EPRI

Floor Sweeper-Scrubbers

Demonstration of Advanced Lead-Acid Batteries and High-Power Charging in Commercial Warehouse Operations

Technical Report

Floor Sweeper-Scrubbers

Demonstration of Advanced Lead-Acid Batteries and High-Power Charging in Commercial Warehouse Operations

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Final Report, June 2001

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REPORT SUMMARY

Electric walk-behind and riding floor scrubbers are in widespread and growing use in the commercial and industrial building sectors. This demonstration indicates that the weight, bulk and battery capacity of existing equipment could be significantly reduced in equipment used for certain 'spot-cleaning' and other limited use duty-cycles. Further, results show that for sealed lead acid batteries, recharge rates on the same order as discharge rates are sufficient for extending peak daily run-time to 200% and more of battery capacity in 'spot-cleaning' operations.

Background

Demand for commercial floor cleaning machines is growing, with the global equipment sales approaching $3 Billion per year. Internal combustion engine (ICE), battery-electric, and corded-electric floor scrubber/polisher models are available. However, air-quality, safety, and noise concerns restrict use of ICE units, particularly in food sales, preparation and/or storage facilities; and walk-behind corded models cannot be sufficiently powered for heavy-duty burnishing of floor surfaces. Battery-powered rider and walk-behind units have their own limitations because of limited runtime and lengthy downtimes for recharging. Improved battery performance is a key to both overall market growth and electric-powered unit market share growth in the commercial floor maintenance equipment sector. Electric utilities, floor maintenance equipment manufacturers, battery and charger manufacturers, and utility customers using battery-powered floor equipment may all benefit from demonstration of advanced battery and charging options.

Objectives

- To characterize commercial floor scrubber duty-cycles, energy-use, and energy costs for a major national retail chain
- To extend floor scrubber run time
- To reduce floor scrubber recharging downtime.

Approach

The project team studied the frequency, duration, and nature of use of floor scrubber equipment in day-to-day commercial operations at Costco warehouse/retail facilities in Memphis, Tennessee. The team then tested walk-behind electric floor scrubbers with advanced design sealed lead-acid batteries and enhanced 220-volt charging. The team replaced standard chargers with high-powered (480 volt, 3-phase) units to test the effectiveness of concurrent use of single 'fast' charger for both walk-behind and rider floor scrubber operations.

Results

Usage of both walk-behind and riding scrubbers was significantly less than expected. Costco uses both its walk-behind and riding floor scrubbers for only limited, 'spot-cleaning" duty-cycles. The aggregate numbers are clear. The walk-behind scrubbers are used about six minutes at a time, about four times each day. They require charging about once a week or less. The riding scrubbers are used more frequently, but not dramatically so. The riders are used about 45 minutes each day. They are charged, in general, every second or third day. Scrubber operations are a nearly insignificant cost to Costco.

The demonstration showed that floor scrubbers, as a class of equipment, might benefit from battery advances. Reducing battery weight by 20% resulted in little discernable change in performance and even an 80% reduction in weight proved feasible. The demonstration showed that opportunity charging of the scrubbers could be effectively repeatedly throughout any given day. More than twice the total capacity was used and replaced in the peak circumstance. Further, reliable, sophisticated, and relatively inexpensive chargers are available now.

EPRI Perspective

The most unexpected aspect of the demonstration was the realization that, given the use patterns at Costco, the battery capacity for the walk-behind scrubbers would be sufficient for about 24 years of operation for walk-behind scrubbers and about 8 years for the riding units. Of course, the actual expected service life of both scrubbers is considerably shorter. Though Costco may not be extracting the full benefit of their investment in battery capacity, the convenience and operational timesaving of infrequent charging may more than offset the excess battery cost. However, tailoring a scrubber reduced battery capacity design specifically to the Costco 'spot-cleaning' duty-cycle may represent an opportunity for product development.

Keywords

Batteries
Floor scrubbers
Market research
Commercial applications
High-powered chargers
Fast Chargers

ABSTRACT

Advanced design sealed lead-acid batteries, with enhanced 220 volt charging, replaced flooded lead-acid batteries and 120 volt charging for walk-behind electric floor scrubbers in a demonstration at two commercial warehouse/retail sales facilities. Battery capacity and weight were reduced to test the potential for daily opportunity charging of walk-behind and riding scrubber units. A high-powered (480 volt, 3-phase) charger replaced standard chargers to test effectiveness of concurrent use of single 'fast' charger for both walk-behind and rider floor scrubber operations.

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FLOOR SCRUBBER DEMONSTRATION OBJECTIVES AND SUMMARY CONCLUSIONS

The concept for this demonstration evolved from presentations by the Tennant Company and discussions among utilities at EPRI conferences related to Industrial and Recreational Transportation in the spring and summer of 1999.

Demand for commercial floor cleaning machines is growing, with the global equipment sales approaching $3 Billion per year. ICE (internal combustion engine), battery-electric and corded-electric floor scrubber/polisher models are available. Air-quality, safety and noise concerns restrict use of ICE units, particularly in food sales, preparation and/or storage facilities. Walk-behind corded models cannot be sufficiently powered for heavy-duty burnishing of floor surfaces—15 HP (horse-power) is needed while convenience outlets limit power draw to only 1.5 HP. At the same time, battery-powered rider and walk-behind units suffer from the need for frequent refueling (limited 'run-time') and the length of time needed to refuel ('downtime' while recharging).

Tennant contends that improved battery performance is a key to both overall market growth and electric-powered unit market share growth in the commercial floor maintenance equipment sector.

For utilities, floor maintenance operations clearly represent a growing end-use demand in the commercial customer sector—growing demand among small and large and local and national commercial customers. Recognized battery performance and recharging limitations are consistent with issues encountered in almost all other electric transportation applications. However, the nature of floor equipment energy consumption, power-demand, and its impact customer bills is not well understood.

As a result, electric utilities, floor maintenance equipment manufacturers, battery and charger manufacturers, and utility customers using battery-powered floor equipment may all benefit from demonstration of advanced battery and charging options. This collaborative demonstration, jointly undertaken by just such a team of stakeholders, was designed to accomplish three objectives, as follows.

Characterize Commercial Floor Scrubber Duty-Cycles, Energy-Use, and Energy Costs for a Major National Chain

Defining the frequency, duration, and nature of use of floor scrubber equipment in day-to-day commercial operations was the first order of business for the demonstration partners. Battery

voltage, current draw (discharge)/input (charge), enclosure and battery temperatures, and imputed state-of-charge were collected at one-minute intervals, 24-hours a day, for a single standard configuration of a Tennant walk-behind scrubber, battery, and charger in each of two similarly-sized Costco warehouses in Memphis, Tennessee. The Tennant battery charger was powered through a 115 VAC convenience outlet independently sub-metered for both energy consumption and demand. It was found that walk-behind scrubbers were consistently used for short-duration spot cleaning adding up to about 30 minutes per day in both warehouses.

Later in the demonstration a similar data collection series was conducted for a Tennant riding scrubber model in a single Memphis Costco warehouse. The riding unit was used for longer durations but less frequently, yielding a total 'run time' of about 50 minutes per day.

Usage of both walk-behind and riding scrubbers was significantly less than expected. The December 1999 EPRI Industrial and Recreational EVs *fact sheet* estimated daily kilowatt hour requirements four times as great as that encountered in the demonstration for both types of equipment. If anything, it had been expected that Costco operations, being extended hours and seven days per week, would exceed typical usage.

Extend Floor Scrubber 'Run Time'

Two strategies for extending scrubber 'run time' were evaluated for walk-behind scrubbers.

In the first, battery weight was reduced about 20% as a result of using sealed lead-acid batteries to assess the potential for increasing the period of time the scrubber would operate per amp-hour delivered from the batteries. Trojan flooded batteries, weighing 606 pounds and rated at about 225 amp-hours capacity, were replaced by Horizon sealed lead-acid batteries, weighing about 500 pounds and rated at 200 amp-hours. There was little discernable change in performance.

In the second strategy that emerged during the demonstration, battery weight and capacity were reduced about 80%. Trojan flooded batteries, weighing 606 pounds and rated at about 225 amp-hours capacity, were replaced by Horizon sealed lead-acid batteries, weighing about 50 pounds (plus 100 pounds of ballast to maintain handling characteristics) and rated at 25 amp-hours. Under these conditions, 'run time' (discharge time) per amp-hour increased from 95 seconds to 120 seconds per amp-hour, about 25%.

Though considered, similar approaches to weight reduction were not undertaken for the riding scrubber because of concerns about unfamiliar handling characteristics and operational safety.

Reduce Floor Scrubber Recharging 'Down-Time'

The standard Tennant walk-behind scrubber equipment configuration, Trojan batteries and a 115-volt, 30-amp charger, required 240-300 seconds of recharge time per amp-hour of delivered battery capacity. The demonstration showed that the scrubber would operate about 30 minutes for each hour of battery charging—the scrubber was unavailable for use for 2 hours for each hour of operation.

With sealed Horizon batteries, charged by a programmable Zivan 230-volt, 100-amp charger, recharging time for Horizon batteries in the walk-behind scrubber model was reduced to to 80-120 seconds per amp-hour. The scrubber operated for 1.1 hours for each hour of charging.

The AeroVironment charger reduced recharging time for Horizon batteries in the walk-behind scrubber model by about 10%, yielding 1.2 hours of use for each hour of charging.

The standard Tennant charger and batteries for the riding scrubber required 2 hours and 20 minutes of charging for each hour of use. The combination of 340 amp-hour Horizon batteries and AeroVironment charger, resulted in only a 20% improvement in performance, requiring 2 hours of charging for each hour of riding scrubber operation.

Scrubber Innovation Opportunities

The most unexpected aspect of the demonstration was the realization that, given the way in which Costco utilizes the scrubber units and based on a projected 600-cycle life, the battery capacity for the walk-behind scrubbers would be sufficient for about 24 years of operation, about 8 years for the riding units. Of course, the actual expected service life of both scrubbers is considerably shorter.

Though Costco may not be extracting the full benefit of their investment in battery capacity, the convenience and operational timesaving of infrequent charging may more than offset the excess battery cost. However, tailoring a scrubber reduced battery capacity design specifically to the Costco ‘spot-cleaning’ duty-cycle may represent an opportunity for product development.

2
SCRUBBER DEMONSTRATION PARTNERS, ROLES, AND DECISIONMAKING

The floor scrubber demonstration involved the coordinated resources and staff of EPRI, two utilities, four manufacturers, corporate oversight and two commercial warehouses of a national retail chain, two electrical contractors, and a management-consulting firm. The demonstration was clearly a collaborative venture. Each and all of the manufacturers directly contributed both in-kind services and materiel and equipment to the effort, which significantly enhanced and expanded the scope of the project.

Core Participants

EPRI, Tennessee Valley Authority (TVA), and Tennant Company jointly established the initial planning for the demonstration and led its execution from inception to completion. W. I. Whiddon & Associates, Inc. was retained as project liaison early in the process. Memphis Light Gas and Water Company (MLGW), a local power distributor, was added to the core team of participants as soon as the commercial utility customers involved in the demonstration were identified. The following descriptions quote and paraphrase information about each core organization as presented on their respective Internet websites.

EPRI

> "With more than 25 years of proven success, EPRI is recognized as a world leader in creating science and technology solutions for the energy industry and for the benefit of the public. EPRI's technical program is unique in its breadth, spanning virtually every aspect of power generation, delivery, and use, including environmental considerations.
>
> "Currently serving more than 1000 energy organizations worldwide, EPRI draws on a global network of technical and business expertise to help solve today's toughest energy problems. Client companies can participate in EPRI's entire program or purchase individual portions, according to their needs."

EPRI was responsible for overall project management and reporting for the demonstration.

TVA

> "TVA is America's largest public power company, with 29,469 megawatts of dependable generating capacity.

> "TVA's power facilities include 11 fossil plants, 29 hydroelectric dams, three nuclear plants, four combustion-turbine plants, a pumped-storage facility, and 17,000 miles of transmission lines.
>
> "Through its 158 locally owned distributors, TVA provides power to nearly eight million residents in the 170 counties of the Tennessee Valley region."

Figure 2-1
Tennessee Valley Authority Service Territory

TVA supplied electricity to the commercial warehouses involved in the demonstration and consulted on management decisions from the perspective of a power generation company throughout the project.

MLGW

> "Memphis Light, Gas and Water (MLGW) was founded in 1939 and serves more than 400,000 people in Memphis and Shelby County. We are the largest three-service municipal utility system in the nation. Truly your hometown energy company, MLGW is publicly owned and is composed of more than 2,600 employees working to achieve our vision of being the "company of choice" for utility services in the competitive 21st century. More importantly, MLGW is concerned with providing you top-notch, personalized utility service with some of the lowest rates in the nation.
>
> "MLGW is TVA's largest distributor, purchasing approximately 11 percent of TVA's power. MLGW serves more than 384,000 electric customers and has a strong electric reliability ration of two outages per 100 miles per year. MLGW has had only one electric rate increase in the last seven years and has guaranteed to hold rates steady through 2003."

MLGW distributed electric power directly to both warehouses involved in the demonstration. Utility technical staff installed an additional dedicated electric meter for the 480-volt, 3-phase

circuit for high-power charging at both warehouses. Most importantly, MLGW customer service and marketing staff regularly downloaded and transmitted data logger files and recorded sub-meter readings for each of the nine series of scrubber battery/charger equipment configurations demonstrated during the project. MLGW acted as the primary point-of-contact with their commercial customers on a day-to-day basis throughout the demonstration.

Tennant Company

> "Tennant Company is a manufacturer of floor cleaning machines, parts and accessories, as well as floor coatings. Founded in 1870, Tennant is headquartered in Minneapolis, Minnesota, and also has manufacturing facilities in Holland, Michigan, and Uden, The Netherlands.
>
> "Tennant's mission is to become the preeminent company in nonresidential floor maintenance equipment, floor coatings and related products. We will achieve this by continuing to implement strategies that leverage our strengths:
>
> - Making an industry-leading R&D investment, plus acquisitions, which allow us to regularly introduce new or significantly upgraded products, and enter new markets.
> - Using technology to create more efficient and effective operations, to better serve customers and support growth.
> - Using multichannel product distribution to increase market penetration.
> - Building upon our international market penetration.
> - Reaching growing niche markets, which helps counter cyclicality in other areas.
> - Using our strong financial condition to fund continued expansion."

Tennant Company provided basic technical and customer field support throughout the demonstration. Minneapolis-based R&D staff implemented and maintained reconfiguration and data collection for each of the nine demonstration series conducted in Memphis. Field customer service representatives conducted equipment inspections and performed trouble-shooting assistance as needed. Tennant established and maintained a website for timely distribution of raw data to all team members as collected. In addition, Tennant arranged, coordinated and supplied all shipping services needed from and among all team participants throughout the project.

Battery and Charger Manufacturers

Electrosource Horizon sealed lead-acid batteries were selected for demonstration based on a response to a Request for Quotation (RFQ) published by EPRI in the Fall of 1999. AeroVironment was invited to supply early production beta units of their second-generation high-power chargers for the demonstration, based on EPRI's knowledge of the impending

introduction of the equipment. Electrosource recommended the use of 230-volt Zivan programmable chargers for standard charging of the Horizon batteries. Electric Conversions, the national sales representative for the Italian charger manufacturer, supplied chargers and technical support to the demonstration.

Electrosource

> "Electrosource develops, manufactures, and markets advanced, high performance energy storage products and systems.
>
> "Using a high-tech approach revolutionary to the battery industry, Electrosource has greatly reduced the time and cost required to produce batteries. Underwriter Laboratories Inc. (UL) registered the company's HORIZON® C2M (co-extruded composite matrix) battery manufacturing facility to the ISO 9001 quality standard. Electrosource meets or surpasses the highest U.S. environmental standards.
>
> "Electrosource is headquartered in San Marcos, Texas, where it operates an 88,000 square foot facility designed for environmentally responsible manufacturing."

Electrosource fabricated and reconfigured Horizon batteries for both walk-behind and riding scrubber models throughout the demonstration, repeatedly responding to technical issues and requests with timely custom solutions.

AeroVironment

> "The Electric & Hybrid Vehicle Systems business develops state-of-the-art vehicles, components and infrastructure products.
>
> "Since 1987, AeroVironment has designed and built complete electric and hybrid concept vehicles that advance the state of the art, including those shown here. Our rapid prototyping and development approach combines broad-based technical skills with solid systems engineering and project management in integrated teams.
>
> "AeroVironment is an industry leader in advanced battery testing and management. Our ABC-150 Power Processing System is the most advanced, most accurate system available for complete battery pack testing, and is also used for other drive train tests.
>
> "PosiCharge™ EV chargers, based on the same technology as the ABC-150 Power Processing System, have been developed for fast electric vehicle charging, allowing an EV to regain 50% of its range in under 10 minutes.
>
> "The Industrial PosiCharge is a fast charging system for electric forklifts, industrial vehicles and airport ground support equipment. Fast charging increases equipment utilization and decreases operating costs for many operations.
>
> "SmartGuard is a distributed battery management system that helps to maximize battery range and life, both critical factors in making EVs economically attractive."

AeroVironment leased two early-production, second-generation chargers and battery monitor and identifiers (BMIDs), and provided technical support for high-power charging to the demonstration team.

Electric Conversions

> "Electric Conversions (elcon) is the primary distributor of Zivan battery chargers for electric vehicles and forklifts in the U.S.A. As well as battery chargers we also carry other products for EVs such as controllers, smoothers(B.M.S.), DC motors, DC/DC converters and more.
>
> "We are committed to helping companies and individuals to find the best and most cost effective electric vehicle system to meet their needs. The selection of power electronic components can often be the reason for success or failure of an entire vehicle program. The issues of a vehicle client's typical usage habits and the level of technical support available will often decide the compromise of technical complexity vs. overall efficiency.
>
> "We promote the use of low-cost DC Motor/Controllers employing regenerative breaking and boasting overall efficiency approaching that of electrically commutated and inductive systems for a fraction the cost. We do not subscribe to the belief that gaining 4-8% efficiency justifies 400% more cost. We also do not dismiss the use of traditional, inexpensive batteries, which share a similar cost-effectiveness comparison to their more exotic cousins."

Electric Conversions provided 230-volt battery chargers and technical assistance in establishing an algorithm for standard charging of Horizon batteries.

Selecting a Commercial Customer/Operator Partner

At the same time EPRI was publishing its RFQ for battery manufacturers, core team participants developed criteria for the identification and selection of a customer/operator partner.

Criteria for Selection

Five criteria were seen as important considerations in evaluating demonstration candidates:

- TVA relationship: characteristics important to TVA; potential working relationship with the customer
- Tennant relationship: characteristics important to Tennant; working relationship and potential as a customer
- Corporate interest/buy-in: point of contact and level in the firm; commitment to involvement and likelihood of action on results
- Operations management: structure; flexibility and willingness of field staff to adapt to demonstration requirements; record keeping capabilities

- Facility/duty-cycle: size; number of units; expected frequency and level of scrubber use

Tennant reviewed its sales records and identified two new Costco warehouses in Memphis, Tennessee, that had recently received delivery of new walk-behind and riding scrubber units. EPRI noted its strong working relationship with Costco corporate staff interested in improved electric equipment performance. TVA agreed that Costco, with its expansion in the service territory, would be an important customer to both TVA and MLGW.

Costco Wholesale Corporation

> "Costco Wholesale Corporation operates an international chain of membership warehouses, mainly under the "Costco Wholesale" name, that carry quality, brand name merchandise at substantially lower prices than are typically found at conventional wholesale or retail sources. The warehouses are designed to help small-to-medium-sized businesses reduce costs in purchasing for resale and for everyday business use. Individuals belonging to certain qualified groups are also able to purchase for their personal needs.
>
> "Costco's warehouses present one of the largest and most exclusive product category selections to be found under a single roof. Categories include groceries, candy, appliances, television and media, automotive supplies, tires, toys, hardware, sporting goods, jewelry, watches, cameras, books, housewares, apparel, health and beauty aids, tobacco, furniture, office supplies and office equipment. Costco is known for carrying top quality national and regional brands, with 100% satisfaction guaranteed, at prices consistently below traditional wholesale or retail outlets.
>
> "Costco warehouses generally are open seven days per week for all members, with special hours reserved for business and executive members."

Discussions through a Vice President for Purchasing at corporate headquarters led to the selection of Costco Store #353 on Hacks Cross Road, Memphis, and Costco Store #352 on North Germantown Parkway, Cordova, for participation in the demonstration.

The local warehouse managers were willing to be involved, as long as the demonstration would not interfere with normal operations. The demonstration team assured Costco management that the demonstration would be transparent to their employees and that the core participants would handle all logistic requirements.

Costco identified an electrical contractor for each warehouse to handle whatever wiring modifications would be needed to install the charging apparatus (GusMus Electric Company and Marathon Electric Company, respectively).

Table 2-1
Key Costco Information

Number of warehouses:	354 (as of 4/23/01)
Areas of operation:	254 locations in 34 U.S. states; 60 locations in nine Canadian provinces; 11 locations in the United Kingdom; 3 locations in Taiwan; 5 locations in Korea; 2 locations in Japan; 19 locations in six Mexican states
Membership Data (as of 3/8/01):	15.6 million members 11.4 million Gold Star 4.2 million Business 19+ million households 34+ million cardholders
Warehouse sizes:	70,000 to 160,000 square feet (average 133,000 square feet)
Annual revenues (FY'00 - Ending 9/3/00):	$31.6 billion
Fiscal year end:	Sunday closest to August 31
Number of U.S. employees:	60,400 full and part-time
Number of employees (worldwide):	86,500 full and part-time

3
SCRUBBER DEMONSTRATION PLAN AND EXECUTION

Initial Approach

As previously stated, the core demonstration team developed a simple statement of purpose: "Comprehensively evaluate the cost and performance of standard battery, advanced battery, standard charging and high-power charging configurations of walk-behind scrubbers in day-to-day commercial operations. Specifically, evaluate and compare run-time and equipment utilization for alternative battery/charger configurations."

At its most basic, the demonstration team wanted to record the real-time current in/out history, voltage, and battery temperature for the walk-behind unit, 24 hours per day, seven days per week.

Three layers of data collection were viewed as sufficient to provide comprehensive evaluation of scrubber and charging system performance:

- Walk-behind scrubber onboard data-logger system
- AeroVironment charger embedded data monitoring, during high-power series, and
- Metered electricity consumption via dedicated MLG&W metering of high-power circuit, or via use of a convenience outlet on the sub-metered high-power circuit for all other demonstration series.

A '1-minute' data sampling frequency was seen as sufficiently 'fine' to capture even brief equipment uses and would adequately describe equipment operation and performance. The '1-minute' rate would result in just over 10,000 data points each week, meaning a single MS Excel spreadsheet could contain up to six weeks of data.

