EVEREADY®
BATTERY ENGINEERING DATA

UNION CARBIDE

This reference manual contains the basic data on all "Eveready" batteries in production at the time of preparation. Since the characteristics of individual batteries are sometimes modified, manufacturers who are designing their product to use a particular battery should contact the nearest Union Carbide Battery Products Division Sales Office for verification of specifications. Manufacturers are urged to use the Battery Engineering Department's consulting service. (See inside back cover for Sales & Engineering offices.)

$15.00

EVEREADY®
BATTERY ENGINEERING DATA

The assembly, organization, and editing of both the descriptive passages and detailed tables of an edition of a technical manual such as the Eveready Battery Engineering Data book obviously requires the efforts of many. It is not unusual in such an undertaking, however, that one individual must act as the catalyst, organizer, and leader in the effort.

Through many editions of this book there has been one such individual guiding the efforts of those concerned to the completion of each publication. F.B. Pipal, Eveready's Manager of Battery Engineering, has shown the perseverance and dedication to successfully guide its publication through the years, and it is to him that the Management of the Battery Products Division wishes to dedicate this 1976 edition.

CHARGING OF PRIMARY BATTERIES

IF "EVEREADY" PRIMARY BATTERIES ARE SUBJECTED TO ANY FORM OF RECHARGING ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE NULL AND VOID. NOTE THE DISCUSSION ON PAGES 27 AND 28.

METAL-JACKETED BATTERIES

It is important to note that some of the batteries listed in this book have metal jackets (see data sheets). Proper design of devices using these batteries should include electrical isolation of the battery jacket from the device circuitry, to prevent short circuit.

CONTENTS

CARBON-ZINC DRY BATTERIES

CONTENTS (Continued)

CONTENTS (Continued)

FOREWORD

Ever since it appeared on the first commercial dry cell in 1890, the trade-mark "Eveready" has distinguished superior packaged power.

Union Carbide manufactures the most complete dry battery line in the world. There are engineers ready to help you choose the right electrochemical source from these basic systems:

Carbon-Zinc *(Primary)*
Alkaline-Manganese Dioxide
(Primary)
(Rechargeable)
Nickel-Cadmium *(Rechargeable)*
Mercuric Oxide *(Primary)*
Silver Oxide *(Primary)*
And others

For additional information, or for consultation, contact the nearest Union Carbide Battery Products Division Office (See inside back cover for Sales and Engineering offices).

HOW TO USE THE DATA BOOK

The assembly and presentation of dry battery data are at best cumbersome because of the many variables involved. Complete data on dry battery characteristics would occupy several large file cabinets and therefore economy and convenience dictate a compromise.

The Table of Contents lists all major sections in this book. These are explained below:

Index: "Eveready" Battery Number to Page Number

Knowing the "Eveready" battery number, all data will be found on the page or pages listed.

Key Factors in Battery Selection

This section lists and discusses information that must be known before a battery can be properly selected for any application.

Six Principal Types of Batteries and Characteristics

This table presents the characteristics of carbon-zinc, zinc chloride, alkaline-manganese dioxide, mercuric oxide, silver oxide and nickel-cadmium batteries.

Dry Batteries: Table of Characteristics and Applications

This table shows characteristics and typical applications of six different types of dry batteries.

Battery Terminology

This section defines terms used in the descriptive discussions of the various types of dry batteries.

Charging of Primary Batteries

This writeup discusses the problems and hazards of attempting to charge (rejuvenate) primary batteries which are not designed to be recharged.

Recommendations to Designers and Producers of Battery-Powered Equipment

This writeup contains suggestions regarding the design of equipment and handling of batteries to insure satisfactory battery performance.

Specification Listing: Carbon-Zinc Batteries

All "Eveready" Carbon-Zinc batteries are arranged in ascending voltage categories starting with 1.5 volts. Within any voltage category batteries are arranged in ascending order of capacity. Dimensions, cell makeup, weight, terminal sketches and other pertinent data are listed. This section also contains a limited amount of service data organized by cell type. The service data shown in the table for each cell apply to a mix which is utilized in a general purpose battery. Other formulations may be used in any given cell size. In these instances the data in the table will still show the order of service life to be expected. In the full page treatment of active battery types the service life given applies specifically to each battery.

Full Page Specifications

All batteries are arranged by type, i.e. Carbon-Zinc, Alkaline-Manganese Dioxide, Nickel-Cadmium, Mercuric oxide and Silver oxide. Batteries within a type are arranged by voltage category, starting with single cells. Batteries within a voltage category are arranged in order of ascending service capacity. Data for Carbon-Zinc and most Alkaline-Manganese Dioxide batteries are in tabular form involving a wide choice of (1) drains within the capabilities of the cells (2) cut off voltages (3) discharge schedules.

For drains not specifically listed, standard interpolation procedures may be used with reasonable accuracy.

Alkaline-Manganese Dioxide Batteries

Alkaline-Manganese Dioxide cells and batteries are organized in the same manner as Carbon-Zinc types. There are separate sections on primary and secondary (rechargeable) batteries. There is a section pertaining to the charging of Alkaline-Manganese Dioxide secondary batteries.

Nickel-Cadmium Batteries

Nickel-Cadmium cells and batteries are first arranged in a tabular specification listing in order of increasing cell capacity. Subsequent pages cover each nickel-cadmium cell and battery in detail, showing dimensional drawings, discharge characteristics at several current drains, capacity vs. discharge current, capacity vs. temperature, charge rates, and resistance and impedance. In addition, pulse discharge capabilities and, in some cases, terminal voltage vs. instantaneous load are indicated for high rate cells. Descriptive sections cover standard, high rate and fast charge cells and charging circuitry for each type.

Mercuric Oxide Batteries

Mercuric oxide cells and batteries are organized in the same manner as Carbon-Zinc types.

Silver Oxide Batteries

Silver oxide batteries are organized in the same manner as Carbon-Zinc types.

Battery Charging

This is a writeup covering Elementary Battery Charging-Theory and Practice and Experimental Charger Components & Circuits.

Cross Reference

The complete line of "Eveready" batteries is cross referenced with the type numbers of other dry battery manufacturers as well as the NEDA (National Electronic Distributors Association), IEC and military numbers.

Sales Offices and Engineering Assistance

See inside back cover for list of Sales Offices and points to which inquiries for technical assistance should be directed.

INDEX

KEY FACTORS IN BATTERY SELECTION

Selecting a battery can be as simple as buying a cell for a pen light—or as complicated as specifying a source of stored energy for a satellite transmitter. Although the many kinds of types of batteries may seem to make a proper choice difficult, the problem can be somewhat simplified by first outlining the application requirements and then matching a battery to the job.

The preliminary information that must be available before a battery can be specified is listed here. Then, the discussion of the basic characteristics and features of various batteries in the following sections will indicate which one or ones are most suitable for the application. Unfortunately, the ideal characteristics cannot be found in any one battery design, nor can the characteristics of one battery always be compared directly with the features of another. Therefore, optimum performance of a battery in an application can usually be achieved best by meeting the critical needs of the application and subordinating the others.

Before a battery can be specified, the minimum information that must be determined from the application is:

1. Voltage
2. Current Drain
3. Operating Schedule
4. Service Life Required
5. Service Temperatures
6. Size and Weight
7. Environment
8. Type of Terminals

If the equipment will not operate below a certain critical voltage, this endpoint voltage should be specified. Both initial and operating current drains may need to be specified. This, along with the discharge schedule and the required service life, will determine the ampere-hour capacity for the battery.

Service temperatures must be known because they will affect battery capacity or life, or both. If the battery will be stored for any period of time before use, the length of time and the temperature should also be indicated.

Allowable size and weight will sometimes determine which battery is selected in spite of other requirements. A premium is usually paid for small size with high output capacity. Bulky and heavy batteries can be reliable as well as economical if their size can be accommodated.

Shock or vibration may indicate the need for a rugged battery construction. Unusual rates of acceleration or high-altitude operation are also a part of the environmental considerations. Storage time and temperature under any of these conditions should be noted.

The choice of secondary (rechargeable) systems may make possible and practical battery operated devices that can not be economically powered by primary batteries.

Characteristics and typical applications of six different types of dry batteries are shown in the table on page 22. Dry battery terminology is listed on pages 23-25.

SIX PRINCIPAL TYPES OF DRY

Usual Name	Carbon-Zinc	Carbon-Zinc (Zinc Chloride)
Electrochemical System	Zinc-Manganese Dioxide (usually called Leclanche or Carbon-Zinc)	Zinc-Manganese Dioxide
Voltage Per Cell	1.5	1.5
Negative Electrode	Zinc	Zinc
Positive Electrode	Manganese Dioxide	Manganese Dioxide
Electrolyte	Aqueous solution of ammonium chloride and zinc chloride	Aqueous solution of zinc chloride
Type	Primary	Primary
Rechargeability (See pages 4, 27 and 28)	Poor	Poor
Number of Cycles	10-20	10-20
Input if Rechargeable		
Overall Equations of Reaction	$2MnO_2+2NH_4Cl+Zn \rightarrow ZnCl_2 \cdot 2NH_3+H_2O+Mn_2O_3$	$8MnO_2+4Zn+ZnCl_2+9H_2O \rightarrow 8MnOOH+ZnCl_2 \cdot 4ZnO \cdot 5H_2O$
Typical Commercial Service Capacities	60mAh to 30 Ah	Several hundred mAh to 9Ah
Energy Density (Commerical): Watt-Hour/Lb.	20	40
Energy Density (Commercial): Watt-Hour/Cubic Inch	2	3
Practical Current Drain Rates: Pulse	Yes	Yes
Practical Current Drain Rates: High (More Than 50mA)	100mA/square inch of zinc area ("D" cell)	150mA/square inch of zinc area ("D" cell)
Practical Current Drain Rates: Low (Less Than 50mA)	Yes	Yes
Discharge Curve (Shape)	Sloping	Sloping
Temperature Range: Storage	$-40^{\circ}F$ to $120^{\circ}F$ ($-40^{\circ}C$ to $48.9^{\circ}C$)	$-40^{\circ}F$ to $160^{\circ}F$ ($-40^{\circ}C$ to $71.1^{\circ}C$)
Temperature Range: Operating	$20^{\circ}F$ to $130^{\circ}F$ ($-6.7^{\circ}C$ to $54.4^{\circ}C$)	$0^{\circ}F$ to $160^{\circ}F$ ($-17.8^{\circ}C$ to $71.1^{\circ}C$)
Effect of Temperature on Service Capacity	Poor low temperature	Good low temperature relative to carbon-zinc
Impedance	Low	Low
Leakage	Medium Under Abusive Conditions	Low
Gassing	Medium	Higher than carbon-zinc
Reliability (Lack of Duds; 95% Confidence Level)	99% at 2 years	99% at 2 years
Shock resistance	Fair to good	Good
Cost: Initial	Low	Low to Medium
Cost: Operating	Low	Low to Medium
Features	Low cost; variety of shapes and sizes	Service capacity at moderate to high current drains greater than carbon-zinc; good leakage resistance; low temperature performance better than carbon-zinc
Limitations	Efficiency decreases at high current drains; poor low-temperature performance	

TABLE A

BATTERIES AND AVERAGE CHARACTERISTICS

Alkaline-Manganese Dioxide	Mercuric Oxide	Silver Oxide	Nickel-Cadmium
Zinc-Alkaline Manganese Dioxide	Zinc-Mercuric Oxide	Zinc-Silver Oxide	Nickel-Cadmium
1.5	1.35	1.5 (monovalent)	1.2
Zinc	Zinc	Zinc	Cadmium
Manganese Dioxide	Mercuric Oxide	Monovalent Silver Oxide	Nickelic Hydroxide
Aqueous solution of potassium hydroxide	Aqueous solution of potassium hydroxide or sodium hydroxide	Aqueous solution of potassium hydroxide or sodium hydroxide	Aqueous solution of potassium hydroxide
Primary and Rechargeable	Primary	Primary	Rechargeable
Good	No	No	Yes
50-60 Rechargeable Only			300-2000
Approximately 100% of energy withdrawn Rechargeable Only			Sealed, minimum of 140% of energy withdrawn
$2Zn+2KOH+3MnO_2 \rightarrow 2ZnO+2KOH+Mn_3O_4$	$Zn+KOH+2MnO_2 \rightleftharpoons ZnO+Mn_2O_3+KOH$	$Zn+Ag_2O+KOH \rightarrow ZnO+2Ag+KOH$	$Cd+2NiOOH+KOH+2H_2O \rightleftharpoons Cd(OH)_2+2Ni(OH)_2+KOH$
Several hundred mAh to 23Ah	16mAh to28Ah	35mAh to 210mAh	Sealed: 20mAh to 4 Ah
Primary: 30-45 Rechargeable: 10	50	50	Sealed: 12-16
Primary: 2-3 Rechargeable: 1-1.2	8	8	Sealed: 1.2-1.5
Yes	Yes	Yes	Yes
200mA/square inch of zinc area ("D" cell)	No	No	8-10A
Yes	Yes	Yes	Yes
Sloping	Flat	Flat	Flat
$-40^{\circ}F$ to $120^{\circ}F$ ($-40^{\circ}C$ to $48.9^{\circ}C$)	$-40^{\circ}F$ to $140^{\circ}F$ ($-40^{\circ}C$ to $60^{\circ}C$)	$-40^{\circ}F$ to $140^{\circ}F$ ($-40^{\circ}C$ to $60^{\circ}C$)	$-40^{\circ}F$ to $140^{\circ}F$ ($-40^{\circ}C$ to $60^{\circ}C$)
$-20^{\circ}F$ to $130^{\circ}F$ ($-28.9^{\circ}C$ to $54.4^{\circ}C$)	$32^{\circ}F$ to $130^{\circ}F$ ($0^{\circ}C$ to $54.4^{\circ}C$)	$32^{\circ}F$ to $130^{\circ}F$ ($0^{\circ}C$ to $54.4^{\circ}C$)	Discharge: $-4^{\circ}F$ to $113^{\circ}F$ ($-20^{\circ}C$ to $45^{\circ}C$) Charge: B, BH & CH Types: $32^{\circ}F$ to $113^{\circ}F$ ($0^{\circ}C$ to $45^{\circ}C$) Charge: CF type: $60^{\circ}F$ to $113^{\circ}F$ ($15.6^{\circ}C$ to $45^{\circ}C$)
Good low temperature	Good high temperature, poor low temperature—depends upon construction	Poor low temperature—depends upon construction	Very good at low temperature—poor at high temperature
Very low	Low	Low	Very low
Rare	Some salting	Some salting	No
Low	Very low	Very low	Low
99% at 2 years	99% at 2 years	99% at 2 years	99% at 2 years
Fair to good	Good	Good	Good
Medium Plus	High	High	High
Medium to high at high power requirements	High	High	Low
High efficiency under moderate and high continuous conditions; good low-temperature performance; low impedance	High service capacity/volume ratio; flat voltage discharge characteristic; good high temperature performance	Moderately flat voltage discharge characteristics	Excellent cycle life; flat voltage discharge characteristic; good high- and low-temperature performance; high resistance to shock and vibration; can be stored indefinitly in any charge state.
Primary type expensive for low drains. Rechargeable-limited cycle life; voltage limited taper current charging	Poor low-temperature performance on some types		High initial cost; only fair charge retention

TABLE A (cont)

DRY BATTERIES

NAME	TYPE	VOLTS/ CELL*	FEATURES	RECOMMENDED APPLICATIONS
Carbon-Zinc	Primary	1.5	Low cost, discharge characteristic falls gradually, variety of shapes and sizes.	Radios, barricade flashers, telephone amplifiers, marine depth finders, toys, lighting systems, signaling circuits, novelties, flashlights, photoflash guns, paging, laboratory instruments.
Carbon-Zinc (Zinc Chloride)	Primary	1.5	Good low temperature performance, discharge characteristic falls gradually, service capacity at moderate to high current drains greater than carbon-zinc.	Cassette players and recorders, calculators, motor driven toys, radios, clocks.
Alkaline-Manganese Dioxide	Primary and Rechargeable	1.5	Good low temperature performance, discharge characteristic falls gradually, high efficiency under continuous or heavy-duty high-drain conditions. Under some conditions, will provide up to seven times service life of carbon-zinc cells. More expensive than carbon-zinc batteries, low impedance, several standard sizes.	Radios (particularly high current drain), bicycle lights and horns, shavers, electronic flash, lighting systems, movie cameras, radio controlled models, model plane ignition, toys, tape recorders, television sets, walkie-talkies, cassette players and recorders, calculators, motor driven toys, clocks, photoflash, heavy duty lighting, any high current drain, heavy discharge schedule use.
Mercuric Oxide	Primary	1.35 and 1.4	Excellent high-temperature performacne, relatively flat discharge characteristic.	Secondary voltage standard, television sets, radios, photoelectric exposure devices, walkie-talkies, paging, radiation detection, test equipment, hearing aids, transistorized equipment, electronic watches.
Silver Oxide	Primary	1.5	Flat discharge characteristic, fair low-temperature performance.	Hearing aids, reference voltage source, photoelectric exposure devices, instruments, electronic watches.
Nickel-Cadmium	Secondary	1.25	Hermetically sealed, maintenance free, relatively flat discharge characteristic, good high and low-temperature performance, competitive in terms of cost per hour of use, high resistance to shock and vibration, button/cylindrical configurations, long life, low self-discharge rate, high effective capacitance.	Filters in d-c power supplies, portable hand tools and appliances, shavers, toothbrushes, photoflash equipment, dictating machines, movie cameras, instruments, portable communication equipment, tape recorders, slide projectors, radios, television sets, satellites, gasoline engine starting, cassette players and recorders, calculators.

*Higher voltages for batteries can be obtained by series connection of individual cells.

TABLE B

BATTERY TERMINOLOGY

AMPERE - HOURS – Product of current in amperes, multiplied by time current is flowing.

BATTERY – Correctly, a battery consists of two or more series or parallel - connected galvanic cells. Frequently, however, a single cell is called a battery.

CAPACITY – Output capability over a period of time; expressed in ampere-hours.

CELL – A primary galvanic cell converts chemical energy directly into electric energy and consists of two electrodes of dissimilar material isolated from one another electronically, in a common ionically conductive electrolyte. The electrolyte may be solid or liquid, but usually is an aqueous salt solution. If the cell is of secondary, or rechargeable, variety, input electric energy can be converted to chemical energy and thus stored.

CELL REVERSAL – Reversing of polarity of terminals of a cell in a multicell battery due to overdischarge.

CHARGE, State of – Condition of a cell in terms of the capacity remaining in the cell.

CHARGE RATE – The current at which a secondary cell or battery is charged. It is usually expressed as a function of the cell or battery's capacity. For example, the 10 hour charge rate of a 4 ampere-hour cell is c/10 = 4/10 = 0.4A = 400mA.

CHARGING – Process of supplying electrical energy for conversion to stored chemical energy.

CUTOFF VOLTAGE – Voltage at the end of useful discharge. Cell voltage below which the connected equipment will not operate or below which operation is not recommended.

CYCLE – One sequence of charge and discharge.

CYCLE LIFE – The total number of charge – discharge cycles provided until the battery is unable to perform satisfactorily.

DEEP DISCHARGE – Withdrawal of all electrical energy to below the normal cutoff voltage before the cell or battery is recharged.

DEPTH OF DISCHARGE – The percentage of rated capacity to which a cell or battery is discharged.

DISCHARGE – Withdrawal of electrical energy from a cell or battery, usually to operate connected equipment.

DISCHARGE RATE – The current at which a cell or battery is discharged, usually expressed as a function of its rated capacity. For example, the 5 hour rate discharge of a 1.2 ampere-hour cell is c/5 = 1.2/5 = 0.24A = 240 mA.

DRAIN – Withdrawal of current from a cell or battery.

DRY – The electrolyte in a cell is immobilized, being either in the form of a paste or gel or absorbed in the separator material.

ELECTRODE – Metal or metal oxide conducting body through which current enters or leaves cell.

ELECTROLYTE – May be solid or liquid. Usually an aqueous salt solution that permits ionic conduction between positive and negative electrodes of cell. In some cases the electrolyte also takes part in chemical reaction in a cell.

ENERGY – Output capability; ampere-hour capacity times average closed-circuit discharge voltage, expressed as watt-hours.

ENERGY DENSITY – Ratio of cell energy to weight or volume (watt-hours per pound or watt-hours per cubic inch.)

FLOAT CHARGING– Method of recharging in which a secondary cell is continuously connected to a constant-voltage supply that maintains the cell in fully charged condition.

HIGH - RATE DISCHARGE – Withdrawal of large currents for short intervals of time, usually at a rate that would completely discharge a cell or battery in less than 1 hour.

IMPEDANCE – The total opposition that a battery offers to the flow of alternating current or any other varying current at a particular frequency. Impedance is a combination of resistance and reactance.

INITIAL DRAIN – Current that a cell or battery supplies when first placed on load.

INTERNAL RESISTANCE – Opposition to direct current flow within a cell, with the cell as source, causing a drop in closed circuit voltage proportional to the current drain from the cell.

LOW - RATE DISCHARGE – Withdrawal of small currents for long periods of time, usually longer than 1 hour.

OPEN - CIRCUIT VOLTAGE – The no load voltage of a cell or battery measured with a high resistance voltmeter.

PRIMARY – A cell or battery designed to be used once and discarded, not designed to be recharged.

RECHARGEABLE – Capable of being recharged; refers to secondary cells or batteries.

SECONDARY – Cell or battery which can be recharged after being discharged under specified conditions of use.

SELF - DISCHARGE RATE – The rate at which a primary or secondary cell or battery loses service capacity when standing idle.

TRICKLE CHARGING – Method of recharging in which a secondary cell is either continuously or intermittently connected to a constant-current supply that maintains the cell in fully or near fully charged condition.

WET – Indication that the liquid electrolyte in a cell is free-flowing.

DRY BATTERIES

Although the electrolyte for all batteries is basically a liquid, combination with various other ingredients can produce a gelatinous or semi-solid composition which effectively makes a battery "dry". Developments with this type of construction have resulted in dry batteries which can be recharged.

Some types of batteries which still use the liquid electrolyte can also be classified as dry batteries. They are completely sealed to prevent leakage and can be operated in any position. They are generally rechargeable types which have overcome the necessity for venting by control of gas generation during the discharging and charging.

The basic characteristics of batteries of five different types are presented in the following sections. These include carbon-zinc (with new heavy duty zinc chloride cells in this category), alkaline-manganese dioxide, silver oxide, mercuric oxide and sealed nickel-cadmium.

CHARGING OF PRIMARY BATTERIES

Home battery chargers which attempt rejuvenation of primary batteries are widely distributed and advertised. Also, some devices, usually radios, have a-c adapters which allow currents to pass through batteries in the charging direction. Advertisements for some home battery chargers claim that all types of batteries can be recharged (rejuvenated is a better term). These types include primary batteries which are not designed to be rechargeable – carbon-zinc, most alkaline-manganese dioxide, mercuric oxide and silver oxide. There are problems and hazards, however, that arise in the attempted rejuvenation of primary batteries.

It has been known for years that the Leclanché system carbon-zinc cell is rechargeable to some degree if the discharge and charge cycles are controlled with precision. On this matter the National Bureau of Standards (letter circular LC965 – see page 742) makes the following comments:

"From time to time attention has been turned to the problem of recharging dry cells. Although the dry cell is nominally considered a primary battery it may be recharged for a limited number of cycles under certain conditions.

1. The opening voltage on discharge should not be below 1.0 volt per cell when battery is removed from service for charging.
2. The battery should be placed on charge very soon after removal from service.
3. The ampere-hours of recharge should be 120%-180% of the discharge.
4. Charging rate should be low enough to distribute recharge over 12-16 hours.
5. Cells must be put into service soon after charging as the recharged cells have poor shelf life.

Recharging of dry cells may be economically feasible only when quantities of dry cells are used under controlled conditions with a system of exchange of used cells for new ones already in practice, and with equipment available to provide direct current for charging. Such a system would not be practical for home use."

By reversing the flow of current through the battery, both the anode and the cathode can, with proper controls, be restored to a near-original condition through the process of electroplating. The efficiency of these replating operations determines how useful the system is for rechargeable batteries. This efficiency is affected by: 1. electrolyte conductivity, 2. the nature of the reaction products, and 3. the type of battery separator that is used.

In the carbon-zinc cells, zinc dissolves in the electrolyte during use and often forms reaction products in combination with the manganese dioxide. Upon recharging, the zinc ion must travel from the electrolyte and redeposit on the anode. To produce a smooth plating operation, it is necessary that a good portion of the original zinc remain intact and that current distribution with the cell be very uniform. Conditions existing in the ordinary dry cell quickly lead to uneveness in the plating after successive charge and discharge cycles. Zinc depositing more heavily in certain areas of the anode causes the formation of dendrites or tree-like growths which penetrate the separator, touch the cathode and cause internal short-circuiting of the battery.

During discharge of the cathode, the manganese dioxide is reduced to one of the lower valent oxides. The reoxidation or "reforming" of the manganese dioxide during recharge may not proceed smoothly if substantial insoluble reaction products prevent even distribution of the current within the cell.

Deep discharge uses battery materials non-uniformly. The low conductivity of the electrolyte used in carbon-zinc batteries, when compared to those used in rechargeable systems, also limits the rate of discharge and the rate of charge acceptance to values that are lower than normally useful in rechargeable systems.

Recharging cells of any chemical system which are not specifically designed for charging may be dangerous. Charging may also cause some leakage. Excessive amounts of gassing which may result from too high a value of charging current, may on rare occasions cause a tightly sealed cell to rupture, resulting in personal injury or damage to equipment.

If new, unused primary cells are subject to charging currents, there is a possibility of rupture due to the generation of hydrogen with resultant pressure buildup. If partially used cells are charged or overcharged, the seal may break, causing leakage and fast cell deterioration.

Similarly, if one attempts to charge mercuric oxide or silver oxide primary batteries, the possibility exists of rupture or at least leakage. This is particularly true if cells are overcharged.

There are, of course, dry batteries which may be recharged. Some of these, described in this manual, are nickel-cadmium and some types of alkaline-manganese dioxide. These types are specifically designed to be recharged and to provide, in some cases, many hundreds of charge-discharge cycles with normal use.

With regard to the charging of primary batteries, note the disclaimer on page 4.

RECOMMENDATIONS TO DESIGNERS AND PRODUCERS OF BATTERY-POWERED EQUIPMENT

Present batteries are more powerful and last longer than ever before. Because many contain highly active chemical systems, the possibility exists that they will leak and in rare instances rupture if incorrectly used or incorrectly inserted in battery operated devices. The following suggestions will help insure long, safe and satisfactory performance.

Every precaution should be taken to ensure that batteries are properly installed by the customer. Equipment should be designed so that batteries may be inserted only in the correct position. Reversed cells can cause discharge of good cells and unsatisfactory performance of the device, or in some cases, leakage, and on rare occasions, rupture of the cell. Polarity markings should be clearly shown in or near the battery compartment. Instructions should indicate battery type, if important, and should recommend changing all batteries at one time with the preferred type. Instructions should be placed on the device in, on or next to the battery compartment and presented in a manner, including appropriate type size and suitable background, to assure easy reading by the user.

Battery compartments should be accessible. The compartments should be large enough, and with proper contacts, to fit the range of battery configurations on the market. Where feasible, compartments should be constructed and located to minimize possible damage from leaking batteries.

For toys or other equipment to be used by small children, the battery compartment should be fitted with a tamper-proof door, and constructed to contain any battery leakage.

Equipment should be designed to be consistent with battery capabilities. Where a special or heavy-duty battery is necessary or advisable, this should be specified in equipment instructions.

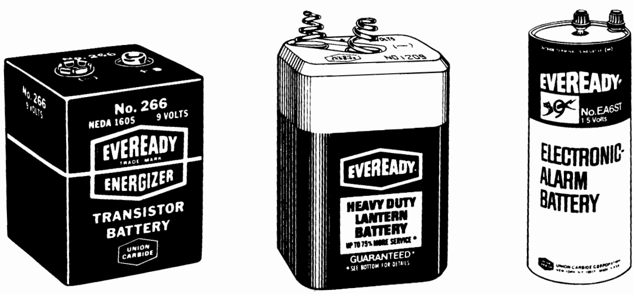
Radio, cassette recorders, or other electronic equipment with dual option a-c battery operation should be designed so that primary batteries are not subject to charging while the set is operating on a-c power or when the set is plugged into house current. Battery leakage in some cases and short life are the usual penalties; rupture may occur on rare occasions.

Another design feature to be avoided is the use of batteries in series/parallel array. Reversal of one cell when installed in a 4-cell hook-up will immediately subject another cell to charging by the remaining three-even through the equipment is not turned on. Such uncontrolled "charging" will in some instances lead to leakage, in rare instances to rupture.

Manufacturers who receive batteries shipped in bulk for assembly into battery-powered equipment should avoid jumbling these batteries during storage and use. Shorting and/or intercell charging is the likely result, using up battery power and inducing leakage. Heat generated by jumbling also may cause cell bulging and in some instances rupturing.

Equipment should be designed to switch off after battery voltage has dropped below the functional limit of the device. This is especially true of motor-operated or other equipment which leaves the battery on a virtual short circuit when it stops, which will very frequently lead to leakage and on rare occasions to rupture.

LECLANCHÉ
(CARBON ZINC)
Dry Batteries



LECLANCHÉ DRY BATTERIES (CARBON-ZINC)

General Features: Carbon-zinc batteries are available in a profusion of styles. For example, there are over a hundred styles in the "Eveready" line of batteries; they come in various voltages, shapes, and sizes, with many different terminal arrangements.

The voltage of a carbon-zinc cell is 1.5 V. Present battery types are available in voltages ranging from 1.5 to 510 V. Cells and batteries may, of course, be connected in series to obtain higher voltages, in parallel to achieve greater service capacity.

The standard carbon-zinc Leclanché battery is expected to still be the most widely used system in the foreseeable future because of low cost and reliable performance.

CONSTRUCTION

The electrochemical system of the familiar Leclanché carbon-zinc battery uses a zinc anode, a manganese-dioxide cathode, and an electrolyte of ammonium chloride and zinc chloride dissolved in water. Powdered carbon is used in the depolarizing mix, usually in the form of acetylene black, to improve conductivity of the mix and to retain moisture.

The standard carbon-zinc dry battery is considered a primary type, i.e. not designed for recharging. The basic cell is made in many shapes and sizes but two general categories exist.

1. Round Cells – available as unit cells or in assembled batteries
2. Flat Cells – available in multi-cell batteries only.

The difference between the round and flat cells is mostly physical. The chemical ingredients are the same in both cases – carbon, depolarizing mix, separator, electrolyte and zinc. The "Mini-Max" flat cell utilizes these materials in a laminated structure while in the round cell they are arranged in a concentric fashion (see Figures 1, 2 & 3).

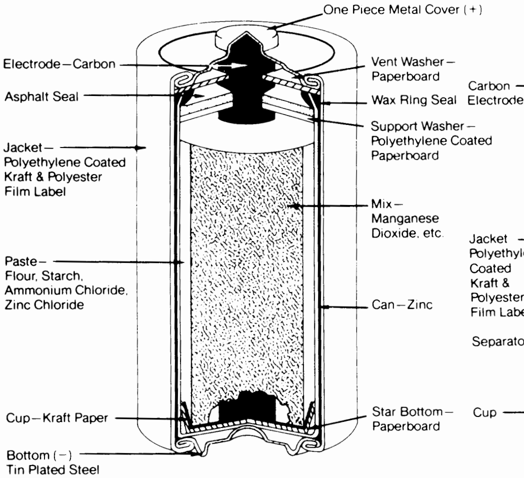


FIGURE 1 – CROSS SECTION OF STANDARD ROUND CELL (SIZE "D")

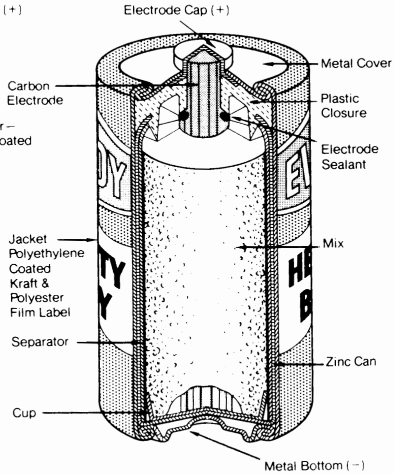


FIGURE 2 – CROSS SECTION OF ZINC CHLORIDE CELL (SIZE "D")

The rod in the center of the round cell in Figure 1 is carbon and functions as a current collector.

ZINC CHLORIDE CELLS

The zinc chloride cell is a special modification of the familiar carbon-zinc cell. Zinc chloride cells are very similar to the traditional carbon-zinc Leclanché cells but differ principally in the electrolyte system. The electrolyte in a zinc chloride cell contains only zinc chloride while in a Leclanché cell the electrolyte contains a saturated solution of ammonium chloride in addition to zinc chloride. The ommission of ammonium chloride improves the electrochemistry of the cells but increases the importance of the cell seal. Zinc chloride cells, therefore, have either a new type of seal not previously used in carbon-zinc cells or an improved conventional seal so that their shelf life is equivalent to that of Leclanché cells.

Electrode blocking by reaction products and electrode polarization at high current densities are minimized by the more uniform and higher diffusion rates that exist in an electrolyte that contains only zinc chloride. Because of their ability to operate at high electrode efficiencies, the useful current output of zinc chloride cells is usually higher than that of Leclanché cells and zinc chloride cells will operate at high current drains for a considerably longer time than Leclanché cells of the same size. In addition, the voltage level under load holds up longer.

Because of the electrochemical reactions that occur in the cell during use, water in the cell is consumed (by a reaction product which is an oxide compound) along with the electrochemically active materials, so that the cell is almost dry at the end of its useful life.

A cross section view of a "D" size zinc chloride cell is shown in figure 2.

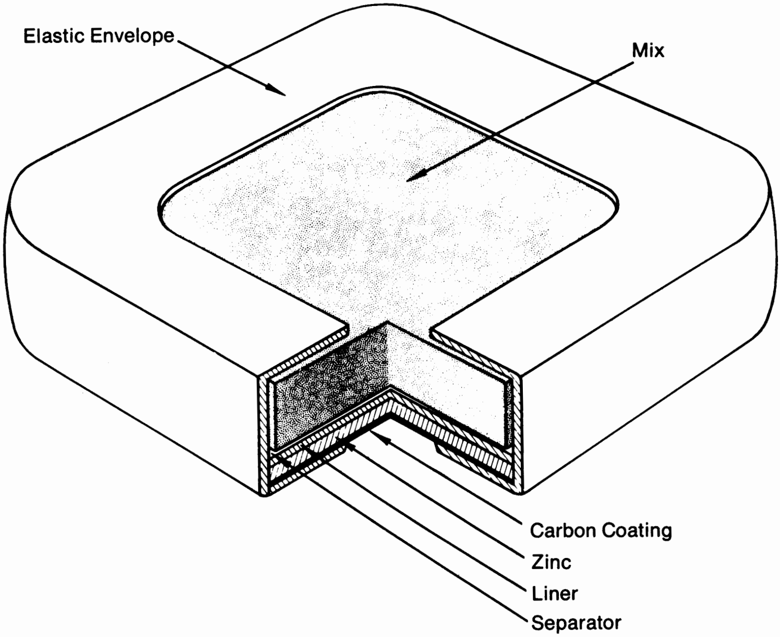


FIGURE 3 – CROSS SECTION OF "MINI-MAX" FLAT CELL

In flat cells, carbon is coated on a zinc plate to form a duplex electrode – a combination of the zinc of one cell and the carbon of the adjacent one. The "Mini-Max" cell (Figure3), contains no expansion chambers or carbon rod as does the round cell. This increases the amount of depolarizing mix available per unit cell volume and therefore the energy content. In addition the flat cell, because of its rectangular form, reduces waste space in assembled batteries. The energy to volume ratio of a battery utilizing round cells is inherently poor because of the voids occurring between cells. These two factors account for an energy to volume improvement of nearly 100% for "Mini-Max" cells compared to round cell assemblies

PERFORMANCE

The closed-circuit or working voltage of a carbon-zinc cell falls gradually as it is discharged, Fig. 4. The service hours delivered are greater as the cutoff or endpoint voltage is lower.

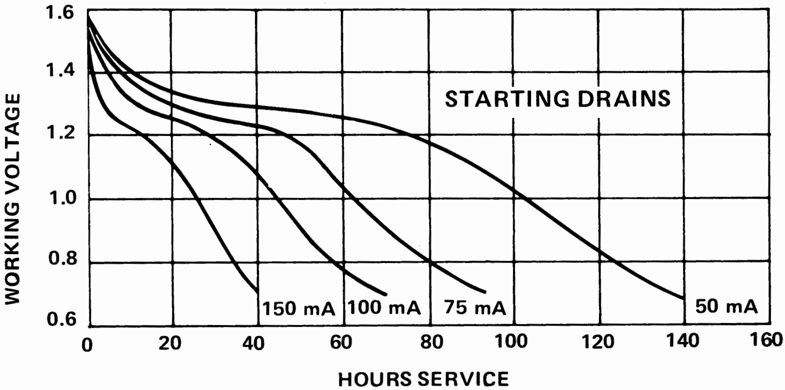


FIGURE 4 – VOLTAGE DISCHARGE CHARACTERISTICS OF CARBON-ZINC SIZE "D" CELL DISCHARGED 2 HOURS PER DAY AT 70°F (21.1°C). (FIXED RESISTANCE LOAD)

Typical cutoff voltages range from 0.65 to 1.1 V per 1.5 V cell, depending upon the application. The cutoff voltage should be made as low as possible so as to use the available energy in the battery. This is sometimes done, if the equipment can tolerate it without causing failure, and, depending upon the character of the load, by using a slightly higher voltage battery than the application normally requires. The cutoff voltage per cell is then lower and more efficient use of the battery can be achieved.

The service capacity of a Leclanché carbon-zinc battery is not a fixed number of ampere-hours because the battery functions at different efficiencies depending upon the conditions imposed upon it. The service varies with current drain, operating schedule, and cutoff voltage. It is also, of course, affected by the operating temperature and storage conditions of the battery prior to use.

Service capacity ranges from several hundred milliampere-hours to 30 ampere-hours. When assembled into batteries in various arrangements, the battery capacities range to over 100 ampere-hours.

The chemical efficiency of a Leclanché carbon-zinc battery improves as current density decreases. This points up an important application principle: Use as large a battery as is possible consistent with physical limitations. Over a certain range of current density, service life may be tripled by halving the current drain. This is equivalent to using a larger battery for a given application and so reducing current density within the cells. This is true down to a certain point beyond which shelf deterioration becomes an important factor.

The service capacity depends on the relative time of discharge and recuperation periods. The performance is normally better when the service is intermittent. Continuous use is not necessarily inefficient if the current drain is very light.

Figure 5 illustrates the service advantage to be obtained by proper selection of a battery for an application. The figure indicates how the rate of discharge and frequency of discharge affect the service efficiency of a battery.

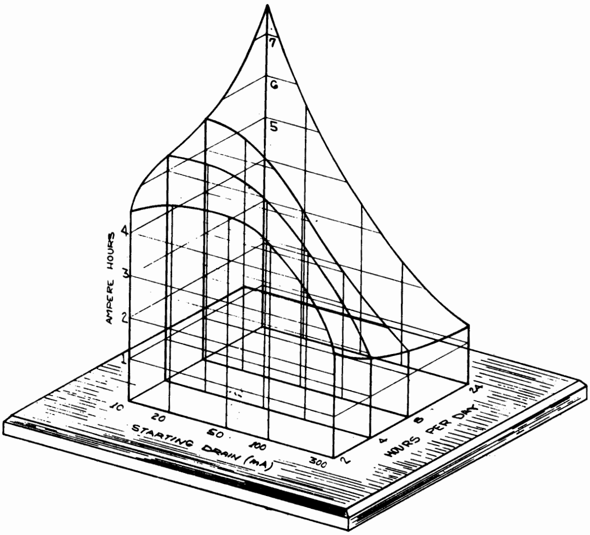


FIGURE 5 – BATTERY SERVICE LIFE AS A FUNCTION OF INITIAL CURRENT DRAIN AND DUTY CYCLE ("D" SIZE CARBON-ZINC CELL).

EFFECT OF TEMPERATURE

Carbon-zinc batteries are normally designed to operate at 70° F. The higher the battery temperature during discharge, the greater the energy output. However, high temperatures reduce shelf life, and prolonged exposure to temperatures above 125° F causes very rapid deterioration of the battery.

Service life at low temperatures is reduced because of decreased chemical activity in the cell. The effects are more pronounced for heavy current drains than for light drains. When a standard carbon-zinc battery has reached a temperature of 0° F, little service is obtained except at light drains. At –10° F, the battery is usually inoperative unless special low temperature electrolytes are used. Since a battery does not reach the temperature of its surroundings immediately, insulation is helpful.

The open-circuit voltage of a carbon-zinc cell decreases on the average 0.0004 volt per degree Celsius when the temperature is decreased form 77° F (25° C) to –4° F (–20° C). For practical purposes the actual working voltage at the terminals of the cell or battery is of more significance than the open-circuit voltage. Figure 6 shows the different voltage characteristics of a size "D" carbon-zinc cell discharged at three different temperatures. In each case, the cells are discharged with a continuous current drain which has an initial value, when a 2.25 ohm load is first applied, of 667 milliamperes (this simulates a 0.5 ampere lamp).

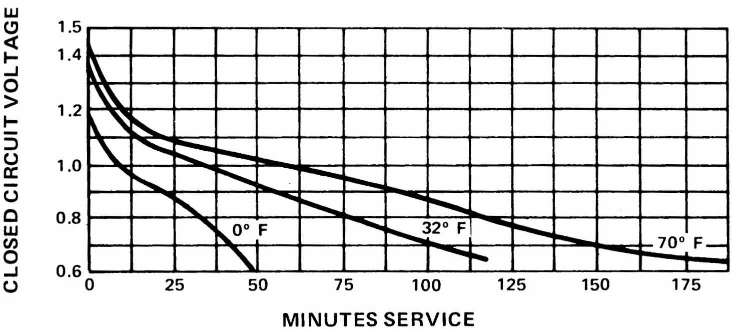


TABLE C — VOLTAGE CHARACTERISTICS OF SIZE "D" CARBON - ZINC CELL DISCHARGED AT 3 DIFFERENT TEMPERATURES WITH A CONTINUOUS CURRENT DRAIN STARTING AT 667 MILLIAMPERES.

Table C below shows the variation of service capacity with temperature for a general purpose size "D" carbon-zinc cell discharged continuously on a 2.25 ohm load to a 0.9 volt cutoff. The initial current drain (instantaneous value) is 667 milliamperes. The load simulates a 0.5 ampere lamp.

TEMPERATURE		CAPACITY BASED ON VALUE AT 70° F TAKEN AS 100%
F	C	
100	37.8	140%
80	26.7	110%
70	21.1	100%
60	15.6	90%
40	4.4	70%
20	−6.7	45%
0	−17.8	25%
−20	−28.9	0

TABLE C — EFFECT OF TEMPERATURE ON THE CAPACITY OF GENERAL PURPOSE SIZE "D" DRY CELLS WHEN DISCHARGED CONTINUOUSLY THROUGH A RESISTANCE OF 2.25 OHMS TO AN ENDPOINT VOLTAGE OF 0.9 VOLT.

The zinc chloride cell performs better at low temperatures than the standard carbon-zinc cell. Table D indicates the variation of service capacity with temperature for a size "D" zinc chloride cell discharged on the 2.25 ohm Light-Industrial Flashlight Test. The load simulates a 0.5 ampere lamp.

TEMPERATURE		CAPACITY BASED ON VALUE AT 70° F TAKEN AS 100%
F	C	
100	37.8	115%
90	32.2	110%
80	26.7	105%
70	21.1	100%
60	15.6	95%
50	10	90%
40	4.4	85%
30	−1.1	80%
20	−6.7	70%
10	−12.2	60%
0	−17.8	45%

TABLE D– EFFECT OF TEMPERATURE ON THE CAPACITY OF SIZE "D" ZINC CHLORIDE CELLS WHEN DISCHARGED 4 MINUTES/HOUR, 8 HOURS/DAY, WITH 16 HOURS REST, THROUGH A RESISTANCE OF 2.25 OHMS TO A CUTOFF VOLTAGE OF 0.9 VOLT.

Low temperatures, or even freezing, are not harmful to carbon-zinc cells as long as there is not repeated cycling from low to higher temperatures. Low-temperature storage is very beneficial to shelf life. A storage temperature of 40° F to 50° F is effective. When batteries are removed from low-temperature storage, they should be allowed to reach room temperature in their original packing so as to avoid condensation of moisture which may cause electrical leakage and destruction of the jackets.

INTERNAL RESISTANCE

The internal resistance of cells becomes important when battery-operated devices require a high current for short periods of time. If the internal resistance of a cell is too high to provide the current, a larger cell may be used.

The internal resistance of unused zinc - carbon cells is low and is usually negligible in most applications. Internal resistance may be measured by flash current (short-circuit amperage). Short-circuit amperage is defined as the maximum current, observed on a dead-beat (damped) ammeter, which a cell or battery can deliver through a circuit of 0.01 ohm resistance, including the ammeter. Amperage readings are not necessarily related to service capacity. Amperage is usually higher in large cells. In cells of any size, amperage may vary with different grades of depolarizing mix.

The internal resistance increases with storage time, use, and decreasing temperature. The cell dries out with age. During discharge some of the ingredients are converted to different chemical forms which have higher resistance.

The table below lists the approximate internal resistance, as determined by the flash current, of several typical round cells of the general purpose and zinc chloride types.

ANSI CELL SIZE	AVERAGE FLASH CURRENT—AMPERES		APPROXIMATE INTERNAL RESISTANCE—OHMS $R = \frac{1.5}{\text{AVERAGE FLASH CURRENT}}$	
	STANDARD CARBON-ZINC	ZINC CHLORIDE	STANDARD CARBON-ZINC	ZINC CHLORIDE
N	2.5 amperes		0.6 ohm	
AAA	3.8		0.4	
AA	5.3	4.5 amperes	0.28	0.33 ohm
C	3.9	6.5	0.39	0.23
D	5.6	8.5	0.27	0.18
F	9	11.3	0.17	0.13
G	12		0.13	
6	30		0.05	

TABLE E — APPROXIMATE INTERNAL RESISTANCE OF STANDARD CARBON—ZINC AND ZINC CHLORIDE CYLINDRICAL CELLS.

TEST PROCEDURES

Union Carbide's Battery Products Division maintains a very extensive battery test program. All types of dry batteries are checked for service capacity and shelf life under closely controlled conditions of temperature and humidity. Many tests last a year or longer. This points up the fact that there is no simple or rapid method for determining the service capacity of a dry battery. Tests must be run which closely duplicate the class of service for which the battery is intended. The schedule of operation is very important, except for very light drains. The service capacity of a battery used two hours per day on a given drain will be considerably different from that of the same battery used 12 hours per day.

There is no relation between continuous duty service and intermittent service. It is, therefore, impossible to rate the merits of different batteries on intermittent service by comparing results of continuous duty tests.

Another fallacy concerning dry batteries is that relative "quality" or service capacity of a battery can be determined by amperage readings. This is not true and in most instances gives results which are totally misleading. The size "D" photoflash round cell and the flashlight cell are identical in size and shape. However, the photoflash cell, which will show more than twice the amperage of the flashlight cells, has less service capacity in typical flashlight uses.

The short circuit amperage of a cell may be adjusted over a wide range by varying the carbon and electrolyte content of the depolarizing mix. Carbon contributes nothing to the service capacity of the cell and is used primarily to control cell resistance. It is apparent that as carbon is added to a cell, depolarizer must be removed. This means service capacity is reduced.

Dry batteries can be tested with a loaded voltmeter to check present condition. A meter test, however, will give no indication of remaining service capacity unless the exact history of the battery is known and can be compared on a capacity vs. meter reading basis with other batteries tested in similar service.

A loaded voltmeter is considered the best spot check device, since open circuit voltmeter readings give no indication of internal resistance, and a short circuit amperage reading is damaging, especially to "B" batteries.

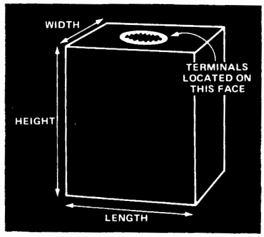
TABLE F –

BELOW LISTS THE MOST WIDELY USED BATTERIES, IN TYPICAL APPLICATIONS, WITH APPLICABLE LOADS, VOLTAGES AND AMPERAGE READINGS FOR TESTIN(

CELL OR BATTERY	APPLICATION	LOAD (ohms)	VOLTAGE READING UNDER LOAD– PER CENT OF APPLIED VOLTAGE (VOLTAGE SHOWN ON CELL OR BATTERY LABEL)	AMPERAGE READING FOR USABLE CELL OR BATTERY (TEST FOR AN INSTANT ONLY)
AAA	Penlites	3	0–61% replace 61%–72% weak 72%–105% good	
AA	Toys, Clocks, Flashlights, Movie Cameras	2.25	as above	
AA	Transistor Radio	10	as above	
C	Toys, Clocks, Flashlights, Movie Cameras	2.25	as above	
C	Transistor Radio	10	as above	
D	Toys, Clocks, Flashlights, Movie Cameras	2.25	as above	
D	Transistor	10	as above	
N	Penlites	3	as above	
6 volt	Lantern	5	as above	
9 volt	Transistor Radio	250	as above	
AAA	Photo	0.01 ohm (entire resistance-lead to lead of tester)		1-3.8 amperes
AA	Photo	as above		3-6.5 amperes
C	Photo	as above		4–9 amperes
D	Photo	as above		10-13.5 amperes

TABLE F –SPECIFICATIONS FOR TESTING BATTERIES

DIMENSIONS . . . This battery tabulation lists maximum dimensions. To be consistent, the terminals are located on the face of the battery bounded by the length and width, with the exception of those batteries having one terminal on each end. This is shown in the sketch at right.



Battery Numbers (In Order of Increasing Service Capacity)	Suggested Current Range (Milli-amperes)	Typical Use	Maximum Dimensions							
			Diameter		Length		Width		Height	
			Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters
1.5 VOLT BATTERIES										
201	0-0.06	Electric Watch	0.445	11.3					0.130	3.3
E340E	0-20	Hearing Aids	0.445	11.3					1.180	30
904	0-20	Flashlight, Toys	0.445	11.3					1.180	30
812	0-20	Photoflash	13/32	10.3					1-3/4	44.5
912	0-20	Flashlight	13/32	10.3					1-3/4	44.5
815	0-25	Photoflash	9/16	14.3					1-31/32	50
HS15	0-25	Flashlight	9/16	14.3					1-31/32	50
915	0-25	Flashlight	9/16	14.3					1-31/32	50
1015	0-25	Transistor Radio	9/16	14.3					1-31/32	50
1215	0-25	General Purpose (Heavy Duty)	9/16	14.3					1-31/32	50
T35	0-1	Electric Clocks	1-1/32	26.2					1-15/16	49.2
835	0-80	Photoflash	1-1/32	26.2					1-15/16	49.2
HS35	0-80	Flashlight	1-1/32	26.2					1-15/16	49.2
935	0-80	Flashlight	1-1/32	26.2					1-15/16	49.2
1035	0-80	Transistor Radio	1-1/32	26.2					1-15/16	49.2
1235	0-80	General Purpose (Heavy Duty)	1-1/32	26.2					1-15/16	49.2
T50	0-1	Electric Clocks	1-11/32	34.1					2-13/32	61.1
850	0-150	Photoflash	1-11/32	34.1					2-13/32	61.1
HS50	0-150	Flashlight	1-11/32	34.1					2-13/32	61.1
950	0-150	Flashlight	1-11/32	34.1					2-13/32	61.1
1050	0-150	Transistor Radio	1-11/32	34.1					2-13/32	61.1
HS150	0-150	Industrial Flashlight	1-11/32	34.1					2-13/32	61.1
1150	0-150	Industrial Flashlight	1-11/32	34.1					2-13/32	61.1
1250	0-150	General Purpose (Heavy Duty)	1-11/32	34.1					2-13/32	61.1
W353	0-500	Portable "A"			2-19/32	65.9	1-3/8	34.9	4-5/32	106
711	0-500	Glo-Plug Ignition			2-5/8	66.7	1-5/16	33.3	4-1/32	102
742	0-1000	Portable "A"			2-5/8	66.7	2-5/8	66.7	3-27/32	97.6
735	0-1000	Instruments,Hobby			2-5/8	66.7	2-5/8	66.7	4-5/16	110
HS6	0-1500	Industrial General Purpose	2-5/8	66.7					6-5/8	168
IF6	0-1500	General Purpose	2-5/8	66.7					6-3/4	172
IS6	0-1500	General Purpose	2-5/8	66.7					6-5/8	168
IS6T	0-1500	General Purpose	2-5/8	66.7					6-17/32	166
EA6F	0-1500	General Purpose	2-5/8	66.7					6-3/4	172
EA6	0-1500	Alarm	2-5/8	66.7					6-17/32	166
EA6FT	0-1500	Alarm	2-5/8	66.7					6-3/4	172
EA6ST	0-1500	Alarm	2-5/8	66.7					6-17/32	166

TERMINALS . . . Almost 100 different terminal arrangements are used for the batteries listed. They are illustrated and numbered to insure that designers and engineers can obtain the necessary standard connection terminals to match those on the batteries. Reference to the "Terminal Sketch" column will give the sketch number for any particular battery.

Battery Numbers (In Order of Increasing Service Capacity)	Number & Size of Cells		Battery Weight			Terminals	Terminal Sketch	Approximate Volume of Body of Battery		Voltage Taps
	Number	Size	Lbs.	Oz.	Grams			Cubic Inches	Cubic Centimeters	
1.5 VOLT BATTERIES										
201	1	103		.049	1.39	Flat Contacts	18	.019	.31	–,+1.5
E340E	1	N		.22	6.24	Flat Contacts	26	.16	2.62	–,+1.5
904	1	N		.22	6.24	Flat Contacts	84	.16	2.62	–,+1.5
812	1	AAA		.3	8.5	Flat Contacts	80	.20	3.28	–,+1.5
912	1	AAA		.3	8.5	Flat Contacts	85	.20	3.28	–,+1.5
815	1	AA		.6	17	Flat Contacts	81	.48	7.87	–,+1.5
HS15	1	AA		.52	14.8	Flat Contacts	10	.48	7.87	–,+1.5
915	1	AA		.52	14.8	Flat Contacts	86	.48	7.87	–,+1.5
1015	1	AA		.6	17	Flat Contacts	89	.48	7.87	–,+1.5
1215	1	AA		.56	15.8	Flat Contacts	94	.48	7.87	–,+1.5
T35	1	C		1.4	39.7	Flat Contacts	13	1.52	24.9	–,+1.5
835	1	C		1.4	39.7	Flat Contacts	82	1.52	24.9	–,+1.5
HS35	1	C		1.5	41	Flat Contacts	12	1.52	24.9	–,+1.5
935	1	C		1.5	41	Flat Contacts	87	1.52	24.9	–,+1.5
1035	1	C		1.4	39.7	Flat Contacts	90	1.52	24.9	–,+1.5
1235	1	C		1.6	45.6	Flat Contacts	96	1.52	24.9	–,+1.5
T50	1	D		3.3	93.6	Flat Contacts	15	3.17	52	–,+1.5
850	1	D		3.3	93.6	Flat Contacts	83	3.17	52	–,+1.5
HS50	1	D		3	85.1	Flat Contacts	14	3.19	52	–,+1.5
950	1	D		3	85.1	Flat Contacts	88	3.19	52	–,+1.5
1050	1	D		3	85.1	Flat Contacts	91	3.19	52	–,+1.5
HS150	1	D		3	85.1	Flat Contacts	17	3.19	52	–,+1.5
1150	1	D		3	85.1	Flat Contacts	92	3.19	52.3	–,+1.5
1250	1	D		3.3	93.6	Flat Contacts	97	3.17	52	–,+1.5
W353	2	F		12.5	354	Socket	27	14.8	243	–,+1.5
711	2	F		12	340	Knurled Nut & Screw	61	12.4	203	–,+1.5
742	4	F	1	6	624	Socket	72	26.5	434	–,+1.5
735	4	F	1	7	652	Knurled Nut & Screw	69	26.5	434	–,+1.5
HS6	1	6	2		907	Knurled Nut & Screw	5	29.3	480	–,+1.5
IF6	1	6	2		907	Fahnestock	6	29.3	480	–,+1.5
IS6	1	6	2		907	Knurled Nut & Screw	7	29.3	480	–,+1.5
IS6T	1	6	2		907	One Brass Knurl One Wire Terminal	8	29.3	480	–,+1.5
EA6F	1	6	2	4	1.02 kilograms	Fahnestock	2	29.3	480	–,+1.5
EA6	1	6	2	2	964	Two Brass Knurls	1	29.3	480	–,+1.5
EA6FT	1	6	2	2	964	One Fahnestock One Wire Terminal	3	29.3	480	–,+1.5
EA6ST	1	6	2	2	964	One Brass Knurl One Wire Terminal	4	29.3	480	–,+1.5

Battery Numbers (In Order of Increasing Service Capacity)	Suggested Current Range (Milli-amperes)	Typical Use	Maximum Dimensions							
			Diameter		Length		Width		Height	
			Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters

3 VOLT BATTERIES

750	0-25	Flat Flashlight			1-7/32	31	5/8	15.9	2-21/32	67.5
W356	0-500	Radio			2-5/8	66.7	2-5/8	66.7	4-9/16	116
W357	0-1000	Telephone			3-25/32	96	2-11/16	68.3	5-13/16	148

4.5 VOLT BATTERIES

703	0-50	Miscellaneous			2-7/16	61.9	27/32	21.4	3-1/16	77.8
781	0-50	Portable "C"			2-7/16	61.9	27/32	21.4	3	76.2
714	0-200	Miscellaneous			3-31/32	101	1-11/32	34.1	3-3/4	95.3
736	0-250	Portable "A"			3-15/16	100	1-5/16	33.3	4	102

6 VOLT BATTERIES

724	0-25	Portable "A"			1-7/32	31	1-7/32	31	2-11/32	59.5
509	0-250	Lantern			2-5/8	66.7	2-5/8	66.7	4-13/32	112
510F	0-250	Miscellaneous			2-5/8	66.7	2-5/8	66.7	4-13/32	112
HS10S	0-250	Lighting, Miscellaneous			2-5/8	66.7	2-5/8	66.7	4-5/16	110
510S	0-250	Lighting, Miscellaneous			2-5/8	66.7	2-5/8	66.7	4-5/16	110
744	0-250	Portable "A"			2-5/8	66.7	2-5/8	66.7	3-27/32	97.6
HS90	0-250	Industrial Lantern			2-5/8	66.7	2-5/8	66.7	4-13/32	112
1209	0-250	Lantern			2-5/8	66.7	2-5/8	66.7	4-13/32	112
2744N	0-250	Barricade Flasher, Miscellaneous			2-5/8	66.7	2-5/8	66.7	3-27/32	97.6
2745N	0-250	Barricade Flasher, Lantern			2-5/8	66.7	2-5/8	66.7	4-13/32	112
2746N	0-250	Lighting Miscellaneous			2-5/8	66.7	2-5/8	66.7	4-5/16	110
HS31	0-500	Lighting			5-11/32	136	2-27/32	72.2	4-15/16	125
731	0-500	Lighting			5-11/32	136	2-27/32	72.2	4-15/16	125
706	0-1000	Emergency Lighting			8-5/16	211	2-13/16	71.4	6-7/16	164
1461	0-1500	Ignition, Lighting			10-7/16	265	2-23/32	69.1	7-7/32	183

7.5 VOLT BATTERIES

773	0-50	Portable "C"			3-29/32	99.2	27/32	21.4	3	76.2
717	0-70	Portable "A"			2-5/32	54.8	1-15/16	49.2	3-1/32	77
715	0-1000	Emergency Lighting			7-1/4	184	4-1/16	103	6-7/16	164
1562	0-1500	Ignition, Lighting			7-27/32	199	4-31/32	126	7-7/32	183

Battery Numbers (In Order of Increasing Service Capacity)	Number & Size of Cells		Battery Weight			Terminals	Terminal Sketch	Approximate Volume of Body of Battery		Voltage Taps
	Number	Size	Lbs.	Oz.	Grams			Cubic Inches	Cubic Centimeters	

3 VOLT BATTERIES

750	2	AA		2	56.7	Spring	74	1.62	26.6	–,+3
W356	4	F	1	6	624	Knurled Nut & Screw	28	28	459	–,+3
W357	8	F	2	12	1.25 kilograms	Fahnestock	29	54.6	895	–,+3

4.5 VOLT BATTERIES

703	3	B		5	142	Spring	59	5.1	83.6	–,+4.5
781	3	B		5	142	Knurled Nut & Screw	79	5.1	83.6	–,+4.5
714	3	55		13.5	383	Knurled Nut & Screw	62	16.9	277	–,+4.5
736	3	F	1		454	Socket	70	20.7	339	–,+4.5

6 VOLT BATTERIES

724	4	AA		2.5	70.9	Flat Contacts	66	3.4	55.7	–,+6
509	4	F	1	5.5	609	Coil Springs	55	26.5	434	–,+6
510F	4	F	1	4	567	Fahnestock	56	26.5	434	–,+6
HS10S	4	F	1	7	652	Knurled Nut & Screw	9	26.5	434	–,+6
510S	4	F	1	7	652	Knurled Nut & Screw	57	26.5	434	–,+6
744	4	F	1	6	624	Socket	73	26.5	434	–,+6
HS90	4	F	1	6.5	638	Coil Springs	16	26.5	434	–,+6
1209	4	F	1	5	595	Coil Springs	93	26.5	434	–,+6
2744N	4	F	1	7	652	Socket	104	27.3	447	–,+6
2745N	4	F	1	7	652	Coil Springs	105	27.3	447	–,+6
2746N	4	F	1	7	652	Knurled Nut & Screw	106	27.3	447	–,+6
HS31	8	F	3	4	1.47 kilograms	Insulated Screw	11	69.5	1139	–,+6
731	8	F	3	4	1.47 kilograms	Insulated Screw	67	69.5	1139	–,+6
706	16	F	5	11	2.58 kilograms	Insulated Screw	60	137	2245	–,+6
1461	4	6	9	4	4.2 kilograms	Knurled Nut & Screw	98	199	3261	–,+6

7.5 VOLT BATTERIES

773	5	B		9	225	5 Knurled Nut & Screw, 1 Wire	77	8.24	135	+,–1.5,–3, –4.5,–6, –7.5
717	5	172		8	227	Socket	65	13	213	–,+7.5
715	20	F	7	10	3.46 kilograms	Insulated Screw	63	173	2835	–,+7.5
1562	5	6	11	4	5.1 kilograms	Knurled Nut & Screw	100	273	4474	–,+7.5

Battery Numbers (In Order of Increasing Service Capacity)	Suggested Current Range (Milli-amperes)	Typical Use	Maximum Dimensions: Diameter Inches	Diameter Milli-meters	Length Inches	Length Milli-meters	Width Inches	Width Milli-meters	Height Inches	Height Milli-meters
9 VOLT BATTERIES										
206	0-7	Transistor Radio	3/4	19.1					2	50.8
216	0-15	Transistor Radio			1-1/32	26.2	21/32	16.7	1-29/32	48.4
1222	0-15	Transistor Radio (Heavy Duty)			1-1/32	26.2	11/16	17.5	1-15/16	49.2
226	0-9	Transistor Radio	1	25.4					1-15/16	49.2
2709N	0-16	Transistor Radio			1-13/32	35.7	47/64	18.7	4-11/16	119
246	0-15	Transistor Radio			1-13/32	35.7	1-11/32	34.1	2-3/4	69.9
266	0-20	Transistor Radio			1-13/16	46	1-13/16	46	2-7/16	61.9
276	0-30	Transistor Radio			2-9/16	65.1	2-1/32	51.6	3-5/32	80.2
2356N	0-80	Transistor Radio			2-3/16	55.6	1-5/32	29.4	6-1/4	159
716	0-1000	Emergency Lighting			8-37/64	218	4-1/16	103	6-7/16	164
12 VOLT BATTERIES										
228	0-9	Communications Equipment	1	25.4					2-7/16	61.9
732	0-250	Lighting			5-11/32	136	2-27/32	72.2	4-15/16	125
2780N	0-250	Flasher			5-11/32	136	2-27/32	72.2	4-5/32	106
1463	0-600	Fence Controllers			10-7/16	265	2-23/32	69.1	7-7/32	183
1862	0-1500	Barricade Flasher			10-1/4	260	5-1/4	133	6-5/8	168
15 VOLT BATTERIES										
504	0-1.5	Radio Paging			5/8	15.9	19/32	15.1	1-3/8	34.9
411	0-2.5	Radio Paging			1-1/32	26.2	5/8	15.9	1-29/64	36.9
417	0-6	Radio Paging			1-5/16	33.3	31/32	24.6	1-9/16	39.7
22.5 VOLT BATTERIES										
505	0-1.5	Radio Paging "B-C" Flash			5/8	15.9	19/32	15.1	1.975	50.2
412	0-2.5	Radio Paging "B-C" Flash			1-1/32	26.2	5/8	15.9	2	50.8
420	0-6	Radio Paging			1-5/16	33.3	31/32	24.6	2-3/16	55.6
425P	0-10	Hearing Aids			1-23/64	34.5	1-1/32	26.2	3-15/16	100
763	0-40	Portable "B" or "C"			3-1/2	88.9	2-3/32	53.2	3-1/16	77.8
778	0-50	Portable "C"			4	102	2-7/16	61.9	3-1/8	79.4
30 VOLT BATTERY										
413	0-2.5	Radio Paging			1-1/32	26.2	5/8	15.9	2-9/16	65.1

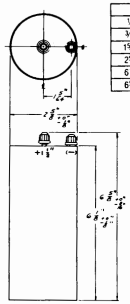
Battery Numbers (In Order of Increasing Service Capacity)	Number & Size of Cells		Battery Weight			Terminals	Terminal Sketch	Approximate Volume of Body of Battery		Voltage Taps
	Number	Size	Lbs.	Oz.	Grams			Cubic Inches	Cubic Centimeters	
9 VOLT BATTERIES										
206	6	109		1.2	34	Flat Contacts, Negative Recessed	19	.85	13.9	–,+9
216	6	117		1.5	42.5	Miniature Snap	20	1.2	19.7	–,+9
1222	6	118		1.5	42.5	Miniature Snap	95	1.28	21	–,+9
226	6	127		2	56.7	Snap	21	1.31	21.5	–,+9
2709N	12	117		2.5	70.9	Snap	103	4.57	74.9	–,+9
246	6	148		4.5	128	Miniature Snap	23	5.02	82.3	–,+9
266	6	165		7	126	Snap	24	7.7	126	–,+9
276	6	175		15	425	Snap	25	16.3	267	–,+9
2356N	54	117 & 118		11	312	Snap	102	17.6	288	–,+9
716	24	F	8	8	3.86 kilograms	Knurled Nut & Screw	64	205	3359	–,+9
12 VOLT BATTERIES										
228	8	127		2.3	65.2	Snap	22	1.68	27.5	–,+12
732	8	F	3	2	1.42 kilograms	Insulated Screw	68	69.5	1139	–,+12
2780N	8	F	3		1.36 kilograms	Socket	107	63.1	1034	–,+12
1463	16	G	7	11	3.49 kilograms	Knurled Nut & Screw	99	199	3261	–,+12
1862	8	6	21		9.53 kilograms	Socket	101	356	5834	–,+12
15 VOLT BATTERIES										
504	10	105		.6	17	Flat Contacts	53	.51	8.36	–,+15
411	10	112		.95	26.9	Flat Contacts	30	.95	15.6	–,+15
417	10	132		1.8	51	Flat Contacts	35	1.87	30.6	–,+15
22.5 VOLT BATTERIES										
505	15	105		.9	25.5	Flat Contacts	54	.74	12.1	–,+22.5
412	15	112		1.3	36.9	Flat Contacts	31	1.31	21.5	–,+22.5
420	15	132		2.5	70.9	Flat Contacts	36	2.66	43.6	–,+22.5
425P	15	135		4.1	116	Socket	37	5.52	91	–,+22.5
763	15	161		14	397	Knurled Nut & Screw	76	18.5	303	–,+22.5
778	15	B	1	4	567	Fahnestock	78	29.1	477	+,–3, –4.5, –6, –9, –10.5, –16.5, –22.5
30 VOLT BATTERY										
413	20	112		1.6	45.4	Flat Contacts	32	1.59	26.1	–,+30

Battery Numbers (In Order of Increasing Service Capacity)	Suggested Current Range (Milli-amperes)	Typical Use	Maximum Dimensions							
			Diameter		Length		Width		Height	
			Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters
45 VOLT BATTERIES										
415	0-4	Portable "B"			1-3/64	26.6	5/8	15.9	3-11/16	93.7
460	0-6	Photographic			1-57/64	48	1-3/8	34.9	2.43	61.7
455	0-10	Portable "B"			2-21/32	67.5	1	25.4	3-11/16	93.7
738	0-25	Portable "B"			3	76.2	2-5/16	58.7	4-1/8	105
482	0-40	Portable"B"			3-19/32	91.3	1-27/32	46.8	5-1/2	139
762S	0-70	Instruments, Portable "B"			4-3/32	104	2-9/16	65.1	5-7/16	138
484	0-70	Portable "B"			3-31/32	100	2-17/32	64.3	5-5/16	135
487	0-80	"B"			5-1/8	130	2-1/16	52.4	7-1/4	184
63 VOLT BATTERY										
477	0-8	Portable "B"			1-59/64	48.8	1-1/16	27	5-7/16	138
67.5 VOLT BATTERIES										
416	0-3	Portable "B"			1-21/64	33.7	63/64	25	3-1/2	88.9
457	0-6	Portable "B"			2-13/16	71.4	1-3/8	34.9	2-1/2	63.5
467	0-10	Portable "B"			2-13/16	71.4	1-3/8	34.9	3-45/64	94.1
69 VOLT BATTERY										
646	0-30	Lighting			2-9/16	65.1	2-1/8	54	8-7/64	206
90 VOLT BATTERIES										
479	0-8	Portable"B"			1-59/64	48.8	1-1/16	27	7-15/32	190
490	0-10	Portable "B"			3-23/32	94.5	1-3/8	34.9	3-45/64	94.1
225 VOLT BATTERY										
489	0-10	Electronic Flash			4-11/32	110	2-11/16	68.3	4-3/16	106
240 VOLT BATTERY										
491	0-2.5	Electronic Flash			2-19/32	65.9	1-5/16	33.3	4-1/2	114
300 VOLT BATTERY										
493	0-2.5	Geiger Counters			2-11/16	68.3	2-7/32	56.4	3-29/32	99.2
450 VOLT BATTERY										
496	0-10	Electronic Flash			6-3/4	172	3	76.2	5	127
510 VOLT BATTERY										
497	0-2.5	Electronic Flash			3	76.2	1-19/32	40.5	5-5/8	143

Battery Numbers (In Order of Increasing Service Capacity)	Number & Size of Cells		Battery Weight			Terminals	Terminal Sketch	Approximate Volume of Body of Battery		Voltage Taps
	Number	Size	Lbs.	Oz.	Grams			Cubic Inches	Cubic Centimeters	
45 VOLT BATTERIES										
415	30	112		2.5	70.9	Miniature Snap	33	2.35	38.5	–,+45
460	30	132		5.3	150	Flat Contacts	40	6.1	100	–,+45
455	30	135		7.8	221	Snap	38	9.6	157	–,+45
738	30	AA	1	3	539	Socket	71	28.6	469	–,+22.5, +45
482	30	165	1	14	851	Socket	44	36.4	597	–,+45
762S	30	172	2	12	1.25 kilograms	Knurled Nut & Screw	75	53.2	872	–,+22.5,+45
484	30	172	3	2	1.42 kilograms	Socket	45	53.4	875	–,+45
487	30	175	4	2	1.87 kilograms	Socket	46	76.7	1256	–,+22.5, +45
63 VOLT BATTERY										
477	42	118		8.6	244	Snap	42	10.9	179	–,+63
67.5 VOLT BATTERIES										
416	46	114		4	113	Miniature Snap	34	4.45	72.9	–,+67.5
457	45	132		7.6	216	Snap	39	9.46	155	–,+67.5
467	45	135		12	340	Snap	41	14.2	233	–,+67.5
69 VOLT BATTERY										
646	46	155	3	3	1.45 kilograms	Flat Contacts	58	44	721	–,+69
90 VOLT BATTERIES										
479	60	118		12	340	Snap	43	15	246	–,+90
490	60	135		15	425	Snap	48	18.8	308	–,+90
225 VOLT BATTERY										
489	152	135	2	12	1.25 kilograms	Socket	47	49.4	810	–,+225
240 VOLT BATTERY										
491	160	112		13	369	Flat Recessed & Socket	49	15	246	–,+240
300 VOLT BATTERY										
493	200	112		14.5	411	Pin Jacks	50	23.4	384	–,+300
450 VOLT BATTERY										
496	300	135	5	4	2.38 kilograms	Socket	51	101	1655	–,+450
510 VOLT BATTERY										
497	336	112	1	10	737	Flat Recessed	52	26.9	441	–,+180, +510

TERMINAL SKETCHES

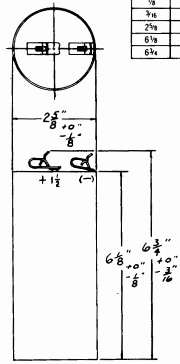
Numbered illustrations keyed to "Terminal Sketch" column on pages 43-49.



Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
1 5/64	1.08	27.4
2 5/8	2.63	66.7
6 1/8	6.13	156
6 5/8	6.63	168

EA6
No. 6 Alarm Cell
2 Plastic Knurls
Terminal Posts -
No. 8-32 Thread

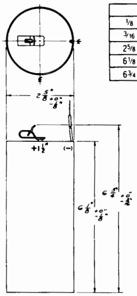
1



Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
2 5/8	2.63	66.7
6 1/8	6.13	156.
6 3/4	6.75	172.

2 FAHNESTOCK TERMINALS

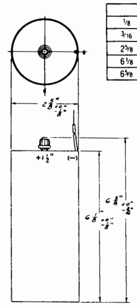
2



Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
2 5/8	2.63	66.7
6 1/8	6.13	156
6 3/4	6.75	172

EA6FT
No. 6 Alarm Cell
+ 1 Fahnestock
(−) 1 Wire Terminal

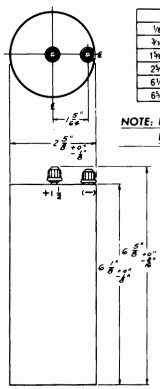
3



Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
2 5/8	2.63	66.7
6 1/8	6.13	156
6 5/8	6.63	168

EA6ST
No. 6 Alarm Cell
+1 Plastic Knurl
(−) 1 Wire Terminal
Terminal Post - No. 8-32 Thread

4

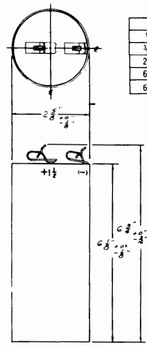


Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
1 5/64	1.08	27.4
2 5/8	2.63	66.7
6 1/8	6.13	156.
6 5/8	6.63	168.

NOTE: FOR INDUSTRIAL USE. NOT AVAILABLE AT RETAIL.

TERMINAL POSTS - No 8-32 THREAD
PLASTIC KNURLS

5

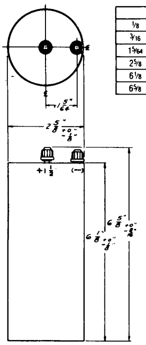


Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
2 5/8	2.63	66.7
6 1/8	6.13	156.
6 3/4	6.75	172.

IF6

2 FAHNESTOCK TERMINALS

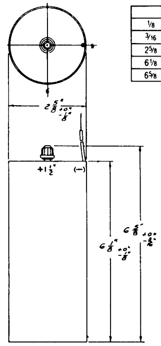
6



Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
1 5/64	1.08	27.4
2 5/8	2.63	66.7
6 1/8	6.13	156.
6 5/8	6.63	168.

IS6
TERMINAL POSTS - No 8-32 THREAD
PLASTIC KNURLS

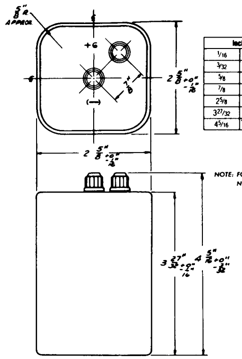
7



Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
2 5/8	2.63	66.7
6 1/8	6.13	156.
6 5/8	6.63	168.

IS6T
+ 1 PLASTIC KNURL
(−) 1 WIRE TERMINAL
TERMINAL POST - No. 8-32 THREAD

8



NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.

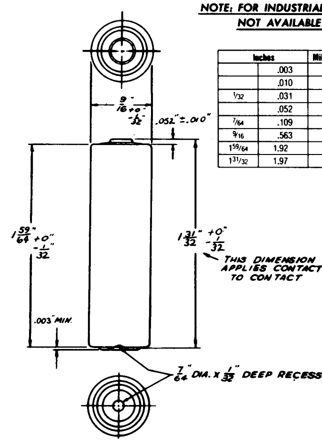
Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
5/8	.625	15.9
7/8	.875	22.2
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 5/16	4.31	110

TERMINAL POSTS - No 8-32 THREAD
PLASTIC KNURLS

METAL JACKET

9

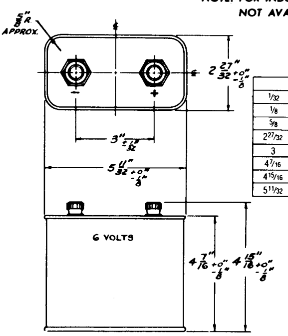
NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.



Inches		Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50.

10

NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.

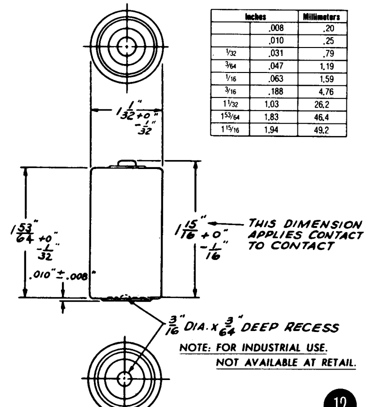


Inches		Millimeters
1/32	.031	.79
1/8	.125	3.18
5/8	.625	15.9
2 27/32	2.84	72.2
3	3.00	76.2
4 7/16	4.44	113
4 15/16	4.94	125.
5 11/32	5.34	136.

METAL JACKET

TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS

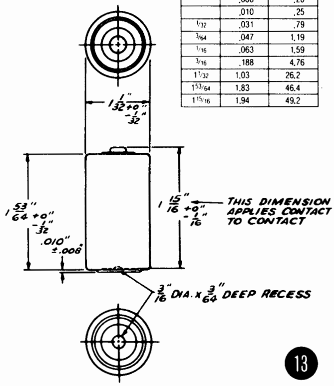
11



Inches		Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2

NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.

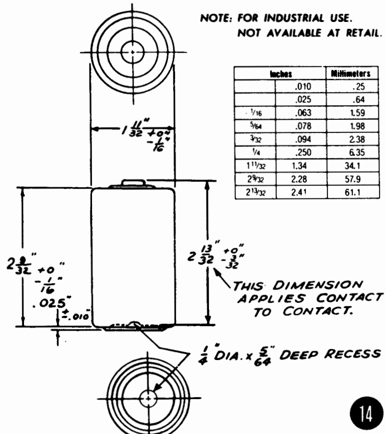
12



	Inches	Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2

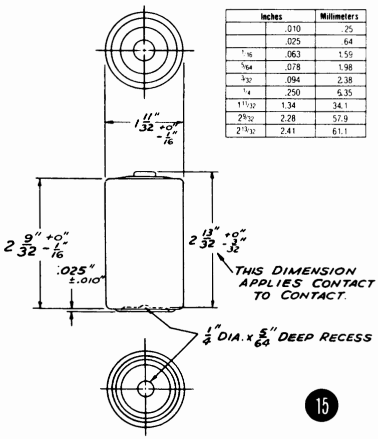
13

NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.



	Inches	Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

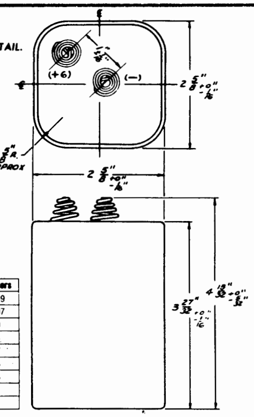
14



	Inches	Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

15

NOTE:
FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.



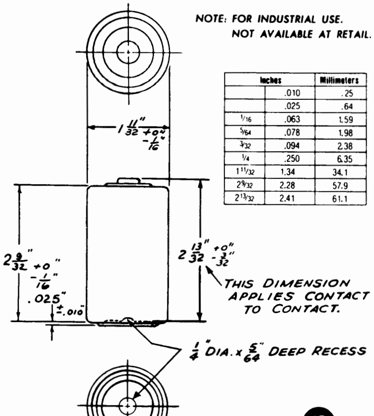
	Inches	Millimeters
1/16	.063	1.59
5/32	.156	3.97
5/8	.625	15.9
1	1.00	25.4
2 5/8	2.63	66.7
3 1/4	3.25	82.5
3 27/32	3.84	97.6
4	4.00	101
4 13/32	4.41	112

BATTERY SHALL PASS FREELY THROUGH A CYLINDRICAL TUBE 3 1/4" DIAMETER x 4" LONG.

METAL JACKET

16

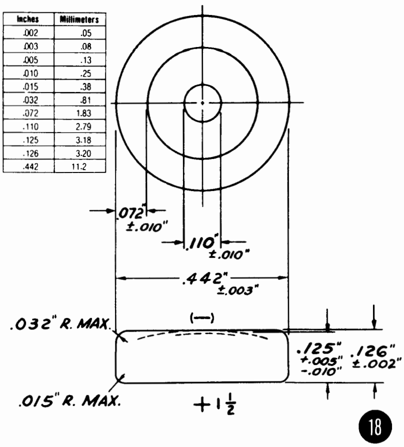
NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.



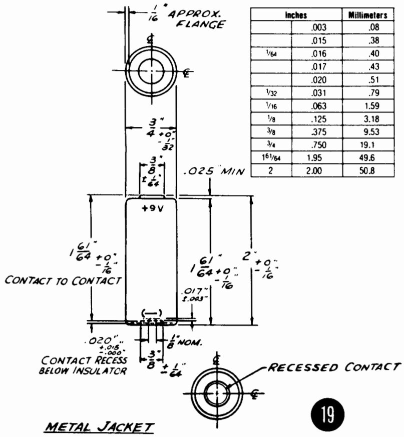
	Inches	Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

17

Inches	Millimeters
.002	.05
.003	.08
.005	.13
.010	.25
.015	.38
.032	.81
.072	1.83
.110	2.79
.125	3.18
.126	3.20
.442	11.2

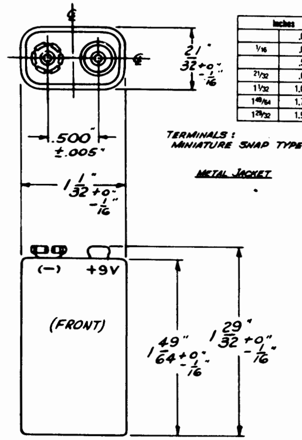


18



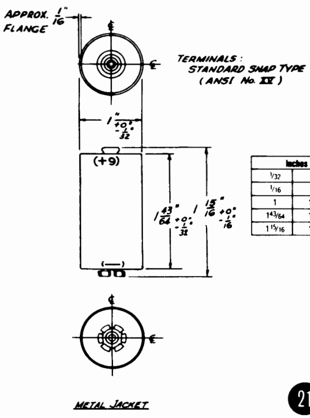
Inches		Millimeters
	.003	.08
	.015	.38
1/64	.016	.40
	.017	.43
	.020	.51
1/32	.031	.79
1/16	.063	1.59
1/8	.125	3.18
3/8	.375	9.53
3/4	.750	19.1
1 61/64	1.95	49.6
2	2.00	50.8

19



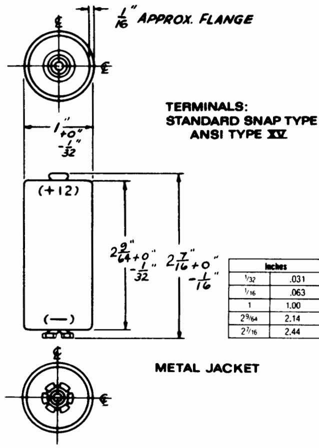
Inches		Millimeters
	.005	.13
1/16	.063	1.59
	.500	12.7
21/32	.656	16.7
1 1/32	1.03	26.2
1 49/64	1.77	44.9
1 29/32	1.91	48.4

20



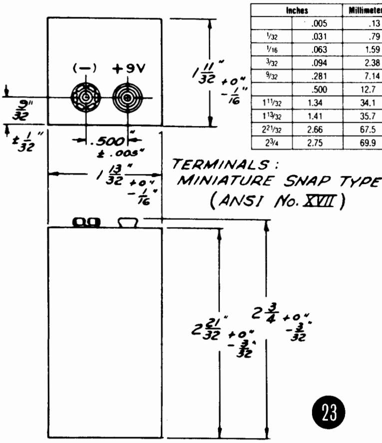
Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
1	1.00	25.4
1 43/64	1.67	42.5
1 15/16	1.94	49.2

21



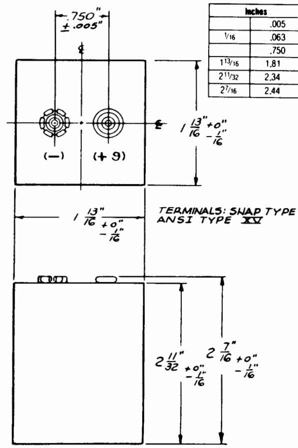
Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
1	1.00	25.4
2 9/64	2.14	54.4
2 7/16	2.44	61.9

22



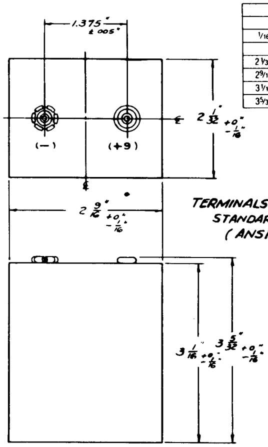
Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
3/32	.094	2.38
9/32	.281	7.14
	.500	12.7
1 11/32	1.34	34.1
1 13/32	1.41	35.7
2 21/32	2.66	67.5
2 3/4	2.75	69.9

23



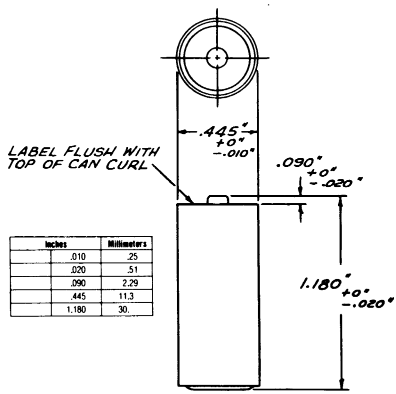
Inches		Millimeters
	.005	.13
1/16	.063	1.59
	.750	19.1
1 13/16	1.81	46
2 11/32	2.34	59.5
2 7/16	2.44	61.9

24



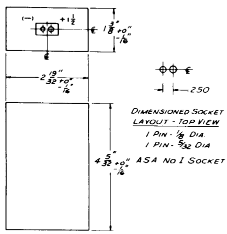
Inches		Millimeters
	.005	.13
1/16	.063	1.59
	1.375	34.9
2 1/32	2.03	51.6
2 9/16	2.56	65.1
3 1/16	3.06	77.8
3 5/32	3.16	80.2

25



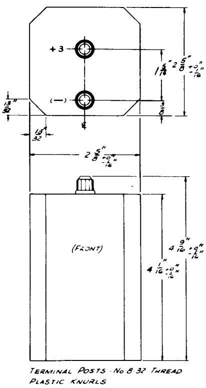
Inches		Millimeters
	.010	.25
	.020	.51
	.090	2.29
	.445	11.3
	1.180	30.

26



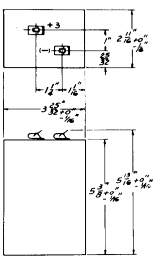
Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
	.250	6.35
1 3/8	1.38	34.9
2 19/32	2.59	65.9
4 5/32	4.16	106.

27



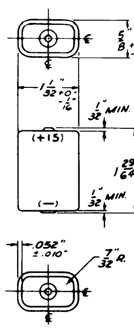
Inches		Millimeters
1/16	.063	1.59
3/8	.375	9.53
13/32	.406	10.3
1 5/16	1.31	33.3
2 5/8	2.63	66.7
4 1/16	4.06	103.
4 9/16	4.56	116.

28



Inches		Millimeters
1/16	.063	1.59
25/32	.781	19.8
1	1.	25.4
1 1/16	1.06	27.
1 1/4	1.25	31.8
2 11/16	2.69	68.3
3 25/32	3.78	96.
5 3/8	5.38	137.
5 13/16	5.81	148.

29



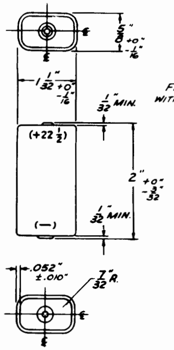
TERMINALS:
FLAT CONTACT TYPE
WITH HOLES 3/32" DIAMETER.

(ANSI No. XVI)

Inches		Millimeters
	.010	.25
1/32	.031	.79
	.052	1.32
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
7/32	.219	5.56
5/8	.625	15.9
1 1/32	1.03	26.2
1 29/64	1.45	36.9

METAL JACKET

30

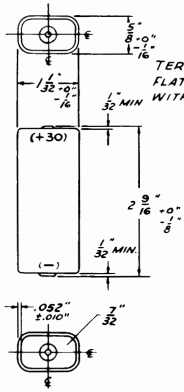


TERMINALS
FLAT CONTACT TYPE
WITH HOLES 3/32" DIAMETER
(ANSI No. XVI)

	Inches	Millimeters
	.010	.25
1/32	.031	.79
	.052	1.32
1/16	.063	1.59
3/32	.094	2.38
7/32	.219	5.56
5/8	.625	15.9
1 1/32	1.03	26.2
2	2.00	50.8

METAL JACKET

31

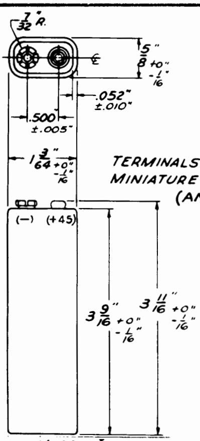


TERMINALS:
FLAT CONTACT TYPE
WITH HOLES 3/32" DIAMETER.
(ANSI No. XVI)

	Inches	Millimeters
	.010	.25
1/32	.031	.79
	.052	1.32
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
7/32	.219	5.56
5/8	.625	15.9
1 1/32	1.03	26.2
2 9/16	2.56	65.1

METAL JACKET

32

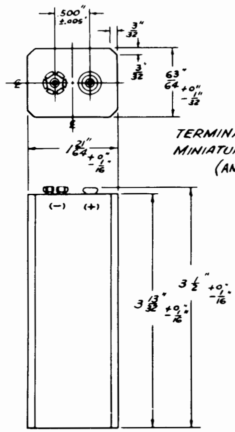


TERMINALS:
MINIATURE SNAP TYPE
(ANSI No. XVII)

	Inches	Millimeters
	.005	.13
	.010	.25
	.052	1.32
1/16	.063	1.59
7/32	.219	5.56
	.500	12.7
5/8	.625	15.9
1 3/64	1.05	26.6
3 9/16	3.56	90.5
3 11/16	3.69	93.7

METAL JACKET

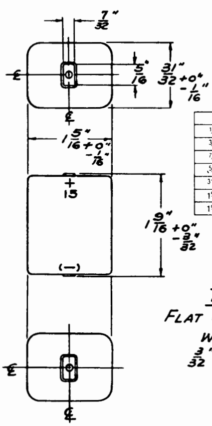
33



TERMINALS :
MINIATURE SNAP TYPE
(ANSI TYPE XVII)

	Inches	Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
3/32	.094	2.38
	.500	12.7
63/64	.984	25.
1 21/64	1.33	33.7
3 13/32	3.41	86.5
3 1/2	3.50	88.9

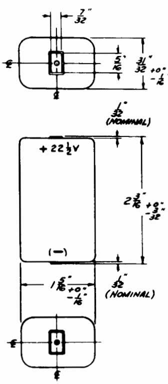
34



	Inches	Millimeters
1/16	.063	1.59
3/32	.094	2.38
7/32	.219	5.56
5/16	.313	7.94
31/32	.969	24.6
1 5/16	1.31	33.3
1 9/16	1.56	39.7

TERMINALS
FLAT CONTACT TYPE
WITH HOLES
3/32" DIAMETER

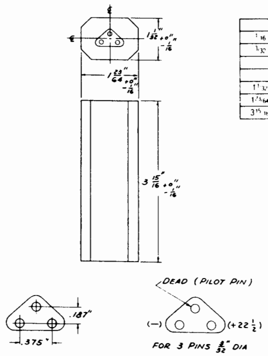
35



	Inches	Millimeters
1/32	.031	.79
1/16	.063	1.59
3/32	.094	2.38
7/32	.219	5.56
5/16	.313	7.94
31/32	.969	24.6
1 5/16	1.31	33.3
2 3/16	2.19	55.6

TERMINALS
FLAT CONTACT TYPE
WITH HOLES 3/32" DIAMETER
(ANSI No. XVI)

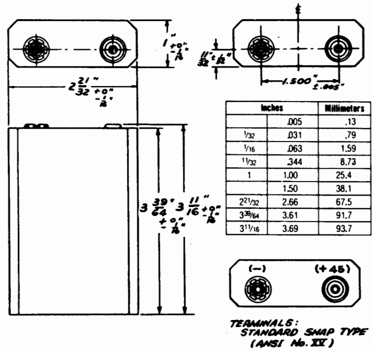
36



TOP VIEW OF SOCKET
SHOWING DIMENSIONS AND TERMINAL MARKINGS
(ANSI No. VIII SOCKET)

Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
	.187	4.75
	.375	9.53
1 1/32	1.03	26.2
1 23/64	1.36	34.5
3 15/16	3.94	100.

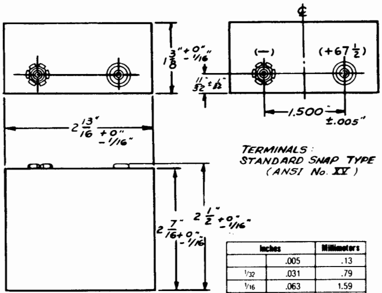
37



Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
11/32	.344	8.73
1	1.00	25.4
	1.50	38.1
2 21/32	2.66	67.5
3 39/64	3.61	91.7
3 11/16	3.69	93.7

TERMINALS:
STANDARD SNAP TYPE
(ANSI No. XV)

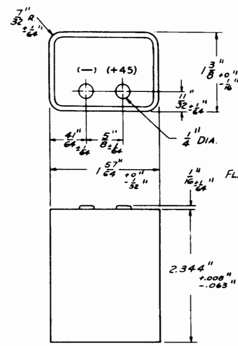
38



TERMINALS:
STANDARD SNAP TYPE
(ANSI No. XV)

Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
11/32	.344	8.73
1 3/8	1.38	34.9
	1.50	38.1
2 7/16	2.44	61.9
2 1/2	2.50	63.5
2 13/16	2.81	71.4

39

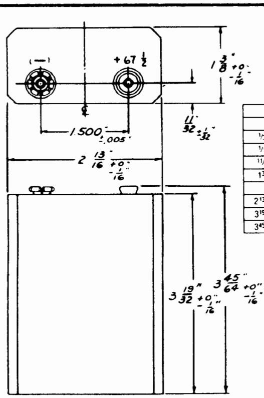


TERMINALS
FLAT CONTACT TYPE

Inches		Millimeters
	.008	.20
1/64	.016	.40
1/32	.031	.79
1/16	.063	1.59
	.063	1.60
7/32	.219	5.56
1/4	.250	6.35
11/32	.344	8.73
5/8	.625	15.9
41/64	.641	16.3
1 3/8	1.38	34.9
1 57/64	1.89	48
	2.344	59.5

METAL JACKET

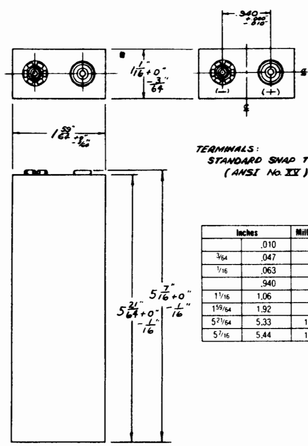
40



Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
11/32	.344	8.73
1 3/8	1.38	34.9
	1.50	38.1
2 13/16	2.81	71.4
3 19/32	3.59	91.3
3 45/64	3.70	94.1

TERMINALS:
STANDARD SNAP TYPE
(ANSI No. XV)

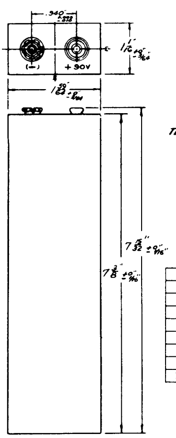
41



TERMINALS:
STANDARD SNAP TYPE
(ANSI No. XV)

Inches		Millimeters
	.010	.25
3/64	.047	1.19
1/16	.063	1.59
	.940	23.9
1 1/16	1.06	27
1 59/64	1.92	48.8
5 21/64	5.33	135
5 7/16	5.44	138

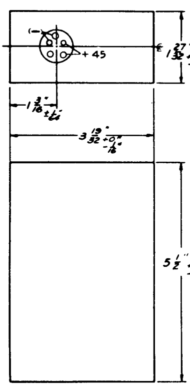
42

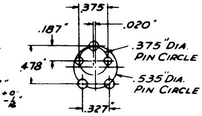


TERMINALS:
STANDARD SNAP TYPE
(ANSI No XV)

Inches		Millimeters
	.010	.25
3/64	.047	1.19
1/16	.063	1.59
	.940	23.9
1 1/16	1.06	27
1 59/64	1.92	48.8
7 3/8	7.38	187
7 15/32	7.47	190

43



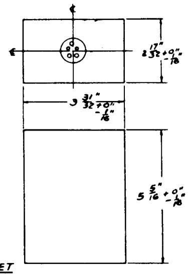


DIMENSIONED SOCKET
LAYOUT - TOP VIEW
HOLES FOR —
3 PINS - 1/8" DIA
3 PINS - 3/32" DIA
(ANSI No. IX SOCKET)

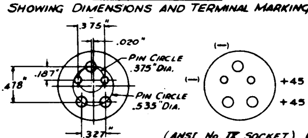
Inches		Millimeters
1/64	.016	.40
	.020	.51
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
	.187	4.75
	.327	8.31
	.375	9.53
	.478	12.1
	.535	13.6
1 3/16	1.19	30.2
1 27/32	1.84	46.8
3 19/32	3.59	91.3
5 1/2	5.50	139.

