours before being used again. Conventional charging is *ideal for single-shift operations* or circumstances where you have multiple batteries available per lift truck. It is your best option for getting the most longevity from your batteries, but may not be ideal for operations requiring multiple shifts. This will require the use of battery changing equipment. Your staff must be comfortable and trained in the usage and dangers involved.

The battery size and weight is specially configured for your forklift. The voltage is specific and the amp hours are relative to the size. The larger the battery the larger the fuel tank. Battery chargers are optimally sized to be with the battery. The charger's amp hour rating is on the unit's data tag and should be within +/- 10% of the batteries amp hour rating.

Example: A battery with an amp hour rating of 850 amps should have a charger rated at no less than 765 amps and no greater than 935 amps.

BATTERY MAINTENANCE TIPS

Industrial batteries, like all pieces of industrial equipment, require proper maintenance to prolong their service life. Battery life is always extended when proper maintenance regimens are observed. On the other hand, poorly maintained and improperly used industrial batteries cannot perform to their full potential for the duration of the warranty period. Here are some "do's and don'ts" of battery care for motive power battery users:

• **Do** maintain the proper electrolyte (acid) level by frequent additions of water. In general, normal city water will suffice, but if the end user has any doubts about purity of the local water supply, contact the battery supplier who will be happy to do a chemical analysis of the water. If in doubt, use distilled water.

• **Don't—that is NEVER**—add sulfuric acid to the battery. If an acid spillage occurs, contact a qualified battery repair service.

• **Do** read the instructions provided with the battery on proper recharging of the battery. Automatic, voltage-controlled chargers will take the guesswork out of charging and there are several types available in the marketplace.

• **Don't** try to save money by buying a charger which is smaller than required. This will result in an undercharged battery with significant reduction in operating life. Your battery vendor has all the information to ensure the battery and charger are precisely matched.

• **Do** check the charger settings and meters on a regular basis. This can be done by an in-house electrician, but should be performed every quarter by the battery service technician.

• **Don't** overcharge the battery. More is not necessarily better when it comes to recharging batteries. The best way to ensure batteries are not being overcharged is to periodically (once a month) check the temperature of the center cell on a battery at the end of regular charge. If the temperature of the electrolyte is more than 36° F above the ambient temperature, call your battery technician— there is a problem.

• **Do** keep regular records on the maintenance of batteries. For instance, keep a log of every time the battery is watered; temperature checks at the end of charge, etc. These records will be invaluable when it comes to predicting when battery replacement is going to be necessary.

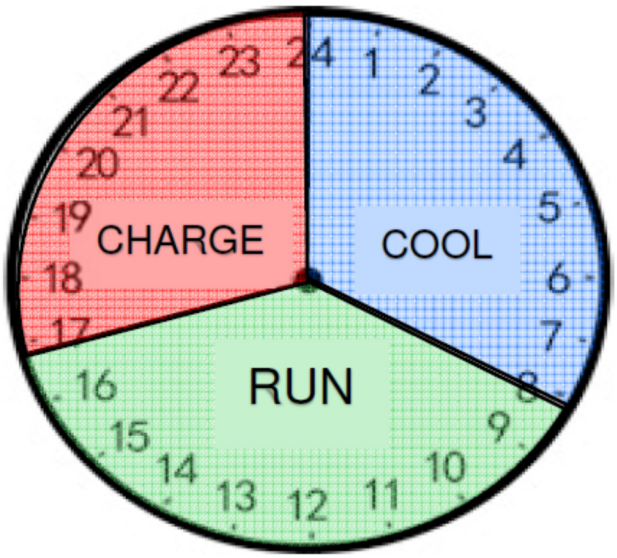
• **Don't** over-discharge batteries. Most battery manufacturer,s warranty their batteries for up to 1.500 cycles of charge and discharge provided, among other things, that the battery is never discharged beyond 80%. This normally coincides with an eight-hour shift. But trucks fitted with extra equipment such as clamps, high speed lifts, etc. will need a higher capacity battery to ensure the battery is not discharged beyond 80%. Lift truck interrupts are available to detect the correct discharge level and are recommended by battery manufacturers as a means of ensuring batteries are not over-discharged.

• **Do** replace a battery with capacity that has fallen below 80% of its rated capacity. Continuing to operate the battery can be false economy since costly damage can be done to a truck's electric motor and electronics.

• **Don't** place metal objects on a battery. Such objects can cause a short circuit between adjacent cells and result in possible injury to those close to the battery. Similarly, people charged with caring for or operating batteries should not wear any metal jewelry.