The Tennant data-logger had sufficient memory to store more than 100 days of data, but the team agreed that the data should be collected much more frequently. MLGW agreed to have a marketing rep download the data for circulation to the team once a week.

The line-up of equipment configurations was also relatively simple.

- First, the demonstration would need to characterize operation of the standard scrubber equipment as sold by Tennant.
- Next, the 225 ampere-hour Trojan flooded lead-acid batteries and standard 110-volt charger would be replaced by a 200 ampere-hour Horizon battery and its 230-volt Zivan charger.

- Next, the Trojan batteries would be reinstalled, this time charged with the AeroVironment high-power charger.
- Finally, Horizon batteries would again replace the Trojan pack, to be charged with the AeroVironment charger.

Participants agreed that four weeks for each series would produce a sufficient record to characterize performance, even if some data was inadvertently lost.

It was decided to delay the start of the demonstration in one of the warehouses for one month so that lessons learned, if any, could be applied in a staggered series. Also, Tennant agreed in principal that Costco should not put its batteries at risk in the AeroVironment series, and that an alternative set would be sought.

Preparation for the field trials would include brief pre-testing, as needed, at Electrosource to verify battery cell performance, at AeroVironment to develop an algorithm for the Horizon sealed battery (they already had extensive experience with the Trojan batteries), and at Tennant to understand expected field performance. All participants wanted to make sure the Costco Warehouse experience would be a good one.

Other than the logistics of having the equipment in the right place at the right time, a simple enough approach. The initial plan is presented in Figure 3-1.

Even before its start, though, the initial plan was delayed for production slippage, first at Electrosource, then at AeroVironment. In fairness, both manufacturers were providing initial product run units for use in the demonstration and delays were understood if not expected. The start date for the first series in Warehouse A slipped to June 1, with expected completion in Warehouse B pushed to the end of October.

Battery Capacity Reduction to Increase Frequency of Charging

The first weeks of data collection in Warehouse A showed very infrequent charging, but the underlying reason for it was not clear. However, Warehouse B baseline series results quickly confirmed that the walk-behind scrubbers were used only sparingly (for what the team referred to as ‘spot-cleaning’) in both operations. Recharging after full discharging was occurring only once every 7-10 days, partial discharge and recharge only slightly more often.

Three options to fundamentally alter the demonstration plan were considered: continue as planned; force increased use of the scrubber; or reduce battery capacity to increase the frequency of charging.

To continue as planned was rejected because insufficient charging would take place to confidently evaluate equipment performance.

Outline Scrubber Demo Plan:	March				April				May				June				July				August			
week #	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
AV Battery Chg Characterization: Trojan and Horizon packs																								
Tennant Horizon battery pack performance characterization																								
Tennant Trojan Scrubber demo base-line development (1 week)																								
Tennant Horizon Scrubber demo pre-tests (1 week)																								
Tennant Trojan/Horizon fast charge demo pre-tests (2 weeks)																								
Fast charge use pattern development, in consultation w/Costco																								
Costco A Trojan baseline development (4 weeks)*																								
Costco A Horizon series (4 weeks)*																								
Costco A Trojan fast charge series (4 weeks)*																								
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Costco B Horizon series (4 weeks)*																								
Costco B Trojan fast charge series (4 weeks)*																								
Costco B Horizon fast charge series (4 weeks)*																								

Figure 3-1
Early Outline Scrubber Demonstration Plan

Forcing increased use of the scrubber was rejected because it would interfere with Costco operations.

Reducing battery capacity was possible solely because of the way in which Electrosource had fabricated the battery. In order to accommodate the volume limitations of the scrubber unit, 8 strings of 3 (12-volt, 25 ampere-hour) cells in series had been interconnected in parallel to achieve a total pack capacity of 200 ampere-hours. Hence, a single-string battery could operate at 36 volts with a capacity of 25 ampere-hours. Since the average daily use was about 25 minutes, a single-string battery would just fulfill the daily requirement. On average, the scrubber would need to be charged every day.

In addition, reducing battery capacity could be used to test the hypothesis that reduced weight would lead to performance improvements. It was decided to evaluate both 'light' and 'heavy' reduced battery capacity configurations (maintaining the original weight for the 'heavy' version by adding ballast).

While decreasing capacity would force more frequent recharge sessions, no additional use actually occurs, and energy costs average only 5¢-10¢ per day. It was felt that there would be little learned from repeating the same tests in both warehouses, especially the high-power charging series. The possibility of demonstrating sealed batteries and advanced charging for the riding scrubber concurrently with the walk-behind unit was suggested. After exploring all options, plans to wrap up tests in Warehouse B and conduct combined demonstrations in Warehouse A were refined.

Concurrent Walk-Behind and Rider Floor Scrubber Operations

Figure 3.2 presents an outline of the demonstration as actually executed from start-up on June 1 to its conclusion.

Nationwide, each Costco Warehouse operates both a riding scrubber and a walk-behind scrubber, with a separate charger for each. The demonstration team agreed to conduct concurrent test series to show how effectively a single high-power charger could be used to recharge both units on a daily basis.

Tennant switched the data logger from the walk-behind scrubber in Warehouse B to the riding model in Warehouse A in order to initiate baseline characterization of riding scrubber usage.

Electrosource fabricated an additional Horizon battery for use in the Warehouse A riding scrubber. Costco elects to use a 600 amp-hour Exide battery package in its Tennant riding scrubber units. However, form factor constraints limit the size of a Horizon sealed battery substitute to 4 parallel strings of 3, 12 volt, 85 ampere-hour, cells in series, producing a total battery capacity of 340 ampere-hours. Ballast was used to equal the Exide package weight. Tennant installed the BMID on the Horizon pack.

Outline Scrubber Demonstration Execution:	June				July				August				September				October				November				December			
(planned/actual duration) week #	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
AV Battery Chg Characterization: Trojan and Horizon packs																												
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Costco A Trojan baseline development (4 weeks)																												
Costco A Full-Horizon/Zivan series (4/7 weeks)																												
Costco A Fast Charger Installation																												
Costco A 'Light' 25ah Horizon/Zivan series (3/7 weeks)																												
Costco A 'Heavy' 50ah Horizon/AV series (3/6 weeks)																												
Costco A Exide/Rider/Tennant baseline series (3/6 weeks)																												
Costco A 'Light' 50ah Horizon/AV series (3 weeks)**																												
Costco A 340ah Horizon Rider/AV series (3 weeks)**																												
Costco B Trojan baseline development (4/7 weeks)																												
Costco B 'Heavy' 25ah Horizon/Tennant/Zivan (3/7 weeks)																												
Tennant Trojan/Horizon fast charge demo pre-tests (2 weeks)																												

>>> decision to reduce walk-behind battery capacity, conduct rider tests, and revise series & schedule

**Two-string Horizon Walk-behind/Multi-string Horizon Riding Scrubber series using single AeroVironment fast charger for both in daily operation.

Figure 3-2
Outline Scrubber Demonstration Execution

The Warehouse A walk-behind scrubber was reconfigured to 50 ampere-hours and ballast added for the initial series using the AeroVironment charger. At the same time, the riding scrubber baseline was developed using the standard Exide battery and Tennant charger configuration.

At the end of November, Horizon batteries were installed in the riding unit, ballast was removed from the walk-behind scrubber, and the final series, consisting of concurrent high-power charging of the riding scrubber and walk-behind unit in daily operation, was started.

The EPRI/TVA/Tennant floor scrubber demonstration was concluded on December 18, 2000.

4
DEMONSTRATION EQUIPMENT: SCRUBBER HARDWARE AND DATA COLLECTION COMPONENTS

Scrubbers, Batteries, and Chargers

The Tennant Model 5700 walk-behind scrubber, on the left of the pictures below, weighs just over 1,000 pounds and can travel at up to 3.1 miles-per-hour. It has a tank capacity of 40 gallons. Costco elects the enhanced battery option, which incorporates 305 Ah @20 hour rate (~225 Ah @ 3 hour rate), Trojan flooded lead-acid batteries and a 30 Amp charger. The form factor for the battery compartment, with maximum combined dimensions of 25.5”x21”x14.34” (LxWxH), limits replacement options.

The Tennant Model 8010 riding scrubber, shown on the right, employs 630 Ah Exide batteries (~466 Ah @ 3 hour rate), with battery compartment limitations of 35.25”x19.38”x19.12” (LxWxH).

Figure 4-1
Model 5700 Walk-Behind Scrubber, Charger Mounts, and Model 8010 Riding Scrubber

Horizon 12C25 sealed lead acid battery cells were combined in 8, 3-cell, strings, with a net 200 Ah capacity @ 3 hour rate, for the walk-behind scrubber. Horizon 12H85 sealed lead acid battery cells were combined in 4, 3-cell, strings, with a net 340 Ah capacity @ 3 hour rate, for the riding scrubber. (Specifications for the Horizon batteries and all other equipment described in this chapter are presented in Appendix A.)

A 230-volt Zivan NG5-36100 programmable charger, shown mounted on the right vertical rack support in middle frame above, was used for 'standard' charging of the Horizon-equipped scrubber configurations. The unit is capable of delivering 100+ Amp charging power and weighs about 19 pounds.

A 480-volt, 3-phase, AeroVironment PosiCharge ELT industrial charger, capable of delivering 36 kilowatts, was used for high-power charging of the Horizon battery-equipped scrubber configurations. The unit, shown on the elevated rack in the middle frame of above, weighs 545 pounds.

Data Loggers and Sub-Meters

Tennant Company provided and maintained two Fluke Hydra Dataloggers for use throughout the seven-month demonstration. Both units were initially installed in Model 5700 walk-behind scrubbers as shown in the first frame of the pictures below. Note that the square panel in the front of the unit was modified to house and provide access to the data logger units for the demonstration. The original equipment housings were reinstalled at the end of the tests.

Later in the demonstration, one data logger was removed from a walk-behind unit and installed in a Model 8010 riding scrubber, as shown in the second and third frames below. Space was at a premium and the only option was to place the instrument in direct contact with the battery pack. There was initial concern that heat might affect the data collection device, but no problems were encountered.

Figure 4-2
Fluke Hydra Data logger Mounting: Model 5700, Model 8010, and Model 8010 Detail

Facility Wiring

Except for the lease costs for the high-power chargers, circuit wiring to accommodate additional chargers was the most expensive capital requirement in the demonstration. While clearly a simple installation—the run from the original 480-volt panel to the charger-bank location was only 20-30 feet—the requirement for a subordinate 480-volt panel, disconnect, and dedicated meter (provided by MLGW and shown in the left frame below) for the AeroVironment charger and a separate 230-volt range-plug outlet for the Zivan charger drove the cost to $2,350 in one warehouse and $2,650 in the second.

In addition, since the 230-volt circuit was not part of the high-power branch, separate sub-metering was needed to record the utility load for the both the Trojan/Tennant charger baseline and Horizon/Zivan charger series of tests. Tennant Company fabricated two sub-meter assemblies as shown in the right-hand frame below. Each sub-meter assembly consisted of a range-plug pig-tailed 50 Amp circuit breaker panel, a 230-volt range-plug receptacle, a 110-volt, 30 Amp convenience outlet, and an E-Mon D-Mon Model 20850D, 3-phase, 120/208-240v/50 Amp kWh/kW demand meter.

Figure 4-3
MLGW High-Power Charging Circuit Meter and Tennant Company Sub-Meter Panel

5
DEMONSTRATION DATA: COLLECTION, REDUCTION, AND SUMMARIES

Raw Operational Data

Data was collected at 1-minute data intervals over the course of the entire seven-month duration of the scrubber demonstration. Altogether, 6 data items—date, time, battery voltage, current, cell temperature, and battery compartment temperature—were collected for 375,146 data periods, a total of 2,250,876 data points.

An imputed state-of-charge, based on the algorithm employed in the Curtis Instruments battery indicator, was also calculated for each data period.

Event Histories

From the data, the condition of the scrubber was categorized as either "in-use," "off," or "charging" for each 1-minute interval. Contiguous periods of like-condition were then aggregated to describe individual discrete "in-use" and "charging" events.

Over the course of the demonstration, 850 discrete scrubber "in-use" events and 279 discrete scrubber "charging" events were recorded. The walk-behind scrubbers were "in-use" 703 times for a total of 73.7 hours; they were charged 239 times for a total of 110.7 hours. The riding scrubber was "in-use" 147 times for total of 43.8 hours; it was charged 40 times for a total of 111.1 hours.

Duration, maximum current draw, total current draw, and total energy consumption were calculated for each event. Summary tables describing these parameters for each and every event recorded during the demonstration are presented in Appendix B.

Daily Comparisons

In order to comprehensively evaluate scrubber operations at a glance, two tables (one for scrubber use, one for scrubber charging) were developed to present daily totals for use (or charge) minutes, percentage of Ampere-hours of battery capacity used (or replaced), and energy costs in cents. The tables, Figure 5-1 and Figure 5-2, respectively, show (shaded areas) the total period covered by each demonstration series, show (by absence of data) periods of inactivity, and note circumstances affecting data collection as they occurred throughout the demonstration.

Walk-Behind, 225ah Trojan, Tennant, Costco A					Walk-Behind, 225ah Trojan, Tennant, Costco B					Walk-Behind, 200ah Horizon, Zivan, Costco A					Walk-Behind, 'light', 25ah single-string, Horizon, Zivan, Costco A					Walk-Behind, 'heavy', 25ah single-string, Horizon, Tennant/Zivan, Costco B					Walk-Behind, 'heavy', 50ah two-string, Horizon, AeroVironm't, Costco A					Walk-Behind, 'light', 50ah two-string, Horizon, AeroVironm't, Costco A					Rider, 600ah Exide, Tennant, Costco A					Rider, 340ah Horizon, AeroVironm't, Costco A				
Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢	Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢	Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢	Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢	Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢	Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢	Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢	Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢	Daily	Use, minutes	Amp-hr Capacity, %		Energy Cost, ¢
6/1	54	14%		14¢	6/28	17	4%		4¢	6/28	3	0%		0¢	8/22	24	34%		4¢										**note					11/29	3	3%		1¢	10/13	31	14%		38¢	11/29	30	22%		33¢
6/2	99	28%		26¢	6/29	31	10%		10¢	6/29	33	12%		11¢	8/23	15	30%		3¢	8/23	16	26%		3¢										11/30	9	8%		2¢	10/14	53	24%		62¢					
6/3	8	2%		2¢	6/30	79	25%		25¢	6/30	56	14%		23¢						8/24	24	36%		4¢															10/15	97	42%		114¢	12/1	19	17%		26¢
6/4	8	5%		4¢	7/1	20	7%		7¢	7/1	4	1%		1¢	8/25	9	10%		1¢	8/25	17	32%		3¢										12/2	11	14%		3¢	10/16	35	11%		30¢	12/2	9	8%		12¢
					7/2	27	9%		9¢	7/2	27	8%		8¢	8/26	30	48%		5¢	8/26	16	27%		3¢										12/3	13	13%		2¢	10/17	95	32%		80¢					
6/6	44	12%		11¢	7/3	34	10%		10¢	7/3	34	8%		8¢	8/27	9	29%		3¢	8/27	19	40%		4¢										12/4	17	17%		3¢	10/18	5	2%		6¢	12/4	26	22%		31¢
6/7	21	5%		5¢											8/28	71	152%		17¢	8/28	101	288%		31¢															10/19	50	20%		53¢	12/5	55	43%		66¢
6/8	15	3%		3¢	7/5	35	7%		7¢	7/5	54	17%		15¢	8/29	32	89%		10¢	8/29	69	164%		18¢															10/20	16	7%		18¢					
					7/6	7	3%		3¢	7/6	52	15%		12¢	8/30	36	87%		9¢	8/30	12	36%		4¢										12/7	11	10%		2¢						12/7	49	34%		50¢
6/10	1	0%		0¢	7/7	34	6%		6¢						8/31	54	98%		11¢	8/31	9	21%		2¢										12/8	6	5%		1¢	10/22	40	18%		47¢	12/8	55	42%		66¢
6/11	8	1%		1¢	7/8	21	3%		3¢	7/8	34	9%		8¢	9/1	37	71%		8¢	9/1	1	5%		0¢										12/9	19	25%		5¢						12/9	7	7%		10¢
6/12	36	8%		8¢	7/9	15	2%		3¢	7/9	10	2%		2¢	9/2	8	12%		1¢																			12/10	10	9%		2¢	10/24	39	17%		44¢	12/10	117	95%		142¢
6/13	35	12%		12¢	7/10	44	6%		6¢	7/10	10	3%		3¢	9/3	30	43%		5¢			*note															12/11	32	41%		8¢						12/11	26	21%		34¢
6/14	25	8%		8¢	7/11	3	1%		1¢	7/11	39	13%		12¢																									10/26	52	22%		60¢	12/12	29	22%		34¢
6/15	56	14%		14¢	7/12	26	6%		6¢	7/12	20	5%		4¢	9/5	30	54%		6¢																			12/12	4	4%		1¢	10/27	34	12%		32¢	12/13	91	57%		83¢
6/16	13	11%		11¢	7/13	60	20%		20¢	7/13	22	12%		11¢	9/6	26	37%		4¢										11/2	16	12%		3¢						10/28	10	4%		11¢	12/14	5	4%		7¢
6/17	40	10%		10¢	7/14	13	4%		4¢	7/14	5	1%		1¢	9/7	46	79%		9¢										11/3	41	36%		8¢	12/14	3	2%		0¢						12/15	5	4%		6¢
					7/15	14	4%		4¢	7/15	66	18%		16¢	9/8	17	22%		2¢	9/8	7	10%		1¢										11/4	21	14%		3¢	12/15	14	14%		3¢	10/30	73	29%		77¢	12/16	7	6%		9¢
					7/16	14	4%		4¢	7/16	15	5%		4¢	9/9	54	97%		10¢	9/9	1	1%		0¢										11/5	33	33%		6¢						10/31	179	68%		177¢	12/17	4	4%		6¢
6/20	54	14%		13¢	7/17	38	7%		7¢	7/17	23	7%		6¢	9/10	14	17%		2¢										11/6	25	17%		3¢	12/17	11	8%		2¢	11/1	232	86%		225¢					
6/21	8	2%		2¢	7/18	34	6%		6¢	7/18	62	19%		16¢	9/11	22	28%		3¢																			11/2	96	19%		55¢					
6/22	21	5%		5¢	7/19	3	1%		1¢	7/19	57	19%		18¢	9/12	74	150%		16¢										***note					****note					11/3	61	25%		69¢	*****note				
		note			7/20	28	9%		9¢	7/20	22	7%		6¢	9/13	43	66%		7¢																			11/4	10	4%		12¢					
					7/21	13	4%		4¢	7/21	10	3%		3¢	9/14	46	62%		7¢																			11/5	3	1%		2¢					
					7/22	30	12%		11¢	7/22	48	12%		11¢	9/15	30	70%		8¢																			11/6	68	28%		74¢					
					7/23	47	12%		12¢	7/23	18	7%		7¢	9/16	28	47%		5¢																												
					7/24	53	15%		14¢	7/24	45	15%		13¢	9/17	26	58%		6¢																			11/8	5	2%		5¢					
										7/25	31	8%		7¢						9/18	2	5%		1¢													11/9	71	28%		71¢					
					7/26	19	5%		5¢	7/26	24	9%		7¢	9/19	39	86%		9¢																			11/10	84	38%		99¢					
					7/27	20	3%		3¢	7/27	27	11%		10¢	9/20	22	47%		5¢	9/20	1	1%		0¢															11/11	66	31%		78¢					
					7/28	12	2%		2¢	7/28	38	11%		10¢	9/21	10	13%		2¢																												
					7/29	21	3%		3¢	7/29	35	11%		10¢	9/22	1	1%		0¢	9/22	6	16%		2¢															11/13	32	12%		31¢					
					7/30	14	2%		2¢	7/30	7	2%		2¢	9/23	39	49%		5¢	9/23	1	1%		0¢															11/14	62	29%		76¢					
					7/31	40	6%		68¢	7/31	21	6%		5¢	9/24	26	33%		4¢	9/24	9	11%		1¢															11/15	65	29%		72¢					
					8/1	29	7%		7¢	8/1	44	14%		13¢	9/25	66	115%		12¢																			11/16	50	24%		65¢					
					8/2	8	4%		3¢	8/2	9	2%		2¢	9/26	50	112%		12¢	9/26	2	3%		0¢															11/17	69	33%		83¢					
					8/3	14	2%		2¢	8/3	86	34%		32¢	9/27	51	120%		13¢	9/27	13	23%		3¢															11/18	108	42%		108¢					
					8/4	23	5%		5¢	8/4	37	9%		8¢	9/28	59	142%		15¢	9/28	3	7%		1¢															11/19	19	9%		23¢					
					8/5	27	5%		5¢	8/5	32	15%		1¢	9/29	30	51%		6¢	9/29	4	20%		2¢															11/20	29	14%		39¢					
					8/6	49	17%		16¢	8/6	8	3%		2¢	9/30	53	116%		13¢	9/30	6	12%		1¢															11/21	63	29%		76¢					
					8/7	19	4%		4¢	8/7	32	6%		6¢	10/1	35	60%		7¢	10/1	6	10%		1¢															11/22	35	16%		42¢					
					8/8	33	7%		7¢	8/8	52	15%		45¢	10/2	20	36%		4¢	10/2	5	10%		1¢																						
					8/9	15	4%		4¢	8/9	76	31%		29¢	10/3	35	49%		6¢	10/3	12	18%		2¢																						
					8/10	26	8%		8¢	8/10	20	6%		5¢	10/4	48	79%		9¢	10/4	5	11%		1¢															11/25	3	2%		4¢					
					8/11	57	11%		10¢	8/11	61	27%		23¢	10/5	42	68%		8¢	10/5	7	15%		2¢																						
					8/12	51	12%		12¢	8/12	15	3%		3¢	10/6	34	62%		7¢	10/6	10	16%		1¢															11/27	77	34%		86¢					
					8/13	26	6%		6¢	8/13	11	2%		1¢	10/7	32	65%		7¢	10/7	31	67%		7¢															11/28	30	9%		23¢					
					8/14	4	1%		1¢	8/14	11	1%		1¢																																
					8/15	5	1%		1¢	8/15	82	36%		33¢	10/9	3	5%		1¢	10/9	4	6%		1¢																						
					8/16	35	12%		11¢	8/16	96	30%		27¢	10/10	16	28%		3¢																												
					8/17	32	9%		9¢	8/17	33	13%		12¢	10/11	5	6%		1¢	10/11	1	0%		0¢																						
										8/18	47	13%		12¢	10/12	21	48%		5¢																												
																				*Tennant charger used waiting connector replacement. Zivan charger fault; unit not working; data logger eventually shuts down as scrubber battery fully discharges; Zivan charger replaced.					**Horizon battery string failure; replaced with two-string configuration. Delay in set-up of AeroVironment charger; bmid availability and installation. ***AeroVironment charger fault; nicad sensing battery					****Apparent reduced use of scrubber may be seasonal; no insight.										*****Apparent reduced use of scrubber may be seasonal; no insight.				
															10/17	15	32%		4¢																										
Final week of data lost on change over to Horizon battery																																															