44

Inches		Millimeters
	.020	.51
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
	.187	4.75
	.327	8.31
	.375	9.53
	.478	12.1
	.535	13.6
2 17/32	2.53	64.3
3 31/32	3.97	100.
5 5/16	5.31	135.



TOP VIEW OF SOCKET
SHOWING DIMENSIONS AND TERMINAL MARKINGS

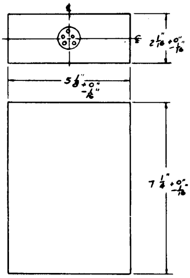


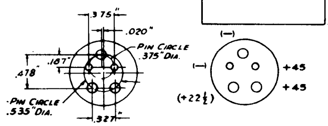
(ANSI No. IX SOCKET)

3 PINS - 1/8" DIA.
2 PINS - 3/32" DIA.

45

Inches		Millimeters
	.020	.51
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
	.187	4.75
	.327	8.31
	.375	9.53
	.478	12.1
	.535	13.6
2 1/16	2.06	52.4
5 1/8	5.13	130.
7 1/4	7.25	184.



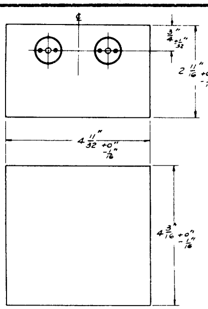


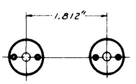
HOLES FOR 3 PINS - 1/8" DIA
HOLES FOR 2 PINS 3/32" DIA.

(ANSI No. IX SOCKET)

TOP VIEW OF SOCKET
SHOWING DIMENSIONS AND TERMINAL MARKINGS

46

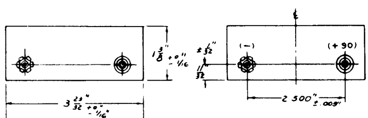


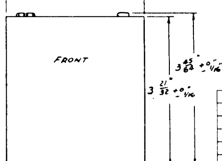


TOP VIEW OF SOCKET
SHOWING DIMENSION
AND TERMINAL VOLTAGES
2 PINS - 5/32" DIA.

Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
5/32	.156	3.97
3/4	.750	19.1
	1.812	46
2 11/16	2.69	68.3
4 3/16	4.19	106
4 11/32	4.34	110

47

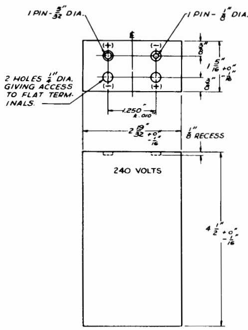




TERMINALS
STANDARD SNAP TYPE
(ANSI No. XV)

Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
11/32	.344	8.73
1 3/8	1.38	34.9
	2.50	63.5
3 21/32	3.66	92.9
3 45/64	3.70	94.1
3 23/32	3.72	94.5

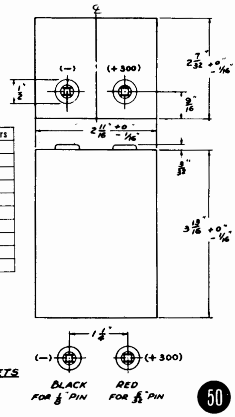
48



Inches		Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
1/4	.250	6.35
3/8	.375	9.53
	1.250	31.8
15/16	1.31	33.3
2 19/32	2.59	65.9
4 1/2	4.5	114

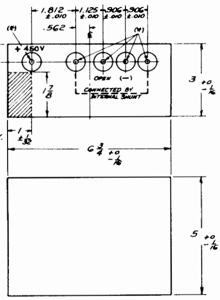
49

Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
5/32	.156	3.97
1/2	.500	12.7
9/16	.563	14.3
1 1/4	1.25	31.8
2 7/32	2.22	56.4
2 11/16	2.69	68.3
3 13/16	3.81	96.8



TOP VIEW OF SOCKETS
(ANSI No. XVIII)

50

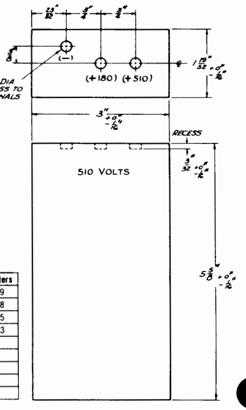


SHADED AREA MUST WITHSTAND 5 LBS. LOAD WITHIN A TEMP. RANGE OF 0°F TO +120°F (−17.8°C TO 48.9°C) FOR 24 HOURS, NORMAL TO TOP PLANE, WITH 1/16" MAX. INDENTATION.

(*) TO ACCOMMODATE 5/32" DIA. PIN

Inches		Millimeters
	.010	.25
1/32	.031	.79
1/16	.063	1.59
5/32	.156	3.97
	.562	14.3
3/4	.750	19.1
	.906	23
1	1	25.4
	1.125	28.6
	1.812	46
1 7/8	1.88	47.6
3	3	76.2
5	5	127
6 3/4	6.75	172

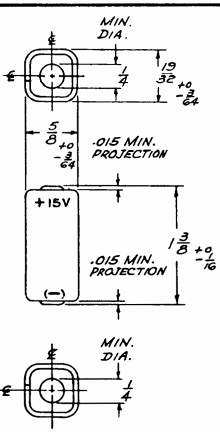
51



3 HOLES 1/4" DIA GIVING ACCESS TO FLAT TERMINALS

Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
1/4	.250	6.35
3/8	.375	9.53
23/32	.719	18.3
3/4	.750	19.1
1 19/32	1.59	40.5
3	3	76.2
5 5/8	5.63	143

52

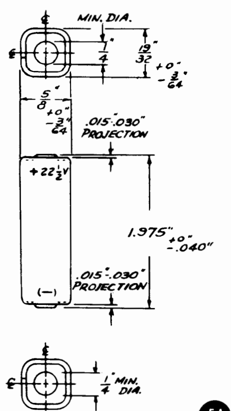


METAL JACKET

Inches		Millimeters
	.015	.38
3/64	.047	1.19
1/16	.063	1.59
1/4	.250	6.35
19/32	.594	15.1
5/8	.625	15.9
1 3/8	1.38	34.9

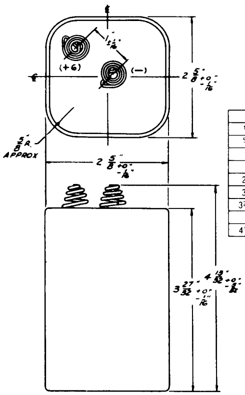
53

Inches		Millimeters
	.015	.38
	.030	.76
	.040	1.02
3/64	.047	1.19
1/4	.250	6.35
19/32	.594	15.1
5/8	.625	15.9
	1.975	50.2



METAL JACKET

54

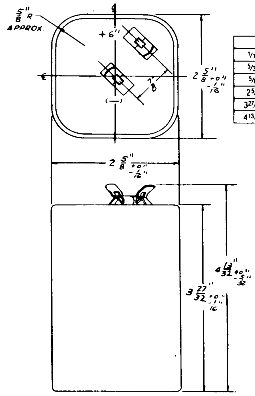


Inches		Millimeters
1/16	.063	1.59
5/32	.156	3.97
5/8	.625	15.9
1	1.00	25.4
2 5/8	2.63	66.7
3 1/4	3.25	82.5
3 27/32	3.84	97.6
4	4.00	101
4 13/32	4.41	112

METAL JACKET

BATTERY SHALL PASS FREELY THROUGH A CYLINDRICAL TUBE 3¼" DIAMETER x 4" LONG.

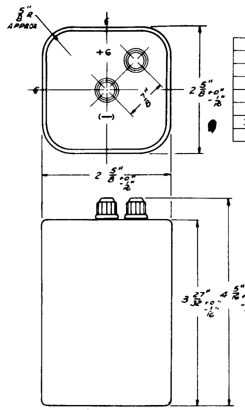
55



Inches		Millimeters
1/16	.063	1.59
5/32	.156	3.97
5/8	.625	15.9
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 13/32	4.41	112

METAL JACKET

56

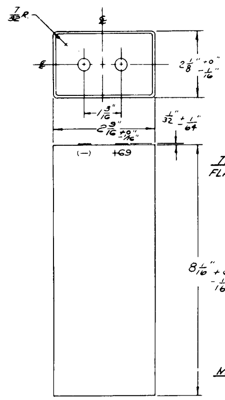


Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
5/8	.625	15.9
7/8	.875	22.2
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 5/16	4.31	110

TERMINAL POSTS - No 8-32 THREAD PLASTIC KNURLS

METAL JACKET

57

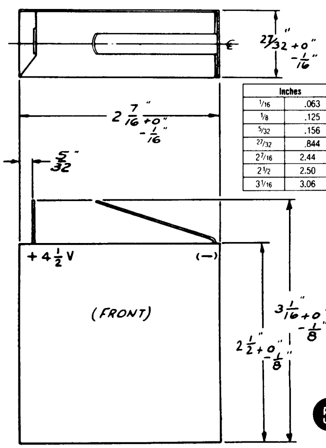


Inches		Millimeters
1/64	.016	.4
1/32	.031	.79
1/16	.063	1.59
7/32	.219	5.56
1 3/16	1.19	30.2
2 1/8	2.13	54
2 9/16	2.56	65.1
8 1/16	8.06	205

TERMINALS
FLAT CONTACT TYPE

METAL JACKET

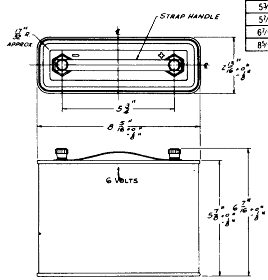
58



Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
27/32	.844	21.4
2 7/16	2.44	61.9
2 1/2	2.50	63.5
3 1/16	3.06	77.8

59

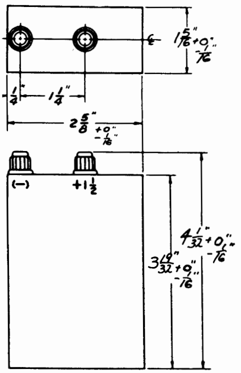
Inches		Millimeters
1/8	.125	3.18
17/32	.531	13.5
2 13/16	2.81	71.4
5 3/4	5.75	146
5 7/8	5.88	149
6 7/16	6.44	164
8 5/16	8.31	211



METAL JACKET

TERMINAL POSTS - No. 8-32 THREAD INSULATED KNURLS

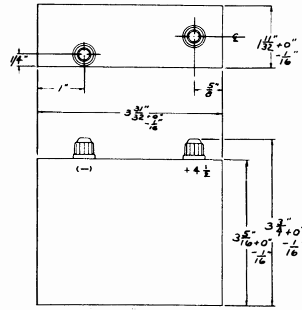
60



Inches		Millimeters
1/16	.063	1.59
1/4	.250	6.35
1¼	1.25	31.8
1 5/16	1.31	33.3
2 5/8	2.63	66.7
3 19/32	3.59	91.3
4 1/32	4.03	102.

TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS

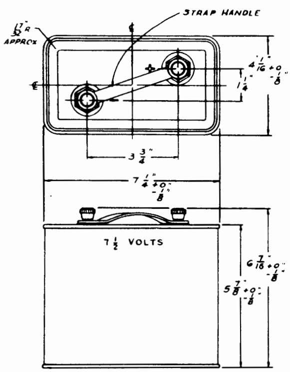
61



Inches		Millimeters
1/16	.063	1.59
1/4	.250	6.35
5/8	.625	15.9
1	1.00	25.4
1 11/32	1.34	34.1
3 5/16	3.31	84.1
3¾	3.75	95.3
3 31/32	3.97	101

TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS

62

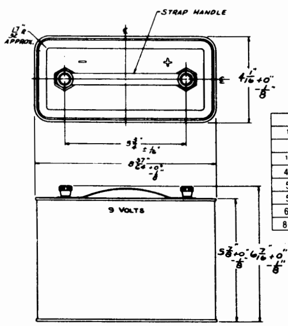


Inches		Millimeters
1/8	.125	3.18
17/32	.531	13.5
1¼	1.25	31.8
3¾	3.75	95.3
4 1/16	4.06	103.
5 7/8	5.88	149.
6 7/16	6.44	164.
7¼	7.25	184.

METAL JACKET

TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS

63



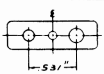
Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
17/32	.531	13.5
4 1/16	4.06	103.
5¾	5.75	146.
5 7/8	5.88	149.
6 7/16	6.44	164.
8 37/64	8.58	218.

METAL JACKET

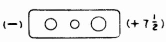
TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS

64

Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
5/32	.156	3.97
7/16	.438	11.1
	.531	13.5
1 15/16	1.94	49.2
2 5/32	2.16	54.8
3 1/32	3.03	77.

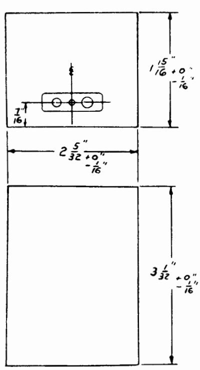


DIMENSIONED SOCKET
LAYOUT - TOP VIEW
1 PIN - 3/32" DIA (PILOT)
1 PIN - 1/8" DIA
1 PIN - 5/32" DIA

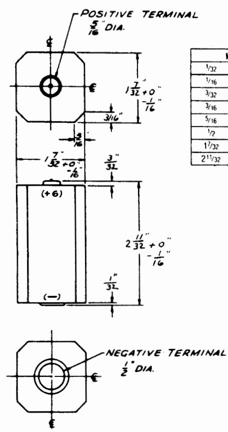


SOCKET TERMINAL
MARKINGS - TOP VIEW

(ANSI No. V SOCKET)

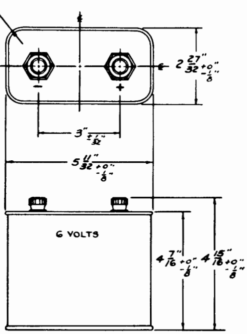


65



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
3/32	.094	2.38
3/16	.188	4.76
5/16	.313	7.94
1/2	.500	12.7
1 7/32	1.22	31
2 11/32	2.34	59.5

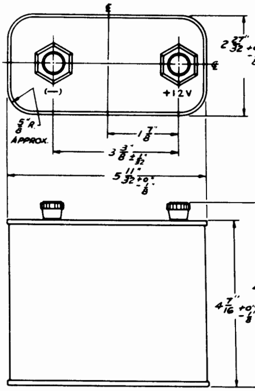
66



Inches		Millimeters
1/32	.031	.79
1/8	.125	3.18
5/8	.625	15.9
2 27/32	2.84	72.2
3	3.00	76.2
4 7/16	4.44	11.3
4 15/16	4.94	125.
5 11/32	5.34	136.

METAL JACKET
TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS

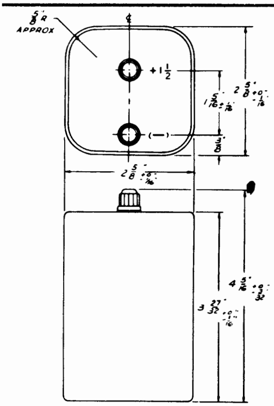
67



Inches		Millimeters
1/32	.031	.79
1/8	.125	3.18
5/8	.625	15.9
1 7/8	1.88	47.6
2 27/32	2.84	72.2
3 3/8	3.38	85.7
4 7/16	4.44	11.3
4 15/16	4.94	125.
5 11/32	5.34	136.

METAL JACKET
TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS

68

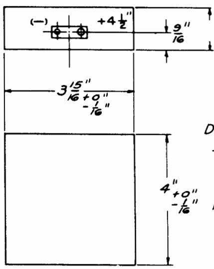


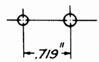
Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
3/8	.375	9.53
5/8	.625	15.9
1 5/16	1.31	33.3
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 5/16	4.31	110

TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS
METAL JACKET

69

Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
9/16	.563	14.3
	.719	18.3
1 5/16	1.31	33.3
3 15/16	3.94	100
4	4	102

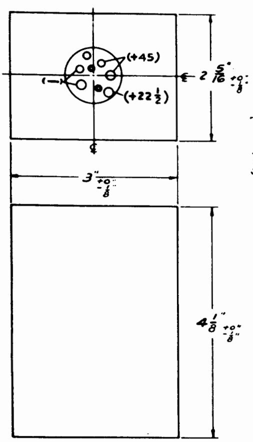


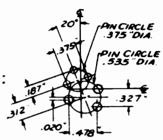


DIMENSIONED SOCKET
LAYOUT - TOP VIEW
1 PIN - 1/8" DIA.
1 PIN - 5/32" DIA.

ANSI No. III SOCKET

70

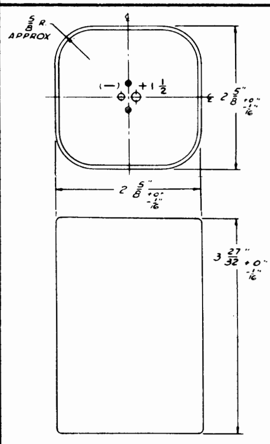


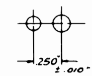


TOP VIEW OF SOCKET
SHOWING DIMENSIONS
3 PINS - 3/32" DIA.
3 PINS - 1/8" DIA.
(ANSI No. X SOCKET)

Inches		Millimeters
3/32	.094	2.38
1/8	.125	3.18
	.187	4.75
	.312	7.93
	.327	8.31
	.375	9.53
	.478	12.1
	.535	13.6
2 5/16	2.31	58.7
3	3.00	76.2
4 1/8	4.13	105.

71



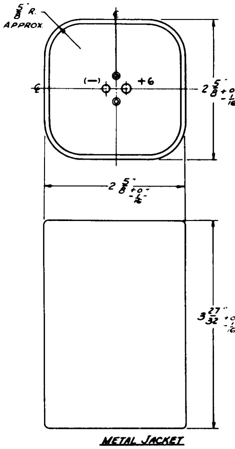


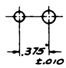
DIMENSIONED SOCKET
LAYOUT - TOP VIEW
1 PIN - 1/8" DIA
1 PIN - 5/32" DIA.
(ANSI No. I SOCKET)

Inches		Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
	.250	6.35
5/8	.625	15.9
2 5/8	2.63	66.7
3 27/32	3.84	97.6

METAL JACKET

72

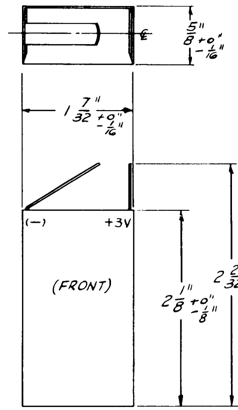




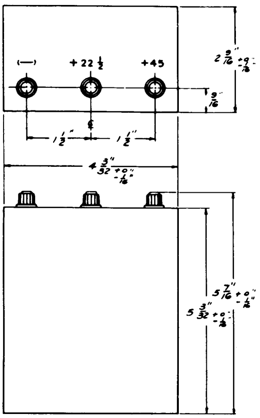
Inches		Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
	.375	9.53
5/8	.625	15.9
2 5/8	2.63	66.7
3 27/32	3.84	97.6

73

Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
5/8	.625	15.9
1 7/32	1.22	31
2 1/8	2.13	54
2 21/32	2.66	67.5



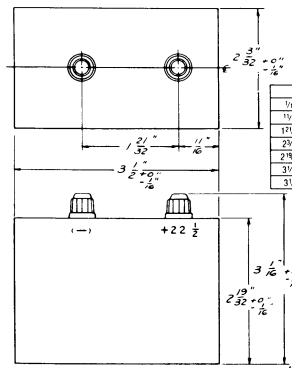
74



Inches		Millimeters
1/16	.063	1.59
9/16	.563	14.3
1 1/2	1.50	38.1
2 9/16	2.56	65.1
4 3/32	4.09	104.
5 3/32	5.09	129.
5 7/16	5.44	138.

TERMINAL POSTS - No. 8-32 THREAD.
PLASTIC KNURLS

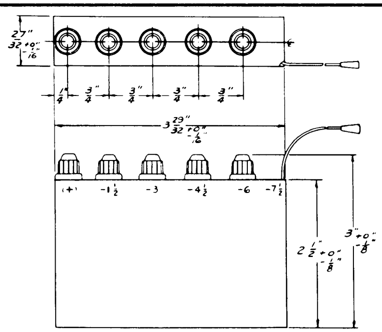
75



Inches		Millimeters
1/16	.063	1.59
11/16	.688	17.5
1 21/32	1.66	42.1
2 3/32	2.09	53.2
2 19/32	2.59	65.9
3 1/16	3.06	77.8
3 1/2	3.50	88.9

TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS

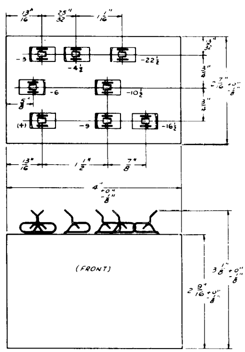
76



Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
1/4	.250	6.35
3/4	.750	19.1
27/32	.844	21.4
2 1/2	2.50	63.5
3	3.00	76.2
3 29/32	3.91	99.2

TERMINAL POSTS - No 8-32 THREAD
PLASTIC KNURLS

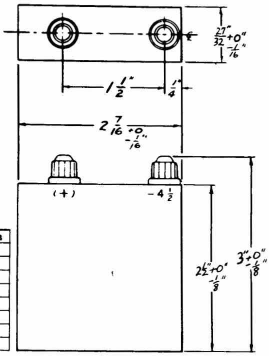
77



Inches		Millimeters
1/8	.125	3.18
13/32	.406	10.3
25/32	.781	19.8
3/4	.75	19.1
13/16	.813	20.6
7/8	.875	22.2
1 1/16	1.06	27
1 1/2	1.5	38.1
2 7/16	2.44	61.9
2 9/16	2.56	65.1
3 1/8	3.13	79.4
4	4	102

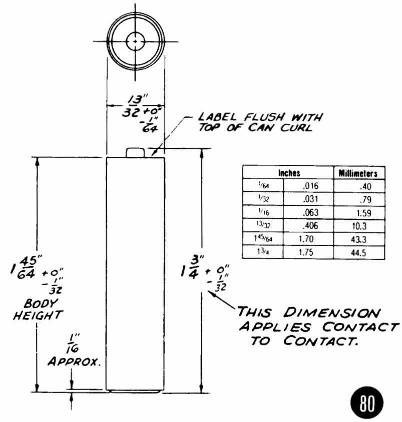
78

Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
1/4	.250	6.35
27/32	.844	21.4
1 1/2	1.50	38.1
2 7/16	2.44	61.9
2 1/2	2.50	63.5
3	3.00	76.2



TERMINAL POSTS - No 8-32 THREAD
PLASTIC KNURLS

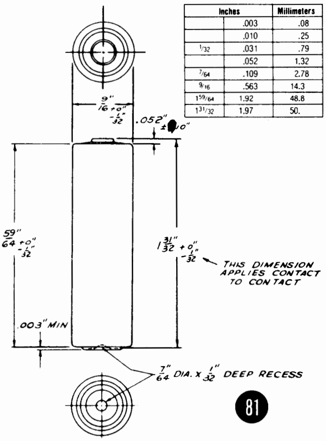
79



Inches		Millimeters
1/64	.016	.40
1/32	.031	.79
1/16	.063	1.59
13/32	.406	10.3
1 45/64	1.70	43.3
1 3/4	1.75	44.5

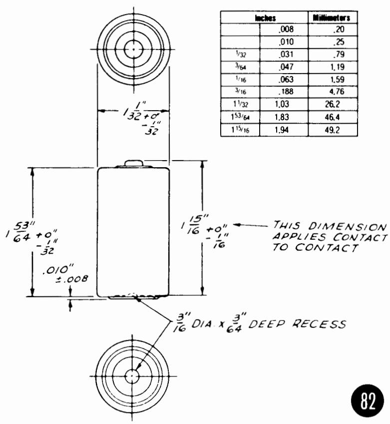
80

Inches		Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50.

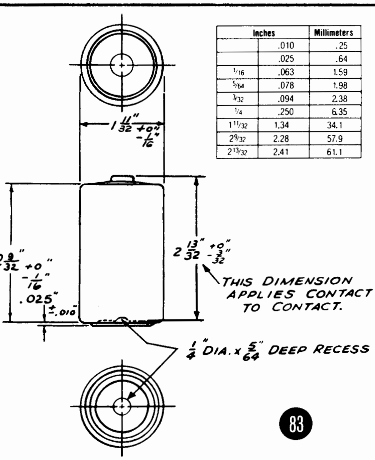


81

Inches		Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2

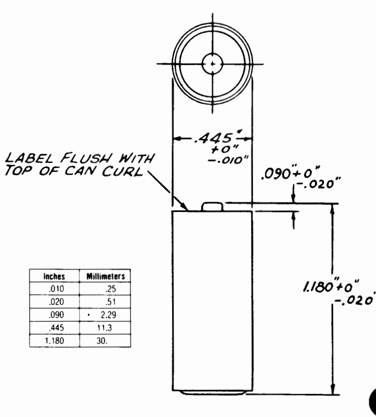


82



Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

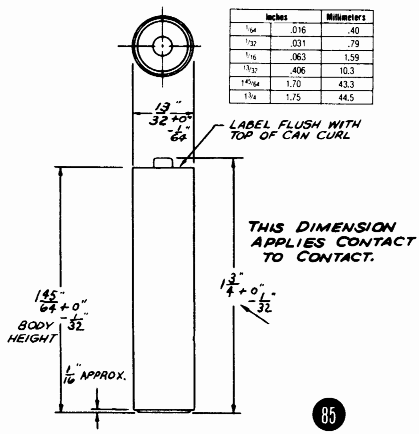
83



Inches	Millimeters
.010	.25
.020	.51
.090	2.29
.445	11.3
1.180	30.

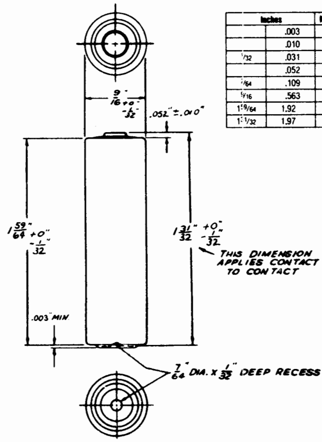
84

	Inches	Millimeters
1/64	.016	.40
1/32	.031	.79
1/16	.063	1.59
13/32	.406	10.3
1 45/64	1.70	43.3
1 3/4	1.75	44.5



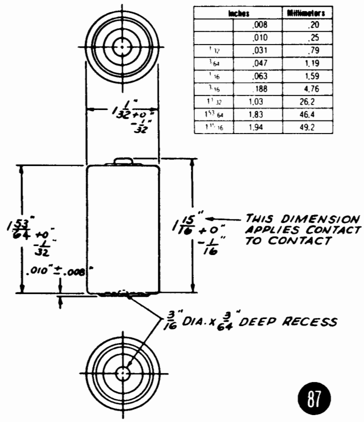
85

	Inches	Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50



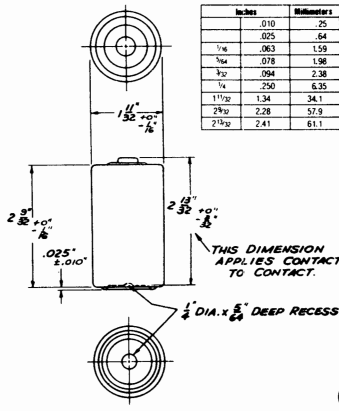
86

	Inches	Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2



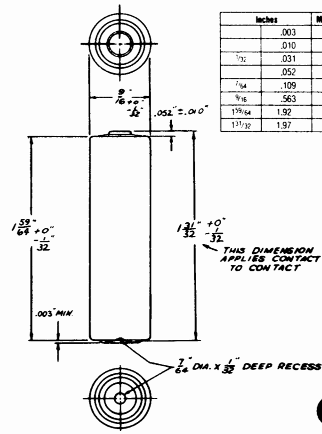
87

	Inches	Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1



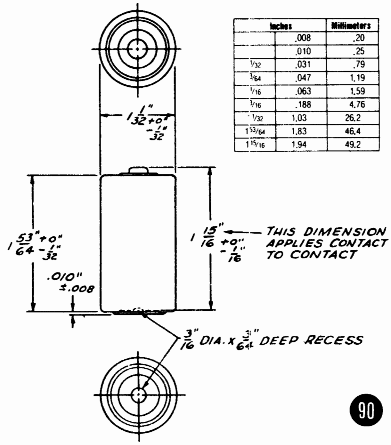
88

	Inches	Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50



89

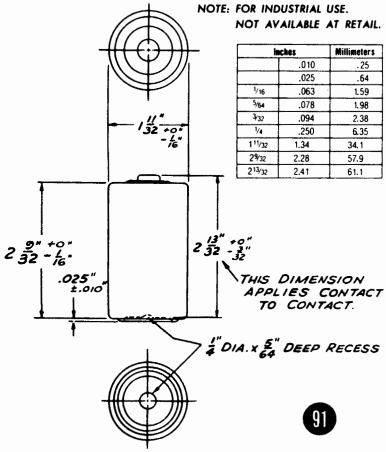
	Inches	Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2



90

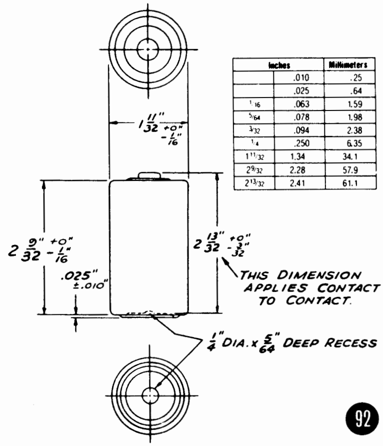
NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.

	Inches	Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1



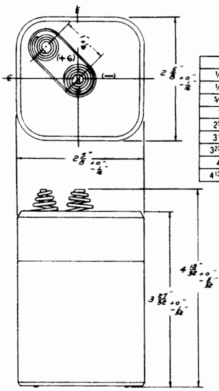
91

	Inches	Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1



92

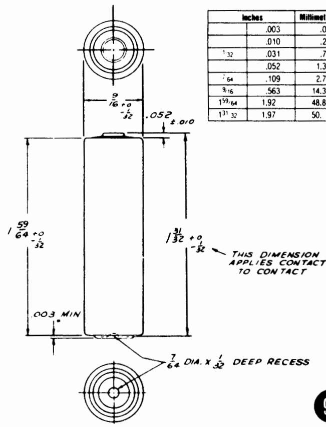
	Inches	Millimeters
1/32	.031	.79
1/16	.063	1.59
5/32	.156	3.97
1	1.00	25.4
2 5/8	2.63	66.7
3 1/4	3.25	82.5
3 27/32	3.84	97.6
4	4.00	101
4 13/32	4.41	112



BATTERY SHALL PASS FREELY THROUGH A CYLINDRICAL TUBE 3 1/4" DIAMETER x 4" LONG.

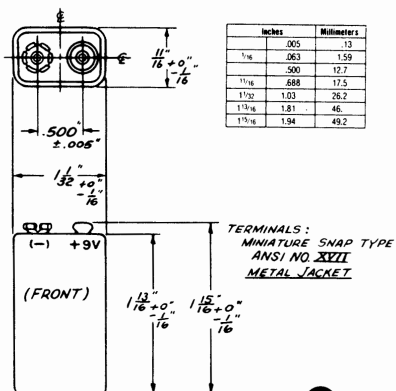
93

	Inches	Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50.



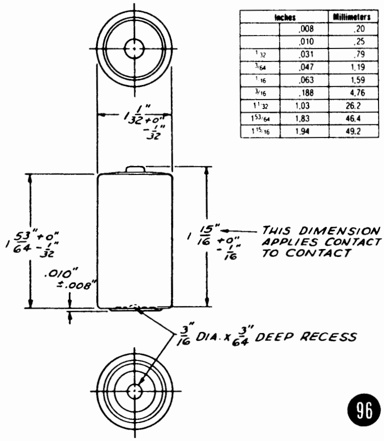
94

	Inches	Millimeters
	.005	.13
1/16	.063	1.59
	.500	12.7
11/16	.688	17.5
1 1/32	1.03	26.2
1 13/16	1.81	46.
1 15/16	1.94	49.2

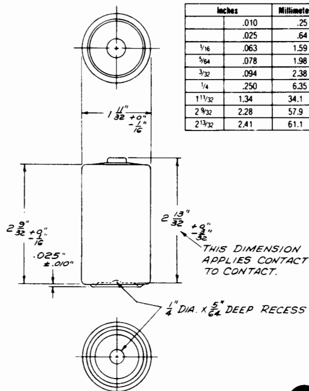


95

	Inches	Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2

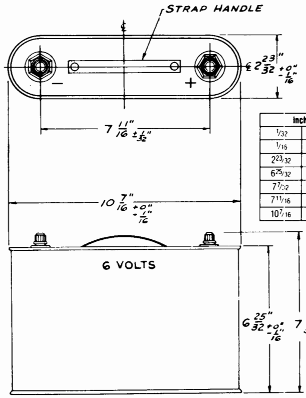


96



Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

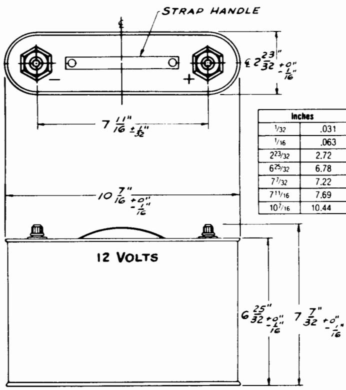
97



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
2 23/32	2.72	69.1
6 25/32	6.78	172
7 7/32	7.22	183
7 11/16	7.69	195
10 7/16	10.44	265

METAL JACKET
TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS

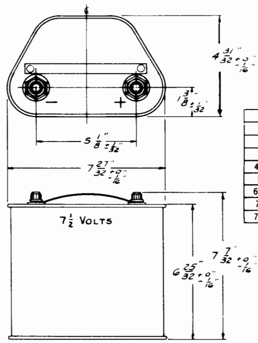
98



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
2 23/32	2.72	69.1
6 25/32	6.78	172
7 7/32	7.22	183
7 11/16	7.69	195
10 7/16	10.44	265

METAL JACKET
TERMINAL POSTS - No. 8-32
THREAD PLASTIC KNURLS

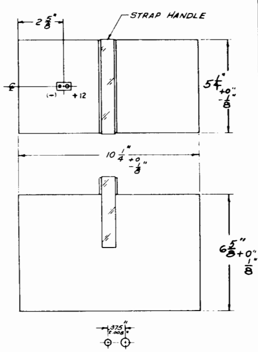
99



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
1 3/8	1.38	34.9
4 31/32	4.97	126
5 1/8	5.13	130
6 25/32	6.78	172
7 7/32	7.22	183
7 27/32	7.84	199

METAL JACKET
TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS

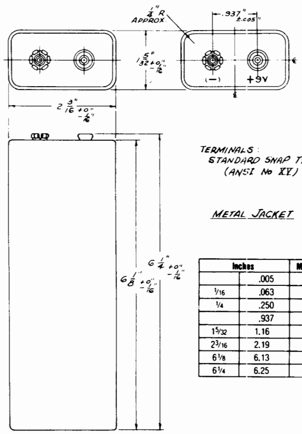
100



Inches		Millimeters
	.005	.13
1/8	.125	3.18
5/32	.156	3.97
	.375	9.53
2 5/8	2.63	66.7
5 1/4	5.25	133
6 5/8	6.63	168
10 1/4	10.3	260

DIMENSIONED SOCKET
LAYOUT - TOP VIEW
1 PIN - 1/8" DIA.
1 PIN - 5/32" DIA.
ANSI No. IV SOCKET

101

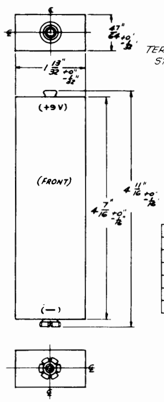


TERMINALS:
STANDARD SNAP TYPE
(ANSI No XV)

METAL JACKET

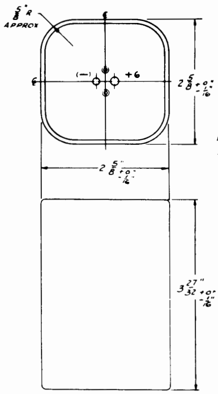
Inches		Millimeters
	.005	.13
1/16	.063	1.59
1/4	.250	6.35
	.937	23.8
1 5/32	1.16	29.4
2 3/16	2.19	55.6
6 1/8	6.13	156
6 1/4	6.25	159

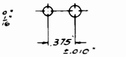
102



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
47/64	.734	18.7
1 13/32	1.41	35.7
4 7/16	4.44	113
4 11/16	4.69	119

103

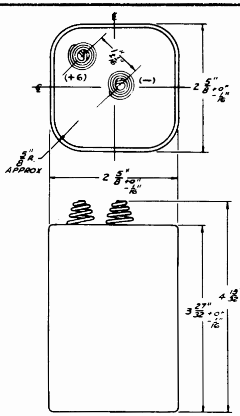




DIMENSIONED SOCKET LAYOUT - TOP VIEW
1 PIN - 1/8" DIA
1 PIN - 5/32" DIA
ANSI No. IV SOCKET

Inches		Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
	.375	9.53
5/8	.625	15.9
2 5/8	2.63	66.7
3 27/32	3.84	97.6

104

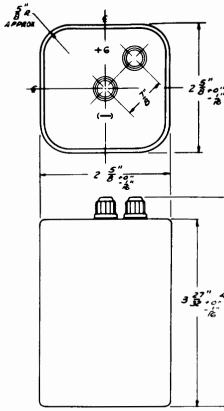


Inches		Millimeters
1/16	.063	1.59
5/32	.156	3.97
5/8	.625	15.9
1	1.00	25.4
2 5/8	2.63	66.7
3 1/4	3.25	82.5
3 27/32	3.84	97.6
4	4.00	101
4 13/32	4.41	112

BATTERY SHALL PASS FREELY THROUGH A CYLINDRICAL TUBE 3 1/4" DIAMETER x 4" LONG.

METAL JACKET

105

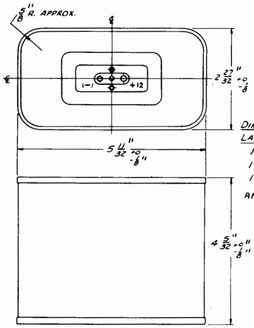


Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
5/8	.625	15.9
7/8	.875	22.2
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 5/16	4.31	110

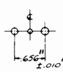
TERMINAL POSTS - No 8-32 THREAD PLASTIC KNURLS

METAL JACKET

106



METAL JACKET



DIMENSIONED SOCKET LAYOUT - TOP VIEW
1 PIN - 1/8" DIA.
1 PIN - 5/32" DIA.
1 PIN - 3/32" DIA.
ANSI No. XX SOCKET

Inches		Millimeters
	.010	.25
3/32	.094	2.38
1/8	.125	3.18
5/32	.156	3.97
5/8	.625	15.9
	.656	16.7
2 27/32	2.84	72.2
4 5/32	4.16	106
5 11/32	5.34	136

107

BATTERY SERVICE LIFE . . . The ampere-hour capacity of a carbon-zinc dry battery is not a fixed value. It varies with current drain, operating schedule, cutoff voltage, temperature and storage period of the battery prior to use. Approximate service capacity for each cell used in the batteries shown in the specification listing for carbon-zinc batteries is given below for three different current drains. The values given are for fresh batteries at 70°F; the operating schedule is 2 hours per day. The cutoff voltage is 0.8 volt per 1.5 volt cell for all of the cells. This is in accord with the cutoff voltages usually associated with their use.

The data below are based on starting drains and fixed resistance tests.

From the voltage of the battery and the total number of cells, determine the number of 1½ volt cells in series and in parallel. Service capacity is shown below for single 1½ volt cells. If a battery uses cells in parallel, divide the current drain which the battery is supplying by the number of parallel strings of cells, and enter the table with this value of current to determine service life.

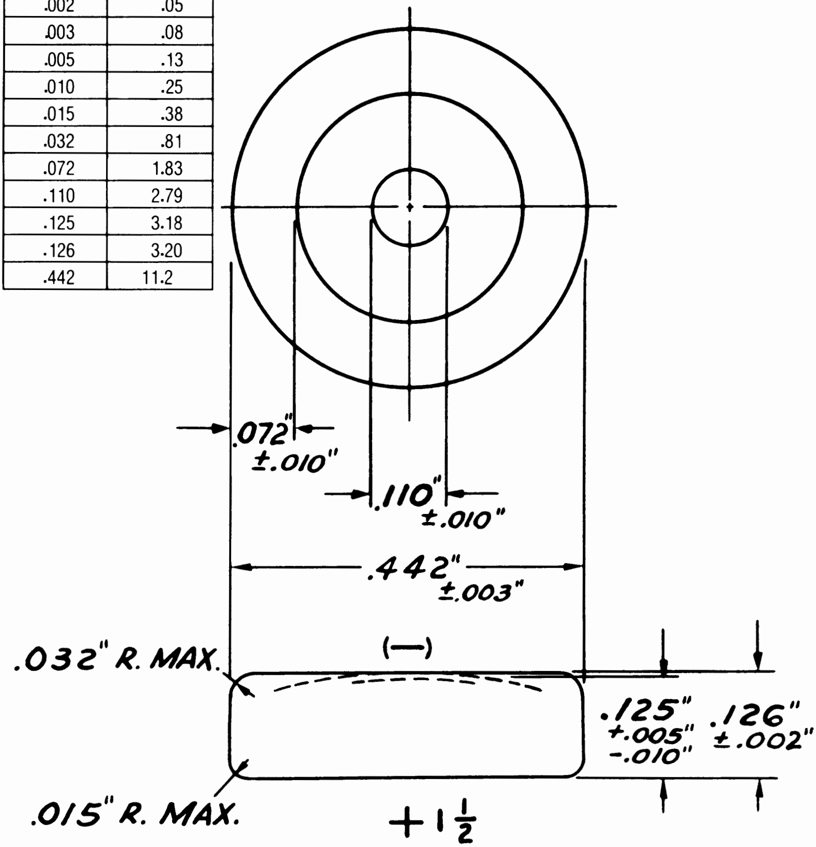
CELL	STARTING DRAIN (milliamperes)	SERVICE CAPACITY (hours)	CELL	STARTING DRAIN (milliamperes)	SERVICE CAPACITY (hours)	CELL	STARTING DRAIN (milliamperes)	SERVICE CAPACITY (hours)
N	1.5 7.5 15	320 60 20	55	15 75 150	635 138 61	135	1.3 6.5 13	550 108 52
AAA	2 10 20	350 54 21	105	0.4 2 4	210 30 8	148	2 10 20	610 150 60
AA	3 15 30	450 80 32	109	0.6 3 6	710 155 75	155	5 15 30	620 170 74
B	5 25 50	420 85 32	112	0.7 3.5 7	210 35 12	161	3 15 30	500 120 55
C	5 25 50	520 115 53	114	0.7 3.5 7	300 57 25	165	3 15 30	770 200 90
D	10 50 100	525 125 57	117	0.8 4 8	475 98 49	172	5 25 50	780 200 90
F	15 75 150	630 135 60	118	0.8 4 8	525 110 54	175	5 25 50	1000 260 110
G	15 75 150	950 190 78	127	1 5 10	475 150 72			
6	50 250 500	750 210 95	132	1.3 6.5 13	275 40 16			

TABLE G

"EVEREADY" NO. 201 CELL

Type: Carbon - Zinc
ANSI Designation: WO
Suggested Current Range: 0-60 microamperes

Inches	Millimeters
.002	.05
.003	.08
.005	.13
.010	.25
.015	.38
.032	.81
.072	1.83
.110	2.79
.125	3.18
.126	3.20
.442	11.2



SPECIFICATIONS

Voltage Taps .... --, + 1.5
Service Capacity (to 1.3 volts) .... 65 milliampere-hours
(Rated capacity at 15,000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.049 oz. (1.39 grams)
Volume .... 0.019 cubic inch (0.31 cubic centimeter)
Cell Size .... One No. 103 (ANSI WO)

For service information see reverse side of this sheet

"EVEREADY" NO. 201

Estimated Average Service at 95°F (35°C)

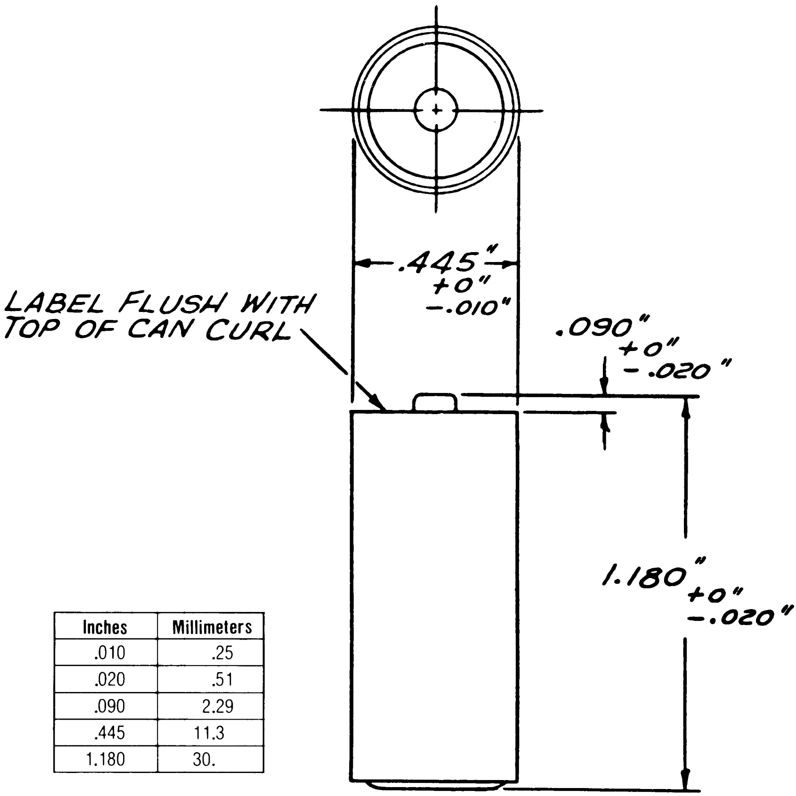
SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.3V
24 hours/day	5.5	270,000	12 months
	100	15,000	650 hours

"EVEREADY" NO. E340E CELL

Type: Carbon – Zinc

ANSI Designation–"N"

Suggested Current Range: 0–20 milliamperes



Inches	Millimeters
.010	.25
.020	.51
.090	2.29
.445	11.3
1.180	30.

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.22 oz. (6.24 grams)
Volume .... 0.16 cubic inch (2.62 cubic centimeters)
Cell .... One No. 4 (ANSI "N")

For service information see reverse side of this sheet

"EVEREADY" NO. E340E

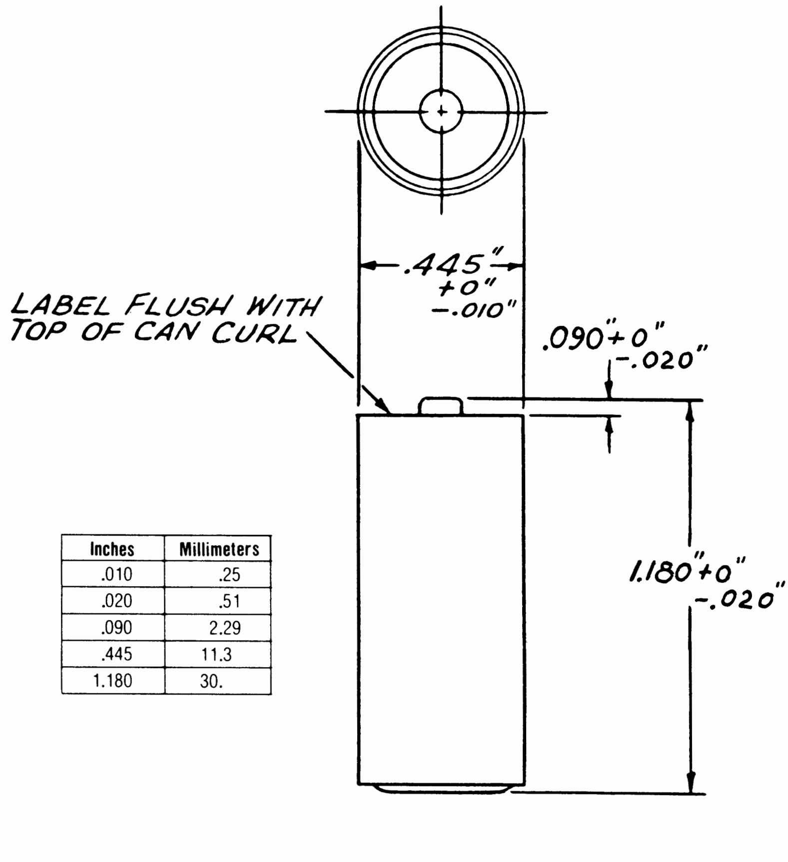
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	0.5	3000	940	910	880	820	780
	1.0	1500	485	460	440	410	360
	2.5	600	190	180	170	155	130
	5.0	300	94	88	81	71	60
	10	150	45	40	37	34	28
	20	75	22	18	16	13.5	11
	30	50	13	11	9.5	7.5	5.5
	50	30	5.4	4.9	4.1	3.2	2.2
	100	15	1.8	1.6	1.2	0.8	0.5
4 hours/day	0.5	3000	940	910	880	820	780
	1.0	1500	485	460	440	410	360
	2.5	600	195	180	170	155	130
	5.0	300	92	86	80	72	60
	10	150	45	40	36.5	32	26
	20	75	20.5	17	15.5	12.5	10.5
	30	50	12	10.5	9	7.4	5.3
12 hours/day	0.5	3000	950	910	880	840	810
	1.0	1500	485	465	440	420	385
	2.5	600	185	175	160	150	135
	5.0	300	88	81	74	68	60
	10	150	40	36	32	29	24.5
	20	75	17	15	12	10.5	9
24 hours/day	0.5	3000	970	930	890	850	800
	1.0	1500	485	455	435	405	370
	2.5	600	185	170	160	145	135
	5.0	300	84	80	72	65	56
	10	150	36	33	30	27	23
	20	75	14.5	13	12	10.5	9
	30	50	8.2	7.4	6.6	5.7	4.7
	50	30	4.2	3.6	3.1	2.7	2.2
	100	15	1.8	1.6	1.2	0.8	0.5

16 hours/day	2.4	625		200			

"EVEREADY" NO. 904 BATTERY

Type: Carbon - Zinc
ANSI Designation: "N"
Suggested Current Range: 0-20 milliamperes



Inches	Millimeters
.010	.25
.020	.51
.090	2.29
.445	11.3
1.180	30.

SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.22 oz. (6.24 grams)
Volume .... 0.16 cubic inch (2.62 cubic centimeters)
Cell .... One No. 4 (ANSI "N")

For service information see reverse side of this sheet

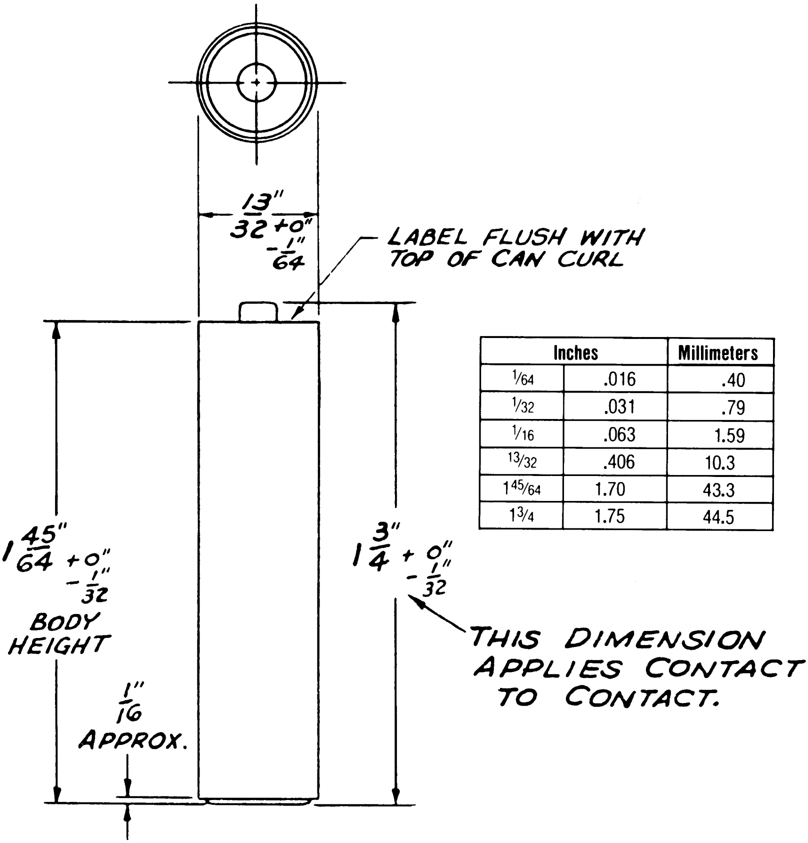
"EVEREADY" NO. 904

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	0.5	3000		940	910	880	820	780
	1.0	1500		485	460	440	410	360
	2.5	600		190	180	170	155	130
	5.0	300		94	88	81	71	60
	10	150		45	40	37	34	28
	20	75		22	18	16	13.5	11
	30	50		13	11	9.5	7.5	5.5
	50	30		5.4	4.9	4.1	3.2	2.2
	100	15		1.8	1.6	1.2	0.8	0.5
4 hours/day	0.5	3000		940	910	880	820	780
	1.0	1500		485	460	440	410	360
	2.5	600		195	180	170	155	130
	5.0	300		92	86	80	72	60
	10	150		45	40	36.5	32	26
	20	75		20.5	17	15.5	12.5	10.5
	30	50		12	10.5	9	7.4	5.3
12 hours/day	0.5	3000		950	910	880	840	810
	1.0	1500		485	465	440	420	385
	2.5	600		185	175	160	150	135
	5.0	300		88	81	74	68	60
	10	150		40	36	32	29	24.5
	20	75		17	15	12	10.5	9
24 hours/day	0.5	3000		970	930	890	850	800
	1.0	1500		485	455	435	405	370
	2.5	600		185	170	160	145	135
	5.0	300		84	80	72	65	56
	10	150		36	33	30	27	23
	20	75		14.5	13	12	10.5	9
	30	50		8.2	7.4	6.6	5.7	4.7
	50	30		4.2	3.6	3.1	2.7	2.2
	100	15		1.8	1.6	1.2	0.8	0.5
1 hour on, 6 hours off, 1 hour on, 16 hours off	100	15		2.1				
5 minutes/day (General-Purpose Intermittent-Flashlight)	300	5	65 minutes					
4 minutes/hour, 8 hour/day; 16 hours rest (Light-Industrial Flashlight Test)	300	5	47 minutes		36 minutes			

"EVEREADY" NO. 812 CELL

Type: Carbon - Zinc
ANSI Designation: "AAA"
Suggested Current Range: 0-20 milliamperes



Inches		Millimeters
1/64	.016	.40
1/32	.031	.79
1/16	.063	1.59
13/32	.406	10.3
1 45/64	1.70	43.3
1 3/4	1.75	44.5

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.3 oz. (8.5 grams)
Volume .... 0.20 cubic inches (3.28 cubic centimeters)
Cell .... One No. 12 (ANSI "AAA")

For service information see reverse side of this sheet

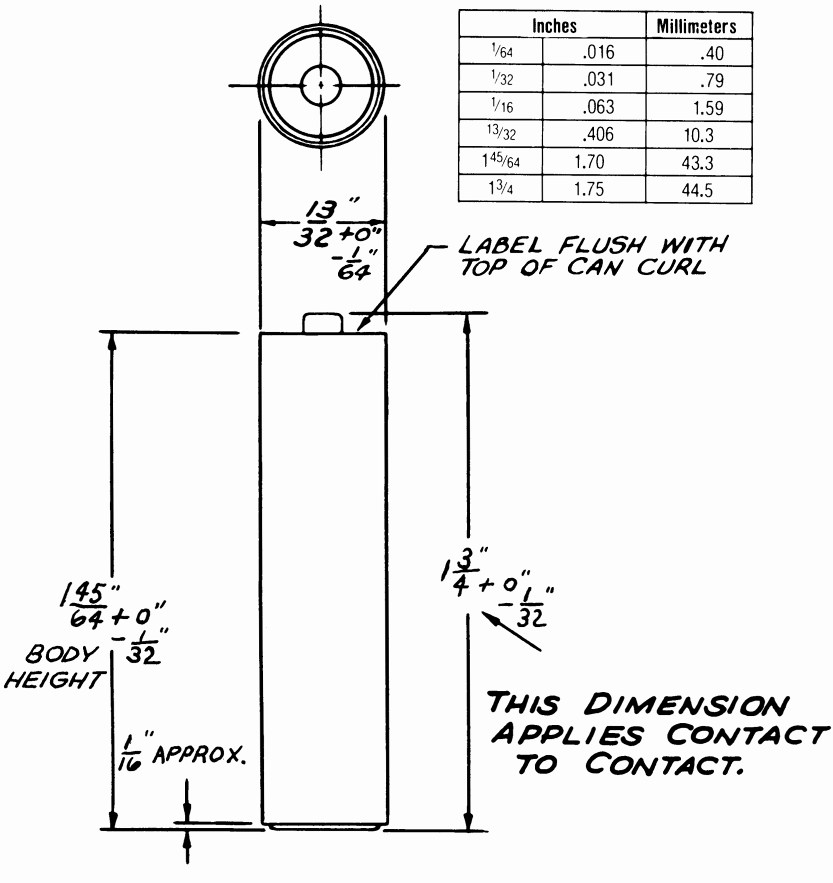
"EVEREADY" NO. 812

Estimated Average Service at 70°F (21.1°C) (Photoflash Application)

SCHEDULE	LOAD (ohms)	CUTOFF	ESTIMATED SERVICE
Store at 70° F— each month measure amperage supplied through 0.75 ohm load	0.75	1 ampere	Average of 1 year

"EVEREADY" NO. 912 CELL

Type: Carbon - Zinc
ANSI Designation: "AAA"
Suggested Current Range: 0-20 milliamperes



Inches		Millimeters
1/64	.016	.40
1/32	.031	.79
1/16	.063	1.59
13/32	.406	10.3
1 45/64	1.70	43.3
1 3/4	1.75	44.5

SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.3 oz. (8.5 grams)
Volume .... 0.20 cubic inch (3.28 cubic centimeters)
Cell .... One No. 12 (ANSI "AAA")

For service information see reverse side of this sheet

"EVEREADY" NO. 912

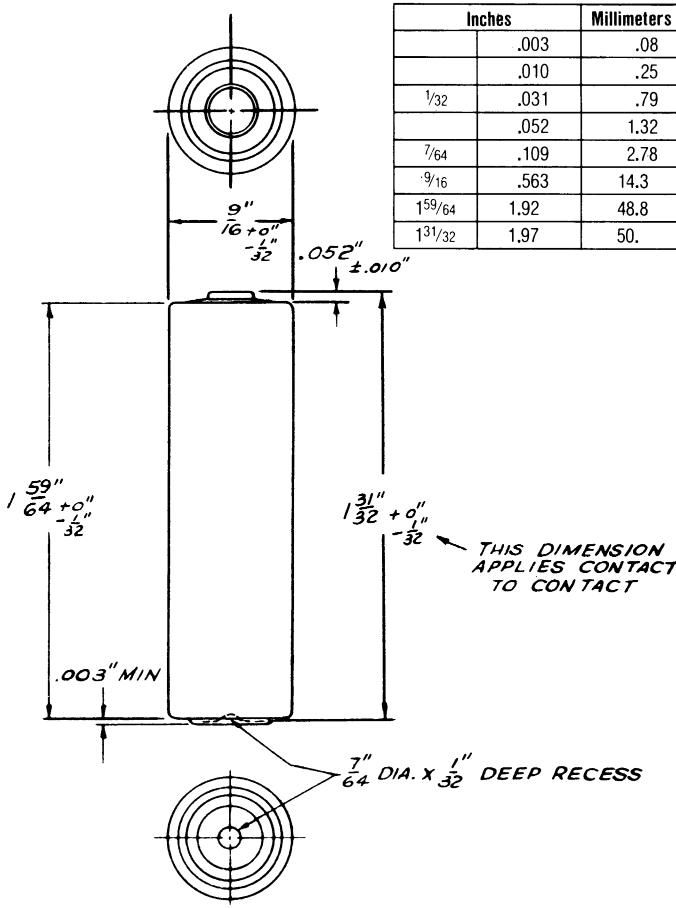
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	2	750		350	320	300	270	250
	2.5	600		289	266	247	228	204
	5	300		128	118	108	97	80
	10	150		54	47	43	39	32
	20	75		21	18	15	13	10
	50	30		5.5	4.5	3.5	1.7	1.1
	100	15		1.8	1.5	1.0	0.5	0.4
4 hours/day	2	750		310	290	270	245	220
	2.5	600		237	228	213	185	171
	5	300		112	104	97	81	75
	10	150		49	44	40	33	28
	20	75		18.5	17	14	11.5	8.4
	30	50		10	8.8	7.8	5.1	3.4
12 hours/day	2	750		320	285	260	230	200
	2.5	600		247	223	204	175	154
	5	300		114	100	90	77	65
	10	150		48	41	37	31	24
	20	75		18	15	11	8	6
	30	50		9	7.4	5.9	4.5	2.9
24 hours/day	2	750		320	270	235	195	155
	2.5	600		250	204	175	147	114
	5	300		135	108	90	73	55
	10	150		40	30	24	19	14
	20	75		15.5	12	11	8	6
	50	30		4.2	3.2	2.3	1.7	1.1
	100	15		1.8	1.5	1.0	0.5	0.4
4 minutes/hour 8 hours/day 16 hours-rest (Light-Industrial Flashlight Test)	300	5	48 minutes		40 minutes			

"EVEREADY" NO. 815 CELL

Type: Carbon - Zinc
ANSI Designation: "AA"
Suggested Current Range: 0-25 milliamperes

Inches		Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50.



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.6 oz. (17 grams)
Volume .... 0.48 cubic inch (7.87 cubic centimeters)
Cell.. One No. 15 (ANSI "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. 815

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.25	CUTOFF VOLTAGE 0.75V	CUTOFF VOLTAGE 0.9V
Continuous	375	4		35 minutes	
4 minutes/hour 8 hours/day 16 hours-rest (Light-Industrial Flashlight Test)	375	4			60 minutes
Discharge 1 second each minute for 1 hour at 24 hour intervals for 5 consecutive days per week (Photoflash Test)		0.15	420 discharges		
Discharge 15 seconds each minute for 1 hour at 24 hour intervals for 5 consecutive days per week (ANSI Electronic-Photoflash Cell Test)	1.5 amperes	1		20 discharges	

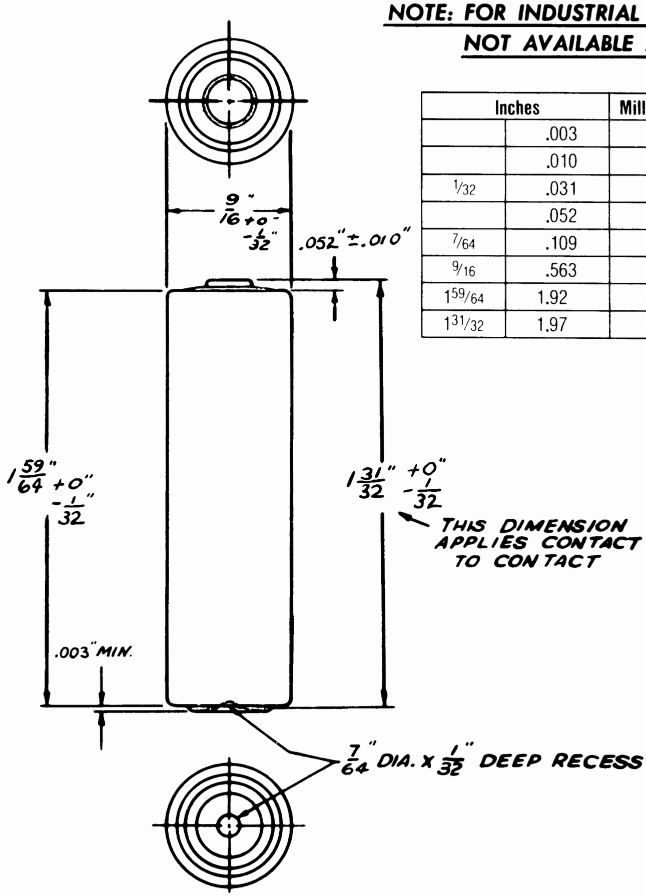
"HERCULES" NO. HS15 INDUSTRIAL CELL

Type: Carbon - Zinc

ANSI Designation: "AA"

Suggested Current Range: 0-25 milliamperes

NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.



Inches		Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50.

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.52 oz. (14.8 grams)
Volume .... 0.48 cubic inch (7.87 cubic centimeters)
Cell .... One No. 15 (ANSI "AA")

For service information see reverse side of this sheet

"HERCULES" NO. HS15

Estimated Average Hours Service at 70°F (21.1°C)

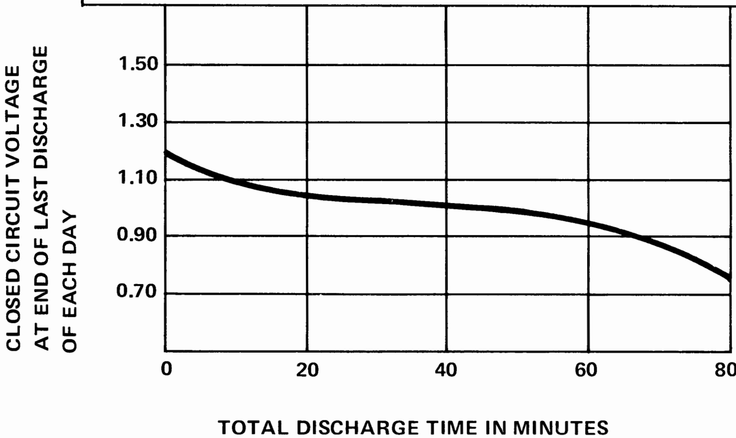
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	5	300		265	255	240	210	145
	10	150		125	120	110	92	60
	20	75		54	50	46	36	22
	30	50		32	28	25	20	11
	50	30		14	12	10	8	3.8
4 hours/day	5	300		260	250	230	200	130
	10	150		120	110	98	84	54
	20	75		48	43	37	30	18
	30	50		26	22	18	14	7.6
8 hours/day	1	1500		1275	1190	1080	950	680
	2	750		620	560	500	420	300
	5	300		240	225	200	160	105
	10	150		110	94	78	64	42
	20	75		42	35	28	21	14
	30	50		22	18	15	10.5	6.7
12 hours/day	1	1500		1420	1280	1210	1120	820
	2	750		700	640	600	510	360
	5	300		230	215	180	140	100
	10	150		100	84	74	60	37
	20	75		40	33	26	19	11
24 hours/day	1	1500		1440	1250	1180	1040	700
	2	750		670	580	500	420	300
	5	300		220	200	160	130	90
	10	150		94	80	66	52	35
	20	75		37	30	25	19	11
	30	50		20	16	13	9	6.7
	50	30		10	8.5	6.8	4.8	2.8
4 hours/day (Radio Test)	37.5	40	22		18			
½ hour/day (Calculator Test)	125	12	5.2		4.2			
5 minutes/day (General Purpose - Intermittent Test-Flashlight)	375	4	120 minutes					
4 minutes/hour 8 hours/day, 16 hours rest, (Light-Industrial Flashlight Test)	375	4	80 minutes		68 minutes			

"HERCULES" NO. HS15

Estimated Average Hours Service at 70°F (21.1°C)

4 Ohm Light-Industrial Flashlight Cell Test

Discharge for 4 minute periods, beginning at hourly intervals, for 8 consecutive hours every day, with 16 hour rest periods intervening.

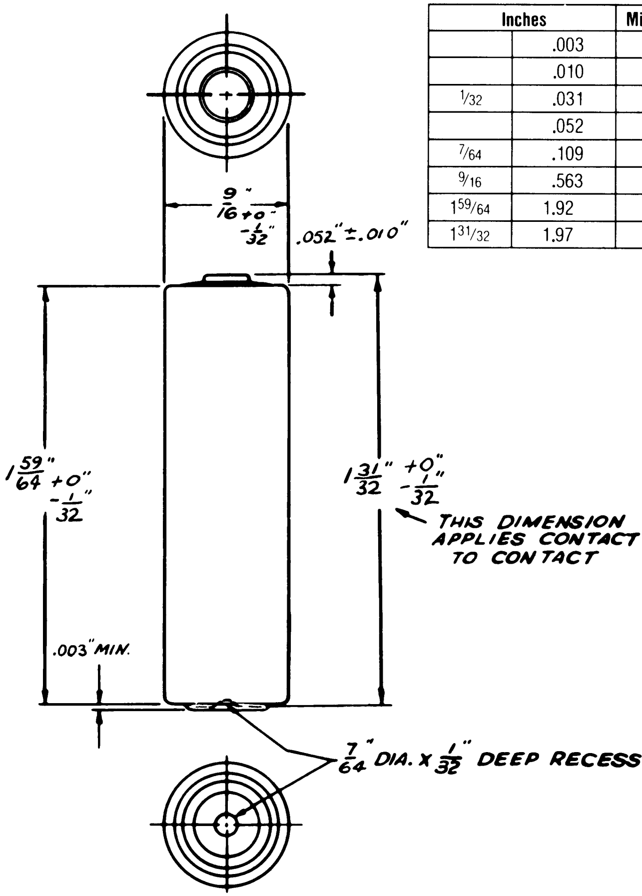


"EVEREADY" NO. 915 CELL

Type: Carbon - Zinc

ANSI Designation: "AA"

Suggested Current Range: 0-25 milliamperes



Inches		Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.52 oz. (14.8 grams)
Volume .... 0.48 cubic inch (7.87 cubic centimeters)
Cell .... One No. 15 (ANSI "AA")

For service information see reverse side of this sheet

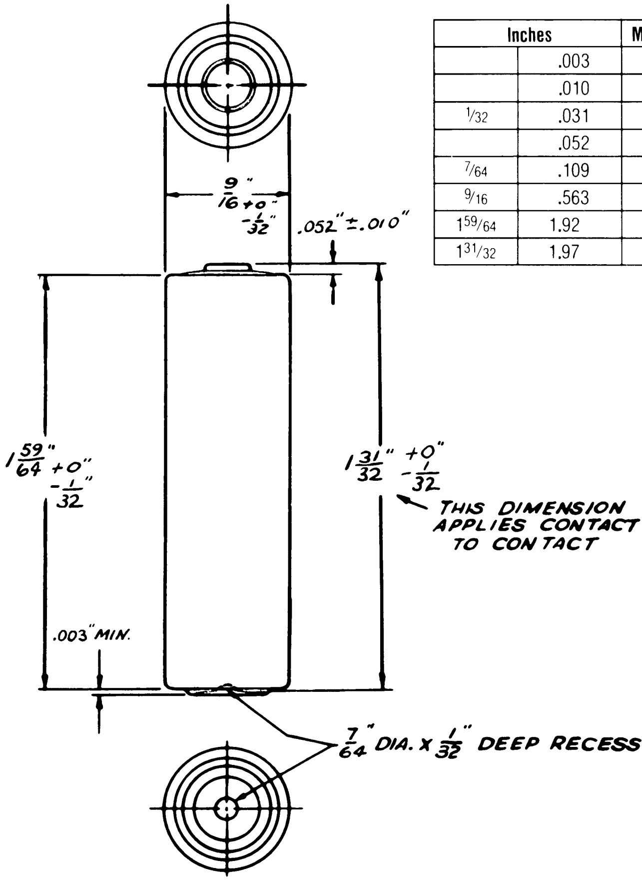
"EVEREADY" NO. 915

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	5	300		265	255	240	210	145
	10	150		125	120	110	92	60
	20	75		54	50	46	36	22
	30	50		32	28	25	20	11
	50	30		14	12	10	8	3.8
4 hours/day	5	300		260	250	230	200	130
	10	150		120	110	98	84	54
	20	75		48	43	37	30	18
	30	50		26	22	18	14	7.6
8 hours/day	1	1500		1275	1190	1080	950	680
	2	750		620	560	500	420	300
	5	300		240	225	200	160	105
	10	150		110	94	78	64	42
	20	75		42	35	28	21	14
	30	50		22	18	15	10.5	6.7
12 hours/day	1	1500		1420	1280	1210	1120	820
	2	750		700	640	600	510	360
	5	300		230	215	180	140	100
	10	150		100	84	74	60	37
	20	75		40	33	26	19	11
24 hours/day	1	1500		1440	1250	1180	1040	700
	2	750		670	580	500	420	300
	5	300		220	200	160	130	90
	10	150		94	80	66	52	35
	20	75		37	30	25	19	11
	30	50		20	16	13	9	6.7
	50	30		10	8.5	6.8	4.8	2.8
4 hours/day (Radio Test)	37.5	40	23		19			
½ hour/day (Calculator Test)	125	12	6		4.5			
5 minutes/day (General-Purpose Intermittent Test—Flashlight)	375	4	130 minutes					
4 minutes/hour 8 hours/day 16 hours rest (Light-Industrial Flashlight Test)	375	4	90 minutes		68 minutes			

"EVEREADY" NO. 1015 CELL

Type: Carbon - Zinc
ANSI Designation: "AA"
Suggested Current Range: 0-25 milliamperes



Inches		Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.6 oz. (17 grams)
Volume .... 0.48 cubic inch (7.87 cubic centimeters)
Cell .... One No. 15 (ANSI "AA")

For service information see reverse side of this sheet

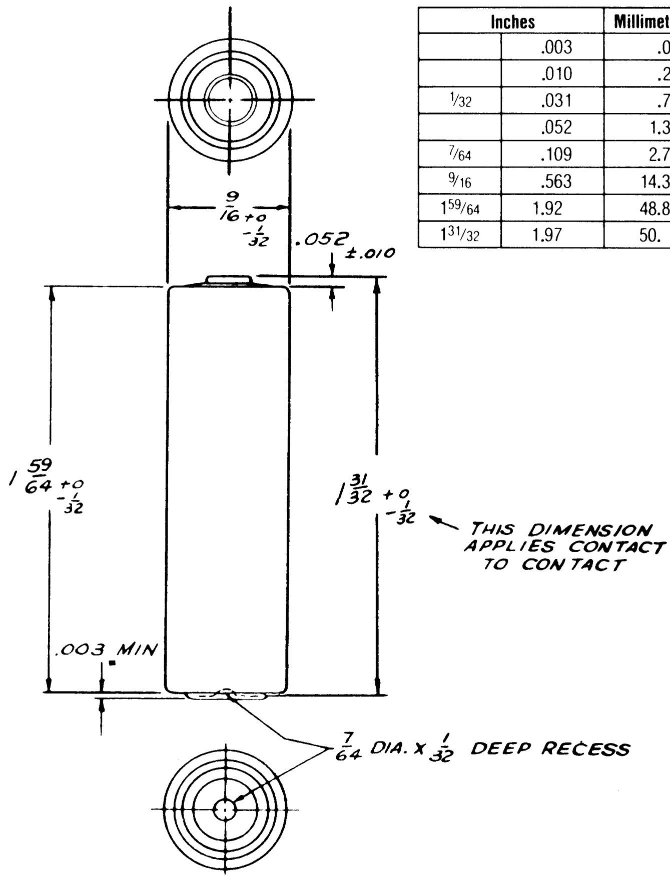
"EVEREADY" NO. 1015

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	5	300		290	285	275	270	250
	10	150		145	140	135	130	115
	20	75		72	68	64	60	49
	30	50		45	43	39	35	27
	50	30		25	22	19	16	12
	100	15		8.5	7	6	4	2.5
4 hours/day	5	300		295	280	270	260	240
	10	150		150	145	135	120	110
	20	75		70	64	60	52	40
	30	50		43	38	35	29	20
	50	30		18	16	14.5	12	8
8 hours/day	5	300		295	280	255	240	220
	10	150		150	135	120	110	100
	20	75		66	60	55	45	34
	30	50		40	32	28	23	17
12 hours/day	5	300		280	265	245	230	200
	10	150		150	135	120	100	90
	20	75		58	54	50	40	32
24 hours/day	5	300		270	255	230	210	185
	10	150		117	110	98	88	74
	20	75		49	45	40	34	28
	30	50		28	26	23	19	15.5
	50	30		14	13	11.5	9	7
	100	15		5	4.5	4	3	2.3
4 hours/day (Radio Test)	37.5	40	33		26			
4 hours/day (Radio Test)	60	25	14		9.5			
½ hour/day (Calculator Test)	125	12	8		7.3			
4 minutes on, 11 minutes off, Repeat for 8 consecutive hours/day (Camera Cranking Test)	250mA constant current					40 minutes		
5 minutes/day (General Purpose Intermittent Test—Flashlight)	375	4	210 minutes					
4 minutes/hour 8 hours/day 16 hours rest, (Light-Industrial Flashlight Test)	375	4	110 minutes		80 minutes			
Continuous (Toy Test)	375	4		27 minutes				

"EVEREADY" NO. 1215 CELL

Type: Carbon - Zinc (Zinc Chloride)
ANSI Designation: "AA"
Suggested Current Range: 0-25 milliamperes



Inches		Millimeters
	.003	.08
	.010	.25
1/32	.031	.79
	.052	1.32
7/64	.109	2.78
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50.

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.56 oz. (15.8 grams)
Volume .... 0.48 cubic inch (7.87 cubic centimeters)
Cell .... One No. 15 (ANSI "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. 1215

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.8V	0.9V	1.0V
4 hours/day (Radio Test)	37.5	40	33		31	
	60	25	20		18	
½ hour/day (Calculator Test)	125	12	8.6		7.7	
2 hour/day (Cassette Test)	187.5	8	5.8		4.9	
4 minutes on, 11 minutes off, 8 hours/day 16 hours rest (Camera Cranking Test)	250 mA constant current					118 minutes
5 minutes/day (General-Purpose Intermittent Test-Flashlight)	375	4	190 minutes			
4 minutes/hour 8 hours/day 16 hours rest (Light-Industrial Flashlight Test)	375	4	175 minutes		139 minutes	
Continuous (Toy Test)	375	4		110 minutes		

TEMPERATURE VS. SERVICE CAPACITY

For Following Conditions:

SCHEDULE: 4 minutes/hour
8 hours/day
16 hours rest
(Light-Industrial Flashlight Test)

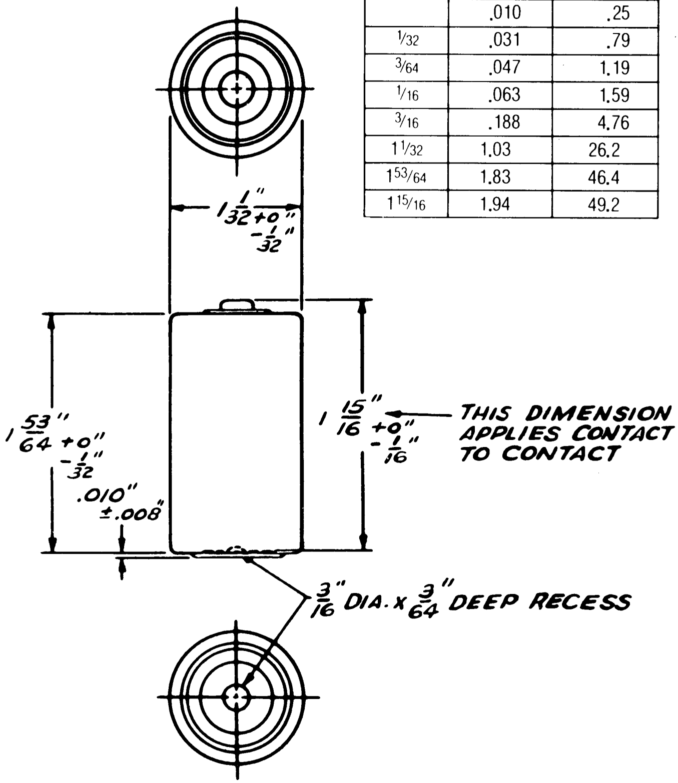
Starting Drain: 375 milliamperes
Load: 4 ohms
Cutoff: 0.9 volt

Temperature F	C	Percent of 70° F (21.1° C) Service
100	37.8	115
90	32.2	110
80	26.7	105
70	21.1	100
60	15.6	90
50	10.0	80
40	4.4	70
30	−1.1	60
20	−6.7	45
10	−12.2	30
0	−17.8	20

"EVEREADY" NO. T35 CELL

Type: Carbon - Zinc
ANSI Designation: "C"
Suggested Current Range: 0-1 milliampere

Inches		Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 1.4 oz. (39.7 grams)
Volume .... 1.52 cubic inches (24.9 cubic centimeters)
Cell .... One No. 35 (ANSI "C")

For service information see reverse side of this sheet

"EVEREADY" NO. T35

Estimated Average Service at 70°F (21.1°C)

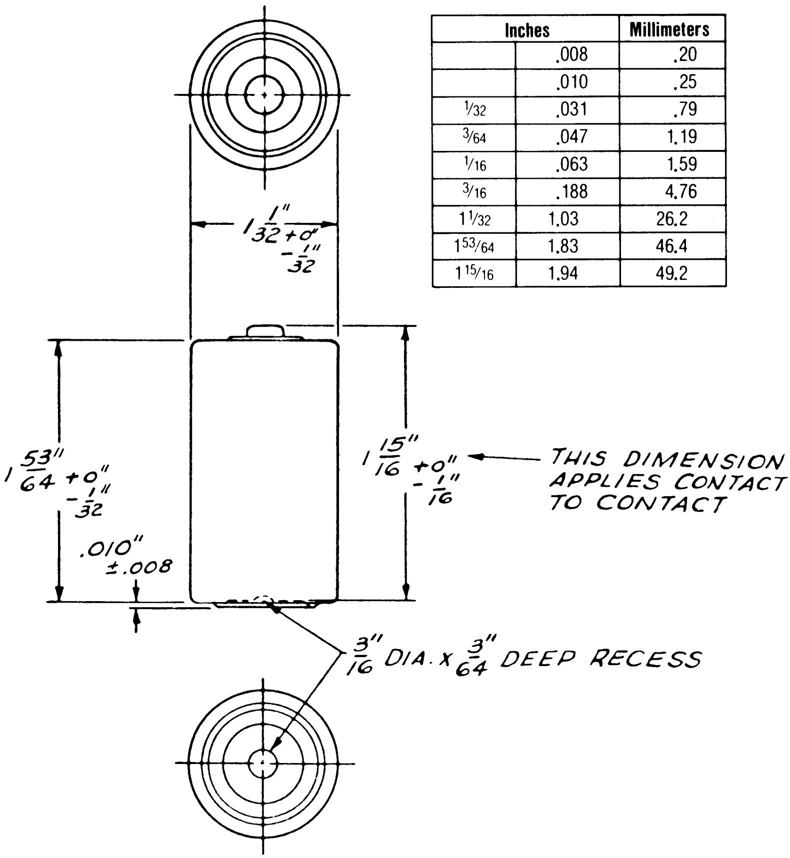
SCHEDULE	STARTING DRAINS	LOAD (ohms)	DAYS TO CUTOFF VOLTAGE 0.8V	0.9V	1.0V
24 hours/day (Simulated Clock Tests)	100 microamperes	15000		1100	
(Transistorized Movements)	400 microamperes	3750		375	
	1000 microamperes	1500	170	150	140
24 hours/day	9 milliamperes	166.7		420 hours	

"EVEREADY" NO. 835 CELL

1.5 VOLTS

Type: Carbon - Zinc
ANSI Designation: "C"
Suggested Current Range: 0-80 milliamperes

Inches		Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 1.4 oz. (39.7 grams)
Volume .... 1.52 cubic inches (24.9 cubic centimeters)
Cell .... One No. 35 (ANSI "C")

For service information see reverse side of this sheet

"EVEREADY" NO. 835

Estimated Average Service at 70°F (21.1°C)

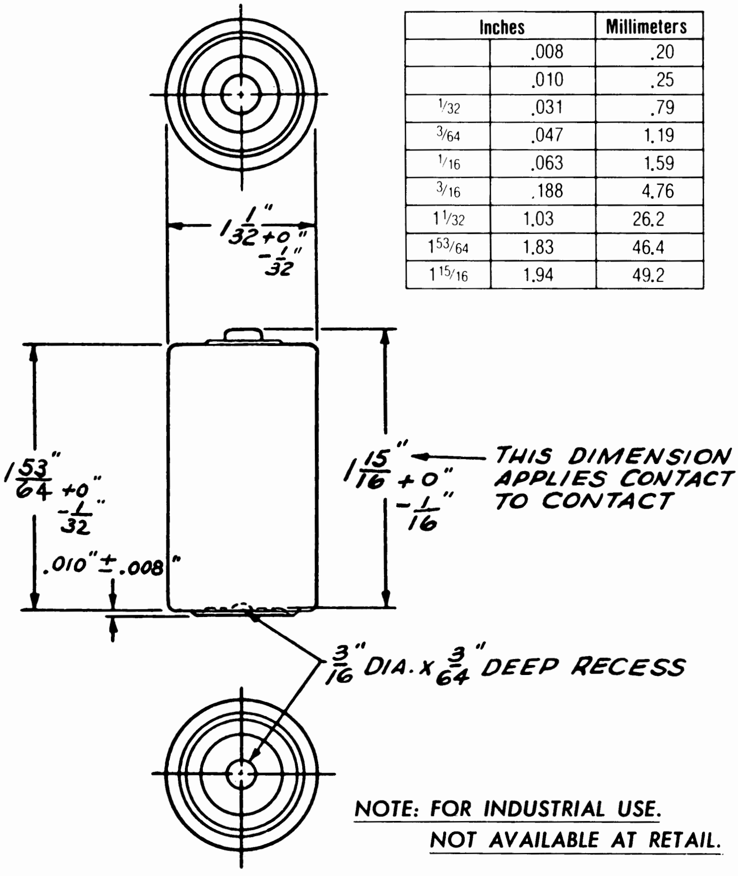
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.25V	CUTOFF VOLTAGE 0.9V
4 minutes/hour 8 hours/day 16 hours rest (Light-Industrial Flashlight Test)	375	4		125 minutes
Discharge for 1 second each minute for 1 hour at 24 hour intervals for 5 consecutive days per week (Photoflash Test)	0.15		1250 discharges	

"HERCULES" NO. HS35 INDUSTRIAL CELL

1.5 VOLTS

Type: Carbon - Zinc
ANSI Designation: "C"
Suggested Current Range: 0-80 milliamperes

	Inches	Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2



NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 1.5 oz. (41 grams)
Volume .... 1.52 cubic inches (24.9 cubic centimeters)
Cell .... One No. 35 (ANSI "C")

For service information see reverse side of this sheet

"HERCULES" NO. HS35

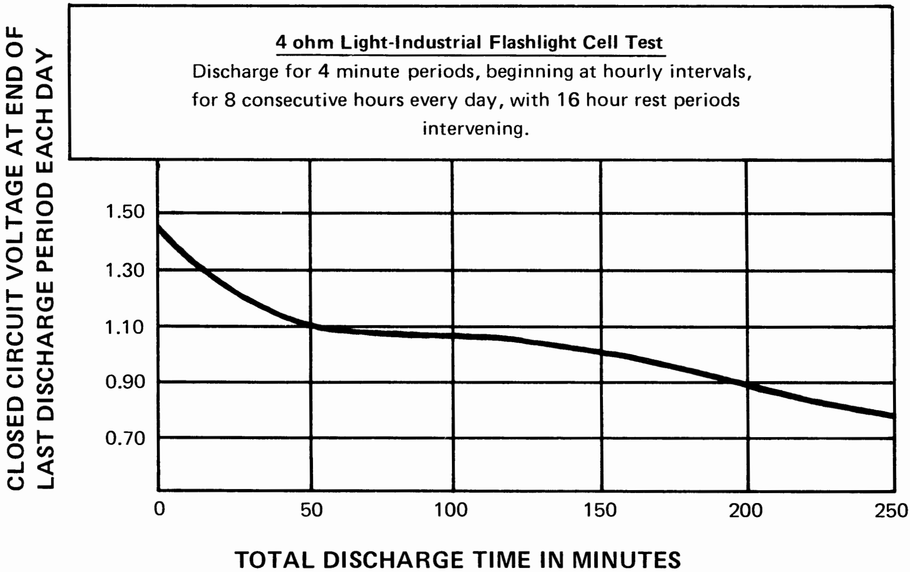
Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.7V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	2.5	600			900	850	800	740	680
	5	300			520	460	420	380	320
	10	150			275	250	220	190	140
	20	75			140	130	115	94	64
	30	50			100	86	74	60	40
	50	30			53	48	40	33	20
	100	15			23	20	17	13	7.8
	150	10	12		9	6.5	5	3	0.3
	200	7.5	8.1		6.2	3.7	3	1.1	0.2
	250	6	5		3.5	2	1.5		
4 hours/day	2.5	600			1200	1150	1100	950	820
	5	300			620	580	540	460	360
	10	150			310	280	240	210	150
	20	75			150	130	110	88	62
	30	50			96	80	68	52	33
	50	30			52	42	33	25	15
	100	15			20	14	10	7	3.5
12 hours/day	2.5	600			1300	1200	1100	1000	820
	5	300			650	600	550	480	390
	10	150			330	300	250	230	180
	20	75			160	125	110	80	60
	30	50			90	72	64	44	30
	50	30			48	38	28	18	11
	100	15			18	11	8	6	3.5
24 hours/day	2.5	600			1450	1300	1200	1000	800
	5	300			700	620	540	440	340
	10	150			320	270	220	170	130
	20	75			140	115	90	64	50
	30	50			82	68	50	35	26
	50	30			40	33	23	16.5	11
	100	15			14	11	8	6	3.5

SCHEDULE	STARTING DRAINS	LOAD (ohms)		
5 minutes/day (General-Purpose Intermittent-Flashlight)	375 milliamperes	4	400 minutes	
4 minutes/hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test)	375 milliamperes	4	250 minutes	190 minutes

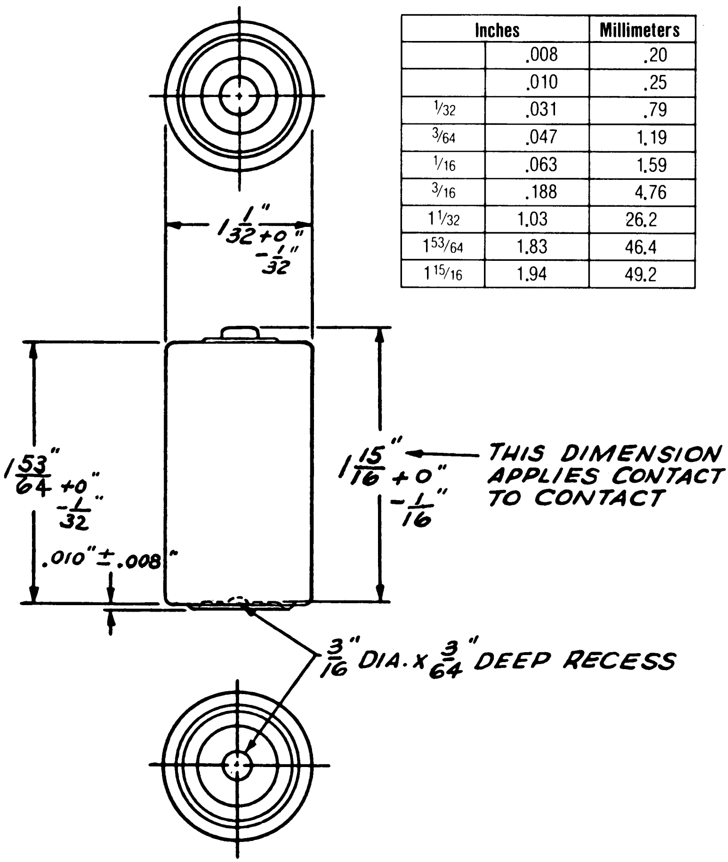
"HERCULES" NO. HS35

Estimated Average Service at 70°F (21.1°C)



"EVEREADY" NO. 935 CELL

Type: Carbon - Zinc
ANSI Designation: "C"
Suggested Current Range: 0-80 milliamperes



Inches		Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2

SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Flat Contacts
Average Weight .... 1.5 oz. (41 grams)
Volume .... 1.52 cubic inches (24.9 cubic centimeters)
Cell .... One No. 35 (ANSI "C")

For service information see reverse side of this sheet

"EVEREADY" NO. 935

Estimated Average Hours Service at 70°F (21.1°C)

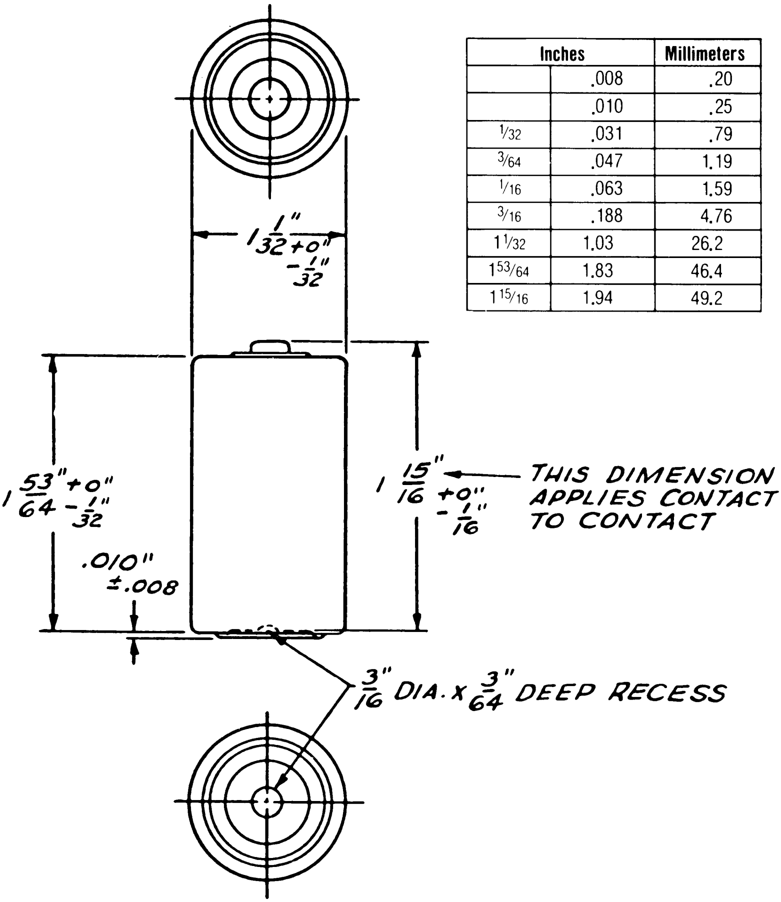
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.7V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	2.5	600			900	850	800	740	680
	5	300			520	460	420	380	320
	10	150			275	250	220	190	140
	20	75			140	130	115	94	64
	30	50			100	86	74	60	40
	50	30			53	48	40	33	20
	100	15			23	20	17	13	7.8
	150	10	12		9	6.5	5	3	0.3
	200	7.5	8.1		6.2	3.7	3	1.1	0.2
	250	6	5		3.5	2	1.5		
4 hours/day	2.5	600			1200	1150	1100	950	820
	5	300			620	580	540	460	360
	10	150			310	280	240	210	150
	20	75			150	130	110	88	62
	30	50			96	80	68	52	33
	50	30			52	42	33	25	15
	100	15			20	14	10	7	3.5
12 hours/day	2.5	600			1300	1200	1100	1000	820
	5	300			650	600	550	480	390
	10	150			330	300	250	230	180
	20	75			160	125	110	80	60
	30	50			90	72	64	44	30
	50	30			48	38	28	18	11
	100	15			18	11	8	6	3.5
24 hours/day	2.5	600			1450	1300	1200	1000	800
	5	300			700	620	540	440	340
	10	150			320	270	220	170	130
	20	75			140	115	90	64	50
	30	50			82	68	50	35	26
	50	30			40	33	23	16.5	11
	100	15			14	11	8	6	3.5

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)		DAYS 0.8V	0.9V	1.0V
24 hours/day (simulated clock tests) (Transistorized Movements)	250	6000		425	415	400
	500	3000		235	225	210
	1000	1500		130	120	110
4 hours/day (Radio Test)	37.5 milliamperes	40	73 hours		50 hours	
4 hours/day (Radio Test)	60 milliamperes	25	41 hours		26 hours	
2 hours/day (Cassette Test)	187.5 milliamperes	8	8.2 hours		5.2 hours	
½ hour/day (Calculator Test)	268 milliamperes	5.6	7.3 hours		6 hours	
5 minutes/day (General-Purpose Intermittent-Flashlight)	375 milliamperes	4	400 minutes			
4 minutes/hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test)	375 milliamperes	4	250 minutes		198 minutes	
Continuous (Toy Test)	375 milliamperes	4	95 minutes	86 minutes	60 minutes	

"EVEREADY" NO. 1035 CELL

Type: Carbon - Zinc
ANSI Designation: "C"
Suggested Current Range: 0-80 milliamperes

Inches		Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 1.4 oz. (39.7 grams)
Volume .... 1.52 cubic inches (24.9 cubic centimeters)
Cell .... One No. 35 (ANSI "C")

For service information see reverse side of this sheet

"EVEREADY" NO. 1035

Estimated Average Service at 70° F (21.1°)

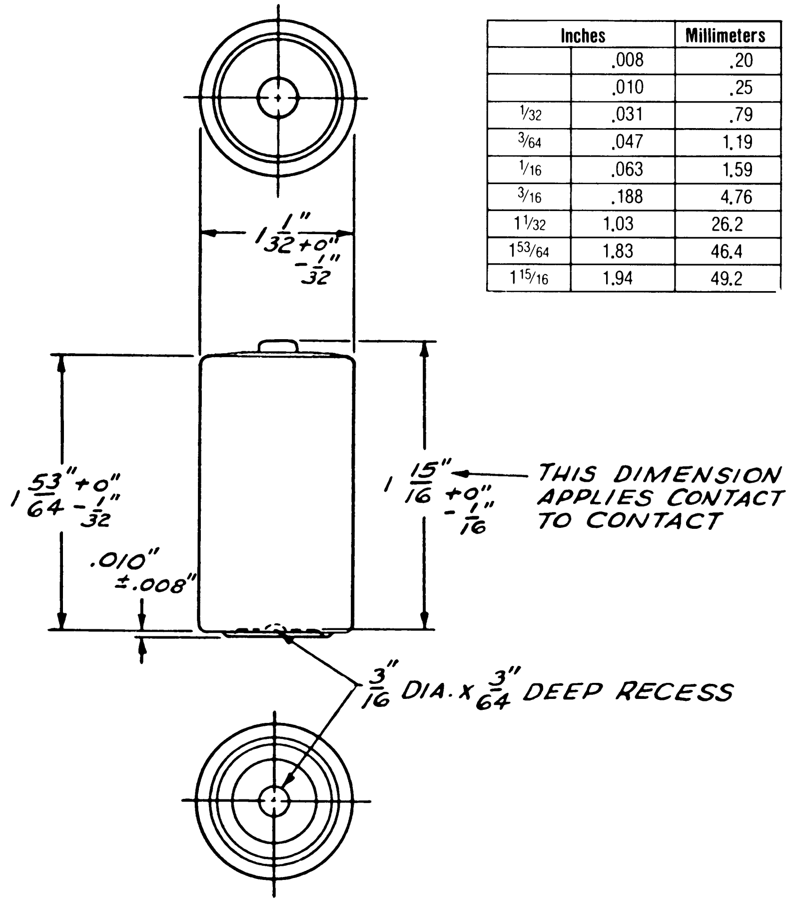
SIMULATED CLOCK DRAINS (TRANSISTORIZED MOVEMENTS)

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.9V	1.0V
24 hours/day	250	6000	420 days	405 days	390 days
	500	3000	255	245	235
	1000	1500	150	145	135

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.9V
4 hours/day	18	83.3	185 hours	175 hours
4 hours/day (Radio Test)	37.5	40	83	67
4 hours/day (Radio Test)	60	25	34	28
2 hours/day (Cassette Test)	187.5	8	6.7	5.4
½hour/day (Calculator Test)	268	5.6	7.9	6.2
4 minutes/hour 8 hours /day 16 hours rest (Light-Industrial Flashlight Test)	375	4	250 minutes	210 minutes

"EVEREADY" NO. 1235 CELL

Type: Carbon - Zinc (Zinc Chloride)
ANSI Designation: "C"
Suggested Current Range: 0-80 milliamperes



Inches		Millimeters
	.008	.20
	.010	.25
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
3/16	.188	4.76
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 15/16	1.94	49.2

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 1.6 oz. (45.6 grams)
Volume .... 1.52 cubic inches (24.9 cubic centimeters)
Cell .... One No. 35 (ANSI "C")

For service information see reverse side of this sheet

"EVEREADY" NO. 1235 CELL

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	CUTOFF VOLTAGE 0.8V	CUTOFF VOLTAGE 0.9V
4 hours/day (Radio Test)	37.5	40	97		91
4 hours/day (Radio Test)	60	25	59		55
2 hours/day (Cassette Test)	187.5	8	17		14.3
5 minutes/day (General-Purpose Intermittent Flashlight)	375	4	570 minutes		
4 minutes/hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test)	375	4	555 minutes		447 minutes
Continuous (Toy Test)	375	4		281 minutes	237 minutes

TEMPERATURE VS. SERVICE CAPACITY

For Following Conditions:

Schedule: 4 minutes/hour
8 hours/day
16 hours rest
(Light-Industrial Flashlight Test)

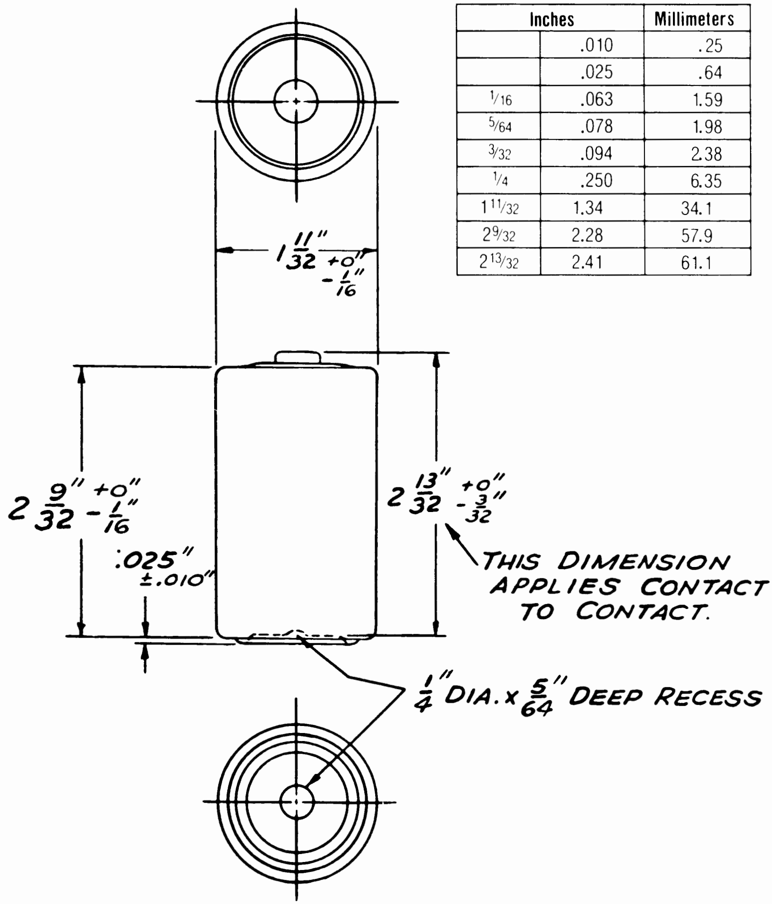
Starting Drain: 375 milliamperes
Load: 4 ohms
Cutoff: 0.9 volt

TEMPERATURE F	TEMPERATURE C	PER CENT OF 70° F (21.1° C) SERVICE
100	37.8	115
90	32.2	110
80	26.7	105
70	21.1	100
60	15.6	90
50	10.0	80
40	4.4	70
30	−1.1	60
20	−6.7	50
10	−12.2	40
0	−17.8	30

"EVEREADY" NO. T50 CELL

Type: Carbon - Zinc (Zinc Chloride)
ANSI Designation: "D"
Suggested Current Range: 0-1 milliampere

	Inches	Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 3.3 oz. (93.6 grams)
Volume .... 3.17 cubic inches (52 cubic centimeters)
Cell .... One No. 50 (ANSI "D")

For service information see reverse side of this sheet

"EVEREADY" NO. T50

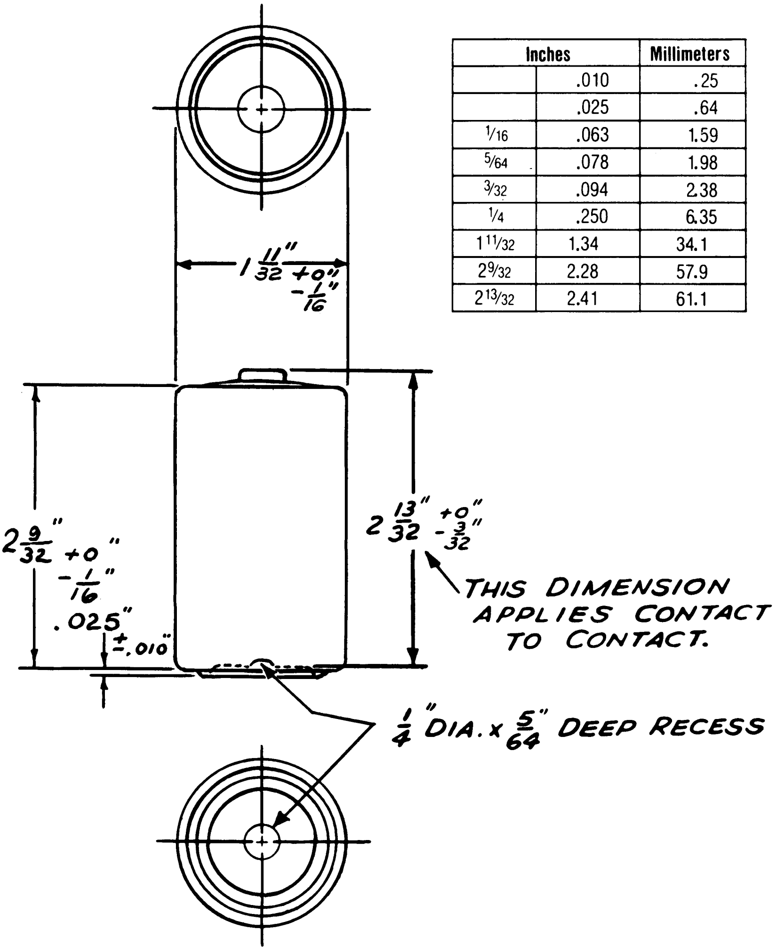
Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	DAYS TO CUTOFF VOLTAGE 0.8V	0.9V	1.0V
24 hours/day	250	6000	1360	1300	1230
(Simulated	500	3000	780	740	700
Clock Test)	1000	1500	400	390	380
(Transistorized Movements)					

24 hours/day	9 milliamperes	166.7	1100 hours

"EVEREADY" NO. 850 CELL

Type: Carbon - Zinc
ANSI Designation: "D"
Suggested Current Range: 0-150 milliamperes



Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 3.3 oz. (93.6 grams)
Volume .... 3.17 cubic inches (52 cubic centimeters)
Cell .... One No. 50 (ANSI "D")

For service information see reverse side of this sheet

"EVEREADY" NO. 850

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	LOAD	CUTOFF VOLTAGE 0.5V
Discharge 1 second each minute for 1 hour at 24 hour intervals for 5 consecutive days per week (Photoflash Test)	0.15 ohm	1150 discharges

"HERCULES" NO. HS50 INDUSTRIAL CELL

1.5 VOLTS

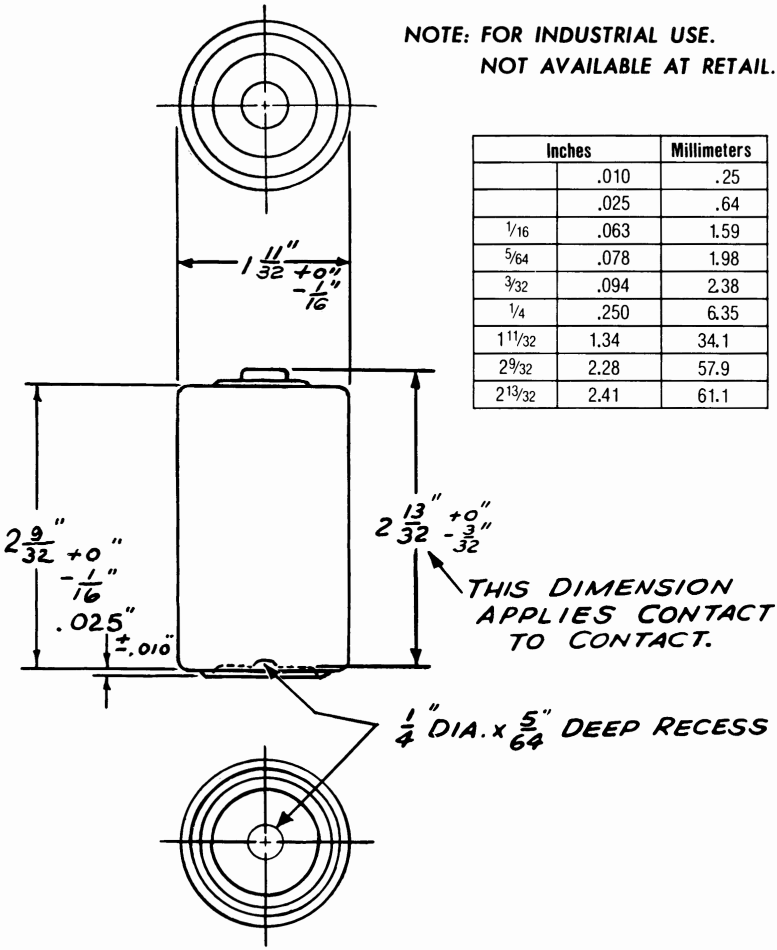
Type: Carbon - Zinc

ANSI Designation: "D"

Suggested Current Range: 0-150 milliamperes

NOTE: FOR INDUSTRIAL USE. NOT AVAILABLE AT RETAIL.

Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 3 oz. (85.1 grams)
Volume .... 3.19 cubic inches (52.3 cubic centimeters)
Cell .... One No. 50 (ANSI "D")

For service information see reverse side of this sheet

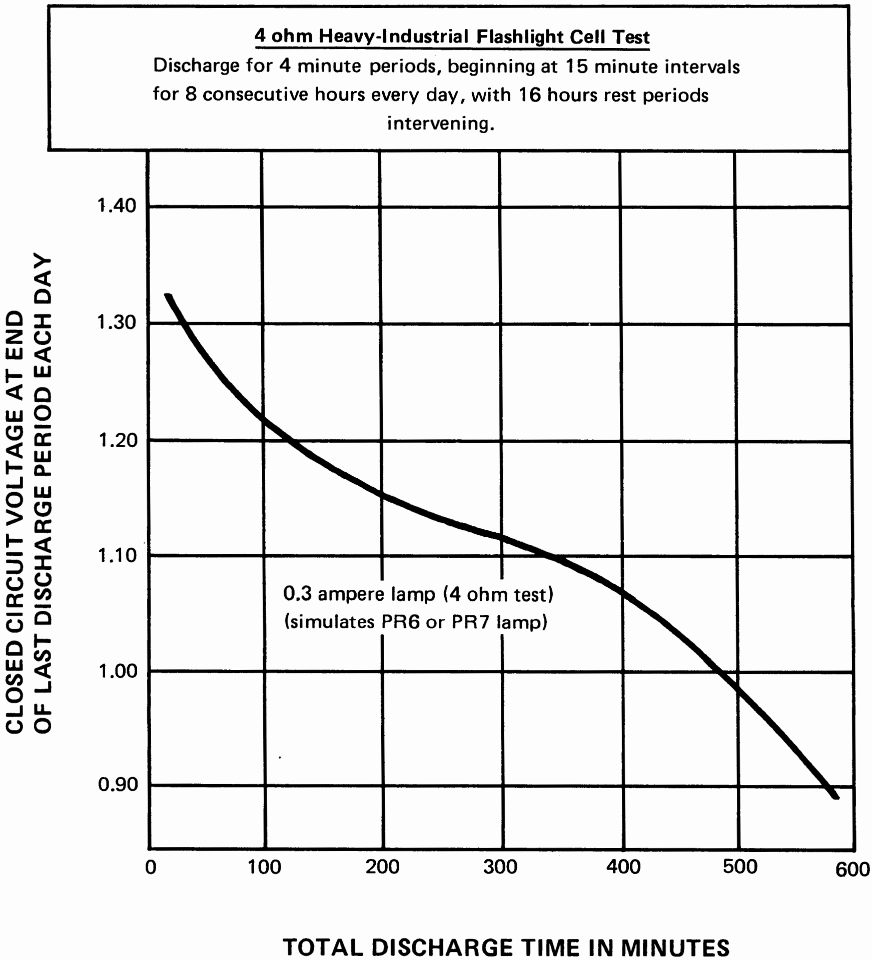
"HERCULES" NO. HS50

Estimated Average Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.75V	0.9V	1.1V
4 hours/day (Radio Test)	60	25		113 hours	100 hours	
4 minutes/hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test) (Simulates 300mA lamp)	375	4			825 minutes	540 minutes
4 minutes every 15 minutes, 8 hours/day, 16 hours rest (Heavy-Industrial Flashlight Test) Simulates 300mA lamp	375	4			570 minutes	350 minutes
4 minutes/hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test) Simulates 500mA lamp	667	2.25	485 minutes		390 minutes	
4 minutes every 15 minutes, 8 hours/day 16 hours rest (Heavy-Industrial Flashlight Test) Simulates 500mA lamp	667	2.25	260 minutes		190 minutes	

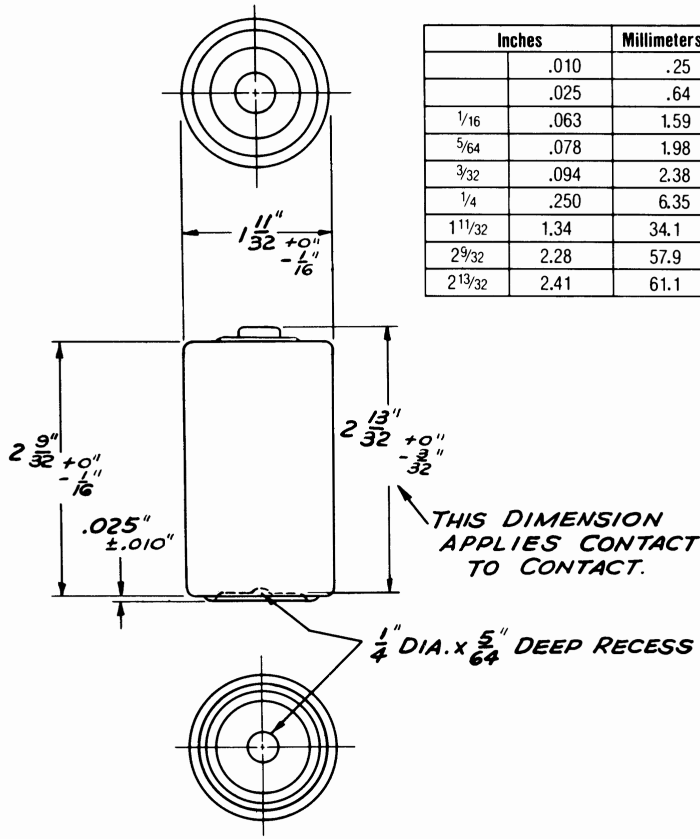
"HERCULES" NO. HS50

Estimated Average Service at 70°F (21.1°C)



"EVEREADY" NO. 950 CELL

Type: Carbon - Zinc
ANSI Designation: "D"
Suggested Current Range: 0-150 milliamperes



Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Flat Contacts
Average Weight .... 3 oz. (85.1 grams)
Volume .... 3.19 cubic inches (52.3 cubic centimeters)
Cell .... One No. 50 (ANSI "D")

For service information see reverse side of this sheet

"EVEREADY" NO. 950

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	10	150			525	500	475	450	430
	20	75			295	270	260	240	210
	30	50			210	185	175	155	135
	50	30			125	113	103	89	77
	100	15			57	50	45	35	29
	150	10			33	29	25	18.5	14
	200	7.5			21.5	18	15.5	11.5	8
	250	6			15	12	10	7.2	4.5
	300	5			11	8.5	7	5	2
4 hours/day	10	150			660	620	580	530	470
	20	75			330	310	290	260	230
	30	50			220	200	185	155	125
	50	30			123	108	96	81	64
	100	15			50	41	36	30	22
	200	7.5			18	13.5	12	9	5.2
	300	5			8	6	3.5	3	2
8 hours/day	10	150			700	660	620	560	460
	20	75			340	310	270	230	180
	30	50			210	180	150	130	100
	50	30			105	82	70	60	50
	100	15			39	28	23	18	13.5
24 hours/day	10	150			1050	745	600	500	370
	20	75			360	260	210	165	125
	30	50			200	145	115	88	65
	50	30			92	67	52	40	29
	100	15			32	24	18.5	13.5	9.6
	200	7.5			11.5	8.4	6.4	4.5	3.2
	300	5			6	4.5	3.5	3	2
4 hours/day (Radio Test)	60	25		107 hours		78 hours			
2 hours/day (Cassette Test)	187.5	8		25 hours		22 hours			
4 minutes/hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test) Simulates 300mA lamp	375	4				650 minutes		400 minutes	

"EVEREADY" NO. 950

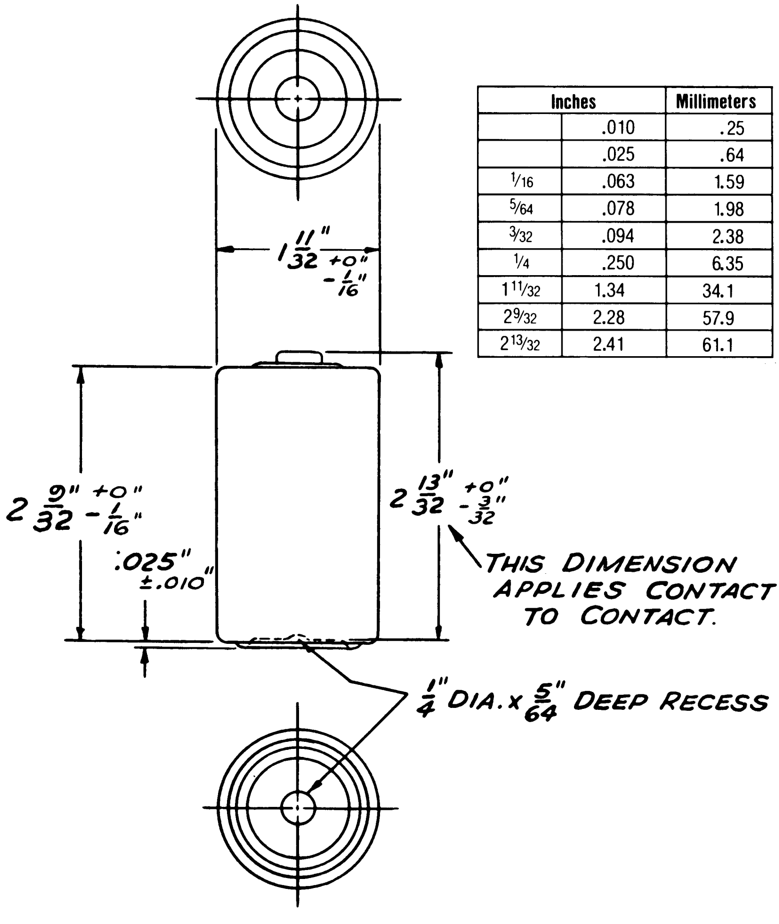
Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
4 minutes every 15 minutes, 8 hours/day 16 hours rest (Heavy-Industrial Flashlight Test) Simulates 300mA lamp	375	4				340 minutes		210 minutes	
5 minutes/day (General-Purpose Intermittent-Flashlight) Simulates 500mA lamp	667	2.25	500 minutes						
4 minutes hour, 8 hours/ day, 16 hours rest (Light-Industrial Flashlight Test) Simulates 500mA lamp	667	2.25	370 minutes			270 minutes			
4 minutes every 15 minutes, 8 hours/day, 16 hours rest (Heavy-Industrial Flashlight Test) Simulates 500mA lamp	667	2.25	230 minutes			110 minutes			
Continuous (Toy Test)	667	2.25			105 minutes				

"EVEREADY" NO. 1050 CELL

1.5 VOLTS

Type: Carbon - Zinc
ANSI Designation: "D"
Suggested Current Range: 0-150 milliamperes



Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 3 oz. (85.1 grams)
Volume .... 3.19 cubic inches (52.3 cubic centimeters)
Cell .... One No. 50 (ANSI "D")

For service information see reverse side of this sheet

"EVEREADY" NO. 1050

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.75V	0.8V	0.9V
4 hours/day	18	83.3		440 hours		400 hours
4 hours/day (Radio Test)	37.5	40		200		180
4 hours/day (Radio Test)	60	25		110		98
4 minutes/hour, 8 hours/day, 16 hours rest, (Light-Industrial Flashlight Test) (Simulates 500 mA Lamp)	667	2.25	500 minutes			325 minutes
Continuous	667	2.25			150 minutes	

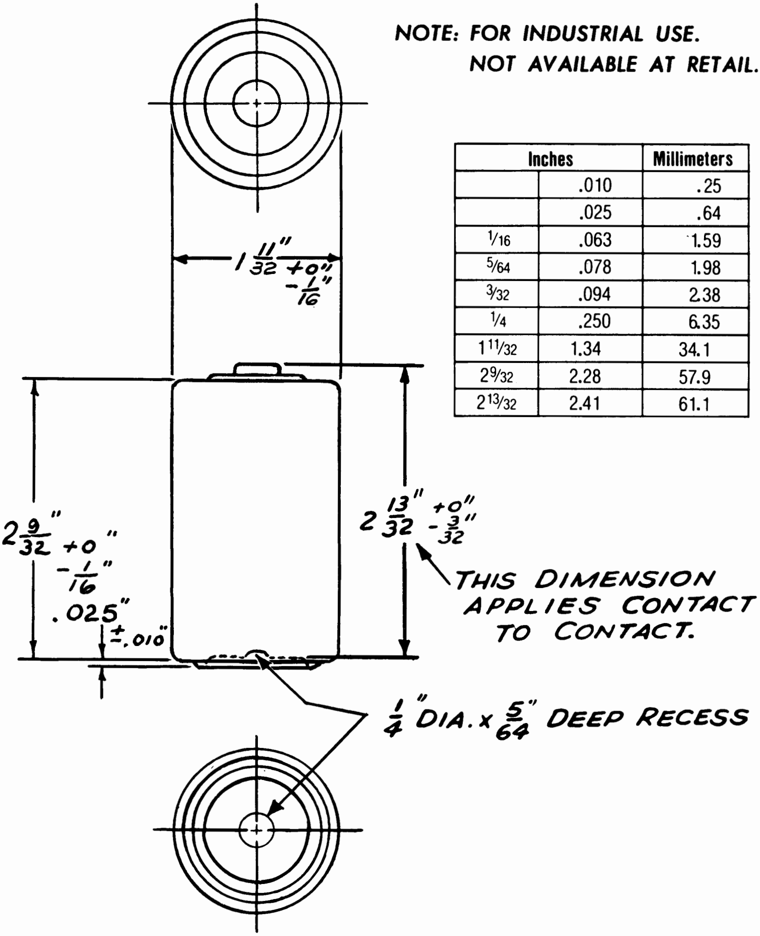
"HERCULES" NO. HS150 HEAVY DUTY INDUSTRIAL CELL

Type: Carbon - Zinc

ANSI Designation: "D"

Suggested Current Range: 0-150 milliamperes

NOTE: FOR INDUSTRIAL USE. NOT AVAILABLE AT RETAIL.



Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 3 oz. (85.1 grams)
Volume .... 3.19 cubic inches (52.3 cubic centimeters)
Cell .... One No. 50 (ANSI "D")

For service information see reverse side of this sheet

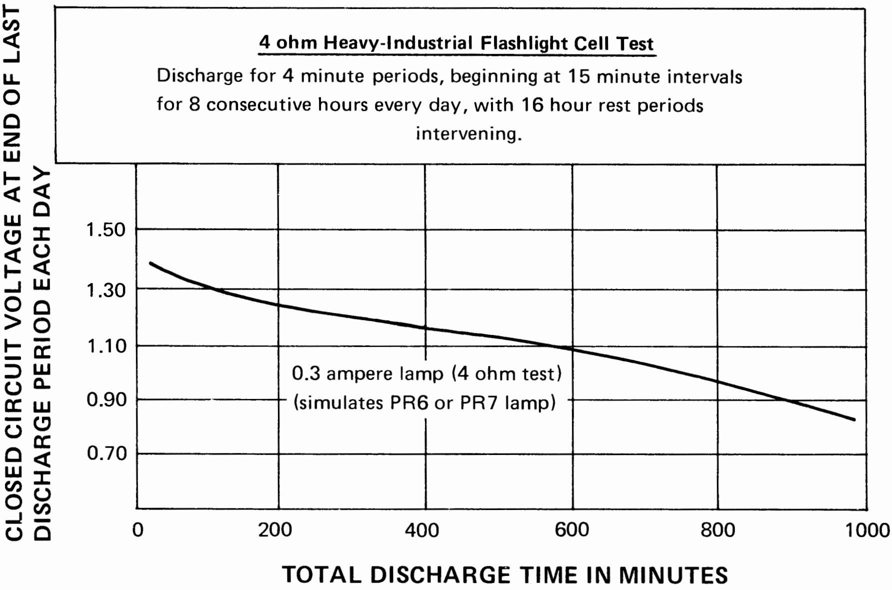
"HERCULES" NO. HS 150

Estimated Average Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.75V	0.9V	1.1V
4 minutes/ hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test) Simulates 300mA lamp	375	4			975 minutes	625 minutes
4 minutes every 15 minutes, 8 hours/day, 16 hours rest (Heavy-Industrial Flashlight Test) Simulates 300 mA lamp	375	4			890 minutes	565 minutes
4 minutes/hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test) Simulates 500 mA lamp	667	2.25	710 minutes		465 minutes	
4 minutes every 15 minutes, 8 hours/day, 16 hours rest (Heavy-Industrial Flashlight Test) Simulates 500 mA lamp	667	2.25	475 minutes		340 minutes	

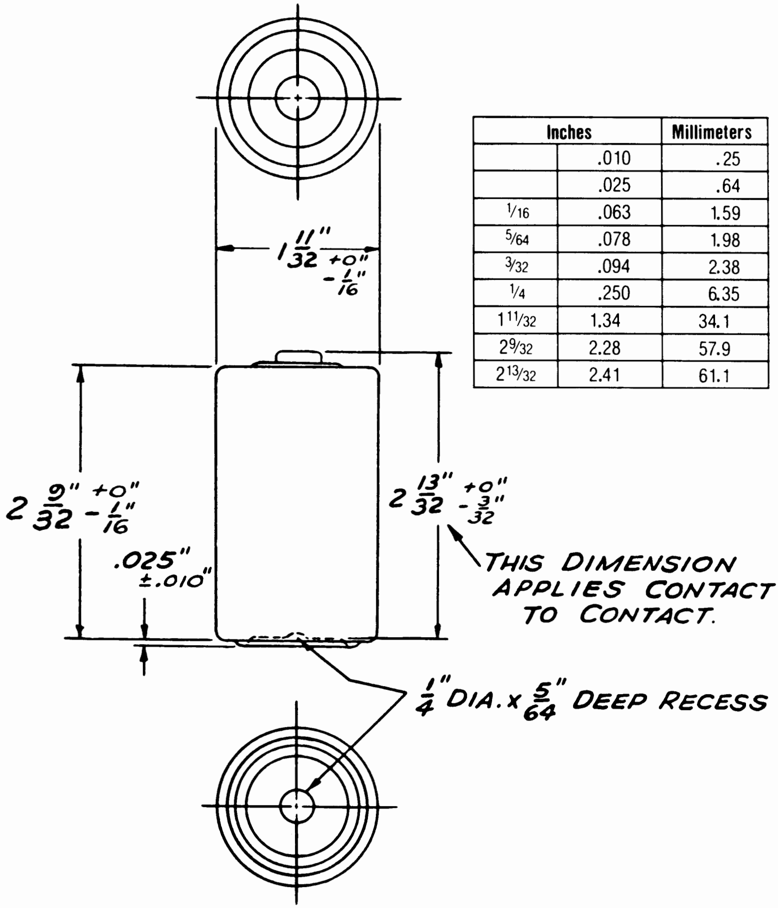
"HERCULES" NO. HS 150

Estimated Average Minutes Service at 70° F (21.1°C)



"EVEREADY" NO. 1150 CELL

Type: Carbon - Zinc
ANSI Designation: "D"
Suggested Current Range: 0-150 milliamperes



Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 3 oz. (85.1 grams)
Volume .... 3.19 cubic inches (52.3 cubic centimeters)
Cell .... One No. 50 (ANSI "D")

For service information see reverse side of this sheet

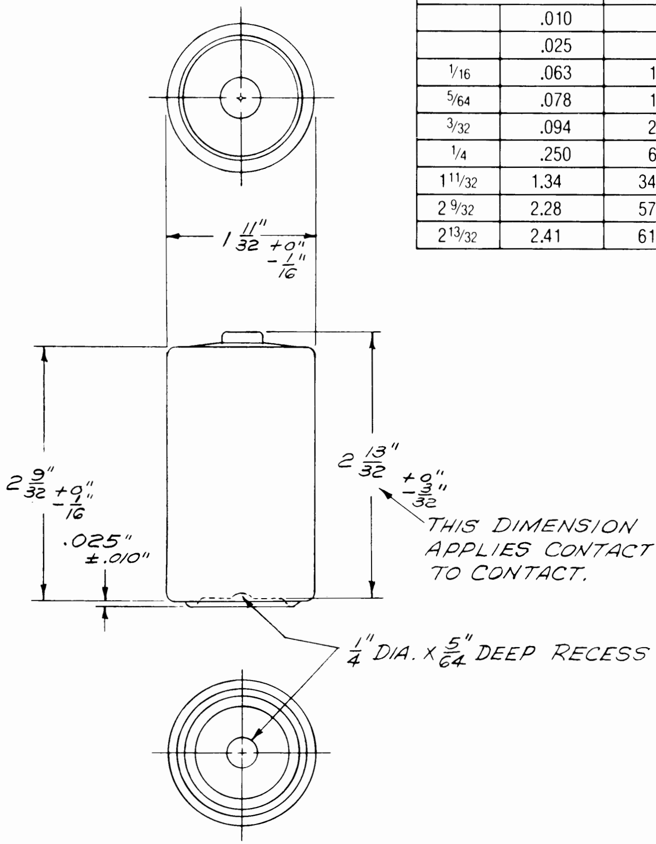
"EVEREADY" NO. 1150

Estimated Average Minutes Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.9V	1.1V
4 minutes/hour 8 hours/day, 16 hours rest, (Light-Industrial Flashlight Test) Simulates 300 mA Lamp	375	4		950	625
4 minutes every 15 minutes, 8 hours/ day, 16 hours rest, (Heavy-Industrial Flashlight Test) Simulates 300 mA Lamp	375	4		900	560
4 minutes/hour 8 hours/day, 16 hours rest, (Light-Industrial Flashlight Test) Simulates 500 mA Lamp	667	2.25	780	500	
4 minutes every 15 minutes, 8 hours/day, 16 hours rest, (Heavy-Industrial Flashlight Test) Simulates 500 mA Lamp	667	2.25	575	400	

"EVEREADY" NO. 1250 CELL

Type: Carbon - Zinc (Zinc Chloride)
ANSI Designation: "D"
Suggested Current Range: 0-150 milliamperes



Inches		Millimeters
	.010	.25
	.025	.64
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
1/4	.250	6.35
1 11/32	1.34	34.1
2 9/32	2.28	57.9
2 13/32	2.41	61.1

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 3.3 oz. (93.6 grams)
Volume .... 3.17 cubic inches (52 cubic centimeters)
Cell .... One No. 50 (ANSI "D")

For service information see reverse side of this sheet

"EVEREADY" NO. 1250

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.75V	0.8V	0.9V	1.1V
4 hours/day (Radio Test)	60	25		139 hours		128 hours	
2 hours/day (Cassette Test)	187.5	8		42 hours		37 hours	
4 minutes every 15 minutes, 8 hours/day, 16 hours rest (Heavy-Industrial Flashlight Test) Simulates 300mA lamp	375	4				961 minutes	580 minutes
4 minutes/hour, 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test) Simulates 500mA lamp	667	2.25	739 minutes			502 minutes	
Continuous (Toy Test)	667	2.25			319 minutes	249 minutes	

"EVEREADY" NO. 1250

Temperature vs. Service Capacity

For Following Conditions:

Schedule: 4 minutes/hour
8 hours/day
16 hours rest
(Light-Industrial Flashlight Test)

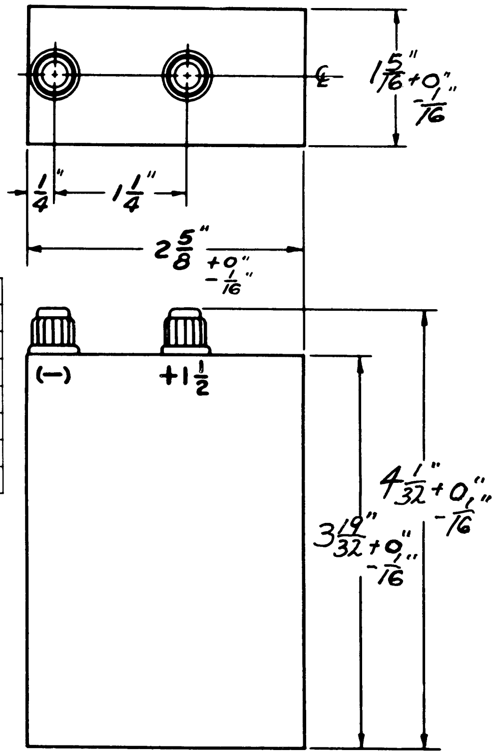
Starting Drain: 667 milliamperes
Load: 2.25 ohms
Cutoff: 0.9V

Temperature F	Temperature C	Per Cent of 70°F (21.1°C) Service
100	37.8	115
90	32.2	110
80	26.7	105
70	21.1	100
60	15.6	95
50	10	90
40	4.4	85
30	−1.1	80
20	−6.7	70
10	−12.2	60
0	−17.8	45

"EVEREADY" NO. 711 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-500 milliamperes

Inches		Millimeters
1/16	.063	1.59
1/4	.250	6.35
1 1/4	1.25	31.8
1 5/16	1.31	33.3
2 5/8	2.63	66.7
3 19/32	3.59	91.3
4 1/32	4.03	102.



TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS

SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Knurled Nut & Screw
Average Weight .... 12 oz. (340 grams)
Volume .... 12.4 cubic inches (203 cubic centimeters)
Cells .... Two No. 60 (ANSI "F") in parallel

For service information see reverse side of this sheet

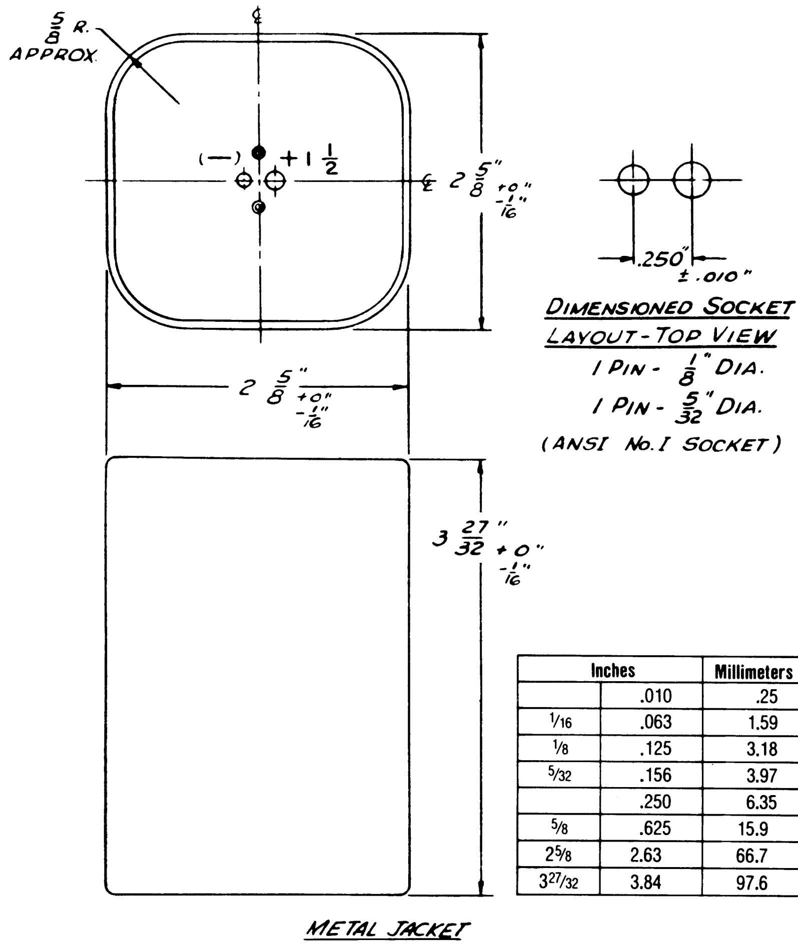
"EVEREADY" NO. 711

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (amperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.3V	0.8V	0.9V
4 hours/day	0.3	5			75
8 hours/day (Glo-Plug Ignition)	1.0	1.5	35		
5 minutes on, 15 minutes off— 8 hours/day (Glo-Plug Ignition)	1.14	1.32		21	

"EVEREADY" NO. 742 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0–1 ampere



Inches		Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
	.250	6.35
5/8	.625	15.9
2 5/8	2.63	66.7
3 27/32	3.84	97.6

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Socket
Average Weight .... 1 lb. 6 oz. (624 grams)
Volume .... 26.5 cubic inches (434 cubic centimeters)
Cells .... Four No. 60 (ANSI "F") in parallel
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet.

"EVEREADY" NO. 742

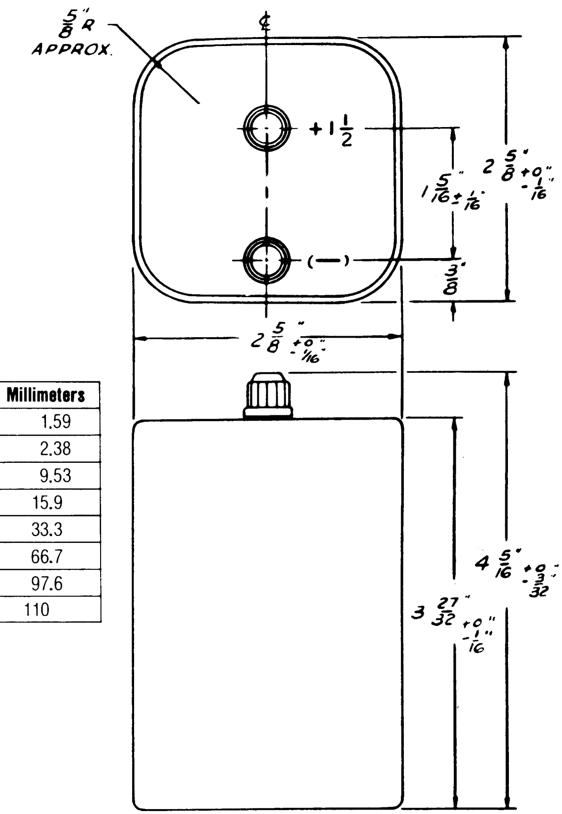
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	80	18.75	490	450	410	370	310
	120	12.5	340	310	280	250	200
	400	3.75	98	88	78	68	47
	800	1.88	41	37	33	27	16
	1200	1.25	23	20.5	18	13.8	6.8
4 hours/day	80	18.75	475	425	400	335	300
	120	12.5	320	275	260	235	180
	400	3.75	90	75	56	44	36
	800	1.88	35	28	22	16	12
	1200	1.25	19	15	12.3	8.5	4
24 hours/day	40	37.5	1200	1050	940	880	620
	80	18.75	550	470	390	335	260
	120	12.5	350	275	250	220	155
	400	3.75	84	70	55	40	25
	800	1.88	33	26	20	13	8
	1200	1.25	18	14	10.5	6.5	4

4 hours/day	300	5		130	105	85	

"EVEREADY" NO. 735 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0–1 ampere



Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
3/8	.375	9.53
5/8	.625	15.9
1 5/16	1.31	33.3
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 5/16	4.31	110

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Knurled Nut & Screw
Average Weight .... 1 lb. 7 oz. (652 grams)
Volume .... 26.5 cubic inches (434 cubic centimeters)
Cells .... Four No. 60 (ANSI "F") in parallel
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet.

"EVEREADY" NO. 735

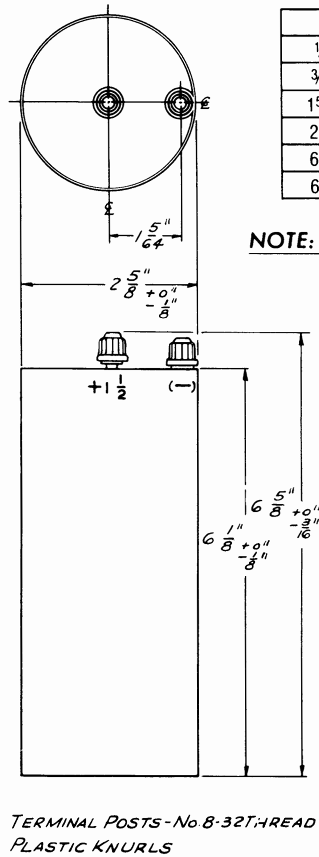
Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (amperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.85V	0.9V	0.93V
Discharge for 10 periods of 4 minutes each, beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	0.225	6.67				150 days
2 hours/day	0.562	2.67		72 hours		
5 minutes on, 15 minutes off— 8 hours/day (Glo-Plug Ignition)	1.14	1.32	32 hours		28 hours	

"EVEREADY" NO. HS6 INDUSTRIAL DRY CELL

1.5 VOLTS

Type: Carbon - Zinc
ANSI Designation: "6"
Suggested Current Range: 0-1.5 amperes



Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
1 5/64	1.08	27.4
2 5/8	2.63	66.7
6 1/8	6.13	156.
6 5/8	6.63	168.

NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.

SPECIFICATIONS

Voltage Taps .... —, + 1.5
Terminals .... Knurled Nut & Screw
Average Weight .... 2 lbs. (907 grams)
Volume .... 29.3 cubic inches (480 cubic centimeters)
Cell .... One No. 6 (ANSI "6")

For service information see reverse side of this sheet

"EVEREADY" NO. HS6

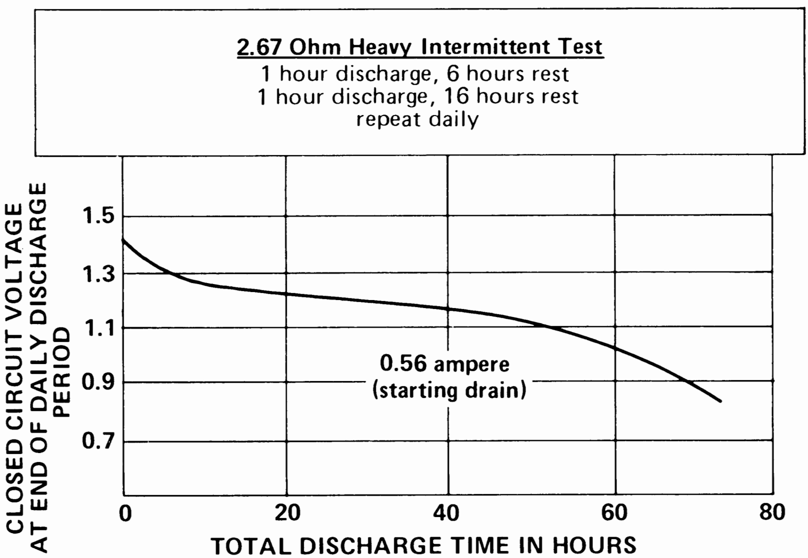
Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	60	25	651	641	610	591	565
	70	21.4	590	580	540	520	475
	80	18.75	540	530	480	460	410
	100	15	460	450	400	370	320
	200	7.5	265	250	210	185	135
	300	5	176	157	133	112	76
	400	3.75	130	110	94	74	48
	600	2.5	75	64	54	37	20
4 hours/day	60	25	817	760	713	665	540
	70	21.4	720	660	600	550	450
	80	18.75	640	580	520	480	390
	100	15	530	470	410	370	300
	200	7.5	275	230	185	160	115
	300	5	166	143	114	92	63
	400	3.75	125	100	78	60	40
	600	2.5	68	55	43	32	20
8 hours/day	20	75	2300	2250	2150	2050	2000
	40	37.5	1300	1250	1200	1100	1000
	60	25	950	890	817	722	627
	70	21.4	820	760	700	620	525
	80	18.75	720	680	620	530	450
	100	15	590	540	490	415	330
	200	7.5	290	260	225	180	120
	300	5	176	157	128	100	60
	400	3.75	114	98	82	60	34
	600	2.5	50	44	35	25	11
24 hours/day	10	150	5100	5000	4800	4600	4300
	20	75	3000	2800	2700	2500	2250
	40	37.5	1550	1450	1350	1200	960
	60	25	1078	980	868	726	566
	70	21.4	850	780	700	580	440
	80	18.75	720	660	600	480	350
	100	15	550	500	450	350	260
	200	7.5	210	190	170	125	74
	300	5	114	99	90	66	35
	400	3.75	74	65	55	40	20
	600	2.5	39	33	29	20	9

"EVEREADY" NO. HS6

Estimated Average Service at 70°F (21.1°C)

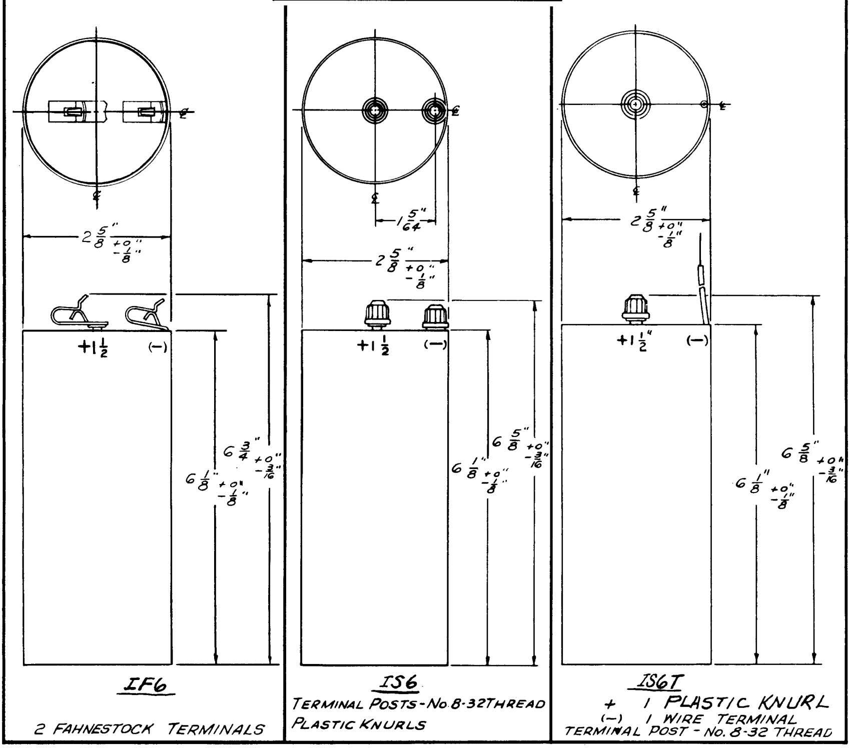
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	CUTOFF VOLTAGE 0.93V	CUTOFF VOLTAGE 1.08V
24 hours/day	5	300	340 days		
Discharge for 10 periods of 4 minutes each beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes.) (Light Intermittent Test)	90	16.67			420 days
as above	225	6.67		250 days	
1 hour discharge, 6 hours rest, 1 hour discharge, 16 hours rest (Heavy Intermittent Test)	562	2.67	70 hours		



"EVEREADY" NO. IF6 CELL (Two Fahnestock terminals)
IS6 CELL (Two screw terminals)
IS6T CELL (One plastic knurl one wire terminal)

Type: Carbon - Zinc
ANSI Designation: "6"
Suggested Current Range: 0-1.5 amperes

Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
1 5/64	1.08	27.4
2 5/8	2.63	66.7
6 1/8	6.13	156.
6 5/8	6.63	168.
6 3/4	6.75	172.



SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Two Fahnestock or two knurled nut & screw or one plastic knurl & one wire terminal
Average Weight .... 2 lbs. (907 grams)
Volume .... 29.3 cubic inches (480 cubic centimeters)
Cell .... One No. 6 (ANSI "6")

For service information see reverse side of this sheet

"EVEREADY" NOS. IF6, IS6 & IS6T

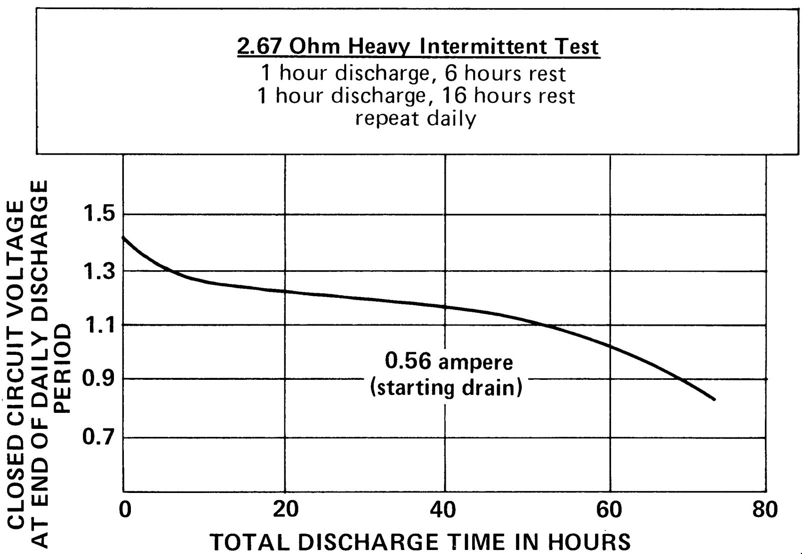
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.9V	1.0V	1.1V	1.2V
2 hours/day	60	25	651	641	610	591	565
	70	21.4	590	580	540	520	475
	80	18.75	540	530	480	460	410
	100	15	460	450	400	370	320
	200	7.5	265	250	210	185	135
	300	5	176	157	133	112	76
	400	3.75	130	110	94	74	48
	600	2.5	75	64	54	37	20
4 hours/day	60	25	817	760	713	665	540
	70	21.4	720	660	600	550	450
	80	18.75	640	580	520	480	390
	100	15	530	470	410	370	300
	200	7.5	275	230	185	160	115
	300	5	166	143	114	92	63
	400	3.75	125	100	78	60	40
	600	2.5	68	55	43	32	20
8 hours/day	20	75	2300	2250	2150	2050	2000
	40	37.5	1300	1250	1200	1100	1000
	60	25	950	890	817	722	627
	70	21.4	820	760	700	620	525
	80	18.75	720	680	620	530	450
	100	15	590	540	490	415	330
	200	7.5	290	260	225	180	120
	300	5	176	157	128	100	60
	400	3.75	114	98	82	60	34
	600	2.5	50	44	35	25	11
24 hours/day	10	150	5100	5000	4800	4600	4300
	20	75	3000	2800	2700	2500	2250
	40	37.5	1550	1450	1350	1200	960
	60	25	1078	980	868	726	566
	70	21.4	850	780	700	580	440
	80	18.75	720	660	600	480	350
	100	15	550	500	450	350	260
	200	7.5	210	190	170	125	74
	300	5	114	99	90	66	35
	400	3.75	74	65	55	40	20
	600	2.5	39	33	29	20	9

"EVEREADY" NOS. IF6, IS6 & IS6T

Estimated Average Service at 70° F (21.1° C)

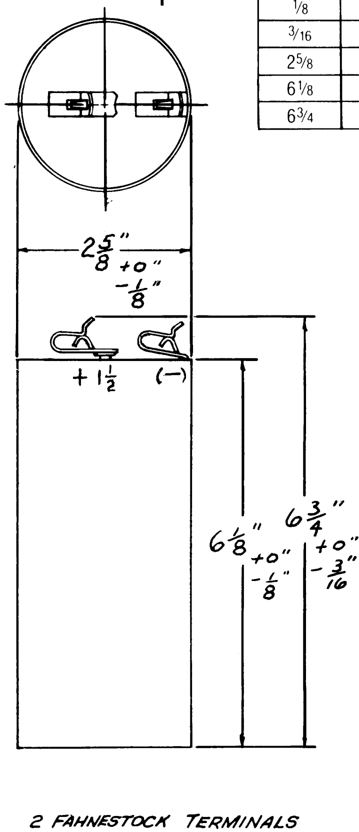
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	0.93V	1.08V
24 hours/day	5	300	340 days		
Discharge for 10 periods of 4 minutes each beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes.) (Light Intermittent Test)	90	16.67			420 days
as above	225	6.67		250 days	
1 hour discharge, 6 hours rest, 1 hour discharge, 16 hours rest (Heavy Intermittent Test)	562	2.67	70 hours		



"EVEREADY" NO. EA6F CELL

Type: Carbon - Zinc
ANSI Designation: "6"
Suggested Current Range: 0-1.5 amperes

Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
2 5/8	2.63	66.7
6 1/8	6.13	156.
6 3/4	6.75	172.



SPECIFICATIONS

Voltage Taps .... —, + 1.5
Terminals .... Two Fahnestock terminals
Average Weight .... 2 lbs. 2 oz. (964 grams)
Volume .... 29.3 cubic inches (480 cubic centimeters)
Cell .... One No. 6 (ANSI "6")

For service information see reverse side of this sheet

"EVEREADY" NO. EA6F

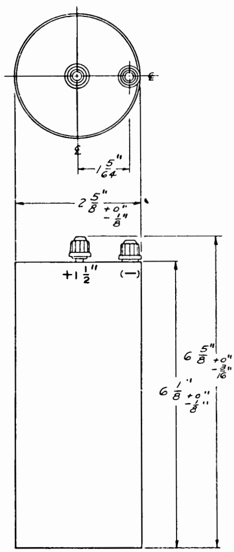
Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE .85V	0.9V	0.93V	1.08V
24 hours/day	5	300		450 days		
Discharge for 10 periods of 4 minutes each beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	90	16.67				650 days
6 hours/day	120	12.5		340 hours		
Discharge for 10 periods of 4 minutes each beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	225	6.67			350 days	
1 hour discharge 6 hours rest 1 hour discharge 16 hours rest (Heavy Intermittent Test)	562	2.67	45 hours			

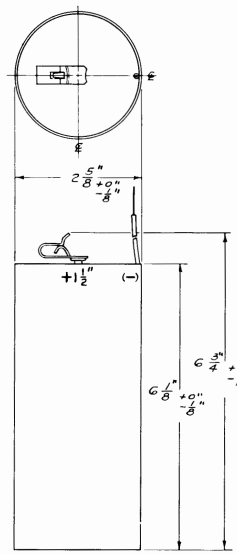
"EVEREADY" NO. EA6 CELL (Two screw terminals)
EA6FT CELL (One Fahnestock terminal, one wire terminal)
EA6ST CELL (One plastic knurl, one wire terminal)

Type: Carbon-Zinc
ANSI Designation: 6"
Suggested Current Range: 0-1.5 amperes

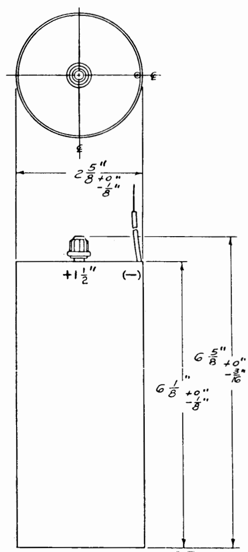
Inches		Millimeters
1/8	.125	3.18
3/16	.188	4.76
1 5/64	1.08	27.4
2 5/8	2.63	66.7
6 1/8	6.13	156
6 5/8	6.63	168
6 3/4	6.75	172



EA6
No. 6 Alarm Cell
2 Plastic Knurls
Terminal Posts -
No. 8-32 Thread



EA6FT
No. 6 Alarm Cell
+ 1 Fahnestock
(−) 1 Wire Terminal



EA6ST
No. 6 Alarm Cell
+1 Plastic Knurl
(−) 1 Wire Terminal
Terminal Post - No. 8-32 Thread

SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals ....Two plastic knurl screw terminals or
One Fahnestock and one wire or one plastic knurl and one wire
Average Weight... 2 lbs. 2 oz. (964 grams)
Volume .... 29.3 cubic inches (480 cubic centimeters)
Cells .... One No. 6 (ANSI "6")

For service information see reverse side of this sheet

"EVEREADY" NOS. EA6, EA6FT & EA6ST

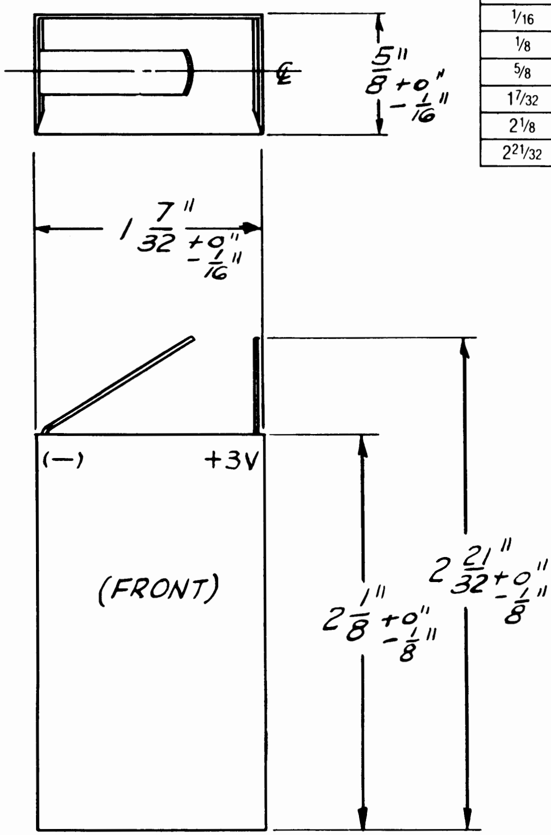
Estimated Average Service at 70 °F (21.1 °C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE .85V	0.9V	0.93V	1.08V
24 hours/day	5	300		450 days		
Discharge for 10 periods of 4 minutes each beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	90	16.67				650 days
6 hours/day	120	12.5		340 hours		
Discharge for 10 periods of 4 minutes each beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	225	6.67			350 days	
1 hour discharge 6 hours rest 1 hour discharge 16 hours rest (Heavy Intermittent Test)	562	2.67	45 hours			

"EVEREADY" NO. 750 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-25 milliamperes

Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
5/8	.625	15.9
1 7/32	1.22	31
2 1/8	2.13	54
2 21/32	2.66	67.5



SPECIFICATIONS

Voltage Taps .... −, + 3
Terminals .... Spring
Average Weight .... 2 oz. (56.7 grams)
Voltage .... 1.62 cubic inches (26.6 cubic centimeters)
Cells .... Two No. 15 (ANSI "AA") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 750

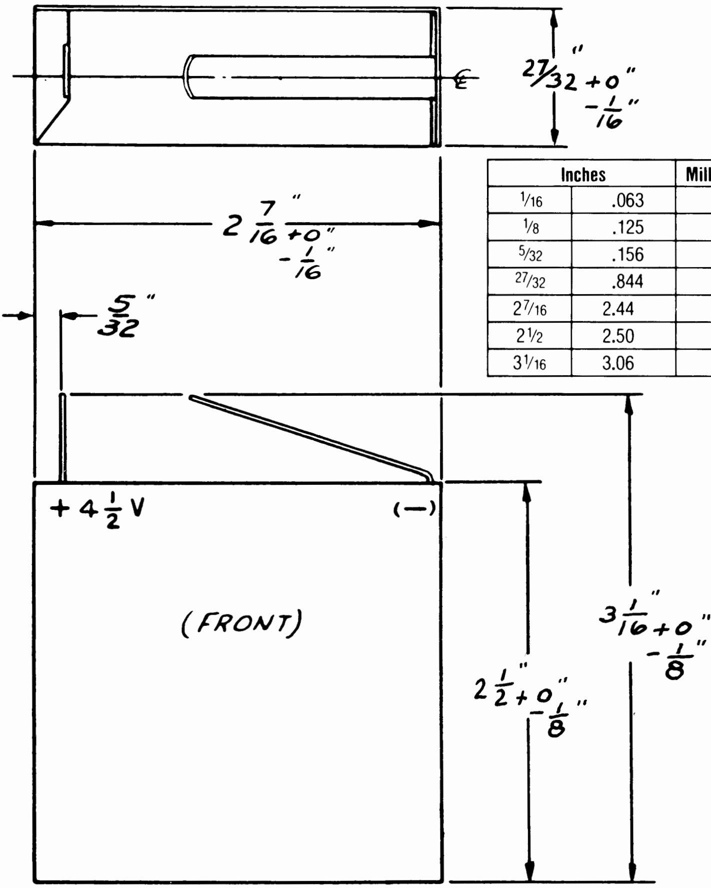
Estimated Average Hours Service at 70^{o} F (21.1^{o} C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.6V	1.8V	2.0V	2.2V	2.4V
2 hours/day	5	600	265	255	240	210	145
	10	300	125	120	110	92	60
	20	150	54	50	46	36	22
	30	100	32	28	25	20	11
	50	60	14	12	10	8	3.8
4 hours/day	5	600	260	250	230	200	130
	10	300	120	110	98	84	54
	20	150	48	43	37	30	18
	30	100	26	22	18	14	7.6
8 hours/day	1	3000	1275	1190	1080	950	680
	2	1500	620	560	500	420	300
	5	600	240	225	200	160	105
	10	300	110	94	78	64	42
	20	150	42	35	28	21	14
	30	100	22	18	15	10.5	6.7
12 hours/day	1	3000	1420	1280	1210	1120	820
	2	1500	700	640	600	510	360
	5	600	230	215	180	140	100
	10	300	100	84	74	60	37
	20	150	40	33	26	19	11
24 hours/day	1	3000	1440	1250	1180	1040	700
	2	1500	670	580	500	420	300
	5	600	220	200	160	130	90
	10	300	94	80	66	52	35
	20	150	37	30	25	19	11
	30	100	20	16	13	9	6.7
	50	60	10	8.5	6.8	4.8	2.8

"EVEREADY" NO. 703 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-50 milliamperes



Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
27/32	.844	21.4
2 7/16	2.44	61.9
2 1/2	2.50	63.5
3 1/16	3.06	77.8

SPECIFICATIONS

Voltage Taps .... −, + 4.5

Terminals .... Spring

Average Weight .... 5 oz. (142 grams)

Volume .... 5.1 cubic inches (83.6 cubic centimeters)

Cells .... Three No. 30 (ANSI "B") in series

For service information see reverse side of this sheet

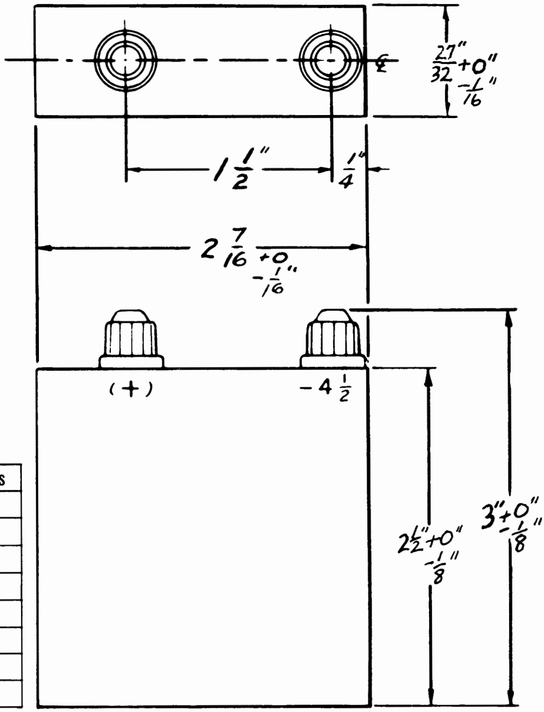
"EVEREADY" NO. 703

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.25V	2.4V	2.7V	3.0V	3.3V	3.6V
2 hours/day	5	900		420	380	340	290	250
	10	450		220	190	155	130	107
	20	225		110	90	75	57	45
	50	90		37	30	24	18	13.5
	100	45		14.5	11.5	9	6.2	4.5
4 hour/day	5	900		480	450	410	330	265
	10	450		240	215	190	150	100
	20	225		110	90	75	55	40
	50	90		28	22	18.5	14	7
24 hours/day	1	4500		3040	2990	2920	2600	1850
	5	900		610	530	440	390	300
	10	450		205	170	130	110	80
	20	225		87	70	50	37	27
	50	90		26	20	13	9	6
	100	45		10	7.5	4.5	3	2.2
	300	15		1.9	1.3	0.7	0.3	0.1
5 minutes/day	375	12	220 minutes					

"EVEREADY" NO. 781 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-50 milliamperes



Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
1/4	.250	6.35
27/32	.844	21.4
1 1/2	1.50	38.1
2 7/16	2.44	61.9
2 1/2	2.50	63.5
3	3.00	76.2

TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS

SPECIFICATIONS

Voltage Taps .... +, − 4.5
Terminals .... Knurled Nut & Screw
Average Weight .... 5 oz. (142 grams)
Volume .... 5.1 cubic inches (83.6 cubic centimeters)
Cells .... Three No. 30 (ANSI "B") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 781

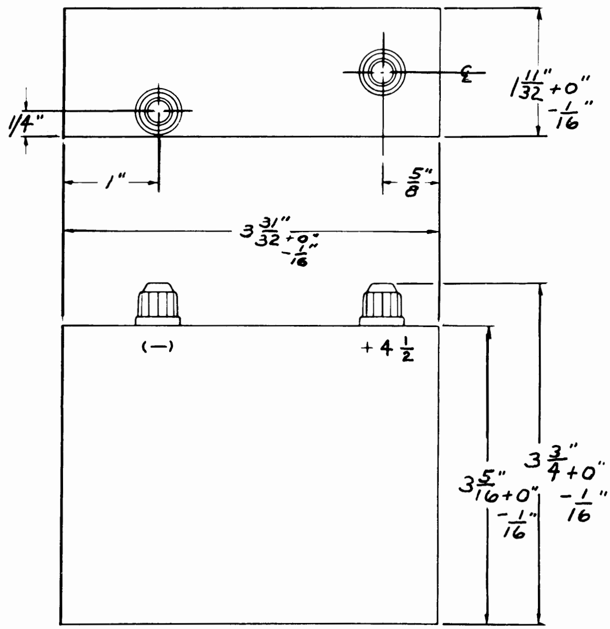
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.4V	2.7V	3.0V	3.3V	3.6V
2 hours/day	5	900	420	380	340	290	250
	10	450	220	190	155	130	107
	20	225	110	90	75	57	45
	50	90	37	30	24	18	13.5
	100	45	14.5	11.5	9	6.2	4.5
4 hours/day	5	900	480	450	410	330	265
	10	450	240	215	190	150	100
	20	225	110	90	75	55	40
	50	90	28	22	18.5	14	7
24 hours/day	1	4500	3040	2990	2920	2600	1850
	5	900	610	530	440	390	300
	10	450	205	170	130	110	80
	20	225	87	70	50	37	27
	50	90	26	20	13	9	6
	100	45	10	7.5	4.5	3	2.2
	300	15	1.9	1.3	0.7	0.3	0.1

"EVEREADY" NO. 714 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-200 milliamperes



TERMINAL POSTS
No. 8-32 THREAD
PLASTIC KNURLS

Inches		Millimeters
1/16	.063	1.59
1/4	.250	6.35
5/8	.625	15.9
1	1.00	25.4
1 11/32	1.34	34.1
3 5/16	3.31	84.1
3 3/4	3.75	95.3
3 31/32	3.97	101

SPECIFICATIONS

Voltage Taps .... —, + 4.5

Terminals .... Knurled Nut & Screw

Average Weight .... 13.5 oz. (383 grams)

Volume .... 16.9 cubic inches (277 cubic centimeters)

Cells .... Three No. 55 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 714

Estimated Average Hours Service at 70°F (21.1°C)

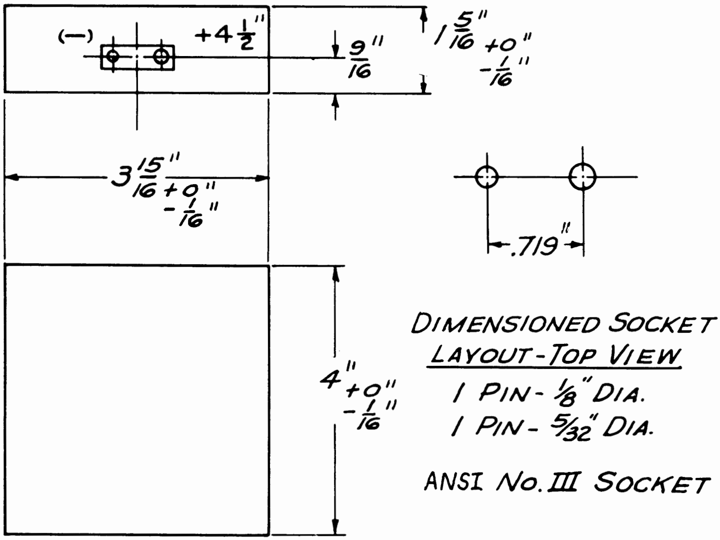
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.7V	2.8V	3.25V
Discharge for 10 periods of 4 minutes each, beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	90	50			145 days
6 hours/day	120	37.5	90 hours		
Discharge for 10 periods of 4 minutes each, beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	225	20		65 days	

"EVEREADY" NO. 736 BATTERY

Type: Carbon-Zinc

Suggested Current Range: 0-250 milliamperes

Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
9/16	.563	14.3
	.719	18.3
1 5/16	1.31	33.3
3 15/16	3.94	100
4	4	102



SPECIFICATIONS

Voltage Taps .... —, + 4.5
Terminals .... Socket
Average Weight .... 1 lb. (454 grams)
Volume .... 20.7 cubic inches (339 cubic centimeters)
Cells .... Three No. 60 (ANSI "F") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 736

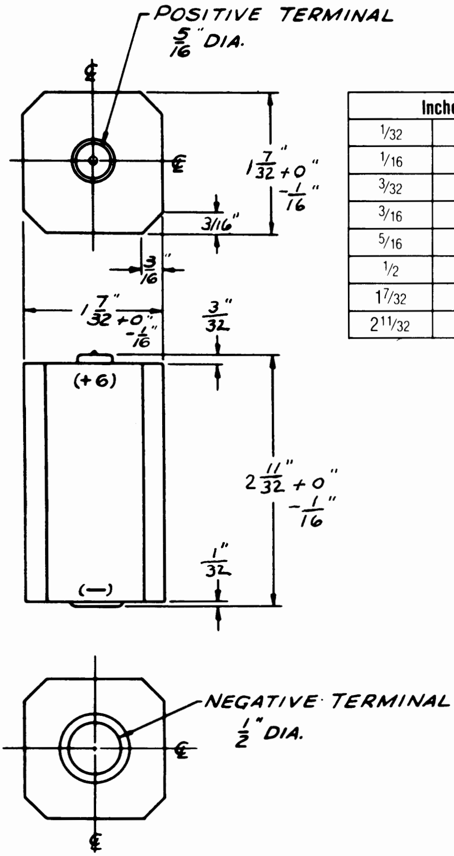
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.4V	2.7V	3.0V	3.3V	3.6V
2 hours/day	5	900	1650	1550	1450	1400	1300
	10	450	900	840	780	720	640
	20	225	490	450	410	370	310
	30	150	340	310	280	250	200
	100	45	98	88	78	68	47
	200	22.5	41	37	33	27	16
	300	15	23	20.5	18	13.8	6.8
4 hours/day	10	450	940	880	840	760	680
	20	225	475	425	400	335	300
	30	150	320	275	260	235	180
	100	45	90	75	56	44	36
	200	22.5	35	28	22	16	12
	300	15	19	15	12.3	8.5	4
24 hours/day	5	900	2450	2350	2200	2000	1450
	10	450	1200	1050	940	880	620
	20	225	550	470	390	335	260
	30	150	350	275	250	220	155
	100	45	84	70	55	40	25
	200	22.5	33	26	20	13	3
	300	15	18	14	10.5	6.5	4

"EVEREADY" NO. 724 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-25 milliamperes



	Inches	Millimeters
1/32	.031	.79
1/16	.063	1.59
3/32	.094	2.38
3/16	.188	4.76
5/16	.313	7.94
1/2	.500	12.7
1 7/32	1.22	31
2 11/32	2.34	59.5

SPECIFICATIONS

Voltage Taps .... −, + 6

Terminals .... Flat Contacts

Average Weight .... 2.5 oz. (70.9 grams)

Volume .... 3.4 cubic inches (55.7 cubic centimeters)

Cells .... Four No. 15 (ANSI "AA") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 724

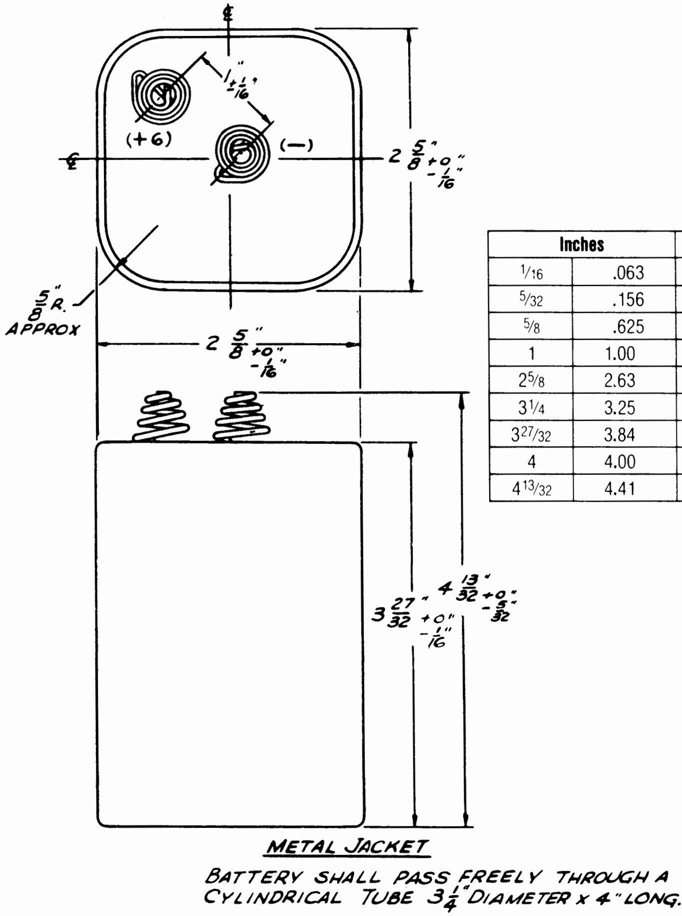
Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	4.0V	4.4V
2 hours/day	60	100	17.5	16.5	14.5

"EVEREADY" NO. 509 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0–250 milliamperes



Inches		Millimeters
1/16	.063	1.59
5/32	.156	3.97
5/8	.625	15.9
1	1.00	25.4
2 5/8	2.63	66.7
3 1/4	3.25	82.5
3 27/32	3.84	97.6
4	4.00	101
4 13/32	4.41	112

SPECIFICATIONS

Voltage Taps .... −, + 6
Terminals .... Two coil springs
Average Weight .... 1 lb. 5.5 oz. (609 grams)
Volume .... 26.5 cubic inches (434 cubic centimeters)
Cells .... Four No. 60 (ANSI "F") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 509

Estimated Average Service at 70° F (21.1° C)

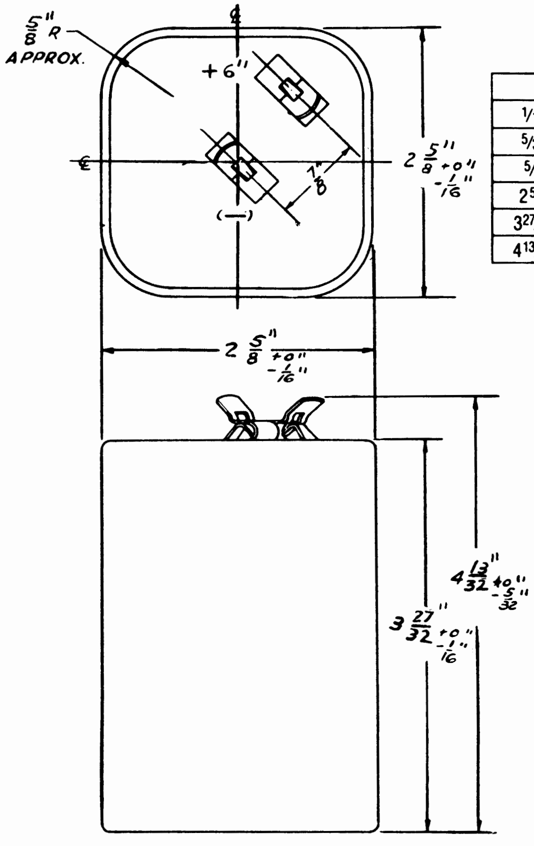
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	CUTOFF VOLTAGE 3.0V	CUTOFF VOLTAGE 3.6V
Discharge 100 milliseconds per second, 24 hours/ day, 7 days/week, 10% "on" time Safety Flasher Test		Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)			800 hours
Discharge 250 milliseconds per second, 24 hours/ day, 7 days/week, 25% "on" time Safety Flasher Test		Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)			350 hours
Discharge every day during 8 periods of 30 minutes each, begining at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) (Railroad-Lantern Battery Test)	187	32			40 hours
Schedule as above (simulates 300mA lamp)	375	16		21 hours	
½ hour/day	667	9	16 hours	14 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) (Railroad-Lantern Battery Test)	667	9	10 hours	9 hours	

"EVEREADY" NO. 510F BATTERY

6 VOLTS

Type: Carbon - Zinc

Suggested Current Range: 0-250 milliamperes



Inches		Millimeters
1/16	.063	1.59
5/32	.156	3.97
5/8	.625	15.9
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 13/32	4.41	112

METAL JACKET

SPECIFICATIONS

Voltage Taps .... −, + 6

Terminals .... Fahnestock

Average Weight .... 1 lb. 4 oz. (567 grams)

Volume .... 26.5 cubic inches (434 cubic centimeters)

Cells .... Four No. 60 (ANSI "F") in series

Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 510F BATTERY

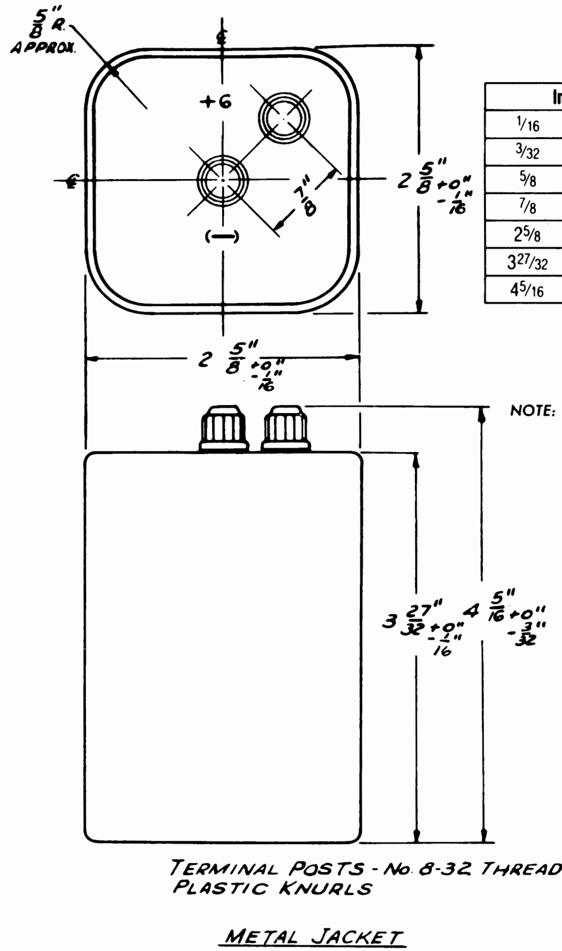
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	CUTOFF VOLTAGE 3.0V	CUTOFF VOLTAGE 3.6V
Discharge 100 milliseconds per second, 24 hours/ day, 7 days/week, 10% "on" time Safety Flasher Test		Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)			825 hours
Discharge 250 milliseconds per second, 24 hours/ day, 7 days/week, 25% "on" time Safety Flasher Test		Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)			375 hours
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) (Railroad-Lantern Battery Test)	187	32			47 hours
Schedule as above (simulates 300mA lamp)	375	16	18 hours	22 hours	
½ hour/day	667	9	18 hours	16 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) (Railroad-Lantern Battery Test)	667	9	11 hours	10 hours	

"HERCULES" NO. HS10S INDUSTRIAL BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-250 milliamperes



Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
5/8	.625	15.9
7/8	.875	22.2
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 5/16	4.31	110

NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.

SPECIFICATIONS

Voltage Taps .... —, +6
Terminals .... Knurled Nut & Screw
Average Weight .... 1 lb. 7 oz. (652 grams)
Volume .... 26.5 cubic inches (434 cubic centimeters)
Cells .... Four No. 60 (ANSI "F") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

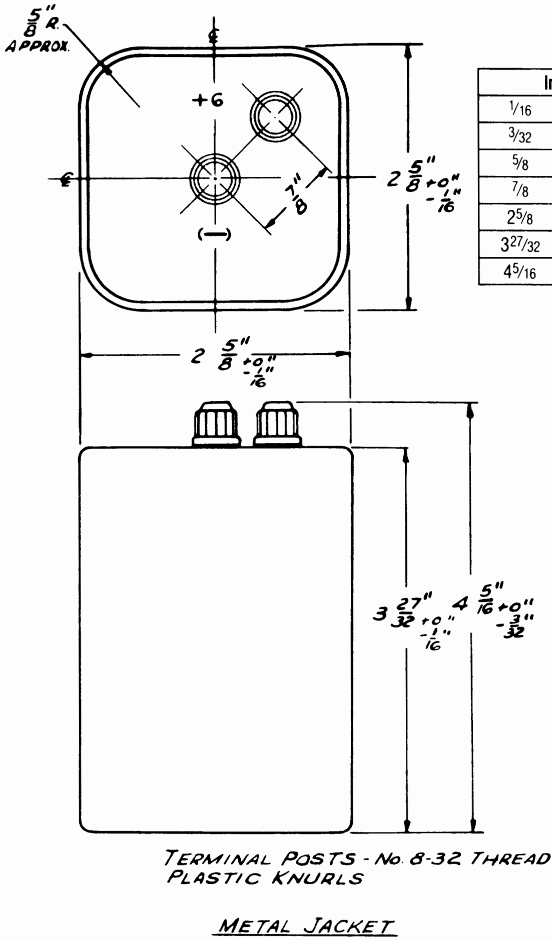
"HERCULES" NO. HS10S INDUSTRIAL BATTERY

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	3.0V	3.6V
Discharge 100 milliseconds per second, 24 hours/ day, 7 days/week, 10% "on" time Safety Flasher Test	Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)				825 hours
Discharge 250 milliseconds per second, 24 hours/ day, 7 days/week, 25% "on" time Safety Flasher Test	Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)				375 hours
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) (Railroad-Lantern Battery Test)	187	32			47 hours
Schedule as above (simulates 300mA lamp)	375	16	18 hours	22 hours	
½ hour/day	667	9	18 hours	16 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) (Railroad-Lantern Battery Test)	667	9	11 hours	10 hours	

"EVEREADY" NO. 510S BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-250 milliamperes



Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
5/8	.625	15.9
7/8	.875	22.2
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 5/16	4.31	110

SPECIFICATIONS

Voltage Taps	—, +6
Terminals	Knurled Nut & Screw
Average Weight	1 lb. 7 oz. (652 grams)
Volume	26.5 cubic inches (434 cubic centimeters)
Cells	Four No. 60 (ANSI "F") in series
Jacket	Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

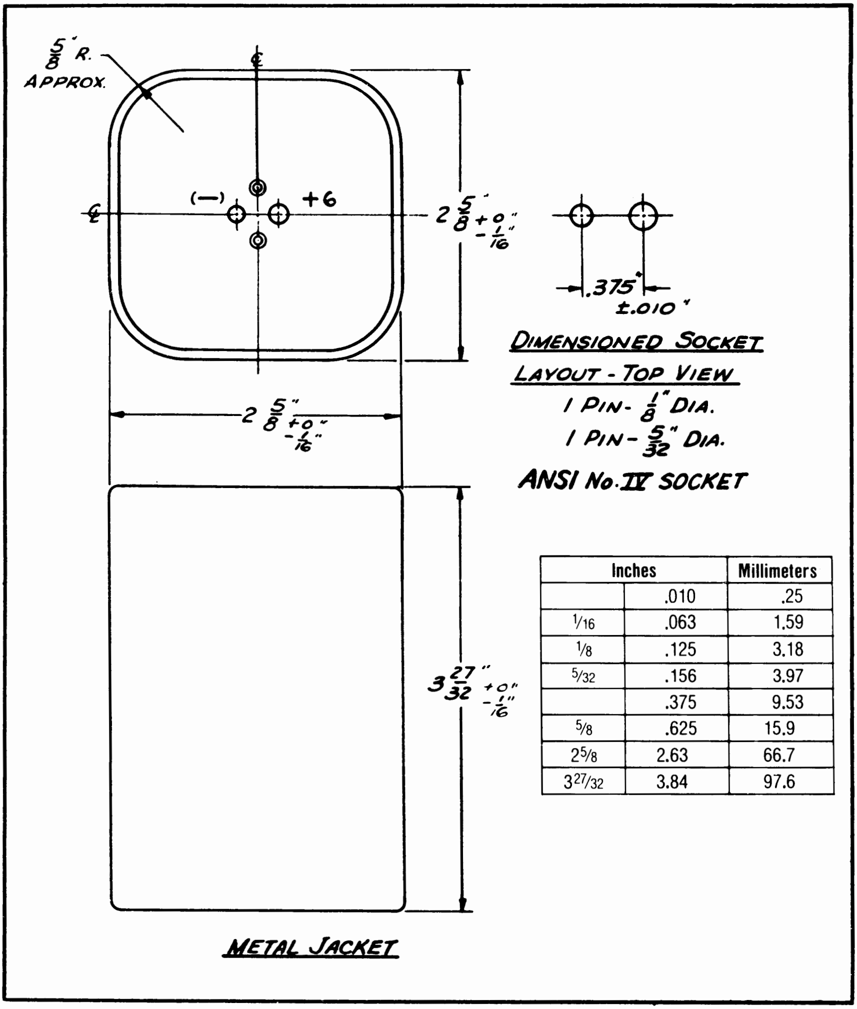
"EVEREADY" NO. 510S

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	3.0V	3.6V
Discharge 100 milliseconds per second, 24 hours/ day, 7 days/week, 10% "on" time Safety Flasher Test	Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)				825 hours
Discharge 250 milliseconds per second, 24 hours/ day, 7 days/week, 25% "on" time Safety Flasher Test	Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)				375 hours
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) (Railroad-Lantern Battery Test)	187	32			47 hours
Schedule as above (simulates 300mA lamp)	375	16	18 hours	22 hours	
½ hour/day	667	9	18 hours	16 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) (Railroad-Lantern Battery Test)	667	9	11 hours	10 hours	

"EVEREADY" NO. 744 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0–250 milliamperes



Inches		Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
	.375	9.53
5/8	.625	15.9
2 5/8	2.63	66.7
3 27/32	3.84	97.6

SPECIFICATIONS

Voltage Taps .... –, + 6
Terminals .... Socket
Average Weight .... 1 lb. 6 oz. (624 grams)
Volume .... 26.5 cubic inches (434 cubic centimeters)
Cells .... Four No. 60 (ANSI "F") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet.

"EVEREADY" NO. 744

Estimated Average Hours of Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	CUTOFF VOLTAGE 4.0V	CUTOFF VOLTAGE 4.4V
4 hours/day	60	100	155	135	115

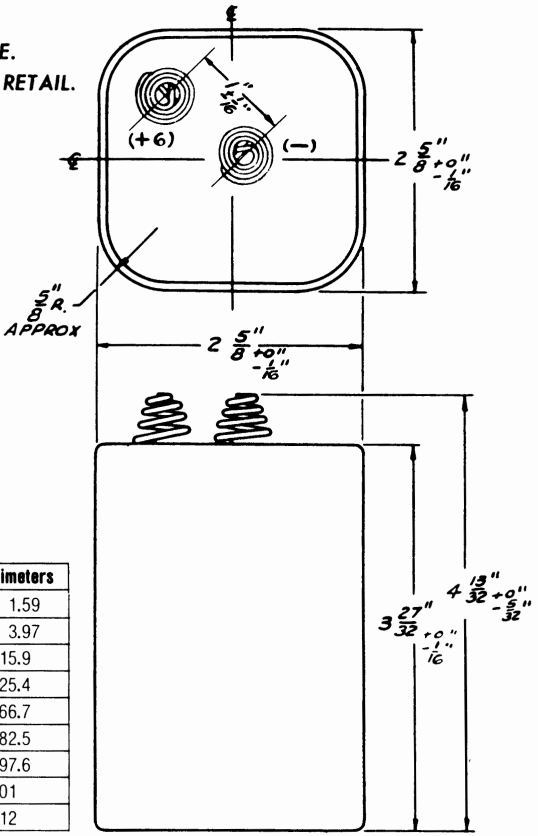
"HERCULES" NO. HS90

INDUSTRIAL LANTERN BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-250 milliamperes

NOTE:
FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.



Inches		Millimeters
1/16	.063	1.59
5/32	.156	3.97
5/8	.625	15.9
1	1.00	25.4
2 5/8	2.63	66.7
3 1/4	3.25	82.5
3 27/32	3.84	97.6
4	4.00	101
4 13/32	4.41	112

BATTERY SHALL PASS FREELY THROUGH A CYLINDRICAL TUBE 3¼" DIAMETER x 4" LONG.

METAL JACKET

SPECIFICATIONS

Voltage Taps .... −, + 6
Terminals .... Two Coil Springs
Average Weight .... 1 lb. 6.5 oz. (638 grams)
Volume .... 26.5 cubic inches (434 cubic centimeters)
Cells .... Four No. 60 (ANSI "F") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"HERCULES" NO. HS90

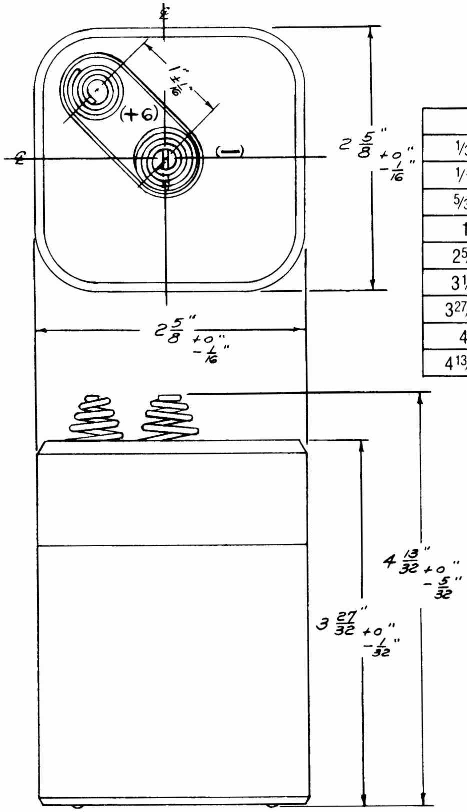
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	CUTOFF VOLTAGE 3.0V	CUTOFF VOLTAGE 3.6V
Discharge 100 milliseconds per second, 24 hours/day, 7 days/week, 10% "on" time Safety Flasher Test	Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)				875 hours
Discharge 250 milliseconds per second, 24 hours/day, 7 days/week, 25% "on" time Safety Flasher Test	Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)				400 hours
Discharge every day during 8 periods of 30 minutes each, begining at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) (Railroad-Lantern Battery Test)	187	32			50 hours
Schedule as above (simulates 300mA lamp)	375	16		23 hours	
½ hour/day	667	9	19 hours	17 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) (Railroad-Lantern Battery Test)	667	9	13 hours	11 hours	

"EVEREADY" NO. 1209 BATTERY

Type: Carbon - Zinc (Zinc Choride)

Suggested Current Range: 0-250 milliamperes



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
5/32	.156	3.97
1	1.00	25.4
2 5/8	2.63	66.7
3 1/4	3.25	82.5
3 27/32	3.84	97.6
4	4.00	101
4 13/32	4.41	112

BATTERY SHALL PASS FREELY THROUGH A CYLINDRICAL TUBE 3 1/4" DIAMETER X 4" LONG.