• **Do** make regular inspections of every battery in the fleet and address problems of acid spillage and resulting corrosion immediately. Periodic (every three months) measurement and recording of the voltage and specific gravity of each cell in the battery will give early warnings of impending problems.

• **Don't** underestimate the money a trained battery repair service can save you. They are the key to long, uninterrupted battery life and successful electric truck operation.



The common single shift operation. There are other single shift schedules but for simplicity this represents a 9 hour work day consisting. The forklifts are actively operating 6-7 hours per day. at the end of the day they go on charge. After the charge is completed the battery goes through the cooling down process. With proper care and maintenance a premium 5 year full warranty battery would have an effective life of 5 to 9 years.

OPERATION/PRODUCTION

CHARGE TIME

COOL DOWN

Premium.Power.

The Industry's most technologically advanced and dependable Heavy-Duty Charger for Multi-Shift applications requiring a full battery recharge in less than 8 hours.

Warranty:

5 Years Parts & Labor

10 Years Parts

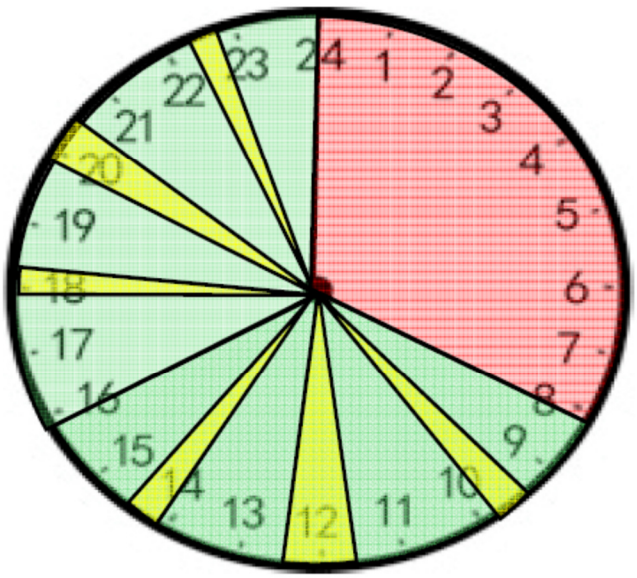
Transformers and Diodes

Opportunity Charging

Run Time: Two shift operation whereas the battery is charged for periods of 10 to 30 minutes per shift with a full charger overnight. Weekly Equalization Charge.

A second charging method is **opportunity charging**, which is exactly what it sounds like: Charging whenever it is convenient. Opportunity utilizes an elevated current to charge the battery rapidly to 80% and then to 100% after an extended cooling period. Similar to the conventional battery charging method, Opportunity charging helps minimize downtime and avoids buying extra batteries for multiple shifts. This method is ideal when extended use is required. Because the battery stops charging to cool down after reaching 80% charge capacity. The charger has a Gassing Stage Block Out that eliminates the gassing stage of the battery costing it a life cycle. When properly managed this method of charging saves time and money. Periodic monitoring should be done so that the chargers can be adjusted for peak periods or slow period. You just want to make sure that your charger is not charging for the slow periods when you are using it in peak periods. That is where a Battery Monitoring Unit or BMU comes into play.

Opportunity charging requires the operator to be familiar with what needs to be done when the forklift is not being used. Opportunity Charging has been used with very good success in Europe for years. Its benefits are finally becoming noticeable in the U.S. However, it is important to make the right choice. Knowledge is key and the representative presenting the product must be knowledgeable. Therefore, you may be asked prior to exploring the prospect of opportunity charging that a power study be done. In this case a Power Logger is installed on the battery to see how much energy is consumed during a normal shift. This allows the manufacturer to review the data and see the actual time the forklift is in use during the day and when it is not in use for the charger to have the correct output. Remember, Charger output can always be turned down so it is normal for the manufacturer to offer a charger that has a higher output and tailor it to your needs.



The common two shift operation.
Or an operation that has extended hours there is Opportunity Charging. During the course of the 24 hour day 16 hours of which the forklifts are operational, it is important to place the batteries on charge. During lunch breaks and any periods of inactivity the batteries must be charging. With the technology today the equalization and cool down time can be adjusted to less than 8 hours, however, a balance is recommended. That is where the power study and monitoring equipment is essential.