Figure 5-1
Daily Scrubber Use

Walk-Behind, 225ah Trojan, Tennant, Costco A				Walk-Behind, 225ah Trojan, Tennant, Costco B				Walk-Behind, 200ah Horizon, Zivan, Costco A				Walk-Behind, 'light', 25ah single-string, Horizon, Zivan, Costco A				Walk-Behind, 'heavy', 25ah single-string, Horizon, Tennant/Zivan, Costco B				Walk-Behind, 'heavy', 50ah two-string, Horizon, AeroVironm't, Costco A				Walk-Behind, 'light', 50ah two-string, Horizon, AeroVironm't, Costco A				Rider, 600ah Exide, Tennant, Costco A				Rider, 340ah Horizon, AeroVironm't, Costco A			
Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢	Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢	Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢	Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢	Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢	Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢	Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢	Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢	Daily	Charge, minutes	Amp-hr Capacity, %	Energy Cost, ¢
6/2	2	0%	0¢	6/29	490	97%	86¢					8/22	60	82%	9¢	8/22	117	98%	11¢					11/29	14	7%	1¢	10/13	56	17%	17¢				
																8/23	4	2%	0¢					11/30	16	11%	2¢	10/14	317	67%	97¢				
				7/1	464	54%	50¢					8/25	32	53%	6¢	8/25	22	38%	4¢									10/15	20	2%	7¢				
												8/26	22	38%	4¢	8/26	17	27%	3¢					12/2	19	16%	4¢								
												8/27	2	2%	0¢	8/27	27	51%	5¢									10/17	480	102%	145¢				
												8/28	92	160%	17¢	8/28	380	426%	44¢					12/4	27	26%	6¢	10/18	20	2%	7¢				
												8/29	27	66%	7¢	8/29	136	169%	17¢													12/5	269	84%	89¢
												8/30	2	2%	0¢	8/30	71	45%	5¢																
				7/7	114	19%	17¢					8/31	61	147%	16¢									12/8	31	27%	6¢					12/8	443	97%	164¢
6/11	1	0%	0¢									9/1	48	84%	9¢									12/9	25	21%	5¢					12/9	20	3%	8¢
6/12	758	124%	110¢									9/2	4	3%	0¢					11/2	40	40%	9¢					10/24	479	85%	151¢	12/10	346	123%	112¢
																				11/3	38	34%	7¢	12/11	49	51%	11¢	10/25	20	2%	7¢	12/11	200	31%	87¢
				7/10	176	28%	25¢					9/4	2	1%	0¢					11/4	19	17%	4¢					10/26	20	2%	7¢				
												9/5	67	108%	11¢					11/5	10	4%	1¢					10/27	67	21%	20¢	12/13	337	122%	106¢
												9/6	44	66%	7¢					11/6	5	2%	0¢	12/14	17	10%	2¢	10/28	182	29%	61¢	12/14	20	3%	9¢
				7/13	332	35%	34¢					9/7	33	80%	9¢													10/29	20	2%	7¢				
												9/8	52	45%	5¢																				
												9/9	28	86%	9¢									12/17	28	22%	5¢	10/31	368	87%	109¢				
												9/10	35	42%	5¢													11/1	227	33%	73¢				
												9/11	31	41%	4¢													11/2	484	118%	140¢				
												9/12	86	160%	17¢													11/3	210	35%	68¢				
												9/13	39	78%	8¢																				
												9/14	32	69%	7¢																				
												9/15	49	74%	8¢																				
												9/16	57	65%	7¢																				
												9/17	23	32%	3¢																				
												9/18	16	12%	1¢													11/9	199	58%	58¢				
												9/19	55	101%	10¢																				
				7/26	602	114%	101¢	7/26	173	92%	75¢	9/20	20	47%	5¢													11/11	82	25%	22¢				
								7/27	1	0%	0¢																										
												9/22	7	5%	1¢													11/13	324	72%	98¢				
												9/23	47	102%	11¢													11/14	20	2%	7¢				
												9/24	16	13%	1¢													11/15	502	83%	159¢				
												9/25	85	160%	17¢																				
								8/1	1	0%	0¢	9/26	60	80%	8¢																				
								8/2	152	75%	62¢	9/27	125	249%	27¢													11/18	147	42%	35¢				
												9/28	66	157%	17¢													11/19	455	96%	149¢				
								8/4	1	0%	0¢	9/29	140	158%	16¢													11/20	20	2%	7¢				
								8/5	138	66%	55¢	9/30	105	159%	17¢													11/21	282	54%	90¢				
								8/6	1	0%	0¢	10/1	41	54%	6¢													11/22	20	2%	7¢				
								8/7	9	1%	1¢	10/2	29	54%	6¢																				
								8/8	100	26%	22¢	10/3	24	43%	5¢																				
												10/4	54	83%	8¢																				
				8/10	409	75%	66¢	8/10	12	1%	1¢	10/5	39	71%	7¢																				
								8/11	15	1%	1¢	10/6	28	55%	6¢																				
								8/12	13	1%	1¢																								
								8/13	121	73%	59¢	10/8	33	68%	7¢																				
								8/14	3	0%	0¢	10/9	1	1%	0¢																				
								8/16	182	86%	71¢	10/11	27	44%	4¢																				
				8/17	365	65%	58¢																												
												10/17	28	36%	4¢																				
												10/18	7	5%	1¢																				

*Final week of data lost on change over to Horizon battery

*Datalogger/shunt mis-calibration; first four weeeks of charge data collection lost/unrecoverable.

*Tennant charger used waiting connector replacement. Zivan charger fault; unit not working; data logger eventually shuts down as scubber battery fully discharges; Zivan charger replaced. Costco B without scrubber for 3

**Horizon battery string failure; replaced with two-string configuration. Delay in set-up of AeroVironment charger; bmid availability and installation.

***AeroVironment charger fault; nicad sensing battery replaced; Costco A without scrubber for 5 weeks.

****Apparent reduced use of scrubber may be seasonal; no insight.

*****Apparent reduced use of scrubber may be seasonal; no insight.

Figure 5-2
Daily Scrubber Charging

The tables explicitly show the impact of battery capacity reduction and the adaptation of opportunity charging in Costco operations. The reduced capacity walk-behind scrubber was charged daily, frequently replacing more than 100% of its rated capacity each day, occasionally more than 200% of capacity. The tables also emphasize just how little the scrubbers are used at Costco and how insignificant the costs of operation actually are.

Consolidated Summaries

Finally, a single table, Figure 5-3, summarizes important derived data, and understanding, for each of the demonstration configurations of scrubber, battery, and charger. Average Duty (minutes/day), Average Task Duration (minutes), Longest Task Duration (minutes), Scrubbing Effectiveness (amp-hrs/hr), Charging Effectiveness (min-use/min-chg), Average Charging Load (kWh/day), Average Energy Cost ($/day), 3-hour Battery Capacity (amp-hrs), Approximate Battery Weight (lbs.), Approximate Battery Cost ($), and Battery Capacity Life @600 cycles (years) are presented for all nine scrubber/battery/charger configurations evaluated.

Data Narratives

Early in the scrubber demonstration, "data narratives" were developed as a possible way to consistently describe and summarize data as it was being collected. The consolidated summary table, described in the preceding section, replaced these narratives, but the incomplete set is offered in the paragraphs below as an alternative approach to understanding the numbers.

Costco A Baseline (Trojan/Tennant): In just under 22 days of data collection, the scrubber was "in use" 74 times for a total of just over 9 hours, an average of about 25 minutes per day. The median use was five minutes, the longest 44 minutes, 25% of uses were for only one minute, 80% of uses were less than 10-minute duration. The batteries delivered a total of just under 12 kWh of energy, 1.3 kWh per hour of use. The scrubber was "charged" for only one minute on three occasions and was charged continuously on one other occasion for just under 13 hours. The batteries absorbed just over 11 kWh of energy, about 0.9 kWh per hour of charging. The facility delivered 14 kWh to the charger (26kWh meter reading less 4 kWh per week meter energy consumption) at a peak rate of 1.3 kW, yielding a charging efficiency of 77%. The scrubber delivered 96 seconds of runtime per amp-hour of battery capacity. Charging downtime was 269 seconds per delivered amp-hour of battery capacity.

Costco B Baseline (Trojan/Tennant): In just over 51 days of data collection, the scrubber was "in use" 273 times for a total of 22 hours, an average of about 26 minutes per day. The median use was four minutes, the longest 55 minutes (the only use longer than 22 minutes). Just over 25% of uses were for only one minute, 86% of uses were less than 10-minute duration. The batteries delivered a total of just over 31 kWh of energy, 1.5 kWh per hour of use. The scrubber was "charged" on nine occasions for a total of over 49 hours. The shortest charge period was 21 minutes, the longest 10 hours. The batteries absorbed 44 kWh of energy, about 0.9 kWh per hour of charging. The facility delivered 53 kWh to the charger at a peak rate of 1.4 kW, yielding a charging efficiency of 83%, an output efficiency of 70%, and a system efficiency of 58%.

	Walk-Behind Floor Scrubber; 225amp-hr Trojan Battery/ Tennant Charger (Baseline)--Costco Warehouse A	Walk-Behind Floor Scrubber; Trojan Battery/Tennant Charger (Baseline)--Costco Warehouse B	Walk-Behind Floor Scrubber; 200amp-hr Horizon Battery/Zivan Charger--Costco Warehouse A	Walk-Behind Floor Scrubber; 'Light' 25amp-hr Horizon Battery/Zivan Charger--Costco Warehouse A	Walk-Behind Floor Scrubber; 'Heavy' 25amp-hr Horizon Battery/Tennant Charger--Costco Warehouse B	Walk-Behind Floor Scrubber; 'Heavy' 50amp-hr Horizon Battery/AeroVironment Charger--Costco Warehouse A	Walk-Behind Floor Scrubber; 'Light' 50amp-hr Horizon Battery/AeroVironment Charger--Costco Warehouse A	Rider Floor Scrubber; 600amp-hr Exide Battery/Tennant Charger (Baseline)--Costco Warehouse A	Rider Floor Scrubber; 340amp-hr Horizon Battery/ AeroVironment Charger--Costco Warehouse A
Average Duty (minutes/day)	25	25	33	27	16	28	9	45	29
Average Task Duration (minutes)	9	6	10	9	6	7	6	18	17
Longest Task Duration (minutes)	44	55	55	41	28	22	16	71	66
Scrubbing Effectiveness (amp-hrs/hr)	39	36	39	28	35	25	32	148	158
Charging Effectiveness (min-use/min-chg)	~0.50	0.54	1.10	0.81	0.35	1.21	0.75	0.42	0.50
Average Charging Load (kWh/day)	1.320	1.095	0.837	0.710	0.460	0.622	0.274	4.168	3.911
Average Energy Cost ($/day)	$0.13	$0.11	$0.08	$0.07	$0.05	$0.06	$0.03	$0.42	$0.39
3-hour Battery Capacity (amp-hrs)	225	225	200	25	25	50	50	600	340
Approximate Battery Weight (lbs.)	606	606	450	60	450	450	450	1200	800
Approximate Battery Cost ($)	$700	$700	$2,000	$250	$250	$500	$500	$2,000	$3,500
Battery Capacity Life @600 cycles (years)	22.7	25.1	15.4	3.3	4.3	7.2	17.8	8.8	7.5

Figure 5-3
Consolidated Floor Scrubber Demonstration Results

The scrubber delivered 105 seconds of runtime per amp-hour of battery capacity. Charging downtime was 240 seconds per delivered amp-hour of battery capacity.

Costco A Sealed/Normal (Horizon/Zivan) Series: In just over 51 days of data collection, the scrubber was "in use" 223 times for a total of 28 hours, averaging about 33 minutes and 21 amp-hours of battery capacity per day. The median use was five minutes, the longest 55 minutes. Just over 20% of uses were for only one minute, 76% of uses were less than 10-minute duration, and 10% were greater than 20 minutes. Only 3% of uses required more than 20 amp-hours of battery capacity. The batteries delivered a total of 36 kWh of energy, 1.3 kWh per hour of use. Looking at measured discharge/charge cycles, the scrubber was charged on eight 'primary' occasions for a total of just over 15 hours. (Based on temperature and voltage data, the scrubber was charged on two additional occasions for a total of about 10 hours—data under review). About ninety recorded 'secondary', short duration, charges of 1 to 3 minutes account for one-hour and 40 minutes of the total. The 'primary' charges ranged from 17 minutes to 171 minutes, averaging 103 minutes. In completed cycles, the batteries absorbed 35 kWh of energy, about 2.3 kWh per hour of charging, while delivering 22 kWh of energy through the scrubber. The facility delivered 61 kWh to the charger at a peak rate of 4.8 kW, yielding a charging efficiency of 60%, an output efficiency of 63%, and a system efficiency of 36%. The scrubber delivered 95 seconds of runtime per amp-hour of battery capacity. Charging downtime was 78 seconds per delivered amp-hour of battery capacity.

Costco B Single-String/'Heavy'/Sealed/Normal (Horizon/Tennant) Series (in-progress): In just under 8 days of data collection, the scrubber was "in use" 53 times for a total of 4.4 hours, an average of about 35 minutes per day. The median use was three minutes, the longest 28 minutes. Just over 25% of uses were for only one minute, 85% of uses were less than 10-minute duration, and only one use was greater than 20 minutes, drawing down 18 amp-hours of battery capacity. The batteries delivered a total of 5.4 kWh of energy, 1.2 kWh per hour of use. The scrubber was charged on fifteen 'primary' occasions for a total of just under 13 hours. Some 27 'secondary' charges of 1 to 4 minutes account for 44 minutes of the total. The 'primary' charges ranged from 9 minutes to 171 minutes, averaging 48 minutes. The batteries absorbed 8.9 kWh of energy, about .7 kWh per hour of charging. The facility delivered 20 kWh to the charger at a peak rate of 1.3 kW, yielding a charging efficiency of 45%, an output efficiency of 61%, and a system efficiency of 27%. The scrubber delivered 104 seconds of runtime per amp-hour of battery capacity. Charging downtime was 308 seconds per delivered amp-hour of battery capacity.

Costco A Single-String/'Light'/Sealed/Normal (Horizon/Zivan) Series (in-progress): In just under 8 days of data collection, the scrubber was "in use" 28 times for a total of 3.4 hours, an average of about 27 minutes per day. The median use was six minutes, the longest 18 minutes. Just over 10% of uses were for only one minute and 75% of uses were less than 10-minute duration. Only one use drew more than 10 ampere-hours of battery capacity, a single 17-minute use drawing 11.1 amp-hours. The batteries delivered a total of 3.7 kWh of energy, 1.1 kWh per hour of use. The scrubber was charged on twelve 'primary' occasions for a total of 4.0 hours. Some 14 'secondary' 1-minute charges account for 14 minutes of the total. The 'primary' charges ranged from 9 minutes to 41 minutes, averaging 19 minutes (only one charge was longer than 20 minutes). The batteries absorbed 4.2 kWh of energy, about 1.1 kWh per hour of charging. The facility delivered 11 kWh to the charger at a peak rate of 1.6 kW,

yielding a charging efficiency of 38%, an output efficiency of 88%, and a system efficiency of 34%. The scrubber delivered 120 seconds of runtime per amp-hour of battery capacity. Charging downtime was 125 seconds per delivered amp-hour of battery capacity.

6
COMMERCIAL FLOOR SCRUBBER DEMONSTRATION CONCLUSIONS AND RECOMMENDATIONS

Floor Scrubber Utilization

Costco uses both its walk-behind and riding floor scrubbers for only limited, 'spot-cleaning" duty-cycles. The aggregate numbers are clear. The walk-behind scrubbers are used about six minutes at a time, about four times each day. They require charging about once a week or less. The riding scrubbers are used more frequently, but not dramatically so. The riders are used about 45 minutes each day. They are charged, in general, every second or third day.

Scrubber operations are a nearly insignificant cost to Costco, and the *nearly* may be an overstatement. Assuming 10 ¢ per day and it may be lower, system-wide, at all 250+ of its stores, Costco is spending $25 per day to operate its walk-behind scrubbers. Projected over a year, that is $9,000. A single half-time employee will cost more.

The riding scrubber units represent a substantially higher cost to the company, $36,000 per year. Anything that would make use of the equipment even the slightest bit less convenient would probably cost the company more. For instance, if an additional two minutes per day were needed by a $10/hour employee to connect and disconnect charging apparatus, system-wide Costco would annually incur a cost of $30,000 plus benefits.

Advanced Batteries and Battery Chargers

The demonstration showed that floor scrubbers, as a class of equipment, may benefit from battery advances. The demonstration showed that opportunity charging of the scrubbers could be effectively repeatedly throughout any given day. More than twice the total capacity was used and replaced in the peak circumstance. Further, reliable, sophisticated and relatively inexpensive chargers are available now.

The programmable Zivan unit consistently achieved charging effectiveness 50% to 100% better than the standard charging apparatus. The AeroVironment charger achieved slightly higher rates for the walk-behind units, for which it is not particularly suited—the charger capabilities are far beyond what is needed.

However, the results with the riding scrubber are inconclusive, at best, since there was no apparent difference between the AeroVironment performance and that achieved by the standard Tennant configuration.

Potential Product Innovations

Costco could conceivably make good use of a walk-behind scrubber with battery capacity tailored to the limited duty-cycle exhibited in their warehouses. A case can be made that if Costco is replacing their equipment, or even just the batteries, every two years, they are discarding about 90% of the purchased battery storage capability that is resident in the batteries. That could amount to about $500 per unit, $125,000 across the entire store population over the service life schedule, whatever it is.

However, here again, care must be taken. The prior hypothetical analysis indicates that an additional 8 minutes per day of inconvenience at each warehouse would be sufficient to entirely offset, in a single year, the potential benefit of smaller batteries that may be realized over a considerably longer timeframe.

Demonstration Management Issues

As in all such exercises, both technical and management issues emerged from the scrubber demonstration. Altogether, the companies and organizations involved performed in a collaboratively excellent fashion—that coming from a perhaps too-closely involved source. The level of cooperation was very high and the willingness to contribute time and materiel was laudable. But, it may be useful to note at least a couple pitfalls that may be avoided by similar demonstration teams in the future.

Operational Reliability

The intent at the very beginning of the planning for this work was to demonstrate only proven, “off-the-shelf” technology. As it turned out, the primary objects of the tests, Horizon batteries and AeroVironment chargers, were early production, ‘beta’ units that required care and understanding in their application. New configurations were fabricated; new algorithms were developed; technical contentions, doubts and concerns were tested and validated—all of which demanded additional time and resources.

Even with care, nearly every component in the chain that could fail did in fact fail, albeit briefly, at some point in the process. All the events could be expected and none was particularly serious, but the upshot was that Costco lost use of the scrubbers at their warehouses more often and for longer periods than should have been the case. It turned out that the demonstration team was fortunate that the scrubber duties were not of greater concern to the customer.

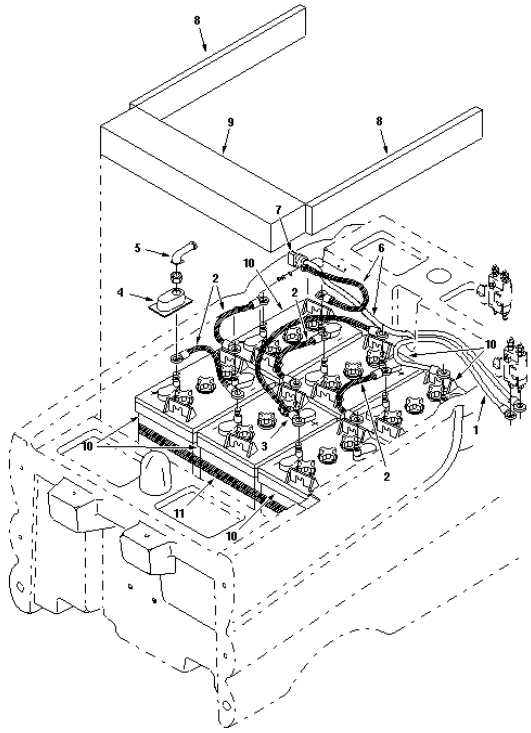
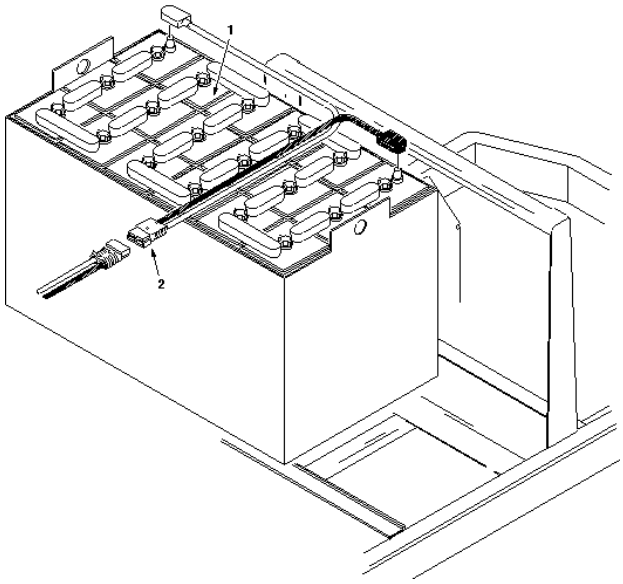
Client/Operator Culture

The last point follows up on that last comment. Costco is a busy place. They are highly successful and driven to do what they do. Floor scrubbers are not a priority. That said, the demonstration did suffer from the indifference of the users. No one at either of the warehouses was assigned responsibility for the equipment. It was difficult to communicate anything about the demonstration to the users, and it was not clear even who they were. It may be sufficient that future demonstrations make a more concerted effort to become visible and interesting to the people who directly use whatever products are being tested.