SPECIFICATIONS

Voltage Taps .... —, + 6

Terminals .... Two Coil Springs

Average Weight .... 1 lb. 5 oz. (595 grams)

Volume .... 26.5 cubic inches (434 cubic centimeters)

Cells .... Four No. 60 (ANSI "F") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 1209

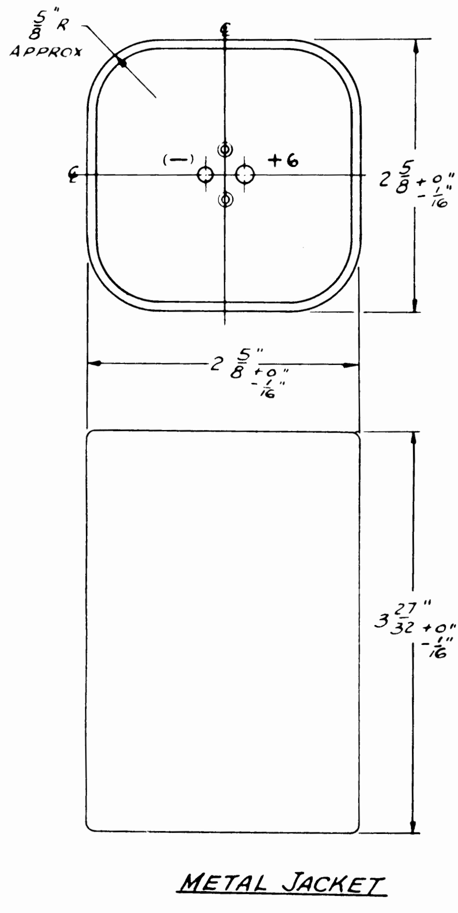
Estimated Average Hours Service at 70°F (21.1°C)

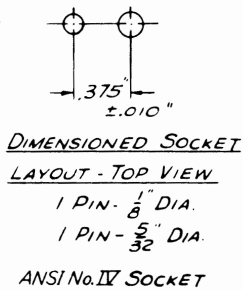
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	CUTOFF VOLTAGE 3.0V	CUTOFF VOLTAGE 3.6V
Discharge 100 milliseconds per second, 24 hours/day, 7 days/week, 10% "on" time Safety Flasher Test		Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)			975 hours
Discharge 250 milliseconds per second, 24 hours/day, 7 days/week, 25% "on" time Safety Flasher Test		Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)			450 hours
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) (Railroad-Lantern Battery Test)	187	32			61 hours
Schedule as above (simulates 300mA lamp)	375	16		33 hours	
½ hour/day	667	9	21 hours	18 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) (Railroad-Lantern Battery Test)	667	9	18 hours	16 hours	

"EVEREADY" NO. 2744N BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-250 milliamperes





Inches		Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
	.375	9.53
5/8	.625	15.9
2 5/8	2.63	66.7
3 27/32	3.84	97.6

SPECIFICATIONS

Voltage Taps .... –, + 6

Terminals .... Socket

Average Weight .... 1 lb. 7 oz. (652 grams)

Volume .... 27.3 cubic inches (447 cubic centimeters)

Cells .... Four No. 60 (ANSI "F") in series

Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

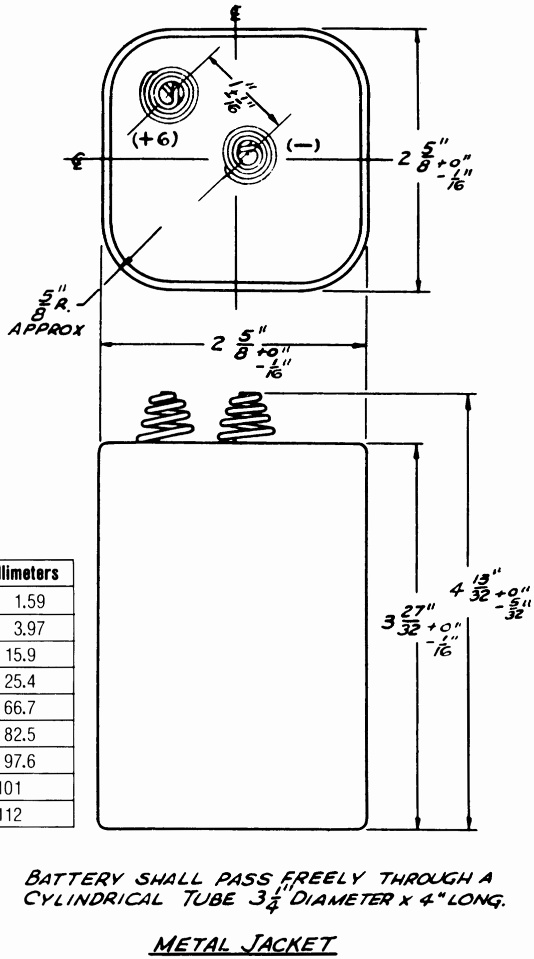
"EVEREADY" NO. 2744N

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	3.0V	3.6V
Discharge 100 milliseconds per second, 24 hours/ day, 7 days/week, 10% "on" time Safety Flasher Test		Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)			875 hours
Discharge 250 milliseconds per second, 24 hours/ day, 7 days/week, 25% "on" time Safety Flasher Test		Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)			400 hours
Discharge every day during 8 periods of 30 minutes each, begining at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) (Railroad-Lantern Battery Test)	187	32			50 hours
Schedule as above (simulates 300mA lamp)	375	16		23 hours	
½ hour/day	667	9	19 hours	17 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) (Railroad-Lantern Battery Test)	667	9	13 hours	11 hours	

"EVEREADY" NO. 2745N BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-250 milliamperes



Inches		Millimeters
1/16	.063	1.59
5/32	.156	3.97
5/8	.625	15.9
1	1.00	25.4
2 5/8	2.63	66.7
3 1/4	3.25	82.5
3 27/32	3.84	97.6
4	4.00	101
4 13/32	4.41	112

SPECIFICATIONS

Voltage Taps .... —, + 6
Terminals .... Coil Springs
Average Weight .... 1 lb. 7 oz. (652 grams)
Volume .... 27.3 cubic inches (447 cubic centimeters)
Cells .... Four No. 60 (ANSI "F") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 2745N

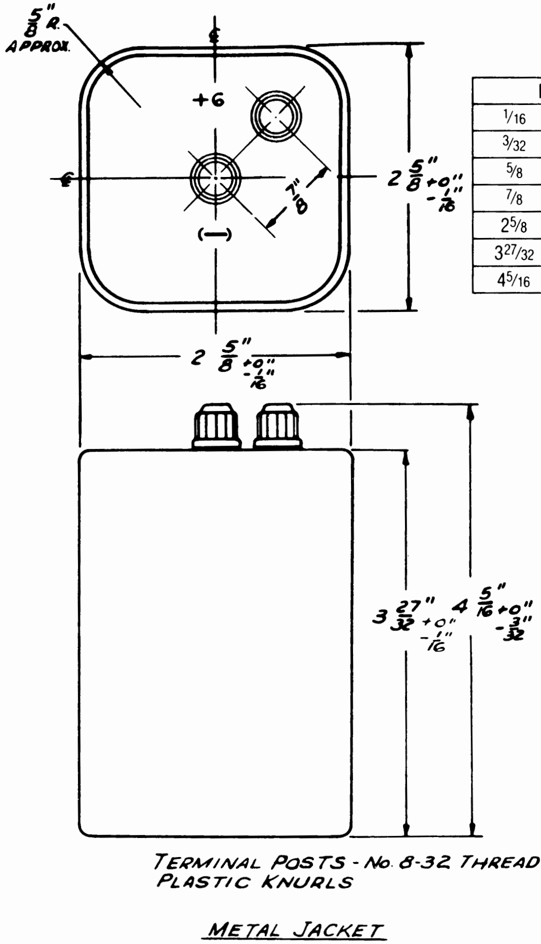
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	3.0V	3.6V
Discharge 100 milliseconds per second, 24 hours/day, 7 days/week, 10% "on" time Safety Flasher Test	Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)				875 hours
Discharge 250 milliseconds per second, 24 hours/day, 7 days/week, 25% "on" time Safety Flasher Test	Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)				400 hours
Discharge every day during 8 periods of 30 minutes each, begining at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) (Railroad-Lantern Battery Test)	187	32			50 hours
Schedule as above (simulates 300mA lamp)	375	16		23 hours	
½ hour/day	667	9	19 hours	17 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) (Railroad-Lantern Battery Test)	667	9	13 hours	11 hours	

"EVEREADY" NO. 2746N BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-250 milliamperes



Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
5/8	.625	15.9
7/8	.875	22.2
2 5/8	2.63	66.7
3 27/32	3.84	97.6
4 5/16	4.31	110

SPECIFICATIONS

Voltage Taps .... —, + 6

Terminals .... Knurled Nut & Screw

Average Weight .... 1 lb. 7 oz. (652 grams)

Volume .... 27.3 cubic inches (447 cubic centimeters)

Cells .... Four No. 60 (ANSI "F") in series

Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 2746N

Estimated Average Hours Service at 70°F (21.1°C)

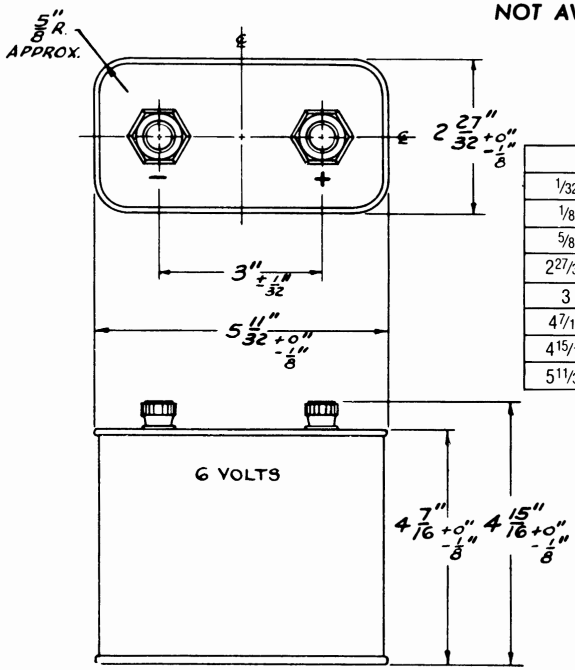
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	CUTOFF VOLTAGE 3.0V	CUTOFF VOLTAGE 3.6V
Discharge 100 milliseconds per second, 24 hours/day, 7 days/week, 10% "on" time <u>Safety Flasher Test</u>		Load is RCR (resistor - capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 100 millisecond pulse. (to simulate lamp characteristics)			875 hours
Discharge 250 milliseconds per second, 24 hours/day, 7 days/week, 25% "on" time <u>Safety Flasher Test</u>		Load is RCR (resistor-capacitor-resistor) network. Components chosen to provide initial peak pulse of 500mA, dropping to a plateau of 100mA (at 6 volts) in 20 milliseconds and remaining at this level for remainder of 250 millisecond pulse (to simulate lamp characteristics)			400 hours
Discharge every day during 8 periods of 30 minutes each, begining at intervals of 1 hour for 8 consecutive hrs. (simulates 150mA lamp) <u>(Railroad-Lantern Battery Test)</u>	187	32			50 hours
Schedule as above (simulates 300mA lamp)	375	16		23 hours	
½ hour/day	667	9	19 hours	17 hours	
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (simulates 500mA lamp) <u>(Railroad-Lantern Battery Test)</u>	667	9	13 hours	11 hours	

"HERCULES" NO. HS31 INDUSTRIAL BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-500 milliamperes

***NOTE: FOR INDUSTRIAL USE.
NOT AVAILABLE AT RETAIL.***



Inches		Millimeters
1/32	.031	.79
1/8	.125	3.18
5/8	.625	15.9
2 27/32	2.84	72.2
3	3.00	76.2
4 7/16	4.44	113
4 15/16	4.94	125.
5 11/32	5.34	136.

METAL JACKET

*TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS*

SPECIFICATIONS

Voltage Taps .... −, + 6

Terminals .... Insulated Screw

Average Weight .... 3 lbs. 4 oz. (1.47 kilograms)

Volume .... 69.5 cubic inches (1139 cubic centimeters)

Cells .... Eight No. 60 (ANSI "F")—Two parallel strings of four in series

Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

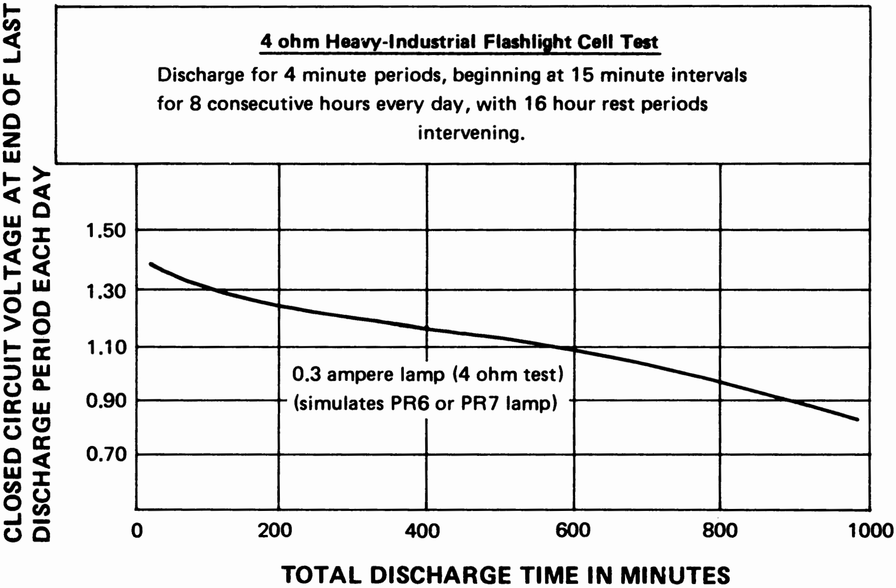
"HERCULES" NO. HS31

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	3.0V	3.6V	4.0V
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test) Simulates 150 mA lamp	187	32			110	
As above Simulates 300 mA lamp	375	16		55		
½ hour/day Simulates 500 mA lamp	667	9	33	29		
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test) Simulates 500 mA lamp	667	9	27	23	19	15

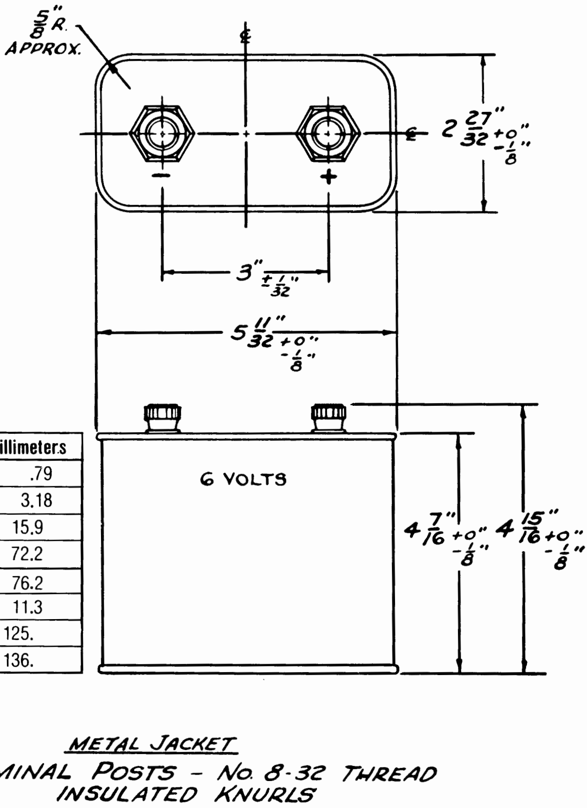
"HERCULES" NO. HS31

Estimated Average Minutes Service at 70° F (21.1°C)



"EVEREADY" NO. 731 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-500 milliamperes



Inches		Millimeters
1/32	.031	.79
1/8	.125	3.18
5/8	.625	15.9
2 27/32	2.84	72.2
3	3.00	76.2
4 7/16	4.44	11.3
4 15/16	4.94	125.
5 11/32	5.34	136.

SPECIFICATIONS

Voltage Taps .... −, + 6
Terminals .... Insulated Screw
Average Weight .... 3 lbs. 4 oz. (1.47 kilograms)
Volume .... 69.5 cubic inches (1139 cubic centimeters)
Cells .... Eight No. 60 (ANSI "F")—Two parallel strings of four in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 731

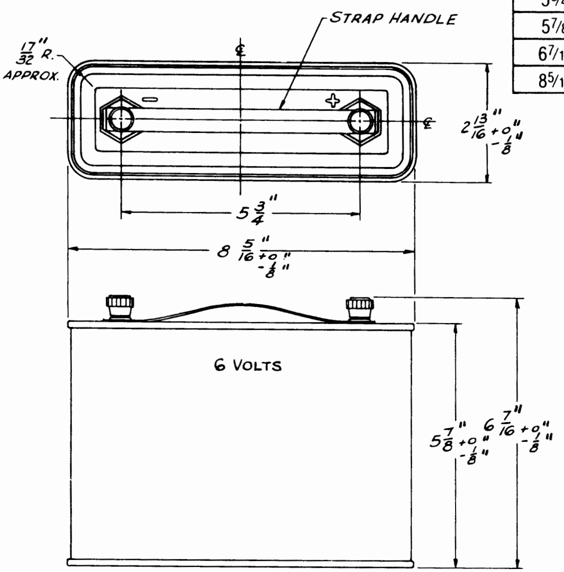
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	3.0V	3.6V	4.0V
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test) Simulates 150 mA lamp	187	32			110	
As above Simulates 300mA lamp	375	16		55		
½ hour/day Simulates 500 mA lamp	667	9	33	29		
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test) Simulates 500 mA lamp	667	9	27	23	19	15

"EVEREADY" NO. 706 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-1 ampere

Inches		Millimeters
1/8	.125	3.18
17/32	.531	13.5
2 13/16	2.81	71.4
5 3/4	5.75	146
5 7/8	5.88	149
6 7/16	6.44	164
8 5/16	8.31	211



METAL JACKET

TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS

SPECIFICATIONS

Voltage Taps .... –, + 6
Terminals .... Insulated Screw
Average Weight .... 5 lbs. 11 oz. (2.58 kilograms)
Volume .... 137 cubic inches (2245 cubic centimeters)
Cells .... Sixteen No. 60 (ANSI "F") – Four parallel strings of four in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

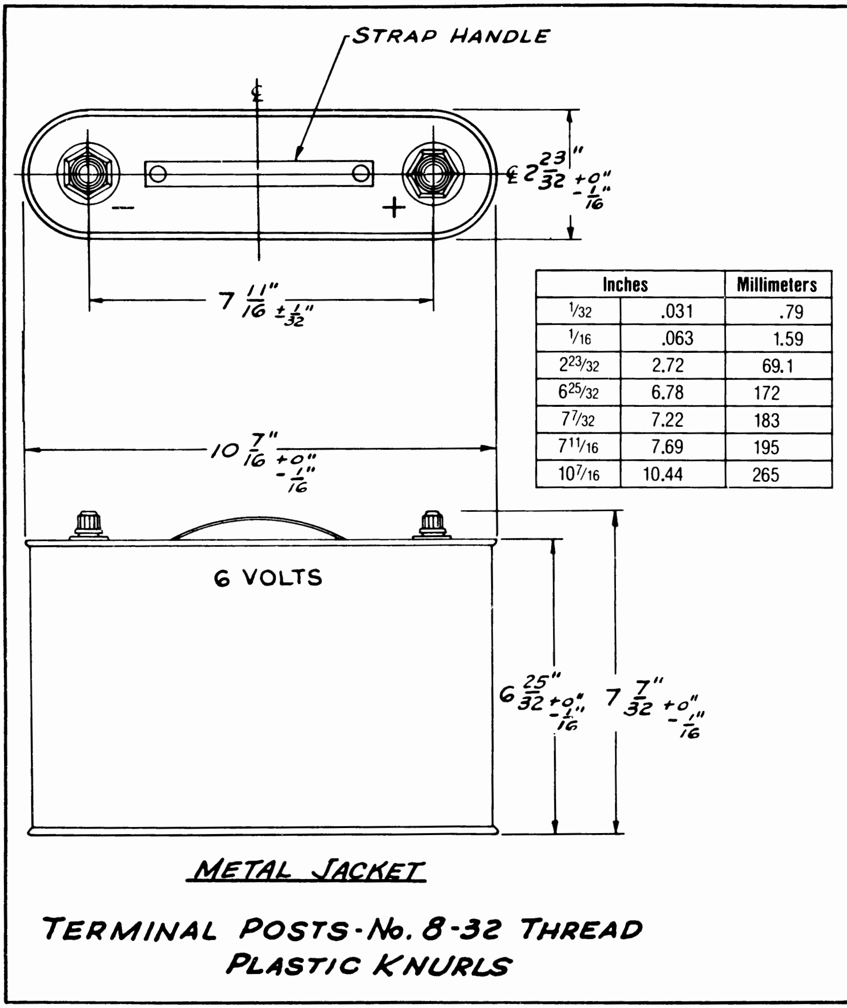
"EVEREADY" NO. 706

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.2V	3.6V	4.0V	4.4V	4.8V
2 hours/day	80	75	490	450	410	370	310
	120	50	340	310	280	250	200
	400	15	98	88	78	68	47
	800	7.5	41	37	33	27	16
	1200	5	23	20.5	18	13.8	6.8
4 hours/day	80	75	475	425	400	335	300
	120	50	320	275	260	235	180
	400	15	90	75	56	44	36
	800	7.5	35	28	22	16	12
	1200	5	19	15	12.3	8.5	4
24 hours/day	40	150	1200	1050	940	880	620
	80	75	550	470	390	335	260
	120	50	350	275	250	220	155
	400	15	84	70	55	40	25
	800	7.5	33	26	20	13	8
	1200	5	18	14	10.5	6.5	4

"EVEREADY" NO. 1461 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-1.5 amperes



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
2 23/32	2.72	69.1
6 25/32	6.78	172
7 7/32	7.22	183
7 11/16	7.69	195
10 7/16	10.44	265

SPECIFICATIONS

Voltage Taps .... –, + 6
Terminals .... Knurled Nut & Screw
Average Weight .... 9 lbs. 4 oz. (4.2 kilograms)
Volume .... 199 cubic inches (3261 cubic centimeters)
Cells .... Four No. 6 (ANSI "6") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

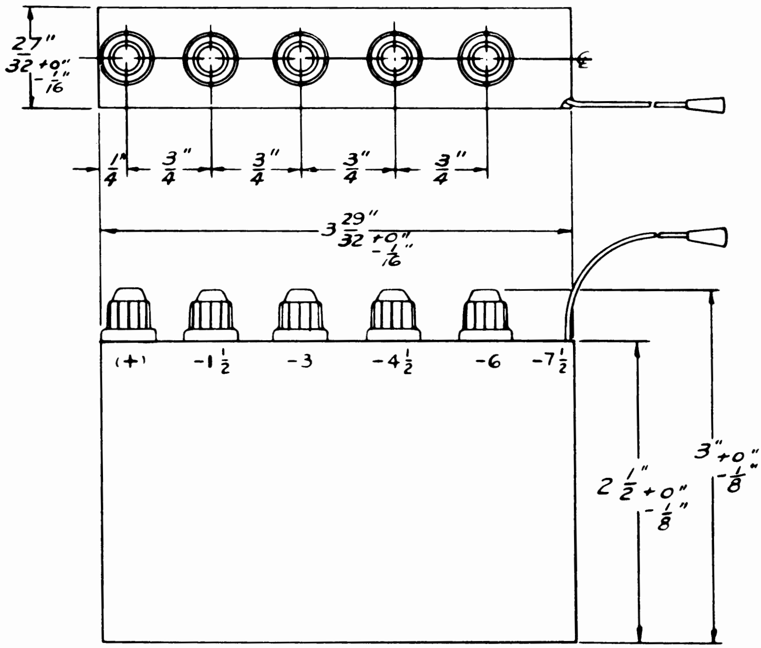
"EVEREADY" NO. 1461

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.4V	CUTOFF VOLTAGE 3.6V
24 hours/day	30	200		2000
	60	100		850
Discharge for 2 periods of 1 hour each daily according to the following schedule: 1hour discharge, 6 hours rest, 1 hour discharge, 16 hours rest. (Heavy Intermittent Test)	562	10.67	72	

"EVEREADY" NO. 773 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-50 milliamperes



Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
1/4	.250	6.35
3/4	.750	19.1
27/32	.844	21.4
2 1/2	2.50	63.5
3	3.00	76.2
3 29/32	3.91	99.2

TERMINAL POSTS - No. 8-32 THREAD
PLASTIC KNURLS

SPECIFICATIONS

Voltage Taps .... +, −1.5, −3, −4.5, −6, −7.5
Terminals .... 5 Knurled Nut & Screw, 1 Wire
Average Weight .... 9 oz. (255 grams)
Volume .... 8.24 cubic inches (135 cubic centimeters)
Cells .... Five No. 30 (ANSI "B") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 773

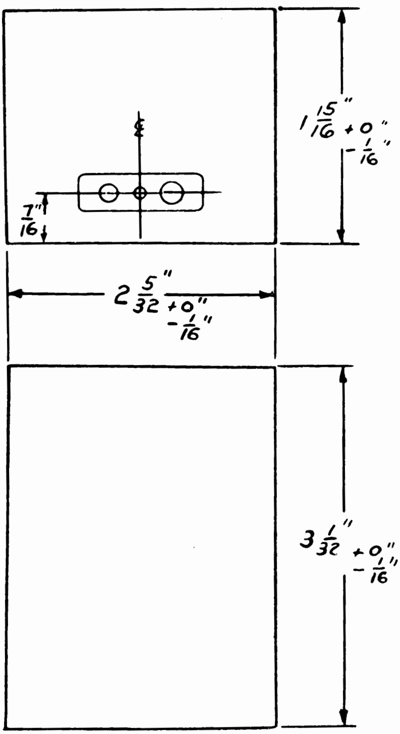
Estimated Average Hours Service at 70° F (21.1° C)

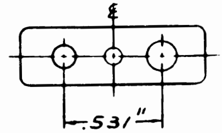
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.0V	4.5V	5.0V	5.5V	6.0V
2 hours/day	5	1500	420	380	340	290	250
	10	750	220	190	155	130	107
	20	375	110	90	75	57	45
	50	150	37	30	24	18	13.5
	100	75	14.5	11.5	9	6.2	4.5
4 hours/day	5	1500	480	450	410	330	265
	10	750	240	215	190	150	100
	20	375	110	90	75	55	40
	50	150	28	22	18.5	14	7
24 hours/day	1	7500	3040	2990	2920	2600	1850
	5	1500	610	530	440	390	300
	10	750	205	170	130	110	80
	20	375	87	70	50	37	27
	50	150	26	20	13	9	6
	100	75	10	7.5	4.5	3	2.2
	300	25	1.9	1.3	.7	.3	.1

"EVEREADY" NO. 717 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-70 milliamperes

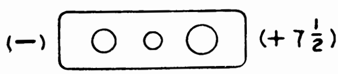
Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
5/32	.156	3.97
7/16	.438	11.1
	.531	13.5
1 15/16	1.94	49.2
2 5/32	2.16	54.8
3 1/32	3.03	77.





DIMENSIONED SOCKET LAYOUT - TOP VIEW

1 PIN - 3/32" DIA (PILOT)
1 PIN - 1/8" DIA
1 PIN - 5/32" DIA



SOCKET TERMINAL MARKINGS - TOP VIEW

(ANSI No. V SOCKET)

SPECIFICATIONS

Voltage Taps .... –, + 7.5
Terminals .... Socket
Average Weight .... 8 oz. (227 grams)
Volume .... 13 cubic inches (213 cubic centimeters)
Cells .... Five No. 172 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 717

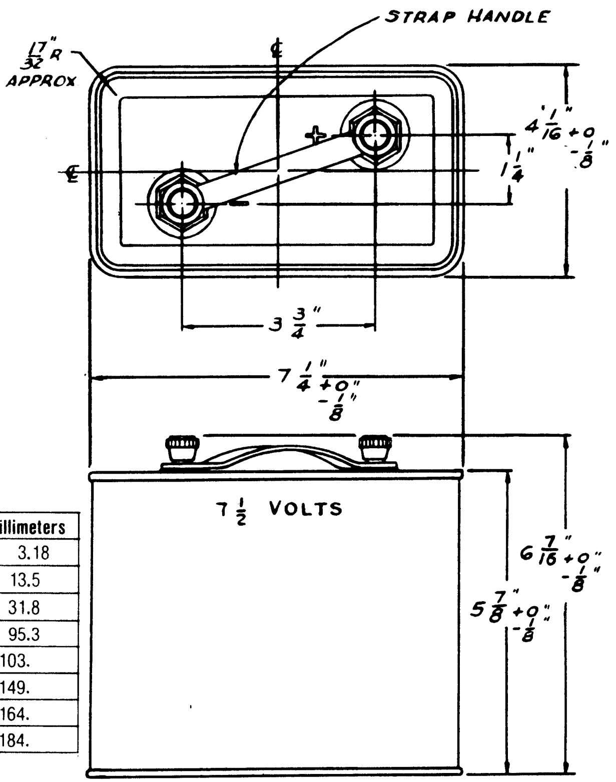
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.0V	4.5V	5.0V	5.5V	6.0V
2 hours/day	10	750	485	430	350	295	240
	20	375	270	230	185	155	120
	40	188	125	108	85	68	45
	80	94	50	40	32	22	10
4 hours/day	3	2500	1925	1800	1650	1325	1050
	5	1500	1350	1220	1080	840	590
	10	750	580	520	450	340	255
	20	375	270	240	200	150	105
	40	188	120	100	80	60	26
	80	94	40	35	25	20	8
8 hours/day	3	2500	1700	1600	1470	1260	940
	5	1500	1080	1000	900	750	540
	10	750	520	470	410	340	230
	20	375	220	195	170	135	85
	40	188	88	75	65	50	27
24 hours/day	3	2500	2075	1950	1800	1600	1150
	5	1500	1175	1050	980	840	580
	10	750	490	430	380	300	210
	20	375	195	165	140	104	72
	40	188	75	60	48	33	24
	80	94	25	20	15	10	6

2 hours/day	54	140			55	45	

"EVEREADY" NO. 715 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0–1 ampere



Inches		Millimeters
1/8	.125	3.18
17/32	.531	13.5
1 1/4	1.25	31.8
3 3/4	3.75	95.3
4 1/16	4.06	103.
5 7/8	5.88	149.
6 7/16	6.44	164.
7 1/4	7.25	184.

METAL JACKET

TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS

SPECIFICATIONS

Voltage Taps .... –, + 7.5
Terminals .... Insulated Screw
Average Weight .... 7 lbs. 10 oz. (3.46 kilograms)
Volume .... 173 cubic inches (2835 cubic centimeters)
Cells .... Twenty No. 60 (ANSI "F")–
Four parallel strings of five in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

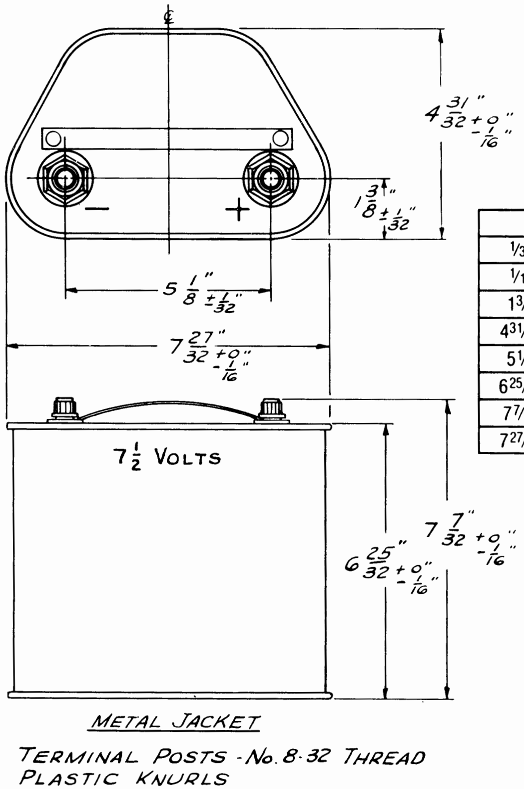
"EVEREADY" NO. 715

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (amperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.5V
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours	.937	8	29 hours
Continuous	3.05	2.46	320 minutes
Continuous	4.36	1.72	130 minutes

"EVEREADY" NO. 1562 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-1.5 amperes



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
1 3/8	1.38	34.9
4 31/32	4.97	126
5 1/8	5.13	130
6 25/32	6.78	172
7 7/32	7.22	183
7 27/32	7.84	199

SPECIFICATIONS

Voltage Taps .... −, + 7.5
Terminals .... Knurled nut & screw
Average Weight .... 11 lbs. 4 oz. (5.1 kilograms)
Volume .... 273 cubic inches (4474 cubic centimeters)
Cells .... Five No. 6 (ANSI "6") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

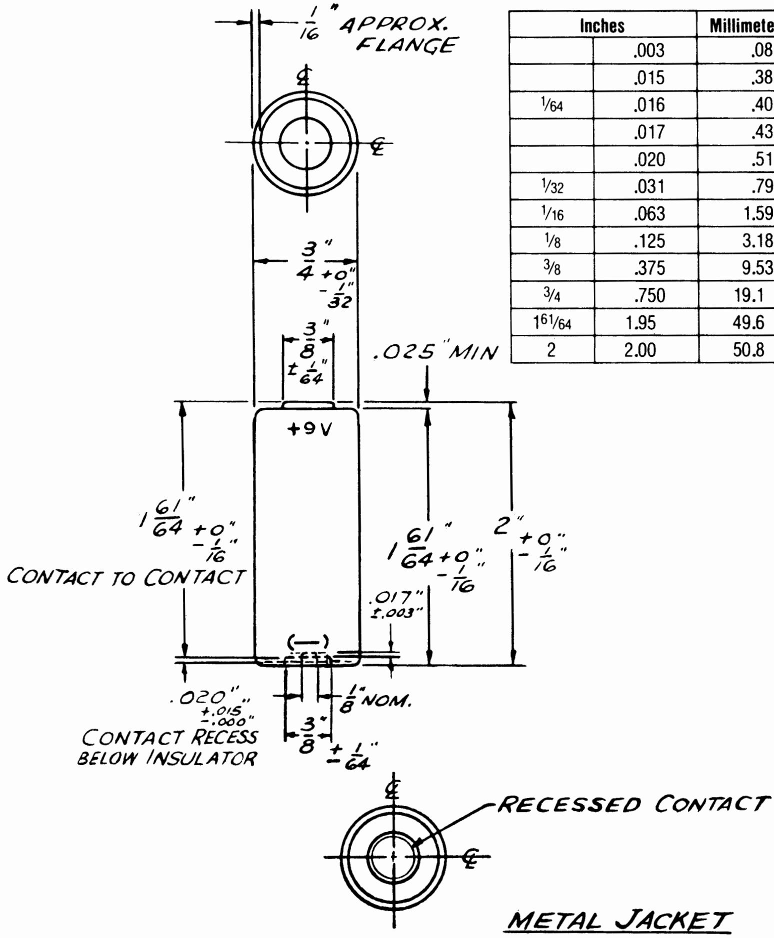
"EVEREADY" NO. 1562

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.25V	4.5V
24 hours/day	30	250		2000
	60	125		850
Discharge for 1 hour, rest 6 hours, discharge for 1 hour, rest 16 hours (Heavy Intermittent Test)	562	13.34	72	

"EVEREADY" NO. 206 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-7 milliamperes



Inches		Millimeters
	.003	.08
	.015	.38
1/64	.016	.40
	.017	.43
	.020	.51
1/32	.031	.79
1/16	.063	1.59
1/8	.125	3.18
3/8	.375	9.53
3/4	.750	19.1
1 61/64	1.95	49.6
2	2.00	50.8

SPECIFICATIONS

Voltage Taps .... −, + 9
Terminals .... Flat Contacts, Negative Recessed
Average Weight .... 1.2 oz. (34 grams)
Volume .... 0.85 cubic inches (13.9 cubic centimeters)
Cells .... Six No. 109 (ANSI F17) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 206

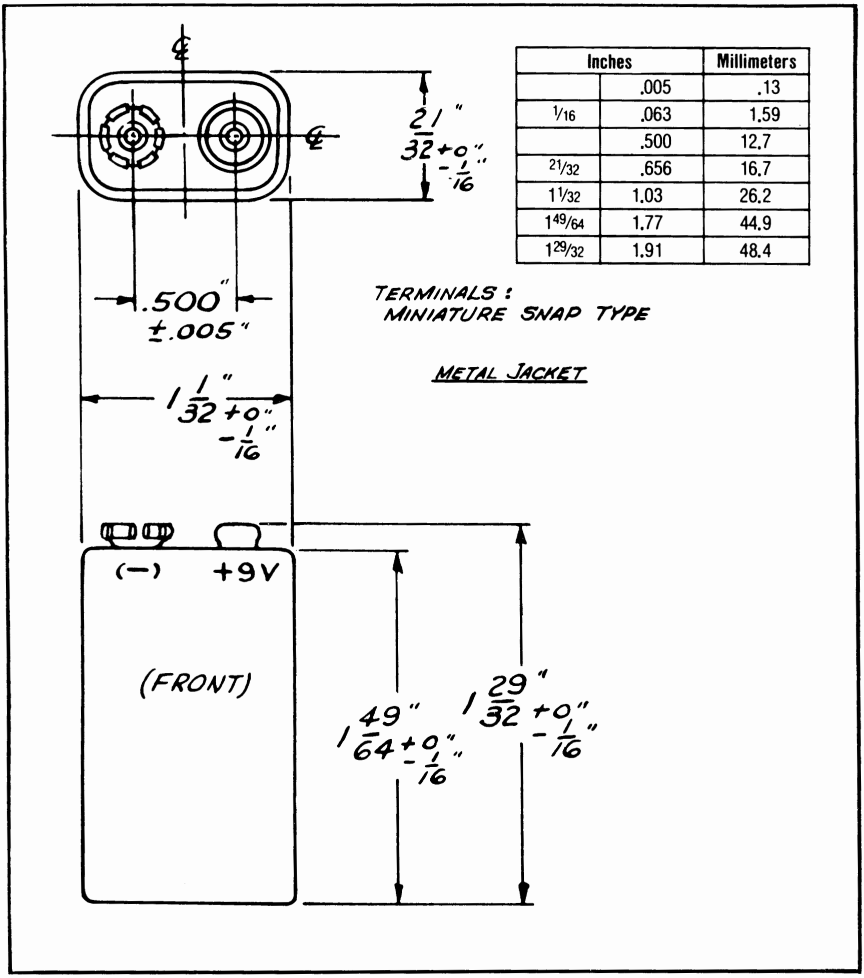
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.2V	5.4V	6.6V
2 hours/day	12	750	40	32	24
	16	560	27	21	13

"EVEREADY" NO. 216 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-15 milliamperes



Inches		Millimeters
	.005	.13
1/16	.063	1.59
	.500	12.7
21/32	.656	16.7
1 1/32	1.03	26.2
1 49/64	1.77	44.9
1 29/32	1.91	48.4

SPECIFICATIONS

Voltage Taps .... –, + 9

Terminals .... Miniature Snap

Average Weight .... 1.5 oz. (42.5 grams)

Volume .... 1.20 cubic inches (19.7 cubic centimeters)

Cells .... Six No. 117 (ANSI F22) in series

Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

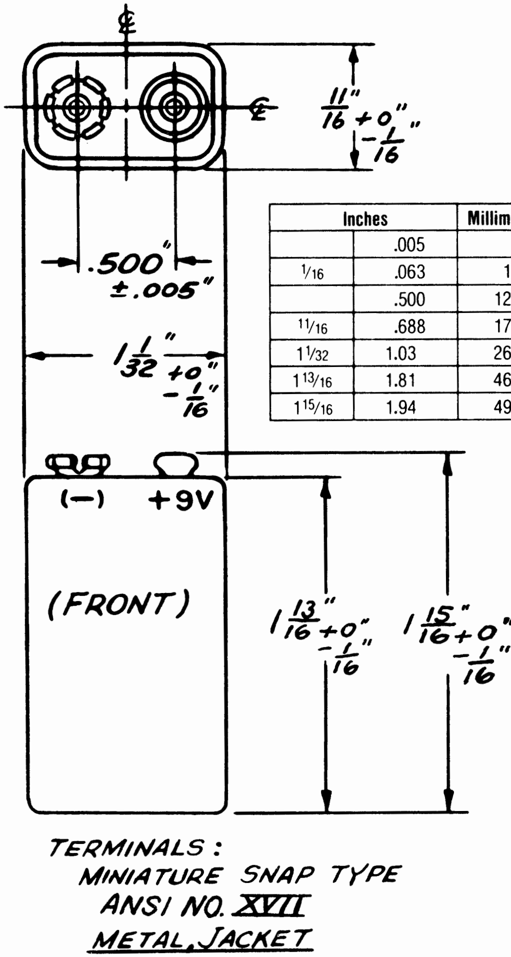
"EVEREADY" NO. 216

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.2V	CUTOFF VOLTAGE 5.4V
4 hours/day	9	1000	50	43
2 hours/day	12	750	41	32
4 hours/day	18	500	23	16
	24	375	14.5	10

"EVEREADY" NO. 1222 BATTERY

Type: Carbon - Zinc (Zinc Chloride)
Suggested Current Range: 0-15 milliamperes



Inches		Millimeters
	.005	.13
1/16	.063	1.59
	.500	12.7
11/16	.688	17.5
1 1/32	1.03	26.2
1 13/16	1.81	46.
1 15/16	1.94	49.2

SPECIFICATIONS

Voltage Taps .... −, + 9
Terminals .... Miniature Snap
Average Weight .... 1.5 oz. (42.5 grams)
Volume .... 1.28 cubic inches (21 cubic centimeters)
Cells .... Six No. 118 (ANSI F22) in series
Jacket........ Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

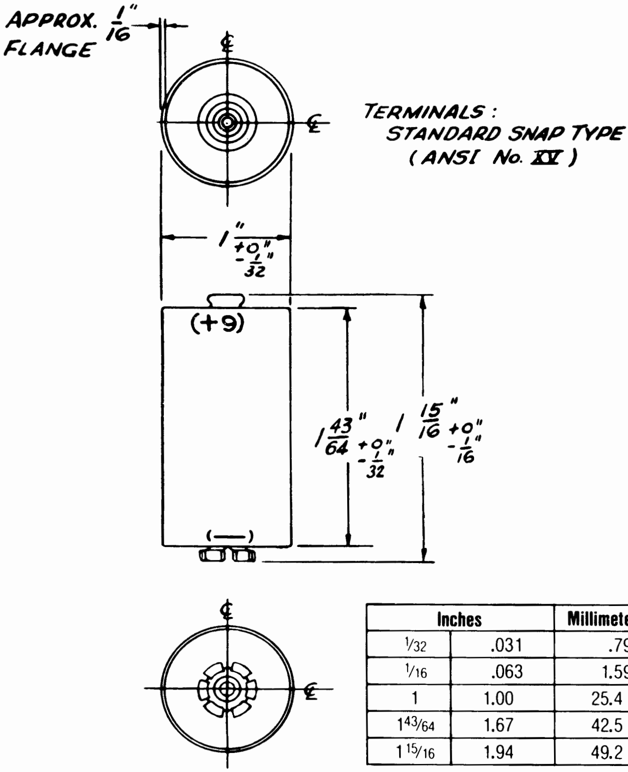
"EVEREADY" NO. 1222

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.2V	CUTOFF VOLTAGE 5.4V
2 hours/day	12	750	41	36
4 hours/day	18	500	25.5	22
	24	375	19.5	15.4
1 hour/day	37.5	240	13	9.2
½ hour/day	60	150	7.7	4.7

"EVEREADY" NO. 226 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-9 milliamperes



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
1	1.00	25.4
1 43/64	1.67	42.5
1 15/16	1.94	49.2

SPECIFICATIONS

Voltage Taps .... –, + 9
Terminals .... Snap
Average Weight .... 2.0 oz. (56.7 grams)
Volume .... 1.31 cubic inches (21.5 cubic centimeters)
Cells .... Six No. 127 (ANSI F24) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 226

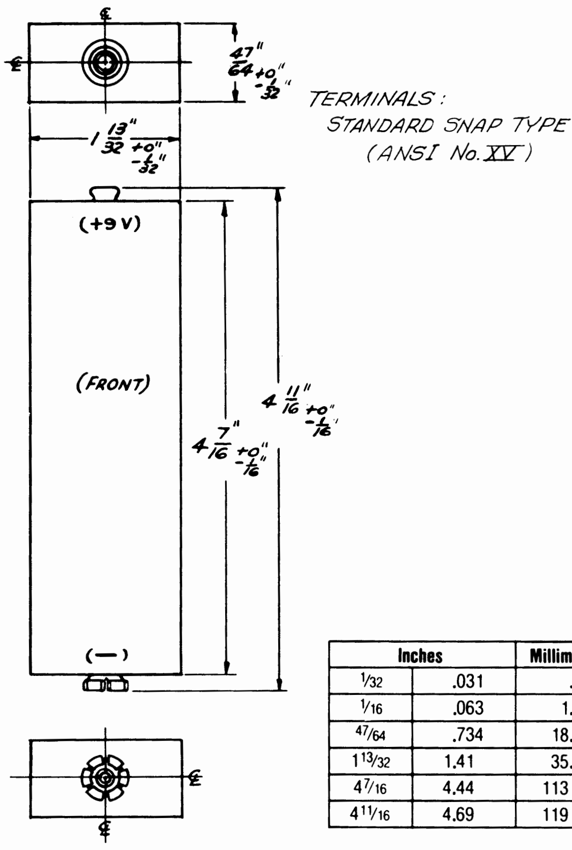
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.2V	CUTOFF VOLTAGE 5.4V
2 hours/day	12	750	61	54
	16	560	44	35

"EVEREADY" NO. 2709N BATTERY

9 VOLTS

Type: Carbon - Zinc
Suggested Current Range: 0-16 milliamperes



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
47/64	.734	18.7
1 13/32	1.41	35.7
4 7/16	4.44	113
4 11/16	4.69	119

SPECIFICATIONS

Voltage Taps .... –, + 9
Terminals .... Snap
Average Weight .... 2.5 oz. (70.9 grams)
Volume .... 4.57 cubic inches (74.9 cubic centimeters)
Cells .... Twelve No. 117 (ASA F22)–two parallel strings of six in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2709N

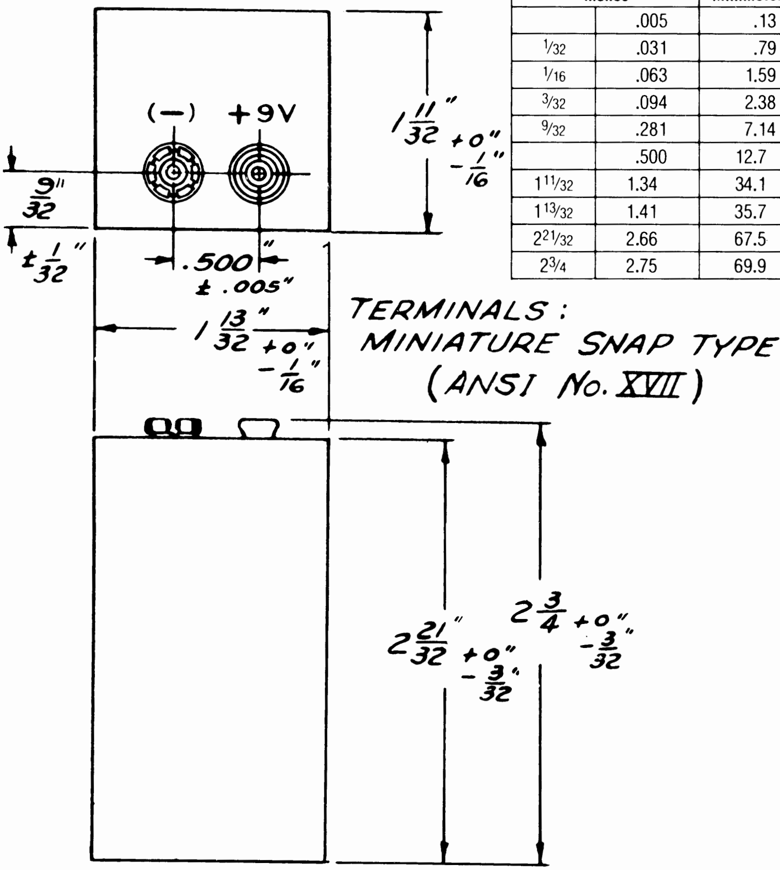
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	CUTOFF VOLTAGE 4.8V
2 hours/day	12	750	90	83
	40	225	24	19

"EVEREADY" NO. 246 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-15 milliamperes

Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
3/32	.094	2.38
9/32	.281	7.14
	.500	12.7
1 11/32	1.34	34.1
1 13/32	1.41	35.7
2 21/32	2.66	67.5
2 3/4	2.75	69.9



SPECIFICATIONS

Voltage Taps .... −, + 9
Terminals .... Miniature Snap
Average Weight .... 4.5 oz. (128 grams)
Volume .... 5.02 cubic inches (82.3 cubic centimeters)
Cells .... Six No. 148 in series

For service information see reverse side of this sheet

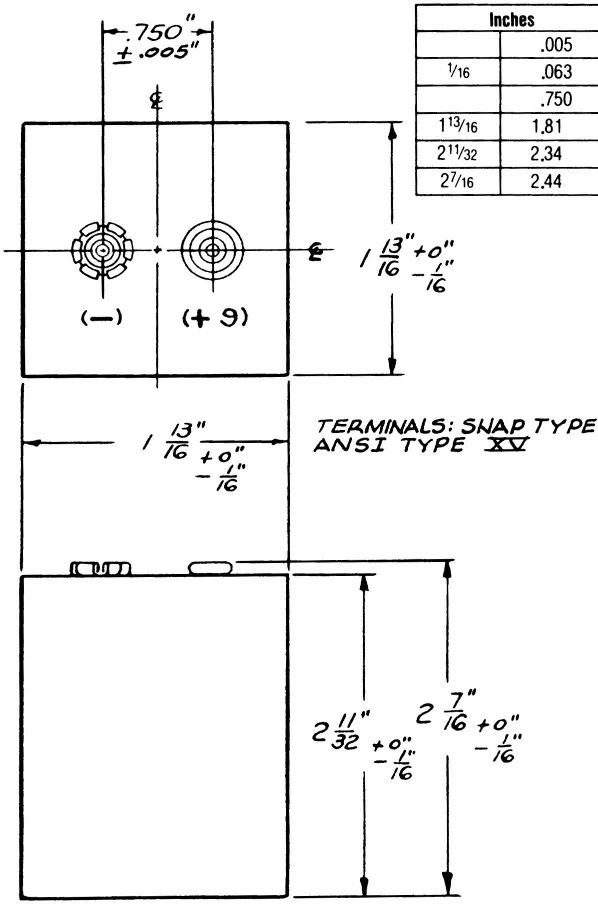
"EVEREADY" NO. 246

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.2V	CUTOFF VOLTAGE 5.4V
2 hours/day	12	750	165	155
	18.7	480	110	100

"EVEREADY" NO. 266 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-20 milliamperes



	Inches	Millimeters
	.005	.13
1/16	.063	1.59
	.750	19.1
1 13/16	1.81	46
2 11/32	2.34	59.5
2 7/16	2.44	61.9

SPECIFICATIONS

Voltage Taps .... −, + 9
Terminals .... Snap
Average Weight .... 7 oz. (198 grams)
Volume .... 7.7 cubic inches (126 cubic centimeters)
Cells .... Six No. 165 (ANSI F90) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 266

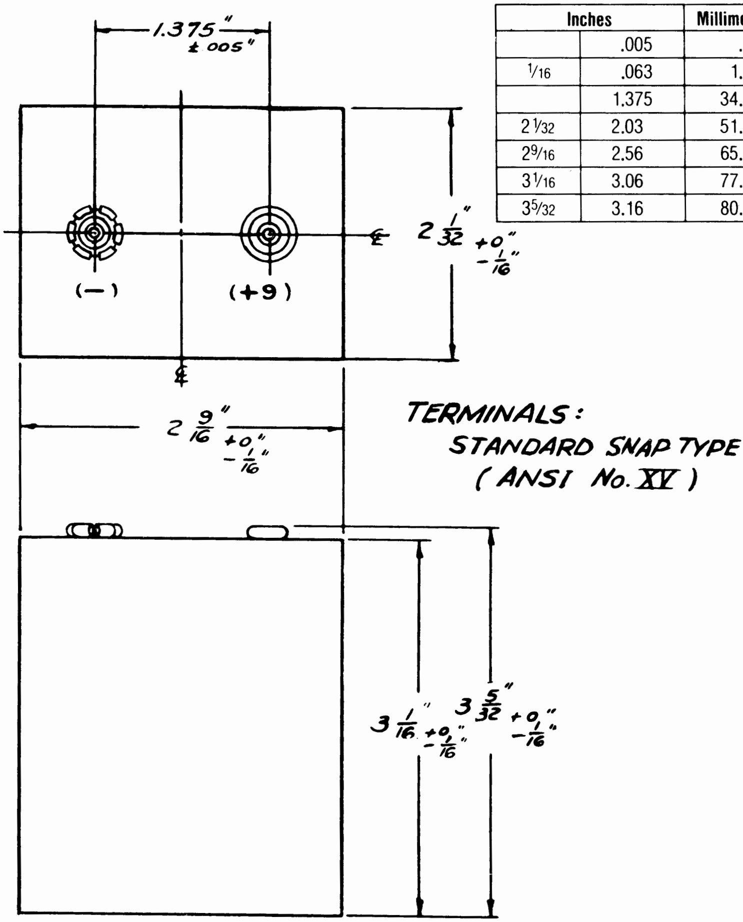
Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.8V	5.4V	6.0V	6.6V	7.2V
4 hours/day	0.5	18K	2400	2200	1950	1700	1400
	1.0	9K	1650	1500	1300	1140	920
	5.0	1800	520	470	395	320	240
	10	900	295	265	220	170	125
	20	450	138	120	96	70	45
	40	225	50	43	32	21.5	9.5
	80	112.5	14.5	11.5	8	3.3	1.3
8 hours/day	0.5	18K	3400	3200	2850	2600	2150
	1.0	9K	2150	1975	1800	1650	1320
	5.0	1800	570	530	475	350	250
	10	900	285	255	220	150	98
	20	450	118	102	84	52	30
	40	225	42	34	27	15	5.7
	80	112.5	12.5	10	7	3.3	1.3
24 hours/day	0.5	18K	6000	5600	5200	4800	4200
	1.0	9K	3350	3100	2900	2575	2100
	5.0	1800	640	590	500	375	230
	10	900	275	250	205	138	78
	20	450	105	92	74	44	23
	40	225	37	30	23	12.3	5.7
	80	112.5	11.5	9	7	3.3	1.3

"EVEREADY" NO. 276 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-30 milliamperes

Inches		Millimeters
	.005	.13
1/16	.063	1.59
	1.375	34.9
2 1/32	2.03	51.6
2 9/16	2.56	65.1
3 1/16	3.06	77.8
3 5/32	3.16	80.2



SPECIFICATIONS

Voltage Taps .... −, + 9
Terminals .... Snap
Average Weight .... 15 oz. (425 grams)
Volume .... 16.3 cubic inches (267 cubic centimeters)
Cells .... Six No. 175 (ANSI F100) in series

For service information see reverse side of this sheet

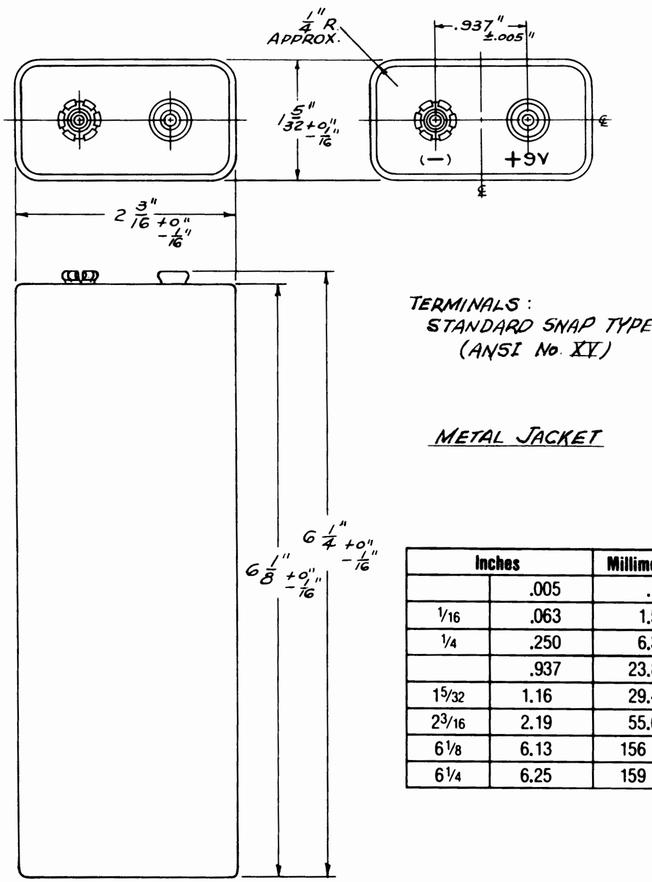
"EVEREADY" NO. 276

Estimated Average Hours Service at 70 ° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.8V	5.4V	6.0V	6.6V	7.2V
2 hours/day	5	1800	920	860	800	715	600
	10	900	540	480	440	380	300
	20	450	300	275	245	200	140
	30	300	200	170	150	130	85
	50	180	110	95	80	60	38
4 hours/day	5	1800	1600		1250	900	
	10	900	750		580	410	
	20	450	350		230	170	
	30	300	200		135	100	
	50	180	110		72	56	
24 hours/day	5	1800	1600		1350	1000	
	10	900	700		540	380	
	20	450	280		210	140	
	30	300	170		125	80	
	50	180	90		65	40	

"EVEREADY" NO. 2356N BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-80 milliamperes



Inches		Millimeters
	.005	.13
1/16	.063	1.59
1/4	.250	6.35
	.937	23.8
1 5/32	1.16	29.4
2 3/16	2.19	55.6
6 1/8	6.13	156
6 1/4	6.25	159

SPECIFICATIONS

Voltage Taps .... −, + 9
Terminals .... Snap
Average Weight .... 11 oz. (312 grams)
Volume.. 17.6 cubic inches (288 cubic centimeters)
Cells ....54 Nos. 117 and 118; nine parallel strings of six in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 2356N

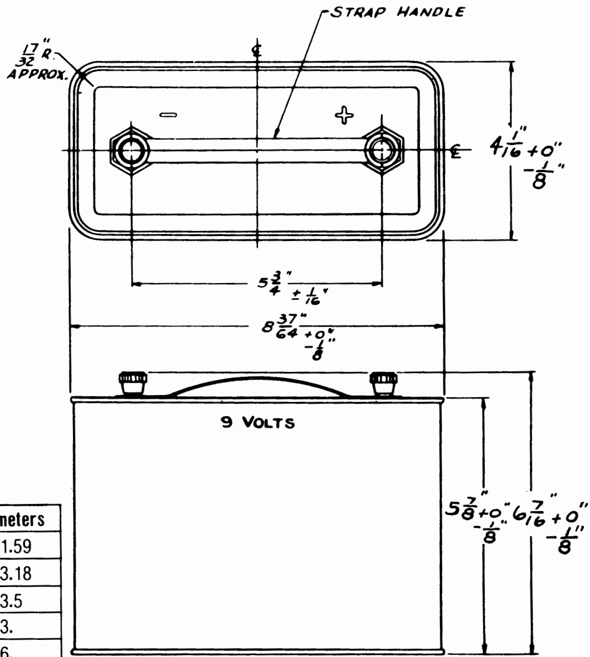
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.8V	CUTOFF VOLTAGE 6V
4 hours/day	15	600	305	290
	25	360	185	175
	36	250	125	115

"EVEREADY" NO. 716 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-1 ampere



Inches		Millimeters
1/16	.063	1.59
1/8	.125	3.18
17/32	.531	13.5
4 1/16	4.06	103.
5 3/4	5.75	146.
5 7/8	5.88	149.
6 7/16	6.44	164.
8 37/64	8.58	218.

METAL JACKET

TERMINAL POSTS - No. 8-32 THREAD
INSULATED KNURLS.

SPECIFICATIONS

Voltage Taps .... –, + 9
Terminals .... Knurled Nut & Screw
Average Weight .... 8 lbs. 8 oz. (3.86 kilograms)
Volume .... 205 cubic inches (3359 cubic centimeters)
Cells .... Twenty-four No. 60 (ANSI "F")–
Four parallel strings of six in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

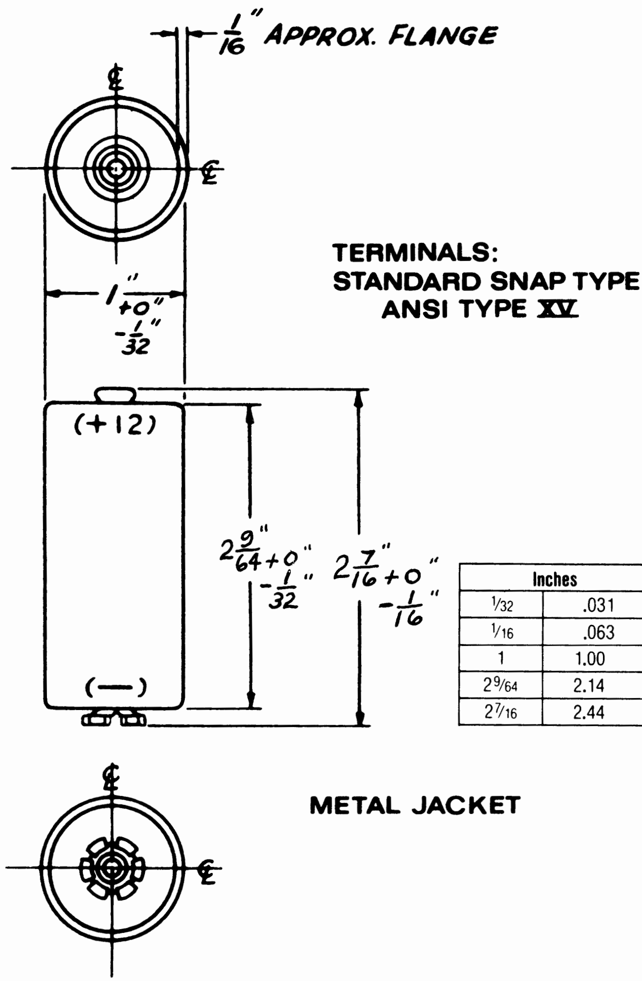
"EVEREADY" NO. 716

Estimated Average Hours Service at 70°F (21.1°C)

	STARTING		CUTOFF VOLTAGE				
SCHEDULE	DRAINS (milliamperes)	LOAD (ohms)	4.8V	5.4V	6.0V	6.6V	7.2V
2 hours/day	80	112.5	490	450	410	370	310
	120	75	340	310	280	250	200
	400	22.5	98	88	78	68	47
	800	11.25	41	37	33	27	16
	1200	7.5	23	20.5	18	13.8	6.8
4 hours/day	80	112.5	475	425	400	335	300
	120	75	320	275	260	235	180
	400	22.5	90	75	56	44	36
	800	11.25	35	28	22	16	12
	1200	7.5	19	15	12.3	8.5	4
24 hours/day	40	225	1200	1050	940	880	620
	80	112.5	550	470	390	335	260
	120	75	350	275	250	220	155
	400	22.5	84	70	55	40	25
	800	11.25	33	26	20	13	8
	1200	7.5	18	14	10.5	6.5	4
Continuous	3.53 amperes	2.55		2.8			

"EVEREADY" NO. 228 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-9 milliamperes



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
1	1.00	25.4
2 9/64	2.14	54.4
2 7/16	2.44	61.9

SPECIFICATIONS

Voltage Taps .... −, + 12
Terminals .... Snap
Average Weight .... 2.3 oz. (65.2 grams)
Volume .... 1.68 cubic inches (27.5 cubic centimeters)
Cells .... Eight No. 127 (ANSI F24) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

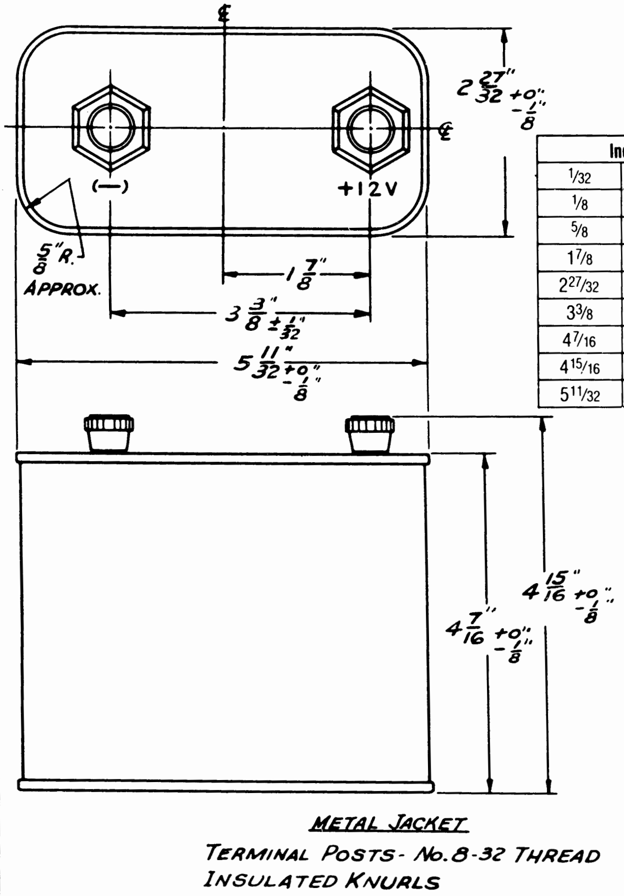
"EVEREADY" NO. 228

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 5.6V	7.2V	8.8V
2 hours/day	12	1000	59	52	37

"EVEREADY" NO. 732 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0–250 milliamperes



Inches		Millimeters
1/32	.031	.79
1/8	.125	3.18
5/8	.625	15.9
1 7/8	1.88	47.6
2 27/32	2.84	72.2
3 3/8	3.38	85.7
4 7/16	4.44	11.3
4 15/16	4.94	125.
5 11/32	5.34	136.

SPECIFICATIONS

Voltage Taps .... —, + 12
Terminals .... Insulated Screw
Average Weight .... 3 lbs. 2 oz. (1.42 kilograms)
Volume .... 69.5 cubic inches (1139 cubic centimeters)
Cells .... Eight No. 60 (ANSI "F") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet.

"EVEREADY" NO. 732

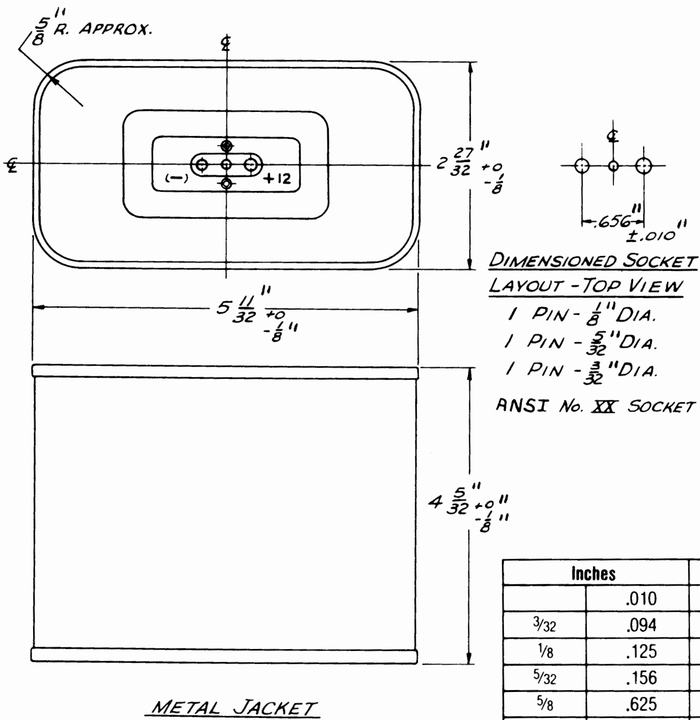
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 5.2V	6.0V	6.4V	7.2V	8V
24 hours/day	20	600			500		475
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours.	187	64				45	
As above	375	32		22	18.5		12
½ hour/day	667	18	18				
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours.	667	18	10.5	7.1			

"EVEREADY" NO. 2780N BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-250 milliamperes



Inches		Millimeters
	.010	.25
3/32	.094	2.38
1/8	.125	3.18
5/32	.156	3.97
5/8	.625	15.9
	.656	16.7
2 27/32	2.84	72.2
4 5/32	4.16	106
5 11/32	5.34	136

SPECIFICATIONS

Voltage Taps .... −, + 12
Terminals.. Socket
Average Weight .... 3 lbs. (1.36 kilograms)
Volume..................................... 63.1 cubic inches (1034 cubic centimeters)
Cells .... Eight No. 60 (ANSI "F") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

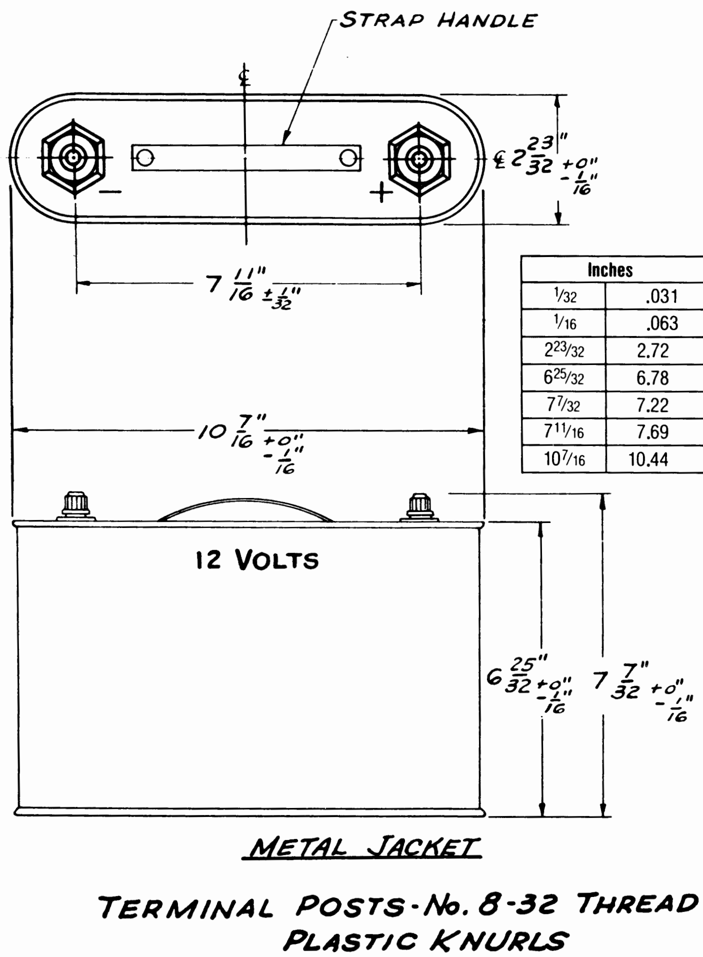
"EVEREADY" NO. 2780N

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 6.4V	CUTOFF VOLTAGE 8V
24 hours/day	20	600	500	475
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test)	375	32	18.5	12

"EVEREADY" NO. 1463 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-600 milliamperes



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
2 23/32	2.72	69.1
6 25/32	6.78	172
7 7/32	7.22	183
7 11/16	7.69	195
10 7/16	10.44	265

SPECIFICATIONS

Voltage Taps .... –, + 12
Terminals .... Knurled Nut & Screw
Average Weight .... 7 lbs. 11 oz. (3.49 kilograms)
Volume .... 199 cubic inches (3261 cubic centimeters)
Cells .... Sixteen No. 64 (ANSI "G")—Two parallel strings of eight in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 1463

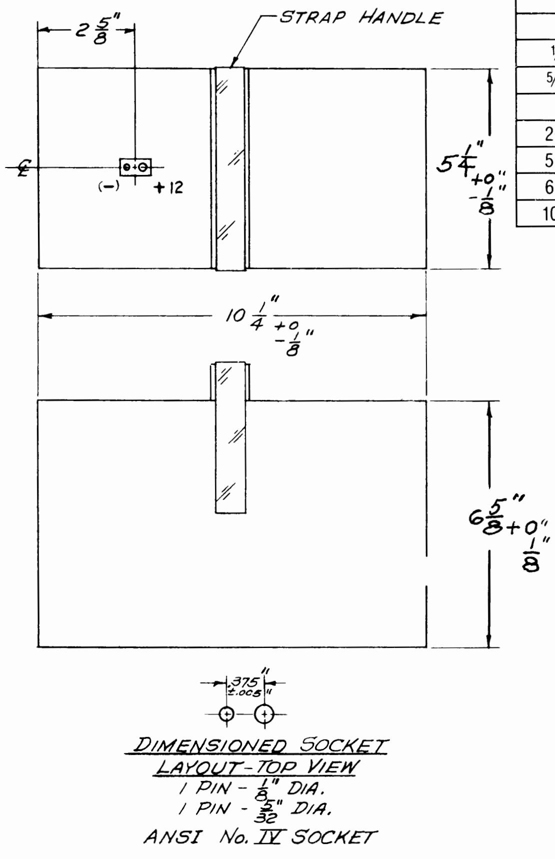
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS	LOAD (ohms)	CUTOFF VOLTAGE 4.0V	CUTOFF VOLTAGE 7.2V
24 hours/day	20mA	600	2300	1750
2 hours discharge, 3 hours rest, 2 hours discharge (per day).	1 ampere	12	31	20
2 hours discharge, 3 hours rest, 2 hours discharge (per day).	2 amperes	6	14.5	3.5

"EVEREADY" NO. 1862 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-1.5 amperes



Inches		Millimeters
	.005	.13
1/8	.125	3.18
5/32	.156	3.97
	.375	9.53
2 5/8	2.63	66.7
5 1/4	5.25	133
6 5/8	6.63	168
10 1/4	10.3	260

SPECIFICATIONS

Voltage Taps .... −, + 12

Terminals .... Socket

Average Weight .... 21 lbs. (9.53 kilograms)

Volume .... 356 cubic inches (5834 cubic centimeters)

Cells .... Eight No. 6 (ANSI "6") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 1862

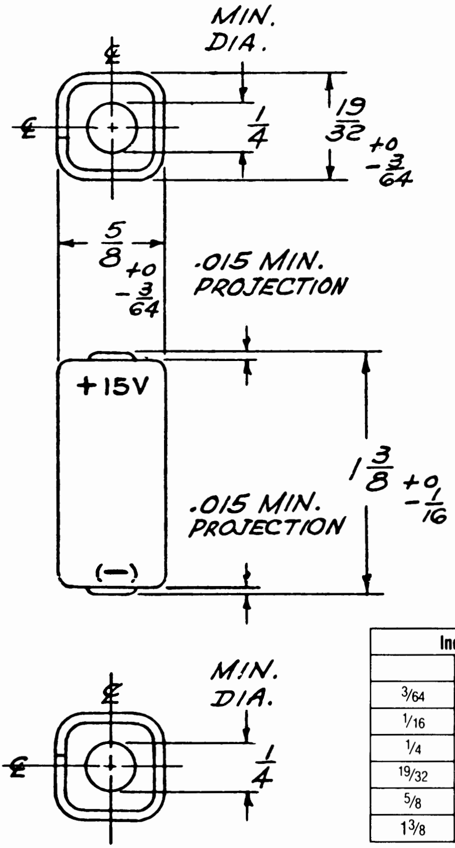
Estimated Average Hours Service

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD	CUTOFF VOLTAGE 7.2V 70°F (21.1°C)	CUTOFF VOLTAGE 7.2V 32°F (0°C)	CUTOFF VOLTAGE 8V 70°F (21.1°C)	CUTOFF VOLTAGE 8V 32°F (0°C)
Discharge 100 milliseconds per second, 24 hours/day, 7 days/week, 10% "on" time Safety Flasher Test	Load is RCR (resistor-capacitor-resistor) network, Components chosen to provide initial peak pulse of 2.7A, dropping to a plateau of about 575mA (at 10.4 volts midpoint) in 40 milliseconds and remaining at this level for remainder of 100 millisecond pulse (simulates characteristics of No. 957 lamp, rated at 9.4V, 500 mA)		750	525	700	475

"EVEREADY" NO. 504 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-1.5 milliamperes



Inches		Millimeters
	.015	.38
3/64	.047	1.19
1/16	.063	1.59
1/4	.250	6.35
19/32	.594	15.1
5/8	.625	15.9
1 3/8	1.38	34.9

METAL JACKET

SPECIFICATIONS

Voltage Taps .... −, + 15
Terminals .... Flat Contacts
Average Weight .... 0.6 oz. (17 grams)
Volume .... 0.51 cubic inches (8.36 cubic centimeters)
Cells ....Ten No. 105 (ANSI F15) in series
Jacket ....Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 504

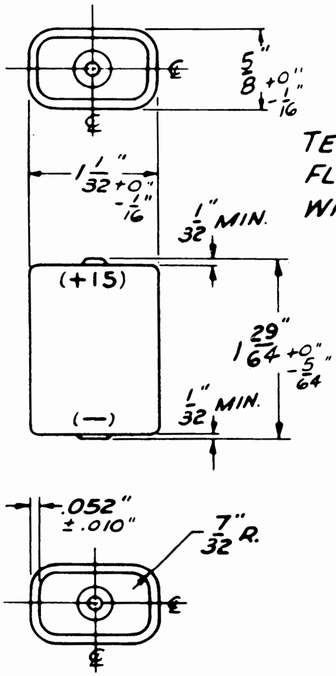
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 8V	9V	10V	11V	12V
2 hours/day	0.1	150K	1010	970	930	880	820
	0.5	30K	245	230	215	200	180
	1.0	15K	112	106	101	95	80
	5.0	3K	11.4	9.9	7	6.1	3.8
12 hours/day	0.05	300K	2300	2150	1950	1800	1600
	0.1	150K	1200	1100	1025	960	850
	0.5	30K	228	217	204	182	156
	1.0	15K	107	96	80	59	35
24 hours/day	0.02	750K	4500	4200	3700	2990	2400
	0.05	300K	2150	2000	1800	1500	1300
	0.1	150K	1150	1040	950	840	680
	0.5	30K	225	190	170	145	100
	1.0	15K	86	74	65	57	33
	5.0	3K	7.6	6.2	5	4	2.5

"EVEREADY" NO. 411 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-2.5 milliamperes



Inches		Millimeters
	.010	.25
1/32	.031	.79
	.052	1.32
1/16	.063	1.59
5/64	.078	1.98
3/32	.094	2.38
7/32	.219	5.56
5/8	.625	15.9
1 1/32	1.03	26.2
1 29/64	1.45	36.9

METAL JACKET

SPECIFICATIONS

Voltage Taps .... –, + 15
Terminals .... Flat Contacts
Average Weight .... 0.95 oz. (26.9 grams)
Volume .... 0.95 cubic inches (15.6 cubic centimeters)
Cells .... Ten No. 112 (ANSI F20) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 411

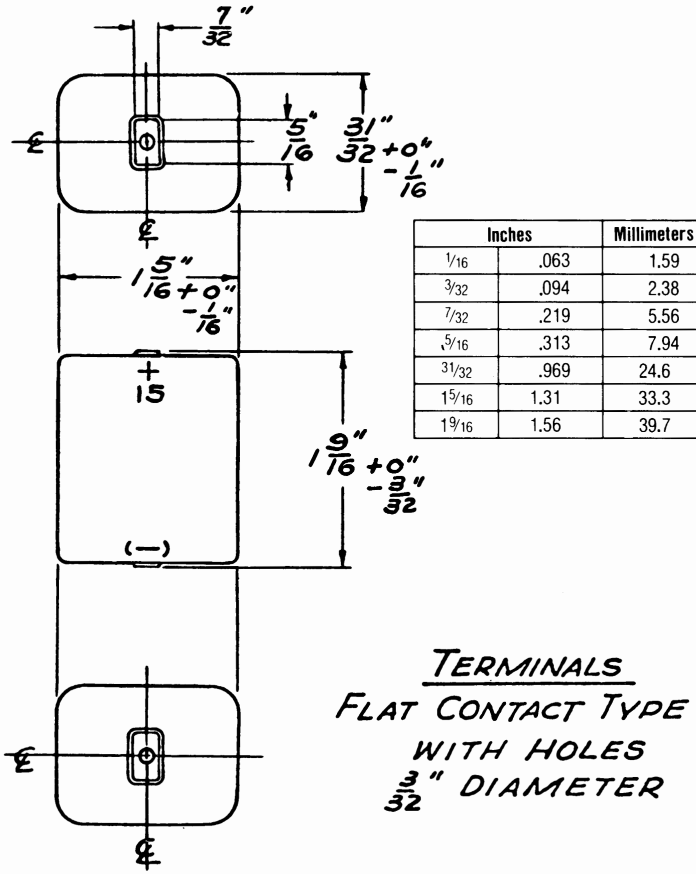
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 8V	9V	10V	11V	12V
2 hours/day	0.1	150K	1300	1265	1210	1130	1100
	0.2	75K	770	730	700	660	610
	0.3	50K	530	515	490	460	420
	0.5	30K	320	310	295	275	250
	1.0	15K	150	144	138	130	115
	2.0	7500	74	68	64	59	50
	5.0	3000	24	21	18	15	5
4 hours/day	0.1	150K	1650	1550	1500	1400	1330
	0.2	75K	860	810	780	768	715
	0.3	50K	570	530	510	490	460
	0.5	30K	330	310	300	280	260
	1.0	15K	155	148	140	130	115
	2.0	7500	68	65	60	54	44
	5.0	3000	22	18	14	10	4
12 hours/day	0.1	150K	1710	1615	1525	1430	1345
	0.2	75K	810	780	740	705	645
	0.3	50K	540	510	480	450	410
	0.5	30K	320	295	275	255	220
	1.0	15K	140	130	117	105	88
	2.0	7500	62	53	45	40	32
	5.0	3000	20	16	10	9	4
24 hours/day	0.6	25K	310	290	270	240	200
	1.0	15K	135	120	110	100	67
	2.0	7500	57	50	44	38	20
	5.0	3000	16	13	10	9	4

"EVEREADY" NO. 417 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-6 milliamperes



Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
7/32	.219	5.56
5/16	.313	7.94
31/32	.969	24.6
1 5/16	1.31	33.3
1 9/16	1.56	39.7

SPECIFICATIONS

Voltage Taps .... —, + 15
Terminals .... Flat contacts
Average Weight .... 1.8 oz. (51 grams)
Volume .... 1.87 cubic inches (30.6 cubic centimeters)
Cells .... Ten No. 132 (ANSI F30) in series

For service information see reverse side of this sheet.