OPERATION/PRODUCTION

OPPORTUNITY CHARGE

CHARGE/EQUALIZE/COOL

EcoTec Access – High Frequency Battery Chargers

Wall Mount

Shelf Mount

The Access features:

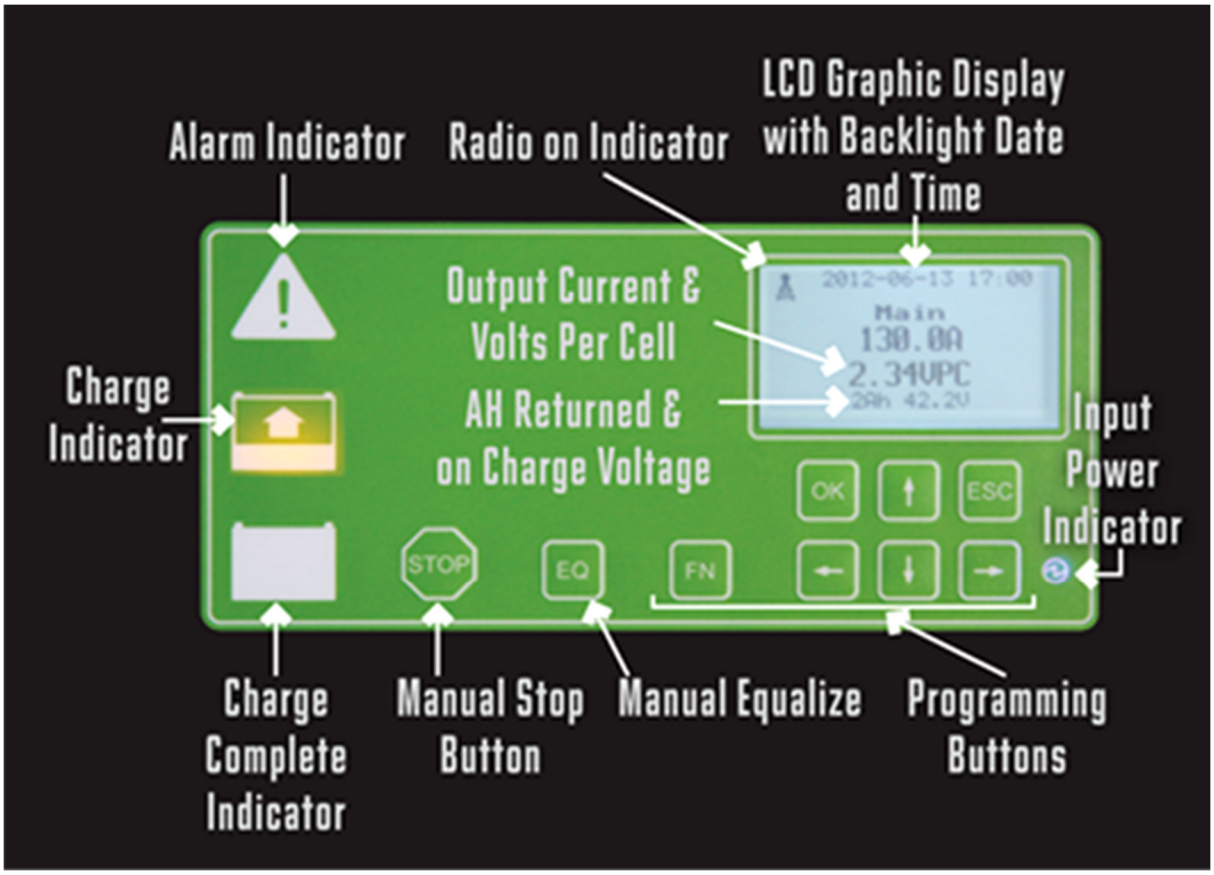
- Microcomputer Smart Charger
- Charges all common battery types
- High efficiency, 92%
- High power factor, 0.95
- Low weight and small volume
- Advanced precision control for best battery life
- Display and control panel permit simple programming
- Archived charge data, 1,800 cycles
- 480VAC 3 phase, 60Hz
- Wireless radio standard on all Access chargers

Ecotec Access

The new Access charger from Ecotec provides you with a powerful, energy efficient battery charger in a sleek lightweight package. This is all accomplished utilizing a modern state of the art MOSFET power conversion circuit that efficiently and accurately converts AC power to the proper DC power levels required to precisely charge an industrial battery.

One charger – Many Solutions

Within the power limits of the charger, every Ecotec Access charger can be set to perform both conventional charging and various levels of opportunity and fast charging. There are 6 different charge curves preprogrammed into every Access charger.