A
APPENDIX: EQUIPMENT SPECIFICATIONS

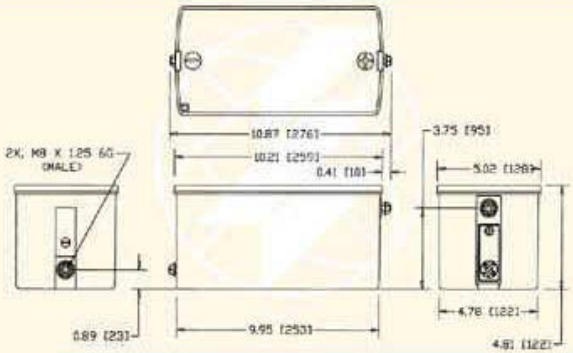
Tennant Model 5700 and Model 8010

Figure A-1
Current Sweeper/Scrubber Battery Capabilities and Limitations

	
Walk-behind sweeper/scrubber battery: Six, 6V, batteries in series (36Vtotal) Current Battery Capacity: up to 335 Ahr Max Dimensions (each battery): 12.75”x7”x14.34” (LxWxH) Max Dimensions (combined): 25.5”x21”x14.34” (LxWxH) Max Battery Weight: 104 lbs each (weight may increase) Batteries are installed as in illustration below. The dimensions above are for the largest batteries that will fit in the walk-behind unit.	Riding sweeper/scrubber battery OneBattery Pack, 36v (single string of cells) Current Battery Capacity: up to 630 Ahr Max Dimensions: 35.25”x19.38”x19.12” (LxWxH) Max Battery Weight: 1300 lbs (weight may be increased) Batteries are installed as in illustration below. The dimensions above are for the largest batteries that will fit in the rider sweeper/scrubber.

Electrosource Horizon 12C25 and 12H85

Model 12C25 - Module Performance Data



12C25 MODEL

Nominal Voltage: 12V

Nominal Capacity (C/3): 25 Ahr

Maximum Dimensions (in/mm):
Length: 10.87 / 276.1 Width: 5.02 / 127.5 Height: 4.81 / 122.2

Weight (Kg/Lbs.): 8.2 / 18.1

Terminal Type: M8 x 1.25 Male Stud

Capacity @25°C:

Discharge Time:	Min	5	10	30	60	180
Capacity:	Ahr	11	15	20	21	25.0
Constant Current:	Amps	135	88	39	21	8.3

Specific Power (USABC Peak Power Test):
> 400 W/kg @ 80% SOC
> 200 W/kg @ 30% SOC

Internal Impedance of Fully Charged Battery @ 25°C (USABC Peak Power Test):
10 mΩ

Temperature Limits:
Storage -40°C to 60°C
Operation -40°C to 50°C

Recommended Charge:

Individual	Algorithm	CI / CV
	Voltage Clamp	14.9 V at 25°C**
	Initial Inrush Current	> 12 A
Pack	Algorithm	Pseudo CI/CV
	(contact Electrosource for technical data)	

* Modules on open circuit stand to be charged on 90 Day intervals or min voltage of 12V, whichever comes first
** See Electrosource Users Guide for temperature compensation guidelines.

Life: C1 80% DOD, 25°C > 400 Cycles

 5/15/00

Electrosource, Inc.
Engineering Applications Department
2809 IH-35 South, San Marcos, Texas 78666
Tel: (512) 753-6500 ▪ www.electrosource.com

Model 12H85 - Module Performance Data

12H85 MODEL

Nominal Voltage: 12V

Nominal Capacity (C/3): 85 Ahr

Maximum Dimensions (in/mm):
Length 30.22 / 767.6 Width 5.05 / 128.3 Height 4.75 / 120.7

Weight (Kg/Lbs.): 26.1 / 57.6

Terminal Type: 10mm Radsok Supertwist Female

Capacity @25°C:

Discharge Time:	Min	1	5	10	30	60	180
Capacity:	Ahr	30*	41*	47*	59*	68.0	85.0
Constant Current:	Amps	1776*	493*	284*	118*	68.0	28.3

Specific Power (USABC Peak Power Test):
380 W/kg at 100% SOC
200 W/kg at 20% SOC (80% DOD)

Internal Impedance of Fully Charged Battery @ 25°C (USABC Peak Power Test):
3.5 mΩ @ 80% SOC
4.0 mΩ @ 100% SOC

Temperature Limits:
Storage -40°C to 60°C
Operation -40°C to 50°C

Max Short Circuit Current: 6000* Amps

Recommended Charge:

Individual	Algorithm	CI / CV
	Voltage Clamp	14.9 Volts
	Initial Inrush Current	> 45 A
Pack	Algorithm	See Handbook
	(or contact Electrosource for technical data)	

Modules on open circuit stand to be charged on 90 Day intervals or min voltage of 12V, whichever comes first

Life: C1 80% DOD, 25°C, 45 A Inrush 700 Cycles

* = Estimated or Projected 5/15/00

Electrosource, Inc.
Engineering Applications Department
2809 IH-35 South, San Marcos, Texas 78666
Tel: (512) 753-6500 ▪ www.electrosource.com

ZIVAN NG5-36100 Charger

Codice / Code / Code / Code	Tipo / Type / Typ / Type	Tensione nominale di batteria / Nominal battery voltage / Nennspannung der Batterie / Tension nominale de batterie	Corrente di uscita / Output current / Ladestrom / Courant de sortie	Capacità di batterie raccomandate / Recommended battery capacity / Empfiehlt Batterie-kapazität / Capacité de batterie recommandée
F8BV..	NG5 24-100	24V	100A	500-1000 Ah
F8CV..	NG5 36-100	36V	100A	500-1000 Ah
F8ET..	NG5 48-80	48V	80A	400-800 Ah
F8HR..	NG5 72-60	72V	60A	300-600 Ah
F8IQ..	NG5 80-50	80V	50A	250-500 Ah
F8LP..	NG5 84-45	84V	45A	225-450 Ah
F8MO..	NG5 96-40	96V	40A	200-400 Ah
F8PM..	NG5 120-30	120V	30A	150-300 Ah

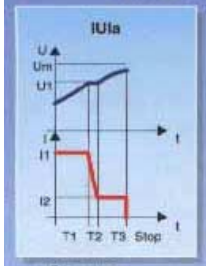
Technical features

- Input voltage: 400 ± 15% VAC Three-phase
- Input frequency: 50 - 60 Hz
- Efficiency: > 85%
- Absorbed minimum power: < 10W
- Current absorbed from battery: < 0.5 mA
- Operating temperature: from -20 to + 50°C
- Output short-circuit protection
- Inverse polarity protection (fuse)
- Charging curve: programmable
- Accuracy of output voltage: ± 0.5 %
- Thermal compensation of battery voltage with temperature sensor (optional)
- External LED indicator (optional)
- Audible alarm
- Auxiliary contacts of mains presence and end of charge
- Cooling: forced
- Case: Base in Aluminium, Cover in ABS
- Size: 320x260x100 mm
- Weight: 9 kg
- Enclosure class: IP20
- CE EN 60335-1 - EN 60335-2-29 - EN 55011 IEC 1000-4-2 - IEC 1000-4-4

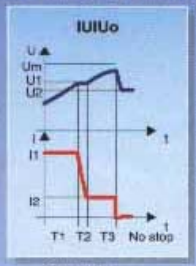
Caractéristiques techniques

- Tension d'entrée: 400 ± 15% VAC Triphasé
- Fréquence d'entrée: 50 - 60 Hz
- Rendement: > 85%
- Puissance minimum absorbée: < 10W
- Courant absorbée par la batterie: < 0.5 mA
- Température de fonctionnement: de -20 à + 50°C
- Protection contre le court-circuit en sortie
- Protection contre l'inversion de polarité (fusible)
- Courbe de charge: programmable
- Precision sur la tension de sortie: ± 0.5%
- Compensation thermique de la tension de la batterie avec sonde thermique (optional)
- Indicateur à LED extérieur (optional)
- Indicateur acoustique d'alarme
- Contacts auxiliares de présence secteur et charge terminée
- Ventilation: forcée
- Boîtier: base d'alluminium, couvercle en ABS
- Dimensions: 320x260x100 mm
- Poids: 9 kg
- Type de protection: IP20
- CE EN 60335-1 - EN 60335-2-29 - EN 55011 IEC 1000-4-2 - IEC 1000-4-4

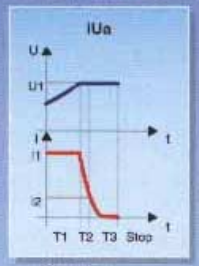
Curve di carica / Charging curves / Ladekennlinien / Courbes de charge



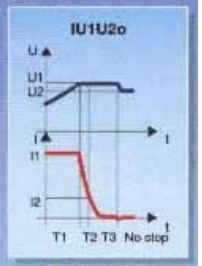
.. Curve type:
01: Pb Acid Low Capacity
02: Pb Acid High Capacity
09: Pb Gel Low Capacity
10: Pb Gel High Capacity



.. Curve type:
03: Pb Acid Low Capacity
04: Pb Acid High Capacity
11: Pb Gel Low Capacity
12: Pb Gel High Capacity



.. Curve type:
05: Pb Acid Low Capacity
06: Pb Acid High Capacity
13: Pb Gel Low Capacity
14: Pb Gel High Capacity



.. Curve type:
07: Pb Acid Low Capacity
08: Pb Acid High Capacity
15: Pb Gel Low Capacity
16: Pb Gel High Capacity

ZIVAN Via della Costituzione, 36 - 42028 Poviglio (RE) Italy - Tel. 0522/960593 - Fax 0522/967417 -E-mail: zivan@re.nettuno.it

AeroVironment ELT

	ELT 600	ELT 680	ELT 750
Compatible Battery Packs	24-48 Volts	24-96 Volts	24-48 Volts
Output Power			
Current	0 - 600 ADC	0 - 300 ADC	0 - 750 ADC
Power	36 kW	36 kW	42 kW
Utility Requirements			
3Ø, 60 Hz, 600 VAC	48 Amps	48 Amps	56 Amps
3Ø, 60 Hz, 480 VAC	60 Amps	60 Amps	70 Amps
Power Characteristic			
Output Voltage:	+/- 0.25V	+/- 0.25V	+/- 0.25V
Output Amperage:	+/- 0.50A	+/- 0.50A	+/- 0.50A
Physical Characteristics			
Weight:	545 Lbs.	545 Lbs.	650 Lbs.
Operating Temperature:	0 to 50°C	0 to 50°C	0 to 50°C
Storage Temperature:	-20 to 85°C	-20 to 85°C	-20 to 85°C
Dimensions:	22 ⅝" x 42" x 27 ⅝" high		
Enclosure:	NEMA 1	NEMA 1	NEMA 1
Certifications	cUL & UL Listed Industrial Battery Charger		
Warranty	5 years on Power Electronics 2 years on Electronic Components		

Tractors Scrubbers Flatbeds AGV's

PosiCharge ® ELT is a compact fast charger that fits almost anywhere. It keeps electric lift trucks running all day on one battery with just a quick charge during breaks and shift changes. Each ELT can pay for itself in less than 12 months and save 50% in battery expenses and productivity costs every year. ELT's localized charging also reduces truck traffic and improves pedestrian safety.

Battery Monitor & Identifier (BMID)

Detects and selects battery type. Provides static and dynamic parameters for charging algorithm. Records voltages, temperatures, and total Amp hours returned. Provides cumulative, last charge, and last equalization information. Small 4" x 2" x .75" form factor. Mounts to battery and installs in minutes.

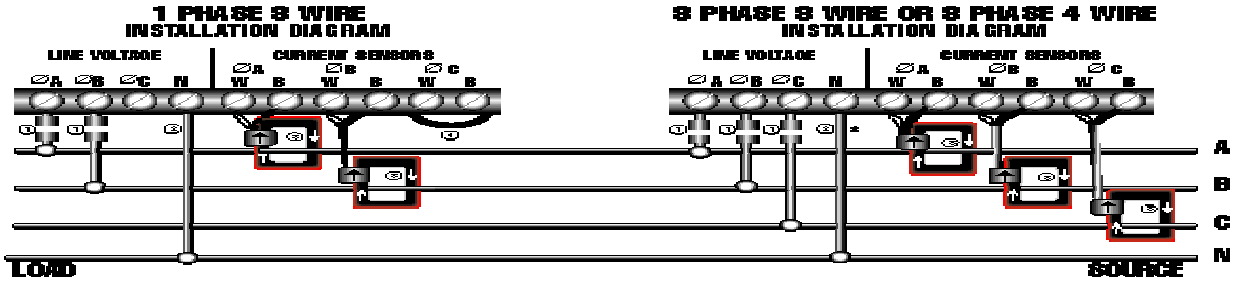
PosiCharge ELT Fast Charger

Charges all common battery types. Significantly increases battery state of charge in minutes. Adaptive charging algorithm ensures safe, reliable charge. Easy to use controls and display. Automatic start/stop with instant anti-arcing disconnect. Small footprint. Records historical charging data. Download charger and battery information to PC for review.

E-Mon D-Mon Model 20850D

(3-phase, 120/208-240v/50amp kWh/kW demand meter)

- Easy to read LCD Displays
- Easy to install split core current sensors
- Reset button located inside of front cover, separate for KWH and Demand displays
- Remote mounting of current sensors up to 2,000 feet from meter
- Parallel up to three (3) sets of current sensors for cumulative reading
- Meters can be used on the following configurations: 3 Phase, 4 Wire; 3 Phase, 3 Wire; 1 Phase, 3 Wire
- Enclosure industrial grade JIC steel box
- 1 1/16" KO (3/4" Cond.) on bottom of enclosure
- Padlocking hasp
- Mounting flanges
- Maintains reading in the event of power failure
- UL Listed/CSA Approved
- Meets or exceeds ANSI C12.1 National Accuracy Standards



7

① Recommended fuses or circuit breaker per N.E.C. (Meter draws 0.025 Amps)
② Neural not used on delta system.
③ Split core current sensors. Install according to installation instructions
④ Install Jumper

***FOR SINGLE PHASE 2-WIRE, PLEASE CONTACT E-MON AT (800) 334-3666

B
DEMONSTRATION EVENT HISTORIES

The following tabulations list scrubber use (in descending order of duration) and charge events (in ascending order of duration) for each demonstration series. The time of the end of the event is logged, together with the time elapsed time from the end of the previous event until the start of the current use or charge. Each event is described by its duration in minutes, maximum power draw in amperes, cumulative power draw in ampere-hours, total energy consumed in kilowatt-hours, and percentage "state-of-charge" that would be indicated to the operator by the scrubber status indicator. Event duration is the total elapsed time from the start of an event until its end, including any 'off' periods of 4 minutes or less. Recorded events of one-minute duration (by definition, isolated in time by at least five minutes before and after each occurrence) are not listed, but are included in the data summary calculations presented in the body of the report.

Walk-Behind Floor Scrubber; 225amp-hr Trojan Battery/Tennant Charger (Baseline)-- Costco Warehouse A

Event End "m/d/y hr:min"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Cum draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
6/6/00 8:14	1/1/00 14:20	44	44	25.9	0.876	36%
6/2/00 7:55	1/0/00 0:01	41	73	27.1	0.946	63%
6/1/00 12:41	1/0/00 1:31	28	86	16.3	0.582	100%
6/2/00 6:58	1/0/00 0:08	25	66	17.7	0.623	94%
6/15/00 10:11	1/0/00 0:11	22	66	12.0	0.427	84%
6/12/00 7:49	1/0/00 4:01	21	44	10.5	0.385	98%
6/22/00 8:20	1/0/00 0:07	20	46	11.4	0.379	30%
6/13/00 19:44	1/0/00 0:06	19	100	15.2	0.540	69%
6/15/00 8:05	1/0/00 14:55	19	40	10.0	0.358	91%
6/14/00 8:57	1/0/00 12:38	17	51	10.1	0.362	84%
6/1/00 14:29	1/0/00 1:32	14	130	9.7	0.337	88%
6/20/00 8:28	1/0/00 0:40	14	66	12.4	0.418	41%
6/20/00 9:17	1/0/00 0:24	13	42	6.1	0.209	48%
6/20/00 9:56	1/0/00 0:22	13	41	6.4	0.219	48%
6/2/00 11:17	1/0/00 0:06	10	63	7.3	0.251	81%
6/7/00 7:50	1/0/00 23:24	10	41	5.3	0.176	59%
6/17/00 11:33	1/0/00 0:09	9	69	7.9	0.272	68%
6/15/00 8:22	1/0/00 0:09	9	46	6.2	0.221	76%
6/4/00 16:55	1/0/00 22:06	8	88	10.2	0.340	39%
6/12/00 8:16	1/0/00 0:20	8	57	5.0	0.184	95%
6/16/00 10:19	1/0/00 23:27	8	57	22.2	0.776	59%

6/1/00 15:01	1/0/00 0:21	8	34	3.1	0.111	91%
6/12/00 8:43	1/0/00 0:19	7	46	2.3	0.086	100%
6/8/00 19:16	1/0/00 10:20	6	78	4.5	0.141	0%
6/17/00 12:03	1/0/00 0:24	6	71	5.5	0.188	72%
6/2/00 8:12	1/0/00 0:12	6	66	5.3	0.184	72%
6/13/00 10:06	1/1/00 1:18	6	54	4.8	0.171	84%
6/7/00 18:09	1/0/00 2:21	6	43	2.7	0.090	57%
6/2/00 17:39	1/0/00 3:44	6	40	3.1	0.020	66%
6/20/00 11:12	1/0/00 0:51	6	18	1.3	0.043	68%
6/13/00 19:18	1/0/00 0:06	5	83	6.1	0.214	77%
6/7/00 15:43	1/0/00 7:48	5	80	3.8	0.124	56%
6/21/00 16:09	1/1/00 4:53	5	79	2.8	0.093	56%
6/20/00 7:34	1/2/00 16:18	5	51	3.5	0.121	57%
6/3/00 17:43	1/1/00 0:00	5	38	2.9	0.100	62%
6/16/00 15:21	1/0/00 4:58	5	30	2.4	0.084	73%
6/17/00 14:59	1/0/00 1:49	5	29	1.6	0.055	66%
6/8/00 8:26	1/0/00 14:11	5	23	1.6	0.054	44%
6/17/00 9:32	1/0/00 0:34	5	18	1.3	0.046	76%
6/14/00 16:51	1/0/00 0:12	4	83	4.1	0.145	77%
6/14/00 16:36	1/0/00 7:36	4	70	4.4	0.156	69%
6/1/00 10:40	1/0/00 0:07	4	52	1.8	0.065	84%
6/17/00 13:05	1/0/00 0:58	4	40	2.3	0.080	67%
6/11/00 9:56	1/0/00 18:18	4	37	1.9	0.062	14%
6/17/00 8:53	1/0/00 17:29	4	37	1.6	0.057	69%
6/17/00 10:00	1/0/00 0:26	4	30	1.6	0.056	71%
6/11/00 14:34	1/0/00 1:04	4	24	1.3	0.040	0%
6/15/00 10:20	1/0/00 0:06	3	35	1.5	0.055	77%
6/15/00 9:34	1/0/00 1:09	3	34	1.0	0.036	90%
6/3/00 18:42	1/0/00 0:57	3	32	1.1	0.040	64%
6/8/00 8:37	1/0/00 0:08	3	17	0.5	0.018	46%
6/20/00 8:41	1/0/00 0:12	2	69	1.8	0.060	38%
6/21/00 19:55	1/0/00 0:09	2	32	0.9	0.031	50%
6/17/00 15:12	1/0/00 0:12	2	27	0.7	0.026	68%
6/2/00 7:10	1/0/00 0:10	2	10	0.3	0.011	94%
6/13/00 18:40	1/0/00 8:25	2	7	0.2	0.008	100%
6/12/00 3:27	1/0/00 0:01	758	-38	-278.1	-11.035	100%

Walk-Behind Floor Scrubber; 225amp-hr Trojan Battery/Tennant Charger (Baseline)--Costco Warehouse B

Event End "m/d/y hr:min"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Event draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
6/30/00 11:16	1/0/00 3:15	55	86	40.9	1.458	74%
7/23/00 13:11	1/0/00 15:36	22	48	13.6	0.459	43%
8/11/00 10:28	1/0/00 4:34	20	56	15.2	0.540	74%
7/17/00 14:32	1/0/00 18:12	19	39	9.1	0.324	80%
7/24/00 18:41	1/0/00 5:25	18	58	13.1	0.413	0%
8/8/00 13:06	1/0/00 10:09	16	62	9.8	0.328	46%
7/8/00 21:35	1/0/00 2:00	15	29	5.3	0.194	94%
7/22/00 13:19	1/0/00 14:56	14	91	15.3	0.512	46%
7/13/00 20:33	1/0/00 0:18	14	63	9.4	0.340	87%
6/28/00 22:06	1/0/00 1:38	14	55	8.5	0.268	30%
8/13/00 18:20	1/0/00 21:12	14	49	7.1	0.246	80%
8/6/00 18:52	1/0/00 0:13	13	91	11.8	0.394	70%
7/20/00 17:53	1/0/00 6:28	13	73	11.4	0.391	52%
8/1/00 15:33	1/0/00 0:11	13	70	5.6	0.198	67%
8/6/00 15:47	1/0/00 7:58	12	85	14.8	0.499	47%
7/13/00 8:02	1/0/00 0:15	12	105	9.0	0.324	100%
8/4/00 21:24	1/0/00 1:33	12	48	7.3	0.259	66%
7/27/00 21:56	1/0/00 0:48	12	32	4.3	0.158	96%
8/11/00 5:04	1/0/00 7:16	12	-33	-5.3	-0.216	100%
8/17/00 14:15	1/0/00 0:08	12	66	7.8	0.256	80%
7/3/00 21:07	1/0/00 0:35	11	60	8.1	0.287	75%
7/22/00 20:39	1/0/00 1:11	11	45	7.8	0.264	49%
8/12/00 5:19	1/0/00 7:49	11	73	7.3	0.256	88%
7/24/00 5:02	1/0/00 8:28	11	50	6.4	0.212	56%
7/23/00 19:54	1/0/00 4:55	11	55	6.0	0.200	29%
7/18/00 8:04	1/0/00 9:54	11	47	5.3	0.188	77%
8/8/00 2:30	1/0/00 6:44	11	35	5.0	0.169	50%
7/18/00 16:17	1/0/00 1:32	11	27	4.1	0.147	80%
8/16/00 14:29	1/0/00 2:32	11	77	11.0	0.367	80%
8/16/00 11:45	1/1/00 2:08	11	38	5.1	0.177	80%
7/13/00 7:36	1/0/00 2:23	10	74	10.5	0.377	85%
6/30/00 21:56	1/0/00 10:28	10	85	8.7	0.302	79%
6/29/00 22:11	1/0/00 1:46	10	55	8.0	0.288	82%
7/1/00 21:58	1/0/00 1:36	10	66	7.7	0.280	92%
7/16/00 19:32	1/0/00 22:19	10	91	7.5	0.265	81%
7/26/00 14:33	1/0/00 2:08	10	94	6.3	0.228	100%
7/13/00 11:17	1/0/00 3:05	10	58	5.7	0.208	97%
7/7/00 21:51	1/0/00 1:44	10	34	3.8	0.138	97%
7/10/00 17:57	1/0/00 0:09	10	33	3.1	0.113	97%