"EVEREADY" NO. 417

Estimated Average Hours Service at 70°F (21.1°C)

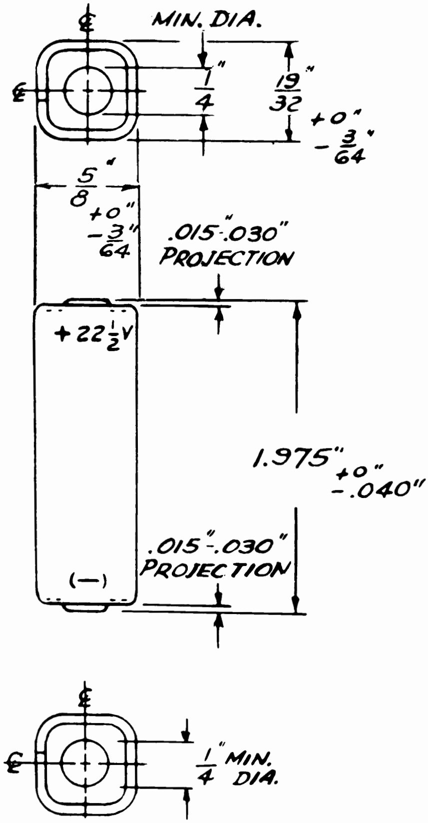
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 8V	9V	10V	11V	12V
2 hours/day	0.5	30K	720	680	630	560	460
	1.0	15K	380	355	330	300	225
	5.0	3000	60	55	48	39	28
	10	1500	25	21	16.5	13	6.8
	20	750	7.5	6	4.5	2	0.8
4 hours/day	0.2	75K	1730	1675	1600	1470	1250
	0.5	30K	760	730	660	590	490
	1.0	15K	370	350	310	270	220
	5.0	3000	59	54	45	35	25
	10	1500	23	19	15	10	3.5
12 hours/day	0.2	75K	1900	1820	1700	1500	1175
	0.5	30K	740	700	650	550	400
	1.0	15K	360	330	300	240	170
	5.0	3000	52	44	32	24	16
	10	1500	19.5	13.5	10	6.5	3.5
24 hours/day	0.1	150K	4100	3550	3400	3100	2600
	0.5	30K	780	700	620	540	390
	1.0	15K	365	330	285	230	165
	5.0	3000	50	40	30	22	14
	10	1500	17.5	12.5	10	6.5	3.5
	20	750	5.5	4	3	2	0.8

"EVEREADY" NO. 505 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-1.5 milliamperes

Inches		Millimeters
	.015	.38
	.030	.76
	.040	1.02
3/64	.047	1.19
1/4	.250	6.35
19/32	.594	15.1
5/8	.625	15.9
	1.975	50.2



METAL JACKET

SPECIFICATIONS

Voltage Taps .... –, + 22.5
Terminals .... Flat Contacts
Average Weight .... 0.9 oz. (25.5 grams)
Volume .... 0.74 cubic inches (12.1 cubic centimeters)
Cells .... Fifteen No. 105 (ANSI F15) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 505

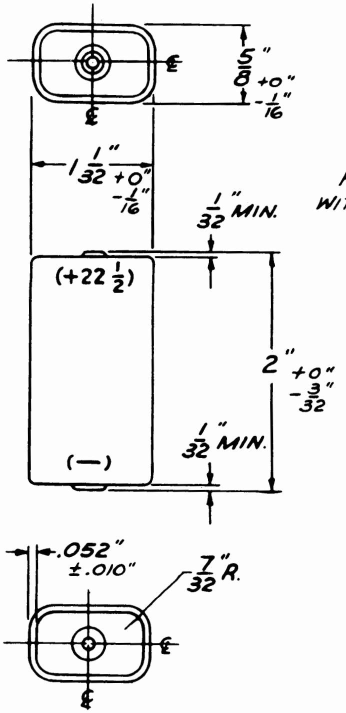
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 12.0V	13.5V	15.0V	16.5V	18.0V
2 hours/day	0.1	225K	1010	970	930	880	820
	0.5	45K	245	230	215	200	180
	1.0	22.5K	112	106	101	95	80
	5.0	4500	11.4	9.9	7	6.1	3.8
12 hours/day	0.05	450K	2300	2150	1950	1800	1600
	0.1	225K	1200	1100	1025	960	850
	0.5	45K	228	217	204	182	156
	1.0	22.5K	107	96	80	59	35
24 hours/day	0.02	1125K	4500	4200	3700	2990	2400
	0.05	450K	2150	2000	1800	1500	1300
	0.1	225K	1150	1040	950	840	680
	0.5	45K	225	190	170	145	100
	1.0	22.5K	86	74	65	57	33
	5.0	4500	7.6	6.2	5	4	2.5

"EVEREADY" NO. 412 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-2.5 milliamperes



TERMINALS
FLAT CONTACT TYPE
WITH HOLES 3/32" DIAMETER
(ANSI No. XVI)

Inches		Millimeters
	.010	.25
1/32	.031	.79
	.052	1.32
1/16	.063	1.59
3/32	.094	2.38
7/32	.219	5.56
5/8	.625	15.9
1 1/32	1.03	26.2
2	2.00	50.8

METAL JACKET

SPECIFICATIONS

Voltage Taps .... —, + 22.5
Terminals .... Flat Contacts
Average Weight .... 1.3 oz. (36.9 grams)
Volume .... 1.31 cubic inches (21.5 cubic centimeters)
Cells .... Fifteen No. 112 (ANSI F20) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

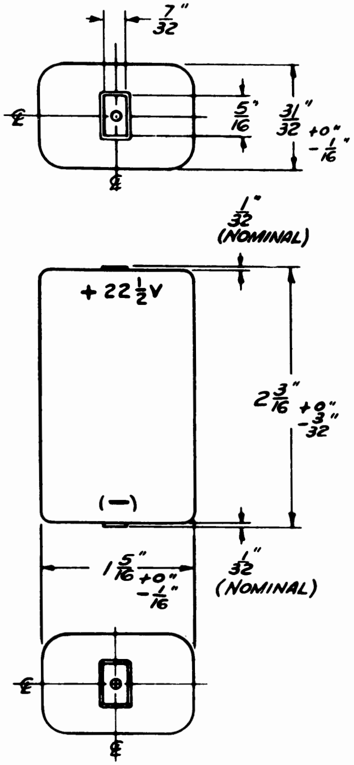
"EVEREADY" NO. 412

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 12.0V	13.5V	15.0V	16.5V	18.0V
2 hours/day	0.1	225K	1300	1265	1210	1130	1100
	0.2	112.5K	770	730	700	660	610
	0.3	75K	530	515	490	460	420
	0.5	45K	320	310	295	275	250
	1.0	22.5K	150	144	138	130	115
	2.0	11.25K	74	68	64	59	50
	5.0	4500	24	21	18	15	5
4 hours/day	0.1	225K	1650	1550	1500	1400	1330
	0.2	112.5K	860	810	780	768	715
	0.3	75K	570	530	510	490	460
	0.5	45K	330	310	300	280	260
	1.0	22.5K	155	148	140	130	115
	2.0	11.25K	68	65	60	54	44
	5.0	4500	22	18	14	10	4
12 hours/day	0.1	225K	1710	1615	1525	1430	1345
	0.2	112.5K	810	780	740	705	645
	0.3	75K	540	510	480	450	410
	0.5	45K	320	295	275	255	220
	1.0	22.5K	140	130	117	105	88
	2.0	11.25K	62	53	45	40	32
	5.0	4500	20	16	10	9	4
24 hours/day	0.6	37.5K	310	290	270	240	200
	1.0	22.5K	135	120	110	100	67
	2.0	11.25K	57	50	44	38	20
	5.0	4500	16	13	10	9	4

"EVEREADY" NO. 420 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-6 milliamperes



TERMINALS
FLAT CONTACT TYPE
WITH HOLES 3/32" DIAMETER
(ANSI No. XVI)

Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
3/32	.094	2.38
7/32	.219	5.56
5/16	.313	7.94
31/32	.969	24.6
1 5/16	1.31	33.3
2 3/16	2.19	55.6

SPECIFICATIONS

Voltage Taps .... −, + 22.5
Terminals .... Flat Contacts
Average Weight .... 2.5 oz. (70.9 grams)
Volume .... 2.66 cubic inches (43.6 cubic centimeters)
Cells .... Fifteen No. 132 (ANSI F30) in series

For service information see reverse side of this sheet

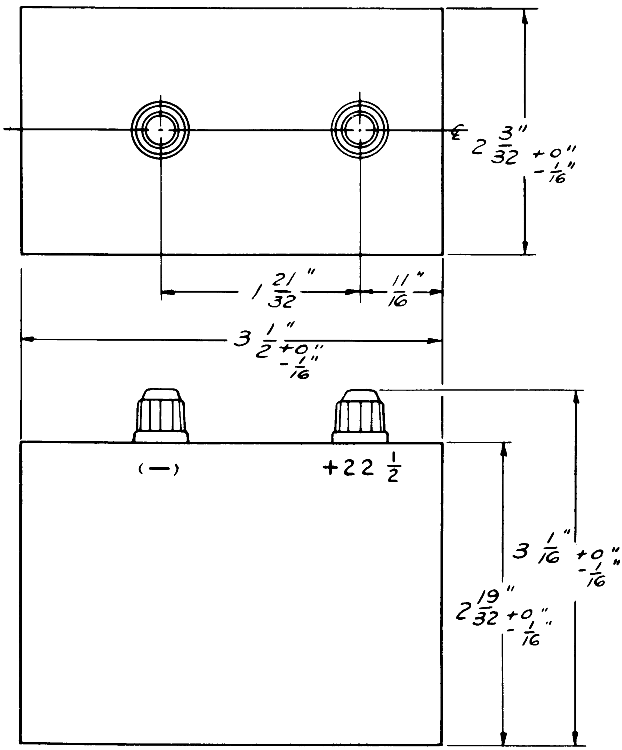
"EVEREADY" NO. 420

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 12.0V	13.5V	15.0V	16.5V	18.0V
2 hours/day	0.5	45K	720	680	630	560	460
	1.0	22.5K	380	355	330	300	225
	5.0	4500	60	55	48	39	28
	10	2250	25	21	16.5	13	6.8
	20	1130	7.5	6	4.5	2	0.8
4 hours/day	0.2	112.5K	1730	1675	1600	1470	1250
	0.5	45K	760	730	660	590	490
	1.0	22.5K	370	350	310	270	220
	5.0	4500	59	54	45	35	25
	10	2250	23	19	15	10	3.5
12 hours/day	0.2	112.5K	1900	1820	1700	1500	1175
	0.5	45K	740	700	650	550	400
	1.0	22.5K	360	330	300	240	170
	5.0	4500	52	44	32	24	16
	10	2250	19.5	13.5	10	6.5	3.5
24 hours/day	0.1	225K	4100	3550	3400	3100	2600
	0.5	45K	780	700	620	540	390
	1.0	22.5K	365	330	285	230	165
	5.0	4500	50	40	30	22	14
	10	2250	17.5	12.5	10	6.5	3.5
	20	1130	5.5	4	3	2	0.8

"EVEREADY" NO. 763 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-40 milliamperes



Inches		Millimeters
1/16	.063	1.59
11/16	.688	17.5
1 21/32	1.66	42.1
2 3/32	2.09	53.2
2 19/32	2.59	65.9
3 1/16	3.06	77.8
3 1/2	3.50	88.9

TERMINAL POSTS - NO. 8-32 THREAD
PLASTIC KNURLS -

SPECIFICATIONS

Voltage Taps .... −, + 22.5
Terminals .... Knurled Nut & Screw
Average Weight .... 14 oz. (397 grams)
Volume .... 18.5 cubic inches (303 cubic centimeters)
Cells .... Fifteen No. 161 in series

For service information see reverse side of this sheet

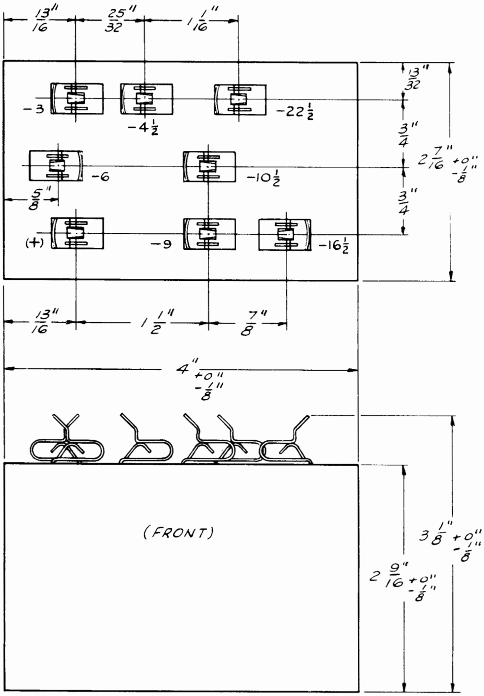
"EVEREADY" NO. 763

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 15V
4 hours/day	4.5	5000	425
	9	2500	205
	18	1250	85
24 hours/day	4.5	5000	385

"EVEREADY" NO. 778 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-50 milliamperes



Inches		Millimeters
1/8	.125	3.18
13/32	.406	10.3
25/32	.781	19.8
3/4	.75	19.1
13/16	.813	20.6
7/8	.875	22.2
1 1/16	1.06	27
1 1/2	1.5	38.1
2 7/16	2.44	61.9
2 9/16	2.56	65.1
3 1/8	3.13	79.4
4	4	102

SPECIFICATIONS

Voltage Taps .... +, – 3, – 4.5, – 6, – 9, – 10.5, – 16.5, – 22.5
Terminals .... Fahnestock
Average Weight .... 1 lb. 4 oz. (567 grams)
Volume .... 29.1 cubic inches (477 cubic centimeters)
Cells .... Fifteen No. 30 (ANSI "B") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 778

Estimated Average Hours Service at 70°F (21.1°C)

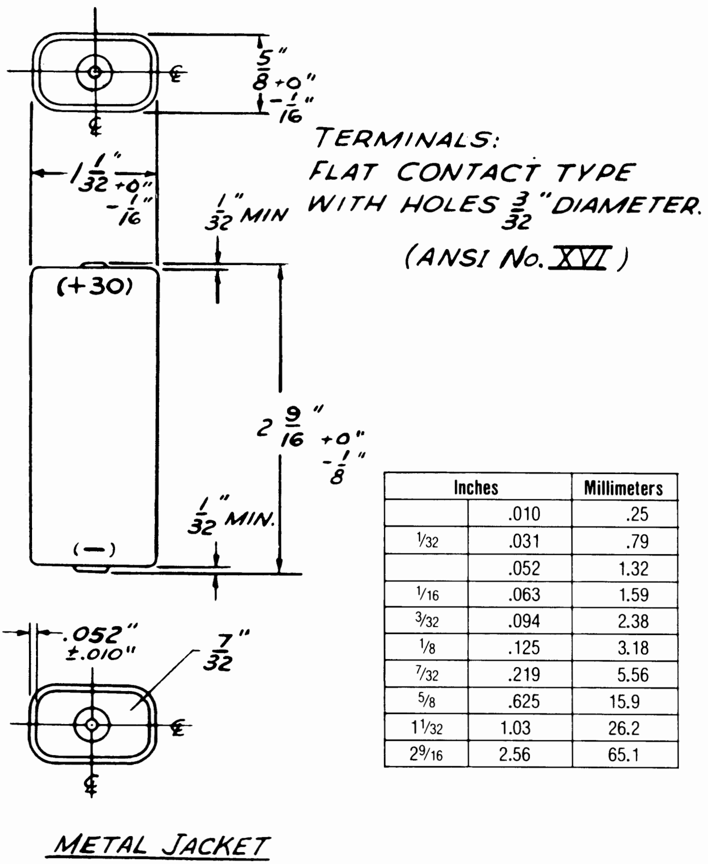
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 12V	13.5V	15V	16.5V	18V
2 hours/day	5	4500	420	380	340	290	250
	10	2250	220	190	155	130	107
	20	1125	110	90	75	57	45
	50	450	37	30	24	18	13.5
	100	225	14.5	11.5	9	6.2	4.5
4 hours/day	5	4500	480	450	410	330	265
	10	2250	240	215	190	150	100
	20	1125	110	90	75	55	40
	50	450	28	22	18.5	14	7
24 hours/day	1	22500	3040	2990	2920	2600	1850
	5	4500	610	530	440	390	300
	10	2250	205	170	130	110	80
	20	1125	87	70	50	37	27
	50	450	26	20	13	9	6
	100	225	10	7.5	4.5	3	2.2
	300	75	1.9	1.3	0.7	0.3	0.1

"EVEREADY" NO. 413 BATTERY

30 VOLTS

Type: Carbon - Zinc

Suggested Current Range: 0-2.5 milliamperes



	Inches	Millimeters
	.010	.25
1/32	.031	.79
	.052	1.32
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
7/32	.219	5.56
5/8	.625	15.9
1 1/32	1.03	26.2
2 9/16	2.56	65.1

SPECIFICATIONS

Voltage Taps.......... −, + 30
Terminals.......... Flat Contacts
Average Weight.......... 1.6 oz. (45.4 grams)
Volume.......... 1.59 cubic inches (26.1 cubic centimeters)
Cell.......... Twenty No. 112 (ANSI F20) in series
Jacket.......... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

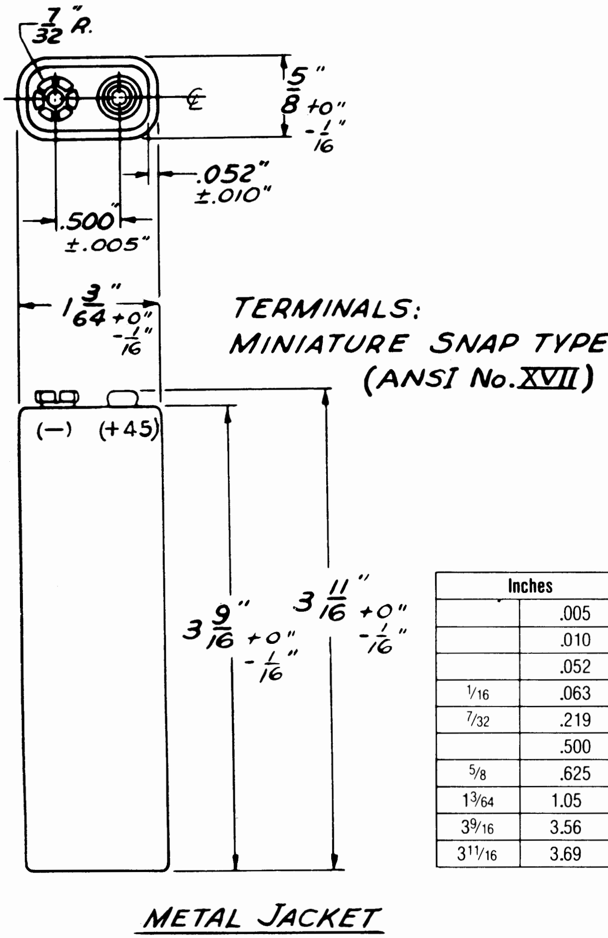
"EVEREADY" NO. 413

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 16V	18V	20V	22V	24V
4 hours/day	0.2	150K	760	720	660	620	570
	0.3	100K	500	470	435	405	370
	0.5	60K	290	275	250	235	215
	1.0	30K	145	135	130	120	105
	2.0	15K	70	66	60	56	50
	5.0	6000	23	21	19	16	13
12 hours/day	0.2	150K	710	675	630	590	550
	0.3	100K	465	440	415	390	360
	0.5	60K	280	260	245	230	210
	1.0	30K	135	130	125	115	100
	2.0	15K	66	62	57	53	46
	5.0	6000	23	21	18	15	12
24 hours/day	0.5	60K	270	250	235	220	200
	0.6	50K	225	210	205	195	165
	1.0	30K	135	125	120	110	95
	2.0	15K	62	58	54	50	43
	5.0	6000	22	19	17	14	11

"EVEREADY" NO. 415 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-4 milliamperes



Inches		Millimeters
	.005	.13
	.010	.25
	.052	1.32
$1/16$	.063	1.59
$7/32$	.219	5.56
	.500	12.7
$5/8$	.625	15.9
$1\,3/64$	1.05	26.6
$3\,9/16$	3.56	90.5
$3\,11/16$	3.69	93.7

SPECIFICATIONS

Voltage Taps .... −, + 45
Terminals .... Miniature Snap
Average Weight .... 2.5 oz. (70.9 grams)
Volume .... 2.35 cubic inches (38.5 cubic centimeters)
Cells .... Thirty No. 112 (ANSI F20) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 415

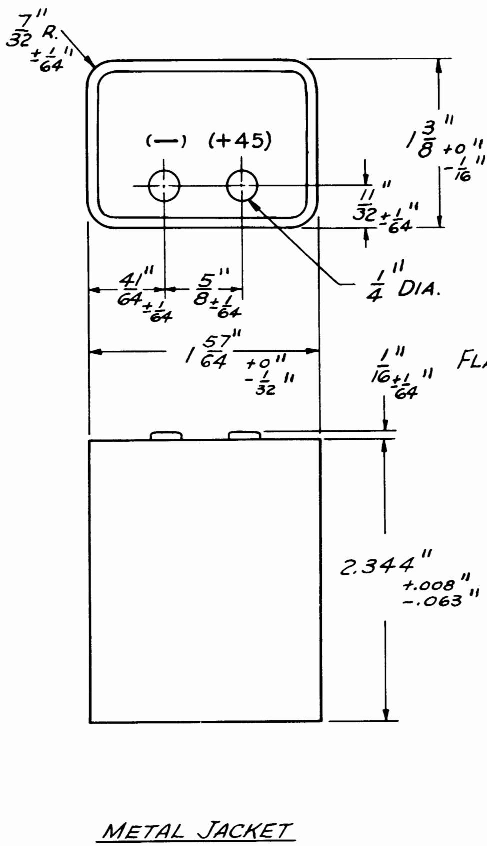
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 24V	27V	30V	33V	36V
2 hours/day	0.1	450K	1300	1265	1210	1130	1100
	0.2	225K	770	730	700	660	610
	0.3	150K	530	515	490	460	420
	0.5	90K	320	310	295	275	250
	1.0	45K	150	144	138	130	115
	2.0	22.5K	74	68	64	59	50
	5.0	9000	24	21	18	15	5
4 hours/day	0.1	450K	1650	1550	1500	1400	1330
	0.2	225K	860	810	780	768	715
	0.3	150K	570	530	510	490	460
	0.5	90K	330	310	300	280	260
	1.0	45K	155	148	140	130	115
	2.0	22.5K	68	65	60	54	44
	5.0	9000	22	18	14	10	4
12 hours/day	0.1	450K	1710	1615	1525	1430	1345
	0.2	225K	810	780	740	705	645
	0.3	150K	540	510	480	450	410
	0.5	90K	320	295	275	255	220
	1.0	45K	140	130	117	105	88
	2.0	22.5K	62	53	45	40	32
	5.0	9000	20	16	10	9	4
24 hours/day	0.6	75K	310	290	270	240	200
	1.0	45K	135	120	110	100	67
	2.0	22.5K	57	50	44	38	20
	5.0	9000	16	13	10	9	4

"EVEREADY" NO. 460 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-6 milliamperes



Inches		Millimeters
	.008	.20
1/64	.016	.40
1/32	.031	.79
1/16	.063	1.59
	.063	1.60
7/32	.219	5.56
1/4	.250	6.35
11/32	.344	8.73
5/8	.625	15.9
41/64	.641	16.3
1 3/8	1.38	34.9
1 57/64	1.89	48
	2.344	59.5

SPECIFICATIONS

Voltage Taps .... —, + 45
Terminals .... Flat Contacts
Average Weight .... 5.3 oz. (150 grams)
Volume .... 6.1 cubic inches (100 cubic centimeters)
Cells .... Thirty No. 132 (ANSI F30) in series
Jacket: .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

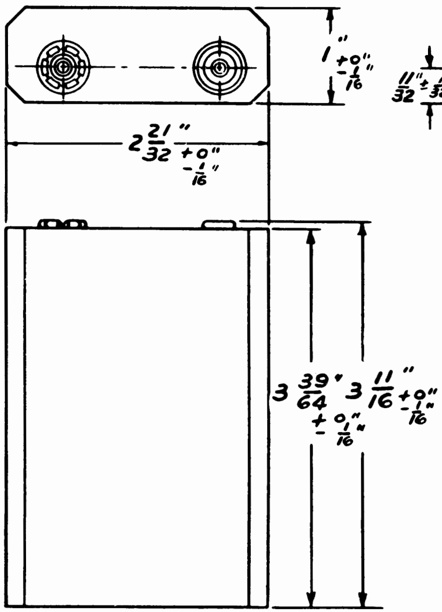
"EVEREADY" NO. 460

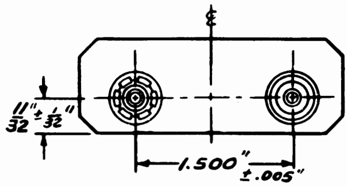
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 24V	27V	30V	33V	36V
2 hours/day	0.5	90K	720	680	630	560	460
	1.0	45K	380	355	330	300	225
	5.0	9000	60	55	48	39	28
	10	4500	25	21	16.5	13	6.8
	20	2250	7.5	6	4.5	2	0.8
4 hours/day	0.2	225K	1730	1675	1600	1470	1250
	0.5	90K	760	730	660	590	490
	1.0	45K	370	350	310	270	220
	5.0	9000	59	54	45	35	25
	10	4500	23	19	15	10	3.5
12 hours/day	0.2	225K	1900	1820	1700	1500	1175
	0.5	90K	740	700	650	550	400
	1.0	45K	360	330	300	240	170
	5.0	9000	52	44	32	24	16
	10	4500	19.5	13.5	10	6.5	3.5
24 hours/day	0.1	450K	4100	3550	3400	3100	2600
	0.5	90K	780	700	620	540	390
	1.0	45K	365	330	285	230	165
	5.0	9000	50	40	30	22	14
	10	4500	17.5	12.5	10	6.5	3.5
	20	2250	5.5	4	3	2	0.8

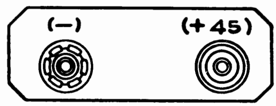
"EVEREADY" NO. 455 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-10 milliamperes





	Inches	Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
11/32	.344	8.73
1	1.00	25.4
	1.50	38.1
2 21/32	2.66	67.5
3 39/64	3.61	91.7
3 11/16	3.69	93.7



TERMINALS:
STANDARD SNAP TYPE
(ANSI No. XV)

SPECIFICATIONS

Voltage Taps .... −, + 45
Terminals .... Snap
Average Weight .... 7.8 oz. (221 grams)
Volume .... 9.6 cubic inches (157 cubic centimeters)
Cells .... Thirty No. 135 (ANSI F40) in series

For service information see reverse side of this sheet

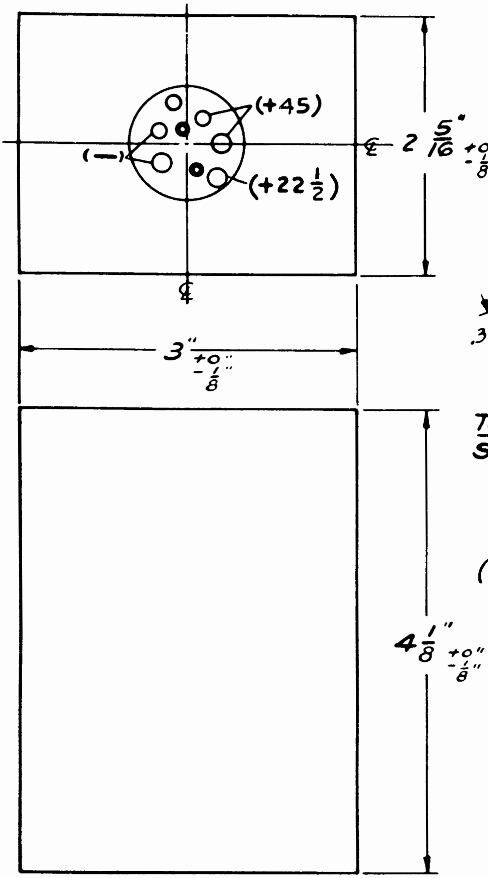
"EVEREADY" NO. 455

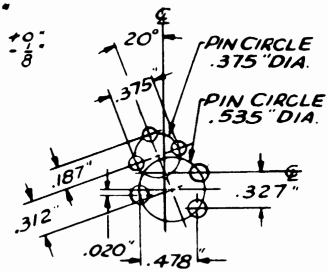
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 24V	27V	30V	33V	36V
2 hours/day	0.5	90K	920	890	850	810	730
	1	45K	630	590	550	480	410
	5	9000	150	140	130	98	70
	10	4500	63	56	47	35	21
	20	2250	20	18	15	11	5.4
	30	1500	9.6	8.6	7.5	4.4	1.5
	35	1290	7	6.2	5.4	2.7	0.8
12 hours/day	0.5	90K	1700	1600	1500	1250	930
	1	45K	790	700	630	580	400
	5	9000	110	92	85	68	45
	10	4500	42	35	30	23	15
	20	2250	16	12	9.6	6.5	4
	30	1500	7.6	6.5	5	3.2	1.5
	35	1290	6	5	3.8	2.4	0.8
24 hours/day	0.5	90K	1700	1620	1550	1300	1000
	1	45K	820	740	650	530	390
	5	9000	105	90	75	55	36
	10	4500	40	33	27	19	10.5
	20	2250	14	12	9.6	6.5	4
	30	1500	7.6	6.5	5	3.2	1.5
	35	1290	6	5	3.8	2.4	0.8

"EVEREADY" NO. 738 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0–25 milliamperes





TOP VIEW OF SOCKET
SHOWING DIMENSIONS
3 PINS - 3/32" DIA.
3 PINS - 1/8" DIA.
(ANSI No. X SOCKET)

Inches		Millimeters
3/32	.094	2.38
1/8	.125	3.18
	.187	4.75
	.312	7.93
	.327	8.31
	.375	9.53
	.478	12.1
	.535	13.6
2 5/16	2.31	58.7
3	3.00	76.2
4 1/8	4.13	105.

SPECIFICATIONS

Voltage Taps .... –, + 22.5, + 45
Terminals .... Socket
Average Weight .... 1 lb. 3 oz. (539 grams)
Volume .... 28.6 cubic inches (469 cubic centimeters)
Cells .... Thirty No. 15 (ANSI "AA") in series

For service information see reverse side of this sheet.

"EVEREADY" NO. 738

Estimated Average Service at 70°F (21.1°C)

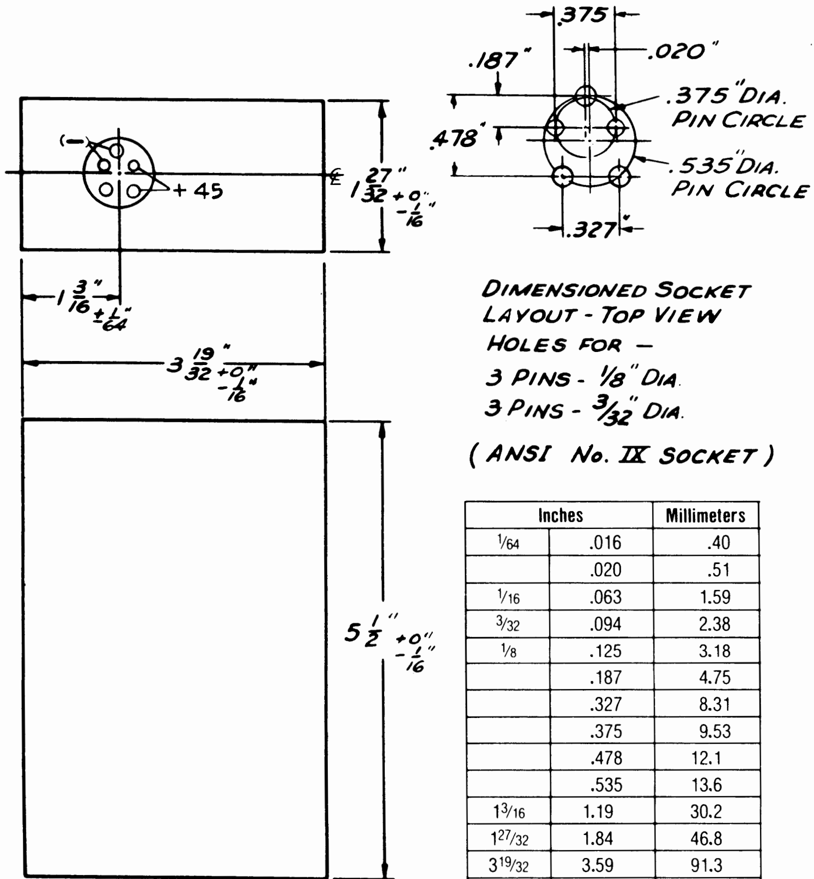
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 30V
4 hours/day	4.5	10,000	255 hours
	9.0	5000	120
	18	2500	45
24 hours/day	4.5	10,000	225

SCHEDULE	LOAD (ohms)	CUTOFF AMPERAGE 2A	2.5A	3A
Discharge 1 second Rest 4 seconds Discharge 1 second Rest 4 seconds Discharge 1 second. Repeat 3 cycles per day at intervals of 3, 3 and 18 hours, 5 days per week. (Cable Breakdown Test)	2	105 days	90 days	60 days

"EVEREADY" NO. 482 BATTERY

Type: Carbon - Zinc

Suggested Current Range: 0-40 milliamperes



Inches		Millimeters
1/64	.016	.40
	.020	.51
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
	.187	4.75
	.327	8.31
	.375	9.53
	.478	12.1
	.535	13.6
1 3/16	1.19	30.2
1 27/32	1.84	46.8
3 19/32	3.59	91.3
5 1/2	5.50	139.

SPECIFICATIONS

Voltage Taps .... −, + 45
Terminals .... Socket
Average Weight .... 1 lb. 14 oz. (851 grams)
Volume .... 36.4 cubic inches (597 cubic centimeters)
Cells .... Thirty No. 165 (ANSI F90) in series

For service information see reverse side of this sheet

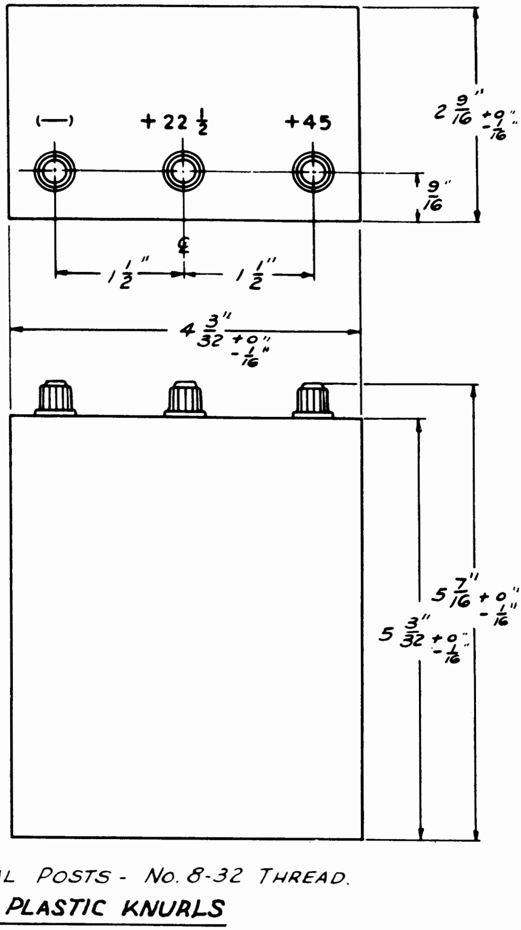
"EVEREADY" NO. 482

Estimated Average Hours Service at 70° F (21.1°)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 24V	27V	30V	33V	36V
4 hours/day	0.5	90K	2400	2200	1950	1700	1400
	1.0	45K	1650	1500	1300	1140	920
	5.0	9K	520	470	395	320	240
	10	4.5K	295	265	220	170	125
	20	2.25K	138	120	96	70	45
	40	1125	50	43	32	21.5	9.5
	80	562	14.5	11.5	8	3.3	1.3
8 hours/day	0.5	90K	3400	3200	2850	2600	2150
	1.0	45K	2150	1975	1800	1650	1320
	5.0	9K	570	530	475	350	250
	10	4.5K	285	255	220	150	98
	20	2.25K	118	102	84	52	30
	40	1125	42	34	27	15	5.7
	80	562	12.5	10	7	3.3	1.3
24 hours/day	0.5	90K	6000	5600	5200	4800	4200
	1.0	45K	3350	3100	2900	2575	2100
	5.0	9K	640	590	500	375	230
	10	4.5K	275	250	205	138	78
	20	2.25K	105	92	74	44	23
	40	1125	37	30	23	12.3	5.7
	80	562	11.5	9	7	3.3	1.3

"EVEREADY" NO. 762S BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0–70 milliamperes



Inches		Millimeters
1/16	.063	1.59
9/16	.563	14.3
1 1/2	1.50	38.1
2 9/16	2.56	65.1
4 3/32	4.09	104.
5 3/32	5.09	129.
5 7/16	5.44	138.

SPECIFICATIONS

Voltage Taps .... –, + 22.5, + 45
Terminals .... Knurled Nut & Screw
Average Weight .... 2 lbs. 12 oz. (1.25 kilograms)
Volume .... 53.2 cubic inches (872 cubic centimeters)
Cells .... Thirty No. 172 in series

For service information see reverse side of this sheet.

"EVEREADY" NO. 762S

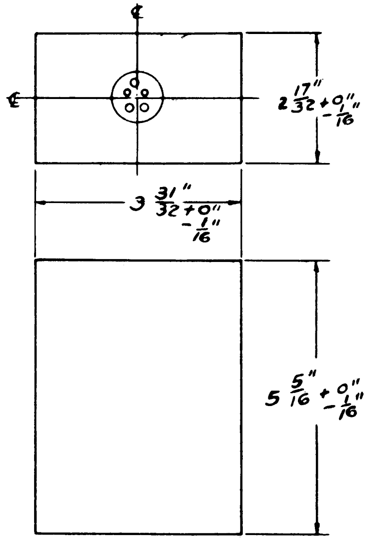
Estimated Average Hours Service at 70°F (21.1°C)

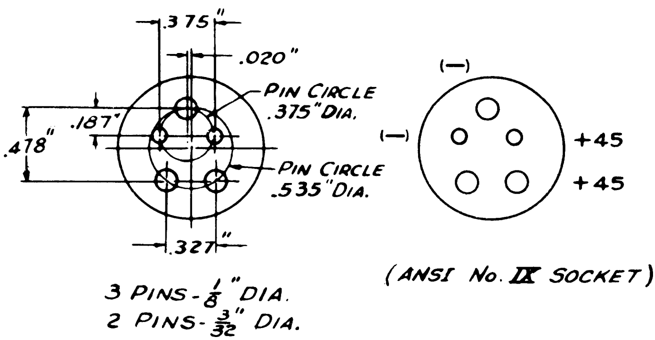
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 24V	27V	30V	33V	34V	36V
2 hours/day	10	4500	485	430	350	295		240
	20	2250	270	230	185	155		120
	40	1125	125	108	85	68		45
	80	563	50	40	32	22		10
4 hours/day	3	15000	1925	1800	1650	1325		1050
	5	9000	1350	1220	1080	840		590
	10	4500	580	520	450	340		255
	20	2250	270	240	200	150		105
	40	1125	120	100	80	60		26
	80	563	40	35	25	20		8
8 hours/day	3	15000	1700	1600	1470	1260		940
	5	9000	1080	1000	900	750		540
	10	4500	520	470	410	340		230
	20	2250	220	195	170	135		85
	40	1125	88	75	65	50		27
24 hours/day	3	15000	2075	1950	1800	1600		1150
	5	9000	1175	1050	980	840		580
	10	4500	490	430	380	300		210
	20	2250	195	165	140	104		72
	40	1125	75	60	48	33		24
	80	563	25	20	15	10		6
4 hours/day	9	5000			500		350	

"EVEREADY" NO. 484 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-70 milliamperes

Inches		Millimeters
	.020	.51
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
	.187	4.75
	.327	8.31
	.375	9.53
	.478	12.1
	.535	13.6
2 17/32	2.53	64.3
3 31/32	3.97	100.
5 5/16	5.31	135.





TOP VIEW OF SOCKET
SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps .... −, + 45
Terminals .... Socket
Average Weight .... 3 lbs. 2 oz. (1.42 kilograms)
Volume .... 53.4 cubic inches (875 cubic centimeters)
Cells .... Thirty No. 172 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 484

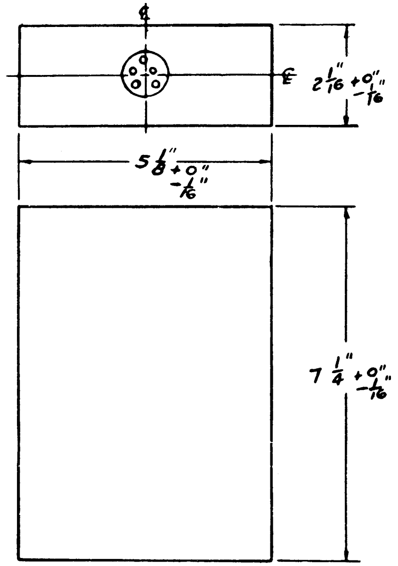
Estimated Average Hours Service at 70° F (21.1°C)

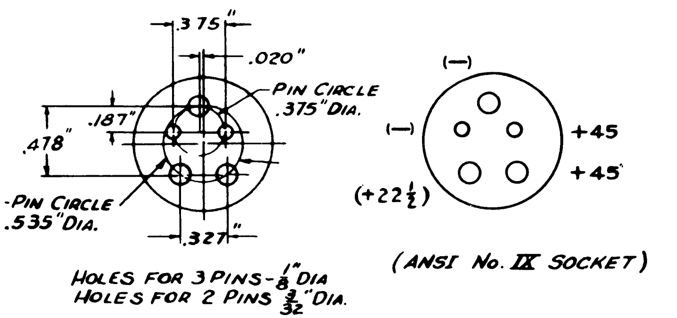
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 24V	27V	30V	33V	36V
2 hours/day	10	4500	485	430	350	295	240
	20	2250	270	230	185	155	120
	40	1125	125	108	85	68	45
	80	562	50	40	32	22	10
4 hours/day	3	15K	1925	1800	1650	1325	1050
	5	9K	1350	1220	1080	840	590
	10	4500	580	520	450	340	255
	20	2250	270	240	200	150	105
	40	1125	120	100	80	60	26
	80	562	40	35	25	20	8
8 hours/day	3	15K	1700	1600	1470	1260	940
	5	9K	1080	1000	900	750	540
	10	4500	520	470	410	340	230
	20	2250	220	195	170	135	85
	40	1125	88	75	65	50	27
24 hours/day	3	15K	2075	1950	1800	1600	1150
	5	9K	1175	1050	980	840	580
	10	4500	490	430	380	300	210
	20	2250	195	165	140	104	72
	40	1125	75	60	48	33	24
	80	562	25	20	15	10	6

"EVEREADY" NO. 487 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-80 milliamperes

Inches		Millimeters
	.020	.51
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
	.187	4.75
	.327	8.31
	.375	9.53
	.478	12.1
	.535	13.6
2 1/16	2.06	52.4
5 1/8	5.13	130.
7 1/4	7.25	184.





TOP VIEW OF SOCKET
SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps .... –, + 22.5, + 45
Terminals .... Socket
Average Weight .... 4 lbs. 2 oz. (1.87 kilograms)
Volume .... 76.7 cubic inches (1256 cubic centimeters)
Cells .... Thirty No. 175 (ANSI F100) in series

For service information see reverse side of this sheet

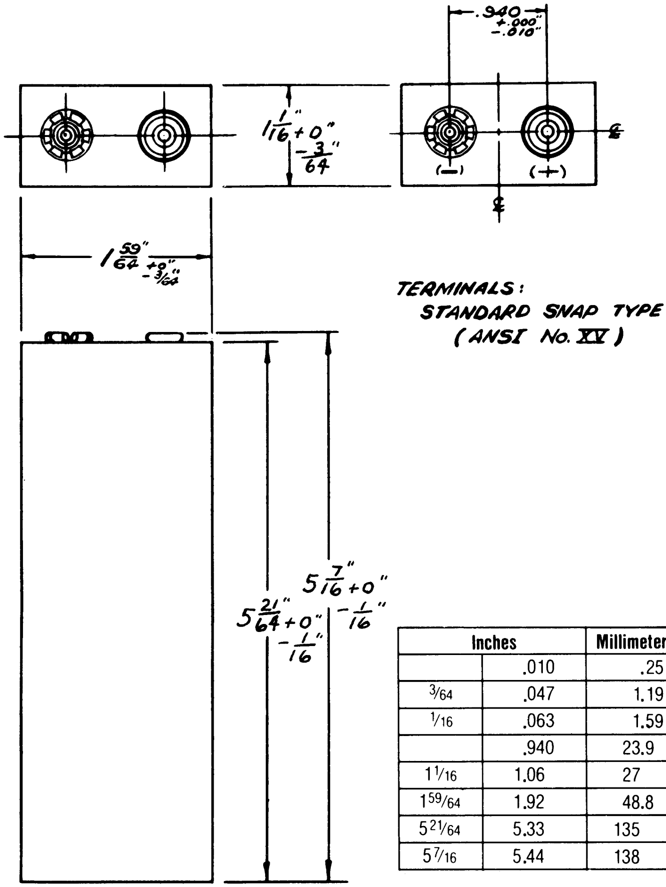
"EVEREADY" NO. 487

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 24V	27V	30V	33V	36V
2 hours/day	5	9000	920	860	800	715	600
	10	4500	540	480	440	380	300
	20	2250	300	275	245	200	140
	30	1500	200	170	150	130	85
	50	900	110	95	80	60	38
4 hours/day	5	9000	1600		1250	900	
	10	4500	750		580	410	
	20	2250	350		230	170	
	30	1500	200		135	100	
	50	900	110		72	56	
24 hours/day	5	9000	1600		1350	1000	
	10	4500	700		540	380	
	20	2250	280		210	140	
	30	1500	170		125	80	
	50	900	90		65	40	

"EVEREADY" NO. 477 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-8 milliamperes



Inches		Millimeters
	.010	.25
3/64	.047	1.19
1/16	.063	1.59
	.940	23.9
1 1/16	1.06	27
1 59/64	1.92	48.8
5 21/64	5.33	135
5 7/16	5.44	138

SPECIFICATIONS

Voltage Taps .... −, + 63
Terminals .... Snap
Average Weight .... 8.6 oz. (244 grams)
Volume .... 10.9 cubic inches (179 cubic centimeters)
Cells .... Forty-two No. 118 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 477

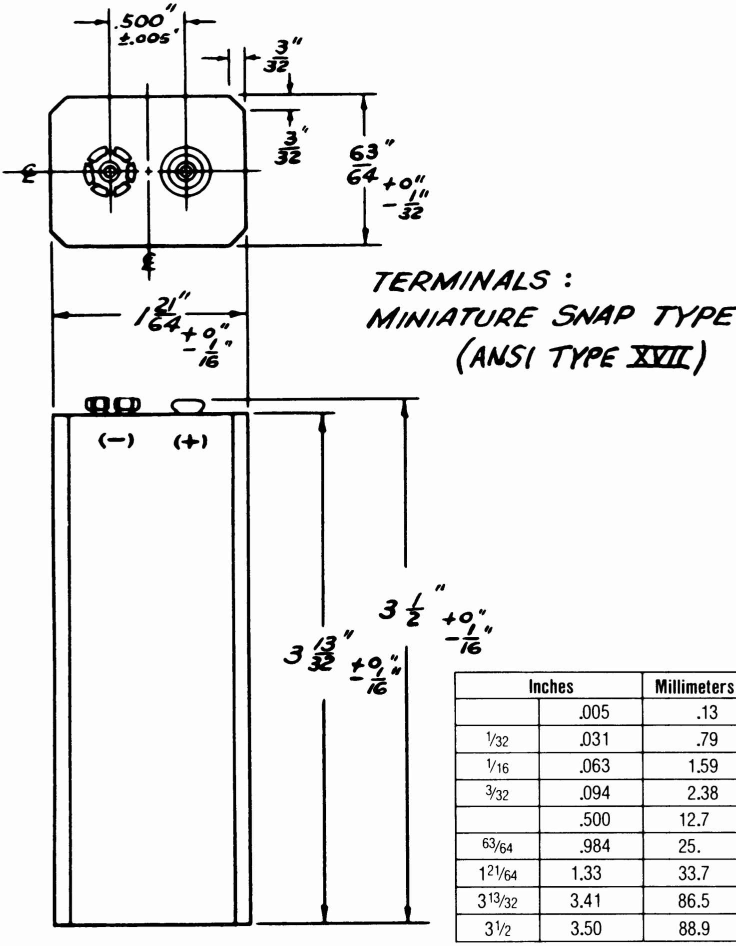
Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 45V
4 hours/day	8.4	7500	49

"EVEREADY" NO. 416 BATTERY

67.5 VOLTS

Type: Carbon - Zinc
Suggested Current Range: 0-3 milliamperes



Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
3/32	.094	2.38
	.500	12.7
63/64	.984	25.
1 21/64	1.33	33.7
3 13/32	3.41	86.5
3 1/2	3.50	88.9

SPECIFICATIONS

Voltage Taps .... −, + 67.5
Terminals .... Miniature Snap
Average Weight .... 4 oz. (113 grams)
Volume .... 4.45 cubic inches (72.9 cubic centimeters)
Cells .... Forty-six No. 114 in series

For service information see reverse side of this sheet

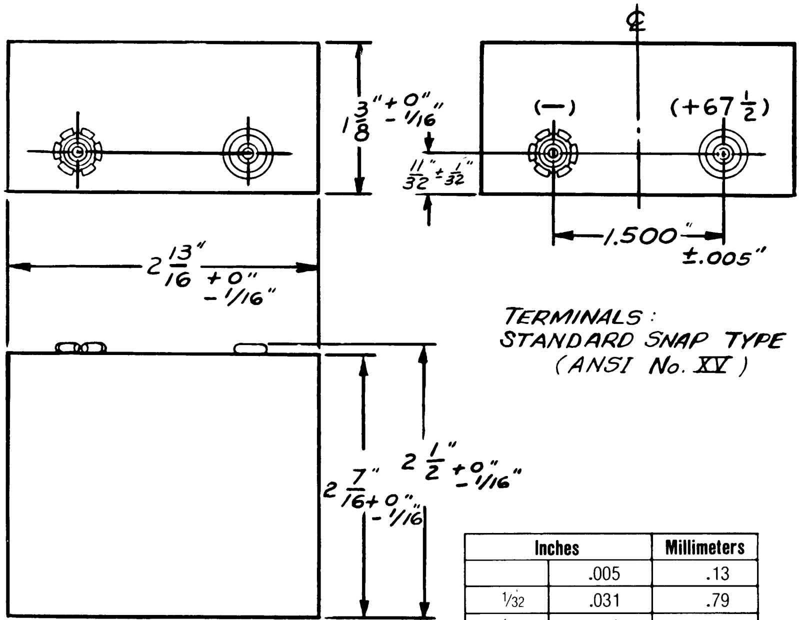
"EVEREADY" NO. 416

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 36V	45V	51V
2 hours/day	3.37	20,000	57	50	42
	6.75	10,000	25	16	9

"EVEREADY" NO. 457 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-6 milliamperes



Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
11/32	.344	8.73
1 3/8	1.38	34.9
	1.50	38.1
2 7/16	2.44	61.9
2 1/2	2.50	63.5
2 13/16	2.81	71.4

SPECIFICATIONS

Voltage Taps .... —, + 67.5
Terminals .... Snap
Average Weight .... 7.6 oz. (216 grams)
Volume .... 9.46 cubic inches (155 cubic centimeters)
Cells .... Forty-five No. 132 (ANSI F30) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 457

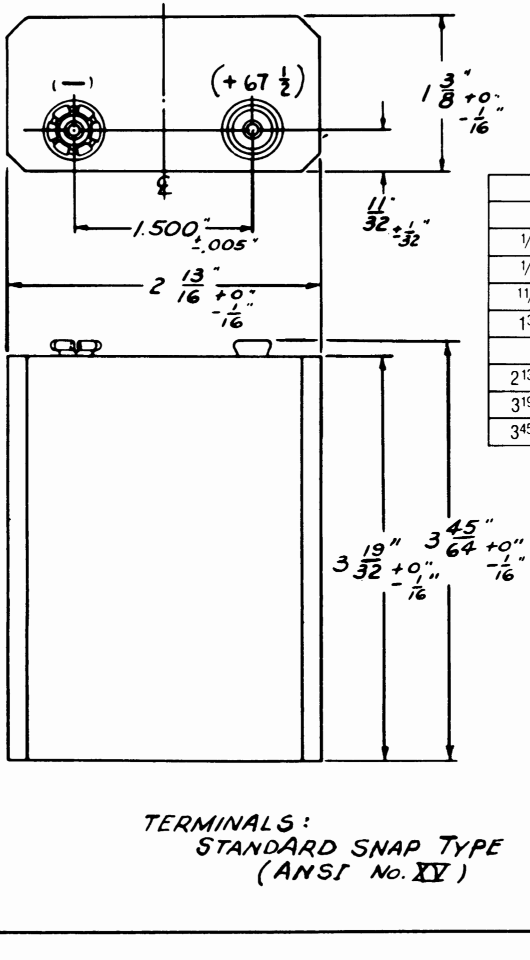
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 36.0V	40.5V	45.0V	49.5V	54.0V
2 hours/day	0.5	135K	720	680	630	560	460
	1.0	67.5K	380	355	330	300	225
	5.0	13.5K	60	55	48	39	28
	10	6750	25	21	16.5	13	6.8
	20	3380	7.5	6	4.5	2	0.8
4 hours/day	0.2	337.5K	1730	1675	1600	1470	1250
	0.5	135K	760	730	660	590	490
	1.0	67.5K	370	350	310	270	220
	5.0	13.5K	59	54	45	35	25
	10	6750	23	19	15	10	3.5
12 hours/day	0.2	337.5K	1900	1820	1700	1500	1175
	0.5	135K	740	700	650	550	400
	1.0	67.5K	360	330	300	240	170
	5.0	13.5K	52	44	32	24	16
	10	6750	19.5	13.5	10	6.5	3.5
24 hours/day	0.1	675K	4100	3550	3400	3100	2600
	0.5	135K	780	700	620	540	390
	1.0	67.5K	365	330	285	230	165
	5.0	13.5K	50	40	30	22	14
	10	6750	17.5	12.5	10	6.5	3.5
	20	3380	5.5	4	3	2	0.8

"EVEREADY" NO. 467 BATTERY

67.5 VOLTS

Type: Carbon - Zinc
Suggested Current Range: 0–10 milliamperes



	Inches	Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
11/32	.344	8.73
1 3/8	1.38	34.9
	1.50	38.1
2 13/16	2.81	71.4
3 19/32	3.59	91.3
3 45/64	3.70	94.1

SPECIFICATIONS

Voltage Taps .... –, + 67.5
Terminals .... Snap
Average Weight .... 12 oz. (340 grams)
Volume .... 14.2 cubic inches (232.7 cubic centimeters)
Cells .... Forty-five No. 135 (ANSI F40) in series

For service information see reverse side of this sheet

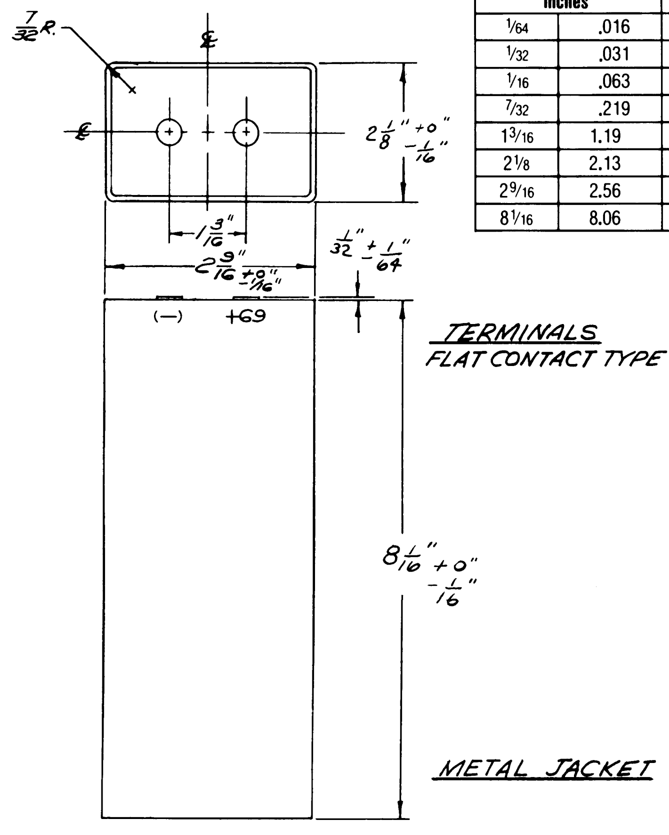
"EVEREADY" NO. 467

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 36.0V	40.5V	45.0V	49.5V	54.0V
2 hours/day	0.5	135K	920	890	850	810	730
	1	67.5K	630	590	550	480	410
	5	13.5K	150	140	130	98	70
	10	6750	63	56	47	35	21
	20	3375	20	18	15	11	5.4
	30	2250	9.6	8.6	7.5	4.4	1.5
	35	1929	7	6.2	5.4	2.7	0.8
12 hours/day	0.5	135K	1700	1600	1500	1250	930
	1	67.5K	790	700	630	580	400
	5	13.5K	110	92	85	68	45
	10	6750	42	35	30	23	15
	20	3375	16	12	9.6	6.5	4
	30	2250	7.6	6.5	5	3.2	1.5
	35	1929	6	5	3.8	2.4	0.8
24 hours/day	0.5	135K	1700	1620	1550	1300	1000
	1	67.5K	820	740	650	530	390
	5	13.5K	105	90	75	55	36
	10	6750	40	33	27	19	10.5
	20	3375	14	12	9.6	6.5	4
	30	2250	7.6	6.5	5	3.2	1.5
	35	1929	6	5	3.8	2.4	0.8

"EVEREADY" NO. 646 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-30 milliamperes



Inches		Millimeters
1/64	.016	.4
1/32	.031	.79
1/16	.063	1.59
7/32	.219	5.56
1 3/16	1.19	30.2
2 1/8	2.13	54
2 9/16	2.56	65.1
8 1/16	8.06	205

SPECIFICATIONS

Voltage Taps .... −, + 69
Terminals .... Flat Contacts
Average Weight .... 3 lbs. 3 oz. (1.45 kilograms)
Volume .... 44 cubic inches (721 cubic centimeters)
Cells .... Forty-six No. 155 in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 646

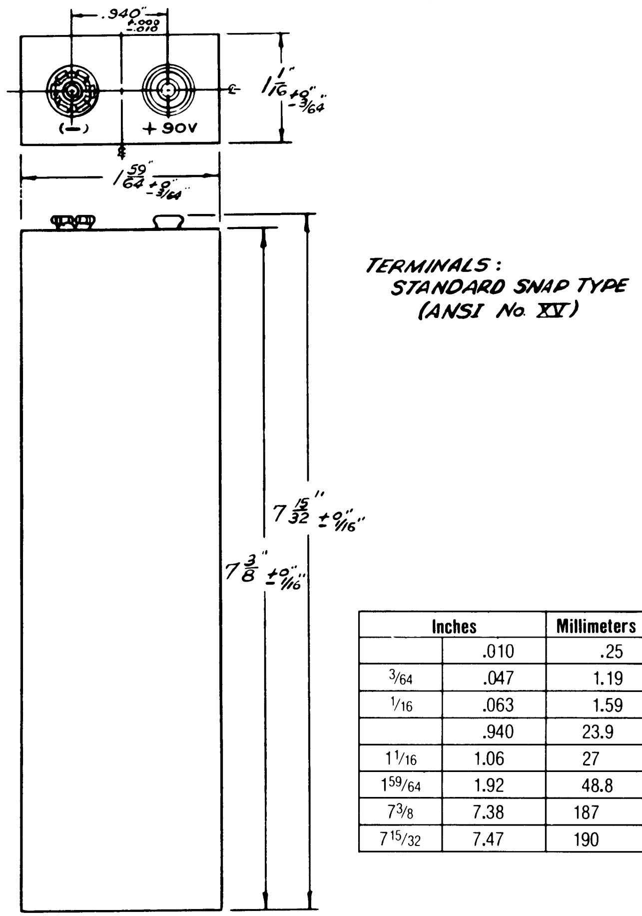
Estimated Average Hours Service at 70°F (21.1°C) (Tentative)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 36.8V	41.4V	46.0V	50.6V	55.2V
4 hours/day	19	3630	195	175	140	131	105
	27	2560	111	107	96	83	63
	40	1730	61	57	50	38	28
	57	1210	36	32	26.5	21	14.4
	78	885	20	19	15	11.5	7.5
24 hours/day	19	3630	115	100	80	75	70
	27	2560	65	58	52	45	42
	40	1730	36	32	28	21	18
	57	1210	21	17	14	11	9
	78	885	12	10	7.8	6.1	4.7

"EVEREADY" NO. 479 BATTERY

90 VOLTS

Type: Carbon - Zinc
Suggested Current Range: 0-8 milliamperes



Inches		Millimeters
	.010	.25
3/64	.047	1.19
1/16	.063	1.59
	.940	23.9
1 1/16	1.06	27
1 59/64	1.92	48.8
7 3/8	7.38	187
7 15/32	7.47	190

SPECIFICATIONS

Voltage Taps .... −, + 90
Terminals .... Snap
Average Weight .... 12 oz. (340 grams)
Volume .... 15 cubic inches (246 cubic centimeters)
Cells .... Sixty No. 118 in series

For service information see reverse side of this sheet

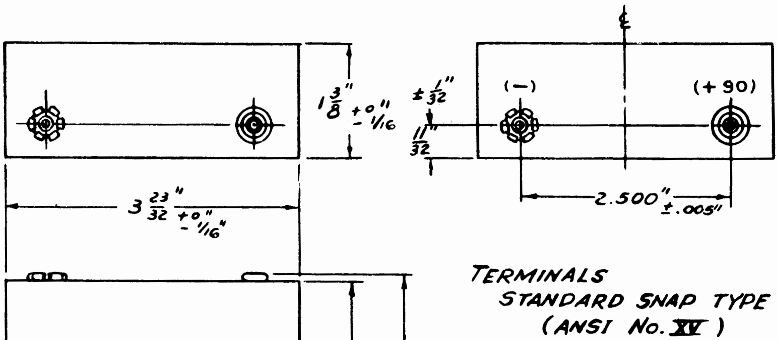
"EVEREADY" NO. 479

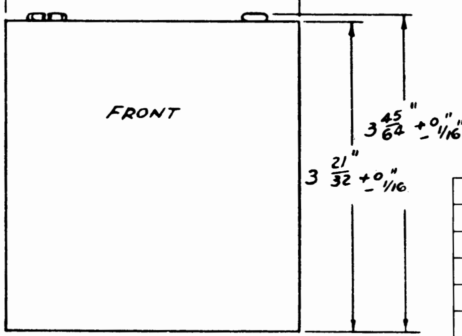
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 48V	60V
4 hours/day	9	10000	60	51

"EVEREADY" NO. 490 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0-10 milliamperes





Inches		Millimeters
	.005	.13
1/32	.031	.79
1/16	.063	1.59
11/32	.344	8.73
1 3/8	1.38	34.9
	2.50	63.5
3 21/32	3.66	92.9
3 45/64	3.70	94
3 23/32	3.72	94.5

SPECIFICATIONS

Voltage Taps .... −, + 90
Terminals .... Snap
Average Weight .... 15 oz. (425 grams)
Volume .... 18.8 cubic inches (308 cubic centimeters)
Cells .... Sixty No. 135 (ANSI F40) in series

For service information see reverse side of this sheet

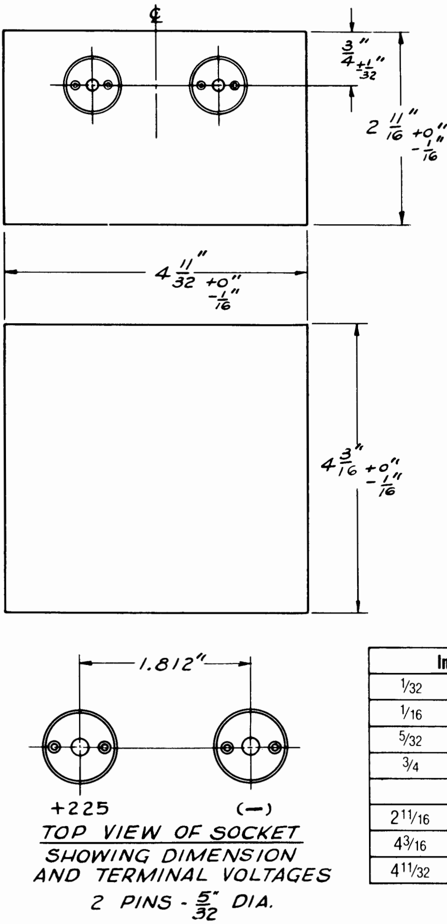
"EVEREADY" NO. 490

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 48V	54V	60V	66V	72V
2 hours/day	0.5	180K	920	890	850	810	730
	1	90K	630	590	550	480	410
	5	18K	150	140	130	98	70
	10	9000	63	56	47	35	21
	20	4500	20	18	15	11	5.4
	30	3000	9.6	8.6	7.5	4.4	1.5
	35	2570	7	6.2	5.4	2.7	0.8
12 hours/day	0.5	180K	1700	1600	1500	1250	930
	1	90K	790	700	630	580	400
	5	18K	110	92	85	68	45
	10	9000	42	35	30	23	15
	20	4500	16	12	9.6	6.5	4
	30	3000	7.6	6.5	5	3.2	1.5
	35	2570	6	5	3.8	2.4	0.8
24 hours/day	0.5	180K	1700	1620	1550	1300	1000
	1	90K	820	740	650	530	390
	5	18K	105	90	75	55	36
	10	9000	40	33	27	19	10.5
	20	4500	14	12	9.6	6.5	4
	30	3000	7.6	6.5	5	3.2	1.5
	35	2570	6	5	3.8	2.4	0.8

"EVEREADY" NO. 489 BATTERY

Type: Carbon-Zinc
Suggested Current Range: 0-10 milliamperes



Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
5/32	.156	3.97
3/4	.750	19.1
	1.812	46
2 11/16	2.69	68.3
4 3/16	4.19	106
4 11/32	4.34	110

SPECIFICATIONS

Voltage Taps .... −, + 225
Terminals .... Socket
Average Weight .... 2 lb. 12 oz. (1.25 kilograms)
Volume .... 49.4 cubic inches (810 cubic centimeters)
Cells .... One hundred and fifty-two No. 135 (ANSI F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 489

Estimated Average Hours Service at 70°F (21.1°C)

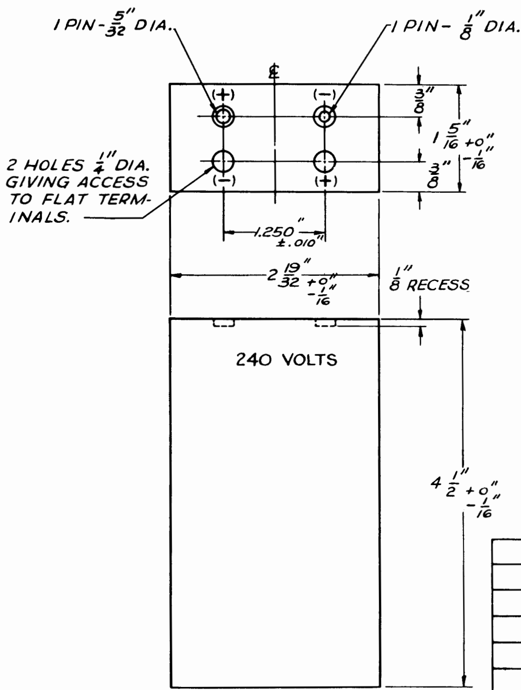
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 121.6V	136.8V	152V	167.2V	182.4V	190V
2 hours/day	0.5	450K	920	890	850	810	730	
	1	225K	630	590	550	480	410	
	5	45K	150	140	130	98	70	
	10	22.5K	63	56	47	35	21	
	20	11.25K	20	18	15	11	5.4	
	30	7500	9.6	8.6	7.5	4.4	1.5	
	35	6430	7	6.2	5.4	2.7	0.8	
12 hours/day	0.5	450K	1700	1600	1500	1250	930	
	1	225K	790	700	630	580	400	
	5	45K	110	92	85	68	45	
	10	22.5K	42	35	30	23	15	
	20	11.25K	16	12	9.6	6.5	4	
	30	7500	7.6	6.5	5	3.2	1.5	
	35	6430	6	5	3.8	2.4	0.8	
24 hours/day	0.5	450K	1700	1620	1550	1300	1000	
	1	225K	820	740	650	530	390	
	5	45K	105	90	75	55	36	
	10	22.5K	40	33	27	19	10.5	
	20	11.25K	14	12	9.6	6.5	4	
	30	7500	7.6	6.5	5	3.2	1.5	
	35	6430	6	5	3.8	2.4	0.8	

One second/ minute, one hour/day, (Photoflash Test)	Load for two No. 489 in series is RC circuit utilizing 990 microfarad capacitor and 500 ohm resistor	1800 seconds
As above	Load for two No. 489 in series is RC circuit utilizing 1980 microfarad capacitor and 250 ohm resistor	600 seconds

"EVEREADY" NO. 491 BATTERY

Type: Carbon-Zinc

Suggested Current Range: 0-2.5 milliamperes



	Inches	Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
1/4	.250	6.35
3/8	.375	9.53
	1.250	31.8
1 5/16	1.31	33.3
2 19/32	2.59	65.9
4 1/2	4.5	114

SPECIFICATIONS

Voltage Taps .... −, + 240

Terminals .... Flat Recessed & Socket

Average Weight .... 13 oz. (369 grams)

Volume .... 15 cubic inches (246 cubic centimeters)

Cells .... One hundred sixty No. 112 (ANSI F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 491 BATTERY

Estimated Average Hours Service at 70°F (21.1°C)

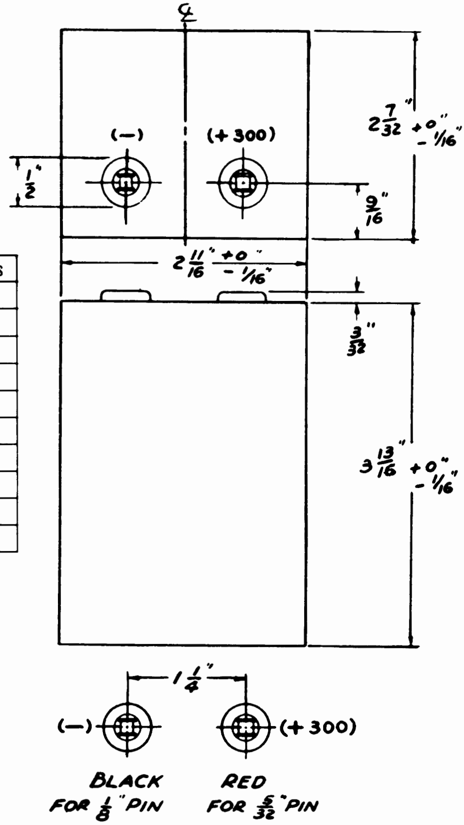
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 128V	144V	160V	176V	190V	192V
2 hours/day	0.1	2.4 megohms	1300	1265	1210	1130		1100
	0.2	1.2 megohms	770	730	700	660		610
	0.3	800K	530	515	490	460		420
	0.5	480K	320	310	295	275		250
	1.0	240K	150	144	138	130		115
	2.0	120K	74	68	64	59		50
	5.0	48K	24	21	18	15		5
4 hours/day	0.1	2.4 megohms	1650	1550	1500	1400		1330
	0.2	1.2 megohms	860	810	780	768		715
	0.3	800K	570	530	510	490		460
	0.5	480K	330	310	300	280		260
	1.0	240K	155	148	140	130		115
	2.0	120K	68	65	60	54		44
	5.0	48K	22	18	14	10		4
12 hours/day	0.1	2.4 megohms	1710	1615	1525	1430		1345
	0.2	1.2 megohms	810	780	740	705		645
	0.3	800K	540	510	480	450		410
	0.5	480K	320	295	275	255		220
	1.0	240K	140	130	117	105		88
	2.0	120K	62	53	45	40		32
	5.0	48K	20	16	10	9		4
24 hours/day	0.6	400K	310	290	270	240		200
	1.0	240K	135	120	110	100		67
	2.0	120K	57	50	44	38		20
	5.0	48K	16	13	10	9		4

One second/minute, one hour/day (Photoflash Test)	Load for two No. 491 in series is RC circuit utilizing 495 microfarad capacitor and 1000 ohm resistor	1450 seconds
As above	Load for two No. 491 in series is RC circuit utilizing 990 microfarad capacitor and 500 ohm resistor	500 seconds

"EVEREADY" NO. 493 BATTERY

Type: Carbon - Zinc
Suggested Current Range: 0–2.5 milliamperes

Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
5/32	.156	3.97
1/2	.500	12.7
9/16	.563	14.3
1 1/4	1.25	31.8
2 7/32	2.22	56.4
2 11/16	2.69	68.3
3 13/16	3.81	96.8



TOP VIEW OF SOCKETS
(ANSI No. XVIII)

SPECIFICATIONS

Voltage Taps .... −, + 300
Terminals .... Pin Jacks
Average Weight .... 14.5 oz. (411 grams)
Volume .... 23.4 cubic inches (384 cubic centimeters)
Cells .... Two hundred No. 112 (ANSI F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 493

Estimated Average Hours Service at 70°F (21.1°C)

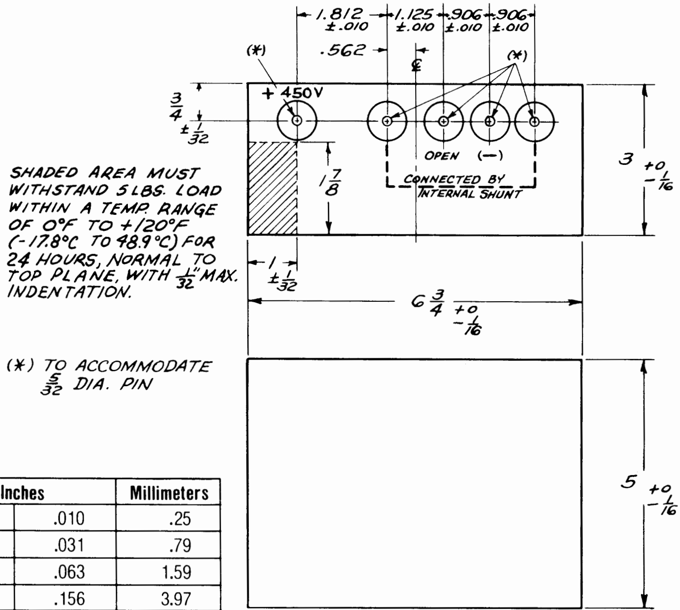
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 160V	180V	200V	220V	240V
2 hours/day	0.1	3 megohms	1300	1265	1210	1130	1100
	0.2	1.5 megohms	770	730	700	660	610
	0.3	1 megohm	530	515	490	460	420
	0.5	600K	320	310	295	275	250
	1.0	300K	150	144	138	130	115
	2.0	150K	74	68	64	59	50
	5.0	60K	24	21	18	15	5
4 hours/day	0.1	3 megohms	1650	1550	1500	1400	1330
	0.2	1.5 megohms	860	810	780	768	715
	0.3	1 megohm	570	530	510	490	460
	0.5	600K	330	310	300	280	260
	1.0	300K	155	148	140	130	115
	2.0	150K	68	65	60	54	44
	5.0	60K	22	18	14	10	4
12 hours/day	0.1	3 megohms	1710	1615	1525	1430	1345
	0.2	1.5 megohms	810	780	740	705	645
	0.3	1 megohm	540	510	480	450	410
	0.5	600K	320	295	275	255	220
	1.0	300K	140	130	117	105	88
	2.0	150K	62	53	45	40	32
	5.0	60K	20	16	10	9	4
24 hours/day	0.6	500K	310	290	270	240	200
	1.0	300K	135	120	110	100	67
	2.0	150K	57	50	44	38	20
	5.0	60K	16	13	10	9	4

"EVEREADY" NO. 496 BATTERY

450 VOLTS

Type: Carbon-Zinc

Suggested Current Range: 0-10 milliamperes



Inches		Millimeters
	.010	.25
1/32	.031	.79
1/16	.063	1.59
5/32	.156	3.97
	.562	14.3
3/4	.750	19.1
	.906	23
1	1	25.4
	1.125	28.6
	1.812	46
1 7/8	1.88	47.6
3	3	76.2
5	5	127
6 3/4	6.75	172

SPECIFICATIONS

Voltage Taps .... —, + 450
Terminals .... Socket
Average Weight .... 5 lbs. 4 oz. (2.38 kilograms)
Volume .... 101 cubic inches (1655 cubic centimeters)
Cells .... Three hundred No. 135 (ANSI F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 496

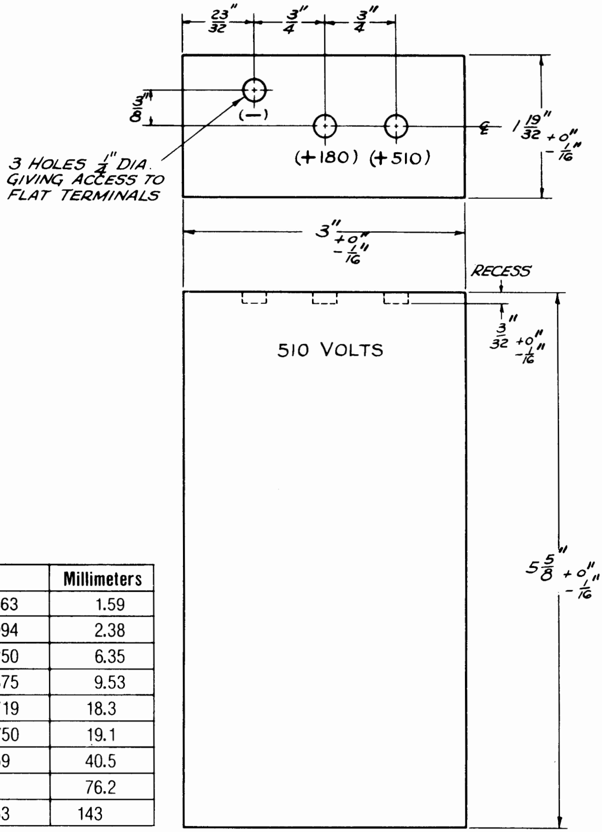
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 240V	270V	300V	330V	360V	380V
2 hours/day	0.5	900K	920	890	850	810	730	
	1	450K	630	590	550	480	410	
	5	90K	150	140	130	98	70	
	10	45K	63	56	47	35	21	
	20	22.5K	20	18	15	11	5.4	
	30	15K	9.6	8.6	7.5	4.4	1.5	
	35	12.86K	7	6.2	5.4	2.7	0.8	
12 hours/ day	0.5	900K	1700	1600	1500	1250	930	
	1	450K	790	700	630	580	400	
	5	90K	110	92	85	68	45	
	10	45K	42	35	30	23	15	
	20	22.5K	16	12	9.6	6.5	4	
	30	15K	7.6	6.5	5	3.2	1.5	
	35	12.86K	6	5	3.8	2.4	0.8	
24 hours/ day	0.5	900K	1700	1620	1550	1300	1000	
	1	450K	820	740	650	530	390	
	5	90K	105	90	75	55	36	
	10	45K	40	33	27	19	10.5	
	20	22.5K	14	12	9.6	6.5	4	
	30	15K	7.6	6.5	5	3.2	1.5	
	35	12.86K	6	5	3.8	2.4	0.8	
One second/ minute, one hour/ day (Photoflash Test)		Load is RC circuit utilizing 990 microfarad capacitor and 500 ohm resistor						1800 seconds
As above		Load is RC circuit utilizing 1980 microfarad capacitor and 250 ohm resistor						600 seconds

"EVEREADY" NO. 497 BATTERY

Type: Carbon-Zinc

Suggested Current Range: 0-2.5 milliamperes



Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
1/4	.250	6.35
3/8	.375	9.53
23/32	.719	18.3
3/4	.750	19.1
1 19/32	1.59	40.5
3	3	76.2
5 5/8	5.63	143

SPECIFICATIONS

Voltage Taps .... –, + 180, + 510
Terminals .... Flat Recessed
Average Weight .... 1 lb. 10 oz. (737 grams)
Volume .... 26.9 cubic inches (441 cubic centimeters)
Cells .... Three hundred thirty-six No. 112 (ANSI F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 497

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 269V	302V	336V	370V	380V	403V
2 hours/day	0.1	5.1 megohms	1300	1265	1210	1130		1100
	0.2	2.55 megohms	770	730	700	660		610
	0.3	1.7 megohms	530	515	490	460		420
	0.5	1.02 megohms	320	310	295	275		250
	1.0	510K	150	144	138	130		115
	2.0	255K	74	68	64	59		50
	5.0	102K	24	21	18	15		5
4 hours/day	0.1	5.1 megohms	1650	1550	1500	1400		1330
	0.2	2.55 megohms	860	810	780	768		715
	0.3	1.7 megohms	570	530	510	490		460
	0.5	1.02 megohms	330	310	300	280		260
	1.0	510K	155	148	140	130		115
	2.0	255K	68	65	60	54		44
	5.0	102K	22	18	14	10		4
12 hours/day	0.1	5.1 megohms	1710	1615	1525	1430		1345
	0.2	2.55 megohms	810	780	740	705		645
	0.3	1.7 megohms	540	510	480	450		410
	0.5	1.02 megohms	320	295	275	255		220
	1.0	510K	140	130	117	105		88
	2.0	255K	62	53	45	40		32
	5.0	102K	20	16	10	9		4
24 hours/day	0.6	850K	310	290	270	240		200
	1.0	510K	135	120	110	100		67
	2.0	255K	57	50	44	38		20
	5.0	102K	16	13	10	9		4

One second/minute, one hour/day (Photoflash Test)		Load is RC circuit utilizing 495 microfarad capacitor and 1000 ohm resistor					1450 seconds	
As above		Load is RC circuit utilizing 990 microfarad capacitor and 500 ohm resistor					500 seconds	

Alkaline-Manganese Dioxide Batteries

ALKALINE-MANGANESE-ZINC DRY BATTERIES

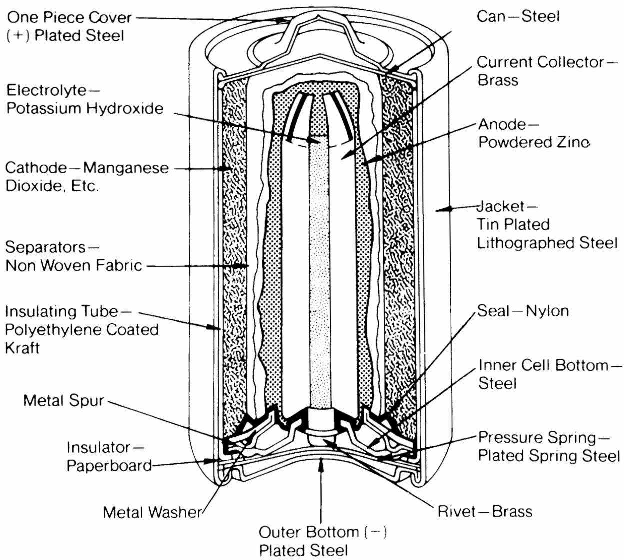
General Features: Both primary and rechargeable alkaline cells are comprised of a zinc anode of large surface area, a manganese-dioxide cathode of high density, and a potassium-hydroxide electrolyte.

In addition to the primary type, a rechargeable alkaline battery is also available as a dry-type battery. Discussion of the rechargeable battery follows this section on primary types.

The alkaline-manganese dioxide-zinc battery described on the following pages represents a major advance in portable power sources over the standard carbon-zinc battery. This battery is the result of many years of combined research and development effort.

In answer to a growing need for a high rate source of electrical energy, the Union Carbide Research Laboratories began early in 1955 an intensive study of the caustic-manganese system as a high rate source of electrical energy. Alkaline dry cells, differing in details of construction from the more familiar carbon-zinc dry cells, had not proven commercially practicable up to that time. Alkaline-manganese cells, however, with a zinc anode of high surface area, show amazing depolarizing efficiency. On heavy or continuous drains the alkaline cell is most spectacular and shows an excellent advantage over standard carbon-zinc cells on a performance-per-unit-of-cost basis.

This cell differs from the Leclanché carbon-zinc cell primarily in the highly alkaline electrolyte that is used. The cell is a high rate source of electrical energy. Its outstanding advantages derive from a combination of unique components and construction methods. (See Figure 7).



CUTAWAY OF ALKALINE CELL (PRIMARY TYPE)
FIGURE 7

Two principal features are a manganese dioxide cathode of high density in conjunction with a steel can which serves as a cathode current collector, and a zinc anode of extra high surface area in contact with the electrolyte. These features, coupled with the use of a potassium hydroxide electrolyte of high conductivity give these cells their very low internal resistance and impedance and high service capacity.

The cells are hermetically sealed and encased in steel. The ampere-hour capacity is relatively constant over a range of current drains and discharge schedules.

The voltage of an alkaline-manganese dioxide primary cell is 1.5 volts in standard N, AAA, AA, C and D cell sizes. Batteries are available with voltage up to 9 volts and in a number of different service capacities.

Performance: The closed-circuit voltage of an alkaline primary battery falls gradually as the battery is discharged, Fig. 8.

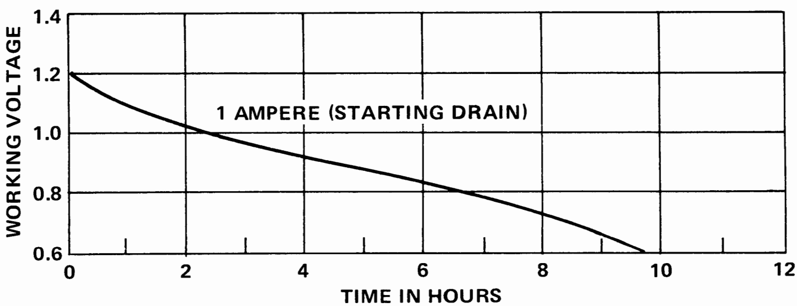


FIG. 8—VOLTAGE DISCHARGE CHARACTERISTIC OF ALKALINE-MANGANESE PRIMARY BATTERY (D CELL) DISCHARGED CONTINUOUSLY.

Similar to carbon-zinc batteries, the service hours delivered by alkaline-manganese primary batteries are greater as the cutoff voltage is lower. The cutoff voltage should be made as low as possible so that the high total energy of the cell can be used.

Service capacity remains relatively constant as the discharge schedule is varied. Capacity does not vary as much with current drain as for the carbon-zinc battery. Service capacity of the entire line ranges from several hundred milliampere-hours to almost 23 ampere-hours depending upon the current drain and cutoff voltage.

The alkaline-manganese primary cell is for applications requiring more power or longer life than can be obtained from Leclanché carbon-zinc batteries. Alkaline cells contain 50 to 100 per cent more total energy than a conventional Leclanché carbon-zinc cell of the same size.

In a conventional carbon-zinc cell, heavy current drains and continuous or heavy-duty usage impair its efficiency to the extent that only a small fraction of the built-in energy can be removed. The chief advantage of the alkaline-manganese battery lies in its ability to work with high efficiency under continuous or heavy duty, high-drain conditions where the standard Leclanché carbon-zinc cell is unsatisfactory. Under some conditions, alkaline cells will provide as much as seven times the service of standard Leclanché carbon-zinc cells. Discharge characteristics of the two battery types are compared in Fig. 9.

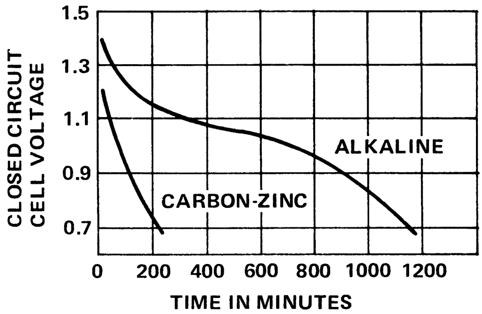


FIG. 9 – COMPARISON OF DISCHARGE CHARACTERISTICS OF ALKALINE–MANGANESE AND CARBON–ZINC "D" SIZE CELLS FOR 500 mA STARTING, DISCHARGED CONTINUOUSLY AT 70° F (21.1° C)

Although alkaline-manganese cells will outperform standard Leclanché batteries in any type of service, they may not show economic advantage over standard cells at light drains, or under intermittent-duty conditions, or both. For example, with intermittent use at current drains below about 300 milliamperes for the "D" size cell, alkaline cells, while performing very well, will begin to lose their economic advantage over the standard carbon-zinc batteries. "Eveready" alkaline primary batteries are ideally suited for use in many types of battery-operated equipment. Some of these applications are listed on page 290. In addition, the characteristics of these batteries make possible the development of equipment which up to this time has been thought impractical because of the lack of a suitable power source.

Alkaline cells are ideal for motion picture camera cranking and cassettes. They have proved their worth for electronic flash, toys, model boats and automobiles and innumerable heavy drain applications.

In radios, alkaline cells usually last twice as long as standard carbon-zinc cells. In cassettes, in some equipment they last five times as long. In battery-powered toys, alkaline batteries last up to seven times as long as standard carbon-zinc cells.

Alkaline-manganese cells are excellent for photoflash applications, In addition to high amperage, they have more energy than standard carbon-zinc photoflash batteries.

Some electronic flash units use transistor or vibrator circuits in a converter to change low voltage d-c into the high voltage necessary to charge the flash capacitor. The current drains involved strain the capabilities even of high amperage photoflash cells. The alkaline cell provides both a sustained short recycling time and 2-3 times as many flashes as standard Leclanché carbon-zinc photoflash or general purpose cells. This is due to the unusual cell construction which provides a very low internal resistance such that the cell delivers its energy faster than standard carbon-zinc types.

The service maintenance of alkaline primary cells is excellent at both normal and elevated temperatures.

The following information applies to "Eveready" cells stored at 70° F (21.1° C).

Time of Storage at 70° F	**Percent Retained of Ah Capacity of Fresh Battery**
1 year	95%
2 years	90%
3 years	85%
4 years	80%

"Eveready" alkaline primary batteries are presently available in seventeen types. Physical characteristics for these are listed in Table H.

SOME RECOMMENDED APPLICATIONS FOR ALKALINE CELLS:

- Heavy duty lighting
- Transistor radios (particularly heavy current drain)
- Electric shavers
- Electronic photoflash
- Movie cameras
- Photoflash
- Radio controlled model planes and boats
- Glo-plug ignition – model planes
- Toys
- Cassette players and recorders
- Any high drain, heavy discharge schedule use

TABLE H – PHYSICAL CHARACTERISTICS OF "EVEREADY" ALKALINE-MANGANESE DIOXIDE PRIMARY BATTERIES (ARRANGED BY INCREASING VOLTAGE AND BY INCREASING SERVICE CAPACITY WITHIN THE VOLTAGE CATEGORY)

"Eveready" Battery Number	Voltage	Number and Size of Cells		Diameter		Length		Width		Height		Terminals	Weight	
		Number	Size	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters		Ounces	Grams
EPX825	1.5	1	2-60192	.905	23					.233	5.92	Flat	.245	6.93
E90	1.5	1	3-0411 "N"	.47	11.9					1-3/16	30.2	Flat	.35	9.9
E89	1.5	1	3-0511 "½AA"	.563	14.3					1.087	27.6	Flat	.4	11.3
E92	1.5	1	3-312 "AAA"	.41	10.4					1.745	44.3	Flat	.4	11.3
E91	1.5	1	3-315 "AA"	9/16	14.3					1-31/32	50	Flat	.75	21.3
E93	1.5	1	3-335 "C"	1-1/32	26.2					1-31/32	50	Flat	2.2	62.4
E95	1.5	1	3-350 "D"	1-11/32	34.1					2-13/32	61.1	Flat	4.5	128
HS95	1.5	1	3-350 "D"	1-11/32	34.1					2-13/32	61.1	Flat	4.5	128
EPX30	3	2	2-60192	.96	24.4					.485	12.3	Flat	.5	14.3
532	3	2	3-0663 "1"	.664	16.9					1.67	42.4	Snap	.8	22.7
538	4.5	3	2-60192			1.6	40.6	.67	17	.45	11.4	Flat	.45	12.8
523	4.5	3	3-0663 "1"	.662	16.8					1.965	49.9	Flat	1.17	33.2
531	4.5	3	3-0663 "1"	.662	16.8					2.29	58.2	Miniature Snap	1.25	35.4
537	6	4	2-45201	.51	13					.99	25.2	One Flat, One Recessed	.5	14.2
539	6	4	3-0316			1.4	35.6	.355	9.02	1.898	48.2	Flat	1.1	31
520	6	4	3-364 "G"			5-17/32	141	4-21/32	118	2-21/32	67.5	Insulated Knurls	2 lbs. 8 oz.	1.13 kilograms
522	9	6	3-0316			1-1/32	26.2	11/16	17.5	1-15/16	49.2	Miniature Snap	1.59	45

ALKALINE TRANSISTOR BATTERIES

Service and dimensional data for multicell alkaline transistor batteries start on page 319.

The individual cells used in the batteries are a result of over ten years of concentrated Research and Development effort aimed at maximizing energy density and minimizing cell impedance.

PRODUCT CHARACTERISTICS

1. "Eveready" alkaline transistor batteries exhibit exceptional current drain carrying capabilities.
2. Battery impedance is low and essentially constant even to low voltage cutoffs.
3. Shelf life characteristics are excellent.
4. Battery capacity is nearly constant at withdrawal rates of 2 to 6 hours per day.

The construction used in "Eveready" alkaline transistor batteries has been subjected to a variety of abuse type tests such as:

1. Continuous short circuit
2. Continuous discharge
3. High temperature storage-
4. High temperature-high humidity storage
5. Shock and vibration
6. Temperature cycling from −20° F to +140° F (−28.9° C to +60° C)

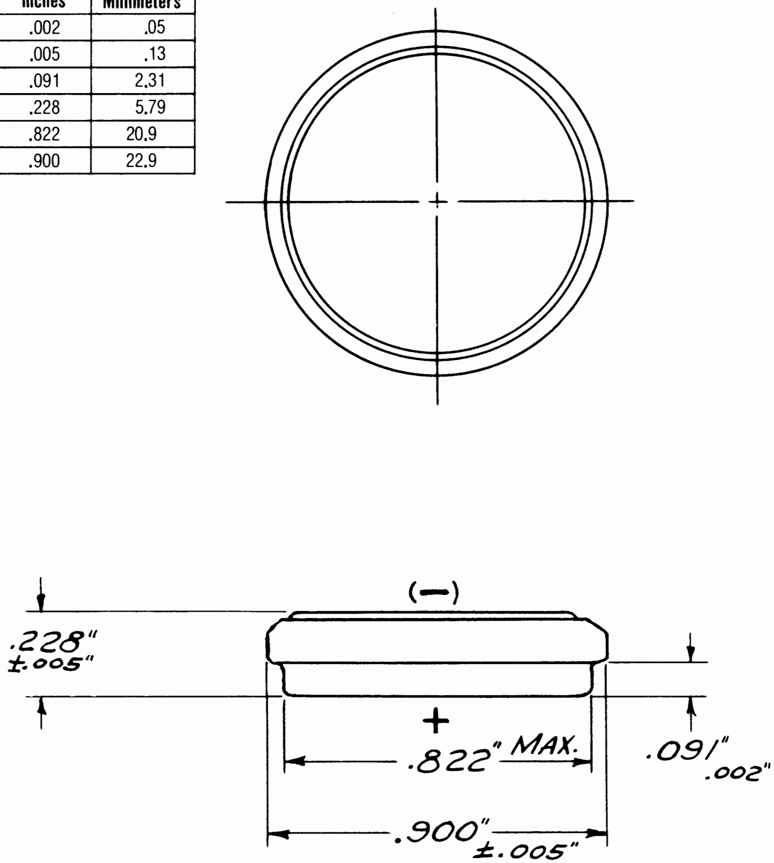
On the basis of these and other tests, "Eveready" alkaline transistor batteries present no hazard to personnel or equipment.

These batteries should not be disposed of in a fire, and they should not be charged. These precautions are not peculiar to these specific batteries, but are general safety procedures which should be followed in handling primary sealed alkaline batteries.

"EVEREADY" NO. EPX825 CELL

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.002	.05
.005	.13
.091	2.31
.228	5.79
.822	20.9
.900	22.9



SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.245 oz. (6.93 grams)
Volume (by displacement) .... 0.122 cubic inch (2 cubic centimeters)
Cells .... One No. 2-60192

For service information see reverse side of this sheet

"EVEREADY" NO. EPX825

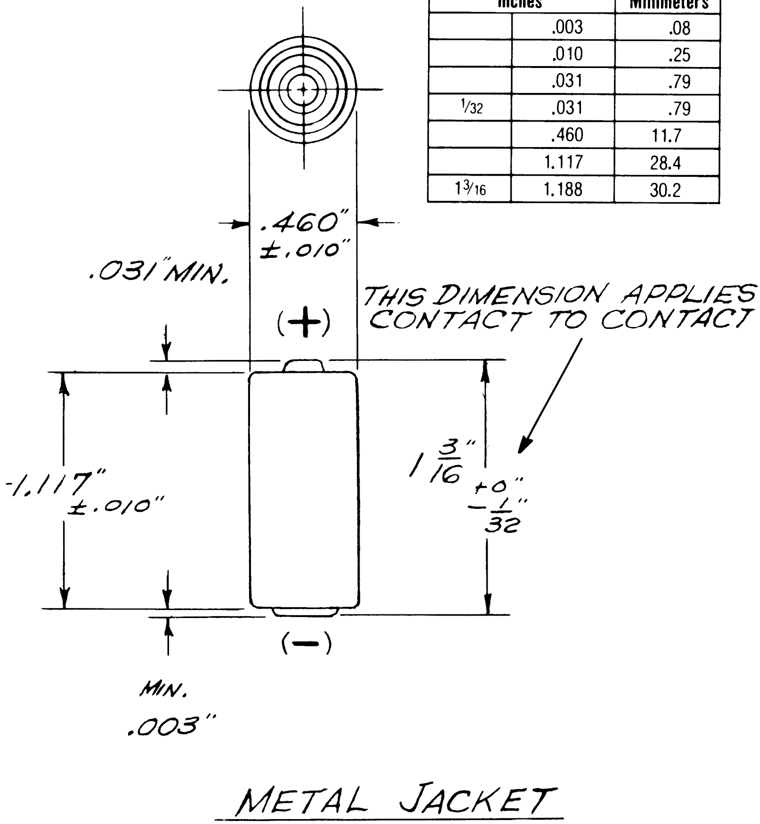
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	CUTOFF VOLTAGE 1.2V
Continuous	10	150	17	7

"EVEREADY" NO. E90 CELL

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-85 milliamperes

Inches		Millimeters
	.003	.08
	.010	.25
	.031	.79
1/32	.031	.79
	.460	11.7
	1.117	28.4
1 3/16	1.188	30.2



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.35 oz. (9.9 grams)
Volume (by displacement).............. 0.17 cubic inch (2.8 cubic centimeters)
Cell ....One No. 3-0411
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. E90

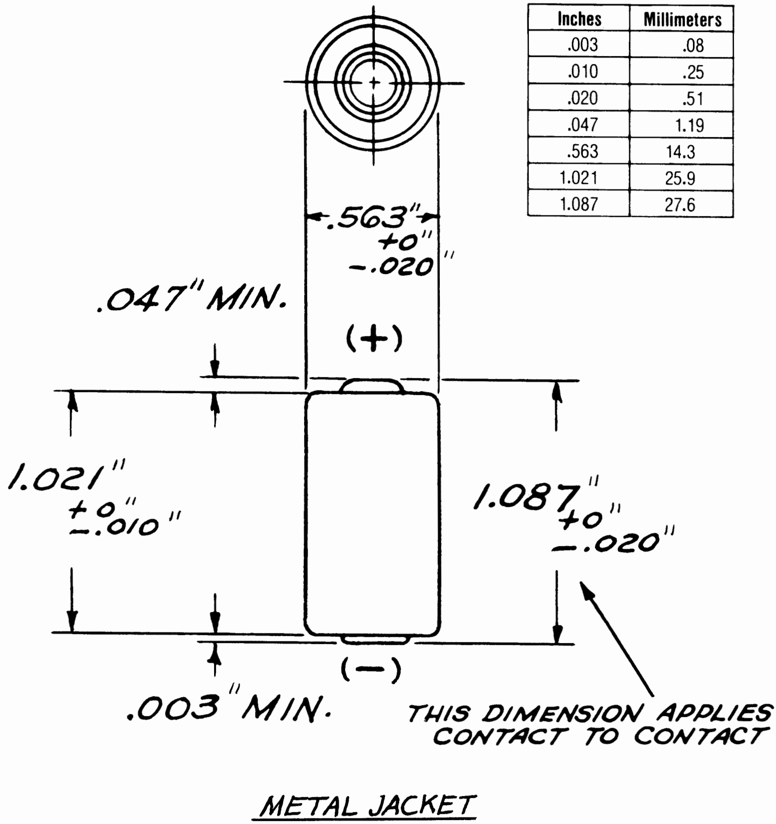
Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.9V
16 hours/day	6	250		120 hours
4 hours/day	9	166⅔	90 hours	75
4 hours/day	18	83.3	43	36
4 hours/day	37.5	40	21	18
5 minutes/day (General Purpose Intermittent Test-Flashlight)	300	5	115 minutes	
4 minutes/hour 8 hours/day 16 hours rest, (Light-Industrial Flashlight Test)	300	5	120	70 minutes

1.5
VOLTS

"EVEREADY" NO. E89 CELL

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-85 milliamperes



Inches	Millimeters
.003	.08
.010	.25
.020	.51
.047	1.19
.563	14.3
1.021	25.9
1.087	27.6

SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.4 oz. (11.3 grams)
Volume .... 0.27 cubic inch (4.4 cubic centimeters)
Cell .... One No. 3-0511
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. E89

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V
16 hours/day	10	150	83
4 hours/day	12	125	66

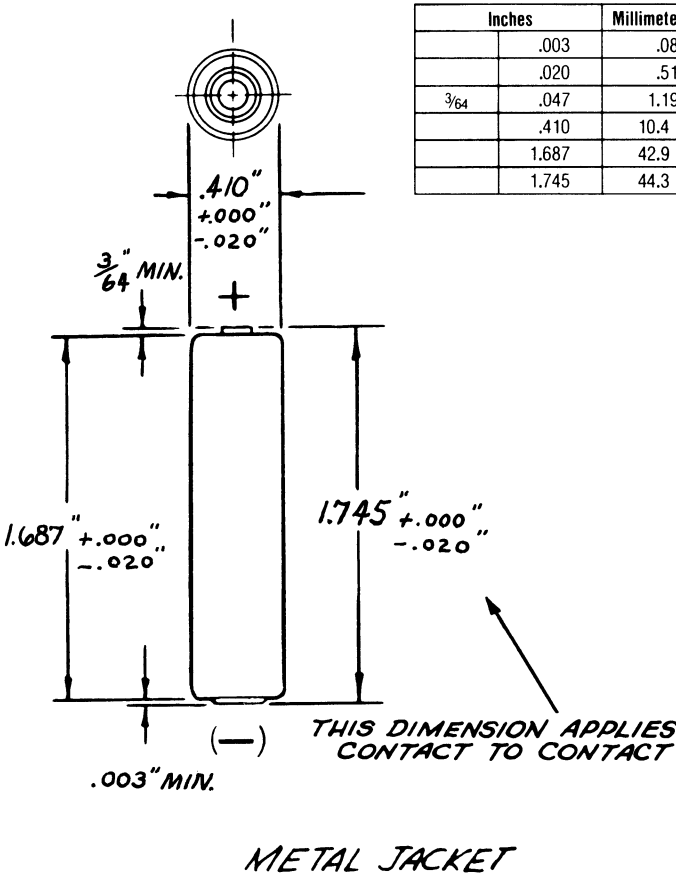
"EVEREADY" NO. E92 CELL

Type: Alkaline - Manganese Dioxide

ANSI Designation: L30

Suggested Current Range: 0-175 milliamperes

Inches		Millimeters
	.003	.08
	.020	.51
3/64	.047	1.19
	.410	10.4
	1.687	42.9
	1.745	44.3



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.4 oz. (11.3 grams)
Volume (by displacement) .... 0.201 cubic inch (3.29 cubic centimeters)
Cell .... One No. 3-312 (ANSI L30)
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. E92

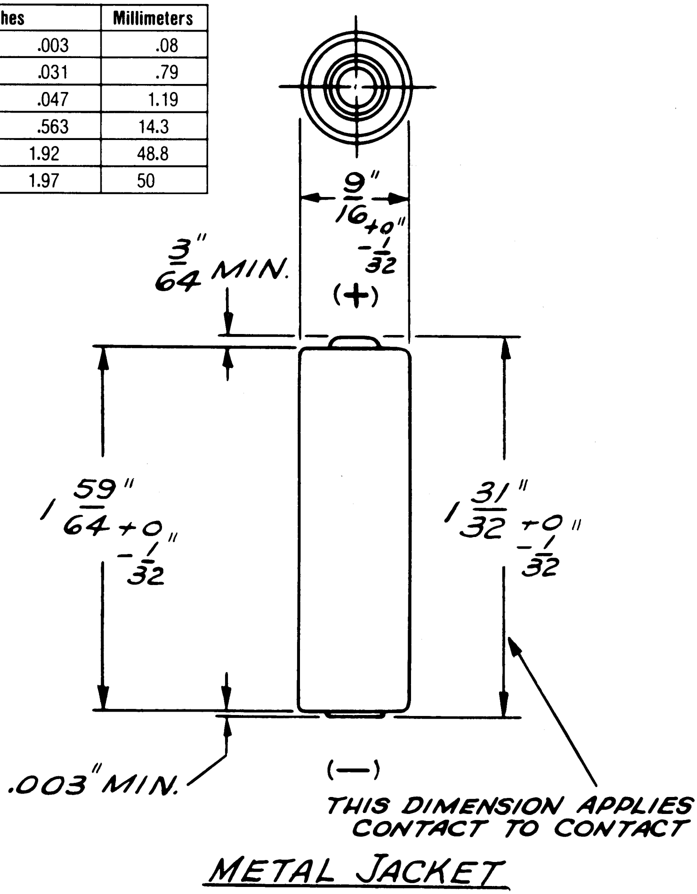
Estimated Average Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.9V	1.0V	1.1V
4 hours/day (Radio Test)	37.5	40	25 hours	22 hours		
24 hours/day	150	10	250 minutes	230 minutes	185 minutes	123 minutes
4 minutes every 15 minutes, 8 hours/day, 16 hours rest (Camera Cranking Test)	250 constant current				65 minutes	
4 minutes/hour 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test)	300	5	150 minutes	110 minutes		
24 hours/day	300	5	95 minutes	90 minutes	60 minutes	28 minutes

"EVEREADY" NO. E91 CELL

Type: Alkaline - Manganese Dioxide
ANSI Designation: L40
IEC Designation: LR6
Suggested Current Range: 0-250 milliamperes

Inches		Millimeters
	.003	.08
1/32	.031	.79
3/64	.047	1.19
9/16	.563	14.3
1 59/64	1.92	48.8
1 31/32	1.97	50



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 0.75 oz. (21.3 grams)
Volume (By displacement) .... 0.439 cubic inch (7.19 cubic centimeters)
Cell .... One No. 3-315 (ANSI "L40")
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. E91

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.9V	1.0V
24 hours/day (Simulated Clock Test)	250 (microamperes)	6000	280 days	250 days	225 days
(Transistorized Movements)	500	3000	145	130	115
	1000	1500	72	65	58

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.8V	0.9V	1.0V	1.1V
24 hours/day (or less)	1	1500	2090 hours	2040 hours	1975 hours	1850 hours	1650 hours
	5	300	425	405	385	340	285
	7.5	200	285	270	250	220	190
	10	150	215	200	180	160	140
	15	100	145	135	125	110	94
	20	75	107	100	93	82	71
	30	50	70	66	61	54	47
	50	30	42	40	37	32	28
	150	10	11.3	10.7	9.9	7.8	4.9
	375	4	3.9	3.6	3.3	2.3	1.2
	667	2.25	1.3	1.2	1.1	0.5	0.2
	1500	1.0	0.4	0.3	0.2		

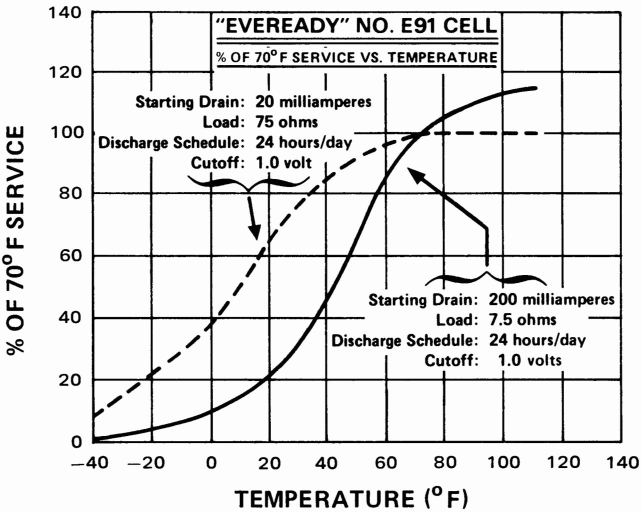
"EVEREADY" NO. E91

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.75V	0.8V	0.9V	1.0V
4 hours/day (Radio Test)	37.5	40	60 hours		51 hours	
½ hour/day (Calculator Test)	125	12	14.5		11.5	
2 hours/day (Cassette Test)	187.5	8	9.5		8.5	
4 minutes on, 11 minutes off, repeat for 8 consecutive hours/day (Camera Cranking Test)	250mA constant current					214 minutes
4 minutes/hour 8 hours/day, 16 hours rest (Light-Industrial Flashlight Test)	375	4	285 minutes		230 minutes	
Continuous (Toy Test)	375	4		228 minutes		
Discharge 15 seconds each minute for 5 consecutive days/week (Electronic Photoflash Cell Test)	1.5 amperes	1	145 discharges			

"EVEREADY" NO. E91

Service vs. Temperature



DEGREES	
F	C
–40	–40
–20	–28.9
0	–17.8
20	–6.7
40	4.4
60	15.6
80	26.7
100	37.8
120	48.9

Internal Resistance

Internal Resistance (fresh cells) (70° F) (21.1° C): 0.18 ohm (approximate)
(Average Flash Current: 8.2 amperes)

INTERNAL RESISTANCE (APPROXIMATE) VS. TEMPERATURE

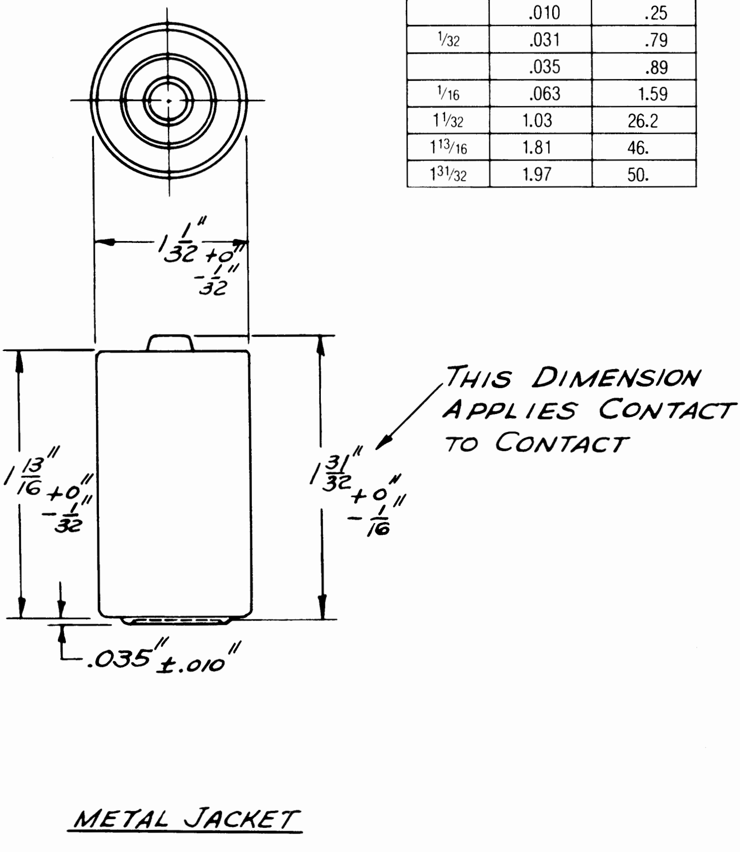
TEMPERATURE	INTERNAL RESISTANCE (OHMS)
70° F (21.1° C)	0.18
32° F (0° C)	0.24
20° F (–6.7° C)	0.31
0° F (–17.8° C)	0.46
–20° F (–28.9° C)	0.74
–40° F (–40° C)	1.14

"EVEREADY" NO. E93 CELL

1.5 VOLTS

Type: Alkaline-Manganese Dioxide
ANSI Designation: L70
IEC Designation: LR14
Suggested Current Range: 0-480 milliamperes

Inches		Millimeters
	.010	.25
1/32	.031	.79
	.035	.89
1/16	.063	1.59
1 1/32	1.03	26.2
1 13/16	1.81	46.
1 31/32	1.97	50.



SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 2.2 oz. (62.4 grams)
Volume .... 1.52 cubic inches (24.9 cubic centimeters)
Cell .... One No. 3-335 (ANSI "L70")
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. E93

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.25V	0.7V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
4 hours/day	18	83.3		320		300	280	260	230	170
	37.5	40		160		145	130	115	100	70
	60	25		100		92	86	78	70	42
24 hours/day	15	100		410		380	335	295	260	205
	30	50		200		185	170	155	125	95
	150	10		34		31	28	25	19	9
	200	7.5		26		24	20.5	17.5	12.4	6.8
	250	6		21		18.5	16	13	8.6	4.5
	300	5		17		15	13.8	10	6	3
	375	4		13.4		11.8	9.5	6.8	3.9	1.5
	667	2.25		6.3		9.2	4	2.4	1	0.2
	1500	1		1.6		1.0	0.8	0.4	0.2	

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	0.25V	0.7V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
4 hours/day (Radio Test)	37.5	40			165 hours		139 hours			
4 hours/day (Radio Test)	60	25			104 hours		88 hours			
2 hours/day (Cassette Test)	187.5	8			32 hours		26.6 hours			
½ hour/day (Calculator Test)	268	5.6			20 hours		16 hours			
4 minutes/hour, 8 hours/day 16 hours rest (Light-Industrial Flashlight Test)	375	4			879 minutes		703 minute			
4 minutes every 15 minutes, 8 hours/day, 16 hours rest (Heavy-Industrial Flashlight Test)	375	4					707 minutes		318 minutes	
Continuous (Toy Test)	375	4			700 minutes	624 minutes	590 minutes			
Discharge for 1 second each minute for 1 hour at 24 hour intervals for 5 consecutive days each week (Photoflash Cell Test)		0.15	2500 seconds							

"EVEREADY" NO. E93

Estimated Service at 70°F (21.1°C)

Internal Resistance

Internal Resistance (fresh cells) (70°F) (21.1°C): 0.15 ohm (approximate)
(Average Flash Current: 9.8 amperes)

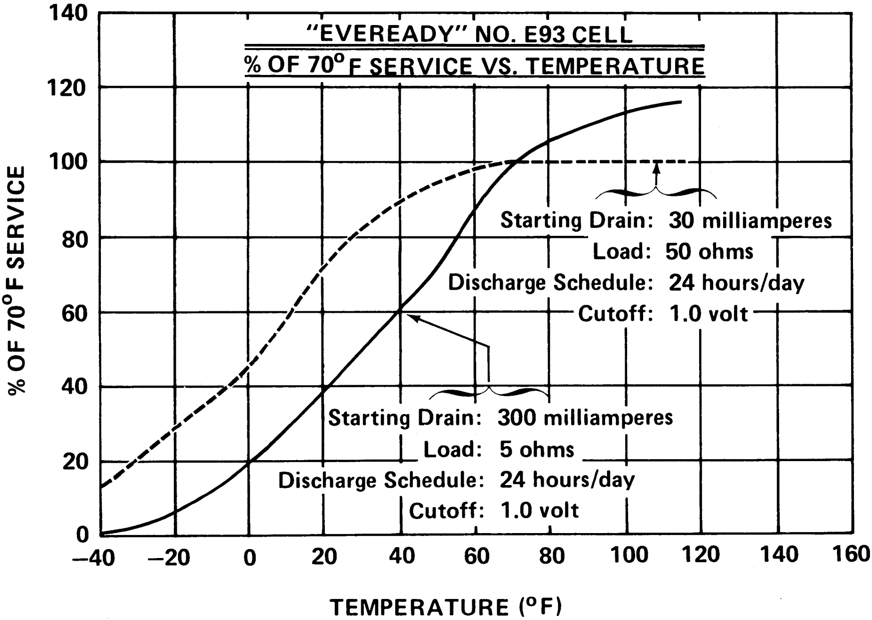
INTERNAL RESISTANCE (APPROXIMATE) VS. TEMPERATURE

TEMPERATURE F	TEMPERATURE C	INTERNAL RESISTANCE (ohms)
70	21.1	0.15
32	0	0.21
20	−6.7	0.28
0	−17.8	0.43
−20	−28.9	0.64
−40	−40	0.96

SIMULATED CLOCK DRAINS

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.9V	1.0V
24 hours/day (Simulated clock tests) (Transistorized movements)	250	6000	725 days	675 days	625 days
	500	3000	425	375	325
	1000	1500	275	225	185

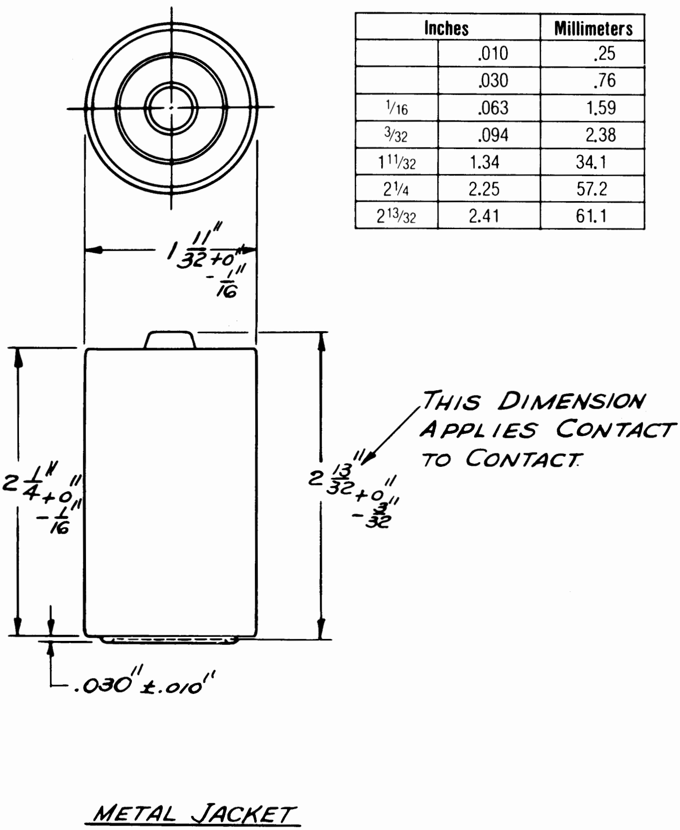
SERVICE VS. TEMPERATURE



DEGREES	
F	C
−40	−40
−20	−28.9
0	−17.8
20	−6.7
40	4.4
60	15.6
80	26.7
100	37.8
120	48.9

"EVEREADY" NO. E95 CELL

Type: Alkaline - Manganese Dioxide
ANSI Designation: L90
IEC Designation: LR20
Suggested Current Range: 0-650 milliamperes



Inches		Millimeters
	.010	.25
	.030	.76
1/16	.063	1.59
3/32	.094	2.38
1 11/32	1.34	34.1
2 1/4	2.25	57.2
2 13/32	2.41	61.1

SPECIFICATIONS

Voltage Taps .... –, + 1.5
Terminals .... Flat Contacts
Average Weight .... 4.5 oz. (128 grams)
Volume .... 3.17 cubic inches (52 cubic centimeters)
Cell .... One No. 3-350 (ANSI "L90")
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. E95

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.7V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
24 hours/day (or less)	10	150		1350		1150	1050	910	780	700
	30	50		450		400	350	315	265	210
	50	30		270		240	210	185	160	120
	150	10		80		72	66	59	47	30
	224	6.7		58		52	45	41	32	18
	300	5		38		36	32	29	23	12
	375	4		29		27	25	22	17	8
	500	3		20		19	17	14	9	3.6
	667	2.25		14		13	12	9	5	1.5
	1500	1.0		5.1		4.3	2.9	1.6	0.4	
	3000	0.5		2.0		1.4	0.6	0.2		
4 hours/day (Radio Test)	60	25			219 hours		182 hours			
2 hours/day (cassette test)	187.5	8			68 hours		57 hours			
4 minutes/hour 8 hours/day, 16 hours rest, (Light Industrial Flashlight Test)	667	2.25	1280 minutes				835 minutes			
4 minutes every 15 minutes, 8 hours/day, 16 hours rest, (Heavy-Industrial Flashlight Test)	667	2.25	1200 minutes				815 minutes			
Continuous (Toy Test)	667	2.25				780 minutes				
Discharge 15 seconds each minute for 5 consecutive days per week (Electronic Photoflash Cell Test)	1.5 amperes	1			1260 discharges					

"EVEREADY" NO. E95

Internal Resistance

Internal Resistance (Fresh Cells) (70°F) (21.1°C): 0.12 ohm (Approximate)
(Average Flash Current: 12 amperes)

INTERNAL RESISTANCE (APPROXIMATE) VS. TEMPERATURE

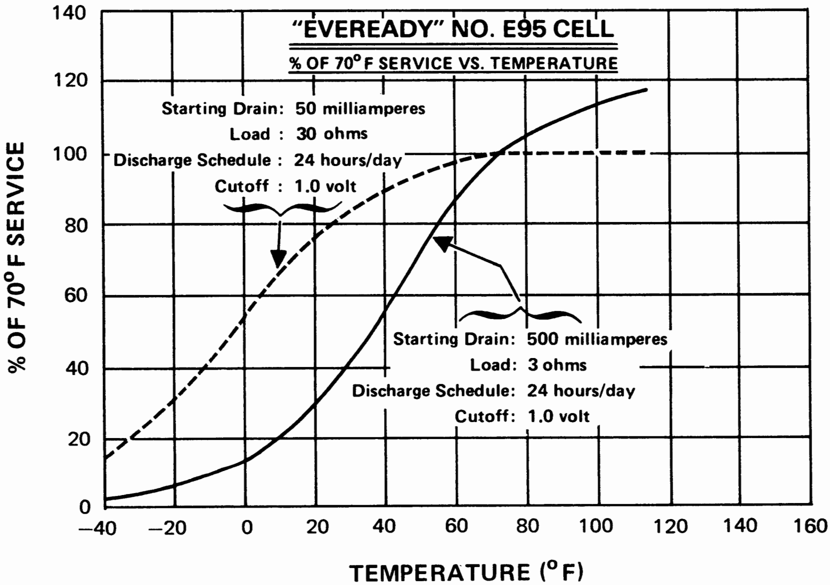
TEMPERATURE F	TEMPERATURE C	INTERNAL RESISTANCE (OHMS)
70	21.1	0.12
32	0	0.17
20	–6.7	0.18
0	–17.8	0.25
–20	–28.9	0.37
–40	–40	0.48

Estimated Average Service at 70°F (21.1°C)

SIMULATED CLOCK DRAINS

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.8V	0.9V	1.0V
24 hours/day (simulated	250	6000	1700 days	1520 days	1320 days
clock tests) (Transistorized	500	3000	900	825	700
Movements)	1000	1500	475	425	365

SERVICE VS. TEMPERATURE

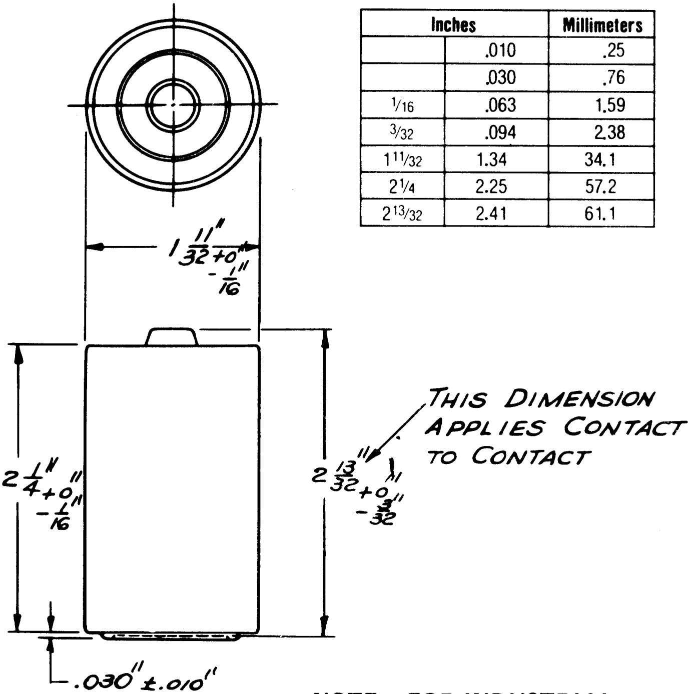


DEGREES	
F	C
−40	−40
−20	−28.9
0	−17.8
20	−6.7
40	4.4
60	15.6
80	26.7
100	37.8
120	48.9

"EVEREADY" NO. HS95 CELL

1.5 VOLTS

Type: Alkaline - Manganese Dioxide
ANSI Designation: L90
IEC Designation: LR20
Suggested Current Range: 0-650 milliamperes



Inches		Millimeters
	.010	.25
	.030	.76
1/16	.063	1.59
3/32	.094	2.38
1 11/32	1.34	34.1
2 1/4	2.25	57.2
2 13/32	2.41	61.1

NOTE: FOR INDUSTRIAL USE. NOT AVAILABLE AT RETAIL.

METAL JACKET

SPECIFICATIONS

Voltage Taps .... −, + 1.5
Terminals .... Flat Contacts
Average Weight .... 4.5 oz. (128 grams)
Volume .... 3.17 cubic inches (52 cubic centimeters)
Cell .... One No. 3-350 (ANSI "L90")
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. HS95

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.65V	0.7V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
24 hours/day	10	150		1350		1150	1050	910	780	700
(or less)	30	50		450		400	350	315	265	210
	50	30		270		240	210	185	160	120
	150	10		80		72	66	59	47	30
	224	6.7		58		52	45	41	32	18
	300	5		38		36	32	29	23	12
	375	4		29		27	25	22	17	8
	500	3		20		19	17	14	9	3.6
	667	2.25		14		13	12	9	5	1.5
	1500	1.0		5.1		4.3	2.9	1.6	0.4	
	3000	0.5		2.0		1.4	0.6	0.2		
4 minutes/hour 8 hours/day, 16 hours rest, (Light Industrial Flashlight Test)	667	2.25	1216 minutes				835 minutes			
4 minutes every 15 minutes, 8 hours/day, 16 hours rest, (Heavy-Industrial Flashlight Test)	667	2.25	1200 minutes				815 minutes			

"EVEREADY" NO. HS95

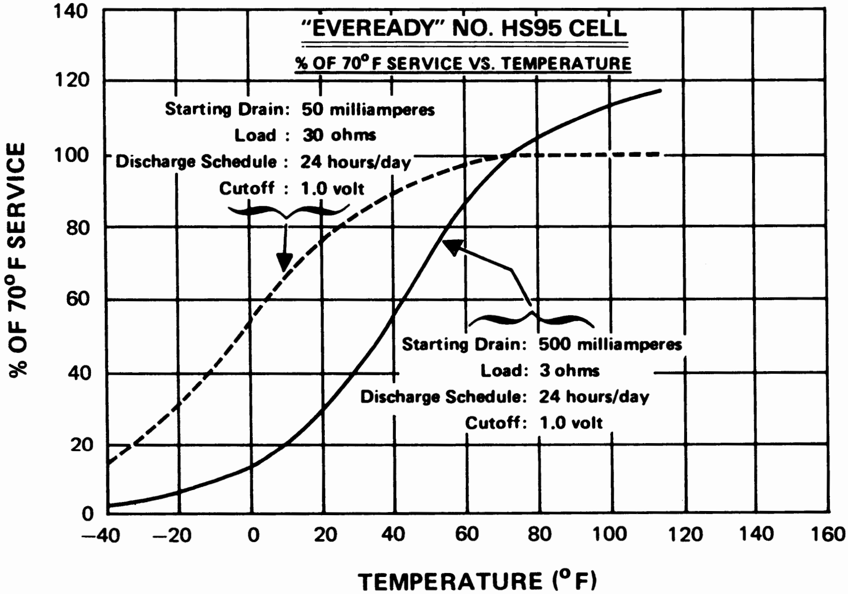
Internal Resistance

Internal Resistance (Fresh Cells) ($70^{\circ}F$) ($21.1^{\circ}C$): 0.12 ohm (Approximate)
(Average Flash Current: 12 amperes)

INTERNAL RESISTANCE (APPROXIMATE) VS. TEMPERATURE

TEMPERATURE F	TEMPERATURE C	INTERNAL RESISTANCE (OHMS)
70	21.1	0.12
32	0	0.17
20	−6.7	0.18
0	−17.8	0.25
−20	−28.9	0.37
−40	−40	0.48

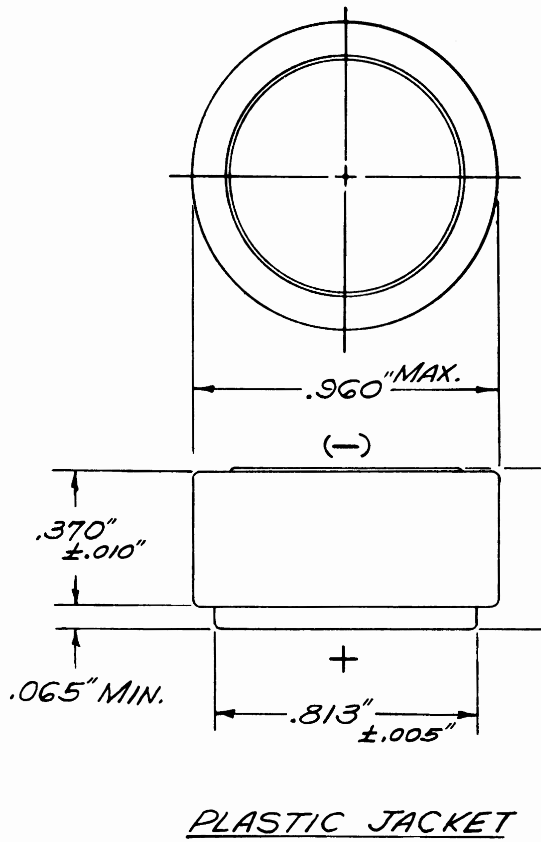
SERVICE VS. TEMPERATURE



DEGREES	
F	C
−40	−40
−20	−28.9
0	−17.8
20	−6.7
40	4.4
60	15.6
80	26.7
100	37.8
120	48.9

"EVEREADY" NO. EPX30 BATTERY

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-10 milliamperes



Inches	Millimeters
.005	.13
.010	.25
.030	.76
.065	1.65
.370	9.4
.485	12.3
.813	20.7
.960	24.4

SPECIFICATIONS

Voltage Taps .... –, + 3
Terminals .... Flat Contacts
Average Weight .... 0.5 oz. (14.3 grams)
Volume (by displacement) .... 0.305 cubic inch (5 cubic centimeters)
Cell .... Two No. 2-60192 in series

For service information see reverse side of this sheet

"EVEREADY" NO. EPX30

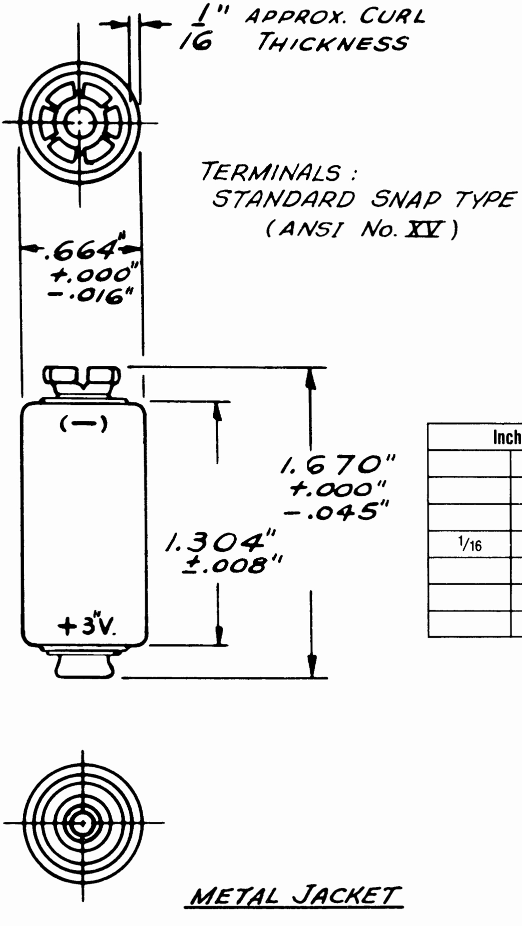
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.6V	CUTOFF VOLTAGE 2.4V
Continuous	10	300	17	7

"EVEREADY" NO. 532 BATTERY

3
VOLTS

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-70 milliamperes



Inches		Millimeters
	.008	.20
	.016	.41
	.045	1.14
1/16	.063	1.59
	.664	16.9
	1.304	33.1
	1.670	42.4

SPECIFICATIONS

Voltage Taps .... –, + 3
Terminals .... Snap
Average Weight .... 0.8 oz. (22.7 grams)
Volume (by displacement) ....0.445 cubic inch (7.3 cubic centimeters)
Cells ....Two No. 3-0663 (ANSI L25) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 532 BATTERY

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.8V
4 hours/day	20	150	35
	60	50	10

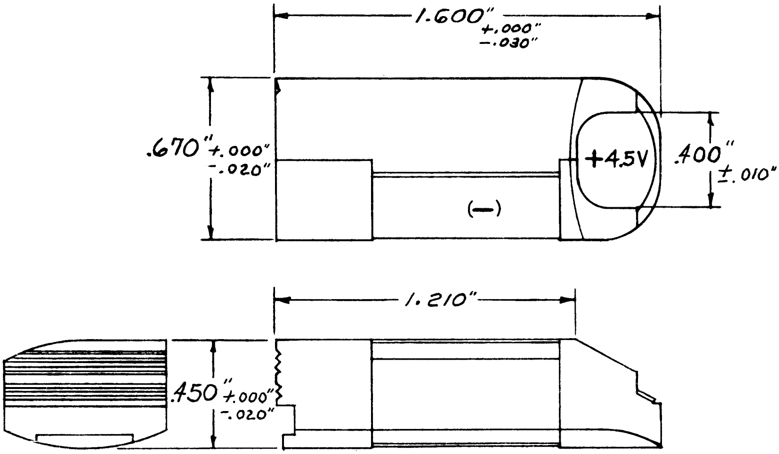
IMPEDANCE

The impedance of the No. 532 battery ranges from 1.8–3.0 ohms and is nearly constant throughout a given discharge even to a 1.2 volt cut-off. This relationship exists over a wide range of drains, 10 to 60 milliamperes, and frequencies, 40 to 1000 hertz.

"EVEREADY" NO. 538 BATTERY

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.010	.25
.020	.51
.030	.76
.400	10.2
.450	11.4
.670	17
1.210	30.7
1.600	40.6



Plastic Case

SPECIFICATIONS

Voltage Taps .... −, + 4.5
Terminals .... Flat Contacts
Average Weight .... 0.45 oz. (12.8 grams)
Volume (by displacement) .... 0.4 cubic inch (6.6 cubic centimeters)
Cells .... Three No. 2-60192 in series

For service information see reverse side of this sheet

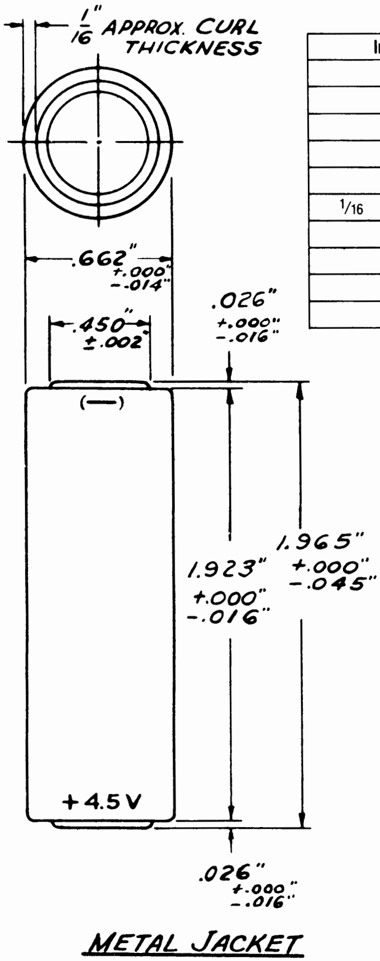
"EVEREADY" NO. 538

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.5V
Continuous	18	250	7.5 hours

"EVEREADY" NO. 523 BATTERY

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-70 milliamperes



Inches		Millimeters
	.002	.05
	.014	.36
	.016	.41
	.026	.66
	.045	1.14
1/16	.063	1.59
	.450	11.4
	.662	16.8
	1.923	48.8
	1.965	49.9

SPECIFICATIONS

Voltage Taps .... –, + 4.5
Terminals .... Flat Contacts
Average Weight .... 1.17 oz. (33.2 grams)
Volume .... 0.67 cubic inch (11 cubic centimeters)
Cells .... Three No. 3-0663 (ANSI L25) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 523 BATTERY

Estimated Average Hours Service at 70°F (21.1°C)

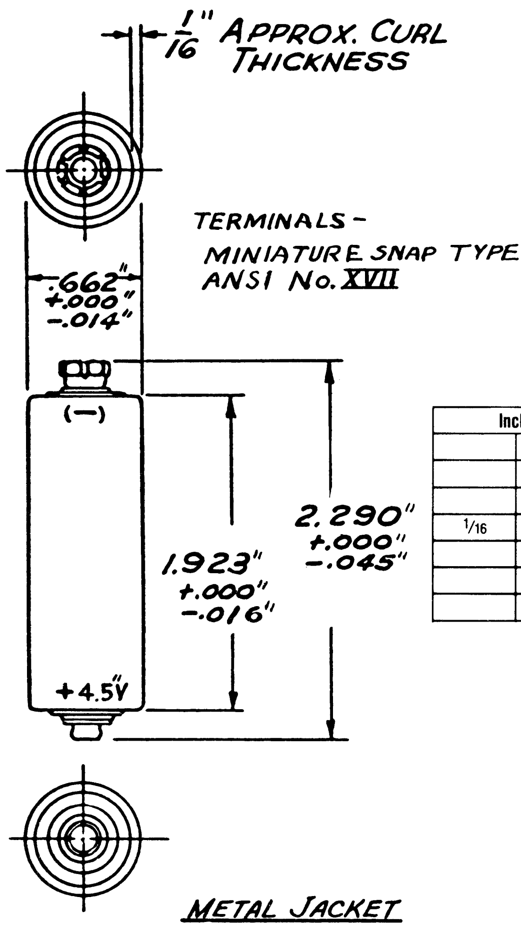
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.7V
4 hours/day	9	500	80
	20	225	35
	60	75	10

IMPEDANCE

The impedance of the No. 523 battery ranges from 2.7–4.5 ohms and is nearly constant throughout a given discharge even to a 1.8 volt cut-off. This relationship exists over a wide range of drains, 10 to 60 milliamperes, and frequencies, 40 to 1000 hertz.

"EVEREADY" NO. 531 BATTERY

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-70 milliamperes



Inches		Millimeters
	.014	.36
	.016	.41
	.045	1.14
1/16	.063	1.59
	.662	16.8
	1.923	48.8
	2.290	58.2

SPECIFICATIONS

Voltage Taps .... −, + 4.5
Terminals .... Miniature Snap
Average Weight .... 1.25 oz. (35.4 grams)
Volume .... 0.67 cubic inch (11 cubic centimeters)
Cells .... Three No. 3-0663 (ANSI L25) in series
Jacket........ Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 531 BATTERY

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.7V
4 hours/day	9	500	80
	20	225	35
	60	75	10

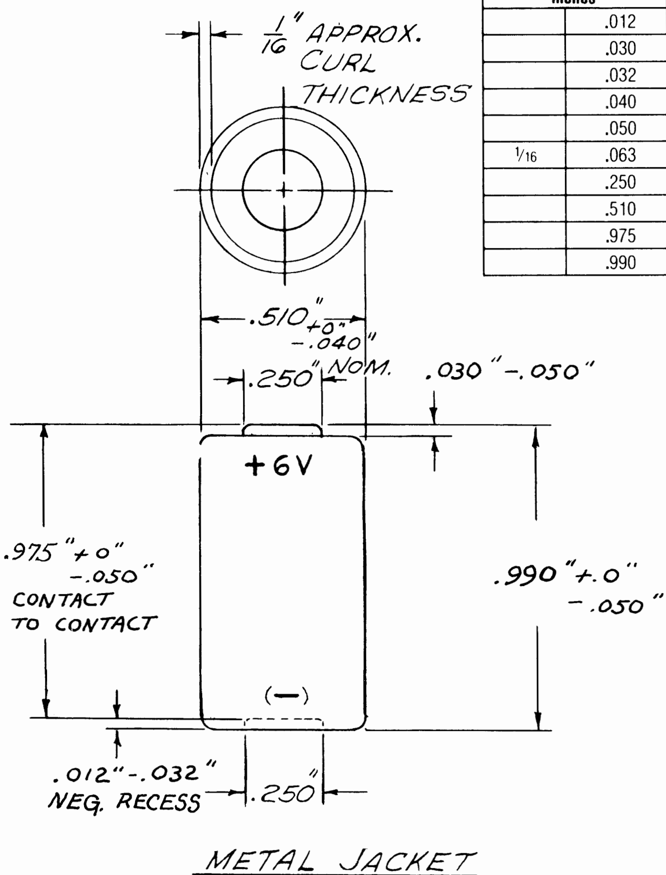
IMPEDANCE

The impedance of the No. 531 battery ranges from 2.7–4.5 ohms and is nearly constant throughout a given discharge even to a 1.8 volt cut-off. This relationship exists over a wide range of drains, 10 to 60 milliamperes, and frequencies, 40 to 1000 hertz.

"EVEREADY" NO. 537 BATTERY

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-10 milliamperes

	Inches	Millimeters
	.012	.31
	.030	.76
	.032	.81
	.040	1.02
	.050	1.27
1/16	.063	1.6
	.250	6.35
	.510	13
	.975	24.8
	.990	25.2



SPECIFICATIONS

Voltage Taps .... –, + 6
Terminals .... One flat, one recessed
Average Weight .... 0.5 oz. (14.2 grams)
Volume .... 0.2 cubic inch (3.3 cubic centimeters)
Cells .... Four No. 2-45201 in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 537

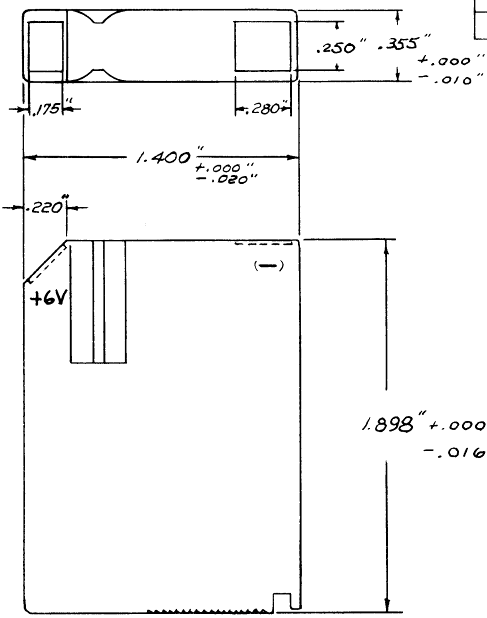
Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	CUTOFF VOLTAGE 3.8V
Continuous	2.5	2400	31 hours	
10 seconds "on", 30 seconds "off", repeated continuously (3 cycles every 2 minutes.)	30	200		830 cycles

"EVEREADY" NO. 539 BATTERY

Type: Alkaline- Manganese Dioxide
Suggested Current Range: 0-100 milliamperes

Inches	Millimeters
.010	.25
.016	.41
.020	.51
.175	4.45
.220	5.59
.250	6.35
.280	7.11
.355	9.02
1.400	35.6
1.898	48.2



Plastic Jacket

SPECIFICATIONS

Voltage Taps .... −, + 6
Terminals .... Flat Contacts
Average Weight .... 1.1 oz. (31 grams)
Volume .... 1 cubic inch (16.4 cubic centimeters)
Cells .... Four No. 3-0316 in series

For service information see reverse side of this sheet

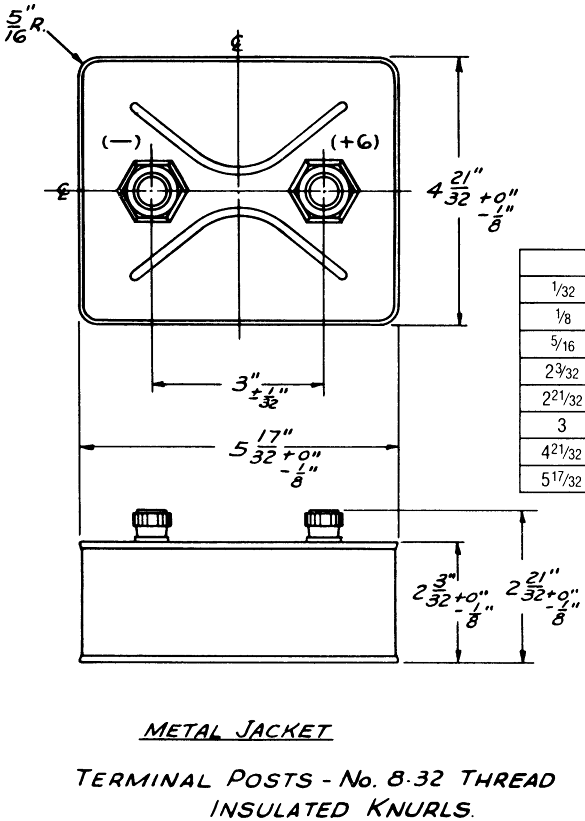
"EVEREADY" NO. 539

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.3V	4V	4.6V	5.3V
4 hours/day	18	333	30.5 hours	26 hours	18.3 hours	3.6 hours
½ hour/day	60	100	8.7	7.2	4	0.65
	90	66.7	5.3	4.2	1.6	
	120	50	4	2.7	0.9	
	180	33.3	2.3	1.5	0.6	

"EVEREADY" NO. 520 BATTERY

Type: Alkaline - Manganese Dioxide
Suggested Current Range: 0-1.3 amperes



Inches		Millimeters
1/32	.031	.79
1/8	.125	3.18
5/16	.313	7.94
2 3/32	2.09	53.2
2 21/32	2.66	67.5
3	3.00	76.2
4 21/32	4.66	118
5 17/32	5.53	141

SPECIFICATIONS

Voltage Taps .... —, + 6
Terminals .... Insulated Knurls
Average Weight .... 2 lbs. 8 oz. (1.13 kilograms)
Volume .... 53.9 cubic inches (883 cubic centimeters)
Cells .... Four No. 3-364 (ANSI "L100") in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 520

Estimated Average Hours Service at 70°F (21.1°C)

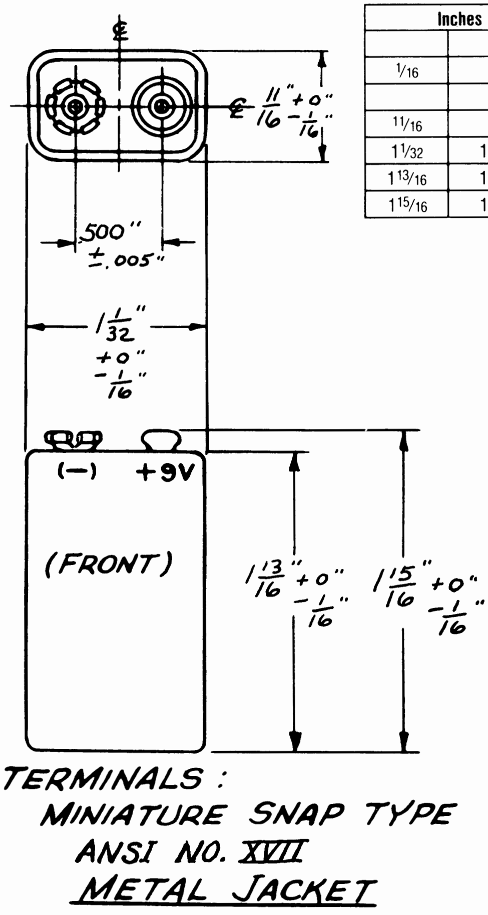
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.6V	3.0V	3.2V	3.6V	4.0V	4.4V
24 hours/day (or less)	30	200			775	680	560	505
	150	40			143	131	117	102
	375	16			59	50	44	35
	667	9			30	27	22	15
	1200	5			16	14	10.5	4.8
	1500	4			12.5	11	8	3
	2000	3			8	7	5	1.6
	3000	2			5	4	2.8	0.6
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Simulates 500mA Lamp)	667	9	31	29				
Schedule as above (Simulates 1 ampere lamp)	1333	4.5			14.5	13	9.5	

"EVEREADY" NO. 522 BATTERY

9 VOLTS

Type: Alkaline-Manganese Dioxide
Suggested Current Range: 0-100 milliamperes

	Inches	Millimeters
	.005	.13
1/16	.063	1.59
	.500	12.7
11/16	.688	17.5
1 1/32	1.03	26.2
1 13/16	1.81	46
1 15/16	1.94	49.2



SPECIFICATIONS

Voltage Taps .... −, + 9
Terminals .... Miniature Snap
Average Weight .... 1.59 oz. (45 grams)
Volume .... 1.28 cubic inches (21 cubic centimeters)
Cells .... Six No. 3-0316 in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 522

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.2V	CUTOFF VOLTAGE 5.4V
4 hours/day (Radio Test)	18	500	33	28
½ hour/day (Calculator Test)	60	150	9	8

RECHARGEABLE ALKALINE-MANGANESE-ZINC BATTERIES

General Features: "Eveready" rechargeable alkaline-manganese dioxide batteries use a unique electrochemical system and are maintenance free, hermetically sealed, and will operate in any position. These batteries have been designed for electronic and electrical applications where low initial cost and a low operating cost are of paramount importance.

"Eveready" rechargeable alkaline-manganese dioxide batteries are an outgrowth of the heavy duty "Eveready" alkaline-manganese dioxide primary batteries. Further research and development have made possible an alkaline battery that can be recharged. The total number of times the battery can be recharged is less than can be obtained with the nickel-cadmium rechargeable system, but the initial cost is only a fraction of nickel-cadmium battery cost. This provides an inexpensive battery that in some cases also offers lower operating cost than can be obtained from nickel-cadmium batteries.

The individual cells that comprise the rechargeable alkaline-manganese dioxide battery use electrodes of zinc and manganese dioxide with an electrolyte of potassium hydroxide. These are put together in a special inside-out cell construction and each individual cell is then hermetically sealed. The voltage per cell is 1.5. They are made in two sizes – "D", and "G". Basic characteristics of these cells are shown in Table I. A cutaway view of the cell is shown in Figure 10.

CELL SIZE	VOLTAGE	AVERAGE OPERATING VOLTAGE	RATED AMPERE-HOUR CAPACITY	MAXIMUM RECOMMENDED DISCHARGE CURRENT
"D"	1.5	1.0–1.2	2.5	0.625 ampere
"G"	1.5	1.0–1.2	5.0	1.25 amperes

Table I
BASIC CHARACTERISTICS OF CELLS IN
"EVEREADY" RECHARGEABLE ALKALINE-MANGANESE DIOXIDE BATTERIES

CUTAWAY OF RECHARGEABLE ALKALINE-MANGANESE DIOXIDE CELL

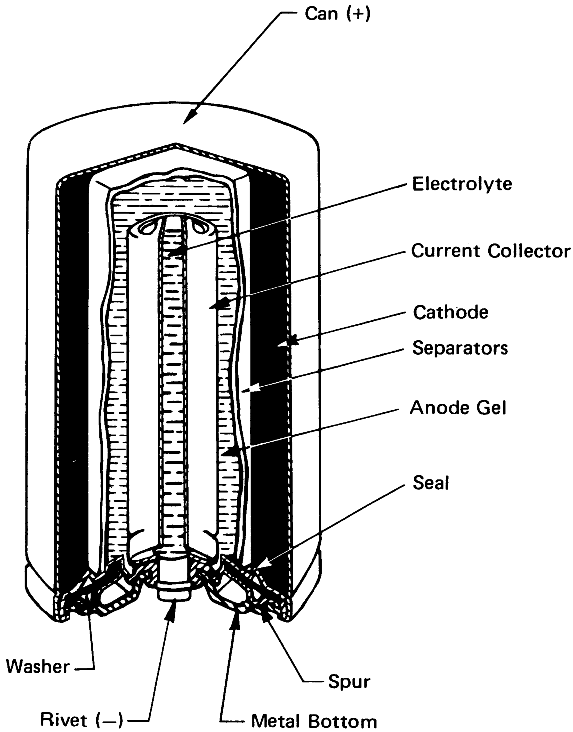


FIGURE 10

Finished batteries having voltages of 3 volts and above are constructed by connecting the required number of the proper cell size in series and sealing them in a metal case. Present types include 4.5 and 7.5 volt batteries using "D" size cells and 6, 13.5, and 15 volt batteries composed of "G" size cells. Specifications are listed in Table J .

"EVEREADY" RECHARGEABLE ALKALINE-MANGANESE DIOXIDE BATTERIES

Physical and Electrical Characteristics

TABLE J

"EVEREADY" BATTERY NUMBER	MAXIMUM DIMENSIONS—INCHES				TERMINALS	WEIGHT	VOLUME
	DIAMETER	LENGTH	WIDTH	HEIGHT			
563	1-23/64			7-5/32	Flat	15 oz.	10.1 cubic inches
565		2-25/32	2-25/32	5-11/32	Socket	2lbs.,8oz.	39.4 cubic inches
560		2-21/32	1-17/32	7-5/32	Socket	1lb., 9oz.	29 cubic inches
564		8-5/16	2-13/16	5-7/8	Socket	5 lbs.,8oz.	137 cubic inches
561		8-5/16	2-13/16	5-7/8	Socket	6 lbs.	137 cubic inches

PHYSICAL CHARACTERISTICS OF
RECHARGEABLE ALKALINE-MANGANESE DIOXIDE BATTERIES

Inches		Millimeters
1 23/64	1.36	34.5
1 17/32	1.53	38.9
2 21/32	2.66	67.5
2 25/32	2.78	70.6
2 13/16	2.81	71.4
5 11/32	5.34	136
5 7/8	5.88	149
7 5/32	7.16	182
8 5/16	8.31	211

15 oz.	425 Grams
1 lb. 9 oz.	709 Grams
2 lbs. 8 oz.	1.13 Kilograms
5 lbs. 8 oz.	2.5 Kilograms
6 lbs.	2.72 Kilograms

10.1 Cubic Inches	166 Cubic Centimeters
29 Cubic Inches	475 Cubic Centimeters
39.4 Cubic Inches	646 Cubic Centimeters
137 Cubic Inches	2245 Cubic Centimeters

"EVEREADY" BATTERY NUMBERS	VOLTAGE	NUMBER AND SIZE OF CELLS	CAPACITY IN AMPERE-HOURS	MAXIMUM RECOMMENDED DISCHARGE CURRENT (amperes)
563	4.5	3 "D"	2.5	0.625
565	6	4 "G"	5	1.25
560	7.5	5 "D"	2.5	0.625
564	13.5	9 "G"	5	1.25
561	15	10 "G"	5	1.25

ELECTRICAL CHARACTERISTICS OF
RECHARGEABLE ALKALINE-MANGANESE DIOXIDE BATTERIES

PERFORMANCE

The discharge characteristics of the "Eveready" rechargeable alkaline-manganese dioxide battery are quite similar to those exhibited by primary batteries. The battery voltage decreases slowly as energy is withdrawn from the battery. The shape of this discharge curve changes slightly as the battery is repeatedly discharged and charged. The total voltage drop for a given energy withdrawal increases as the number of discharge and charge cycles increase. Coupled with this is the fact that the available energy per cell lessens with each discharge—charge cycle even though the open circuit voltage remains quite constant. This is shown graphically in Figure 11 below.

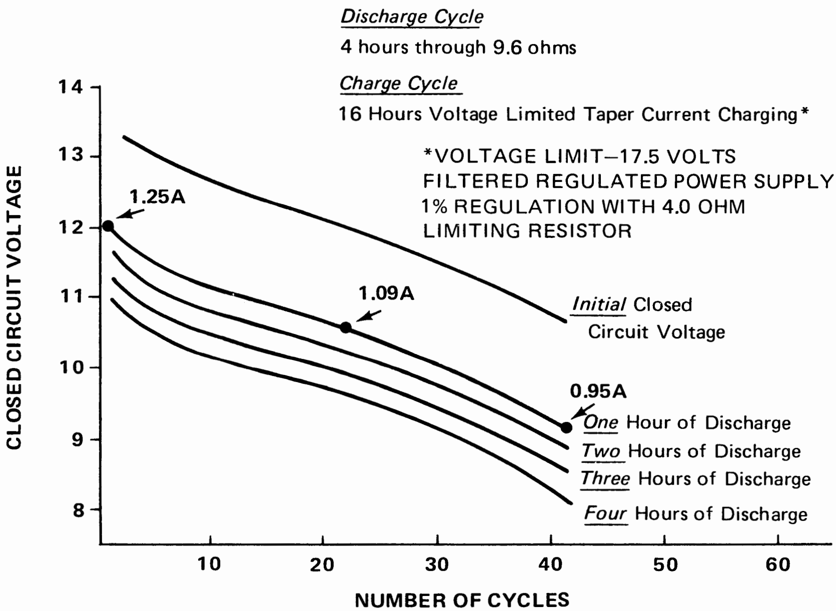


FIGURE 11
CHANGES IN BATTERY PERFORMANCE WITH EVERY FIFTH CYCLE
561 BATTERY ON 9.6 OHM LOAD FOR 4 HOURS

When a rechargeable battery of the alkaline-manganese dioxide type is discharged at the maximum rate for a period of time to remove the rated ampere-hour capacity and then recharged for the recommended period of time, the complete discharge and charge cycle can be repeated many times before the battery voltage will drop below 0.9 volts per cell in any discharge period, depending on cell size. Decreasing either the discharge current or the total ampere-hour withdrawal, or both, will increase the cycle life of the battery by a significant percentage. Conversely, if the power demands are increased to a point where they exceed the rated battery capacity, the cycle life will decrease more than in proportion to the increased power demand.

During the early part of its cycle life there is a very large power reserve in the "Eveready" rechargeable alkaline-manganese dioxide battery. In these early cycles, the battery terminal voltages may measure 1.0 to 1.2 volts per cell after the battery has delivered its rated ampere-hour capacity. If it is discharged beyond its rated capacity however, total battery cycle life will be reduced. Nevertheless this reserve power can be used in situations where maximum total battery life can be sacrificed for immediate power. During the latter part of cycle life, there is little or no reserve power and the terminal voltage of the battery will fall to between 1.0 and 0.9 volts per cell at end of discharge. Figure 11 shows the maximum and minimum discharge voltages that the battery will reach on evenly spaced cycles throughout its cycle life. This curve shows 561 battery performance on a 9.6 ohm load for 4 hours.

"Eveready" rechargeable alkaline-manganese dioxide batteries have excellent charge retention properties. A new battery as received by the consumer is fully charged and has the charge retention characteristics of a primary battery. These charge retention characteristics also apply during the charge-discharge cycling of the battery. *The new battery must be discharged to its rated capacity before it will be capable of standing any over-charge. This is important! Discharge the battery before charging it!* It should be discharged for a complete cycle, the cycle to be described by the manufacturer of the device which the battery powers. Again, care should be exercised not to discharge the batteries beyond the rated capacity.

RECHARGING PROCEDURE

The recommended method for charging alkaline secondary batteries is through the use of Voltage Limited-Taper Current charging which is described in detail on pages 351-358. This method offers the maximum cycle life and resultant lowest battery operating costs. Cycle life can be as much as twice that obtained with other methods of charging. While constant current charging can be used with resultant loss of cycle life, it is recommended that the Battery Engineering Department be consulted before such charging methods are contemplated.

Batteries should not be charged continuously after the charge current has returned 120% of the ampere-hours removed on previous discharge or float charged for extended periods.

DISCHARGE LIMITATIONS

An "Eveready" rechargeable alkaline-manganese dioxide battery must not be discharged completely. For best results, the rated capacity of the battery should not be exceeded on discharge. During deep discharge a secondary electrochemical reaction takes place. This reaction is not reversible and will seriously reduce the battery cycle life. To avoid possible complaints of short battery service, it is therefore desirable that the device using the battery contain some provision against excessive discharge of the battery.

Where Voltage Limited-Taper Charging is used, the charger will replace the energy needed to recharge the battery and a timer or ampere-hour control is unnecessary to monitor the charging time. However, as noted on page 339, the battery should be removed from the charger after completion of the charge. Also, to prevent deep cell discharge, a timer would provide effective control over the energy withdrawn from the cell during any cycle.

With constant current charging, a dc timer or ampere-hour counter to control both the discharge and charge cycles is needed. A system of this sort would be adjustable to permit removal of the rated ampere-hour capacity from the battery and thereby insure maximum battery service life.

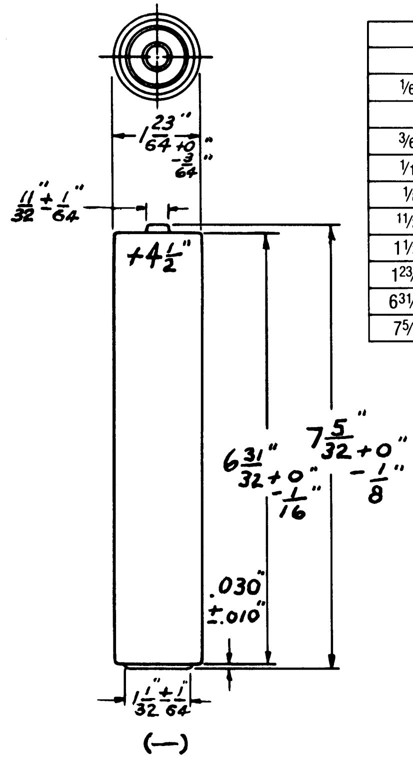
FUSING

"Eveready" battery Nos. 561 and 564 are used in portable TV applications and are fused for 8 amperes. The reading of short circuit amperage of these batteries should not be attempted. Battery Nos. 560, 563 and 565 are not fused.

"EVEREADY" NO. 563 BATTERY

4.5 VOLTS

Type: Rechargeable Alkaline-Manganese Dioxide
Suggested Current Drain: 625 milliamperes maximum



Inches		Millimeters
	.010	.25
1/64	.016	.40
	.030	.76
3/64	.047	1.19
1/16	.063	1.59
1/8	.125	3.18
11/32	.344	8.73
1 1/32	1.03	26.2
1 23/64	1.36	34.5
6 31/32	6.97	177
7 5/32	7.16	182

METAL JACKET

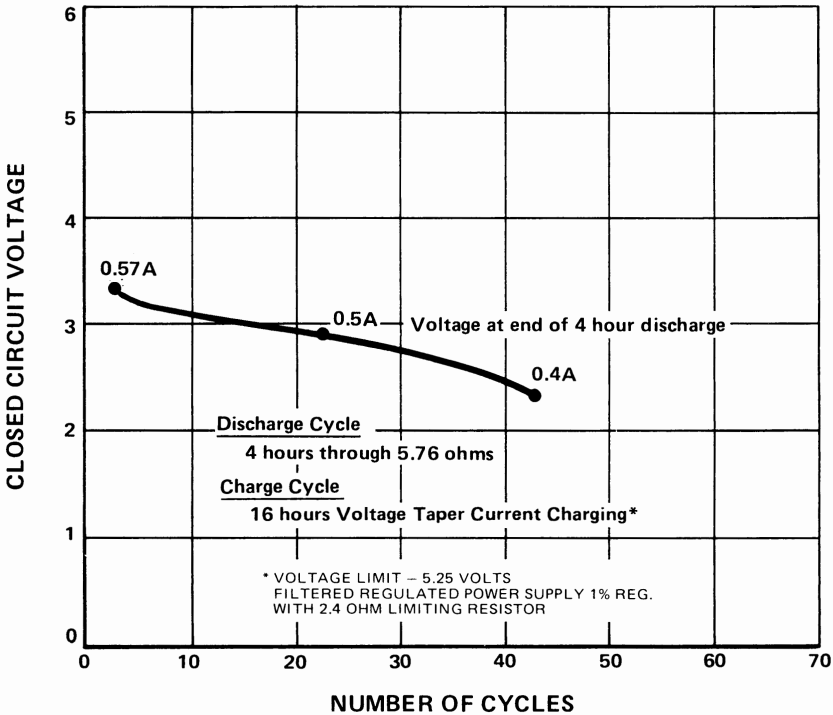
SPECIFICATIONS

Voltage Taps .... —, + 4.5
Average Service Capacity (to 2.7 volts) .... 2.5 ampere-hours
(Rated at 0.625 ampere)
Terminals .... Flat Contacts
Average Weight .... 15 oz. (425 grams)
Volume........ 10.1 cubic inches (166 cubic centimeters)
Cells........Three No. 4-450 (ANSI L90) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

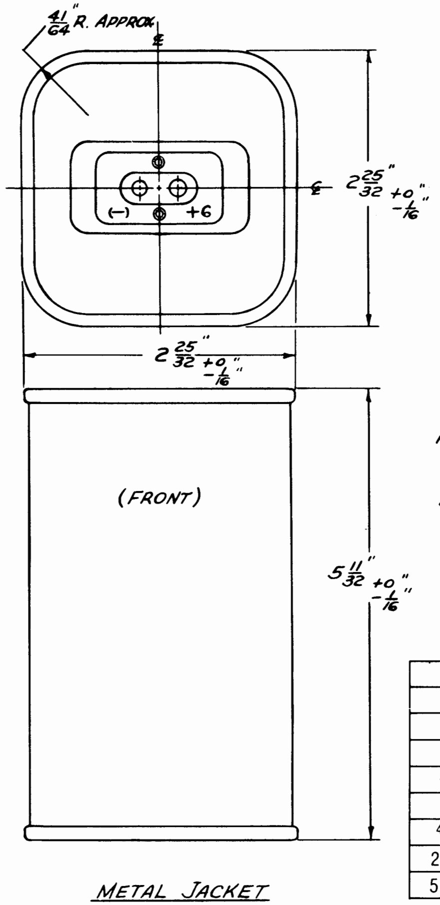
"EVEREADY" NO. 563

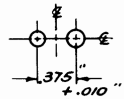
Average Performance Characteristics at 70° F (21.1° C)



"EVEREADY" NO. 565 BATTERY

Type: Rechargeable Alkaline-Manganese Dioxide
Suggested Current Drain: 1.25 amperes maximum





DIMENSIONED SOCKET LAYOUT - TOP VIEW
HOLES FOR 1 PIN-1/8" DIA.
AND 1 PIN-5/32" DIA.
ANSI No. IV SOCKET

Inches		Millimeters
	.010	.25
1/16	.063	1.59
1/8	.125	3.18
5/32	.156	3.97
	.375	9.53
41/64	.641	16.3
2 25/32	2.78	70.6
5 11/32	5.34	136.

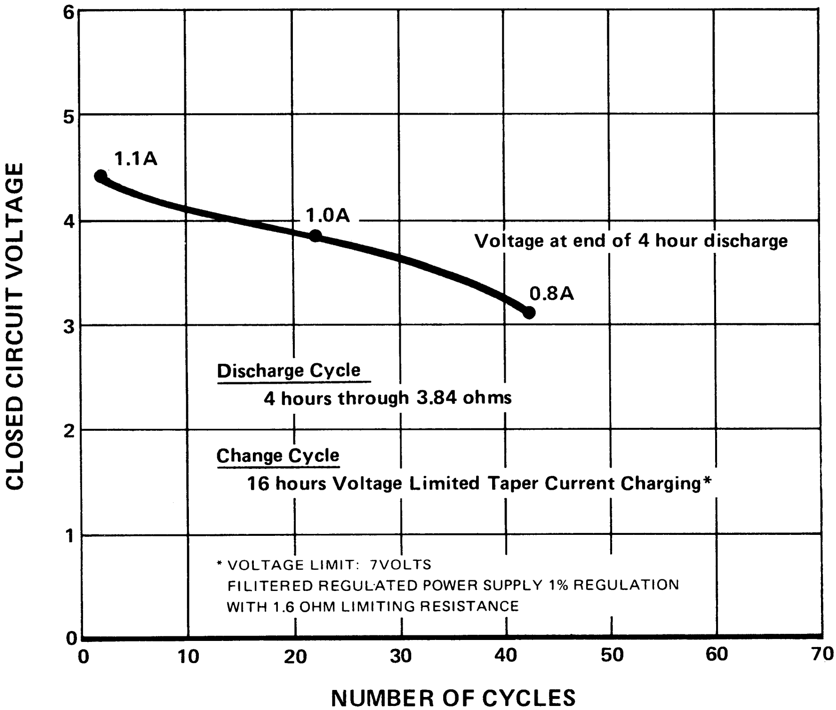
SPECIFICATIONS

Voltage Taps .... −, + 6
Average Service Capacity (to 3.6 volts) .... 5 ampere-hours
(Rated at 1.25 amperes)
Terminals .... Socket
Average Weight .... 2 lbs. 8 oz. (1.13 kilograms)
Volume .... 39.4 cubic inches (646 cubic centimeters)
Cells........................ 4 No. 4-464 (ANSI L100) in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 565

Average Performance Characteristics at 70° F (21.1°C)



Discharge: 5 amperes for 1 second
Discharge: 1.5 amperes for 19 minutes, 59 seconds
Rest: 10 minutes

Constant Current Discharge

Repeat above cycle 5 times/day

Cutoff: 3.6 volts
Discharge: 100 minutes/day
No. 565 will provide 30 days of use on above schedule.

Charging: Voltage Limited Taper Current Charging

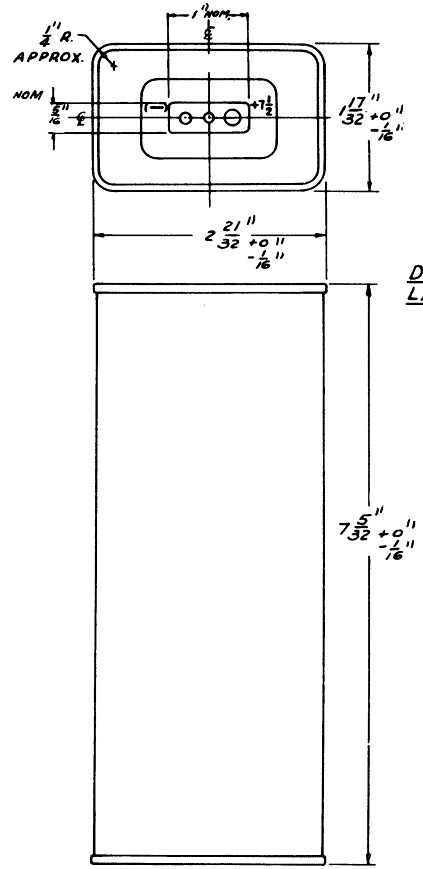
Voltage Limit: 7 volts
Filtered Regulated Power Supply
1% regulation with
1.6 ohm limiting resistor
Charge 16 hours

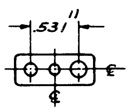
"EVEREADY" NO. 560 BATTERY

7.5 VOLTS

Type: Rechargeable Alkaline-Manganese Dioxide

Suggested Current Drain: 625 milliamperes maximum





DIMENSIONED SOCKET LAYOUT- TOP VIEW

1 PIN - 1/8" DIA.

1 PIN - 5/32" DIA.

1 PIN - 3/32" DIA.

Inches		Millimeters
1/16	.063	1.59
3/32	.094	2.38
1/8	.125	3.18
5/32	.156	3.97
1/4	.250	6.35
5/16	.313	7.94
17/32	.531	13.5
	.531	13.5
1	1.00	25.4
1 17/32	1.53	38.9
2 21/32	2.66	67.5
7 5/32	7.16	182

METAL JACKET

SPECIFICATIONS

Voltage Taps .... −, + 7.5

Average Service Capacity (to 4.5 volts) .... 2.5 ampere-hours
(Rated at 0.625 ampere)

Terminals .... Socket

Average Weight .... 1 lb. 9 oz. (709 grams)

Volume .... 29.0 cubic inches (475 cubic centimeters)

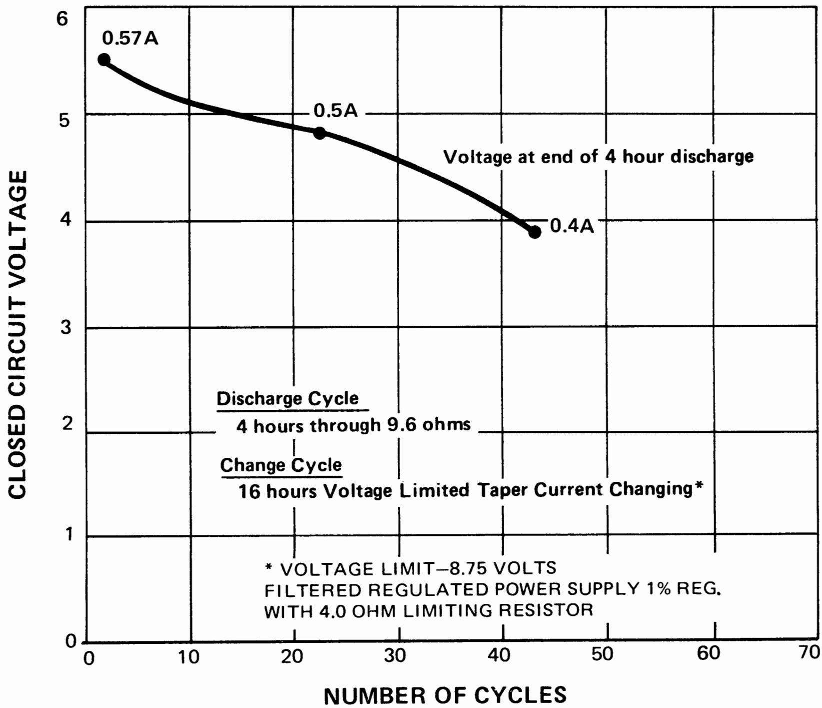
Cells .... Five No. 4-450 (ANSI L90) in series

Jacket........................ Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 560

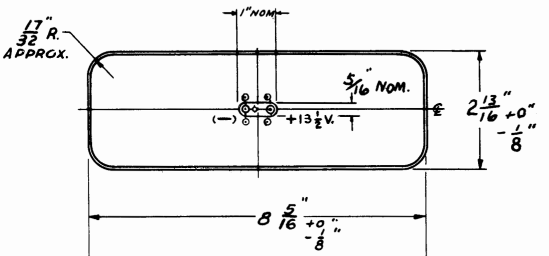
Average Performance Characteristics at 70°F (21.1°C)



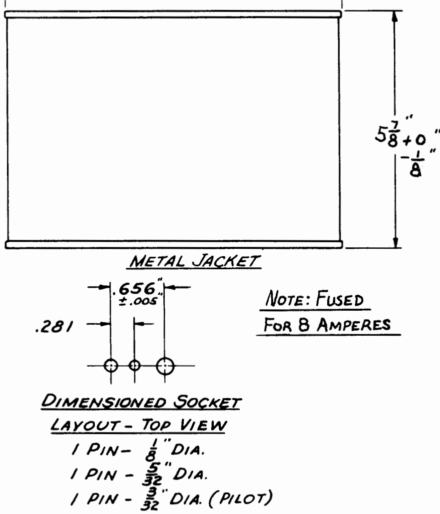
"EVEREADY" NO. 564 BATTERY

Type: Rechargeable Alkaline-Manganese Dioxide

Suggested Current Drain: 1.25 amperes maximum



Inches		Millimeters
	.005	.13
3/32	.094	2.38
1/8	.125	3.18
5/32	.156	3.97
	.281	7.14
5/16	.313	7.94
17/32	.531	13.5
	.656	16.7
1	1.00	25.4
2 13/16	2.81	71.4
5 7/8	5.88	149
8 5/16	8.31	211



BATTERY WEIGHT - 5½ LBS.

SPECIFICATIONS

Voltage Taps.. −, + 13.5

Average Service Capacity (to 8.1 volts) .... 5 ampere-hours
(Rated at 1.25 amperes)

Terminals .... Socket

Average Weight .... 5 lbs. 8 oz. (2.5 kilograms)

Volume .... 137 cubic inches (2245 cubic centimeters)

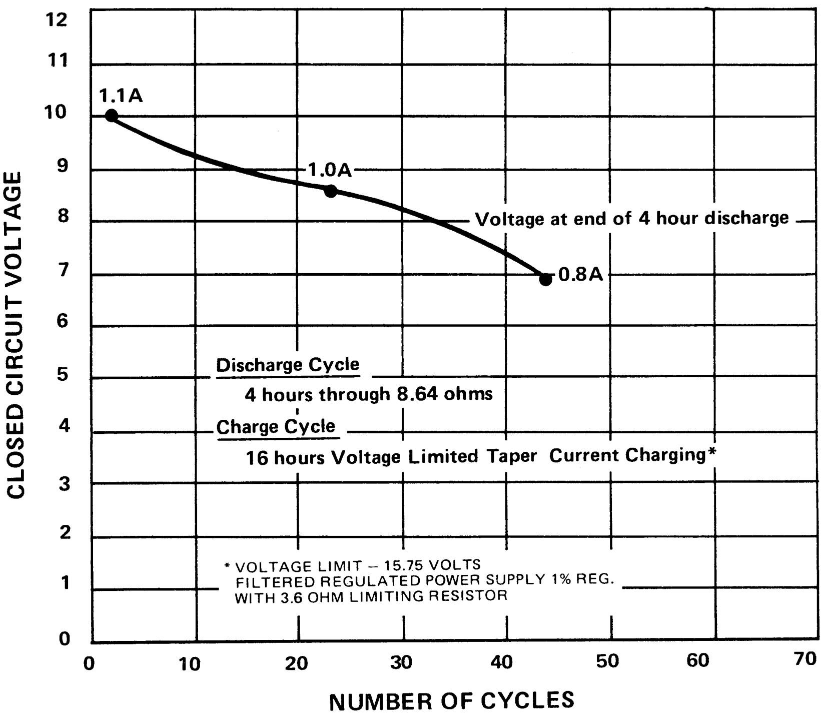
Cells .... Nine No. 4-464 (ANSI L100) in series

Jacket..................................... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

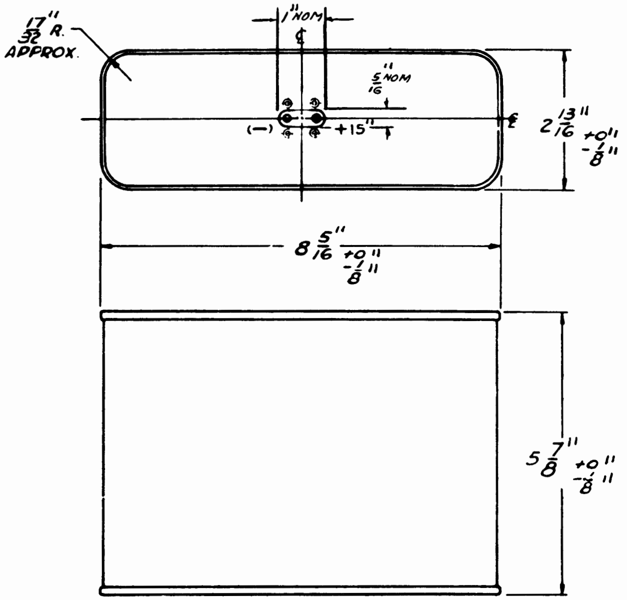
"EVEREADY" NO. 564

Average Performance Characteristics at 70° F (21.1°C)

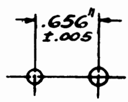


"EVEREADY" NO. 561 BATTERY

Type: Rechargeable Alkaline-Manganese Dioxide
Suggested Current Drain: 1.25 amperes maximum



METAL JACKET



NOTE: FUSED FOR 8 AMPERES

DIMENSIONED SOCKET LAYOUT - TOP VIEW
1 PIN- 1/8" DIA.
1 PIN - 5/32" DIA.
(ANSI No. XXI SOCKET)

Inches		Millimeters
	.005	.13
1/8	.125	3.18
5/32	.156	3.97
5/16	.313	7.94
17/32	.531	13.5
	.656	16.7
1	1.00	25.4
2 13/16	2.81	71.4
5 7/8	5.88	149.
8 5/16	8.31	211.

SPECIFICATIONS

Voltage Taps .... −, + 15

Average Service Capacity (to 9 volts) .... 5 ampere-hours
(Rated at 1.25 amperes)

Terminals .... Socket

Average Weight .... 6 lbs. (2.72 kilograms)

Volume .... 137 cubic inches (2245 cubic centimeters)

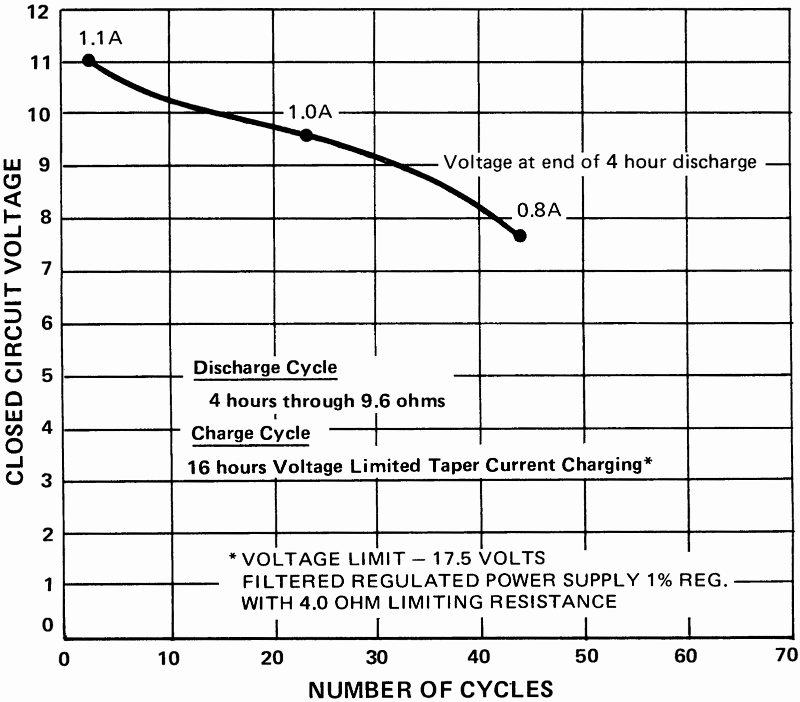
Cells .... Ten No. 4-464 (ANSI L100) in series

Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 561

Average Performance Characteristics at 70° F (21.1°C)



CHARGING SEALED ALKALINE-MANGANESE DIOXIDE RECHARGEABLE BATTERIES

Charging Methods

The recommended method for charging the Alkaline-MnO_2 rechargeable battery is the Voltage Limited-Taper Current system. The batteries are tolerant to various charge current characteristics such as constant current or taper current, with some loss in cycle life. However the more common circuits, constant voltage, constant current and taper current, are not recommended without modifications. In addition these circuits require some degree of attention by user in terminating charge or proportioning charge-discharge times to prevent excessive overcharge and loss of battery service. Fundamentally the battery should be charged proportionate to discharge, the charge current returning about 100 to 120% of the ampere-hours removed on previous discharge. It is suggested that the Battery Engineering Department be consulted if use of a simple uncontrolled charge circuit is anticipated.

The Alkaline-Manganese Dioxide rechargeable batteries have excellent charge retention characteristics. A new battery is shipped fully charged and has the charge retention characteristics of a primary battery. The battery should always be discharged before charging. THE BATTERY MUST NEVER BE CHARGED PRIOR TO FIRST DISCHARGE.

During the early part of the cycle life there is a very large power reserve in an "Eveready" rechargeable alkaline battery. This usually amounts to between 100% and 200% of the rated ampere-hour capacity of the battery. During these early cycles, the battery terminal voltage may measure 1.0 to 1.2 volts per cell after the battery has delivered its rated ampere-hour capacity. If it is discharged beyond its rated capacity total battery life will be reduced. However, this reserve power can be used in situations where immediate power is more important than maximum battery cycle life.

After a number of cycles the power reserve is decreased, the terminal voltage of the battery will fall to between 0.9 and 1.0 volt per cell after discharging to rated capacity.

The Alkaline-Manganese rechargeable battery must never be discharged completely. During deep discharge a secondary electrochemical reaction takes place. This reaction is not reversible and will seriously reduce the battery cycle life. To avoid possible customer complaints of short battery service, it is desirable that the instrument using the battery contain some provision to prevent discharge beyond rated capacity. Conversely, cycle life can be increased more than proportionately when less than rated capacity is used during each cycle.

The ampere-hours returned on charge may vary with history, number of cycles and charging method. Extended periods of overcharge may reduce cycle life and should be avoided. The Alkaline-MnO_2 battery exhibits an appreciable voltage rise during charge. The charge voltage source should be "limited" to prevent irreversible chemical reactions occuring as a result of high charge potentials.

When an alkaline rechargeable battery is discharged to rated capacity at the maximum recommended discharge current and then recharged in the recommended manner, the complete discharge and charge cycle can be repeated approximately 32 times before the battery will fall below 0.9 volts per cell in any 4 hour discharge period.

Voltage Limited—Taper Current Charging

An inexpensive voltage regulator added to the basic constant current type transformer-rectifier circuit having a current limiting resistor between the battery and the regulated output voltage removes the burden of adjusting charge time to discharge time and provides automatic current control. This charge method is called Voltage Limited-Taper Current charging or VLTC. Though the regulator circuit is somewhat more expensive than other common circuits the initial cost is more than offset by 50% to 100% greater cycle life.

The basic characteristics of sealed alkaline-manganese dioxide rechargeable cells when using Voltage Limited-Taper Current charging are given in Table K.

TABLE K

Cell Size	Average Operating Voltage At Max. Current	Maximum Initial Charging Current At 1.3V / Cell	Current *Limiting Resistance	Source Voltage Limit
D	1.0–1.2	0.6 ampere	0.8 ohms/cell	1.70-1.75 volts/cell
G	1.0–1.2	1.12	0.4 ohms/cell	1.70-1.75 volts/cell

The Voltage Limited-Taper Current charger circuit design is quite straightforward. The design of transformer-rectifier power supplies is discussed in detail in the section titled "Nickel-Cadmium Battery Chargers". The basic power supply design for VLTC charging of the alkaline-MnO_2 battery utilizes the same principles. In addition, a regulator providing voltage regulation of 2 or 3 per cent at low current values is adequate. Poorer regulation when the battery is first placed on charge and the voltage is low is often satisfactory. The regulator output voltage is adjusted to the battery end of charge voltage. Correct battery voltage is determined by number of cells and cell voltages given in Table K.

The current limiting resistance* should limit the initial current to the 4–6 hour rate at start of charge when battery voltage is low. Typical starting voltage after withdrawal of rated capacity is 1.30 to 1.35 volts/cell. The maximum recommended initial charge current at these voltages are also shown in Table K.

The advantages of this method of charging are readily apparent:

a) High charge currents flow during the early portion of the charge period. when the battery is best suited for accepting charge and tapers to very low currents near the end of charge resulting in less critical control of the time on charge.
b) Currents at end of charge due to battery voltage increase are small enough to minimize cell heating and internal gassing which can be detrimental to battery life.
c) The necessity of the user calculating the length of charge time dependent upon the discharge time and rate is avoided. In this method of charging, the battery tends to accept only the amount of energy needed to bring the battery back to approximate rated capacity.

---

*The total current limiting resistance consists of the series resistance plus inherent resistance of regulator circuit which may vary with design and component selection.

d) Permits the charging of paritally discharged batteries, and prevents serious damage, within the recommended charge period, if batteries are inadvertently placed on charge prior to discharge. Batteries should be removed from the charger after charging, however, and should not be left on float charge.

The minimum voltage that a cell will reach at the end of the recommended discharge capacity is shown in Figure 12. This voltage is measured while the discharge current is flowing.

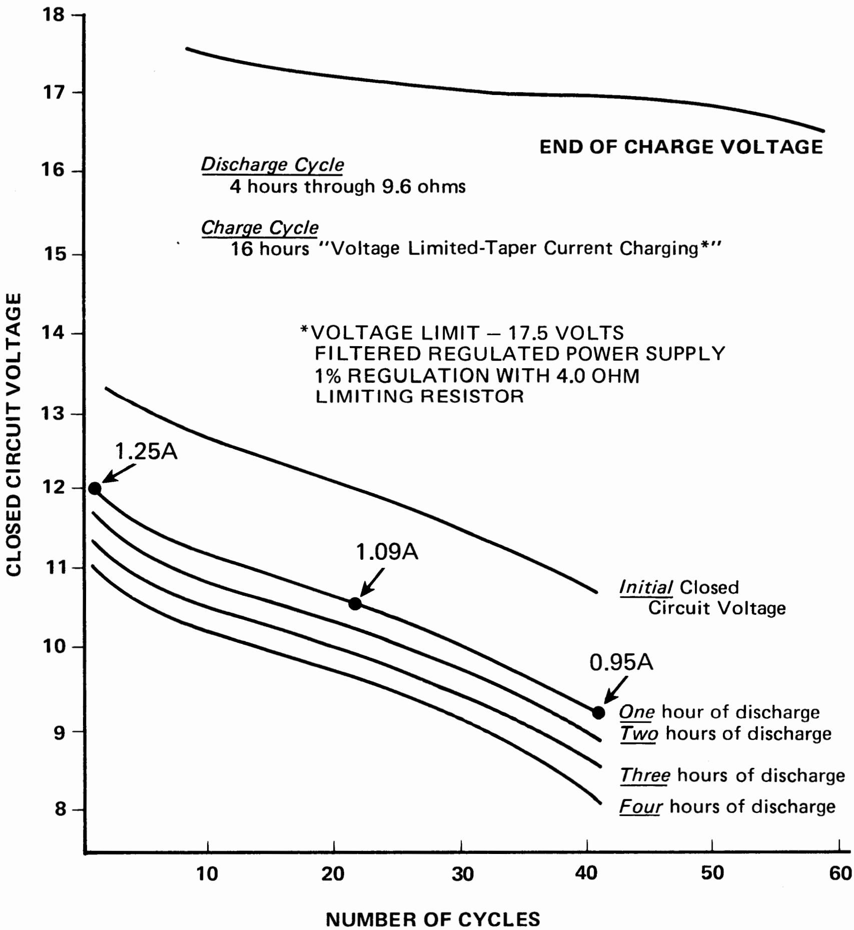


FIGURE 12 – TYPICAL VOLTAGE PERFORMANCE #561 BATTERY

The curves of Figure 12 represent cell behavior at maximum discharge current rating to rated capacity and minimum of 16 hours recharge time using a VLTC charge circuit. The initial closed circuit voltage and end of discharge voltage curves give the "working" voltage range of the cell at various discharge levels.

To prevent damage to cell on charge cycle the charging potential should be limited to about 1.7 volts per cell with a maximum permissible of 1.75 volts/cell. The voltage rise on the charge and end of charge voltage value is dependent on charge current character. As shown in Figure 12, the end of charge voltage will decrease slightly as cycle life progresses as the result of gradual change in the reversibilty of the system.

Since the current tapers as the result of battery voltage increase or is "voltage responsive", the end of charge current will increase as cycling progresses. The current will equilibrate at some specific value but will never reach zero or shutoff since the voltage decreases as current is reduced as the result of internal resistance and chemical reaction.

The battery voltage after charge will gradually decrease to the value of 1.5 volts/cell when the charger is disconnected and the battery remains on open circuit. When changing from charge to discharge cycle with no time delay between, the battery voltage decay rate will vary with discharge current. At rates near 1 ampere the battery voltage will fall to indicated initial closed circuit values within 5 minutes.

Design of Voltage Limited Taper Current Chargers

A charge time of 16 hours is recommended for a complete VLTC charge. Where the application permits longer charge periods may be advantageous. Table K lists the design criteria normally used in designing VLTC chargers for sealed alkaline-manganese dioxide rechargeable batteries based on a 16 hour charge period. (These values assume a linear current taper characteristic comparable to that of Figure 13(B).

The detailed design considerations are often best illustrated by examples.

Example

Assume that an "Eveready" No. 561 battery (10 "G" size cells in series) is being used to its rated 5 ampere hour capacity and that a charger capable of recharging the battery in a 16 hour period is desired.

1) Determine the required voltage output of the regulated voltage source: 1.75V/cell x 10 cells = 17.5 volts. (Table K).
2) Also from Table K, the maximum current should be limited to about 1.12A at 1.3V/cell. The limiting resistance is 0.4 ohm/cell times 10 cells = 4.0 ohms.*

---

*Current Limiting Resistance represents the series resistor and the internal resistance of the regulated supply, the fixed resistance value may vary.

3) The wattage rating of the resistor is calculated from the equation Watts = I^2R. Thus, $(1.12)^2 \times 4.0 = 5$ watts. A 7 or 8 watt resistor may be used in this application, providing a safety factor.

4) Because of the numerous methods and circuits possible for obtaining a regulated voltage source, its design is not discussed here. Circuits can be found in electronics handbooks and application notes of many electronic component manufacturers.

A circuit which meets the requirements of this example is shown in Figure 13 (A). A tapered charging current is supplied to the battery through the series current limiting resistor R_4 as battery voltage increases with charge. The performance of the circuit of Figure 13(A) may vary with the components used. Often the replacement transistors, for example the SK3009 replacement for 2N1304, may require reduction in value of R_3 for proper circuit operation.

To determine the value of the series limiting resistor (R_4) and for initial circuit adjustment, place a voltmeter, 10,000 ohms or greater/volt, across R_3 (no battery connected) and adjust R_3 to obtain indicated source voltage limit, Table K, page 353. Connect voltage source equivalent to 1.3 volts/cell for battery to be charged and select R_4 to limit charge current to recommended values shown in Table K.

The battery should be disconnected from the charger when the charge circuit is not energized to prevent discharge through resistance R_3.

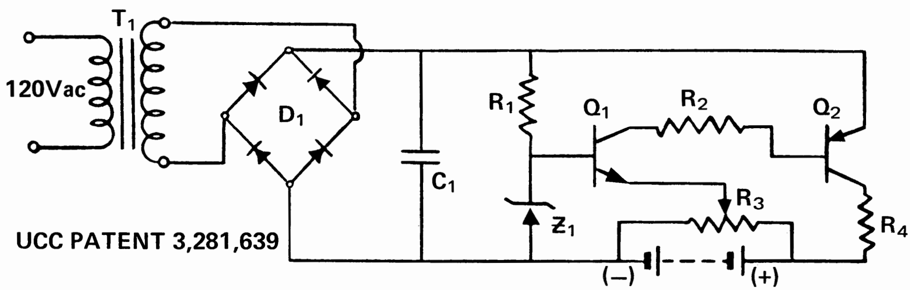
The suggested linear taper current for the #561 battery and actual current character obtained with the circuit of Figure 13 (A) are shown in Figure 13 (B). The current character can be tailored by selection of components. Curves shown were obtained with use of component values shown in Figure 13 (A).

The permissible deviation of charge current from the indicated suggested linear taper varies somewhat with application and usage pattern. Where application requires repetitive discharge to rated capacity the charge current values should fall within shaded area of Figure 14 (A) with charge time adjustment for circuit tolerance should operation fall in "minimum" area relative to linear character.

Figure 14(B) shows the battery voltage and charge current for a typical 16 hour charge period at about mid-cycle life of the 561 battery. The area under the charge current curve is the amount of charge in ampere hours. In this example it is approximately 6 ampere hours.

In some applications where extended cycle life and improved battery performances are desired, only a portion of the rated battery capacity is used. In these cases the regulated voltage source can be designed for a somewhat lower value or the current limiting resistance can be greater to decrease the rate of charge returned to the battery in a given charge period. A voltage limit between 1.6 and 1.7 volts per cell is recommended with current limiting resistance values between one and two times the recommended design values of Table H.

NOTE: For further details on charging theory and experimental type circuits refer to pages 801-816.



T_1	STANCOR RT 201 (INPUT ac TO TERMINALS 1 AND 7; CONNECT TERMINALS 3 AND 6) (SECONDARY CONNECTIONS TO BRIDGE— 8 AND 11; CONNECT TERMINALS 9 AND 10)
D_1	2A50 SOLITRON DEVICES, INC. (OR EQUIVALENT)
C_1	500 MICROFARADS 50V dc.
Z_1	¼ M12 Z (MOTOROLA) IN 963B TI OR INT. REC.
Q_1	2N1304 RCA, TI OR EQUIVALENT
Q_2	2N1557 MOTOROLA, 2N514 TI
R_1	4700 OHM ½ WATT
R_2	390 OHM ½ WATT
R_3	1,000 OHMS 1 WATT
R_4	4 OHMS 10 WATT

FIGURE 13(A)

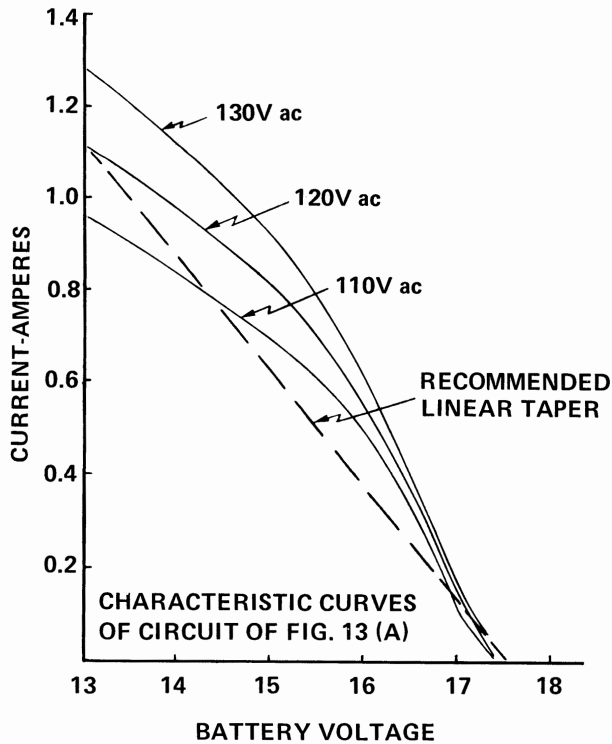
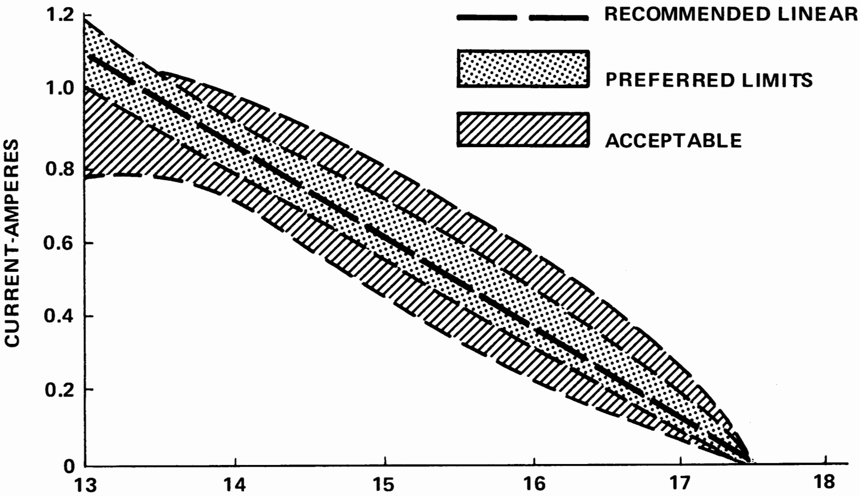
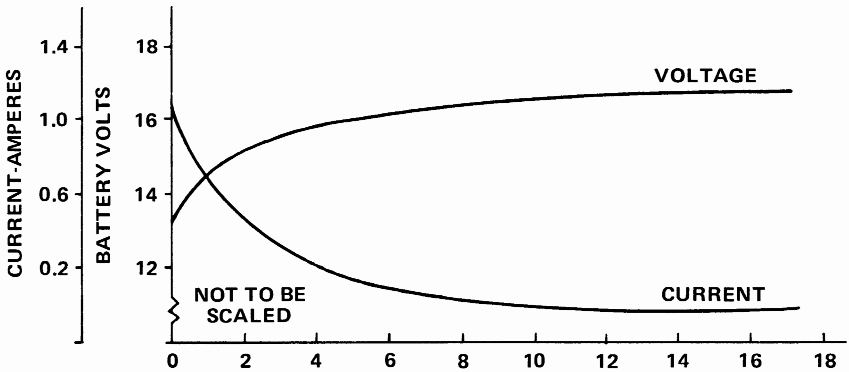


FIGURE 13(B)



BATTERY VOLTAGE
CHARGE CURRENT VALUE
FOR No. 561 BATTERY

FIGURE 14(A)

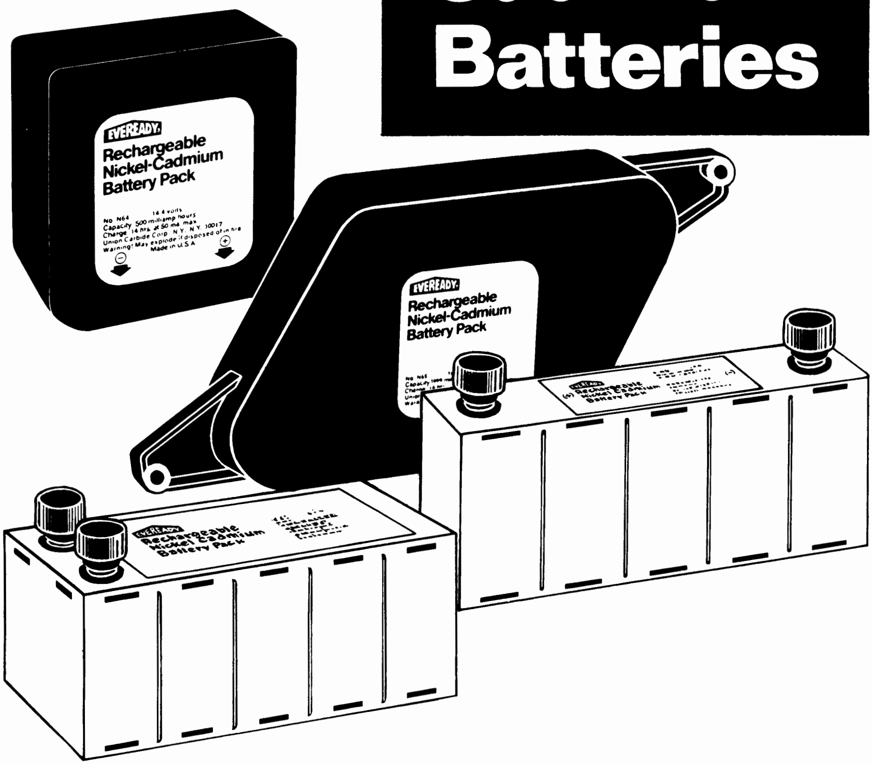


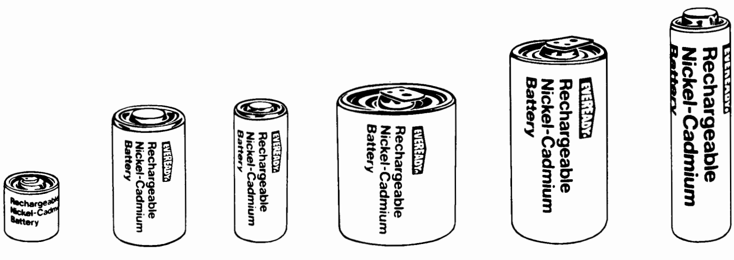
CHARGE TIME IN HOURS

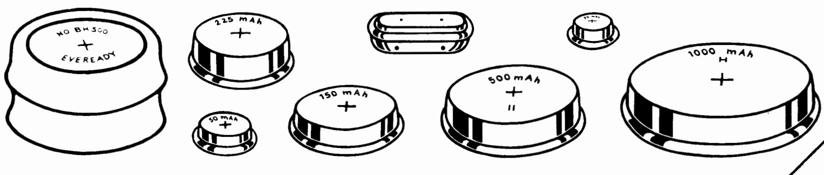
VOLTAGE-CURRENT CHARACTER
561 BATTERY ABOUT MID CYCLE
LIFE USING VLTC CHARGE

FIGURE 14(B)

Nickel Cadmium Batteries







NOTE: "Eveready" nickel-cadmium cell numbers are determined as follows:

PREFIX (First letter)

Prefix	Indicates
B	Button cell (standard rate)
C	Cylindrical cell
OB	Oval button cell (standard rate)

PREFIX (Second letter)

When a second letter is used:

H	Indicates high discharge rate cell
F	Indicates fast charge, high discharge rate cell

NUMERALS

Numerals after the prefix letters indicate:

Milliampere-hour capacity: Up through 999 mAh

Ampere-hour capacity: 1 Ah and up

SUFFIX

Suffix	Indicates
T	Solder tab terminals

For example:

BH500T (cell number)

Solder tabs

Milliampere-hour capacity

High rate

Button

NICKEL-CADMIUM BATTERIES

The nickel-cadmium battery is a remarkable device. More than fifty years of successful use has proved this point. Nickel-cadmium batteries may be recharged many times and have a relatively constant potential during discharge. They will stand more abuse than any other cell, have good low temperature performance characteristics, and are more than competitive with other systems in terms of cost per hour of use. They are true storage batteries using one of the very best electrochemical systems.

"Eveready" Sealed Nickel-Cadmium Cells

The nickel-cadmium cell has been used in Europe for many years in its original form, as a vented or unsealed cell. Technological advances have made possible the extension of the nickel-cadmium system to small hermetically sealed batteries—rechargeable batteries that are free of the usual routine maintenance, such as the addition of water. These developments have brought the economic advantages of rechargeability to small batteries.

"Eveready" sealed nickel-cadmium cells can be recharged many times to give long useful life, and are not adversely affected by standing many months, either charged or discharged.

These high quality batteries use expensive active raw materials and a complicated construction. When used within their recommended ratings, in applications where the use of rechargeable cells is justified, "Eveready" nickel-cadmium cells will provide economical, trouble-free service. New portable devices requiring more energy than is economically available from ordinary primary batteries are now practical with this complete line of rechargeable batteries.

Applications

"Eveready" sealed nickel-cadmium batteries are ideally suited for use in many types of battery-operated equipment. Some of the many applications are listed here:

- TRANSCEIVERS
- CALCULATORS
- HEDGE CLIPPERS
- GRASS SHEARS
- ELECTRIC TOOTHBRUSH
- ELECTRIC KNIFE
- ELECTRONIC PHOTOFLASH
- DICTATING MACHINES
- ELECTRIC SHAVERS
- TAPE RECORDERS
- INSTRUMENTS
- ALARM SYSTEMS
- TRANSMITTERS
- RECEIVERS
- MOVIE CAMERAS
- EMERGENCY LIGHTING
- HEARING AIDS
- AMPLIFIERS
- TELEMETERING
- TOOLS AND APPLIANCES
- GASOLINE ENGINE STARTING
- CASSETTE PLAYERS & RECORDERS
- TOYS

Operation of the Sealed Nickel-Cadmium Battery

Any secondary cell is a combination of active materials which can be electrolytically oxidized and reduced repeatedly. The oxidation of the negative electrode occurring simultaneously with the reduction of the positive generates electric power. In a rechargeable battery both electrode reactions are reversible and the input of current in the proper direction from an outside source will drive the primary or discharge reaction backwards and in effect recharge the electrodes.