Access Control

The feature rich electronic control of the Access charger is easily programmed to perform a variety of functions the way you want them performed. This auto start/stop control constantly monitors the condition of the battery and automatically compensates for variations in battery temperature, age of the battery, and the battery's condition. Two different levels of security are provided with each level having its own password.

BMU (Battery Monitoring Unit)

Batteries can be equipped with BMU modules to allow multiple battery sizes, voltages and types to be charged by the same charger without reprogramming between charge cycles. The BMU wirelessly communicates battery size, type, voltage, and temperature information to the Access charger to enable optimum charging over a wide range of conditions and battery types. Optimizing the charging process is particularly important when opportunity and fast charging.

Service Tool Software

Data can be downloaded wirelessly into the Service Tool battery and charger data analysis software using the Wireless Gateway USB interface. Battery and charger usage can be easily analyzed in detail using Service Tool software charting and report generation features.

Graphic Display

The display is a backlit LCD display with adjustable brightness and contrast for ease of viewing in a variety of lighting conditions. The display can have up to 6 lines of information and also displays information graphically.

Equalize

Batteries must be equalized on a regular basis to ensure maximum life. The Access charger facilitate this routine through its auto equalize feature which allows equalize cycles to be programmed for a specific day of week, or by number of complete charge cycles.

Energy Saving Features

In addition to the energy efficient MOSFET design of the Access charger, the advanced control provides other energy saving options such as charge block-out periods. Each day, up to 3 different periods may be blocked from charging. This could be used to avoid peak demand periods, time of day use billing, or any other reason why you may not want chargers running during a particular time of day.

Monday Morning Refresh

When a battery has been sitting over the weekend there is a certain amount of self-discharge that occurs. In order to provide a fresh, fully charged battery, you can program the charger to charge for up to 60 minutes prior to the start of the workweek.

Communication

Every Access charger is equipped with a radio transceiver that allows the charger to communicate with other chargers as well as a host computer when equipped with the optional Access USB Gateway. The wireless communication system is FCC certified.

D3 Disconnect Detection Device: (Exclusive Anti-Arc Device)

OPTIONAL: The D3 Monitors the battery connection to the charger constantly while charging. It is designed to sense any attempt to improperly disconnect the battery from the charger during a charge cycle. The D3 automatically stops the current flow from the charger to the battery eliminating the possibility of arcing and voltage surges through the charger. This surge protection reduces the chance of blowing out expensive charger boards and prevents potential hazards.

Wireless “Best Battery” Choice

The ability to communicate between chargers allows the chargers to display the next available battery in a particular group, based on the length of time since the battery was completely charged. You can set up as many as 999 different groups. This ensures that all batteries receive equal usage and helps to promote a first in – first out battery rotation. This capability is standard in all chargers and can be implemented without additional hardware. In addition to the charger display, the next battery available can also be viewed on a remote terminal display.

Wireless Maximum Power Limit

The wireless feature of the Access charger allows you to limit the AC power that a particular group of chargers are allowed to draw. This feature may be used where AC power is limited, or in applications where you don’t want the power consumed by the chargers to push your total power demand costs higher than necessary.

Ionic Mixing Option

When the Ionic mixing charge curve is selected, the charger pulses the output current during the finish portion of the charge cycle resulting in brief periods of increased gassing. This gassing action improves the mixing of the electrolyte without increasing electrolyte usage. This ensures that the heavy acid at the bottom of the cell is thoroughly mixed throughout the cell, preventing stratification and extending battery life.

Gassing Block-out

All the opportunity charge curves include a gassing block-out period that prevents the charger from entering the gas producing finish charge stage for the first two hours that the battery is connected to the charger. In opportunity charging it is critical to return as many ampere-hours as possible in the limited time available. For this reason, the Ecotec Access charger does not shut down when it reaches the gassing point, but simply reduces the charge current to minimize gassing.

Your Charger will be customized based on data that we have recorded with adjustment for growth

Opportunity Charge: Charging Parameters based on the actual recorded usage from a Power Study using a Battery Monitoring Unit.

25A/100AH This curve is designed for a 25 Amp per 100 Amp Hour of Battery to charge the battery during scheduled breaks. Two breaks per shift and Lunch Break for 2 shifts operation where the level of discharge is typically at or below 1.25 Times the 80% rating of the battery.

Example: 1,000 Amp Battery. Effective usable amps 80% (800 Amps) Actual metered usage typically at or below 1.25 time or 1,000 Amps per 2 shifts in the course of a day.