7/15/00 20:50	1/0/00 1:11	9	59	6.7	0.237	77%
8/10/00 21:09	1/0/00 2:39	9	53	6.5	0.234	92%
8/6/00 18:27	1/0/00 2:04	9	52	5.5	0.190	53%
7/5/00 21:43	1/0/00 8:29	9	48	5.5	0.195	85%
7/23/00 14:49	1/0/00 1:27	9	48	4.9	0.164	64%
8/12/00 5:47	1/0/00 0:17	9	50	4.6	0.163	73%
8/5/00 19:10	1/0/00 0:05	9	35	4.2	0.149	69%
7/17/00 21:05	1/0/00 6:07	9	27	3.5	0.126	82%
7/31/00 20:34	1/0/00 0:26	9	24	3.5	0.124	86%
6/30/00 22:52	1/0/00 0:09	9	30	3.4	0.123	82%
7/29/00 20:42	1/0/00 1:28	9	25	3.2	0.115	91%
8/2/00 8:05	1/0/00 15:25	8	77	8.0	0.277	63%
7/21/00 21:42	1/0/00 1:26	8	68	7.1	0.243	60%
7/20/00 21:04	1/0/00 3:01	8	54	6.1	0.209	57%
8/9/00 4:33	1/0/00 11:06	8	55	5.7	0.189	37%
7/12/00 16:04	1/0/00 0:57	8	47	4.5	0.162	84%
7/12/00 14:45	1/0/00 0:25	8	49	4.4	0.157	97%
8/6/00 19:46	1/0/00 0:47	8	39	4.1	0.139	62%
7/28/00 20:51	1/0/00 1:45	8	37	3.3	0.118	93%
7/10/00 4:28	1/0/00 7:57	8	27	3.0	0.107	87%
7/30/00 19:29	1/0/00 1:09	8	29	2.8	0.103	89%
7/18/00 14:23	1/0/00 0:06	8	27	2.8	0.101	87%
7/5/00 10:24	1/0/00 1:35	8	21	2.5	0.092	92%
7/2/00 19:49	1/0/00 1:41	7	73	7.4	0.264	80%
8/1/00 15:10	1/0/00 3:18	7	82	7.2	0.249	67%
8/11/00 20:48	1/0/00 1:30	7	58	5.8	0.204	84%
7/14/00 21:42	1/0/00 1:52	7	57	5.3	0.190	77%
8/3/00 11:10	1/0/00 0:11	7	50	3.7	0.130	70%
7/7/00 22:15	1/0/00 0:17	7	36	3.4	0.125	95%
8/5/00 19:45	1/0/00 0:29	7	38	3.0	0.106	67%
7/17/00 21:33	1/0/00 0:22	7	32	2.9	0.103	83%
6/29/00 6:29	1/0/00 0:03	7	28	2.5	0.093	100%
7/31/00 17:32	1/0/00 7:04	7	33	0.3	5.000	91%
8/16/00 20:15	1/0/00 1:33	7	95	7.0	0.234	80%
8/17/00 13:52	1/0/00 0:15	7	48	4.1	0.136	80%
8/12/00 20:17	1/0/00 0:46	7	43	3.6	0.128	80%
8/13/00 18:49	1/0/00 0:22	7	33	3.4	0.118	80%
6/29/00 7:04	1/0/00 0:18	6	94	7.6	0.272	85%
7/2/00 20:11	1/0/00 0:17	6	62	5.5	0.195	81%
8/10/00 5:50	1/0/00 19:14	6	72	5.0	0.160	37%
7/1/00 22:31	1/0/00 0:28	6	52	4.0	0.145	94%
7/24/00 21:43	1/0/00 1:08	6	54	3.6	0.112	0%
8/7/00 19:31	1/0/00 0:21	6	44	3.2	0.110	69%
8/7/00 19:05	1/0/00 1:04	6	34	3.1	0.106	55%
7/10/00 22:09	1/0/00 0:19	6	31	2.3	0.085	100%
7/9/00 20:08	1/0/00 1:01	6	27	2.1	0.077	89%
8/5/00 11:42	1/0/00 1:42	6	35	2.0	0.072	86%

8/6/00 7:38	1/0/00 11:31	6	24	1.7	0.060	76%
7/10/00 18:18	1/0/00 0:08	6	24	1.5	0.056	96%
7/13/00 11:53	1/0/00 0:32	5	79	5.7	0.202	79%
7/6/00 11:47	1/0/00 13:33	5	87	5.5	0.191	57%
8/11/00 5:17	1/0/00 0:05	5	63	3.7	0.135	97%
7/12/00 14:57	1/0/00 0:08	5	46	3.4	0.123	90%
7/13/00 21:01	1/0/00 0:24	5	47	3.3	0.120	96%
7/7/00 15:51	1/0/00 11:05	5	95	3.3	0.113	90%
7/24/00 12:22	1/0/00 3:05	5	49	3.1	0.102	42%
7/26/00 2:12	1/1/00 3:58	5	104	3.1	0.100	18%
7/3/00 21:34	1/0/00 0:23	5	52	3.0	0.107	83%
7/24/00 22:05	1/0/00 0:18	5	55	3.0	0.094	15%
8/10/00 21:37	1/0/00 0:23	5	43	2.7	0.097	100%
8/1/00 4:28	1/0/00 7:21	5	32	2.4	0.085	81%
8/12/00 6:01	1/0/00 0:09	5	35	2.1	0.075	75%
7/10/00 21:45	1/0/00 0:31	5	24	1.9	0.070	100%
7/27/00 22:22	1/0/00 0:20	5	31	1.6	0.057	100%
8/16/00 20:39	1/0/00 0:20	5	50	3.3	0.112	80%
8/12/00 19:24	1/0/00 0:34	5	48	2.8	0.097	80%
8/15/00 9:27	1/1/00 4:28	5	39	2.2	0.076	80%
8/10/00 10:10	1/0/00 4:15	4	71	4.3	0.138	10%
7/23/00 20:16	1/0/00 0:19	4	70	3.5	0.115	42%
7/2/00 14:29	1/0/00 0:15	4	56	3.4	0.121	88%
7/14/00 21:59	1/0/00 0:14	4	54	3.0	0.109	88%
7/20/00 21:35	1/0/00 0:28	4	54	3.0	0.104	61%
7/15/00 21:02	1/0/00 0:09	4	54	2.8	0.101	80%
7/5/00 22:04	1/0/00 0:18	4	45	2.7	0.096	77%
8/11/00 21:08	1/0/00 0:17	4	50	2.5	0.089	85%
7/3/00 5:03	1/0/00 0:18	4	46	2.4	0.087	87%
7/2/00 14:11	1/0/00 15:36	4	48	2.0	0.072	100%
8/12/00 7:01	1/0/00 0:57	4	34	2.0	0.070	75%
8/9/00 7:46	1/0/00 1:49	4	48	1.8	0.062	49%
7/16/00 19:54	1/0/00 0:19	4	34	1.8	0.066	80%
7/31/00 18:14	1/0/00 0:10	4	37	1.8	0.066	83%
7/31/00 10:19	1/0/00 14:21	4	34	1.6	0.059	100%
7/9/00 20:20	1/0/00 0:09	4	29	1.4	0.050	91%
7/18/00 14:08	1/0/00 5:59	4	39	1.4	0.049	93%
7/31/00 21:03	1/0/00 0:26	4	24	1.4	0.050	88%
8/8/00 17:20	1/0/00 4:07	4	22	1.2	0.040	51%
7/7/00 15:59	1/0/00 0:05	4	25	0.8	0.029	81%
8/14/00 4:53	1/0/00 9:32	4	50	2.7	0.093	80%
8/17/00 21:38	1/0/00 0:16	4	42	2.6	0.094	80%
8/13/00 19:18	1/0/00 0:17	4	39	2.3	0.079	80%
7/3/00 6:45	1/0/00 0:38	3	83	3.7	0.129	71%
7/1/00 10:15	1/0/00 11:21	3	73	3.4	0.117	62%
6/29/00 22:28	1/0/00 0:15	3	65	3.1	0.109	81%
7/3/00 4:42	1/0/00 0:08	3	85	2.9	0.103	75%

7/22/00 21:05	1/0/00 0:24	3	45	2.2	0.075	49%
7/24/00 12:59	1/0/00 0:35	3	50	2.2	0.072	24%
7/24/00 9:12	1/0/00 4:07	3	49	1.9	0.064	26%
7/19/00 8:15	1/0/00 15:56	3	71	1.9	0.065	76%
8/4/00 21:45	1/0/00 0:18	3	51	1.8	0.064	68%
6/30/00 22:26	1/0/00 0:28	3	45	1.7	0.061	77%
7/31/00 17:53	1/0/00 0:19	3	35	1.4	0.052	92%
7/9/00 19:02	1/0/00 0:50	3	31	1.4	0.052	92%
8/5/00 9:54	1/0/00 12:07	3	34	1.4	0.048	75%
7/29/00 21:02	1/0/00 0:18	3	28	1.2	0.045	90%
7/3/00 6:05	1/0/00 1:00	3	32	1.2	0.045	93%
7/30/00 19:55	1/0/00 0:24	3	26	1.1	0.040	92%
7/31/00 19:40	1/0/00 1:24	3	23	1.0	0.038	88%
7/5/00 12:49	1/0/00 1:36	3	20	1.0	0.035	92%
8/12/00 8:52	1/0/00 1:50	3	27	1.0	0.034	80%
8/11/00 5:07	1/0/00 0:01	3	25	0.9	0.034	100%
8/11/00 5:34	1/0/00 0:15	3	26	0.9	0.032	96%
7/29/00 8:04	1/0/00 0:24	3	24	0.9	0.032	100%
7/31/00 20:00	1/0/00 0:09	3	26	0.9	0.031	96%
7/12/00 14:13	1/1/00 3:15	3	22	0.8	0.030	100%
7/5/00 6:30	1/0/00 1:10	3	20	0.5	0.019	94%
7/30/00 18:13	1/0/00 20:59	3	12	0.4	0.015	100%
8/17/00 13:31	1/0/00 0:39	3	80	2.9	0.095	80%
8/17/00 21:19	1/0/00 0:44	3	71	2.9	0.106	80%
8/12/00 16:01	1/0/00 7:07	3	52	1.7	0.060	80%
7/5/00 13:06	1/0/00 0:06	2	73	2.4	0.083	68%
7/6/00 13:10	1/0/00 1:22	2	60	2.0	0.070	67%
7/11/00 9:13	1/0/00 10:56	2	54	1.7	0.060	88%
8/7/00 8:30	1/0/00 2:42	2	50	1.6	0.056	49%
7/5/00 12:59	1/0/00 0:09	2	68	1.5	0.051	67%
7/2/00 20:32	1/0/00 0:20	2	45	1.4	0.050	89%
7/21/00 22:01	1/0/00 0:18	2	41	1.3	0.045	59%
8/7/00 13:07	1/0/00 4:36	2	32	1.0	0.034	58%
7/26/00 15:11	1/0/00 0:16	2	32	0.9	0.034	100%
7/28/00 21:16	1/0/00 0:24	2	30	0.9	0.031	90%
7/31/00 19:49	1/0/00 0:08	2	26	0.8	0.030	87%
7/8/00 13:45	1/0/00 2:19	2	26	0.8	0.030	95%
8/9/00 4:54	1/0/00 0:20	2	28	0.8	0.027	44%
6/29/00 6:41	1/0/00 0:11	2	25	0.8	0.030	100%
7/26/00 14:54	1/0/00 0:20	2	27	0.8	0.029	100%
7/17/00 14:50	1/0/00 0:17	2	31	0.7	0.027	91%
7/13/00 5:00	1/0/00 0:41	2	23	0.7	0.027	100%
7/20/00 11:09	1/1/00 2:53	2	23	0.7	0.025	79%
8/1/00 16:14	1/0/00 0:07	2	20	0.7	0.024	87%
7/9/00 18:07	1/0/00 20:21	2	32	0.6	0.023	100%
7/10/00 18:26	1/0/00 0:06	2	19	0.6	0.022	93%
6/28/00 18:58	1/0/00 0:08	2	18	0.6	0.020	38%

7/7/00 4:41	1/0/00 15:30	2	25	0.5	0.019	84%
7/7/00 19:58	1/0/00 0:56	2	20	0.5	0.018	100%
8/4/00 10:06	1/0/00 5:35	2	21	0.4	0.016	80%
8/4/00 10:06	1/0/00 5:35	2	21	0.4	0.016	80%
7/3/00 4:32	1/0/00 7:50	2	19	0.4	0.016	99%
7/7/00 19:00	1/0/00 0:02	2	12	0.4	0.014	100%
7/10/00 21:09	1/0/00 0:01	2	9	0.3	0.011	100%
7/2/00 20:41	1/0/00 0:08	2	10	0.3	0.010	100%
7/29/00 19:06	1/0/00 8:12	2	8	0.2	0.009	100%
7/2/00 18:01	1/0/00 3:31	2	7	0.2	0.009	100%
7/7/00 22:26	1/0/00 0:10	2	8	0.2	0.009	100%
7/29/00 21:09	1/0/00 0:06	2	7	0.2	0.008	100%
7/21/00 20:09	1/0/00 22:17	2	6	0.2	0.008	82%
6/29/00 22:50	1/0/00 0:21	2	6	0.2	0.008	100%
7/8/00 19:11	1/0/00 5:22	2	6	0.2	0.007	100%
8/7/00 17:56	1/0/00 4:48	2	5	0.2	0.006	74%
8/12/00 20:43	1/0/00 0:25	2	35	1.1	0.039	80%
7/10/00 17:36	1/0/00 6:43	21	-30	-8.0	-0.316	100%
7/7/00 18:55	1/0/00 1:02	114	-30	-43.4	-1.712	100%
7/10/00 21:03	1/0/00 0:03	155	-30	-55.2	-2.226	100%
7/13/00 4:18	1/0/00 4:53	332	-36	-79.9	-3.359	100%
8/17/00 20:33	1/0/00 0:02	365	-36	-146.9	-5.752	80%
8/10/00 18:21	1/0/00 0:37	409	-37	-169.5	-6.582	100%
7/1/00 18:07	1/0/00 0:09	464	-36	-121.1	-5.020	100%
6/29/00 6:19	1/0/00 0:04	490	-37	-219.0	-8.627	100%
7/26/00 12:15	1/0/00 0:02	602	-38	-256.5	-10.103	100%

Walk-Behind Floor Scrubber; 200amp-hr Horizon Battery/Zivan Charger--Costco Warehouse A

Event end "date time"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Cum draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
6/30/00 9:39	1/0/00 3:45	55	81	27.1	1.817	87%
7/5/00 8:39	1/0/00 0:07	41	76	27.3	0.955	74%
8/15/00 9:08	1/0/00 13:05	39	122	33.7	1.242	95%
8/16/00 13:41	1/0/00 0:08	39	30	12.9	0.445	53%
7/29/00 8:42	1/0/00 0:08	34	46	21.8	0.799	98%
7/6/00 14:19	1/0/00 3:15	33	52	19.4	0.646	19%
8/5/00 9:12	1/0/00 13:12	30	84	28.6	0.017	78%
7/15/00 7:54	1/0/00 0:39	30	39	15.3	0.546	79%
7/24/00 6:14	1/0/00 0:09	29	81	19.3	0.671	68%
8/3/00 10:33	1/0/00 0:07	28	93	26.4	0.982	100%
7/22/00 9:29	1/0/00 0:34	27	42	14.2	0.513	91%
8/18/00 9:39	1/0/00 0:18	26	40	14.1	0.523	100%
7/18/00 15:15	1/0/00 2:45	26	66	11.4	0.436	100%
7/19/00 8:53	1/0/00 14:05	25	70	15.2	0.569	100%
8/11/00 8:02	1/0/00 0:35	24	78	23.1	0.822	72%
8/11/00 17:42	1/0/00 0:50	23	104	18.6	0.639	67%
8/3/00 13:23	1/0/00 0:06	22	99	13.8	0.509	100%
7/20/00 14:56	1/0/00 23:06	22	43	13.1	0.481	96%
8/9/00 9:40	1/0/00 0:11	21	78	16.4	0.612	100%
8/9/00 9:02	1/0/00 10:36	20	85	19.8	0.744	100%
7/18/00 9:12	1/0/00 0:16	20	76	19.3	0.632	0%
8/3/00 9:58	1/0/00 0:12	20	71	17.5	0.657	100%
7/8/00 16:48	1/2/00 2:10	20	40	10.4	0.394	100%
6/29/00 13:00	1/0/00 5:07	19	79	16.1	0.595	100%
7/25/00 9:58	1/0/00 0:37	19	43	11.5	0.391	45%
7/6/00 10:31	1/0/00 20:37	19	39	10.2	0.351	51%
8/8/00 13:00	1/0/00 1:49	18	74	15.9	0.588	100%
8/18/00 8:54	1/0/00 14:54	18	43	9.2	0.343	100%
7/26/00 9:12	1/0/00 3:26	16	66	14.4	0.451	0%
7/19/00 15:27	1/0/00 5:45	16	64	12.1	0.446	100%
7/31/00 8:32	1/0/00 18:39	16	54	7.7	0.277	92%
8/4/00 9:58	1/0/00 3:33	16	39	6.8	0.248	100%
7/2/00 14:44	1/0/00 2:26	15	64	12.0	0.429	87%
7/15/00 10:15	1/0/00 1:07	15	47	9.9	0.350	71%
8/1/00 11:01	1/0/00 0:27	15	40	8.2	0.292	74%
7/15/00 8:47	1/0/00 0:23	15	54	8.2	0.291	72%
8/15/00 15:44	1/0/00 0:06	14	83	13.5	0.488	94%
8/1/00 10:11	1/0/00 3:29	14	39	6.5	0.231	87%
7/27/00 13:40	1/0/00 3:57	13	65	9.4	0.352	100%
7/17/00 5:03	1/0/00 12:03	13	73	8.5	0.293	56%
7/23/00 9:46	1/0/00 21:40	12	84	11.9	0.422	81%

8/16/00 0:44	1/0/00 5:03	12	87	11.7	0.414	70%
8/9/00 12:50	1/0/00 0:17	12	69	10.7	0.394	98%
7/11/00 12:44	1/0/00 4:07	12	50	9.0	0.331	99%
7/13/00 10:08	1/0/00 0:09	11	79	12.0	0.430	85%
8/16/00 6:34	1/0/00 0:05	11	79	11.0	0.381	54%
7/19/00 9:24	1/0/00 0:06	11	78	9.1	0.339	100%
7/11/00 8:26	1/0/00 0:41	11	69	8.0	0.294	100%
8/16/00 6:12	1/0/00 1:47	11	65	7.7	0.272	74%
7/22/00 8:28	1/0/00 0:06	11	44	5.7	0.207	87%
8/17/00 7:32	1/0/00 0:05	10	80	10.8	0.404	100%
8/1/00 6:25	1/0/00 0:16	10	80	10.4	0.367	73%
7/28/00 12:50	1/0/00 0:06	10	55	6.7	0.249	100%
8/8/00 17:10	1/0/00 0:10	10	26	3.5	0.128	100%
8/16/00 18:42	1/0/00 0:05	9	104	10.9	0.412	100%
7/11/00 7:30	1/0/00 1:08	9	83	7.7	0.285	100%
8/4/00 6:09	1/0/00 0:27	9	64	6.8	0.249	100%
7/28/00 9:13	1/0/00 0:09	9	39	4.7	0.174	100%
8/2/00 15:36	1/0/00 11:50	9	52	3.7	0.129	68%
7/12/00 17:33	1/0/00 11:13	9	39	3.4	0.125	98%
7/2/00 9:50	1/0/00 18:21	9	26	3.3	0.119	100%
8/10/00 10:18	1/0/00 1:49	9	26	3.0	0.112	100%
8/15/00 18:35	1/0/00 0:21	8	71	8.3	0.297	88%
8/3/00 9:26	1/0/00 14:54	8	70	7.3	0.276	100%
6/29/00 13:13	1/0/00 0:06	8	70	6.2	0.229	100%
7/27/00 7:41	1/0/00 16:51	8	77	5.4	0.203	100%
8/6/00 13:34	1/0/00 12:14	8	61	5.3	0.200	100%
8/17/00 15:29	1/0/00 5:09	8	63	4.7	0.177	100%
7/25/00 10:11	1/0/00 0:05	8	39	3.4	0.114	43%
8/8/00 16:50	1/0/00 0:48	8	21	2.7	0.099	100%
8/9/00 12:19	1/0/00 2:33	7	79	8.0	0.295	100%
8/15/00 17:51	1/0/00 0:18	7	78	6.6	0.237	87%
8/11/00 13:14	1/0/00 4:56	7	60	5.9	0.209	70%
8/15/00 19:30	1/0/00 0:49	7	69	5.6	0.199	78%
7/16/00 9:42	1/0/00 0:09	7	45	5.0	0.173	64%
7/30/00 13:38	1/1/00 4:45	7	54	3.9	0.141	94%
7/8/00 19:00	1/0/00 1:53	7	45	3.8	0.144	100%
7/8/00 17:01	1/0/00 0:07	7	37	3.7	0.142	100%
7/28/00 13:22	1/0/00 0:26	7	58	3.7	0.139	100%
8/7/00 16:06	1/0/00 1:33	7	63	3.1	0.115	100%
7/3/00 3:56	1/0/00 13:03	7	33	2.4	0.088	88%
7/3/00 16:18	1/0/00 0:07	7	29	2.1	0.076	88%
8/7/00 10:48	1/0/00 1:49	7	26	1.9	0.072	100%
8/12/00 10:14	1/0/00 2:16	7	32	1.9	0.067	72%
7/27/00 9:30	1/0/00 1:44	6	87	6.5	0.245	100%
7/13/00 3:19	1/0/00 8:16	6	64	5.5	0.200	91%
8/11/00 8:12	1/0/00 0:05	6	71	5.5	0.194	74%
7/21/00 5:03	1/0/00 14:02	6	76	5.2	0.186	100%