In the uncharged condition the positive electrode of a nickel-cadmium cell is nickelous hydroxide, the negative cadmium hydroxide. In the charged condition the positive electrode is nickelic hydroxide, the negative metallic cadmium. The electrolyte is potassium hydroxide. The average operating voltage of the cell under normal discharge conditions is about 1.2 volts. The over-all chemical reaction of the nickel-cadmium system can be considered as:

$$\underset{\text{(Charged)}}{Cd + 2NiOOH + 2H_2O} \quad \overset{KOH}{\rightleftharpoons} \quad \underset{\text{(Discharged)}}{Cd\,(OH)_2 + 2Ni\,(OH)_2}$$

During the latter part of a recommended charge cycle and during overcharge, nickel-cadmium batteries generate gas. Oxygen is generated at the positive (nickel) electrode after it becomes fully charged and hydrogen is formed at the negative (cadmium) electrode when it reaches full charge.

These gases must be vented from the conventional nickel-cadmium system. In order for the system to be overchargeable while sealed, the evolution of hydrogen must be prevented and provision made for the reaction of oxygen within the cell container. These things are accomplished by the following:

1. The battery is constructed with excess capacity in the cadmium electrode.
2. Starting with both electrodes fully discharged, charging the battery causes the positive electrode to reach full charge first and it starts oxygen generation. Since the negative (cadmium) electrode has not reached full charge hydrogen will not be generated.
3. The cell is designed so that the oxygen formed in the positive can reach the metallic cadmium surface of the negative electrode which it oxidizes directly.
4. Thus, in overcharge, the cadmium electrode is oxidized at a rate just sufficient to offset input energy, keeping the cell in equalibrium indefinitely. At this point of equilibrium the positive electrode is fully charged and the negative is somewhat less than fully charged.

Polarity Reversal:

When cells are connected in series and discharged completely, small cell capacity differences will cause one cell to reach complete discharge sooner than the remainder. The cell which reaches full discharge first will be driven into reverse by the others. When this happens in an ordinary nickel-cadmium sealed cell, oxygen will be evolved at the cadmium electrode and hydrogen at the nickel electrode. Gas pressure will increase as long as current is driven through the cell and eventually it will either vent or burst. This condition is prevented in some sealed nickel-cadmium cells by special construction features. These include the use of a reducible material in the positive in addition to the nickel hydroxide, to suppress hydrogen evolution when the positive expires. If cadmium oxide is used it is possible to prevent hydrogen formation and to react the oxygen formed at the negative by the same basic process used to regulate pressure during overcharge.

A cell is considered electrochemically protected against reversal of polarity if, after discharge at the 10 hour rate down to 1.1 volts, it may receive an additional 5 hour discharge with the same current without being damaged or otherwise affected. This protection applies to all "Eveready" button nickel-cadmium cells except No. B20. "Eveready" cylindrical cells are protected against cell rupture, caused by gassing generated during polarity reversal, by a pressure relief vent. A discussion regarding venting mechanisms is on page 383.

"Eveready" Sealed Nickel-Cadmium Rechargeable Batteries

"Eveready" nickel-cadmium cells are available in two basic configurations—button and cylindrical. The range capacities for each type is as follows:

BUTTON: 20 mAh – 1 Ah

CYLINDRICAL: 150 mAh – 4 Ah

Electrical and physical characteristics of button and cylindrical nickel-cadmium cells and batteries that comprise the basic "Eveready" line are listed in Tables L and M All of these cells may, of course, be assembled in series to make up batteries of various voltages. Tables L and M show the electrical and physical characteristics of 159 cells and batteries. The items are arranged in ascending voltage categories varing from 1.2 to 14.4 volts. Within any voltage category, batteries are arranged in ascending order of capacity.

TABLE L

NICKEL-CADMIUM CELL AND BATTERY ELECTRICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Voltage	Capacity (1 Hour Rate)	Current Discharge (1 Hour Rate)	Capacity (10 Hour Rate)	Current Discharge (10 Hour Rate)	Charge For 4 Hours At (See Footnote)	Charge For 14 Hours At (Do Not Exceed)	Charging Voltage	Cutoff Voltage (1 Hour Rate)	Cutoff Voltage (10 Hour Rate)
1.2 VOLTS										
B20	1.2			20mAh	2mA		2mA	1.35-1.5		1.1
B20T	1.2			20mAh	2mA		2mA	1.35-1.5		1.1
B50	1.2			50mAh	5mA		5mA	1.35-1.5		1.1
B50T	1.2			50mAh	5mA		5mA	1.35-1.5		1.1
OB90	1.2			90mAh	9mA		9mA	1.35-1.5		1.1
OB90T	1.2			90mAh	9mA		9mA	1.35-1.5		1.1
B150	1.2			150mAh	15mA		15mA	1.35-1.5		1.1
B150T	1.2			150mAh	15mA		15mA	1.35-1.5		1.1
CF150	1.2	150mAh	150mA			50mA		1.5-1.6	1.0	
CF150T	1.2	150mAh	150mA			50mA		1.5-1.6	1.0	
CH150	1.2	150mAh	150mA				15mA	1.35-1.45	1.0	
CH150T	1.2	150mAh	150mA				15mA	1.35-1.45	1.0	
HS4133	1.2	150mAh	150mA				15mA	1.35-1.45	1.0	
B225	1.2			225mAh	22mA		22mA	1.35-1.5		1.1
B225T	1.2			225mAh	22mA		22mA	1.35-1.5		1.1
BH225	1.2			225mAh	22mA		22mA	1.35-1.45		1.1
BH225T	1.2			225mAh	22mA		22mA	1.35-1.45		1.1
CF225	1.2	225mAh	225mA			75mA		1.5-1.6	1.0	
CF225T	1.2	225mAh	225mA			75mA		1.5-1.6	1.0	
CH225	1.2	225mAh	225mA				22mA	1.35-1.45	1.0	
CH225T	1.2	225mAh	225mA				22mA	1.35-1.45	1.0	
CF450	1.2	450mAh	450mA			150mA		1.5-1.6	1.0	
CF450T	1.2	450mAh	450mA			150mA		1.5-1.6	1.0	
CH450	1.2	450mAh	450mA				45mA	1.35-1.45	1.0	
CH450T	1.2	450mAh	450mA				45mA	1.35-1.45	1.0	
BH500	1.2			500mAh	50mA		50mA	1.35-1.45		1.1
BH500T	1.2			500mAh	50mA		50mA	1.35-1.45		1.1
CF500	1.2	500mAh	500mA			175mA		1.5-1.6	1.0	
CF500T	1.2	500mAh	500mA			175mA		1.5-1.6	1.0	
CH500	1.2	500mAh	500mA				50mA	1.35-1.45	1.0	
CH500T	1.2	500mAh	500mA				50mA	1.35-1.45	1.0	
BH1	1.2			1Ah	100mA		100mA	1.35-1.45		1.1
BH1T	1.2			1Ah	100mA		100mA	1.35-1.45		1.1

TABLE M
NICKEL-CADMIUM CELL AND BATTERY PHYSICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Type	Maximum Dimensions								Weight	
		Diameter		Length		Width		Height			
		Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Ounces	Grams
				1.2 VOLTS							
B20	Button Cell-Flat Contacts	.457	11.6					.213	5.41	.04	1.13
B20T	Button Cell- Two Solder Tabs	.457	11.6					.223	5.66	.04	1.13
B50	Button Cell-Flat Contacts	.610	15.5					.235	5.97	.12	3.4
B50T	Button Cell-Two Solder Tabs	.610	15.5					.245	6.22	.12	3.4
OB90	Oval Button Cell-Flat Contacts			1.012	25.7	.559	14.2	.236	5.99	.2	5.7
OB90T	Oval Button Cell-Two Solder Tabs			1.012	25.7	.559	14.2	.246	6.25	.2	5.7
B150	Button Cell-Flat Contacts	.992	25.2					.272	6.91	.4	11.3
B150T	Button Cell-Two Solder Tabs	.992	25.2					.284	7.21	.4	11.3
CF150	Cylindrical-High Rate, Fast Charge-Flat Contacts	.475	12.1					1.139	28.9	.4	11.3
CF150T	Cylindrical-High Rate Fast Charge-Two Solder Tabs	.475	12.1					1.151	29.2	.4	11.3
CH150	Cylindircal- High Rate-Flat Contacts	.475	12.1					1.139	28.9	.4	11.3
CH150T	Cylindrical-High Rate—Two Solder Tabs	.475	12.1					1.151	29.2	.4	11.3
HS4133	Cylindrical-High Rate-One Flat Contact-One Conical Projection	.470	11.9					1.228	31.2	.3	8.5
B225	Button Cell-Flat Contacts	.992	25.2					.351	8.92	.45	12.8
B225T	Button Cell-Two Solder Tabs	.992	25.2					.363	9.22	.45	12.8
BH225	Button Cell (Double Plate-High Rate) Flat Contacts	.992	25.2					.358	9.09	.47	13.3
BH225T	Button Cell (Double Plate-High Rate) Two Solder Tabs	.992	25.2					.370	9.4	.47	13.3
CF225	Cylindrical-High Rate Fast Charge-Flat Contacts	.675	17.2					.646	16.4	.4	11.3
CF225T	Cylindrical-High Rate-Fast Charge-Two Solder Tabs	.675	17.2					.658	16.7	.4	11.3
CH225	Cylindrical-High Rate-Flat Contacts	.675	17.2					.646	16.4	.4	11.3
CH225T	Cylindrical-High Rate-Two Solder Tabs	.675	17.2					.658	16.7	.4	11.3
CF450	Cylindrical-High Rate-Fast Charge-Flat Contacts	.675	17.2					1.116	28.4	.71	20.1
CF450T	Cylindrical-High Rate-Fast Charge-Two Solder Tabs	.675	17.2					1.128	28.7	.71	20.1
CH450	Cylindrical-High Rate-Flat Contacts	.675	17.2					1.116	28.4	.71	20.1
CH450T	Cylindrical-High Rate-Two Solder Tabs	.675	17.2					1.128	28.7	.71	20.1
BH500	Button Cell (Double Plate-High Rate) Flat Contacts	1.360	34.5					.394	10	1	28.4
BH500T	Button Cell (Double Plate-High Rate) With Two Solder Tabs	1.360	34.5					.406	10.3	1	28.4
CF500	Cylindrical-High Rate-Fast Charge-Flat Contacts	.553	14.1					1.969	50	.8	22.7
CF500T	Cylindrical-High Rate-Fast Charge-Two Solder Tabs	.553	14.1					1.981	50.3	.8	22.7
CH500	Cylindrical-High Rate-"AA" Size Cell-Flat Contacts	.553	14.1					1.969	50	.8	22.7
CH500T	Cylindrical-High Rate-"AA" Size Cell- Two Solder Tabs	.553	14.1					1.981	50.3	.8	22.7
BH1	Button Cell (Double Plate-High Rate) Flat Contacts	1.980	50.3					.394	10	2	56.7
BH1T	Button Cell (Double Plate-High Rate) With Two Solder Tabs	1.980	50.3					.406	10.3	2	56.7

TABLE L (cont.)

NICKEL-CADMIUM CELL AND BATTERY ELECTRICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Voltage	Capacity (1 Hour Rate)	Current Discharge (1 Hour Rate)	Capacity (10 Hour Rate)	Current Discharge (10 Hour Rate)	Charge For 4 Hours At (See Footnote)	Charge For 14 Hours At (Do Not Exceed)	Charging Voltage	Cutoff Voltage (1 Hour Rate)	Cutoff Voltage (10 Hour Rate)
1.2 VOLTS (cont.)										
CF1	1.2	1Ah	1A			350mA		1.5-1.6	1.0	
CF1T	1.2	1Ah	1A			350mA		1.5-1.6	1.0	
CH1	1.2	1Ah	1A				100mA	1.35-1.45	1.0	
CH1T	1.2	1Ah	1A				100mA	1.35-1.45	1.0	
CF1.2	1.2	1.2Ah	1.2A			420mA		1.5-1.6	1.0	
CF1.2T	1.2	1.2Ah	1.2A			420mA		1.5-1.6	1.0	
CH1.2	1.2	1.2Ah	1.2A				120mA	1.35-1.45	1.0	
CH1.2T	1.2	1.2Ah	1.2A				120mA	1.35-1.45	1.0	
CH1.2/C	1.2	1.2Ah	1.2A				120mA	1.35-1.45	1.0	
CH1.2/D	1.2	1.2Ah	1.2A				120mA	1.35-1.45	1.0	
CH1.5	1.2	1.5Ah	1.5A				150mA	1.35-1.45	1.0	
CH1.5T	1.2	1.5Ah	1.5A				150mA	1.35-1.45	1.0	
CH1.8	1.2			1.8Ah	180mA		180mA	1.35-1.45		1.1
CH1.8T	1.2			1.8Ah	180mA		180mA	1.35-1.45		1.1
CH2.2	1.2			2.2Ah	220mA		220mA	1.35-1.45		1.1
CH2.2T	1.2			2.2Ah	220mA		220mA	1.35-1.45		1.1
CF4	1.2	4Ah	4A			1.4A		1.5-1.6	1.0	
CF4T	1.2	4Ah	4A			1.4A		1.5-1.6	1.0	
CH4	1.2	4Ah	4A				400mA	1.35-1.45	1.0	
CH4T	1.2	4Ah	4A				400mA	1.35-1.45	1.0	
2.4 VOLTS										
2/B150	2.4			150mAh	15mA		15mA	2.7-3		2.2
2/B150T	2.4			150mAh	15mA		15mA	2.7-3		2.2
2/B225	2.4			225mAh	22mA		22mA	2.7-3		2.2
2/B225T	2.4			225mAh	22mA		22mA	2.7-3		2.2
2/BH225	2.4			225mAh	22mA		22mA	2.7-2.9		2.2
2/BH225T	2.4			225mAh	22mA		22mA	2.7-2.9		2.2
2/BH500	2.4			500mAh	50mA		50mA	2.7-2.9		2.2

TABLE M (cont.)

NICKEL-CADMIUM CELL AND BATTERY PHYSICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Type	Maximum Dimensions								Weight	
		Diameter		Length		Width		Height			
		Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Ounces	Grams
1.2 VOLTS (cont.)											
CF1	Cylindrical Cell-High Rate-Fast Charge-Flat Contacts	1.043	26.5					1.161	29.5	1.8	51
CF1T	Cylindrical Cell- High Rate-Fast Charge-Two Solder Tabs	1.043	26.5					1.175	29.9	1.8	51
CH1	Cylindrical-High Rate-Flat Contacts	1.043	26.5					1.161	29.5	1.8	51
CH1T	Cylindrical-High Rate-Two Solder Tabs	1.043	26.5					1.175	29.9	1.8	51
CF1.2	Cylindrical-High Rate-Fast Charge-Flat Contacts	.900	22.9					1.679	42.7	1.9	53.9
CF1.2T	Cylindrical-High Rate-Fast Charge-Two Solder Tabs	.900	22.9					1.695	43.1	1.9	53.9
CH1.2	Cylindrical-High Rate-"Sub C" Size-Flat Contacts	.900	22.9					1.679	42.7	1.9	53.9
CH1.2T	Cylindrical-High Rate-"Sub C" Size-Two Solder Tabs	.900	22.9					1.695	43.1	1.9	53.9
CH1.2/C	Cylindrical-High Rate-"Sub C" Cell In "C" Size Container-Flat Contacts	1-1/32	26.2					1-31/32	50	1.95	55.2
CH1.2/D	Cylindrical—High Rate-"Sub C" Cell in "D" Size Container-Flat Contacts	1-11/32	34.1					2-27/64	61.5	2.2	62.5
CH1.5	Cylindrical-High Rate-"Sub C" Size-Flat Contacts	.900	22.9					1.679	42.7	1.94	55
CH1.5T	Cylindrical-High Rate-"Sub C" Size-Two Solder Tabs	.900	22.9					1.695	43.1	1.94	55
CH1.8	Cylindrical-High Rate-"C" Size-Flat Contacts	1.031	26.2					1.969	50	2.3	65.2
CH1.8T	Cylindrical-High Rate-"C" Size-Two Solder Tabs	1.031	26.2					1.989	50.5	2.3	65.2
CH2.2	Cylindrical-High Rate-"Short D" Size-Flat Contacts	1.344	34.1					1.508	38.3	3.2	90.7
CH2.2T	Cylindrical-High Rate-"Short D" Size-Two Solder Tabs	1.344	34.1					1.528	38.8	3.2	90.7
CF4	Cylindrical-High Rate-Fast Charge-"D" Size-Flat Contacts	1.305	33.2					2.310	58.7	5.4	153
CF4T	Cylindrical-High Rate-Fast Charge-"D" Size-Two Solder Tabs	1.305	33.2					2.330	59.2	5.4	153
CH4	Cylindrical-High Rate-"D" Size-Flat Contacts	1.305	33.2					2.310	58.7	5.4	153
CH4T	Cylindrical-High Rate-"D"Size-Two Solder Tabs	1.305	33.2					2.330	59.2	5.4	153
2.4 VOLTS											
2/B150	Two Button Cells in series-Flat Contacts	1-1/16	27					37/64	14.7	.9	25.5
2/B150T	Two Button Cells in series-Two Solder Tabs	1-1/16	27					37/64	14.7	.9	25.5
2/B225	Two Button Cells in series-Flat Contacts	1-1/16	27					47/64	18.7	1	28.4
2/B225T	Two Button Cells in series-Two Solder Tabs	1-1/16	27					47/64	18.7	1	28.4
2/BH225	Two High Rate Button Cells in series-Flat Contacts	1-1/16	27					3/4	19.1	1	28.4
2/BH225T	Two High Rate Button Cells in series-Two Solder Tabs	1-1/16	27					3/4	19.1	1	28.4
2/BH500	Two High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					13/16	20.6	2.2	62.4

TABLE L (cont.)

NICKEL-CADMIUM CELL AND BATTERY ELECTRICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Voltage	Capacity (1 Hour Rate)	Current Discharge (1 Hour Rate)	Capacity (10 Hour Rate)	Current Discharge (10 Hour Rate)	Charge For 4 Hours At (See Footnote)	Charge For 14 Hours At (Do Not Exceed)	Charging Voltage	Cutoff Voltage (1 Hour Rate)	Cutoff Voltage (10 Hour Rate)
2.4 VOLTS (cont.)										
2/BH500T	2.4			500mAh	50mA		50mA	2.7-2.9		2.2
2/BH1	2.4			1Ah	100mA		100mA	2.7-2.9		2.2
2/BH1T	2.4			1AH	100mA		100mA	2.7-2.9		2.2
3.6 VOLTS										
3/B150	3.6			150mAh	15mA		15mA	4.05-4.5		3.3
3/B150T	3.6			150mAh	15mA		15mA	4.05-4.5		3.3
3/B225	3.6			225mAh	22mA		22mA	4.05-4.5		3.3
3/B225T	3.6			225mAh	22mA		22mA	4.05-4.5		3.3
3/BH225	3.6			225mAh	22mA		22mA	4.05-4.35		3.3
3/BH225T	3.6			225mAh	22mA		22mA	4.05-4.35		3.3
3/BH500	3.6			500mAh	50mA		50mA	4.05-4.35		3.3
3/BH500T	3.6			500mAh	50mA		50mA	4.05-4.35		3.3
3/BH1	3.6			1Ah	100mA		100mA	4.05-4.35		3.3
3/BH1T	3.6			1Ah	100mA		100mA	4.05-4.35		3.3
4.8 VOLTS										
4/B150	4.8			150mAh	15mA		15mA	5.4-6		4.4
4/B150T	4.8			150mAh	15mA		15mA	5.4-6		4.4
4/B225	4.8			225mAh	22mA		22mA	5.4-6		4.4
4/B225T	4.8			225mAh	22mA		22mA	5.4-6		4.4
4/BH225	4.8			225mAh	22mA		22mA	5.4-5.8		4.4
4/BH225T	4.8			225mAh	22mA		22mA	5.4-5.8		4.4
4/BH500	4.8			500mAh	50mA		50mA	5.4-5.8		4.4
4/BH500T	4.8			500mAh	50mA		50mA	5.4-5.8		4.4
4/BH1	4.8			1Ah	100mA		100mA	5.4-5.8		4.4
4/BH1T	4.8			1Ah	100mA		100mA	5.4-5.8		4.4
6 VOLTS										
5/B150	6			150mAh	15mA		15mA	6.75-7.5		5.5
5/B150T	6			150mAh	15mA		15mA	6.75-7.5		5.5
5/B225	6			225mAh	22mA		22mA	6.75-7.5		5.5
5/B225T	6			225mAh	22mA		22mA	6.75-7.5		5.5

TABLE M (cont.)

NICKEL-CADMIUM CELL AND BATTERY PHYSICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Type	Maximum Dimensions								Weight	
		Diameter		Length		Width		Height			
		Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Ounces	Grams
2.4 VOLTS (cont.)											
2/BH500T	Two High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					13/16	20.6	2.2	62.4
2/BH1	Two High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					13/16	20.6	4	113
2/BH1T	Two High Rate Button Cells in Series-Two Solder Tabs	2-1/16	52.4					13/16	20.6	4	113
3.6 VOLTS											
3/B150	Three Button Cells in Series-Flat Contacts	1-1/16	27					27/32	21.4	1.3	36.9
3/B150T	Three Button Cells In Series-Two Solder Tabs	1-1/16	27					27/32	21.4	1.3	36.9
3/B225	Three Button Cells in Series-Flat Contacts	1-1/16	27					1-5/64	27.4	1.4	39.7
3/B225T	Three Button Cells in Series-Two Solder Tabs	1-1/16	27					1-5/64	27.4	1.4	39.7
3/BH225	Three High Rate Button Cells in Series-Flat Contacts	1-1/16	27					1-7/64	28.2	1.5	42.5
3/BH225T	Three High Rate Button Cells in Series-Two Solder Tabs	1-1/16	27					1-7/64	28.2	1.5	42.5
3/BH500	Three High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					1-7/32	31	3.2	90.7
3/BH500T	Three High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					1-7/32	31	3.2	90.7
3/BH1	Three High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					1-7/32	31	6.2	176
3/BH1T	Three High Rate Button Cells in Series-Two Solder Tabs	2-1/16	52.4					1-7/32	31	6.2	176
4.8 VOLTS											
4/B150	Four Button Cells in Series-Flat Contacts	1-1/16	27					1-1/8	28.6	1.7	48.2
4/B150T	Four Button Cells in Series-Two Solder Tabs	1-1/16	27					1-1/8	28.6	1.7	48.2
4/B225	Four Button Cells in Series-Flat Contacts	1-1/16	27					1-7/16	36.5	1.8	51
4/B225T	Four Button Cells in Series-Two Solder Tabs	1-1/16	27					1-7/16	36.5	1.8	51
4/BH225	Four High Rate Button Cells in Series-Flat Contacts	1-1/16	27					1-15/32	37.3	1.9	53.9
4/BH225T	Four High Rate Button Cells in Series-Two Solder Tabs	1-1/16	27					1-15/32	37.3	1.9	53.9
4/BH500	Four High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					1-39/64	40.9	4.1	116
4/BH500T	Four High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					1-39/64	40.9	4.1	116
4/BH1	Four High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					1-39/64	40.9	8.2	233
4/BH1T	Four High Rate Button Cells in Series- Two Solder Tabs	2-1/16	52.4					1-39/64	40.9	8.2	233
6 VOLTS											
5/B150	Five Button Cells in Series-Flat Contacts	1-1/16	27					1-13/32	35.7	2.1	59.5
5/B150T	Five Button Cells in Series-Two Solder Tabs	1-1/16	27					1-13/32	35.7	2.1	59.5
5/B225	Five Button Cells in Series-Flat Contacts	1-1/16	27					1-51/64	45.6	2.2	62.4
5/B225T	Five Button Cells in Series-Two Solder Tabs	1-1/16	27					1-51/64	45.6	2.2	62.4

TABLE L (cont.)

NICKEL-CADMIUM CELL AND BATTERY ELECTRICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Voltage	Capacity (1 Hour Rate)	Current Discharge (1 Hour Rate)	Capacity (10 Hour Rate)	Current Discharge (10 Hour Rate)	Charge For 4 Hours At (See Footnote)	Charge For 14 Hours At (Do Not Exceed)	Charging Voltage	Cutoff Voltage (1 Hour Rate)	Cutoff Voltage (10 Hour Rate)
6 VOLTS (cont.)										
5/BH225	6			225mAh	22mA		22mA	6.75-7.25		5.5
5/BH225T	6			225mAh	22mA		22mA	6.75-7.25		5.5
5/BH500	6			500mAh	50mA		50mA	6.75-7.25		5.5
5/BH500T	6			500mAh	50mA		50mA	6.75-7.25		5.5
HS4172	6	500mAh	500mA				50mA	6.75-7.25		
N67	6			900mAh	90mA		90mA	6.75-7.5		5.5
5/BH1	6			1Ah	100mA		100mA	6.75-7.25		5.5
5/BH1T	6			1Ah	100mA		100mA	6.75-7.25		5.5
N91	6	1.2Ah	1.2A				120mA	6.75-7.25	5	
N70	6			1.5Ah	150mA		150mA	6.75-7.5		5.5
7.2 VOLTS										
6/B150	7.2			150mAh	15mA		15mA	8.1-9		6.6
6/B150T	7.2			150mAh	15mA		15mA	8.1-9		6.6
6/B225	7.2			225mAh	22mA		22mA	8.1-9		6.6
6/B225T	7.2			225mAh	22mA		22mA	8.1-9		6.6
6/BH225	7.2			225mAh	22mA		22mA	8.1-8.7		6.6
6/BH225T	7.2			225mAh	22mA		22mA	8.1-8.7		6.6
6/BH500	7.2			500mAh	50mA		50mA	8.1-8.7		6.6
6/BH500T	7.2			500mAh	50mA		50mA	8.1-8.7		6.6
6/BH1	7.2			1Ah	100mA		100mA	8.1-8.7		6.6
6/BH1T	7.2			1Ah	100mA		100mA	8.1-8.7		6.6
8.4 VOLTS										
N88	8.4			90mAh	9mA		9mA	9.45-10.5		7.7
7/B150	8.4			150mAh	15mA		15mA	9.45-10.5		7.7
7/B150T	8.4			150mAh	15mA		15mA	9.45-10.5		7.7
7/B225	8.4			225mAh	22mA		22mA	9.45-10.5		7.7
7/B225T	8.4			225mAh	22mA		22mA	9.45-10.5		7.7
7/BH225	8.4			225mAh	22mA		22mA	9.45-10.15		7.7
7/BH225T	8.4			225mAh	22mA		22mA	9.45-10.15		7.7
7/BH500	8.4			500mAh	50mA		50mA	9.45-10.15		7.7
7/BH500T	8.4			500mAh	50mA		50mA	9.45-10.15		7.7
7/BH1	8.4			1Ah	100mA		100mA	9.45-10.15		7.7
7/BH1T	8.4			1Ah	100mA		100mA	9.45-10.15		7.7

TABLE M (cont.)

NICKEL-CADMIUM CELL AND BATTERY PHYSICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Type	Maximum Dimensions: Diameter		Length		Width		Height		Weight	
		Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Ounces	Grams
6 VOLTS (cont.)											
5/BH225	Five High Rate Button Cells in Series-Flat Contacts	1-1/16	27					1-53/64	46.4	2.4	68
5/BH225T	Five High Rate Button Cells in Series-Two Solder Tabs	1-1/16	27					1-53/64	46.4	2.4	68
5/BH500	Five High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					2-1/64	51.2	5	142
5/BH500T	Five High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					2-1/64	51.2	5	142
HS4172	Five CH500 High Rate Cells in Series-Solder Tabs			1.6	40.6	1.346	34.2	2	50.8	3.9	111
N67	Five C900 Cylindrical Cells in Plastic Case-Wire Leads			1-17/32	38.9	1-17/32	38.9	3-53/64	97.2	8.3	235
5/BH1	Five High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					2-1/64	51.2	10.5	298
5/BH1T	Five High Rate Button Cells in Series-Two Solder Tabs	2-1/16	52.4					2-1/64	51.2	10.5	298
N91	Five CH1.2 High Rate Cells in Series-Screw Terminals-Plastic Nuts-Plastic Case			5-1/32	128	1-1/32	26.2	2-31/64	63.1	10	284
N70	Five Rectangular Pocket Plate Cells in Series-Plastic Case-Wire Leads			3-7/8	98.4	1-9/16	39.7	4-1/32	102	1 lb. 12 oz.	794
7.2 VOLTS											
6/B150	Six Button Cells in Series-Flat Contacts	1-1/16	27					1-11/16	42.9	2.5	70.9
6/B150T	Six Button Cells in Series-Two Solder Tabs	1-1/16	27					1-11/16	42.9	2.5	70.9
6/B225	Six Button Cells in Series-Flat Contacts	1-1/16	27					2-5/32	54.8	2.8	79.4
6/B225T	Six Button Cells in Series-Two Solder Tabs	1-1/16	27					2-5/32	54.8	2.8	79.4
6/BH225	Six High Rate Button Cells in Series-Flat Contacts	1-1/16	27					2-13/64	56	3	85.1
6/BH225T	Six High Rate Button Cells in Series-Two Solder Tabs	1-1/16	27					2-13/64	56	3	85.1
6/BH500	Six High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					2-13/32	61.1	6	170
6/BH500T	Six High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					2-13/32	61.1	6	170
6/BH1	Six High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					2-13/32	61.1	12.5	354
6/BH1T	Six High Rate Button Cells in Series-Two Solder Tabs	2-1/16	52.4					2-13/32	61.1	12.5	354
8.4 VOLTS											
N88	Seven OB90 Cells in Series-Snap Fasteners			1-3/64	26.6	39/64	15.5	1-15/16	49.2	1.5	42.5
7/B150	Seven Button Cells in Series-Flat Contacts	1-1/16	27					1-61/64	49.6	2.9	82.2
7/B150T	Seven Button Cells in Series-Two Solder Tabs	1-1/16	27					1-61/64	49.6	2.9	82.2
7/B225	Seven Button Cells in Series-Flat Contacts	1-1/16	27					2-33/64	63.9	3.2	90.7
7/B225T	Seven Button Cells in Series-Two Solder Tabs	1-1/16	27					2-33/64	63.9	3.2	90.7
7/BH225	Seven High Rate Button Cells in Series-Flat Contacts	1-1/16	27					2-9/16	65.1	3.4	96.4
7/BH225T	Seven High Rate Button Cells in Series-Two Solder Tabs	1-1/16	27					2-9/16	65.1	3.4	96.4
7/BH500	Seven High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					2-13/16	71.4	7	198
7/BH500T	Seven High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					2-13/16	71.4	7	198
7/BH1	Seven High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					2-13/16	71.4	14.6	414
7/BH1T	Seven High Rate Button Cells in Series-Two Solder Tabs	2-1/16	52.4					2-13/16	71.4	14.6	414

TABLE L (cont.)

NICKEL-CADMIUM CELL AND BATTERY ELECTRICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Voltage	Capacity (1 Hour Rate)	Current Discharge (1 Hour Rate)	Capacity (10 Hour Rate)	Current Discharge (10 Hour Rate)	Charge For 4 Hours At (See Footnote)	Charge For 14 Hours At (Do Not Exceed)	Charging Voltage	Cutoff Voltage (1 Hour Rate)	Cutoff Voltage (10 Hour Rate)
9.6 VOLTS										
8/B150	9.6			150mAh	15mA		15mA	10.8-12		8.8
8/B150T	9.6			150mAh	15mA		15mA	10.8-12		8.8
8/B225	9.6			225mAh	22mA		22mA	10.8-12		8.8
8/B225T	9.6			225mAh	22mA		22mA	10.8-12		8.8
8/BH225	9.6			225mAh	22mA		22mA	10.8-11.6		8.8
8/BH225T	9.6			225mAh	22mA		22mA	10.8-11.6		8.8
8/BH500	9.6			500mAh	50mA		50mA	10.8-11.6		8.8
8/BH500T	9.6			500mAh	50mA		50mA	10.8-11.6		8.8
8/BH1	9.6			1Ah	100mA		100mA	10.8-11.6		8.8
8/BH1T	9.6			1Ah	100mA		100mA	10.8-11.6		8.8
1007	9.6	4Ah	4A				400mA	10.8-11.6	8	
10.8 VOLTS										
9/B150	10.8			150mAh	15mA		15mA	12.15-13.5		9.9
9/B150T	10.8			150mAh	15mA		15mA	12.15-13.5		9.9
9/B225	10.8			225mAh	22mA		22mA	12.15-13.5		9.9
9/B225T	10.8			225mAh	22mA		22mA	12.15-13.5		9.9
9/BH225	10.8			225mAh	22mA		22mA	12.15-13.05		9.9
9/BH225T	10.8			225mAh	22mA		22mA	12.15-13.05		9.9
9/BH500	10.8			500mAh	50mA		50mA	12.15-13.05		9.9
9/BH500T	10.8			500mAh	50mA		50mA	12.15-13.05		9.9
9/BH1	10.8			1Ah	100mA		100mA	12.15-13.05		9.9
9/BH1T	10.8			1Ah	100mA		100mA	12.15-13.05		9.9
12 VOLTS										
10/B150	12			150mAh	15mA		15mA	13.5-15		11
10/B150T	12			150mAh	15mA		15mA	13.5-15		11
10/B225	12			225mAh	22mA		22mA	13.5-15		11
10/B225T	12			225mAh	22mA		22mA	13.5-15		11
10/BH225	12			225mAh	22mA		22mA	13.5-14.5		11
10/BH225T	12			225mAh	22mA		22mA	13.5-14.5		11

TABLE M (cont.)

NICKEL-CADMIUM CELL AND BATTERY PHYSICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Type	Maximum Dimensions								Weight	
		Diameter		Length		Width		Height			
		Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Ounces	Grams
9.6 VOLTS											
8/B150	Eight Button Cells in Series-Flat Contacts	1-1/16	27					2-15/64	56.8	3.3	93.6
8/B150T	Eight Button Cells in Series-Two Solder Tabs	1-1/16	27					2-15/64	56.8	3.3	93.6
8/B225	Eight Button Cells in Series-Flat Contacts	1-1/16	27					2-55/64	72.6	3.6	102
8/B225T	Eight Button Cells in Series-Two Solder Tabs	1-1/16	27					2-55/64	72.6	3.6	102
8/BH225	Eight High Rate Button Cells in Series-Flat Contacts	1-1/16	27					2-59/64	74.2	3.8	108
8/BH225T	Eight High Rate Button Cells in Series-Two Solder Tabs	1-1/16	27					2-59/64	74.2	3.8	108
8/BH500	Eight High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					3-13/64	81.4	8.1	230
8/BH500T	Eight High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					3-13/64	81.4	8.1	230
8/BH1	Eight High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					3-13/64	81.4	16.6	471
8/BH1T	Eight High Rate Button Cells in Series-Two Solder Tabs	2-1/16	52.4					3-13/64	81.4	16.6	471
1007	Power Pack-High Rate-Eight CH4 Cells in Series-Stainless Steel Case-Socket			6-13/32	163	3-7/32	81.8	3-1/8	79.4	3 lbs. 13 oz.	1.73 kilo-grams
10.8 VOLTS											
9/B150	Nine Button Cells in Series-Flat Contacts	1-1/16	27					2-33/64	63.9	3.8	108
9/B150T	Nine Button Cells in Series-Two Solder Tabs	1-1/16	27					2-33/64	63.9	3.8	108
9/B225	Nine Button Cells in Series-Flat Contacts	1-1/16	27					3-7/32	81.8	3.9	111
9/B225T	Nine Button Cells in Series-Two Solder Tabs	1-1/16	27					3-7/32	81.8	3.9	111
9/BH225	Nine High Rate Button Cells in Series-Flat Contacts	1-1/16	27					3-9/32	83.3	4.3	122
9/BH225T	Nine High Rate Button Cells in Series-Two Solder Tabs	1-1/16	27					3-9/32	83.3	4.3	122
9/BH500	Nine High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					3-39/64	91.7	9.2	261
9/BH500T	Nine High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					3-39/64	91.7	9.2	261
9/BH1	Nine High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					3-39/64	91.7	18.5	525
9/BH1T	Nine High Rate Button Cells in Series-Two Solder Tabs	2-1/16	52.4					3-39/64	91.7	18.5	525
12 VOLTS											
10/B150	Ten Button Cells in Series-Flat Contacts	1-1/16	27					2-25/32	70.6	4.2	119
10/B150T	Ten Button Cells in Series-Two Solder Tabs	1-1/16	27					2-25/32	70.6	4.2	119
10/B225	Ten Button Cells in Series-Flat Contacts	1-1/16	27					3-27/64	86.9	4.3	122
10/B225T	Ten Button Cells in Series-Two Solder Tabs	1-1/16	27					3-27/64	86.9	4.3	122
10/BH225	Ten High Rate Button Cells in Series-Flat Contacts	1-1/16	27					3-41/64	92.5	4.7	133
10/BH225T	Ten High Rate Button Cells in Series-Two Solder Tabs	1-1/16	27					3-41/64	92.5	4.7	133

TABLE L (cont.)

NICKEL-CADMIUM CELL AND BATTERY ELECTRICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Voltage	Capacity (1 Hour Rate)	Current Discharge (1 Hour Rate)	Capacity (10 Hour Rate)	Current Discharge (10 Hour Rate)	Charge For 4 Hours At (See Footnote)	Charge For 14 Hours At (Do Not Exceed)	Charging Voltage	Cutoff Voltage (1 Hour Rate)	Cutoff Voltage (10 Hour Rate)
12 VOLTS (cont.)										
10/BH500	12			500mAh	50mA		50mA	13.5-14.5		11
10/BH500T	12			500mAh	50mA		50mA	13.5-14.5		11
HS4151	12	500mAh	500mA			175mA		15-16	10	
HS4153	12	500mAh	500mA				50mA	13.5-14.5	10	
10/BH1	12			1Ah	100mA		100mA	13.5-14.5		11
10/BH1T	12			1Ah	100mA		100mA	13.5-14.5		11
N86	12	1.2Ah	1.2A				120mA	13.5-14.5	10	
13.2 VOLTS										
N65	13.2	1Ah	1A				100mA	14.85-15.95	11	
HS4280	13.2	1Ah	1A				100mA	14.85-15.95	11	
14.4 VOLTS										
HS4130	14.4	225mAh	225mA				22mA	16.2-17.4	12	
HS4080	14.4	225mAh	225mA			75mA		18-19.2	12	
HS4125	14.4	450mAh	450mA				45mA	16.2-17.4	12	
HS4081	14.4	450mAh	450mA			150mA		18-19.2	12	
HS4068	14.4	500mAh	500mA				50mA	16.2-17.4	12	
N64	14.4	500mAh	500mA				50mA	16.2-17.4	12	
HS4073	14.4	4Ah	4A				400mA	16.2-17.4	12	

TABLE M (cont.)

NICKEL-CADMIUM CELL AND BATTERY PHYSICAL CHARACTERISTICS

"Eveready" or "Hercules" Battery Numbers	Type	Maximum Dimensions								Weight	
		Diameter		Length		Width		Height			
		Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Ounces	Grams
12 VOLTS (cont.)											
10/BH500	Ten High Rate Button Cells in Series-Flat Contacts	1-7/16	36.5					4-1/64	102	10.2	289
10/BH500T	Ten High Rate Button Cells in Series-Two Solder Tabs	1-7/16	36.5					4-1/64	102	10.2	289
HS4151	Ten CF500 High Rate Fast Charge Cells in Series-Thermistor Control			2.505	63.6	.650	16.5	5.65	144	8.5	241
HS4153	Ten CH500 High Rate Cells in Series			2.505	63.6	.650	16.5	5.65	144	9	255
10/BH1	Ten High Rate Button Cells in Series-Flat Contacts	2-1/16	52.4					4-1/64	102	20.5	581
10/BH1T	Ten High Rate Button Cells in Series-Two Solder Tabs	2-1/16	52.4					4-1/64	102	20.5	581
N86	Ten CH1.2 High Rate Cells in Series-Plastic Case-Screw Terminals-Plastic Nuts			5-1/32	128	2-1/32	51.6	2-29/64	62.3	1 lb. 4 oz.	567
13.2 VOLTS											
N65	Eleven CH1 High Rate Cells in Series-Plastic Case-Socket			7.32	186	1.46	37.1	3.1	78.7	1 lb. 11 oz.	765
HS4280	Eleven CH1 High Rate Cells in Series-Plastic Case-Socket			7.32	186	1.46	37.1	3.1	78.7	1 lb. 11 oz.	765
14.4 VOLTS											
HS4130	Twelve CH225 High Rate Cells in Series			2.175	55.3	.760	19.3	2.760	70.1	5	142
HS4080	Twelve CF225 High Rate Fast Charge Cells in Series-Thermistor Control			2.175	55.3	.760	19.3	2.760	70.1	5	142
HS4125	Twelve CH450 High Rate in Series			2.175	55.3	1.265	32.1	2.760	70.1	9	255
HS4081	Twelve CF450 High Rate Fast Charge Cells in Series-Thermistor Control			2.175	55.3	1.265	32.1	2.760	70.1	9	255
HS4068	Twelve CH500 High Rate Cells in Series-Plastic Case			2-7/8	73	1-21/64	33.7	2-51/64	71	12	340
N64	Twelve CH500 High Rate Cells in Series-Plastic Case			2-7/8	73	1-21/64	33.7	2-51/64	71	12	340
HS4073	Twelve CH4 High Rate Cells in Series-Socket Terminals-Plastic Case			3-11/32	84.9	2-5/8	66.7	7-63/64	203	4 lb. 13 oz.	2.18 kilo-grams

NOTE: Height of button cell types subject to +.020" (.51mm) per cell maximum temporary increase in dimension due to internal pressure.

If the standard types of "Eveready" batteries listed in the tables do not meet the necessary requirements of an application, contact the nearest Union Carbide Battery Products Division Sales Office advising details of special configurations and voltage desired.

Button Cells

Two cutaway views of a standard rate button cell are shown in Figure 15. A cross section of a double plate molded electrode high rate button cell is illustrated in Figure 16. Specifications for all button cells are listed in Tables L and M.

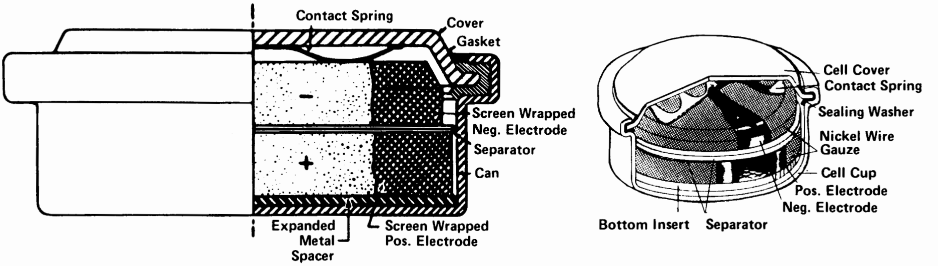


FIGURE 15 – CUTAWAY VIEWS OF STANDARD RATE BUTTON CELL

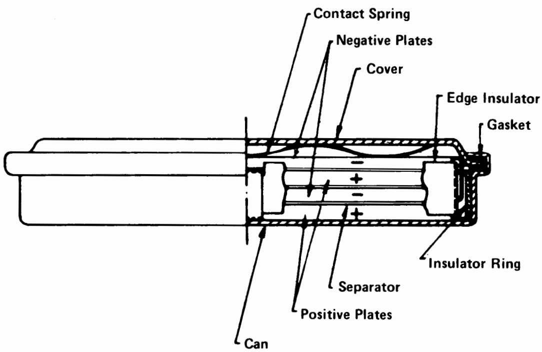


FIGURE 16 – CROSS SECTION VIEW–DOUBLE PLATE MOLDED ELECTRODE HIGH RATE BUTTON CELL

Button type cells utilize a cell cup (postitive pole) and a cell cover (negative pole). The electrodes consist of pressed powder tablets wrapped in nickel wire gauze, separated by a fine pored separator. Sealing is accomplished by crimping the rim of the cell cup over the rim of the cell cover with a plastic washer placed between them. This washer at the same time serves to insulate the cell cup from the cell cover.

Button cells are supplied with and without solder tabs. They may be used in a clip or holder or may be soldered into the circuit by means of the tabs welded on the top and bottom of the cell. *One should never attempt to solder directly to the cell case as the seal may be damaged by heat.*

Since the nickel-cadmium cell is a long-life device, it can be considered an integral electronic component, as any other installed part, and wired directly into the circuit.

Button Cell Stack Assemblies

When required, two to ten button cells may be assembled into a higher voltage series stack by special factory welding techniques. The assembly is jacketed with plastic tubing to provide stack insulation and to improve rigidity. The stacks are usually furnished with solder tabs at both ends. A typical assembly is shown in Figure 17.

It is not recommended that unit button cells be stacked in a pressure held assembly because of possible contact resistance changes in long term use. Cells should be assembled in the factory on a welded cell-to-cell basis.

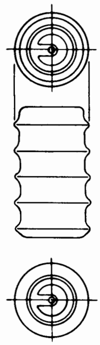


FIGURE 17— BUTTON CELL STACK ASSEMBLY

The table on page 380 lists the part numbers and specifications of button cell stack assemblies made up of 2 to 10 cells of 5 different types. Under special conditions more than 10 cells may be stacked.

NOTE: The stacks of button cells listed in the tables have flat contacts for terminals. The height dimensions shown apply to this type of terminal. Stacks are usually furnished with a solder tab at each end. The solder tab terminals are designated by the suffix letter T. For example:

A stack assembly of 6 B225 cells, with solder tab terminals, would have the following part number:

6/B225T: One solder tab at each end.

The slant line indicates jacketing with plastic tubing.

The height indicated in the table is the maximum height of the assembled stack. The height of the stack is subject, due to internal pressure, to a +0.020" (.51 millimeter) maximum temporary increase in dimension for each cell in the assembly.

Solder Tabs

One at each end.

For assemblies of B150, B225, BH225, BH500, and BH1 cells: No increase in stack height.

"Eveready" nickel-cadmium cells are assembled in a wide variety of battery types. If the standard types listed in the tables do not meet the necessary requirements of an application, contact the nearest Union Carbide Battery Products Division Sales Office for details on special configurations and voltage desired.

BUTTON CELL STACK ASSEMBLIES

(Jacketed With Plastic Tubing)

"Eveready" Battery Number	Number Of Cells Per Stack	Volts	Terminals (See Note)	Maximum Dimensions (Inches) Diameter	Maximum Dimensions (Inches) Height (See Note)	Approx. Weight (Ounces)	Maximum Dimensions (Millimeters) Diameter	Maximum Dimensions (Millimeters) Height (See Note)	Approx. Weight (Grams)
Assemblies of B150 Cells — 150 mAh Capacity (10 hour rate)									
2/B150	2	2.4	flat	1-1/16	37/64	0.9	27	14.7	25.5
3/B150	3	3.6	flat	1-1/16	27/32	1.3	27	21.4	36.9
4/B150	4	4.8	flat	1-1/16	1-1/8	1.7	27	28.6	48.2
5/B150	5	6	flat	1-1/16	1-13/32	2.1	27	35.7	59.5
6/B150	6	7.2	flat	1-1/16	1-11/16	2.5	27	42.9	70.9
7/B150	7	8.4	flat	1-1/16	1-61/64	2.9	27	49.6	82.2
8/B150	8	9.6	flat	1-1/16	2-15/64	3.3	27	56.8	93.6
9/B150	9	10.8	flat	1-1/16	2-33/64	3.8	27	63.9	108
10/B150	10	12	flat	1-1/16	2-25/32	4.2	27	70.6	119
Assemblies of B225 Cells — 225 mAh Capacity (10 hour rate)									
2/B225	2	2.4	flat	1-1/16	47/64	1.0	27	18.7	28.4
3/B225	3	3.6	flat	1-1/16	1-5/64	1.4	27	27.4	39.7
4/B225	4	4.8	flat	1-1/16	1-7/16	1.8	27	36.5	51
5/B225	5	6	flat	1-1/16	1-51/64	2.2	27	45.6	62.4
6/B225	6	7.2	flat	1-1/16	2-5/32	2.8	27	54.8	79.4
7/B225	7	8.4	flat	1-1/16	2-33/64	3.2	27	63.9	90.7
8/B225	8	9.6	flat	1-1/16	2-55/64	3.6	27	72.6	102
9/B225	9	10.8	flat	1-1/16	3-7/32	3.9	27	81.8	111
10/B225	10	12	flat	1-1/16	3-27/64	4.3	27	86.9	122
Assemblies of BH225 Cells (High Rate) — 225 mAh Capacity (10 hour rate)									
2/BH225	2	2.4	flat	1-1/16	3/4	1.0	27	19.1	28.4
3/BH225	3	3.6	flat	1-1/16	1-7/64	1.5	27	28.2	42.5
4/BH225	4	4.8	flat	1-1/16	1-15/32	1.9	27	37.3	53.9
5/BH225	5	6	flat	1-1/16	1-53/64	2.4	27	46.4	68
6/BH225	6	7.2	flat	1-1/16	2-13/64	3.0	27	56	85.1
7/BH225	7	8.4	flat	1-1/16	2-9/16	3.4	27	65.1	96.4
8/BH225	8	9.6	flat	1-1/16	2-59/64	3.8	27	74.2	108
9/BH225	9	10.8	flat	1-1/16	3-9/32	4.3	27	83.3	122
10/BH225	10	12	flat	1-1/16	3-41/64	4.7	27	92.5	133
Assemblies of BH500 Cells (High Rate)—500 mAh Capacity (10 hour rate)									
2/BH500	2	2.4	flat	1-7/16	13/16	2.2	36.5	20.6	62.4
3/BH500	3	3.6	flat	1-7/16	1-7/32	3.2	36.5	31	90.7
4/BH500	4	4.8	flat	1-7/16	1-39/64	4.1	36.5	40.9	116
5/BH500	5	6	flat	1-7/16	2-1/64	5.0	36.5	51.2	142
6/BH500	6	7.2	flat	1-7/16	2-13/32	6.0	36.5	61.1	170
7/BH500	7	8.4	flat	1-7/16	2-13/16	7.0	36.5	71.4	198
8/BH500	8	9.6	flat	1-7/16	3-13/64	8.1	36.5	81.4	230
9/BH500	9	10.8	flat	1-7/16	3-39/64	9.2	36.5	91.7	261
10/BH500	10	12	flat	1-7/16	4-1/64	10.2	36.5	102	289
Assemblies of BH1 Cells (High Rate) — 1 Ah Capacity (10 hour rate)									
2/BH1	2	2.4	flat	2-1/16	13/16	4.0	52.4	20.6	113
3/BH1	3	3.6	flat	2-1/16	1-7/32	6.2	52.4	31	176
4/BH1	4	4.8	flat	2-1/16	1-39/64	8.2	52.4	40.9	233
5/BH1	5	6	flat	2-1/16	2-1/64	10.5	52.4	51.2	298
6/BH1	6	7.2	flat	2-1/16	2-13/32	12.5	52.4	61.1	354
7/BH1	7	8.4	flat	2-1/16	2-13/16	14.6	52.4	71.4	414
8/BH1	8	9.6	flat	2-1/16	3-13/64	16.6	52.4	81.4	471
9/BH1	9	10.8	flat	2-1/16	3-39/64	18.5	52.4	91.7	525
10/BH1	10	12	flat	2-1/16	4-1/64	20.5	52.4	102	581

TABLE N

CYLINDRICAL CELLS

This cell type incorporates a different electrode arrangement than the button cell.

Sintered plates are used in all "Eveready" cylindrical cells for the positive electrode. This electrode consists of thin, highly porous nickel plaques impregnated with active materials. The plaque is made by heating nickel powder in an inert atmosphere until the particles are welded together. The metallic phase serves as a highly conductive supporting structure for the electrode. The structure of the plate is such that a large surface is furnished for reaction of the active materials. With the sintered electrode it is possible to build cells of very low internal resistance.

The negative electrode of most "Eveready" cylindrical cells is a pressed powder electrode which consists of dry blended active materials pressed into an expanded metal carrier. It is this electrode that gives "Eveready" cylindrical nickel-cadmium cells outstanding cycle life, long term overcharge capability, with essentially no fade and with little or no memory effect.

A number of "Eveready" cylindrical high rate cells use the "Jelly Roll" construction illustrated below, Figure 18.

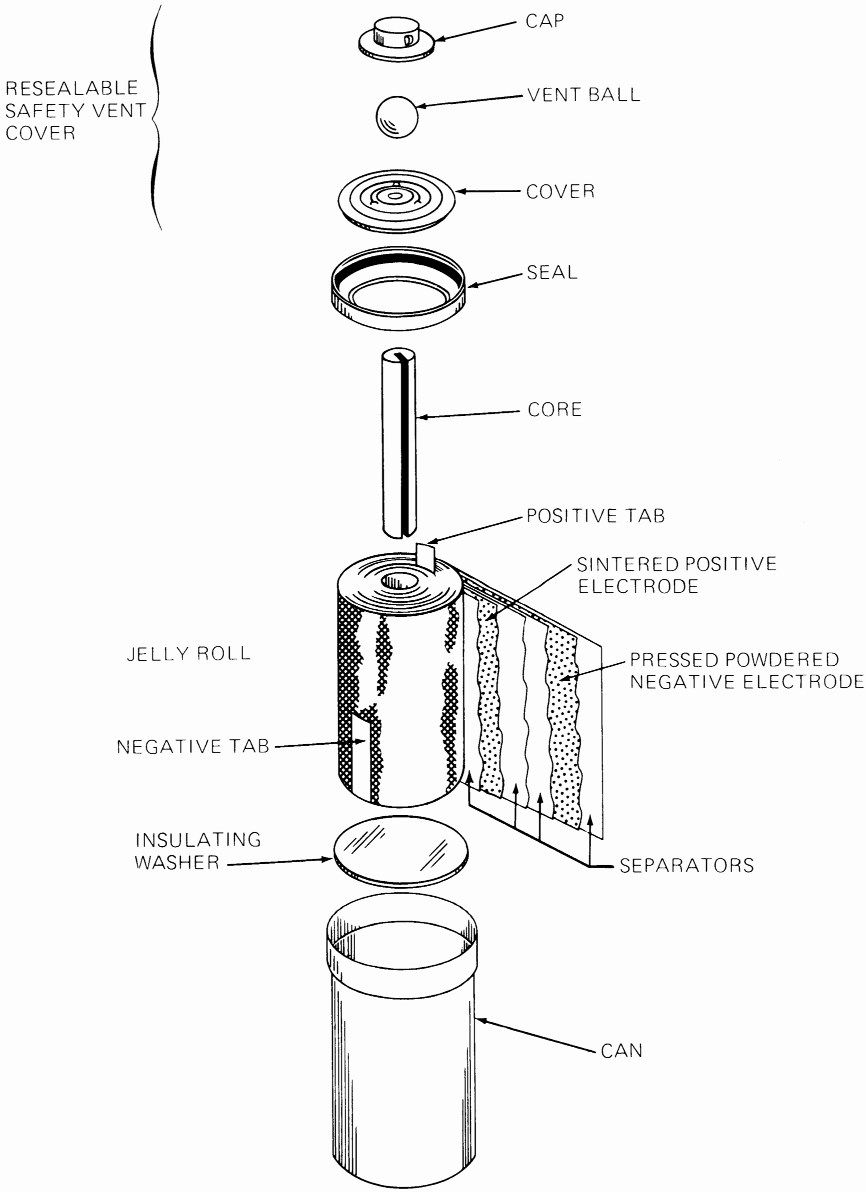


FIGURE 18

HIGH RATE CYLINDRICAL TYPE CELL—EXPANDED VIEW

Sealed nickel-cadmium cells under certain abuse conditions such as excessive charge or overcharge rate, or deep discharge with subsequent polarity reversal, may develop high internal gas pressure. Usually the gas is oxygen, although hydrogen is also evolved in some cases. Either or both hydrogen and oxygen must be vented.

All "Eveready" high rate cylindrical cells have a resealing pressure vent, except Nos. CH1.8 and CH2.2, which have a puncture type fail-safe venting mechanism. The resealing pressure vent is illustrated, for the "Sub C" cell, in Figure 18. This vent permits the cell to release excess gas evolved if the cell, for example, is abused. When the internal pressure has dropped to an acceptable level, the vent will reseal, permitting the cell to be recycled in the normal manner with little or no further loss of electrolyte or capacity.

Specifications for all cylindrical cells are listed in Tables L and M, starting on pages 366 and 367.

Contact Material

The best material for making electrical connections to nickel-cadmium cells is pure nickel. For most purposes, however, nickel plated steel will suffice. The pure nickel is, of course, the better conductor of the two. External electrical connections can be made with any good conductor having adequate current handling capabilities.

Potting

Nickel-cadmium cells or batteries of any type should not be totally potted. A number of "Eveready" cells have resealable vent mechanisms which would be rendered inoperative by the potting compound. Even those cells which have no venting mechanism should be allowed to expand and contract due to normal internal pressure build-up caused by charging and discharging.

Electrical Characteristics

"Eveready" sealed nickel-cadmium cells and batteries exhibit relatively constant discharge voltages. They can be recharged many times for long lasting economical power. They are small convenient packages of high energy output, hermetically sealed in steel cases, leak resistant and will operate in any position. The cells have very low internal resistance and impedance, are rugged and highly resistant to shock and vibration.

The temperature range under which these cells may be operated is wide. Use at high temperatures, however, or charging at higher than recommended rates, or repeated discharge beyond the normal cutoffs may be harmful. In the case of button cells which do not contain a safety vent, charging at temperatures lower than those recommended may cause swelling or cell rupture.

Capacity

The capacity rating of "Eveready" nickel-cadmium cells and batteries is based upon output in discharge at the 1 hour rate to an endpoint of 1.0V / cell for all cylindrical cells (except CH1.8 and CH2.2) and at the 10 hour rate to 1.1V / cell for button cells (and CH1.8 and CH2.2). If current is withdrawn at faster rates than these standards, capacity is decreased. Curves which follow on the individual specification sheets show cell or battery capacity in relation to discharge current.

Paralleling of Cells

"Eveready" sealed nickel-cadmium cells should not be charged in parallel unless each cell or series string of the parallel circuit has its own current limiting resistor. Minor differences in internal resistance of the cells may result, after cycling, in extreme variation in their states of charge. This may lead to overcharge at excessive currents in some cells and undercharge in other cells.

Voltage Characteristics

Except in the case of complete discharge, neither cell condition nor state of charge can be determined by open circuit voltage. Within a short while after charging it may be above 1.4 volts. It will fall shortly thereafter to 1.35V and continue to drop as the cell loses charge.

During discharge, the average voltage of a sealed nickel-cadmium battery is approximately 1.2 volts per cell. At normal discharge rates the characteristic is very nearly flat until the cell approaches complete discharge. The battery provides most of its energy above 1.0 volt per cell. If the cell is discharged with currents exceeding the rated value, however, the voltage characteristic will have more of a slope, a lower endpoint voltage will be necessary and the ampere-hours per cycle will be reduced.

High Current Pulse Discharging

High rate nickel-cadmium cells will deliver exceedingly high currents. If they are discharged continuously under short circuit conditions, self-heating may do irreparable damage. If the output is withdrawn in pulses which are spaced so as to limit to a safe figure the temperatures of a few critical areas in the cell, high currents can be utilized.

The heat problems vary somewhat from one cell type to another, but in most cases internal metal strip tab connectors overheat or the electrolyte boils. In some instances both events occur.

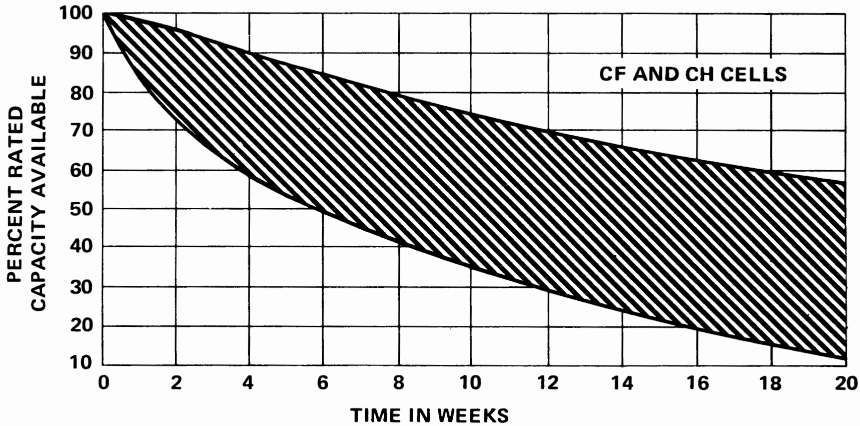
General overheating is normally easy to prevent because the outside temperature of the battery can be used to indicate when rest, for cooling, is required. In terms of cutoff temperature during discharge, it is acceptable practice to keep the battery always below 150°F (65.5°C).

The overheated internal connectors are difficult to detect. This form of overheating takes place in a few seconds or less, and overall cell temperature may hardly be affected. It is thus advisable to withdraw no more ampere-seconds per pulse, and to withdraw it at no greater average current per complete discharge, than recommended on the data sheet for the "Eveready" cell in question. In special cases, where cooling of the cell or battery is likely to be poor, or unusually good, special tests should be run to check the important temperatures before any duty cycle adjustment is made.

Output capacity in any discharge composed of pulses is difficult to predict accurately because there are infinite combinations of current, "on" time, rest time, and end point voltage. Testing on a specific cycle is the simplest way to get a positive answer.

Self-Discharge

Self-discharge characteristics of "Eveready" nickel-cadmium cells are shown in Figure 19. The characteristics are shown as a decline in percent of rated capacity available. Self-discharge is increased by elevated temperatures. Batteries are not harmed even if not used for long periods of time.



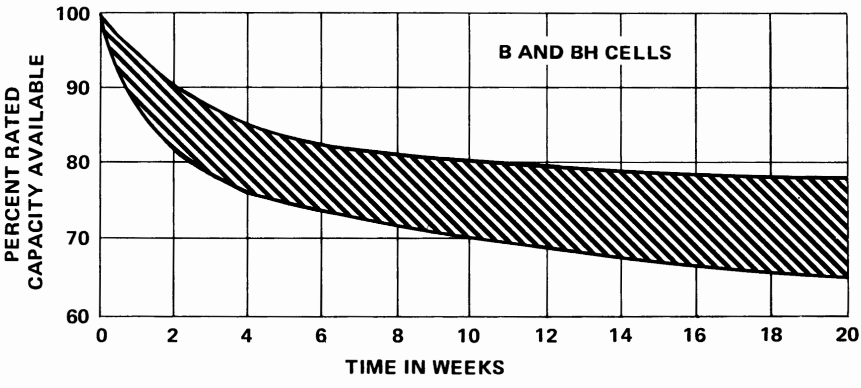


FIGURE 19—
CHARGE RETENTION OF SEALED NICKEL-CADMIUM CELLS [AT 70°F (21.1°C)]

Continuous Overcharge

The overcharge capability of "Eveready" cylindrical nickel-cadmium cells is outstanding. Figure 20 illustrates initial and subsequent discharge curves after 2 years continuous overcharge without periodic discharges. The first discharge after the 2 year charge period yields a slightly reduced voltage curve and 65% capacity. The second cycle after 2 years continuous overcharge provides essentially the same discharge curve as the initial one.

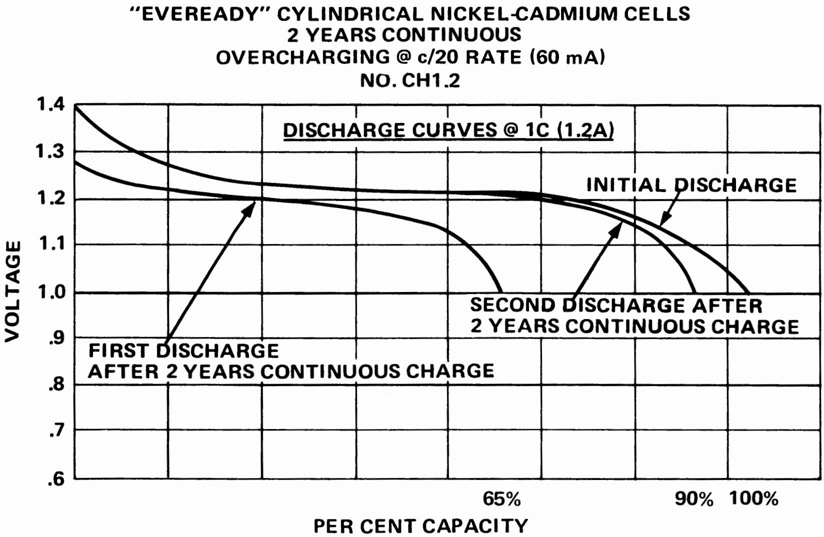


FIGURE 20 INITIAL AND SUBSEQUENT DISCHARGE CURVES AFTER 2 YEARS CONTINUOUS OVERCHARGE WITHOUT PERIODIC DISCHARGES

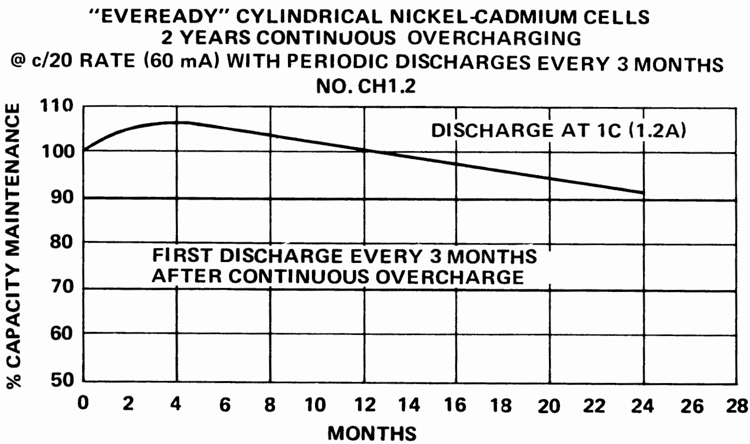


FIGURE 21 CAPACITY MAINTENANCE VS. CONTINUOUS OVERCHARGE

Figure 21 illustrates capacity maintenance vs. months of continuous overcharge at the 20 hour rate with periodic discharges every 3 months at the 1 hour rate. The cells maintain 90% of their initial capacity after 2 years of this overcharge regimen. This pattern of use would occur if batteries are left on charge continuously and used one cycle only on an occasional basis.

Memory Effect

Memory effect is that characteristic attributed to nickel-cadmium cells wherein the cell retains the characteristics of previous cycling. That is, after repeated shallow depth discharges the cell will fail to provide a satisfactory full depth discharge. "Eveready" cylindrical nickel-cadmium cells are particularly excellent with regard to lack of memory effect. Figure 22 depicts initial and subsequent cycles after repeated shallow discharges. The graphs show the initial discharge curve and the first and second discharge curves after 100 40% depth of discharge cycles. You will note that the subsequent full depth discharges yield nearly equal capacity to the initial curve at slightly reduced voltage levels.

The comments regarding continuous overcharge and memory effect do not apply to Nos. CH1.8 and CH2.2.

"EVEREADY" CYLINDRICAL NICKEL-CADMIUM CELLS
MEMORY EFFECT
NO. CH1.2

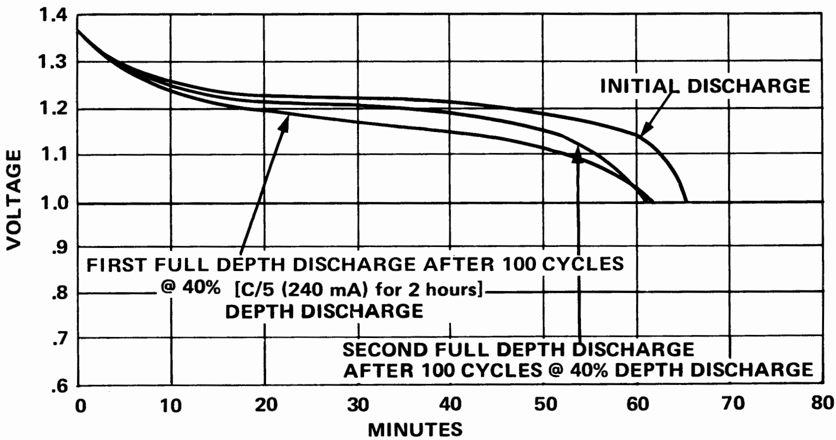


FIGURE 22
INITIAL AND SUBSEQUENT CYCLES AFTER REPEATED SHALLOW DISCHARGES

Storage

At elevated storage temperatures self-discharge will be considerably higher than at room temperature. It is recommended that batteries be stored at 70°F (21.1°C) or lower for this reason.

When button cells (B and BH cells) have been stored for a long period, over 6 months, regardless of storage temperature, they should not immediately be charged, but should first be fully discharged and then charged once at half the normal rate; i.e., 28 hours at the 20 hour rate. This procedure is not required for CF and CH cells.

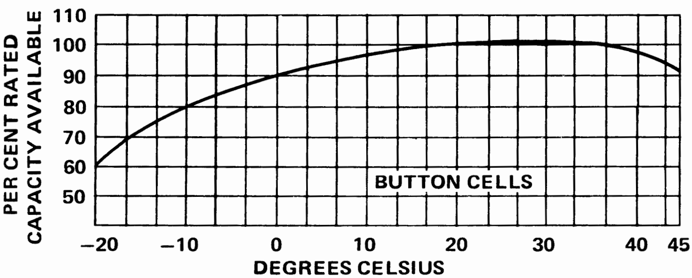
Temperature Characteristics

"Eveready" sealed nickel-cadmium cells experience a relatively small change of output capacity over a wide range of operating temperature. Charging, however, must be done in a much narrower range. Temperature limits applicable to operation of the cells are listed in Table 0.

CELL TYPE	CHARGE RATE	CHARGE TEMPERATURE	DISCHARGE TEMPERATURE	STORAGE TEMPERATURE
B	10 HOUR	32°F to 113°F (0°C to 45°C)	–4°F to 113°F (–20°C to 45°C)	–40°F to 140°F (–40°C to 60°C)
BH	10 HOUR	32°F to 113°F (0°C to 45°C)	–4°F to 113°F (–20°C to 45°C)	–40°F to 140°F (–40°C to 60°C)
CF	1 TO 3 HOUR	60°F to 113°F (15.6°C to 45°C)	–4°F to 113°F (–20°C to 45°C)	–40°F to 140°F (–40°C to 60°C)
CF	10 HOUR	32°F to 113°F (0°C to 45°C)	–4°F to 113°F (–20°C to 45°C)	–40°F to 140°F (–40°C to 60°C)
CH	10 HOUR	32°F to 113°F (0°C to 45°C)	–4°F to 113°F (–20°C to 45°C)	–40°F to 140°F (–40°C to 60°C)

TABLE 0

The capacity vs. temperature curves which are on some individual specification sheets represent cells discharged at the temperatures shown after charging at room temperature for 14 hours at the 10 hour rate. This characteristic is also generalized on the two curves following.



DEGREES	
C	F
–20	–4
–10	14
0	32
10	50
20	68
30	86
40	104
45	113

FIGURE 23

CAPACITY OF SEALED NICKEL-CADMIUM BUTTON CELLS ON 10 HOUR RATE DISCHARGE AT TEMPERATURES BETWEEN –20°C and 45°C (–4°F and 113°F)

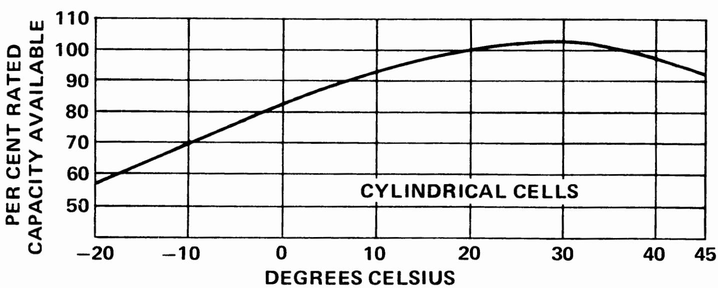


FIGURE 24

CAPACITY OF SEALED NICKEL-CADMIUM CYLINDRICAL CELLS ON 1 HOUR RATE DISCHARGE AT TEMPERATURES BETWEEN –20°C and 45°C (–4°F and 113°F)

Effect of high and low temperatures on storage, discharging and charging of "Eveready" Nickel-Cadmium cells and batteries

	LOW TEMPERATURE	HIGH TEMPERATURE
STORAGE (All Types)	at –40°F (–40°C) No detrimental effect. However, cells or batteries should be allowed to return to room temperature prior to charging.	at 140°F (60°C) No detrimental effect. However, self-discharge is more rapid starting at 90°F and increases as temperature is further elevated.
DISCHARGE (All Types)	at –4°F (–20°C) No detrimental effect but capacity will be reduced as shown by curves on page 389.	at 113°F (45°C) No detrimental effect.
CHARGE **CF and CH Types (10 Hour Rate)**	at 32°F (0°C) Cells or batteries should not be charged below 32°F at the 10 hour rate.	at 113°F (45°C) Cells or batteries evidence charge acceptance of approximately 50%.
CF Types (1 to 3 Hour Rate)	at 60°F (15.6°C) Cells or batteries should not be charged below 60°F at the 1 hour rate or below 50°F at the 3 hour rate.	at 113°F (45°C) Cells or batteries evidence charge acceptance of approximately 90%.
Button Cells	at 32°F (0°C) Cells or batteries should not be charged below 32°F at the 10 hour rate.	at 113°F (45°C) Cells or batteries evidence charge acceptance of approximately 60%. Also possible detrimental effect on cycle life.

TABLE P

Impedance and Resistance

Sealed nickel-cadmium cells have a high effective capacitance. Their impedance is so low that cells which, in effect, are being continuously overcharged, make excellent ripple filters.

Cell impedance is dependent upon frequency and state of charge of the cell. It is lower for a charged cell than it is for a discharged cell. Values of impedance and resistance are shown on the individual specification sheets for each cell.

Cycle Life

Cycle life of the nickel-cadmium sealed cell depends both upon cell design and the type of use to which it is subjected. Excepting violent abuse, the use factors which most seriously influence life expectancy are:

a. Amount of overcharge (excessive overcharge is undesirable).
b. Temperature of charge and overcharge (elevated or lowered temperature is undesirable).
c. Endpoint requirements regarding rate and capacity (increased cycle life will ordinarily be the result of a shallow discharge regimen).

Any treatment which causes a cell to vent itself is harmful. Frequent or extended venting of even properly valved cells eventually destroys them.

In rating cycle life, end of life of the sealed nickel-cadmium cell is considered to be when it no longer provides 80% of its rated capacity. The discharge currents used in determining the cycle lives listed in Table Q are the 10 hour rate for button cells and the 1 hour rate for cylindrical types. The charge current is terminated after return of approximately 140% of the capacity previously removed. If a cell can be considered to be satisfactory while delivering less than the arbitrary 80% endpoint figure, cycle life will be greater than that listed in the following table. The ratings are for 70° F (21.1° C) performance.

CELL	ESTIMATED AVERAGE NUMBER OF CYCLES
Cylindrical	
CH Types	1000
CF Types	1000
Button	
B Types	300
BH Types	300

TABLE Q

NOTE: Cycle life of Nos. CH1.8 and CH2.2 is 300 cycles.

Charging

Constant current charging is recommended for sealed nickel-cadmium cells. The 10 hour rate should not be exceeded unless overcharge is specifically to be prevented. The recharge efficiency of sealed nickel-cadmium cell is dependent on a number of things, but is is most important to remember that charging becomes more difficult as temperature increases and charge rate decreases.

It is possible, under certain conditions, to charge at rates much higher than the 10 hour rate, but control devices which prevent high rate over-charge are sometimes required. See the writeup on fast charge cells on pages 393-401.

The nickel-cadmium battery can be trickle charged but floating and constant voltage charging are not recommended. For maximum performance in situations of long term trickle charge the current should be kept to a minimum. The trickle charge current required to keep the battery fully charged is approximately the 30-50 hour rate plus whatever is necessary to compensate for any major withdrawals. Lower trickle rates maintain the battery at some lower state of charge.

If either floating or constant voltage charging is mandatory, a thermal cutout which senses battery temperature must be included in the charge circuitry. Battery overheating which follows from any irregularity in the voltage-current control system can be totally destructive to either battery or charger, or both.

Most sealed nickel-cadmium cells are shipped partially charged.

Charging Circuits

Charging circuits for nickel-cadmium batteries are discussed thoroughly in the section "Nickel-Cadmium Battery Chargers" on pages 577-590.

"EVEREADY" FAST CHARGE NICKEL-CADMIUM CELLS

Technical Background Information

This "Eveready" battery construction provides practical high rate charging with minimum cost and weight for control circuitry. Control concepts make use of the fact that, in the nickel-cadmium cell system, the cell will heat if charging continues after the electrodes reach full charge. The cell has been designed to exhibit sufficient temperature rise to effect charge control without a significent change in operating pressure. The "Eveready" Fast Charge cell series develops the desired temperature rise, and has the built-in ability to withstand short term overcharge at rates to one hour values without physical damage or loss in cell capacity. The cell construction is specifically designed to withstand overcharge at the three hour rate without special control circuitry. Considerable heat can be generated within the cell, however, if overcharge is extended beyond a reasonable period of time. To prevent this heat from causing gradual cell degradation, it is recommended that the cell temperature not exceed 115° F (46.1° C) during this extended overcharge and that the cells be removed from the charger within two or three days of reaching full charge.

Prior to this construction, any cell overcharged at the one hour rate would be permanently damaged. This "Eveready" Fast Charge cell can withstand overcharge at these high rates long enough for the temperature rise to be sensed by simple control elements. This temperature rise is very pronounced, and provides a positive signal for charge control. As a result, the control element can be small, lightweight and inexpensive.

Sealed secondary nickel-cadmium cells have been manufactured for many years based on the so-called "oxygen recombination" principle. The charge-accepting capacity of the negative electrode is made to exceed the charge-accepting capacity of the positive electrode. Upon charging, the positive electrode reaches a state of full charge before the negative electrode and oxygen is evolved at the positive electrode. The oxygen gas reacts or combines with the active cadmium metal on the surfaces of the negative electrode. Thus, recombination of oxygen prevents the buildup of an excessive internal gas pressure.

In charging nickel-cadmium cells, an overcharge, i.e., ampere-hours input which is in excess of that previously removed upon discharge, must be provided to insure that the cells have reached full charge. If overcharge is continued at too high a rate of charge current, the evolved oxygen gas may not fully recombine, consequently a build up of excessive internal gas pressure may result. A safety resealable vent is provided to limit excessive build up of pressure. The proper selection of the electrolyte volume controls oxygen recombination pressure below the safety vent opening pressure.

The safe charge rate for sealed secondary nickel-cadmium cells for extended charge periods has been established at the ten hour, or the C/10, rate. Capacity (C) is the rated ampere-hour capacity of the cell and 10 is the number of hours required at perfect charge efficiency to bring a completely discharged cell to full charge. At the 10 hour rate and lower currents, an equilibrium condition is maintained in the cell and consequently there is no excessive build up of internal gas pressure.

"Eveready" sealed secondary nickel-cadmium cells and batteries are now widely used as a rechargeable power source in many different types of portable or cordless electric appliances. Charging at the safe recommended C/10 rate has proven satisfactory for recharging the cells or batteries used in many of these appliances, such as tooth brushes, shavers, etc. where relatively long rest periods between uses are possible. However, there is now a demand for use of sealed nickel-cadmium cells and batteries in other appliances such as chain saws, electronic flash, portable drills, professional hair clippers, etc. where the rest periods between uses of the appliances are much shorter and consequently shorter recharging times, from about 3 hour to about 1 hour, i.e. C/3 to C/1 rate, are required.

Various proposals have been made for charging sealed secondary nickel-cadmium cells and batteries at high rates minimizing overcharge. A pressure operated switch to cut off the charge current when the internal gas pressure reaches a predetermined level has been proposed. Another proposal has been to incorporate an oxygen-consuming auxiliary electrode located inside the cell to consume oxygen gas as it is evolved and thus prevent the build up of excessive internal gas pressure. These proposals, however, require extensive modification of the cell structure and consequently are expensive and generally increase the overall cost.

Another approach which does not require modification of cell structure is the external sensing of the "on-charge" voltage of the cell or battery. Auxiliary circuitry is required to shut off the charging current in response to the voltage sensor. The difficulty with the use of voltage sensing is that the voltage of a sealed nickel-cadmium cell tends to change with repetitive cycling and may vary with temperature and charge rate.

Charge control, using temperature rise of the cell as a control parameter has also been used. Sealed nickel-cadmium cells normally tend to warm up on overcharge in proportion to the rate of oxygen recombination at the negative electrode.

Unfortunately, the ability of most commercially available nickel-cadmium cells to recombine oxygen gas is rather limited as evidenced by the acceptance of the C/10 overcharge rate. The cells can withstand higher rates, but in overcharge at high rate only a fraction of the evolved oxygen will be recombined, with resultant heat. This change in temperature is gradual and difficult to detect. The excess of unrecombined oxygen will result in internal pressure buildup and cell venting. Excessive venting of cells may reduce useful capacity.

To accomplish charge termination safely and reliably through temperature sensing has required fast-acting, precise and expensive equipment at the lower charge rates. Because of the size, cost and complexity of such a system, the thermal sensing approach to overcharge control heretofore has been impractical for the consumer oriented nickel-cadmium battery powered portable appliances and devices.

The "Eveready" Fast Charge cell has been specially designed to withstand high rate overcharge (up to the 1 hour rate) and thus to overcome the above mentioned drawbacks.

The "Eveready" Fast Charge cell exhibits a relatively sharp rise in temperature during high rate overcharge. The particular type of thermal sensor to be used in combination with the cell or battery and the charger system is not critical. Probably the least expensive overall cell or battery control unit is provided by use of a simple snap-action thermostatic switch. The snap-action thermostatic switch combines the temperature sensing and circuit switching functions in one small, inexpensive device which can be easily attached to the cell or battery.

A solid-state thermistor sensor may also be used. The thermistor is also relatively inexpensive and even more compact, although it performs only the function of a sensor. Auxiliary circuitry and a switching means are required to cut off the charging current in response to the thermistor input. Among the commercially available types of thermistors, the positive temperature coefficient type is preferred because it changes resistance abruptly at a predetermined temperature. Auxiliary circuitry is thereby simplified without loss of reliability.

In constructing individual cell or battery units, it is not critical that the thermal sensor be placed or maintained in actual physical contact with the cell proper, although this is preferred. Individual cell units may be constructed with a small flat disc-type thermostatic switch welded in contact with the bottom of the cell. Similar battery units may be constructed with a small thermistor or bimetallic switch placed in the space between adjoining cells. Any arrangement is satisfactory providing the thermal sensor is well exposed to the heat generated by the individual cell or one or more cells of the battery. The use of extensive heat sinks, such as placing the entire battery in a water bath, is not recommended since this can prevent heat build up, impede oxygen recombination within the cell and lead to cell venting before sufficient heat rise occurs.

The terminal leads from the thermal sensor may be connected to additional external contacts or may be brought out from the cell or battery unit and connected directly into the circuit. Where a sensor-switch device is used in a series-connected battery, it may be preferred to wire the switch internally between two series cells so that no additional external contacts are required. The practicality of this connection depends upon discharge current value and sensor current rating. The advantage would be that the circuit would also open on discharge in case the battery becomes overheated for any reason.

The charger circuit required for charging the individual cell or battery is not unique. A constant current type charger is recommended with due regard for heat dissipation and wattage ratings of all components.

Further discussion on charging circuits and design considerations are found in the section titled "Fast Charge Nickel-Cadmium Battery Chargers," pages 591-597, following the section on "Nickel-Cadmium Battery Chargers."

"EVEREADY" FAST CHARGE NICKEL-CADMIUM CELLS

Product Information

Recent commercial use of "Eveready" Fast Charge cells in a variety of industrial and consumer applications has created widespread interest in various methods of charge control for nickel-cadmium cells and batteries. Much has been written and many approaches attempted – all with the single goal of achieving a low cost, reliable fast charging system. A review of some of the factors involved, and a discussion of the principles leading to the Fast Charge concept may be of interest.

The use of a thermal cutout for fast charge control permits various modes of operation. The charge can be terminated and locked out. Or, the current can be reduced to a sustaining rate and maintained at this rate. Or, by selection of the control element, the current will cycle on and off and keep the battery at full charge.

The use of temperature sensing is not new. Such systems have been considered by various manufacturers at various times. In fact, Union Carbide has supplied special military battery systems, using temperature sensing charge control. The circuitry to accomplish this, however, was complex, expensive and operated at the 10 hour charge rate. What is new and different here is the cell's ability to withstand high, one hour rate overcharge and exhibit a sharp temperature rise, which can easily be sensed by simple, inexpensive devices.

Any rechargeable battery application requires careful consideration of the charging system and the charger to be used. Each must be tailored to the proposed usage schedule to insure maximum battery performance. Possible misapplications and mistakes must be considered and all safety features investigated. When high rate charging is required, it is strongly recommended that you contact your Union Carbide Battery Products Division Sales Office. They will be able to work with you and provide you with a specially tailored battery suited to your particular needs.

The line of "Eveready" Fast Charge cylindrical cells includes capacities from 150 mAh to 4 Ah. A complete listing of cell types is found in Tables L and M, starting on pages 366 and 367, with individual specification sheets in the section beginning on page 405.

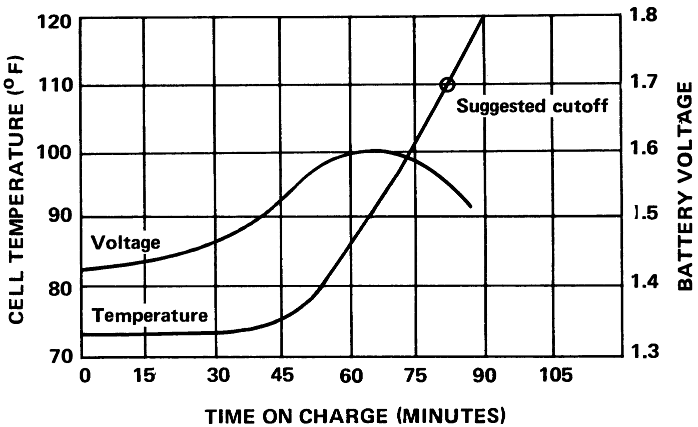
Figure 25 shows typical voltage and temperature characteristics of the "Eveready" CF1 cells when charged at the one hour rate. Note that the temperature remains relatively constant until the cell approaches full charge. At this point, a steep rise in temperature is initiated and continued until the cutoff range of 110°F to 120°F (43.3°C to 48.9°C) is reached.

Either mechanical or electronic methods can be used to terminate the charge at the desired temperature. Experimental work has successfully used a mechanical snap-action or bimetallic thermostat such as those used commercially in gas heaters, liquid heaters, percolators, fire alarm detectors, clothes dryers and the like. Three possible concepts using this type of device are shown as Figures 26, 27 and 28, with comments on the pros and cons of the circuit in each case.

A second means of terminating charge on the battery at the desired cutoff temperature is through the use of temperature responsive electronic circuitry. In essence, this circuit will electronically terminate charge when the desired temperature is reached through the use of a sensing element and switching type devices. A possible electronic circuit for this type of charge control is shown in Figure 29. The time to reach cutoff and the period of cycling "on" and "off" depends upon charge rate, battery packaging and ambient temperature. Your Union Carbide Battery Products Division Sales Office can arrange for a special battery design suited to your particular needs.

NOTE: No patent liability shall be incurred by Union Carbide Corporation for the commercial use of any of the circuits described herein.

TYPICAL VOLTAGE & TEMPERATURE CURVES OF A CF1 CELL AT 1 HOUR CHARGE RATE



DEGREES	
F	C
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9

FIGURE 25

"EVEREADY" FAST CHARGE
CONCEPT I

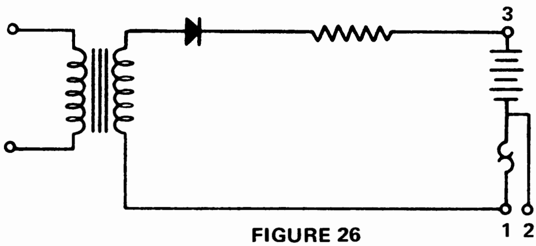


FIGURE 26

1. Thermostat with non lock out features – snap-action opens at 110-120°F (43.3-48.9°C). Closes automatically at 95-105°F (35-40.6°C)
2. Negative battery terminal for discharge. (2)
3. Positive battery terminal for both charge and discharge.

Comments – This is the least expensive means of control available. This system would allow considerable overcharge if the battery is connected to the charger for long periods of time, since the battery would go back on charge as soon as the battery temperature dropped below 95°F (35°C). One distinct advantage is that a battery which has reached high temperature on discharge will automatically go on charge as soon as the battery cools down.

"EVEREADY" FAST CHARGE
CONCEPT II

Lock Out Thermostat, Automatic Reset

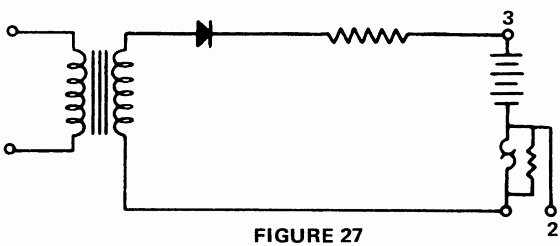


FIGURE 27

1. Thermostat with electrical lock out – snap-action opens at about 110-120°F (43.3-48.9°C).
2. Negative battery terminal for discharge. (2)
3. Positive battery terminal for both charge and discharge.

Comments — The shunting of the charge current through a heating element in thermal contact with the thermostat holds the thermostat in the open position until the battery is disconnected from the charger. As a result, there would be no significant overcharge current if the battery was left connected to the charger for lengthly periods of time. If some continuous charge current was desired, an appropriate resistor could be connected across the contacts of the thermostat as shown in Figure 27. A possible disadvantage would be the premature locking out of the thermostat if a battery still hot from a high rate discharge was connected to the charger.

"EVEREADY" FAST CHARGE CONCEPT III

Lock Out Thermostat, Mechanical Reset (Push Button)

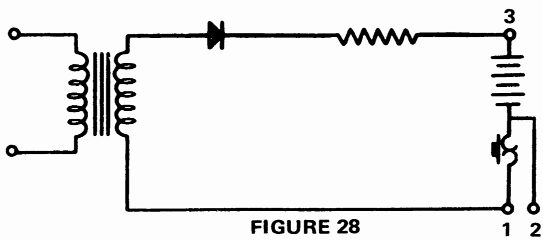


FIGURE 28

1. Thermostat with lock out feature — snap-action opens at about 110-120° F (43.3-48.9° C). Push button for mechanically resetting thermostats.
2. Negative battery terminal for discharge. (2)
3. Positive battery terminal for both charge and discharge.

Comments — The snap-action thermostat would cut off all charge currents. This concept might be useful in an application where high rate charge was not normally needed, but would be useful at certain intervals. A charger could be designed to provide more moderate charging such as the C/10 rate, unless the user pushed the reset button when a fast charge was required (as indicated in Figure 27). Again a heated battery from high rate discharge would necessitate a wait until the thermostat could be reset.

"EVEREADY" FAST CHARGE CONCEPT IV

Electronic Circuit Control

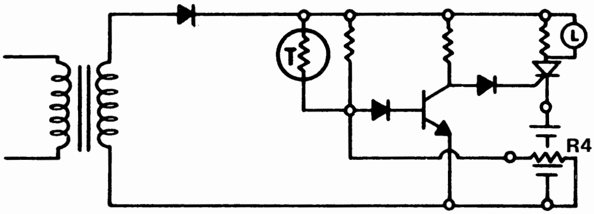


FIGURE 29

Circuit designed to cut off charge at 110-120°F (43.3-48.9°C).

Comments – The big advantage of this concept is the small size of the thermistor (R4) contained in the battery pack. The circuit must be specifically designed for each application and its stability checked out over the temperature range encountered by the battery in actual use.

CAUTION! CAUTION! CAUTION!

"Eveready" FAST CHARGE cells and batteries should not be continually overcharged at high rates. Undesirable cell degradation or heat build up damage will occur if batteries are left on high rate chargers.

Specific guidelines, based on extensive laboratory testing are as follows:

Trickle Charge

To maintain a fully charged cell for standby service, charge at the 30 hour to 50 hour rate.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at the 10 hour to 30 hour rate.

High Rate Charge

To charge "Eveready" FAST CHARGE cells for immediate use, charge at the 3 hour to 10 hour rate. Occasional overcharging for up to three days at these rates will not adversly effect cell performance.

High Rate Charge with Control

To charge "Eveready" FAST CHARGE cells as quickly as possible charge at the 1 hour to 3 hour rate with proper charge control device. Overcharging, which might harm the cells, is prevented by the charge control device. It is also possible to charge at rates up to the 15 minute rate with specific charge control techniques. Your Union Carbide Application Sales Field Manager can supply this information.

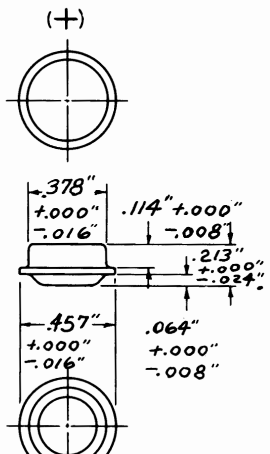
DATA SHEETS

NICKEL-CADMIUM CELLS & BATTERIES

"EVEREADY" NO. B20 CELL (Flat Contacts)
B20T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-2 milliamperes

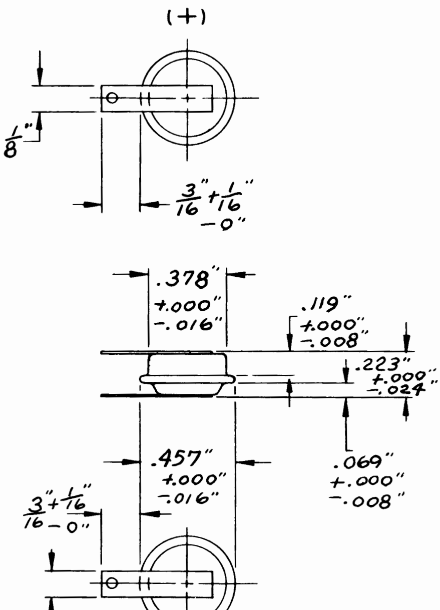
Inches		Millimeters
	.008	.20
	.016	.41
	.024	.61
1/16	.063	1.59
	.064	1.63
	.069	1.75
	.114	2.9
	.119	3.02
1/8	.125	3.18
3/16	.188	4.76
	.213	5.41
	.223	5.66
	.378	9.6
	.457	11.6



(—)

B20
Flat Contacts

NOTE:
POSITION OF TABS IN RELATION TO ONE ANOTHER TO BE WITHIN ±5°



(—)

B20T
Two Solder Tabs

SPECIFICATIONS

Voltage Taps .... —, + 1.2
Average Service Capacity (to 1.1 volts) .... 20 milliampere-hours
(Rated at 2 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.04 oz. (1.13 grams)
Volume (by displacement) .... 0.03 cubic inch (0.49 cubic centimeter)
Cell ....One button (standard molded electrode)

For service information see following page

"EVEREADY" NOS. B20 & B20T

Average Performance Characteristics at 70° F (21.1° C)

Nos. B20 ar B20T should be discharged only with currents up to 2 milliamperes. With a 2 milliampere discharge current the cell voltages are:

Initial Voltage **1.32 volts**

(Voltage under load after 2 milliampere-hours have been removed from a fully charged cell)

Average Voltage **1.22 volts**

(Voltage under load at midlife, after 10 milliampere-hours have been removed from a fully charged cell.)

Final Voltage **1.10 volts**

(Voltage under load after 20 milliampere-hours have been removed from a fully charged cell.)

Temperature Characteristics

Ranges of temperature applicable to operation of the B20 or B20T cell are:

Charge:	+32° F to +113° F (0° C to 45° C)
Discharge:	–4° F to +113° F (–20° C to 45° C)
Storage:	–40° F to +140° F (–40° C to 60° C)

Charging Rate

For fully discharged cells, charge for 14 hours at 2 milliamperes. Charging voltage: 1.35-1.50 volts. For partially discharged cells, reduce time or current proportionally.

Trickle Charge

Not recommended;

Internal Resistance

The internal resistance of a B20 or B20T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged	Cell Discharged
4000 milliohms	5340 milliohms	7800 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a B20 or B20T cell varies with state of charge and frequency, as follows:

	Impedance (milliohms)		
Frequency (Hz)	Cell Charged	Cell ½ Discharged	Cell Discharged
50	2100	2600	4900
100	1900	2400	4300
1000	1500	1800	2500
10000	1250	1450	1700

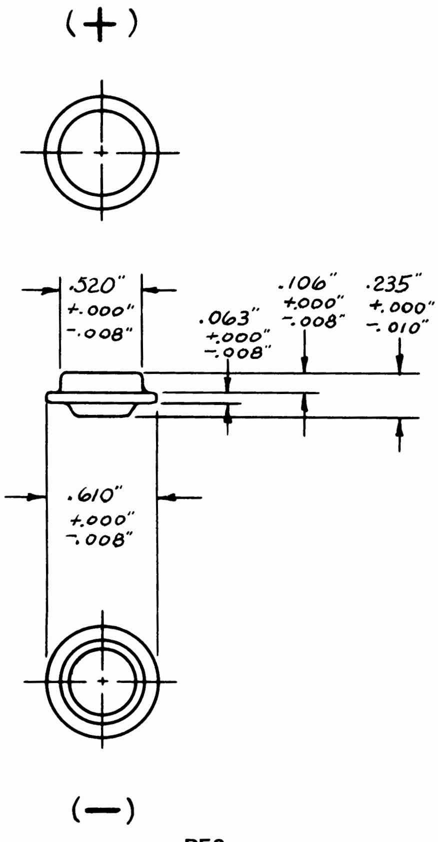
(Tolerance of ± 20% applies to above values)

Soldering

Do not make soldered connections to the B20 cell. Use the B20T cell for this purpose.