30A/100AH This curve is designed for a 30 Amp per 100 Amp Hour of Battery to charge the battery during scheduled breaks. Two breaks per shift and Lunch Break for 2 shifts operation where the level of discharge is typically at or below 1.37 Times the 80% rating of the battery.

Example: 1,000 Amp Battery. Effective usable amps 80% (800 Amps) Actual metered usage typically at or below 1.37 times or 1,100 Amps per 2 shifts in the course of a day.

35A/100AH This curve is designed for a 35 Amp per 100 Amp Hour of Battery to charge the battery during scheduled breaks. Two breaks per shift and Lunch Break for 2 shifts operation where the level of discharge is typically at or below 1.49 Times the 80% rating of the battery.

Example: 1,000 Amp Battery. Effective usable amps 80% (800 Amps) Actual metered usage typically at or below 1.49 times or 1,200 Amps per 2 shifts in the course of a day.

40A/100AH This curve is designed for a 40 Amp per 100 Amp Hour of Battery to charge the battery during scheduled breaks. Two breaks per shift and Lunch Break for 2 shifts operation where the level of discharge is typically at or below 1.60 Times the 80% rating of the battery.

Example: 1,000 Amp Battery. Effective usable amps 80% (800 Amps) Actual metered usage typically at or below 1.60 times or 1,280 Amps per 2 shifts in the course of a day.

Note: Charging start rates can be adjusted downward as business cycles and fluctuations warrant. It is imperative that a comprehensive Battery Maintenance Plan be part of this program to ensure the intended life expectancy and effectiveness of this program

Fast Charging

Commonly known as 24/6 24 Hours a day 6 days a week. Charge time 10 to 30 minutes plus a weekly equalization charge and cool down. Crown Fast charge batteries are constructed differently with heavier duty components due to the excesive heats that are generated. Both the battery and the charger must be carefully sized based on studies done of power consumption.

This is best for multi-shift operations where there is no time to charge batteries, and it eliminates the need for extra batteries. It saves space and because there is no need for a battery changing area.

Cost – Benefit Analysis must be done due to the expensive nature of the battery and charger. In addition Fast-Charging is extremely hard on the overall life of the battery. Warranties are reduced and batteries must be replaced usually at 3 to 4 years.

If you run multiple shifts, you may well benefit from a different charging method known as fast charging**.** Fast charging has great potential to boost productivity and diminish costs associated with buying extra batteries by allowing for charging of a lead acid battery in approximately half the time conventional charging would take—as little as 2–4 hours. Fast charging utilizes a higher current and does not decrease the charge rate like conventional chargers do. This method can actually be a safer means of charging than the conventional method because the voltage and electrolyte levels are constantly monitored during the process. The trick with fast charging is to equalize batteries weekly to mitigate sulfating, which takes 6–8 hours and may not be ideal for round-the-clock operations.

What is Best for You?

So, what is the right charging method for your electric lift trucks? It really depends. Fast and opportunity charging can mean increased productivity and operational savings in certain circumstances. If you're running multiple shifts, one of these is likely the right choice for you. If your operations allow for the extended charge periods required for conventional charging, however, you'll ultimately get more life out of your battery by going that route. Whatever method you pick, remember to play it safe: Ensure your batteries and lift trucks are modified appropriately to accommodate the charging method you choose, and always follow all applicable guidelines related to venting of hydrogen gas during charging.

CONFIDENCE DELIVERED

SERVICE AFTER THE SALE



Battery & Charger Preventative Maintenance

BATTERY:

- Removal of corrosion.
- Acid neutralization
- Thorough cleaning
- Individual cell voltage readings.
- Specific gravity readings.
- Electrolyte level check
- Verify Readings are in Recommended Parameters.
- Single point watering string inspection (if present)
- Load Test Battery if indicators warrant.
- Cable inspection
- Housing and tip inspection
- Contact and connector inspection

CHARGER:

- Start rate to manufacturers specifications.
- Finish rate confirmation to manufacturers specifications.
- Cable inspection for cuts and defects.
- AC and DC fuse inspection.
- Circuit board inspection.
- Housing and tip inspection for irregularities
- External cabinet cleaning to ensure charger ventilation is dust and dirt free Interior cabinet cleaning (high pressure air) to clean circuit boards and internal components

→ Short & Long Term Rentals.

→ Battery & Charger Repairs.

→ Reconditioned Batteries, Chargers.

→ Guaranteed Power Program.

→ Fleet Programs

→ Charger Replacement Parts.

→ Battery Handling Equipment

PennWest
Toyota Lift

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