8/7/00 14:25	1/0/00 2:30	6	56	4.2	0.157	100%
7/5/00 9:42	1/0/00 0:58	6	56	4.1	0.144	65%
7/16/00 9:27	1/0/00 23:07	6	48	3.7	0.131	65%
8/8/00 13:21	1/0/00 0:16	6	58	3.2	2.649	100%
7/18/00 18:16	1/0/00 2:52	6	32	2.3	0.087	100%
8/4/00 19:26	1/0/00 0:21	6	28	2.0	0.072	99%
7/5/00 13:35	1/0/00 3:48	6	36	2.0	0.068	64%
8/17/00 17:39	1/0/00 2:00	6	21	1.4	0.054	100%
7/13/00 9:49	1/0/00 6:26	5	90	6.4	0.229	84%
8/17/00 7:55	1/0/00 0:19	5	83	5.9	0.220	100%
7/24/00 16:57	1/0/00 6:56	5	102	5.1	0.172	62%
8/9/00 18:43	1/0/00 3:32	5	71	3.9	0.141	93%
7/31/00 9:30	1/0/00 0:54	5	64	3.7	0.132	91%
7/3/00 13:22	1/0/00 8:07	5	41	3.1	0.111	83%
8/12/00 16:18	1/0/00 0:40	5	40	2.9	0.101	62%
7/22/00 8:12	1/0/00 2:41	5	43	2.9	0.104	95%
7/17/00 7:14	1/0/00 2:07	5	41	2.7	0.092	58%
7/26/00 5:29	1/0/00 19:14	5	40	2.7	0.090	40%
7/14/00 19:01	1/1/00 8:49	5	35	2.6	0.093	88%
8/9/00 15:07	1/0/00 2:13	5	36	2.5	0.091	100%
8/16/00 7:32	1/0/00 0:54	5	35	2.5	0.086	67%
7/15/00 8:10	1/0/00 0:12	5	40	2.2	0.078	87%
7/9/00 13:25	1/0/00 1:01	5	31	2.1	0.079	100%
7/18/00 6:11	1/0/00 14:17	5	48	1.9	0.065	64%
7/19/00 9:05	1/0/00 0:08	5	42	1.7	0.064	100%
8/7/00 11:50	1/0/00 0:43	5	19	1.3	0.048	100%
6/29/00 7:34	1/0/00 2:41	5	19	1.2	0.043	100%
8/14/00 19:08	1/0/00 5:54	5	15	1.0	0.036	100%
7/3/00 16:04	1/0/00 0:08	4	85	5.4	0.189	74%
7/17/00 15:46	1/0/00 6:59	4	62	3.4	0.117	49%
7/28/00 13:35	1/0/00 0:10	4	74	3.4	0.126	99%
7/28/00 8:56	1/0/00 0:13	4	60	3.0	0.114	100%
7/24/00 8:25	1/0/00 2:00	4	64	3.0	0.102	73%
7/23/00 16:41	1/0/00 3:44	4	40	2.1	0.073	75%
7/12/00 18:58	1/0/00 1:22	4	33	2.0	0.073	99%
8/8/00 9:20	1/0/00 9:47	4	33	1.9	0.021	100%
7/9/00 14:02	1/0/00 0:34	4	37	1.5	0.056	100%
8/7/00 4:34	1/0/00 14:52	4	47	1.4	0.047	100%
8/14/00 13:09	1/0/00 3:29	4	22	1.3	0.050	100%
8/4/00 18:47	1/0/00 1:26	4	18	1.0	0.037	100%
7/3/00 17:32	1/0/00 1:08	4	18	1.0	0.035	84%
8/3/00 10:44	1/0/00 0:05	4	29	0.8	0.031	100%
7/25/00 9:03	1/0/00 12:56	4	18	0.6	0.022	68%
7/11/00 6:13	1/0/00 14:55	4	10	0.5	0.018	100%
8/15/00 18:06	1/0/00 0:13	3	69	3.0	0.108	87%
7/10/00 14:27	1/0/00 0:09	3	61	2.8	0.105	100%
7/24/00 19:54	1/0/00 2:53	3	69	2.5	0.086	63%

8/16/00 4:13	1/0/00 3:25	3	51	2.4	0.084	74%
8/3/00 12:53	1/0/00 2:06	3	47	2.3	0.086	100%
7/1/00 15:21	1/0/00 7:27	3	48	2.1	0.078	92%
7/12/00 4:20	1/0/00 2:08	3	48	2.0	0.074	98%
7/18/00 8:37	1/0/00 2:24	3	70	2.0	0.067	45%
7/10/00 15:14	1/0/00 0:14	3	57	1.9	0.071	100%
8/18/00 11:01	1/0/00 1:20	3	38	1.8	0.065	100%
8/10/00 18:12	1/0/00 0:05	3	38	1.6	0.058	97%
8/13/00 9:10	1/0/00 0:39	3	42	1.4	0.048	65%
7/3/00 4:10	1/0/00 0:08	3	29	1.3	0.047	86%
8/12/00 10:25	1/0/00 0:09	3	27	1.3	0.045	68%
7/22/00 5:27	1/0/00 20:38	3	43	1.2	0.045	100%
7/12/00 6:09	1/0/00 1:47	3	26	1.1	0.041	100%
7/11/00 13:30	1/0/00 0:44	3	30	1.1	0.041	100%
8/8/00 15:52	1/0/00 1:02	3	25	1.0	0.039	100%
8/13/00 14:14	1/0/00 0:22	3	27	1.0	0.033	61%
8/16/00 12:44	1/0/00 5:08	3	16	0.8	0.028	69%
8/7/00 11:01	1/0/00 0:10	3	19	0.7	0.027	100%
8/9/00 19:05	1/0/00 0:08	3	6	0.2	0.000	100%
8/1/00 11:09	1/0/00 0:07	2	70	2.3	0.080	67%
8/10/00 14:01	1/0/00 0:13	2	70	2.2	0.081	88%
8/10/00 13:12	1/0/00 2:53	2	58	1.8	0.066	92%
7/16/00 16:48	1/0/00 7:05	2	48	1.6	0.055	62%
8/17/00 9:13	1/0/00 1:17	2	44	1.4	0.054	100%
8/5/00 9:48	1/0/00 0:02	2	77	1.4	0.051	100%
7/3/00 5:10	1/0/00 0:59	2	39	1.2	0.044	85%
7/2/00 11:46	1/0/00 1:54	2	54	1.0	0.036	87%
7/26/00 11:23	1/0/00 1:22	2	39	1.0	0.031	34%
8/8/00 14:48	1/0/00 1:26	2	29	1.0	0.035	100%
7/10/00 14:16	1/0/00 4:56	2	46	0.9	0.033	100%
8/9/00 18:52	1/0/00 0:07	2	28	0.8	0.028	100%
8/10/00 19:20	1/0/00 0:16	2	32	0.7	0.027	98%
7/22/00 11:53	1/0/00 2:23	2	29	0.6	0.021	93%
7/18/00 12:03	1/0/00 2:49	2	19	0.4	0.018	100%
7/3/00 15:53	1/0/00 2:30	2	20	0.4	0.015	93%
6/28/00 16:00	1/0/00 0:03	2	19	0.4	0.016	100%
7/21/00 8:47	1/0/00 1:11	2	13	0.3	0.012	100%
8/15/00 15:24	1/0/00 3:54	2	13	0.3	0.011	100%
8/13/00 12:53	1/0/00 2:08	2	6	0.2	0.007	70%
8/5/00 12:15	1/0/00 0:05	2	-11	-0.4	-0.016	100%
8/8/00 19:05	1/0/00 0:06	2	-11	-0.4	-0.015	100%
8/13/00 14:49	1/0/00 0:09	2	-12	-0.4	-0.013	76%
8/10/00 19:56	1/0/00 0:35	2	-13	-0.4	-0.015	100%
8/7/00 21:06	1/0/00 0:15	2	-15	-0.4	-0.016	100%
8/12/00 2:14	1/0/00 4:58	2	-15	-0.4	-0.015	83%
8/13/00 19:17	1/0/00 0:09	2	-14	-0.5	-0.018	100%
8/8/00 19:16	1/0/00 0:08	2	-16	-0.5	-0.020	100%

8/5/00 11:49	1/0/00 0:07	3	-14	-0.6	-0.026	100%
8/16/00 18:59	1/0/00 0:01	17	-97	-11.7	-0.505	100%
8/5/00 9:45	1/0/00 0:12	22	-104	-36.6	-1.441	100%
8/8/00 18:56	1/0/00 0:06	92	-90	-50.4	-2.086	100%
8/13/00 17:31	1/0/00 0:05	94	-112	-139.8	-5.707	100%
8/5/00 11:36	1/0/00 0:01	108	-108	-93.6	-3.962	100%
8/2/00 18:07	1/0/00 0:01	150	-102	-148.7	-6.173	100%
8/16/00 16:34	1/0/00 0:03	165	-99	-160.0	-6.555	100%
7/26/00 14:21	1/0/00 0:04	171	-103	-182.7	-7.447	100%

Walk-Behind Floor Scrubber; 'Light' 25amp-hr Horizon Battery/Zivan Charger--Costco Warehouse A

Event End "m/d/y hr:min"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Cum draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
9/7/00 9:04	1/0/00 11:00	41	54	18.1	0.632	6%
9/9/00 12:35	1/0/00 1:14	38	44	14.2	0.469	0%
10/4/00 9:20	1/0/00 13:02	36	40	15.4	0.530	0%
9/28/00 14:36	1/0/00 0:49	31	65	16.3	0.568	0%
9/3/00 9:22	1/0/00 17:23	27	18	7.8	0.279	73%
9/24/00 6:44	1/0/00 4:19	26	45	8.1	0.300	100%
9/19/00 17:10	1/0/00 2:46	25	49	15.0	0.520	11%
10/6/00 8:48	1/0/00 0:44	25	39	12.3	0.425	62%
9/12/00 9:47	1/0/00 0:10	22	20	6.3	0.210	1%
9/28/00 9:28	1/0/00 0:05	21	122	16.4	0.550	77%
9/20/00 9:25	1/0/00 11:26	21	78	11.4	0.403	17%
9/12/00 16:58	1/0/00 0:08	21	72	17.3	0.582	0%
9/15/00 8:25	1/0/00 5:43	20	59	14.4	0.495	67%
10/2/00 11:00	1/0/00 4:19	20	46	9.0	0.305	10%
9/23/00 10:43	1/0/00 22:00	20	28	5.9	0.206	29%
9/13/00 8:50	1/0/00 3:50	19	27	6.0	0.223	99%
9/14/00 8:25	1/0/00 7:44	19	26	5.5	0.200	87%
9/25/00 12:53	1/0/00 0:07	19	24	5.4	0.200	91%
9/13/00 9:12	1/0/00 0:05	18	33	8.4	0.293	42%
10/3/00 9:53	1/0/00 0:05	18	25	5.4	0.201	96%
8/22/00 19:06	1/0/00 0:48	18	21	5.1	0.189	100%
8/28/00 9:50	1/0/00 0:55	17	64	11.1	0.400	54%
10/5/00 16:59	1/0/00 2:44	17	40	6.0	0.222	100%
9/1/00 19:29	1/0/00 2:08	17	23	4.4	0.145	0%
9/8/00 18:13	1/0/00 0:25	17	22	5.4	0.199	96%
9/25/00 5:22	1/0/00 0:16	16	106	8.7	0.264	0%
9/26/00 8:06	1/0/00 0:45	16	47	10.5	0.376	71%
10/10/00 20:13	1/1/00 4:34	16	45	6.9	0.228	3%
10/12/00 8:45	1/0/00 1:38	16	45	7.9	0.250	0%
9/27/00 19:08	1/0/00 0:35	15	40	8.5	0.313	87%
9/29/00 8:07	1/0/00 3:15	15	39	7.1	0.234	40%
9/17/00 9:44	1/0/00 0:40	15	37	5.9	0.212	73%
9/29/00 17:24	1/0/00 0:27	15	35	5.6	0.208	93%
9/1/00 8:13	1/0/00 2:11	14	48	8.7	0.308	58%
9/26/00 11:23	1/0/00 1:23	14	45	8.6	0.307	66%
9/30/00 9:10	1/0/00 1:48	14	43	4.9	0.182	94%
8/31/00 13:53	1/0/00 3:22	14	34	5.2	0.193	100%
8/28/00 14:29	1/0/00 0:36	14	22	4.2	0.157	100%
8/26/00 16:46	1/0/00 0:05	14	19	4.2	0.154	88%
9/6/00 19:05	1/0/00 5:56	14	19	4.0	0.146	89%
9/27/00 9:46	1/0/00 0:12	13	68	7.5	0.235	0%

10/5/00 11:27	1/0/00 1:45	13	52	6.2	0.214	16%
10/7/00 8:32	1/0/00 15:02	13	25	3.8	0.142	97%
9/16/00 9:34	1/0/00 1:29	13	24	4.1	0.150	96%
9/11/00 8:35	1/0/00 10:16	13	19	3.9	0.144	100%
9/26/00 19:48	1/0/00 1:44	12	58	6.4	0.206	0%
9/12/00 8:48	1/0/00 3:21	12	43	6.8	0.245	72%
9/14/00 8:41	1/0/00 0:05	12	33	5.6	0.190	30%
8/30/00 11:59	1/0/00 3:37	11	45	7.2	0.252	57%
8/30/00 19:06	1/0/00 0:01	11	44	6.5	0.219	34%
8/31/00 14:14	1/0/00 0:10	11	30	3.8	0.139	96%
9/14/00 19:16	1/0/00 0:06	11	20	3.4	0.126	100%
9/30/00 11:40	1/0/00 0:04	10	73	10.5	0.335	0%
10/7/00 11:45	1/0/00 3:03	10	64	6.6	0.225	29%
8/29/00 12:35	1/0/00 0:33	10	58	7.9	0.277	52%
10/3/00 19:30	1/0/00 6:11	10	41	3.8	0.140	100%
9/25/00 17:25	1/0/00 0:01	10	35	5.3	0.194	95%
8/23/00 8:42	1/0/00 13:12	10	34	4.6	0.166	91%
9/21/00 9:44	1/0/00 20:30	10	29	3.3	0.123	100%
8/31/00 14:33	1/0/00 0:10	10	28	3.3	0.118	85%
9/10/00 12:33	1/0/00 0:08	10	26	3.1	0.111	82%
10/7/00 12:22	1/0/00 0:29	9	66	5.9	0.183	32%
9/9/00 10:40	1/0/00 6:01	9	54	6.4	0.230	77%
8/27/00 9:10	1/0/00 7:46	9	53	7.1	0.255	72%
10/17/00 12:05	1/0/00 0:02	9	44	5.5	0.198	54%
9/5/00 13:27	1/0/00 1:03	9	36	4.4	0.164	100%
9/5/00 11:39	1/0/00 0:13	9	26	3.0	0.114	100%
8/25/00 19:06	1/0/00 8:59	9	17	2.4	0.080	13%
8/28/00 8:05	1/0/00 3:19	8	69	6.5	0.201	12%
9/30/00 17:59	1/0/00 1:17	8	49	4.5	0.165	100%
8/26/00 17:58	1/0/00 1:03	8	42	4.3	0.151	65%
9/25/00 17:37	1/0/00 0:05	8	31	3.1	0.111	91%
9/26/00 9:45	1/0/00 1:12	8	25	2.6	0.097	100%
10/4/00 19:20	1/0/00 0:16	8	24	2.6	0.098	100%
8/28/00 17:24	1/0/00 1:25	7	95	5.2	0.189	100%
8/29/00 5:39	1/0/00 10:32	7	63	3.9	0.141	96%
8/31/00 15:34	1/0/00 0:16	7	63	5.6	0.183	45%
9/27/00 9:20	1/0/00 0:05	7	60	4.9	0.174	77%
9/25/00 12:19	1/0/00 0:03	7	49	4.6	0.170	99%
9/19/00 12:48	1/0/00 12:22	7	36	3.2	0.111	26%
9/12/00 13:58	1/0/00 0:03	7	32	2.7	0.102	100%
10/6/00 17:09	1/0/00 7:50	7	31	2.7	0.100	100%
9/23/00 12:44	1/0/00 1:34	7	31	2.7	0.081	0%
10/5/00 9:30	1/0/00 0:35	7	26	2.1	0.078	94%
9/5/00 9:12	1/1/00 3:21	7	25	1.8	0.051	0%
10/3/00 12:42	1/0/00 2:40	6	63	3.0	0.102	65%
9/27/00 8:26	1/0/00 0:12	6	61	5.1	0.189	92%
8/28/00 18:46	1/0/00 1:00	6	58	4.3	0.159	100%

10/1/00 17:57	1/0/00 3:30	6	57	4.4	0.162	100%
9/12/00 9:13	1/0/00 0:18	6	54	2.9	0.103	77%
8/28/00 12:26	1/0/00 2:31	6	44	3.0	0.102	31%
8/22/00 17:46	1/0/00 0:21	6	43	3.3	0.119	96%
9/6/00 6:42	1/0/00 8:10	6	42	2.7	0.098	83%
9/30/00 14:35	1/0/00 0:32	6	36	3.0	0.112	100%
10/1/00 9:59	1/0/00 0:05	6	28	2.2	0.082	100%
10/1/00 13:56	1/0/00 2:20	6	27	2.1	0.078	94%
9/13/00 14:47	1/0/00 0:40	6	24	2.0	0.074	100%
9/11/00 8:52	1/0/00 0:12	6	22	1.8	0.065	91%
9/15/00 16:50	1/0/00 0:05	6	19	1.6	0.059	100%
9/5/00 22:13	1/0/00 1:37	5	89	4.2	0.151	87%
9/1/00 5:45	1/0/00 0:07	5	66	4.2	0.152	86%
8/29/00 13:59	1/0/00 1:16	5	65	4.4	0.141	0%
9/17/00 12:49	1/0/00 0:18	5	63	3.5	0.128	100%
10/12/00 6:51	1/0/00 13:51	5	58	4.2	0.145	40%
8/30/00 5:51	1/0/00 0:06	5	53	3.6	0.132	90%
8/23/00 19:15	1/0/00 10:29	5	49	3.0	0.106	73%
8/30/00 19:00	1/0/00 6:52	5	44	2.6	0.089	45%
9/16/00 13:46	1/0/00 0:04	5	43	2.8	0.099	73%
9/30/00 16:05	1/0/00 1:19	5	43	3.0	0.110	100%
10/5/00 8:47	A3225-A3224	5	38	2.8	0.101	91%
9/30/00 12:12	1/0/00 0:25	5	38	1.9	0.060	0%
9/16/00 15:46	1/0/00 0:01	5	37	2.6	0.098	100%
9/19/00 19:22	1/0/00 0:50	5	31	2.0	0.073	100%
9/27/00 18:04	1/0/00 0:02	5	30	1.9	0.073	100%
9/7/00 12:59	1/0/00 3:29	5	27	1.7	0.065	100%
9/23/00 15:14	1/0/00 0:05	5	26	1.3	0.040	0%
8/28/00 14:58	1/0/00 0:11	5	18	1.5	0.055	94%
9/28/00 18:21	1/0/00 0:18	4	98	2.5	0.092	100%
9/17/00 8:49	1/0/00 8:46	4	71	4.4	0.156	75%
8/26/00 8:53	1/0/00 0:05	4	60	2.7	0.096	100%
10/17/00 13:59	1/0/00 0:58	4	42	1.7	0.062	100%
9/9/00 15:45	1/0/00 1:25	4	36	2.1	0.080	100%
8/29/00 11:53	1/0/00 6:03	4	30	1.7	0.064	100%
9/23/00 11:04	1/0/00 0:15	4	30	1.6	0.051	10%
9/2/00 14:12	1/0/00 1:25	4	27	1.4	0.052	100%
10/11/00 8:42	1/0/00 12:25	4	27	1.2	0.036	0%
9/15/00 16:39	1/0/00 0:25	4	24	1.4	0.053	100%
9/14/00 18:59	1/0/00 4:26	4	19	1.1	0.040	100%
8/28/00 14:41	1/0/00 0:08	4	18	1.2	0.044	100%
8/28/00 13:39	1/0/00 0:29	4	16	0.9	0.032	100%
10/4/00 18:36	1/0/00 0:39	3	73	1.5	0.056	88%
9/3/00 13:48	1/0/00 4:24	3	63	2.9	0.092	0%
10/1/00 9:09	1/0/00 0:07	3	47	1.7	0.061	74%
8/30/00 19:03	1/0/00 0:01	3	43	1.5	0.049	27%
9/11/00 9:01	1/0/00 0:05	3	36	1.2	0.045	86%

9/6/00 12:54	1/0/00 2:28	3	32	1.2	0.042	98%
9/6/00 8:17	1/0/00 0:59	3	31	1.3	0.048	100%
10/1/00 9:00	1/0/00 4:53	3	30	1.0	0.036	91%
10/1/00 18:05	1/0/00 0:05	3	29	1.1	0.039	100%
10/1/00 9:18	1/0/00 0:07	3	27	1.3	0.046	82%
10/1/00 11:31	1/0/00 1:28	3	25	0.8	0.031	100%
9/25/00 8:57	1/0/00 0:33	3	21	0.8	0.023	0%
9/12/00 14:10	1/0/00 0:08	3	20	0.7	0.026	100%
9/30/00 13:44	1/0/00 0:21	3	10	0.4	0.014	100%
9/27/00 9:08	1/0/00 0:22	2	55	1.6	0.058	92%
9/19/00 13:33	1/0/00 0:44	2	51	1.2	0.040	28%
9/30/00 16:27	1/0/00 0:20	2	30	0.9	0.032	100%
9/9/00 17:52	1/0/00 2:06	2	30	0.9	0.033	100%
9/2/00 12:44	1/0/00 2:22	2	30	0.9	0.034	100%
9/10/00 8:25	1/0/00 0:19	2	29	0.6	0.022	100%
10/9/00 15:21	1/0/00 6:34	2	29	0.9	0.036	100%
9/16/00 16:32	1/0/00 0:05	2	27	0.9	0.033	100%
9/16/00 16:38	1/0/00 0:05	2	27	0.9	0.032	100%
9/10/00 12:15	1/0/00 2:47	2	24	0.5	0.018	92%
9/12/00 14:17	1/0/00 0:06	2	23	0.7	0.027	100%
8/26/00 16:25	1/0/00 3:33	2	21	0.5	0.018	100%
9/2/00 15:32	1/0/00 1:19	2	20	0.7	0.024	100%
9/17/00 12:58	1/0/00 0:07	2	19	0.6	0.023	100%
9/23/00 15:22	1/0/00 0:07	2	16	0.5	0.014	0%
9/28/00 9:00	1/0/00 0:53	2	8	0.2	0.008	100%
9/27/00 8:45	1/0/00 0:18	2	6	0.2	0.008	100%
9/29/00 10:48	1/0/00 0:20	2	-10	-0.3	-0.014	100%
9/5/00 11:16	1/0/00 0:06	2	-10	-0.3	-0.014	100%
9/18/00 14:29	1/0/00 0:22	2	-10	-0.3	-0.013	100%
9/28/00 17:07	1/0/00 0:15	2	-10	-0.3	-0.015	100%
9/30/00 4:11	1/0/00 0:15	2	-10	-0.3	-0.014	100%
9/15/00 16:11	1/0/00 1:34	2	-11	-0.4	-0.015	100%
9/25/00 4:30	1/0/00 0:09	2	-11	-0.4	-0.013	100%
9/27/00 23:35	1/0/00 0:08	2	-11	-0.3	-0.015	100%
9/29/00 22:07	1/0/00 0:24	2	-11	-0.4	-0.015	100%
9/8/00 23:19	1/0/00 0:12	2	-11	-0.4	-0.015	100%
9/26/00 14:02	1/0/00 2:36	2	-11	-0.4	-0.013	100%
9/27/00 13:02	1/0/00 0:16	2	-11	-0.4	-0.013	70%
9/30/00 1:16	1/0/00 0:19	2	-11	-0.4	-0.016	100%
10/18/00 0:55	1/0/00 0:33	2	-11	-0.4	-0.015	100%
9/6/00 10:24	1/0/00 0:37	2	-11	-0.4	-0.014	100%
9/15/00 2:23	1/0/00 0:57	2	-11	-0.4	-0.015	100%
9/16/00 15:19	1/0/00 0:07	2	-11	-0.4	-0.017	100%
9/8/00 4:26	1/0/00 0:56	2	-12	-0.4	-0.016	100%
9/16/00 13:38	1/0/00 0:45	2	-12	-0.4	-0.014	100%
9/16/00 14:18	1/0/00 0:08	2	-12	-0.4	-0.014	100%
9/12/00 5:02	1/0/00 9:39	2	-12	-0.4	-0.015	100%

9/16/00 12:40	1/0/00 1:04	2	-12	-0.4	-0.015	100%
9/29/00 14:25	1/0/00 0:05	2	-12	-0.4	-0.017	100%
9/10/00 7:59	1/0/00 2:18	2	-12	-0.4	-0.014	100%
9/30/00 7:06	1/0/00 0:20	2	-12	-0.4	-0.016	100%
9/13/00 0:42	1/0/00 0:14	2	-12	-0.4	-0.016	100%
9/25/00 7:55	1/0/00 1:52	2	-12	-0.4	-0.013	74%
9/13/00 3:20	1/0/00 2:19	2	-12	-0.4	-0.016	100%
9/28/00 10:07	1/0/00 0:05	2	-12	-0.4	-0.017	100%
9/8/00 1:11	1/0/00 2:06	2	-13	-0.4	-0.017	100%
9/8/00 12:46	1/0/00 0:07	2	-13	-0.4	-0.017	100%
9/24/00 14:30	1/0/00 0:33	2	-13	-0.4	-0.014	100%
9/30/00 10:04	1/0/00 0:12	2	-13	-0.4	-0.014	100%
9/7/00 23:01	1/0/00 0:07	2	-13	-0.4	-0.018	100%
9/30/00 13:21	1/0/00 0:38	2	-13	-0.4	-0.018	100%
9/8/00 15:56	1/0/00 0:20	2	-13	-0.4	-0.016	100%
9/10/00 13:58	1/0/00 0:18	2	-13	-0.4	-0.019	100%
9/13/00 16:24	1/0/00 1:03	2	-13	-0.4	-0.015	100%
9/29/00 11:38	1/0/00 0:07	2	-13	-0.4	-0.017	100%
10/1/00 3:07	1/0/00 0:18	2	-13	-0.4	-0.015	100%
9/27/00 17:58	1/0/00 0:07	2	-14	-0.4	-0.017	100%
9/29/00 11:30	1/0/00 0:06	2	-14	-0.4	-0.018	100%
9/28/00 12:21	1/0/00 2:10	2	-14	-0.4	-0.018	100%
9/19/00 19:24	1/0/00 0:01	2	-14	-0.4	-0.017	100%
9/25/00 6:02	1/0/00 0:37	2	-14	-0.4	-0.014	74%
9/16/00 15:41	1/0/00 0:18	2	-14	-0.4	-0.019	100%
9/27/00 23:26	1/0/00 0:11	2	-15	-0.4	-0.017	100%
9/29/00 21:29	1/0/00 0:07	2	-15	-0.5	-0.019	100%
9/19/00 0:20	1/0/00 1:47	2	-15	-0.4	-0.017	100%
9/29/00 14:51	1/0/00 0:10	2	-15	-0.5	-0.020	100%
9/30/00 4:26	1/0/00 0:11	2	-15	-0.4	-0.018	100%
9/30/00 0:37	1/0/00 0:05	2	-16	-0.5	-0.020	100%
9/23/00 22:19	1/0/00 0:26	2	-16	-0.5	-0.021	100%
9/30/00 3:24	1/0/00 0:07	2	-16	-0.5	-0.020	100%
9/1/00 5:25	1/0/00 0:12	2	-17	-0.5	-0.019	100%
9/12/00 21:55	1/0/00 3:01	2	-17	-0.5	-0.023	100%
9/25/00 2:11	1/0/00 0:05	2	-18	-0.5	-0.018	100%
9/29/00 23:30	1/0/00 0:12	2	-18	-0.5	-0.021	100%
10/17/00 11:55	1/0/00 0:17	2	-20	-0.5	-0.022	100%
9/30/00 5:17	1/0/00 0:14	2	-21	-0.5	-0.022	100%
9/30/00 2:12	1/0/00 0:10	2	-21	-0.5	-0.022	100%
9/16/00 16:40	1/0/00 0:01	2	-22	-0.6	-0.026	100%
9/29/00 16:43	1/0/00 0:16	2	-24	-0.7	-0.028	100%
9/27/00 21:33	1/0/00 0:08	3	-11	-0.5	-0.021	100%
10/17/00 11:37	1/5/00 2:47	3	-12	-0.5	-0.023	100%
9/8/00 16:34	1/0/00 0:18	3	-12	-0.6	-0.024	100%
9/16/00 11:35	1/0/00 1:30	3	-12	-0.6	-0.022	100%
9/29/00 15:05	1/0/00 0:05	3	-12	-0.6	-0.026	100%

9/29/00 14:58	1/0/00 0:05	3	-13	-0.6	-0.024	100%
9/30/00 0:56	1/0/00 0:01	3	-13	-0.6	-0.024	100%
9/27/00 23:14	1/0/00 0:15	3	-13	-0.6	-0.024	100%
9/30/00 0:00	1/0/00 0:25	3	-14	-0.6	-0.027	100%
9/29/00 15:38	1/0/00 0:26	3	-15	-0.6	-0.026	100%
9/30/00 2:00	1/0/00 0:05	3	-15	-0.6	-0.026	100%
9/29/00 18:26	1/0/00 0:10	3	-16	-0.6	-0.027	100%
9/30/00 6:12	1/0/00 0:49	3	-16	-0.6	-0.027	100%
9/16/00 16:26	1/0/00 0:23	3	-16	-0.6	-0.027	100%
9/27/00 14:04	1/0/00 0:57	3	-18	-0.8	-0.027	69%
9/30/00 9:49	1/0/00 0:32	4	-12	-0.8	-0.029	100%
9/29/00 9:53	1/0/00 0:16	4	-14	-0.8	-0.033	100%
9/29/00 8:59	1/0/00 0:10	4	-14	-0.8	-0.033	100%
9/29/00 15:56	1/0/00 0:12	4	-14	-0.8	-0.034	100%
10/4/00 19:28	1/0/00 0:05	4	-18	-1.0	-0.041	100%
9/8/00 13:31	1/0/00 0:38	4	-19	-0.9	-0.039	100%
10/11/00 16:54	1/0/00 0:05	4	-19	-0.3	0.029	100%
9/6/00 7:07	1/0/00 0:05	4	-20	-0.9	-0.040	100%
9/11/00 13:43	1/0/00 1:04	4	-23	-0.8	-0.020	100%
9/30/00 0:24	1/0/00 0:12	4	-30	-1.3	-0.054	100%
9/29/00 20:22	1/0/00 0:20	5	-14	-1.1	-0.045	100%
9/29/00 16:24	1/0/00 0:16	5	-15	-1.0	-0.042	100%
10/6/00 17:18	1/0/00 0:03	5	-20	-1.2	-0.052	100%
9/27/00 18:10	1/0/00 0:01	5	-26	-1.2	-0.051	100%
9/27/00 15:56	1/0/00 0:05	6	-15	-1.3	-0.057	100%
9/29/00 13:17	1/0/00 0:12	6	-20	-1.2	-0.051	100%
9/7/00 13:11	1/0/00 0:06	6	-21	-1.5	-0.061	100%
10/17/00 14:31	1/0/00 0:03	6	-29	-1.7	-0.073	100%
9/30/00 16:33	1/0/00 0:01	6	-61	-2.9	-0.126	100%
9/29/00 18:04	1/0/00 0:10	7	-14	-1.4	-0.057	100%
8/29/00 5:46	1/0/00 0:01	7	-29	-2.3	-0.097	100%
9/30/00 14:42	1/0/00 0:01	7	-60	-3.0	-0.131	100%
9/15/00 17:00	1/0/00 0:02	8	-22	-2.0	-0.084	100%
9/12/00 14:40	1/0/00 0:16	8	-25	-2.2	-0.090	100%
10/3/00 19:42	1/0/00 0:05	8	-26	-2.3	-0.096	100%
8/28/00 18:58	1/0/00 0:05	8	-38	-2.8	-0.116	100%
9/16/00 15:55	1/0/00 0:01	8	-51	-2.9	-0.128	100%
9/5/00 11:53	1/0/00 0:03	9	-26	-2.4	-0.101	100%
8/22/00 17:56	1/0/00 0:02	9	-30	-2.7	-0.112	100%
9/14/00 19:26	1/0/00 0:02	9	-30	-2.8	-0.118	100%
8/22/00 19:18	1/0/00 0:03	10	-35	-3.2	-0.132	100%
9/5/00 13:39	1/0/00 0:01	10	-35	-3.1	-0.128	100%
8/28/00 17:37	1/0/00 0:01	11	-48	-4.2	-0.173	100%
10/17/00 12:18	1/0/00 0:01	11	-70	-5.0	-0.219	100%
9/8/00 18:29	1/0/00 0:02	12	-26	-3.4	-0.143	100%
9/29/00 17:36	1/0/00 0:01	12	-43	-5.0	-0.207	100%
10/4/00 18:55	1/0/00 0:06	13	-34	-2.9	-0.038	100%

10/5/00 17:15	1/0/00 0:04	13	-39	-4.9	-0.203	100%
10/1/00 14:18	1/0/00 0:01	13	-53	-4.6	-0.203	100%
10/1/00 9:34	1/0/00 0:01	16	-55	-6.5	-0.286	100%
9/16/00 15:11	1/0/00 0:01	16	-60	-6.6	-0.289	100%
10/3/00 13:09	1/0/00 0:12	16	-74	-8.4	-0.366	100%
9/6/00 19:24	1/0/00 0:03	17	-35	-5.7	-0.240	100%
9/6/00 6:59	1/0/00 0:01	17	-74	-8.8	-0.383	100%
8/28/00 15:39	1/0/00 0:24	18	-56	-7.0	-0.293	100%
9/10/00 12:56	1/0/00 0:01	18	-57	-7.2	-0.316	100%
9/28/00 9:46	1/0/00 0:01	18	-99	-16.0	-0.683	100%
9/25/00 13:28	1/0/00 0:14	19	-74	-9.3	-0.386	100%
8/29/00 14:21	1/0/00 0:04	19	-98	-14.0	-0.600	100%
9/17/00 12:27	1/0/00 2:21	20	-41	-7.4	-0.309	100%
9/26/00 8:26	1/0/00 0:01	20	-57	-9.2	-0.384	100%
9/27/00 19:33	1/0/00 0:02	20	-72	-9.4	-0.389	100%
9/20/00 13:04	1/0/00 0:01	20	-90	-11.8	-0.512	100%
9/14/00 9:03	1/0/00 0:03	20	-97	-13.9	-0.603	100%
8/26/00 18:21	1/0/00 0:03	21	-54	-9.3	-0.387	100%
10/11/00 9:08	1/0/00 0:06	21	-67	-10.3	-0.449	100%
9/7/00 9:25	1/0/00 0:01	21	-99	-17.3	-0.741	100%
9/13/00 9:40	1/0/00 0:07	21	-100	-15.8	-0.684	100%
9/11/00 9:28	1/0/00 0:02	22	-82	-8.5	-0.354	100%
8/31/00 15:58	1/0/00 0:03	22	-100	-17.4	-0.743	100%
9/19/00 14:00	1/0/00 0:02	23	-41	-8.4	-0.351	100%
10/6/00 9:13	1/0/00 0:02	23	-74	-12.5	-0.519	100%
9/26/00 2:02	1/0/00 6:28	24	-34	-7.5	-0.314	100%
10/2/00 11:25	1/0/00 0:02	24	-66	-12.5	-0.518	100%
8/28/00 8:33	1/0/00 0:03	24	-74	-12.1	-0.503	100%
9/15/00 8:52	1/0/00 0:03	24	-82	-13.1	-0.541	100%
8/28/00 12:57	1/0/00 0:03	25	-79	-12.8	-0.530	100%
9/19/00 17:44	1/0/00 0:09	25	-88	-15.2	-0.628	100%
9/9/00 14:17	1/0/00 0:04	25	-99	-20.9	-0.894	100%
9/28/00 16:15	1/0/00 0:16	25	-102	-18.6	-0.797	100%
10/5/00 13:52	1/0/00 0:05	26	-97	-12.8	-0.465	100%
8/31/00 9:09	1/0/00 2:48	26	-99	-16.9	-0.736	100%
9/12/00 17:37	1/0/00 0:11	26	-99	-16.9	-0.696	100%
9/30/00 12:42	1/0/00 0:02	26	-100	-19.6	-0.827	100%
9/29/00 8:44	1/0/00 0:07	28	-69	-13.9	-0.577	100%
8/25/00 19:40	1/0/00 0:05	30	-53	-12.9	-0.537	100%
9/27/00 15:39	1/0/00 1:05	30	-101	-24.2	-1.038	100%
9/27/00 8:09	1/0/00 2:01	31	-97	-19.6	-0.851	100%
10/4/00 17:09	1/0/00 4:19	33	-66	-15.9	-0.660	100%
10/8/00 9:55	1/0/00 21:00	33	-94	-17.1	-0.702	100%
9/1/00 20:13	1/0/00 0:08	34	-82	-18.1	-0.748	100%
9/23/00 17:52	1/0/00 1:32	34	-100	-22.6	-0.980	100%
9/5/00 11:07	1/0/00 1:17	39	-73	-19.8	-0.820	100%
9/25/00 9:53	1/0/00 0:06	39	-100	-25.4	-1.091	100%

8/22/00 17:15	1/0/00 0:02	41	-30	-14.6	-0.607	100%
9/12/00 13:46	1/0/00 0:22	41	-74	-18.8	-0.781	100%

Walk-Behind Floor Scrubber; 'Heavy' 25amp-hr Horizon Battery/Tennant Charger--Costco Warehouse B

Event End "m/d/y hr:min"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Event draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
8/29/00 9:58	1/0/00 0:02	28	44	17.5	0.623	54%
10/7/00 11:07	1/0/00 0:08	22	48	12.8	0.418	0%
8/28/00 12:13	1/0/00 0:23	15	44	9.3	0.327	45%
8/28/00 5:36	1/0/00 0:05	14	91	12.2	0.410	49%
8/28/00 10:09	1/0/00 0:55	14	62	10.8	0.363	0%
8/27/00 19:59	1/0/00 0:05	11	57	7.9	0.262	10%
8/29/00 8:09	1/0/00 0:07	11	48	7.3	0.252	46%
8/28/00 14:13	1/0/00 1:33	10	112	4.8	0.150	21%
8/29/00 8:37	1/0/00 0:18	10	66	5.2	0.170	0%
9/27/00 18:52	1/0/00 0:43	9	40	4.7	0.166	58%
8/23/00 20:14	1/0/00 0:40	9	33	4.2	0.156	100%
8/28/00 11:36	1/0/00 0:01	8	49	4.7	0.174	96%
8/26/00 18:23	1/0/00 0:58	8	37	4.1	0.144	56%
8/24/00 11:55	1/0/00 0:32	8	27	3.1	0.110	84%
8/28/00 10:57	1/0/00 0:06	7	88	8.1	0.286	51%
8/28/00 9:01	1/0/00 0:16	7	61	6.0	0.219	83%
10/3/00 13:49	1/0/00 17:13	7	19	2.0	0.059	0%
9/8/00 12:43	1/0/00 0:09	6	51	2.3	0.077	72%
8/28/00 20:09	1/0/00 2:09	6	49	4.5	0.169	100%
8/28/00 8:39	1/0/00 0:01	6	49	4.7	0.175	100%
8/25/00 20:38	1/0/00 0:50	6	42	3.5	0.123	62%
10/5/00 19:55	1/0/00 15:22	6	41	3.5	0.127	78%
8/24/00 20:18	1/0/00 8:16	6	34	2.3	0.083	74%
9/30/00 19:54	1/0/00 21:43	6	34	3.1	0.101	0%
8/29/00 19:56	1/0/00 0:29	5	84	4.7	0.170	99%
8/28/00 20:44	1/0/00 0:07	5	57	3.3	0.121	95%
8/30/00 19:14	1/0/00 2:04	5	49	3.8	0.138	93%
8/31/00 22:43	1/0/00 0:19	5	49	2.9	0.096	4%
10/6/00 11:49	1/0/00 0:05	5	38	2.6	0.078	0%
10/7/00 20:24	1/0/00 9:13	5	38	2.9	0.108	98%
10/2/00 20:30	1/1/00 1:36	5	35	2.5	0.084	0%
8/24/00 21:17	1/0/00 0:49	5	33	2.0	0.068	51%
10/1/00 18:50	1/0/00 0:37	5	32	2.3	0.086	100%
8/26/00 18:58	1/0/00 0:28	5	31	2.3	0.079	48%
8/23/00 20:46	1/0/00 0:28	5	29	2.0	0.075	98%
9/29/00 22:06	1/1/00 11:16	4	99	4.9	0.167	29%
8/29/00 20:27	1/0/00 0:28	4	57	2.8	0.103	91%
9/24/00 17:18	1/1/00 11:23	4	48	1.4	0.044	0%
8/31/00 22:20	1/1/00 0:39	4	43	2.4	0.081	40%
10/4/00 19:31	1/0/00 0:38	4	38	2.2	0.072	1%
8/25/00 21:07	1/0/00 0:26	4	34	2.1	0.071	55%

10/3/00 21:01	1/0/00 1:39	4	34	2.1	0.078	97%
9/22/00 9:19	1/2/00 3:43	3	70	2.6	0.093	96%
8/30/00 19:46	1/0/00 0:30	3	49	2.4	0.086	86%
10/9/00 17:18	1/0/00 8:00	3	43	1.4	0.049	94%
8/29/00 7:52	1/0/00 3:29	3	42	1.7	0.062	78%
8/28/00 12:30	1/0/00 0:15	3	42	1.9	0.065	34%
9/28/00 10:47	1/0/00 15:41	3	38	1.7	0.054	0%
8/27/00 20:37	1/0/00 0:36	3	32	1.1	0.033	0%
10/6/00 12:23	1/0/00 0:32	3	28	1.0	0.031	0%
9/24/00 17:26	1/0/00 0:05	3	18	0.7	0.022	27%
8/30/00 21:37	1/0/00 1:32	2	82	2.7	0.093	57%
8/25/00 3:53	1/0/00 6:23	2	53	1.6	0.054	32%
9/18/00 12:27	1/9/00 1:12	2	41	1.3	0.045	64%
9/27/00 19:04	1/0/00 0:11	2	34	0.8	0.030	69%
8/29/00 20:35	1/0/00 0:07	2	34	0.7	0.024	100%
8/24/00 11:13	1/0/00 14:26	2	30	0.9	0.033	91%
10/7/00 21:01	1/0/00 0:36	2	30	0.8	0.031	100%
8/24/00 20:24	1/0/00 0:05	2	24	0.7	0.025	72%
9/26/00 10:22	1/1/00 14:08	2	21	0.7	0.025	100%
8/28/00 8:32	1/0/00 0:11	2	20	0.4	0.017	100%
8/27/00 9:32	1/0/00 14:13	2	20	0.6	0.020	2%
9/24/00 20:13	1/0/00 2:46	2	19	0.6	0.016	0%
9/27/00 18:01	1/1/00 7:36	2	11	0.3	0.011	100%
8/26/00 17:18	1/0/00 0:13	2	9	0.2	0.009	100%
8/23/00 19:25	1/0/00 3:52	2	8	0.2	0.009	100%
8/25/00 19:42	1/0/00 0:01	2	7	0.2	0.008	100%
10/7/00 10:37	1/0/00 22:12	2	7	0.2	0.008	100%
8/29/00 19:22	1/0/00 4:27	2	7	0.2	0.008	100%
8/27/00 18:51	1/0/00 0:01	2	6	0.2	0.007	100%
8/29/00 14:37	1/0/00 0:35	2	-5	-0.2	-0.008	100%
8/29/00 13:46	1/0/00 0:08	2	-5	-0.2	-0.009	100%
8/28/00 16:06	1/0/00 0:05	2	-6	-0.2	-0.009	100%
8/28/00 16:00	1/0/00 0:06	2	-6	-0.2	-0.009	100%
8/30/00 6:41	1/0/00 0:20	2	-7	-0.2	-0.010	100%
8/28/00 17:30	1/0/00 0:26	2	-7	-0.2	-0.010	100%
8/30/00 16:41	1/0/00 7:07	3	-6	-0.3	-0.013	100%
8/30/00 5:59	1/0/00 0:05	3	-6	-0.3	-0.016	100%
8/28/00 16:42	1/0/00 0:05	4	-6	-0.4	-0.018	100%
8/30/00 7:33	1/0/00 0:06	4	-6	-0.4	-0.020	100%
8/23/00 15:32	1/0/00 17:41	4	-7	-0.4	-0.020	100%
8/28/00 17:01	1/0/00 0:07	9	-6	-0.9	-0.043	100%
8/28/00 16:31	1/0/00 0:08	10	-6	-0.9	-0.045	100%
8/22/00 21:44	1/0/00 0:06	13	-8	-1.5	-0.075	100%
8/26/00 17:01	1/0/00 19:27	17	-31	-6.9	-0.272	100%
8/25/00 19:38	1/0/00 0:02	22	-34	-9.6	-0.376	100%
8/28/00 11:25	1/0/00 0:02	27	-35	-10.5	-0.411	100%
8/27/00 18:49	1/0/00 8:51	27	-35	-12.8	-0.498	100%

8/28/00 10:45	1/0/00 0:07	30	-35	-14.0	-0.537	100%
8/28/00 5:13	1/0/00 0:03	40	-35	-15.1	-0.594	100%
8/30/00 5:50	1/0/00 8:17	48	-31	-8.9	-0.398	100%
8/29/00 9:28	1/0/00 0:03	49	-36	-18.8	-0.753	100%
8/29/00 13:35	1/0/00 0:05	80	-37	-22.9	-0.940	100%
8/28/00 15:53	1/0/00 0:02	91	-36	-27.9	-1.127	100%
8/22/00 21:15	1/0/00 0:03	104	-33	-22.9	-0.995	100%
8/28/00 8:20	1/0/00 0:02	160	-36	-36.0	-1.573	100%

Walk-Behind Floor Scrubber; 'Heavy' 50amp-hr Horizon Battery/AeroVironment Charger--Costco Warehouse A

Event End "m/d/y hr:min"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Cum draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
11/3/00 9:32	1/0/00 1:08	22	49	8.8	0.312	61%
11/4/00 9:32	1/0/00 11:41	21	38	6.9	0.243	61%
11/5/00 9:46	1/0/00 1:45	17	50	8.9	0.303	44%
11/6/00 10:12	1/0/00 0:21	14	30	4.9	0.150	15%
11/2/00 18:20	1/0/00 1:59	7	23	2.3	0.076	14%
11/5/00 10:03	1/0/00 0:12	6	42	3.8	0.122	5%
11/3/00 15:58	1/0/00 3:17	6	35	3.0	0.107	66%
11/3/00 12:34	1/0/00 2:33	6	38	2.7	0.103	100%
11/6/00 7:08	1/0/00 0:22	5	38	2.0	0.063	2%
11/5/00 12:31	1/0/00 0:23	5	23	1.7	0.009	24%
11/5/00 7:43	1/0/00 21:34	4	43	1.9	0.068	100%
11/3/00 8:02	1/0/00 13:19	4	53	1.9	0.068	98%
11/2/00 16:15	1/0/00 2:27	4	29	1.4	0.051	67%
11/2/00 13:36	1/0/00 0:23	4	42	2.0	0.073	90%
11/3/00 18:05	1/0/00 1:35	3	45	1.8	0.066	100%
11/6/00 10:14	1/0/00 0:01	2	22	0.7	0.021	0%
11/6/00 9:23	1/0/00 0:05	2	17	0.4	0.013	22%
11/6/00 9:09	1/0/00 1:59	2	19	0.4	0.014	2%
11/5/00 13:53	1/0/00 1:22	1	18	0.3	0.010	22%
11/2/00 12:39	1/0/00 0:01	3	-52	-2.5	-0.104	100%
11/2/00 18:36	1/0/00 0:05	12	-51	-5.0	-0.214	100%
11/3/00 16:28	1/0/00 0:04	18	-52	-6.9	-0.299	100%
11/4/00 10:06	1/0/00 0:06	19	-50	-8.3	-0.361	100%
11/3/00 9:54	1/0/00 0:04	19	-53	-9.9	-0.428	100%
11/2/00 13:10	1/0/00 0:05	25	-51	-12.4	-0.534	100%

Walk-Behind Floor Scrubber; 'Light' 50amp-hr Horizon Battery/AeroVironment Charger--Costco Warehouse A

Event End "m/d/y hr:min"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Cum draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
12/11/00 15:41	1/0/00 5:01	16	52	9.7	0.310	5%
12/4/00 18:12	1/0/00 8:56	12	55	6.4	0.207	33%
12/9/00 9:05	1/0/00 3:38	10	213	6.8	0.230	14%
12/15/00 11:23	1/0/00 0:44	9	52	5.4	0.168	0%
12/3/00 9:46	1/0/00 16:56	9	48	5.2	0.161	3%
12/9/00 9:18	1/0/00 0:05	9	40	5.6	0.179	7%
11/30/00 9:05	1/0/00 0:18	9	37	3.8	0.128	13%
12/2/00 11:30	1/1/00 15:13	8	48	4.9	0.150	0%
12/17/00 12:58	1/0/00 5:24	8	40	3.2	0.105	25%
12/11/00 9:46	1/0/00 16:08	7	73	7.0	0.209	0%
12/7/00 11:50	1/2/00 17:32	7	46	3.6	0.116	15%
12/10/00 17:08	1/0/00 0:49	6	25	1.9	0.062	24%
12/15/00 10:28	1/0/00 15:02	5	45	1.7	0.056	23%
12/11/00 15:55	1/0/00 0:10	5	41	2.4	0.072	0%
12/12/00 19:17	1/0/00 21:45	4	83	2.2	0.069	20%
12/11/00 21:12	1/0/00 4:33	4	49	1.5	0.048	37%
12/4/00 8:28	1/0/00 0:09	4	37	1.8	0.053	0%
12/3/00 18:47	1/0/00 8:54	4	24	1.1	0.034	18%
12/10/00 16:11	1/1/00 6:28	3	67	2.6	0.081	8%
12/2/00 16:42	1/0/00 3:28	3	44	1.9	0.061	15%
11/29/00 8:10	1/0/00 0:02	3	44	1.4	0.050	93%
12/8/00 15:23	1/0/00 6:59	3	37	1.7	0.050	0%
12/7/00 12:32	1/0/00 0:24	3	28	1.0	0.033	5%
12/8/00 8:22	1/0/00 17:10	3	22	0.8	0.024	1%
12/17/00 19:05	1/0/00 5:23	2	26	0.8	0.026	9%
11/29/00 16:44	1/0/00 0:53	2	-11	-0.4	-0.013	100%
11/30/00 20:10	1/0/00 0:42	2	-15	-0.5	-0.018	100%
11/29/00 15:47	1/0/00 0:39	2	-16	-0.5	-0.018	100%
12/11/00 21:23	1/0/00 0:08	4	-32	-1.4	-0.060	100%
11/29/00 8:15	1/0/00 0:02	4	-40	-1.5	-0.063	100%
12/9/00 5:15	1/0/00 13:08	8	-22	-1.8	-0.080	100%
11/30/00 9:20	1/0/00 0:04	10	-66	-4.3	-0.187	100%
12/14/00 19:21	1/0/00 0:03	17	-44	-5.1	-0.228	100%
12/9/00 9:41	1/0/00 0:07	17	-51	-8.8	-0.378	100%
12/2/00 12:16	1/0/00 0:29	18	-51	-7.9	-0.346	100%
12/11/00 10:19	1/0/00 0:12	22	-51	-11.0	-0.475	100%
12/11/00 16:36	1/0/00 0:16	23	-51	-12.9	-0.543	100%
12/4/00 9:02	1/0/00 0:08	27	-73	-12.9	-0.563	100%
12/17/00 7:21	1/1/00 19:30	28	-44	-10.9	-0.487	100%
12/8/00 16:00	1/0/00 0:06	31	-50	-13.4	-0.585	100%

Rider Floor Scrubber; 600amp-hr Exide Battery/Tennant Charger (Baseline)--Costco Warehouse A

Event End "m/d/y hr:min"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Cum draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
11/27/00 10:53	1/0/00 3:35	71	224	187.1	6.415	100%
11/2/00 1:25	1/0/00 0:03	70	183	93.3	3.311	52%
11/17/00 10:25	1/0/00 20:58	66	252	189.1	6.409	89%
11/6/00 14:06	1/1/00 3:35	66	179	166.3	5.890	69%
11/10/00 10:14	1/0/00 0:06	61	274	171.9	6.064	93%
11/15/00 12:32	1/0/00 2:08	58	231	164.3	5.490	79%
11/9/00 9:54	1/0/00 0:08	58	187	145.0	4.912	71%
11/1/00 12:18	1/0/00 0:11	57	239	145.3	5.242	100%
11/14/00 13:23	1/0/00 0:07	57	227	163.7	5.824	73%
10/15/00 12:08	1/0/00 4:57	52	221	139.0	5.007	82%
11/18/00 9:43	1/0/00 0:02	51	223	145.8	4.943	55%
10/26/00 15:51	1/0/00 7:33	50	227	132.0	4.720	100%
10/31/00 15:22	1/0/00 0:24	49	177	105.5	3.486	6%
10/14/00 12:27	1/0/00 1:16	47	250	133.5	4.578	48%
10/30/00 11:27	1/0/00 22:30	47	216	115.8	4.158	100%
11/1/00 13:25	1/0/00 0:15	47	206	118.8	4.209	94%
11/3/00 10:22	1/0/00 10:31	46	226	125.8	4.528	100%
10/15/00 13:02	1/0/00 0:11	44	272	114.0	4.025	99%
11/11/00 9:57	1/0/00 0:06	40	225	113.9	3.769	0%
10/22/00 11:16	1/1/00 23:31	39	202	107.5	3.719	66%
10/17/00 13:03	1/0/00 0:39	35	199	85.9	2.780	53%
11/21/00 10:19	1/0/00 0:10	32	231	94.3	3.251	54%
11/1/00 14:01	1/0/00 0:05	32	229	89.0	3.060	88%
11/1/00 14:46	1/0/00 0:13	32	209	80.9	2.706	67%
10/31/00 10:34	1/0/00 0:06	31	193	73.6	2.554	51%
11/20/00 10:11	1/0/00 2:01	29	227	86.5	3.081	82%
11/13/00 13:20	1/0/00 3:27	29	184	67.4	2.268	35%
10/19/00 11:58	1/0/00 21:41	28	214	71.1	2.541	100%
10/31/00 23:05	1/0/00 0:09	26	198	75.3	2.723	84%
10/17/00 8:30	1/0/00 0:18	26	184	59.2	2.009	64%
10/30/00 14:37	1/0/00 2:35	26	178	56.3	2.005	95%
10/27/00 11:54	1/0/00 19:25	25	162	57.0	2.027	92%
11/18/00 13:26	1/0/00 0:28	25	62	15.0	0.545	95%
11/1/00 22:27	1/0/00 0:05	23	172	42.5	1.406	61%
11/1/00 21:29	1/0/00 5:49	23	143	17.3	0.611	79%
10/19/00 12:29	1/0/00 0:10	22	193	48.3	1.725	100%
10/24/00 20:29	1/0/00 0:01	21	210	53.1	1.947	87%
11/16/00 12:08	1/0/00 1:34	19	243	56.7	2.002	78%
11/19/00 11:42	1/0/00 21:56	19	211	56.8	1.879	25%
10/13/00 11:54	1/0/00 1:34	19	202	56.0	2.002	78%
11/18/00 12:13	1/0/00 0:11	18	233	51.3	1.820	78%
10/31/00 11:00	1/0/00 0:09	18	191	40.1	1.375	83%

11/16/00 9:52	1/0/00 3:28	17	235	53.5	1.901	79%
10/24/00 13:15	1/0/00 3:40	15	204	40.2	1.368	93%
11/22/00 9:54	1/0/00 0:06	15	202	37.3	1.336	89%
10/31/00 9:58	1/0/00 0:05	15	191	31.4	1.114	100%
11/10/00 18:22	1/0/00 4:13	15	148	34.1	1.191	66%
11/21/00 5:03	1/0/00 18:36	14	247	40.4	1.413	72%
11/18/00 12:34	1/0/00 0:08	14	233	39.0	1.353	98%
10/31/00 22:31	1/0/00 0:10	14	193	35.6	1.306	100%
11/21/00 13:55	1/0/00 0:26	13	238	39.2	1.331	45%
10/16/00 9:24	1/0/00 20:00	13	205	27.4	0.961	86%
10/31/00 14:07	1/0/00 2:53	12	227	29.0	0.980	37%
10/16/00 12:26	1/0/00 2:52	11	236	28.1	0.962	100%
10/17/00 18:22	1/0/00 0:01	11	211	15.1	0.564	100%
11/22/00 9:32	1/0/00 0:12	10	212	30.4	1.085	80%
11/28/00 13:24	1/0/00 1:19	10	207	26.4	0.868	83%
11/11/00 21:57	1/0/00 5:45	10	205	23.5	0.821	75%
11/16/00 10:15	1/0/00 0:14	10	199	27.7	0.985	72%
10/28/00 11:51	1/0/00 22:27	10	161	23.4	0.851	90%
11/11/00 16:03	1/0/00 4:10	9	235	28.3	0.985	63%
11/28/00 11:56	1/0/00 1:12	9	214	19.9	0.664	35%
11/4/00 11:13	1/0/00 1:28	9	202	25.1	0.904	87%
10/13/00 10:02	1/0/00 0:10	9	187	21.4	0.780	100%
10/20/00 11:07	1/0/00 2:07	9	180	21.2	0.752	70%
11/22/00 12:35	1/0/00 2:33	8	227	26.0	0.918	82%
11/9/00 13:35	1/0/00 0:01	8	157	18.3	0.684	100%
10/31/00 21:58	1/0/00 0:12	8	138	7.7	0.290	100%
10/20/00 8:52	1/0/00 20:17	7	188	20.5	0.724	71%
11/1/00 22:39	1/0/00 0:06	7	162	13.4	0.423	50%
11/2/00 13:53	1/0/00 0:07	6	204	15.1	0.501	24%
11/27/00 11:03	1/0/00 0:05	6	192	14.4	0.481	37%
11/2/00 16:07	1/0/00 0:55	6	187	12.1	0.403	59%
11/11/00 11:45	1/0/00 0:02	5	250	18.1	0.639	71%
10/16/00 17:06	1/0/00 0:53	5	247	10.2	0.364	91%
11/3/00 11:43	1/0/00 1:17	5	226	15.9	0.566	89%
11/8/00 10:03	1/1/00 18:30	5	223	10.7	0.375	100%
10/18/00 13:46	1/0/00 3:55	5	176	13.8	0.497	89%
10/27/00 13:15	1/0/00 0:02	5	154	11.1	0.415	100%
11/1/00 11:09	1/0/00 8:08	5	60	2.8	0.106	100%
10/17/00 10:48	1/0/00 1:10	5	52	3.3	0.116	83%
11/2/00 13:41	1/0/00 12:12	4	263	11.2	0.371	30%
11/10/00 13:55	1/0/00 0:09	4	213	11.8	0.412	69%
11/14/00 16:31	1/0/00 2:56	4	197	7.1	0.255	100%
11/28/00 10:36	1/0/00 23:29	4	164	8.1	0.280	82%
10/17/00 5:24	1/0/00 1:41	4	164	9.1	0.316	64%
10/17/00 3:34	1/0/00 9:37	4	106	6.0	0.214	72%
10/27/00 12:02	1/0/00 0:05	4	102	4.0	0.148	100%
10/14/00 10:25	1/0/00 0:05	3	198	9.4	0.331	66%

11/25/00 5:49	1/2/00 11:08	3	188	9.0	0.316	75%
11/1/00 15:18	1/0/00 0:28	3	175	3.9	0.133	90%
11/17/00 12:17	1/0/00 1:50	3	173	6.4	0.216	44%
11/13/00 9:22	1/1/00 11:23	3	164	6.1	0.212	59%
10/31/00 9:37	1/0/00 18:58	3	157	7.0	0.248	79%
11/16/00 12:21	1/0/00 0:09	3	157	6.5	0.235	98%
11/5/00 9:26	1/0/00 22:11	3	105	3.3	0.122	100%
11/1/00 21:57	1/0/00 0:25	3	66	2.5	0.087	70%
11/21/00 13:17	1/0/00 2:56	3	64	2.6	0.096	99%
11/3/00 19:45	1/0/00 0:05	3	54	2.4	0.092	100%
11/3/00 19:38	1/0/00 0:04	3	51	2.1	0.083	100%
11/9/00 7:41	1/0/00 21:36	3	42	1.9	0.071	100%
10/16/00 15:55	1/0/00 3:25	3	36	1.6	0.058	97%
11/28/00 15:20	1/0/00 0:01	3	5	0.3	0.009	98%
11/10/00 9:07	1/0/00 19:31	2	210	3.7	0.131	100%
10/13/00 4:39	1/0/00 0:00	2	197	6.2	0.214	61%
10/24/00 9:11	1/1/00 17:01	2	168	4.6	0.162	60%
11/3/00 12:36	1/0/00 0:52	2	162	5.2	0.186	88%
11/10/00 13:43	1/0/00 3:28	2	140	4.4	0.156	77%
11/15/00 9:02	1/0/00 0:29	2	138	2.8	0.100	100%
10/17/00 3:40	1/0/00 0:05	2	122	3.1	0.108	68%
11/15/00 8:32	1/0/00 0:19	2	99	2.1	0.078	100%
11/15/00 9:27	1/0/00 0:24	2	80	2.4	0.086	92%
10/17/00 11:35	1/0/00 0:12	2	74	2.4	0.086	71%
10/31/00 22:08	1/0/00 0:09	2	42	1.1	0.042	100%
11/6/00 15:29	1/0/00 1:22	2	40	1.2	0.044	100%
11/3/00 19:52	1/0/00 0:05	2	38	1.0	0.039	100%
10/16/00 16:09	1/0/00 0:13	2	38	1.1	0.040	100%
11/2/00 16:17	1/0/00 0:02	9	-112	-16.7	-0.228	100%
10/15/00 6:19	1/0/00 12:01	20	-33	-10.5	-0.683	100%
11/22/00 8:34	1/0/00 12:01	20	-33	-10.5	-0.718	100%
10/18/00 9:47	1/0/00 12:02	20	-33	-10.5	-0.681	100%
10/25/00 12:01	1/0/00 12:01	20	-33	-10.5	-0.680	100%
11/14/00 7:05	1/0/00 12:01	20	-33	-10.6	-0.677	100%
10/26/00 0:21	1/0/00 12:01	20	-33	-10.5	-0.695	100%
11/20/00 7:39	1/0/00 12:01	20	-45	-14.4	-0.713	100%
10/29/00 12:11	1/0/00 12:01	20	-46	-14.8	-0.741	100%
11/18/00 8:49	1/0/00 19:47	46	-112	-83.7	-1.256	100%
10/13/00 9:42	1/0/00 4:08	56	-113	-104.0	-1.654	100%
10/27/00 13:09	1/0/00 0:01	67	-112	-124.0	-1.966	100%
11/11/00 11:39	1/0/00 0:01	82	-112	-151.9	-2.217	100%
11/2/00 0:11	1/0/00 0:11	82	-113	-151.9	-2.098	100%
11/18/00 11:45	1/0/00 0:20	101	-112	-168.6	-2.229	100%
10/28/00 23:51	1/0/00 8:59	182	-155	-174.3	-6.136	100%
10/17/00 21:26	1/0/00 0:02	183	-113	-109.4	-6.005	100%
10/24/00 23:41	1/0/00 0:01	192	-113	-133.4	-6.404	100%
11/9/00 13:27	1/0/00 0:04	199	-113	-348.7	-5.804	100%

11/3/00 19:32	1/0/00 3:27	210	-113	-208.3	-6.781	100%
11/1/00 2:53	1/0/00 0:02	227	-113	-199.4	-7.267	100%
11/21/00 20:14	1/0/00 1:38	282	-113	-323.7	-8.954	100%
10/24/00 20:07	1/0/00 2:06	287	-113	-378.8	-8.732	100%
10/17/00 18:10	1/0/00 0:11	297	-113	-503.0	-8.508	100%
10/14/00 17:59	1/0/00 0:02	317	-113	-399.7	-9.733	100%
11/13/00 18:45	1/0/00 0:02	324	-113	-432.2	-9.758	100%
10/31/00 21:32	1/0/00 0:03	368	-113	-520.8	-10.860	100%
11/2/00 23:05	1/0/00 0:07	402	-113	-558.2	-11.931	100%
11/19/00 19:19	1/0/00 0:03	455	-155	-576.9	-14.891	100%
11/15/00 21:06	1/0/00 0:13	502	-113	-498.8	-15.859	100%

Rider Floor Scrubber; 340amp-hr Horizon Battery/AeroVironment Charger--Costco Warehouse A

Event End "m/d/y hr:min"	Idle since 'last' "days hrs:min"	Duration "minutes"	Max draw "amps"	Cum draw "amp-hrs"	Ttl energy "kWh"	End s-o-c "%"
12/10/00 10:23	1/0/00 0:13	66	246	186.9	6.760	88%
12/5/00 18:59	1/0/00 6:48	51	265	142.3	5.171	91%
12/13/00 18:05	1/0/00 0:14	41	166	84.6	2.787	9%
12/10/00 12:34	1/0/00 1:06	32	218	88.8	2.949	26%
12/12/00 10:07	1/0/00 12:18	29	222	76.2	2.753	80%
11/29/00 9:58	1/0/00 0:17	29	195	73.2	2.630	81%
12/13/00 13:47	1/1/00 3:12	29	170	62.4	2.215	70%
12/8/00 17:59	1/0/00 0:02	28	223	71.5	2.681	100%
12/11/00 17:51	1/0/00 1:24	23	232	63.3	2.362	100%
12/4/00 17:54	1/0/00 6:21	21	202	58.1	1.911	37%
12/7/00 18:54	1/0/00 3:26	21	198	51.0	1.768	48%
12/13/00 15:10	1/0/00 1:05	19	161	45.3	1.571	67%
12/1/00 10:14	1/0/00 0:10	17	243	57.3	2.053	75%
12/8/00 20:27	1/0/00 0:06	17	233	51.8	1.944	100%
12/10/00 10:57	1/0/00 0:06	16	280	46.2	1.614	59%
12/7/00 20:18	1/0/00 1:05	16	199	42.6	1.411	25%
12/2/00 11:28	1/1/00 0:38	9	210	27.0	0.942	62%
12/7/00 15:08	1/0/00 4:06	7	238	17.6	0.616	88%
12/9/00 13:44	1/0/00 1:26	7	211	22.3	0.831	100%
12/8/00 4:43	1/0/00 8:12	7	194	18.0	0.574	0%
12/16/00 14:06	1/1/00 2:32	7	178	19.1	0.701	99%
12/4/00 11:09	1/1/00 23:35	5	223	15.8	0.543	59%
12/14/00 13:59	1/0/00 1:52	5	206	14.3	0.534	100%
12/15/00 11:28	1/0/00 21:25	5	193	12.2	0.448	100%
12/17/00 19:10	1/1/00 5:01	4	201	12.3	0.446	92%
12/11/00 21:21	1/0/00 3:28	3	211	9.6	0.356	100%
12/7/00 20:25	1/0/00 0:05	3	68	2.4	0.080	37%
12/5/00 11:21	1/0/00 11:08	3	20	0.6	0.023	100%
12/8/00 8:16	1/0/00 3:32	2	116	2.1	0.070	44%
12/13/00 17:09	1/0/00 1:58	2	95	1.7	0.061	80%
12/9/00 12:11	1/0/00 12:01	20	-33	-10.4	-0.826	100%
12/14/00 12:03	1/0/00 12:02	20	-33	-10.5	-0.882	100%
12/11/00 6:50	1/0/00 12:01	20	-33	-10.6	-0.855	100%
12/8/00 17:24	1/0/00 7:13	116	-92	-74.3	-4.242	100%
12/8/00 20:03	1/0/00 0:02	123	-113	-111.5	-4.377	100%
12/11/00 16:05	1/0/00 6:16	180	-33	-94.8	-7.825	100%
12/8/00 23:51	1/0/00 0:01	204	-112	-142.6	-7.744	100%
12/5/00 0:08	1/0/00 1:46	269	-112	-286.6	-8.920	100%
12/13/00 23:42	1/0/00 0:01	337	-113	-414.6	-10.644	100%

Target:
Industrial Transportation

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