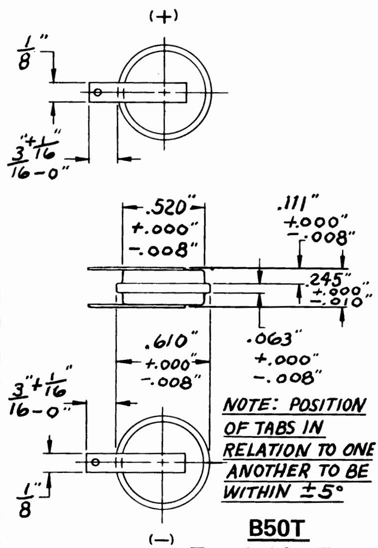
"EVEREADY" NO. B50 CELL (Flat Contacts)
B50T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-5 milliamperes



B50
Flat Contacts

Inches		Millimeters
	.008	.20
	.010	.25
1/16	.063	1.59
	.063	1.6
	.106	2.69
	.111	2.82
1/8	.125	3.18
3/16	.188	4.76
	.235	5.97
	.245	6.22
	.520	13.2
	.610	15.5



B50T
Two Solder Tabs

SPECIFICATIONS

Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.1 volts) .... 50 milliampere-hours
(Rated at 5 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.12 oz. (3.4 grams)
Volume (by displacement) ....0.06 cubic inch (0.98 cubic centimeter)
Cell .... One button (standard molded electrode)

For service information see following page

"EVEREADY" NOS. B50 & B50T

Average Performance Characteristics at 70°F (21.1°C)

Nos. B50 or B50T should be discharged only with currents up to 5 milliamperes. With a 5 milliampere discharge current the cell voltages are:

Initial Voltage — **1.32 volts**

(Voltage under load after 5 milliampere-hours have been removed from a fully charged cell).

Average Voltage — **1.22 volts**

(Voltage under load at midlife, after 25 milliampere-hours have been removed from a fully charged cell.)

Final Voltage — **1.10 volts**

(Voltage under load after 50 milliampere-hours have been removed from a fully charged cell.)

Temperature Characteristics

Ranges of temperature applicable to operation of the B50 or B50T cell are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charging Rate

For fully discharged cells, charge for 14 hours at 5 milliamperes. Charging voltage: 1.35-1.50 volts. For partially discharged cells, reduce time or current proportionally.

Trickle Charge

Not recommended.

Internal Resistance

The internal resistance of a B50 or B50T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged	Cell Discharged
1500 milliohms	1800 milliohms	5000 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a B50 or B50T cell varies with state of charge and frequency, as follows:

	Impedance (milliohms)		
Frequency (Hz)	Cell Charged	Cell ½ Discharged	Cell Discharged
50	1160	1450	1680
100	1090	1260	1400
1000	900	880	910
10000	700	650	710

(Tolerance of ± 20% applies to above values)

Polarity Reversal

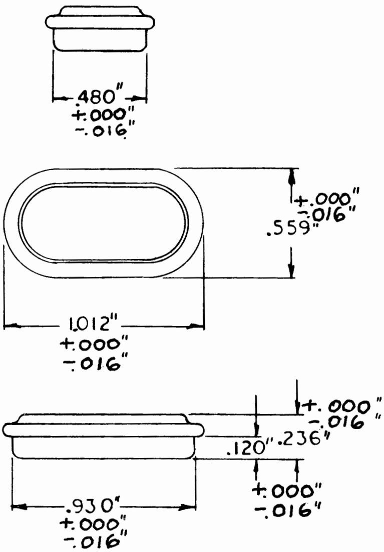
The B50 or B50T cell can be reversed without damage for 5 hours at 5 milliamperes. This permits its use without hazard in series groups.

Soldering

Do not make soldered connections to the B50 cell. Use the B50Tcell for this purpose.

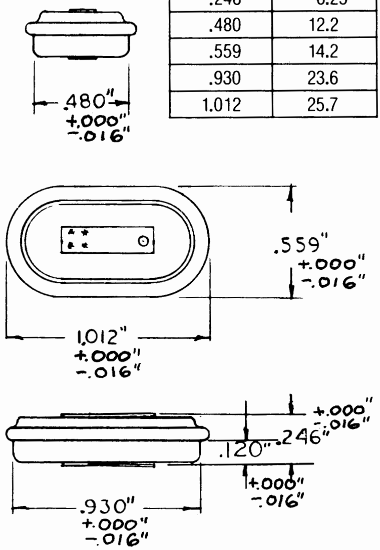
"EVEREADY" NO. OB90 CELL (Flat Contacts)
OB90T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-45 milliamperes



OB90
Flat Contacts

Inches	Millimeters
.016	.41
.120	3.05
.236	5.99
.246	6.25
.480	12.2
.559	14.2
.930	23.6
1.012	25.7



OB90T
Two Solder Tabs

SPECIFICATIONS

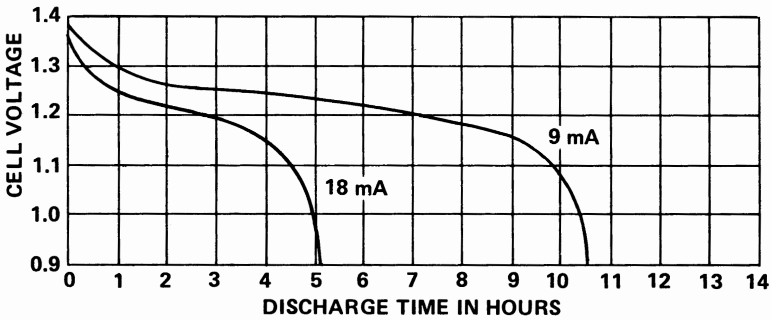
Voltage Taps .... –, + 1.2
Average Service Capacity (to 1.1 volts) .... 90 milliampere-hours
(Rated at 9 milliamperes)
Terminals ....Flat contacts or two solder tabs
Average Weight .... 0.2 oz. (5.7 grams)
Volume (by displacement)............... 0.07 cubic inch (1.2 cubic centimeters)
Cell ....One oval button (standard molded electrode)

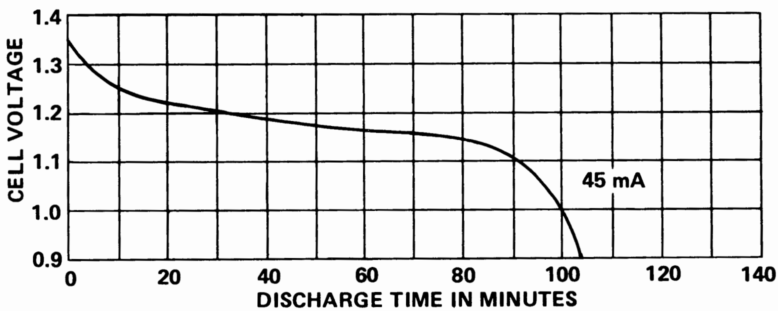
For service information see following pages

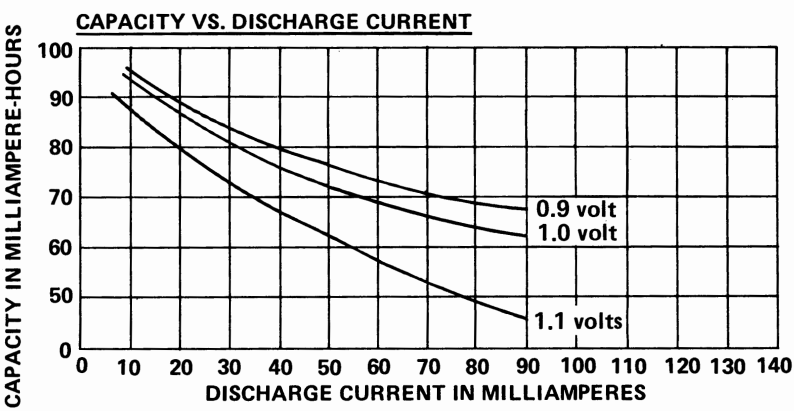
"EVEREADY" NOS. OB9O & OB9OT

Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves



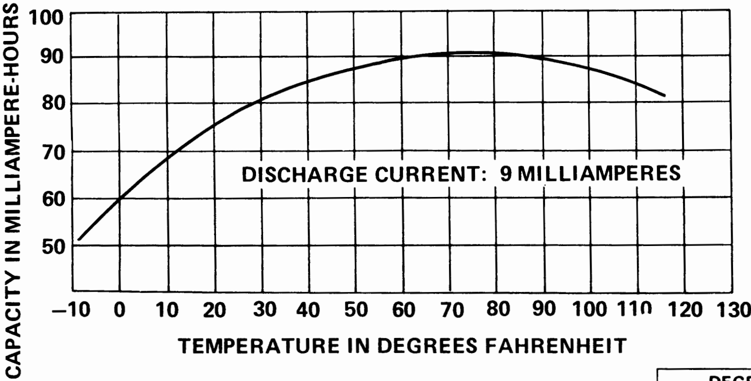




EXAMPLE: Assume a 35 milliampere discharge to a 1.1 volt endpoint. The OB90 (or OB90T) cell has a capacity of 70 milliampere-hours (this provides a discharge time of 2 hours.)

"EVEREADY" NOS. OB9O & OB9OT

CAPACITY VS. TEMPERATURE

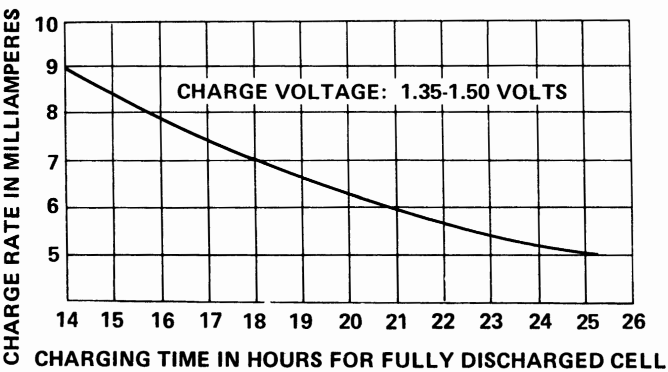


Ranges of temperature applicable to operation of the OB90 or OB90T cell are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (-20°C to 45°C)
Storage: –40°F to +140°F (-40°C to 60°C)

DEGREES	
F	C
–10	–23.3
0	–17.8
10	–12.2
20	–6.7
30	–1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9

CHARGE RATE VS. CHARGING TIME



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

Not recommended.

"EVEREADY" NOS. OB9O & OB9OT

Internal Resistance

The internal resistance of an OB90 (or OB90T) cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged	Cell Discharged
1100 milliohms	1050 milliohms	4000 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of an OB90 (or OB90T) cell varies with frequency and state of charge, as follows:

	Impedance (milliohms)		
Frequency (Hz)	Cell Charged	Cell ½ Discharged	Cell Discharged
50	1050	2750	5300
100	925	2300	4100
1000	550	1000	1350
10000	450	650	750

(Tolerance of ± 20% applies to above values)

Polarity Reversal

The OB90 (or OB90T) cell can be reversed without damage for 5 hours at 9 milliamperes. This permits its use without hazard in series groups.

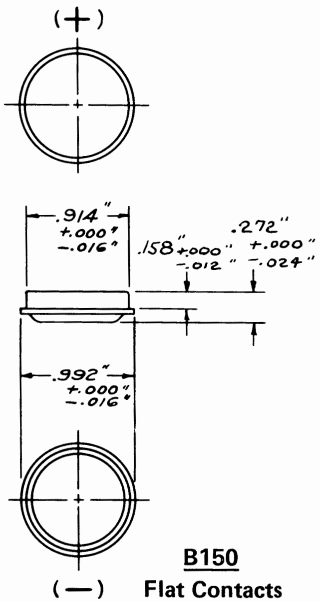
Soldering

Do not make soldered connections to the OB90 cell. Use the OB90T cell for this purpose.

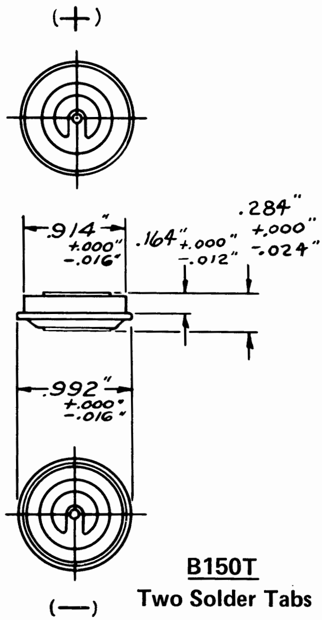
"EVEREADY" NO. B150 CELL (Flat Contacts)
B150T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-75 milliamperes

Inches	Millimeters
.012	.31
.016	.41
.024	.61
.158	4.01
.164	4.17
.272	6.91
.284	7.21
.914	23.2
.992	25.2



B150
Flat Contacts



B150T
Two Solder Tabs

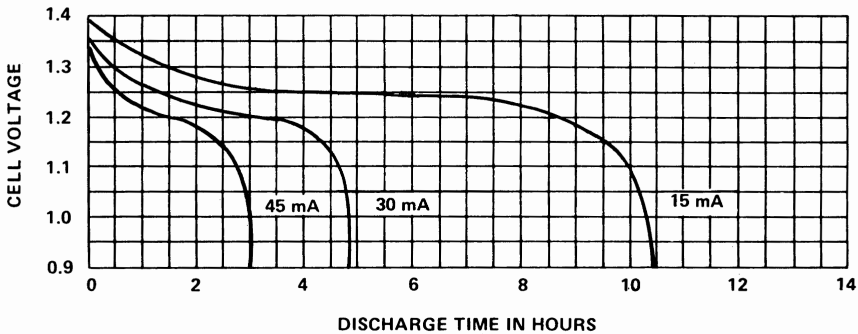
SPECIFICATIONS

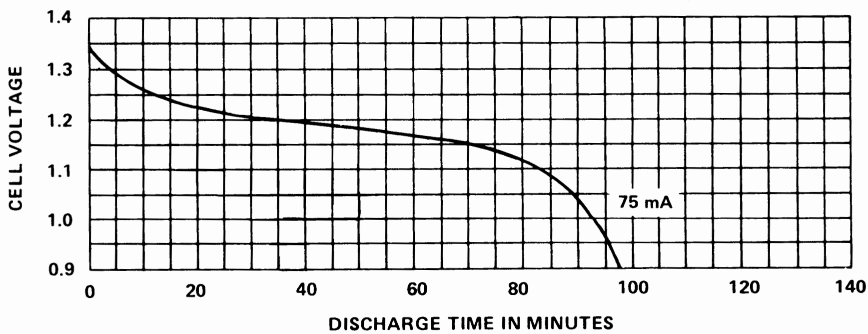
Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.1 volts) .... 150 milliampere-hours
(Rated at 15 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.4 oz. (11.3 grams)
Volume (by displacement)............... 0.16 cubic inch (2.6 cubic centimeters)
Cell .... One button (ANSI K23) (standard molded electrode)

For service information see following pages

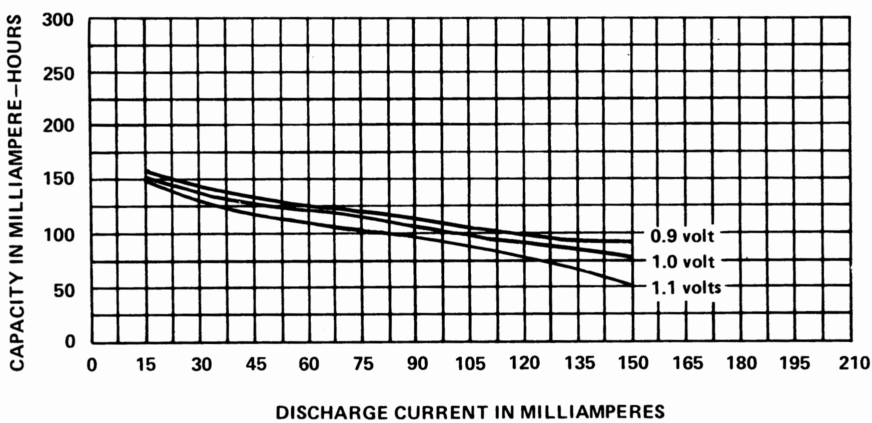
"EVEREADY" NOS. B150 & B150T

Average Performance Characteristics at 70°F (21.1°C)
Typical Discharge Curves





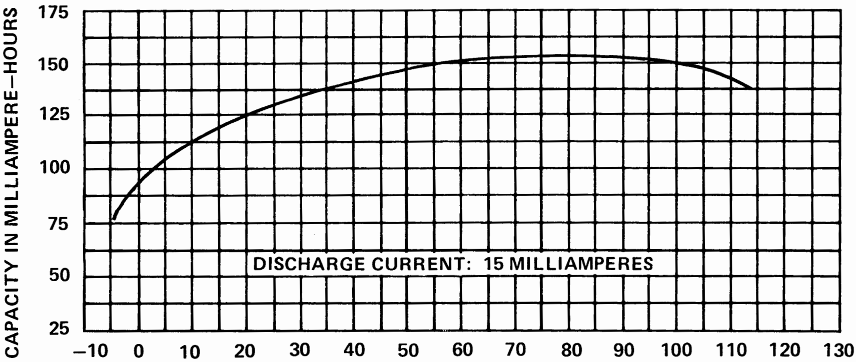
CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 60 milliampere discharge to a 0.9 volt endpoint. The B150 (or B150T) cell has a capacity of 125 milliampere-hours. (This provides a discharge time of 2.1 hours.)

"EVEREADY" NOS. B150 & B150T

CAPACITY VS. TEMPERATURE

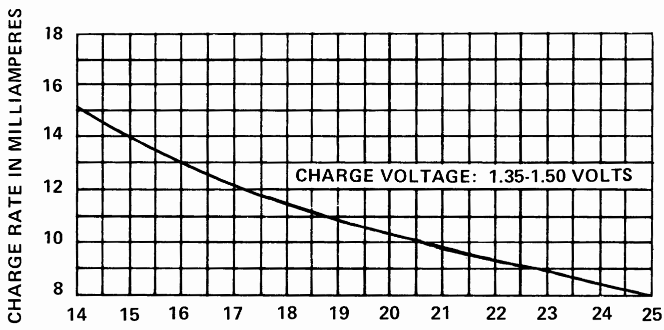


DEGREES	
F	C
−10	−23.3
0	−17.8
10	−12.2
20	−6.7
30	−1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9

Ranges of temperature applicable to operation of the B150 or B150T cell are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (-20°C to 45°C)
Storage: −40°F to +140°F (-40°C to 60°C)

CHARGE RATE VS. CHARGING TIME



CHARGING TIME IN HOURS FOR FULLY DISCHARGED CELL

For partially discharged cells, reduce time or current proportionally.

Trickle Charge

Not recommended.

"EVEREADY" NOS. B150 & B150T

Internal Resistance

The internal resistance of a B150 (or B150T) cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged	Cell Discharged
550 milliohms	640 milliohms	1370 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a B150 (or B150T) cell varies with frequency and state of charge, as follows:

	Impedance (milliohms)		
Frequency (Hz)	Cell Charged	Cell ½ Discharged	Cell Discharged
50	240	310	490
100	230	270	450
1000	190	200	250
10000	150	155	185

(Tolerance of ± 20% applies to above values)

Polarity Reversal

The B150 (or B150T) cell can be reversed without damage for 5 hours at 15 milliamperes. This permits its use without hazard in series groups.

Soldering

Do not make soldered connections to the B150 cell. Use the B150T cell for this purpose.

"EVEREADY" NO. CF150 CELL (Flat Contacts)
CF150T CELL (Two Solder Tabs)

Type: Nickel-Cadmium

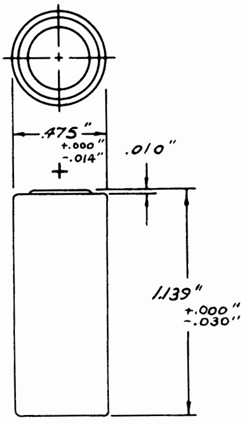
Suggested Current Range: 0-600 milliamperes

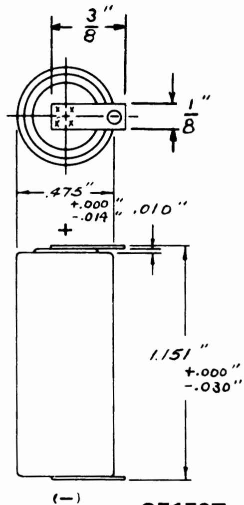
NOTE: See pages 393-401 for general information on Fast Charge cells.

Dimensions are for labeled cells

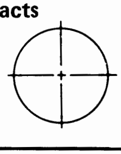
NOTE: Data are tentative. Cells presently available on a sample basis. Can be made available for large scale applications.

Inches		Millimeters
	.010	.25
	.014	.36
	.030	.76
1/8	.125	3.18
3/8	.375	9.53
	.475	12.1
	1.139	28.9
	1.151	29.2

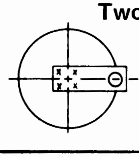




CF150
Flat Contacts



CF150T
Two Solder Tabs



SPECIFICATIONS

Voltage Taps .... —, + 1.2
Average Service Capacity (to 1.0 volt) .... 150 milliampere-hours
(Rated at 150 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.4 oz. (11.3 grams)
Volume (by displacement).............. 0.19 cubic inch (3.1 cubic centimeters)
Cells ....One cylindrical
(N size) High Rate-Fast Charge

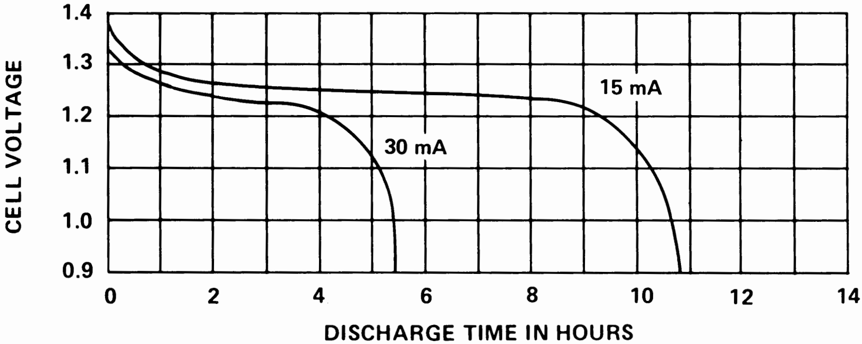
For service information see following pages

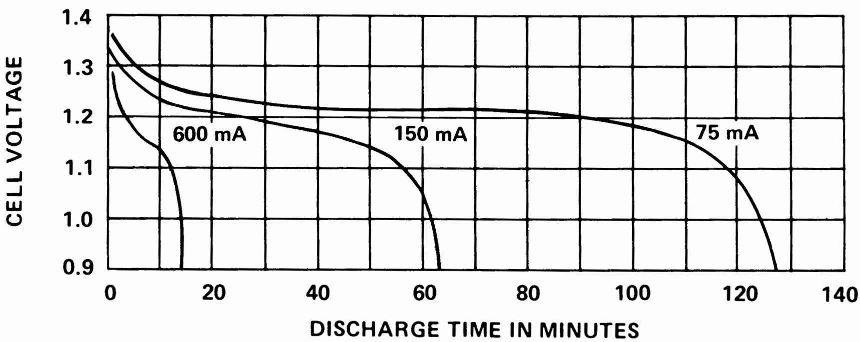
"EVEREADY" NOS. CF150 & CF150T

Average Performance Characteristics at 70°F (21.1°C)

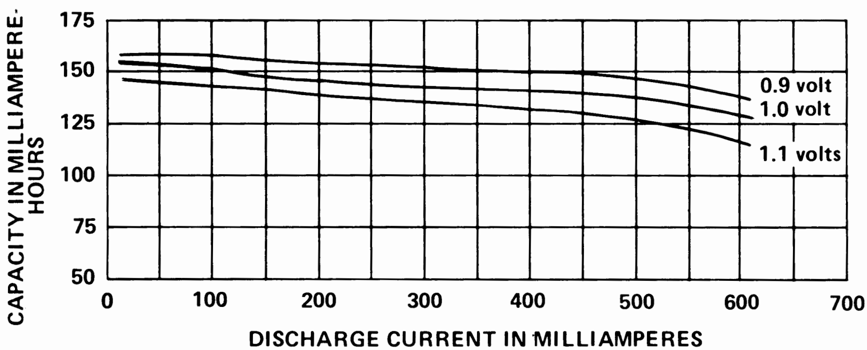
Typical Discharge Curves

The following performance curves assume the cells were fast charged at 50 milliamperes. A slight reduction in capacity will be experienced when charged at lower rates.





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 400 milliampere discharge to a 0.9 volt endpoint. The CF150 (or CF150T) cell has a capacity of 150 milliampere-hours. (This provides a discharge time of 23 minutes.)

"EVEREADY" NOS. CF150 & CF150T

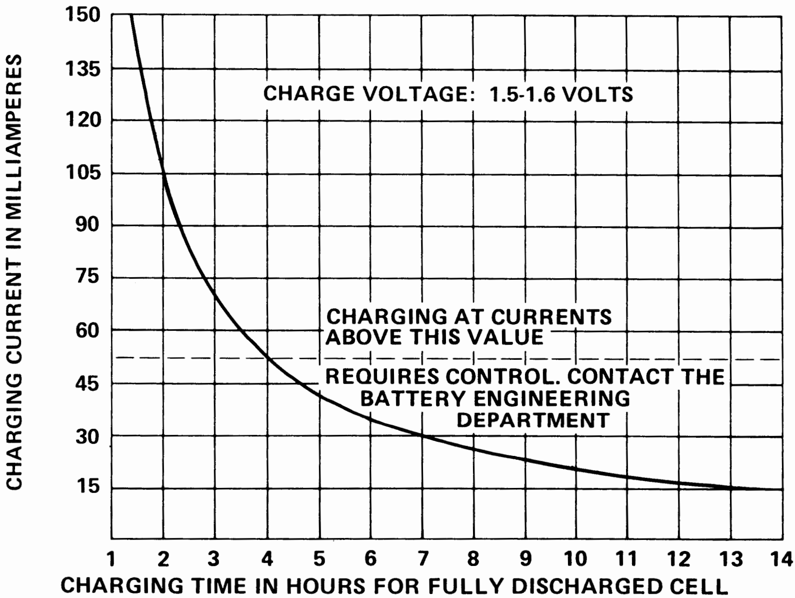
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CF150 or CF150T cell are:

Charge:	+60°F to +113°F (15.6°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

Note: See pages 393-401 for general information on Fast Charge cells.



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 3 to 5 mA.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 3.75 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 5 to 15 mA.

"EVEREADY" NOS. CF150 & CF150T

High Rate Charge

To charge cells for immediate use, charge at 15 to 50 mA. Occasional overcharging for up to three days at these rates will not adversely affect cell performance.

High Rate Charge with Control

To charge cells as quickly as possible charge at 50 to 150 mA with proper charge control device. Overcharging, which might harm the cells, is prevented by the charge control device.

Internal Resistance

The internal resistance of a CF150 or CF150T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
50 milliohms	60 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No load)

The impedance of a charged CF150 or CF150T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (For Charged Cell)
50	55
1000	50
10000	45

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

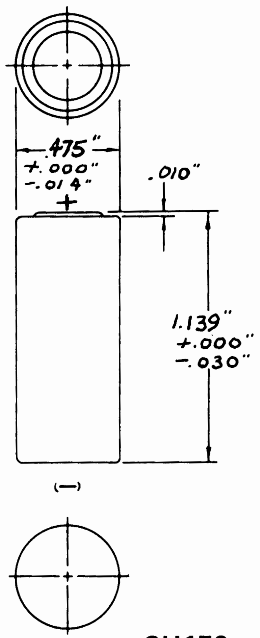
(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 12.5 ampere-seconds.
Average current over entire discharge period:
Not to exceed 625 milliamperes

"EVEREADY" NO. CH150 CELL (Flat Contacts)
CH150T CELL (Two Solder Tabs)

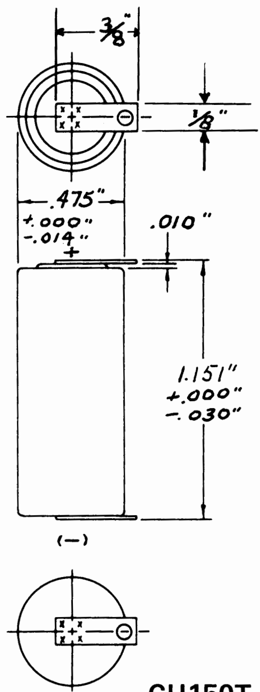
Type: Nickel-Cadmium

Suggested Current Range: 0-600 milliamperes **Dimensions are for labeled cells**

Inches		Millimeters
	.010	.25
	.014	.36
	.030	.76
1/8	.125	3.18
3/8	.375	9.53
	.475	12.1
	1.139	28.9
	1.151	29.2



CH150
Flat Contacts



CH150T
Two Solder Tabs

SPECIFICATIONS

Voltage Taps .... –, + 1.2

Average Service Capacity (to 1.0 volt) .... 150 milliampere-hours
(Rated at 150 milliamperes)

Terminals .... Flat contacts or two solder tabs

Average Weight .... 0.4 oz. (11.3 grams)

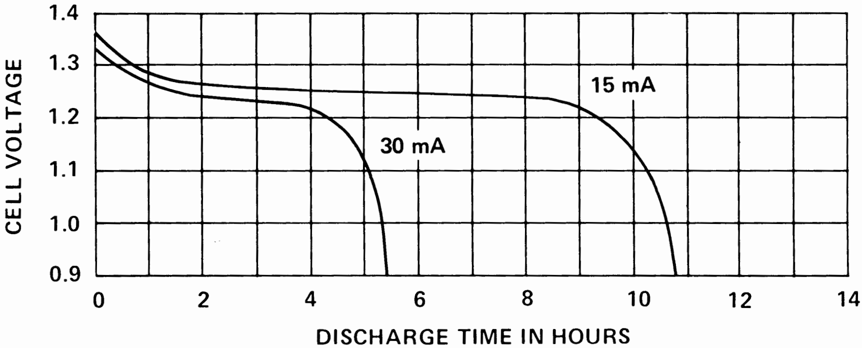
Volume (by displacement)............... 0.19 cubic inch (3.1 cubic centimeters)

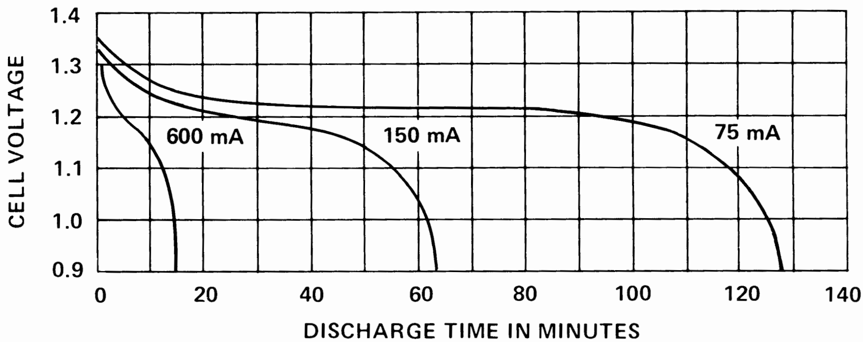
Cell ....One cylindrical (N size) High Rate

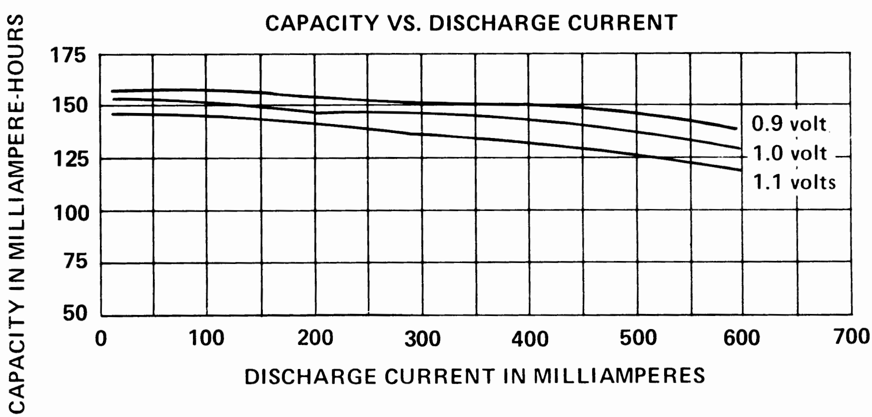
For service information see following pages

"EVEREADY" NOS. CH150 & CH150T

Average Performance Characteristics at 70°F (21.1°C)
Typical Discharge Curves







EXAMPLE: Assume a 100 milliampere discharge to a 1.0 volt endpoint. The CH150 (or CH150T) has a capacity of 150 milliampere-hours. (This provides a discharge time of 1.5 hours.)

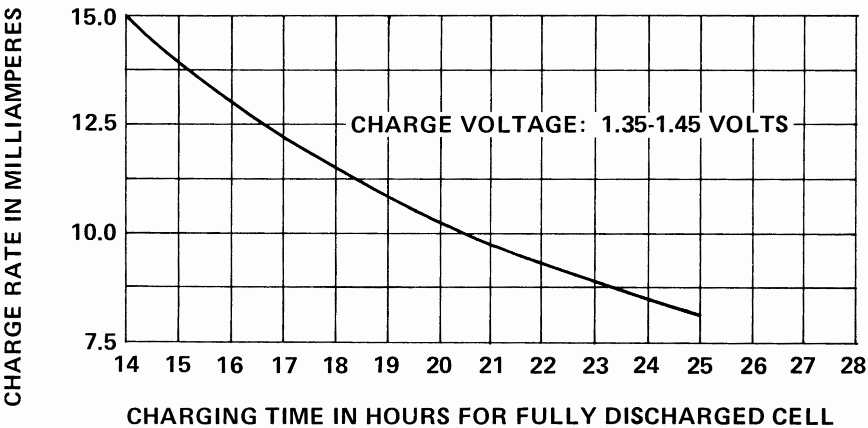
"EVEREADY" NOS. CH150 & CH150T

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH150 or CH150T cell are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

"EVEREADY" NOS. CH150 & CH150T

Trickle Charge

To maintain a fully charged cell for standby service, charge at 3 to 5 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 3.75 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 5 to 15 mA.

Internal Resistance

The internal resistance of a CH150 or CH150T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
40 milliohms	50 milliohms

(Tolerance of ±20% applies to above values)

Impedance (no load)

The impedance of a charged CH150 or CH150T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	44
1000	40
10000	35

(Tolerance of ± 20% applies to above values)

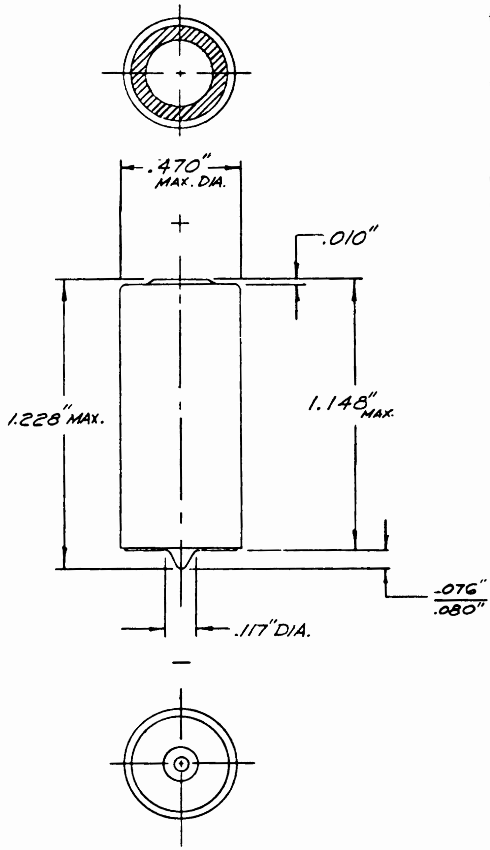
Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 12.5 ampere-seconds.
Average current over entire discharge period:
Not to exceed 625 milliamperes

"HERCULES" NO. HS4133 CELL

Type: Nickel-Cadmium
Suggested Current Range: 0-600 milliamperes



Inches	Millimeters
.010	.25
.076	1.93
.080	2.03
.117	2.97
.470	11.9
1.148	29.2
1.228	31.2

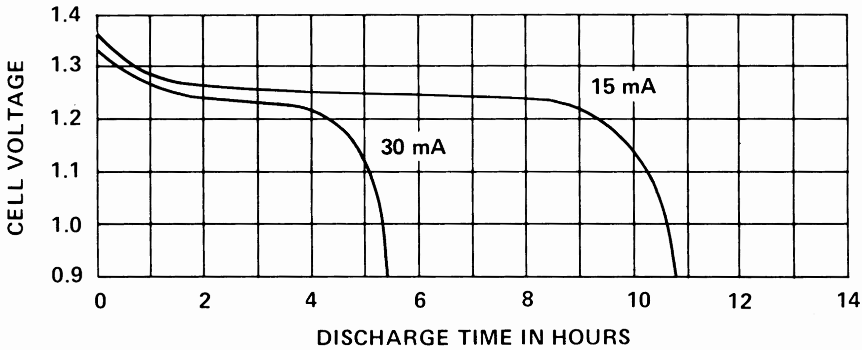
SPECIFICATIONS

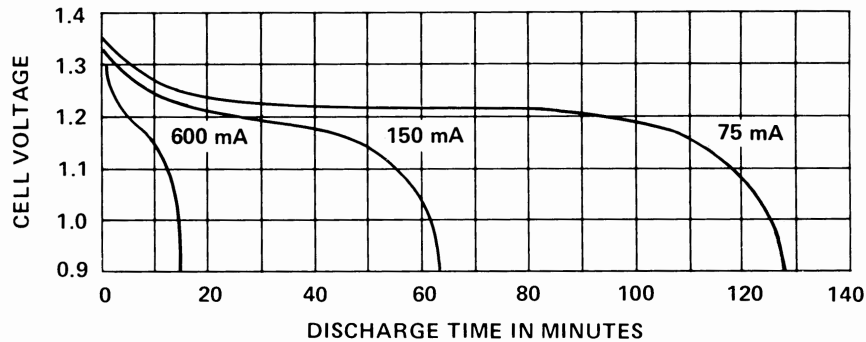
Voltage Taps .... –, + 1.2
Average Service Capacity (to 1.0 volt) .... 150 milliampere-hours
(Rated at 150 milliamperes)
Terminals .... One flat, one conical projection
Average Weight .... 0.3 oz. (8.5 grams)
Cell .... One cylindrical (CH150) High Rate

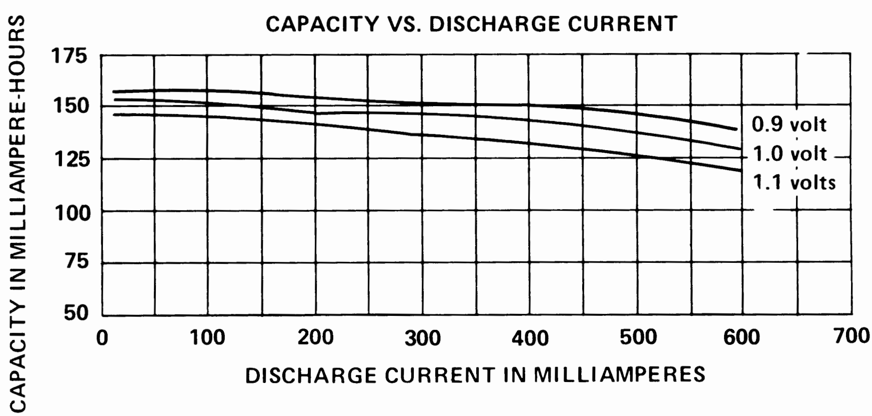
For service information see following pages

"HERCULES" NO. HS4133

Average Performance Characteristics at 70°F (21.1°C)
Typical Discharge Curves







EXAMPLE: Assume a 100 milliampere discharge to a 1.0 volt endpoint. The HS4133 battery has a capacity of 150 milliampere-hours. (This provides a discharge time of 1.5 hours.)

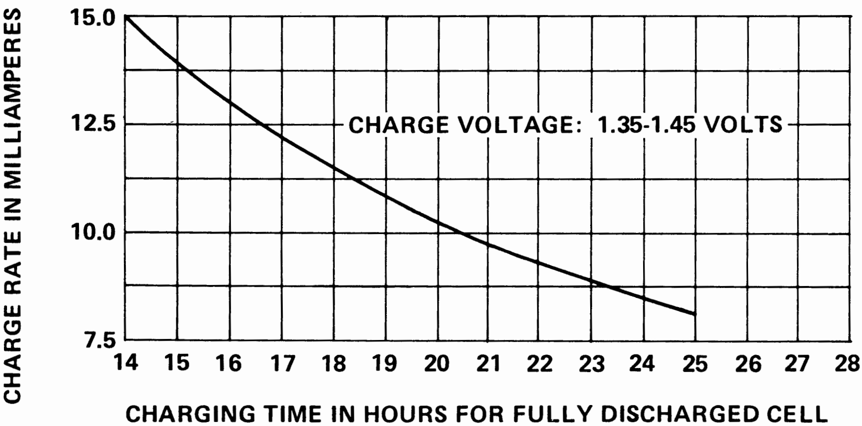
"HERCULES" NO. HS4133

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4133 cell are:

Charge: $+32^\circ$F to $+113^\circ$F (0°C to 45°C)
Discharge: -4°F to $+113^\circ$F (-20°C to 45°C)
Storage: -40°F to $+140^\circ$F (-40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 3 to 5 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 3.75 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 5 to 15 mA.

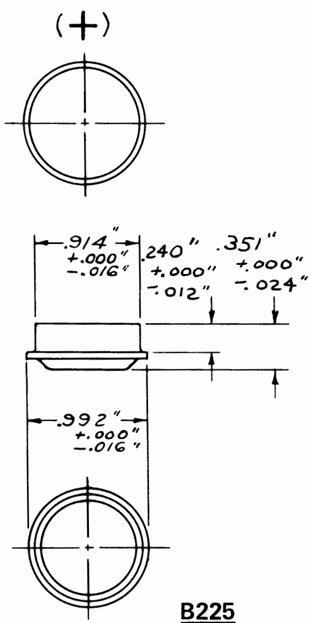
Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 12.5 ampere-seconds.
Average current over entire discharge period:
Not to exceed 625 milliamperes

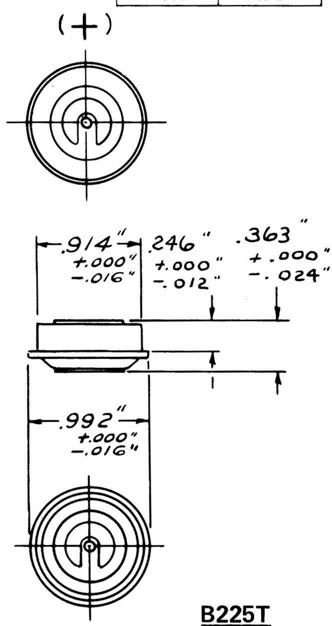
"EVEREADY" NO. B225 CELL (Flat Contacts)
B225T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-115 milliamperes



B225
Flat Contacts

Inches	Millimeters
.012	.31
.016	.41
.024	.61
.240	6.1
.246	6.25
.351	8.92
.363	9.22
.914	23.2
.992	25.2



B225T
Two Solder Tabs

SPECIFICATIONS

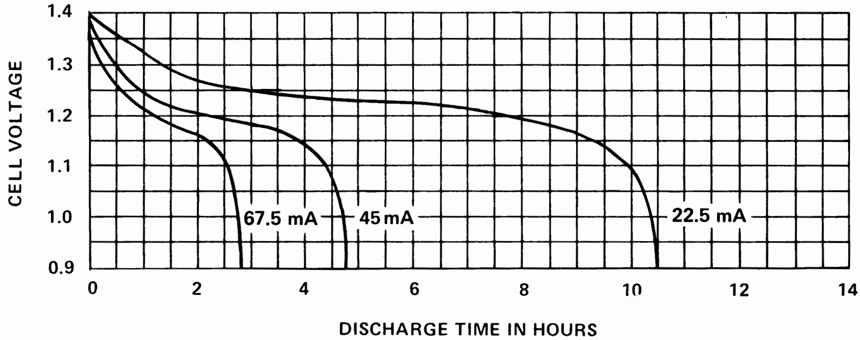
Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.1 volts) .... 225 milliampere-hours
(Rated at 22 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.45 oz. (12.8 grams)
Volume (by displacement) .... 0.23 cubic inch (3.77 cubic centimeters)
Cell.......................... One button (ANSI K28) (standard molded electrode)

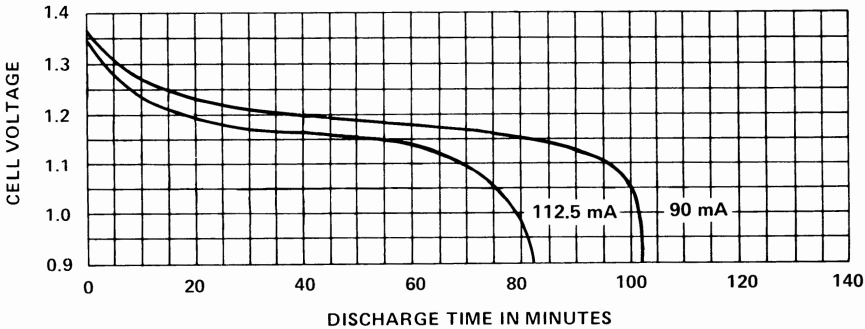
For service information see following pages

"EVEREADY" NOS. B225 & B225T

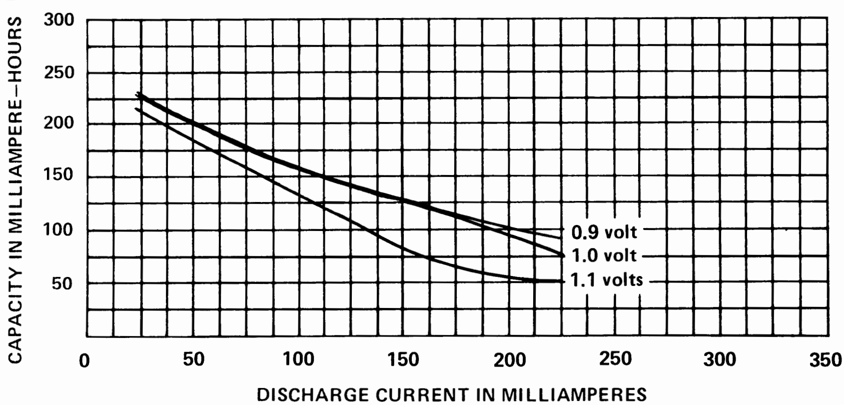
Average Performance Characteristics at 70° F (21.1° C)

Typical Discharge Curves





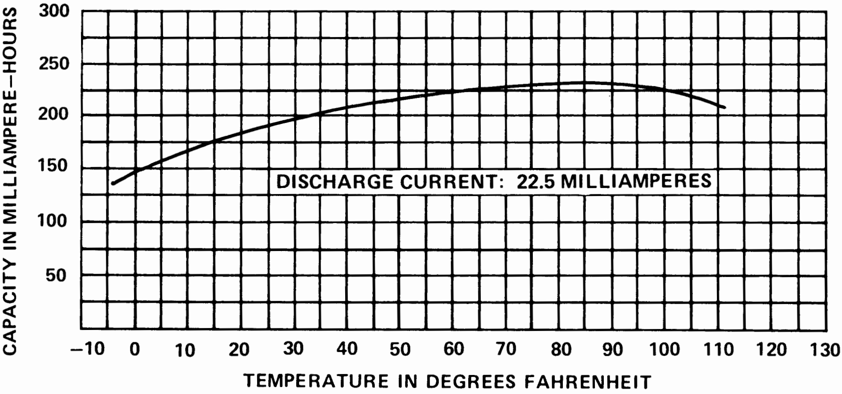
CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 200 milliampere discharge to a 0.9 volt endpoint. The B225 (or B225T) cell has a capacity of 100 milliampere-hours. (This provides a discharge time of 30 minutes.)

"EVEREADY" NOS. B225 & B225T

CAPACITY VS. TEMPERATURE

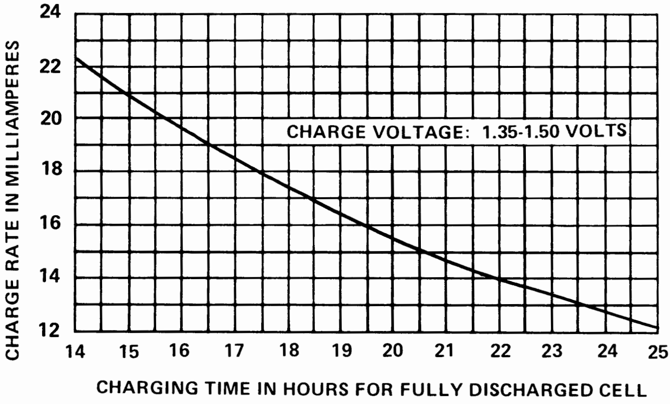


DEGREES	
F	C
−10	−23.3
0	−17.8
10	−12.2
20	−6.7
30	−1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9

Ranges of temperature applicable to operation of the BH225 (or B225T) cell are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (-20°C to 45°C)
Storage: −40°F to +140°F (-40°C to 60°C)

CHARGE RATE VS. CHARGING TIME



For partially discharged cells, reduce time or current proportionally.

"EVEREADY" NOS. B225 & B225T

Trickle Charge

Not recommended.

Internal Resistance

The internal resistance of a B225 (or B225T) cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged	Cell Discharged
465 milliohms	690 milliohms	1340 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a B225 (or B225T) cell varies with state of charge and frequency, as follows:

	Impedance (milliohms)		
Frequency (Hz)	Cell Charged	Cell ½ Discharged	Cell Discharged
50	200	330	440
100	190	250	350
1000	150	190	210
10000	120	140	135

(Tolerance of ± 20% applies to above values)

Polarity Reversal

The B225 (or B225T) cell can be reversed without damage for 5 hours at 22 milliamperes. This permits its use without hazard in series groups.

Soldering

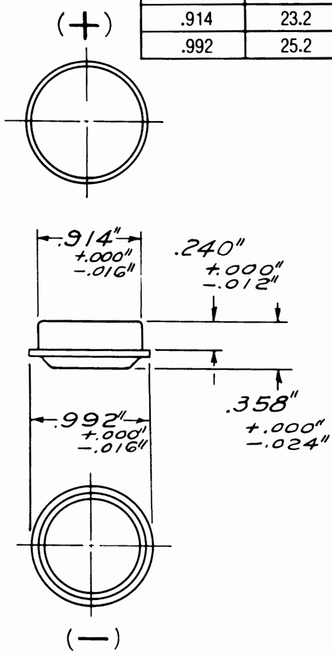
Do not make soldered connections to the B225 cell. Use the B225T cell for this purpose.

"EVEREADY" NO. BH225 CELL (Flat Contacts)
BH225T CELL (Two Solder Tabs)

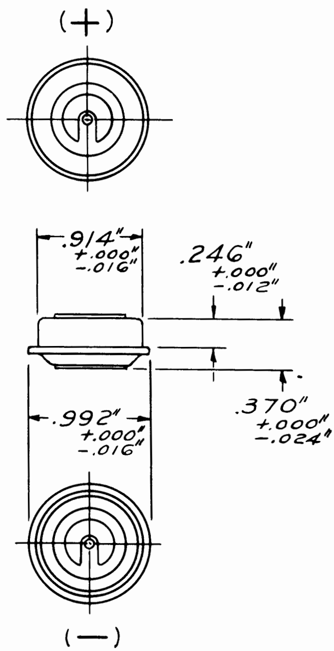
Type: Nickel-Cadmium

Suggested Current Range: 0-115 milliamperes

Inches	Millimeters
.012	.31
.016	.41
.024	.61
.240	6.1
.246	6.25
.358	9.09
.370	9.4
.914	23.2
.992	25.2



BH225
Flat Contacts



BH225T
Two Solder Tabs

SPECIFICATIONS

Voltage Taps .... −, + 1.2

Average Service Capacity (to 1.1 volts) .... 225 milliampere-hours
(Rated at 22 milliamperes)

Terminals .... Flat contacts or two solder tabs

Average Weight .... 0.47 oz. (13.3 grams)

Volume (by displacement).............. 0.23 cubic inch (3.8 cubic centimeters)

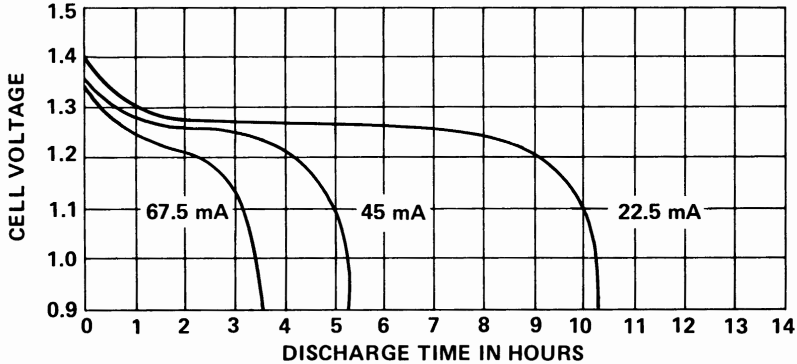
Cell .... One button (ANSI K28) [High Rate (molded electrode)]

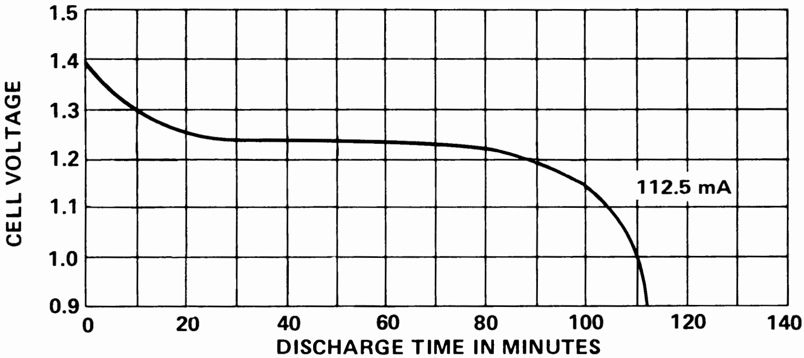
For service information see following pages

"EVEREADY" NOS. BH225 & BH225T

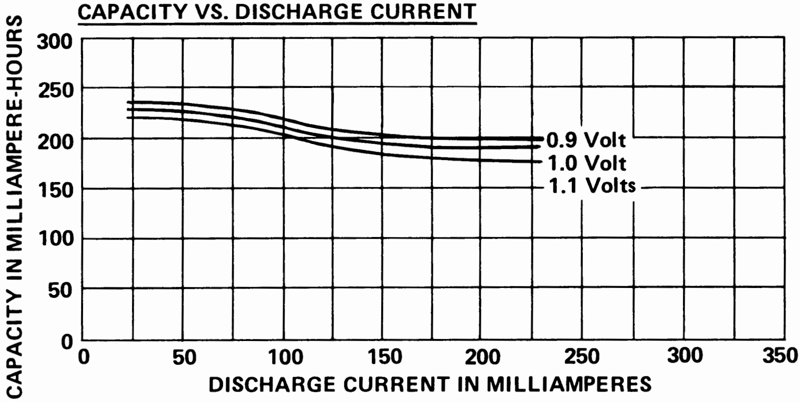
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves





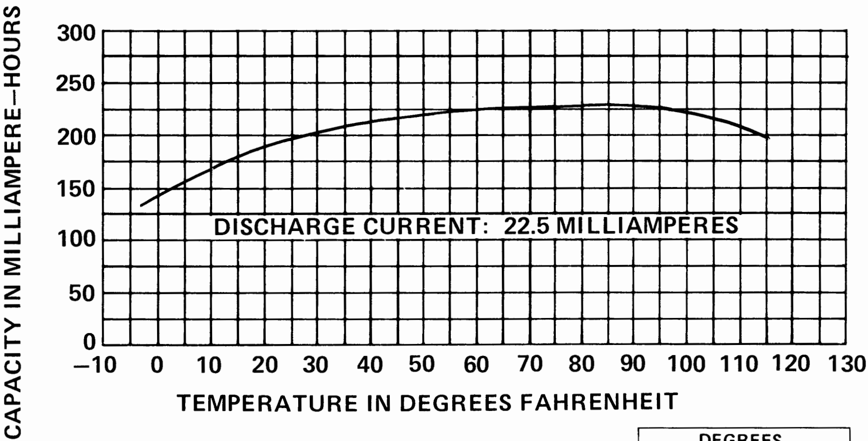
CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 175 milliampere discharge to a 0.9 volt endpoint. The BH225 (or BH225T) cell has a capacity of 200 milliampere-hours. (This provides a discharge time of 1.1 hours.)

"EVEREADY" NOS. BH225 & BH225T

CAPACITY VS. TEMPERATURE

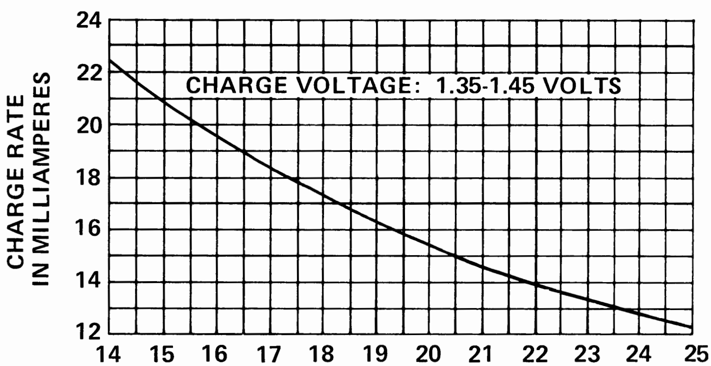


DEGREES	
F	C
–10	–23.3
0	–17.8
10	–12.2
20	–6.7
30	–1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9

Ranges of temperature applicable to operation of the BH225 (or BH225T) cell are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

CHARGE RATE VS. CHARGING TIME



CHARGING TIME IN HOURS FOR FULLY DISCHARGED CELL
For partially discharged cells, reduce time or current proportionally.

Trickle Charge

Not recommended.

"EVEREADY" NOS. BH225 & BH225T

Internal Resistance

The internal resistance of a BH225 (or BH225T) cell varies with state of charge, as follows:

Charged	½ Discharged	Discharged
230 milliohms	190 milliohms	310 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (no load)

The impedance of a BH225 (or BH225T) cell varies with state of charge and frequency, as follows:

	Impedance (milliohms)		
Frequency (Hz)	Charged	½Discharged	Discharged
50	110	120	205
100	100	115	175
1000	85	85	100
10000	65	65	60

(Tolerance of ± 20% applies to above values)

Polarity Reversal

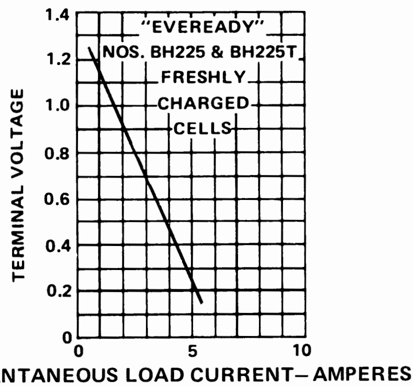
The BH225 (or BH225T) cell can be reversed without damage for 5 hours at 22 milliamperes. This permits its use without hazard in series groups.

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: not to exceed 15 ampere-seconds
Average current over entire discharge period: Not to exceed 0.75 ampere

Terminal Voltage vs. Load (for computing output power)



Soldering

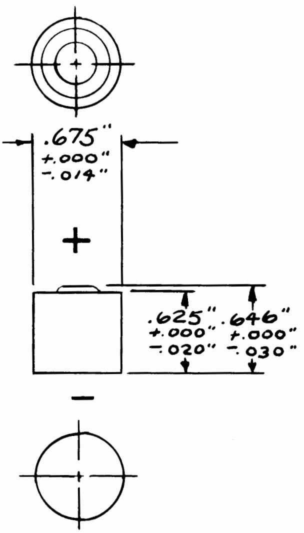
Do not make soldered connections to the BH225 cell. Use the BH225T cell for this purpose.

"EVEREADY" NO. CF225 CELL (Flat Contacts)
CF225T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-900 milliamperes

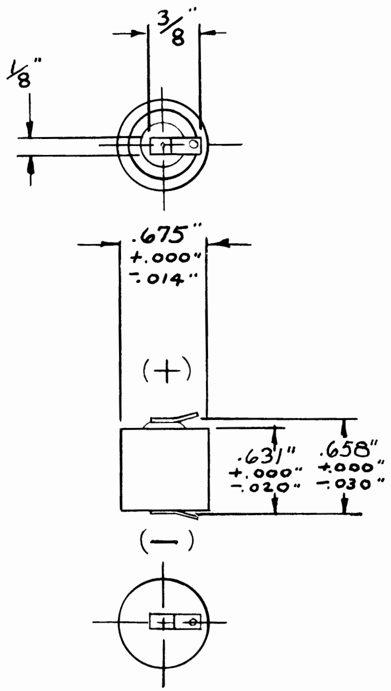
NOTE: See pages 393-401 for general information on Fast Charge cells.

Inches		Millimeters
	.014	.36
	.020	.51
	.030	.76
1/8	.125	3.18
3/8	.375	9.53
	.625	15.9
	.631	16
	.646	16.4
	.658	16.7
	.675	17.2



CF225
Flat Contacts

DIMENSIONS ARE FOR LABELED CELLS.



CF225T
Two Solder Tabs

SPECIFICATIONS

Voltage Taps .... –, + 1.2
Average Service Capacity (to 1.0 volt)........ 225 milliampere-hours
(Rated at 225 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.4 oz. (11.3 grams)
Volume (by displacement)........ 0.23 cubic inch (3.8 cubic centimeters)
Cell .... One cylindrical High Rate–Fast Charge

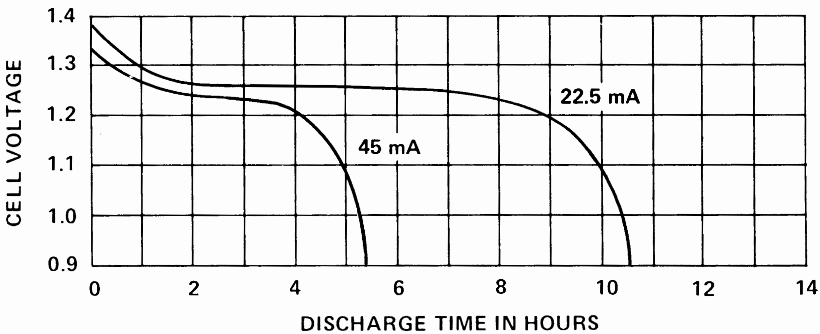
For service information see following pages

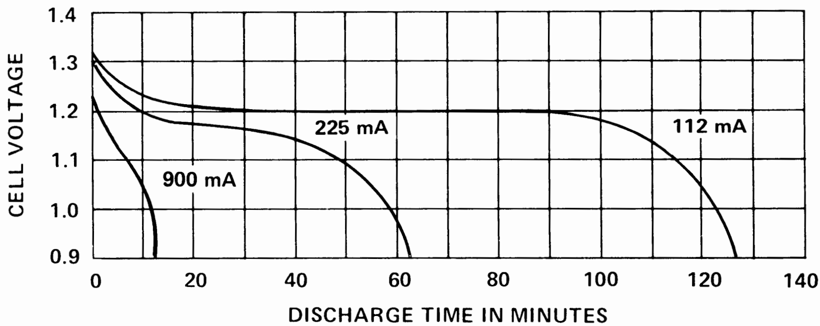
"EVEREADY" NOS. CF225 & CF225T

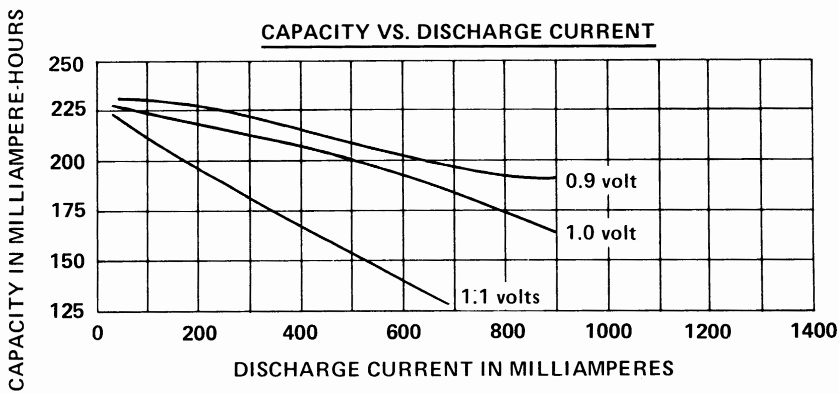
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves

The following performance curves assume the cells were fast charged at 75 milliamperes. A slight reduction in capacity will be experienced when charged at lower rates.







EXAMPLE: Assume a 500 milliampere discharge to a 1.0 volt endpoint. The CF225 (or CF225T) cell has a capacity of 200 milliampere-hours. (This provides a discharge time of 24 minutes.)

"EVEREADY" NOS. CF225 & CF225T

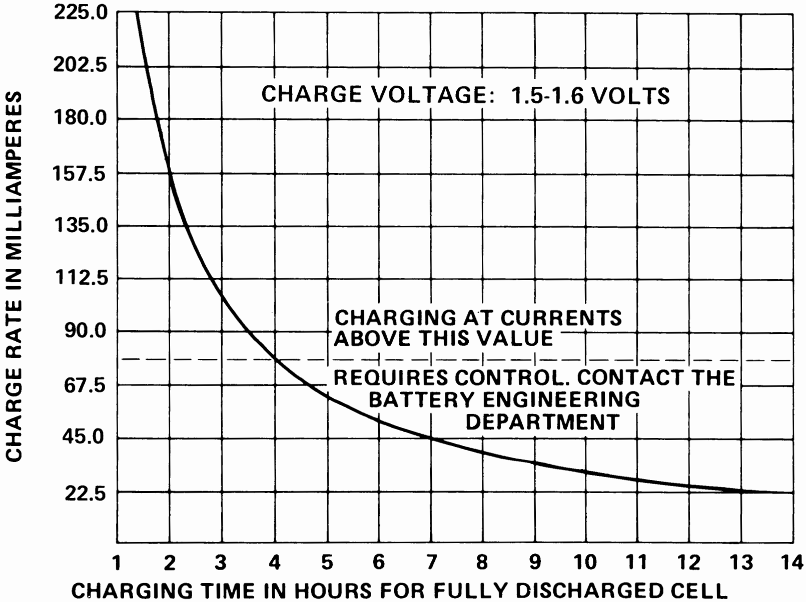
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CF225 or CF225T cell are:

Charge:	+60°F to +113°F (15.6°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

NOTE: See pages 393-401 for general information on Fast Charge cells.



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 4.5 to 7.5 mA.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 5.6mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 7.5 to 22.5 mA.

High Rate Charge

To charge cells for immediate use, charge at 22.5 to 75 mA. Occasional overcharging for up to three days at these rates will not adversely affect cell performance.

"EVEREADY" NOS. CF225 & CF225T

High Rate Charge with Control

To charge cells as quickly as possible charge at 75 to 225 mA with proper charge control device. Overcharging, which might harm the cells, is prevented by the charge control device.

Internal Resistance

The internal resistance of a CF225 or CF225T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
33 milliohms	45 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No load)

The impedance of a charged CF225 or CF225T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	33
1000	32
10000	34

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

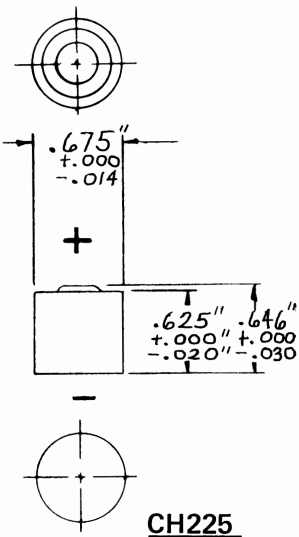
(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 18 ampere-seconds
Average current over entire discharge period:
not to exceed 750 milliamperes

"EVEREADY" NO. CH225 CELL (Flat Contacts)
CH225T CELL (Two Solder Tabs)

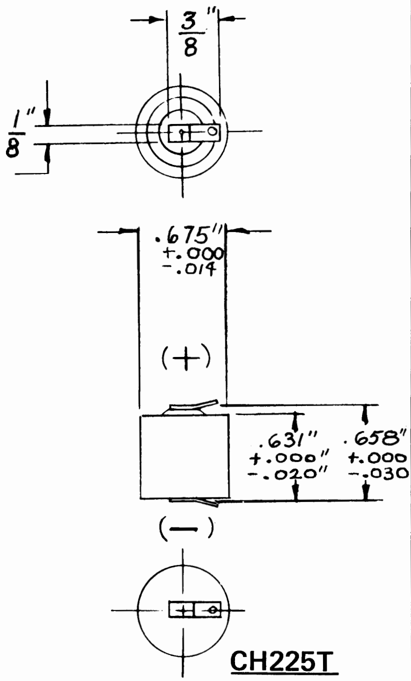
Type: Nickel-Cadmium
Suggested Current Range: 0-900 milliamperes

DIMENSIONS ARE FOR LABELED CELLS.

Inches		Millimeters
	.014	.36
	.020	.51
	.030	.76
1/8	.125	3.18
3/8	.375	9.53
	.625	15.9
	.631	16
	.646	16.4
	.658	16.7
	.675	17.2



CH225
Flat Contacts



CH225T
Two Solder Tabs

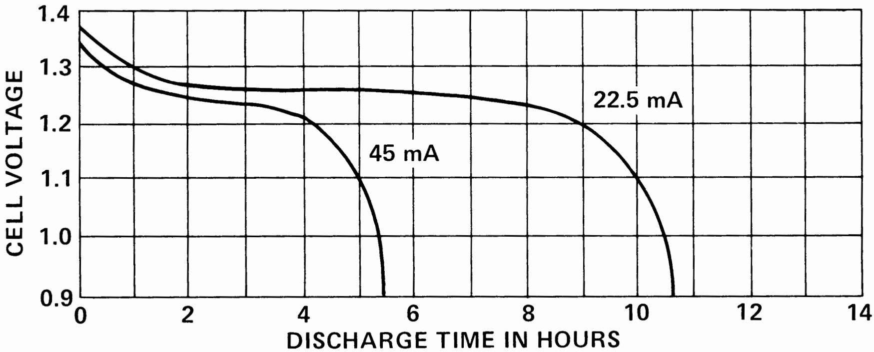
SPECIFICATIONS

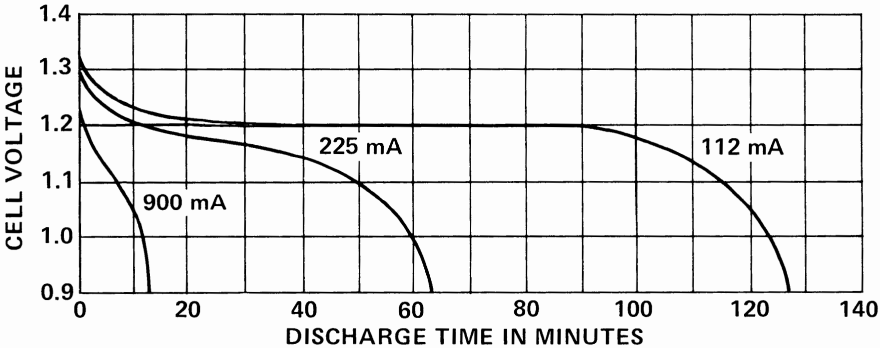
Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.0 volt) .... 225 milliampere-hours
(Rated at 225 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.4 oz. (11.3 grams)
Volume (by displacement) ....0.23 cubic inch (3.8 cubic centimeters)
Cell .... One cylindrical High Rate

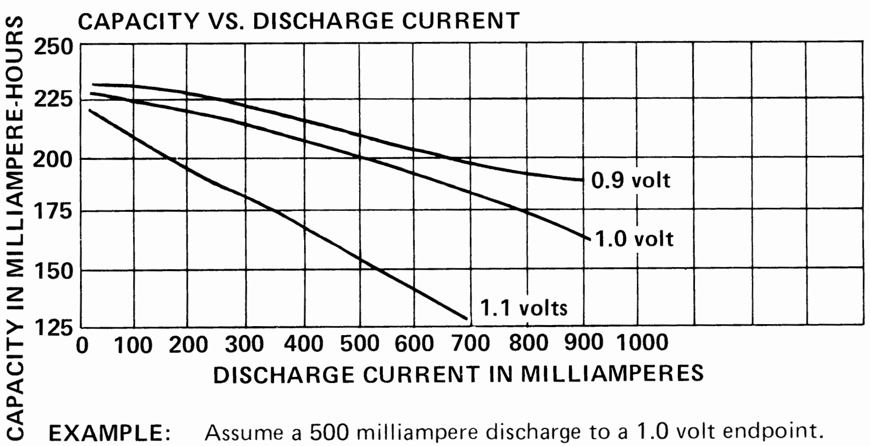
For service information see following pages

"EVEREADY" NOS. CH225 & CH225T

Average Performance Characteristics at 70°F (21.1°C) Typical Discharge Curves







EXAMPLE: Assume a 500 milliampere discharge to a 1.0 volt endpoint. The CH225 (or CH225T) has a capacity of 200 milliampere-hours. (This provides a discharge time of 24 minutes.)

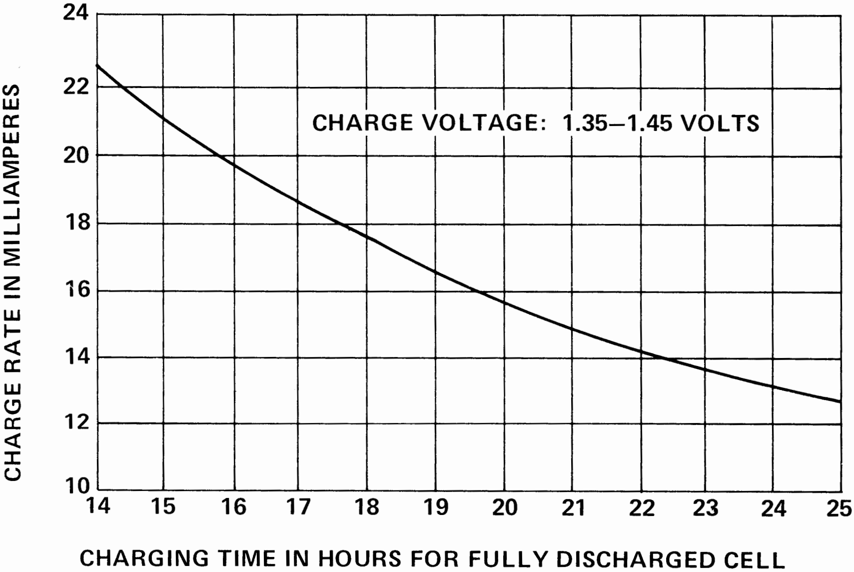
"EVEREADY" NOS. CH225 & CH225T

Operating & Storage Temperatures

Ranges of temperature applicable to operation of the CH225 or CH225T cell are:

Charge: $+32^{\circ}$F to $+113^{\circ}$F (0°C to 45°C)
Discharge: -4°F to $+113^{\circ}$F (-20°C to 45°C)
Storage: -40°F to $+140^{\circ}$F (-40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 4.5 to 7.5 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 5.6 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 7.5 to 22.5 mA.

"EVEREADY" NOS. CH225 & CH225T

Internal Resistance

The internal resistance of a CH225 or CH225T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
33 milliohms	45 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No load)

The impedance of a charged CH225 or CH225T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	33
1000	32
10000	34

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)

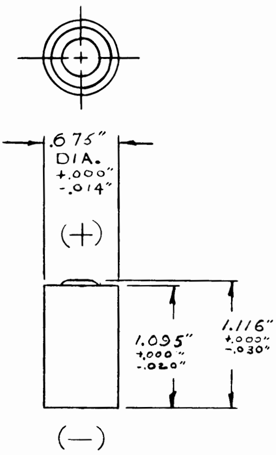
Discharge per pulse: Not to exceed 18 ampere-seconds.
Average current over entire discharge period: Not to exceed 750 milliamperes

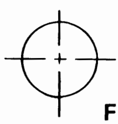
"EVEREADY" NO. CF450 CELL (Flat Contacts)
CF450T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-1.8 amperes

NOTE: SEE PAGES 393-401 for general information on Fast Charge cells.

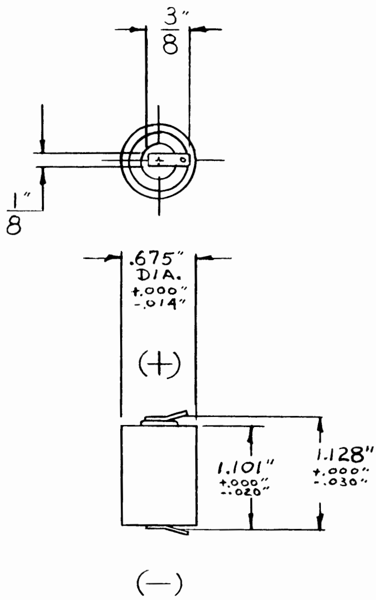
Inches		Millimeters
	.014	.36
	.020	.51
	.030	.76
1/8	.125	3.18
3/8	.375	9.53
	.675	17.2
	1.095	27.8
	1.101	28
	1.116	28.4
	1.128	28.7

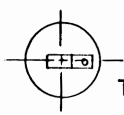




CF450
Flat Contacts

Dimensions are for labeled cells.





CF450T
Two Solder Tabs

SPECIFICATIONS

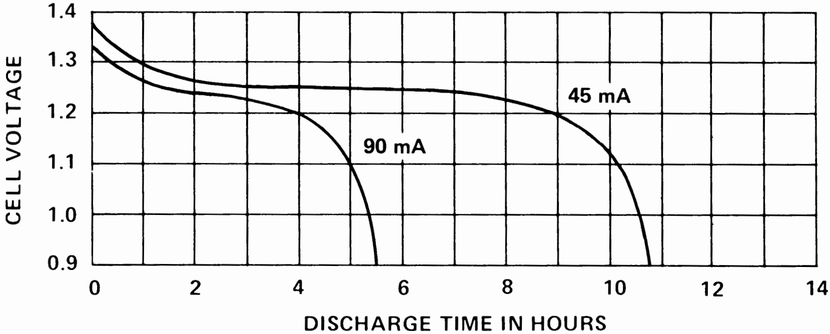
Voltage Taps .... –, + 1.2
Average Service Capacity (to 1.0 volt)...................... 450 milliampere-hours
(Rated at 450 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.71 oz. (20.1 grams)
Volume (by displacement) .... 0.4 cubic inch (6.6 cubic centimeters)
Cell .... One cylindrical—High Rate—Fast Charge

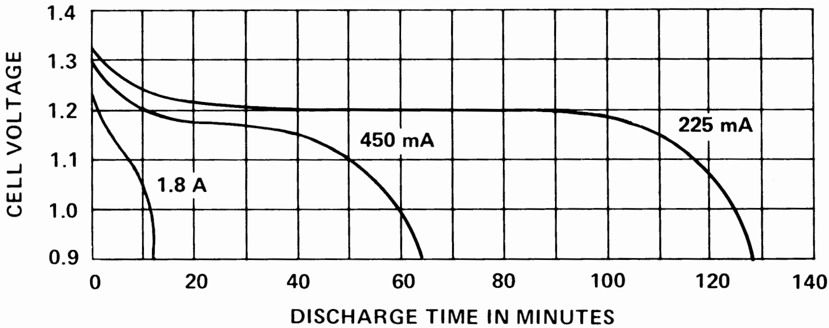
For service information see following pages

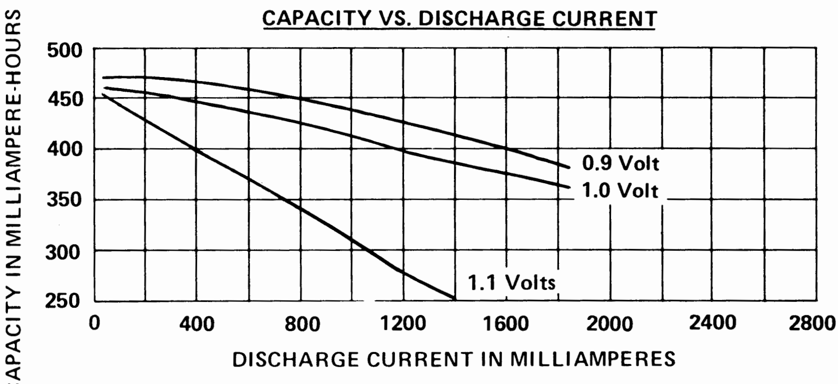
"EVEREADY" NOS. CF450 & CF450T

Average Performance Characteristics at 70°F (21.1°C)
Typical Discharge Curves

The following performance curves assume the cells were fast charged at 150 milliamperes. A slight reduction in capacity will be experienced when charged at lower rates.







EXAMPLE: Assume a 400 milliampere discharge to a 1.1 volt endpoint. The CF450 (or CF450T) cell has a capacity of 400 milliampere-hours. (This provides a discharge time of 1 hour.)

"EVEREADY" NOS. CF450 & CF450T

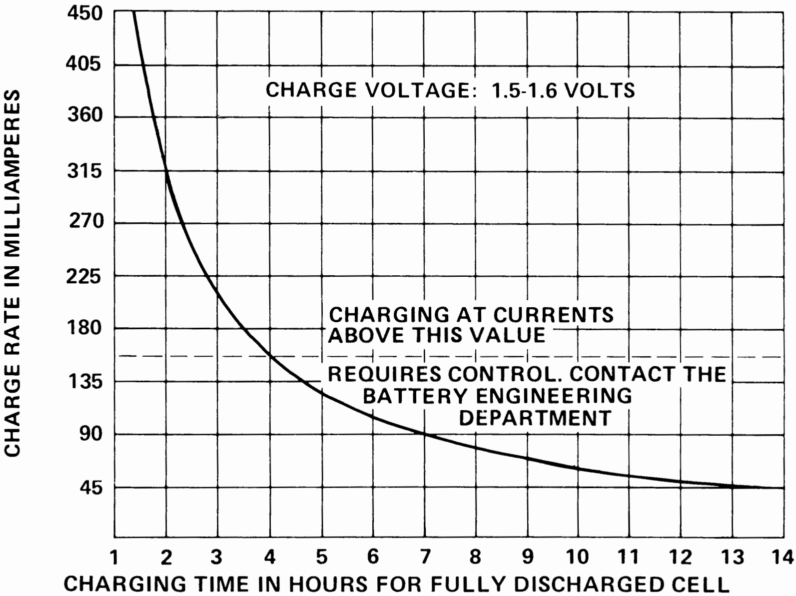
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CF450 or CF450T cell are:

Charge: +60°F to +113°F (15.6°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

Note: See pages 393-401 for general information on Fast Charge cells.



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 9 to 15 mA.
NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 11.3mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 15 to 45mA.

High Rate Charge

To charge cells for immediate use, charge at 45 to 150 mA. Occasional overcharging for up to three days at these rates will not adversely affect cell performance.

"EVEREADY" NOS. CF450 & CF450T

High Rate Charge with Control

To charge cells as quickly as possible charge at 150 to 450 mA. with proper charge control device. Overcharging, which might harm the cells, is prevented by the charge control device.

Internal Resistance

The internal resistance of a CF450 or CF450T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
25 milliohms	33 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (no load)

The impedance of a charged CF450 or CF450T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cells)
50	27
1000	22
10000	29

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 36 ampere-seconds.
Average current over entire discharge period: Not to exceed 1.5 amperes.

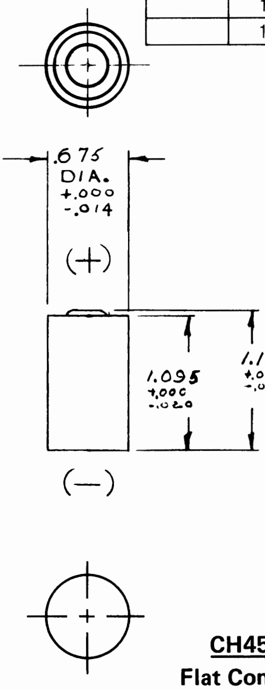
"EVEREADY" NO. CH450 CELL (Flat Contacts)
CH450T CELL (Two Solder Tabs)

1.2 VOLTS

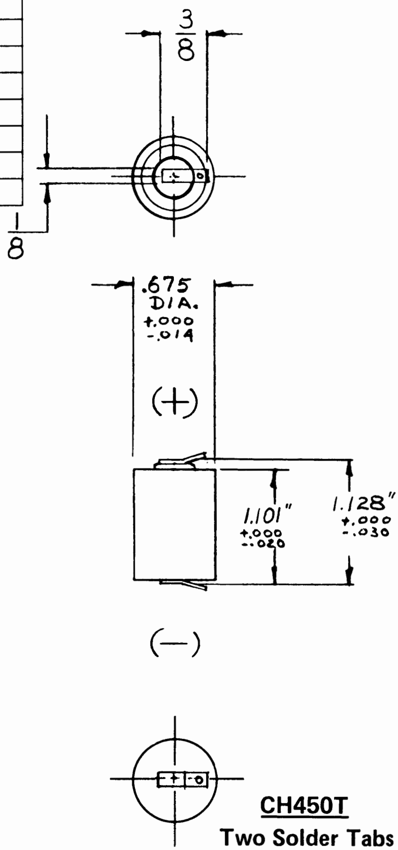
Type: Nickel - Cadmium
Suggested Current Range: 0-1.8 amperes

DIMENSIONS ARE FOR LABELED CELLS.

Inches		Millimeters
	.014	.36
	.020	.51
	.030	.76
1/8	.125	3.18
3/8	.375	9.53
	.675	17.2
	1.095	27.8
	1.101	28
	1.116	28.4
	1.128	28.7



CH450
Flat Contacts



CH450T
Two Solder Tabs

SPECIFICATIONS

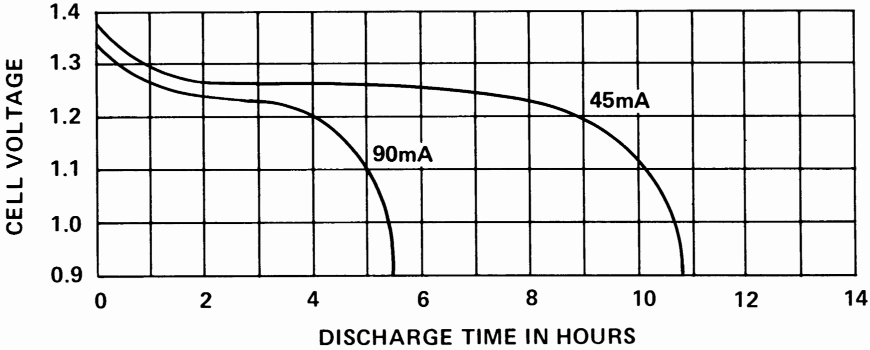
Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.0 volt)...................... 450 milliampere-hours
(Rated at 450 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.71 oz. (20.1 grams)
Volume (by displacement) .... 0.4 cubic inch (6.6 cubic centimeters)
Cell .... One cylindrical — High Rate

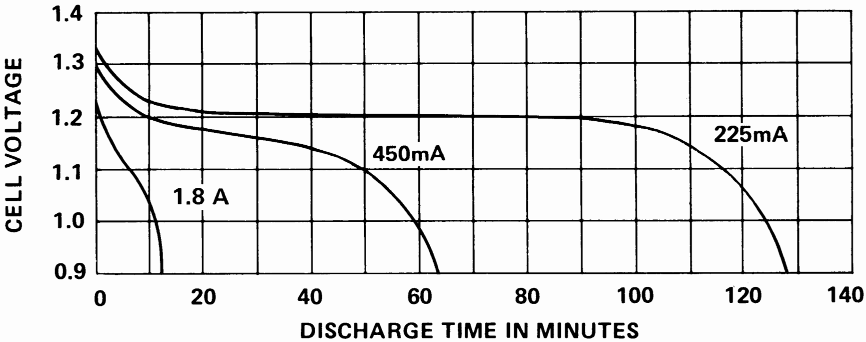
For service information see following pages

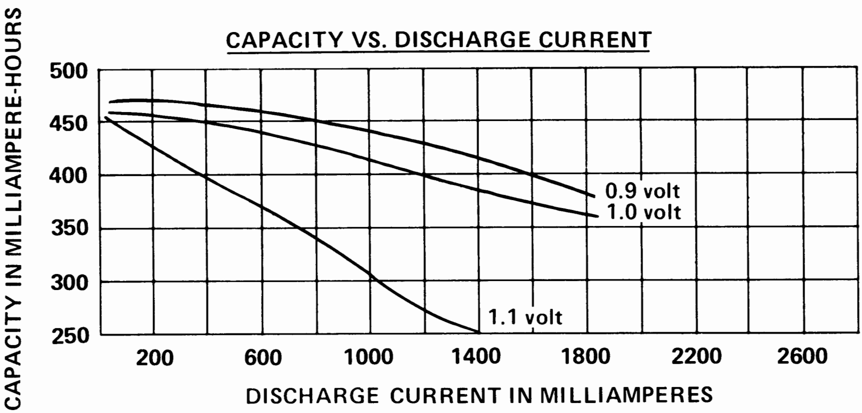
"EVEREADY" NOS. CH450 & CH450T

Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves







Example: Assume a 1600 milliampere discharge to a 0.9 volt endpoint. The CH450 or CH450T cell has a capacity of 400 milliampere-hours. (This provides a discharge time of 15 minutes).

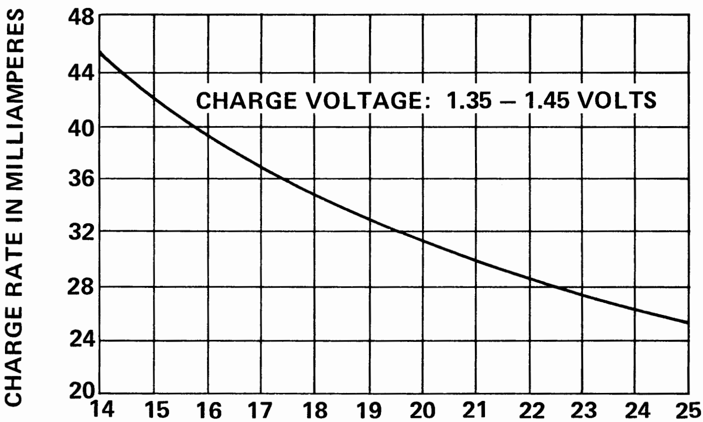
"EVEREADY" NOS. CH450 & CH450T

Operating & Storage Temperatures

Ranges of temperature applicable to operation of the CH450 or CH450T cell are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



CHARGING TIME IN HOURS FOR FULLY DISCHARGED CELL

For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell, for standby service, charge at 9 to 15 milliamperes.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 11.3 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 15 to 45 mA.

"EVEREADY" NOS. CH450 & CH450T

Internal Resistance

The internal resistance of a CH450 or CH450T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
25 milliohms	33 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (no load)

The impedance of a charged CH450 or CH450T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	27
1000	22
10000	29

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)

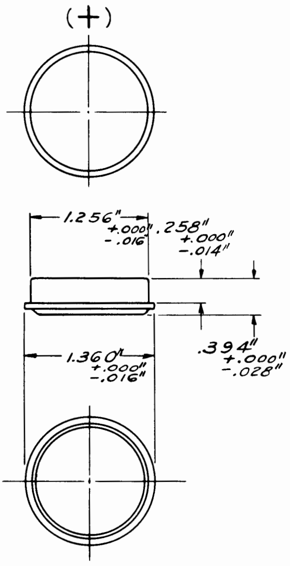
Discharge per pulse: Not to exceed 36 ampere-seconds.

Average current over entire discharge period: Not to exceed 1.5 amperes.

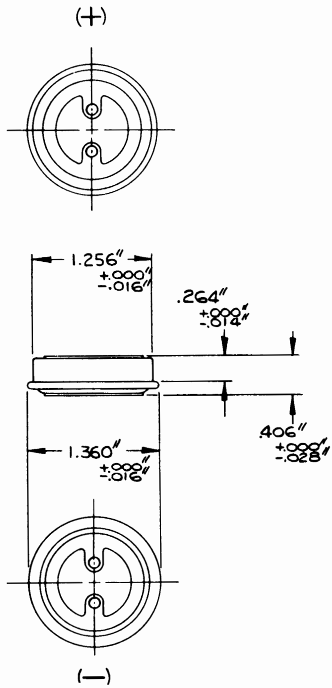
"EVEREADY" NO. BH500 CELL (Flat Contacts)
BH500T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-250 milliamperes

Inches	Millimeters
.014	.36
.016	.41
.028	.71
.258	6.55
.264	6.71
.394	10.
.406	10.3
1.256	31.9
1.360	34.5



BH500
Flat Contacts



BH500T
Two Solder Tabs

SPECIFICATIONS

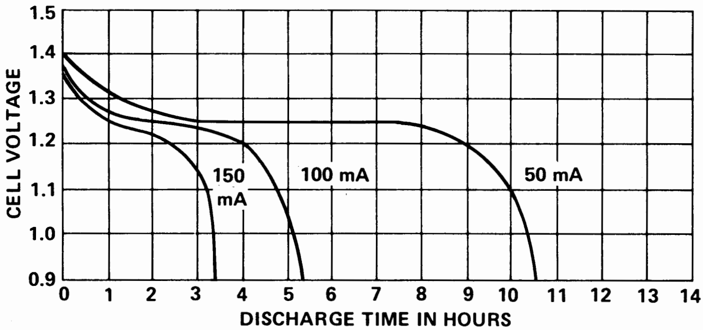
Voltage Taps ....—, + 1.2
Average Service Capacity (to 1.1 volts) .... 500 milliampere-hours
(Rated at 50 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 1.0 oz. (28.4 grams)
Volume (by displacement) ....0.43 cubic inch (7.1 cubic centimeters)
Cell ....One button (ANSI K45) [High Rate (molded electrode)]

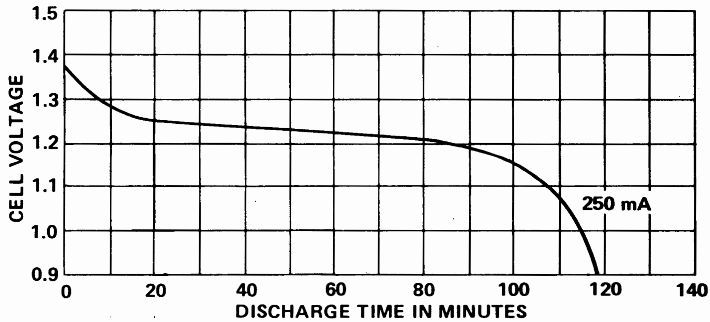
For service information see following pages

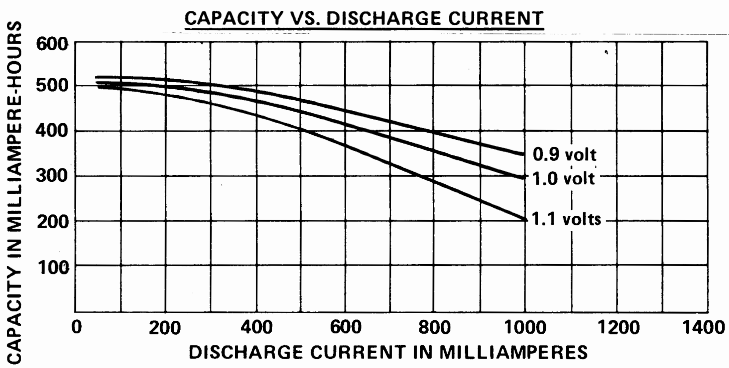
"EVEREADY" NO. BH500 CELL & BH500T

Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves



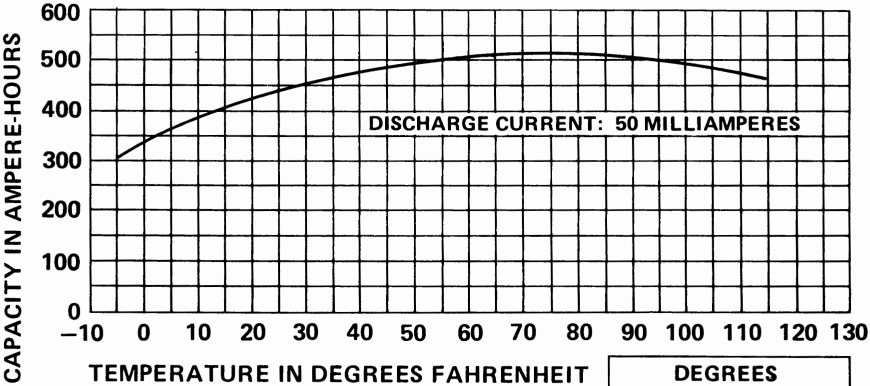




EXAMPLE: Assume a 500 milliampere discharge to a 1.1 volt endpoint. The BH500 (or BH500T) cell has a capacity of 400 milliampere-hours. (This provides a discharge time of 48 minutes.)

"EVEREADY" NOS. BH500 & BH500T

CAPACITY VS. TEMPERATURE

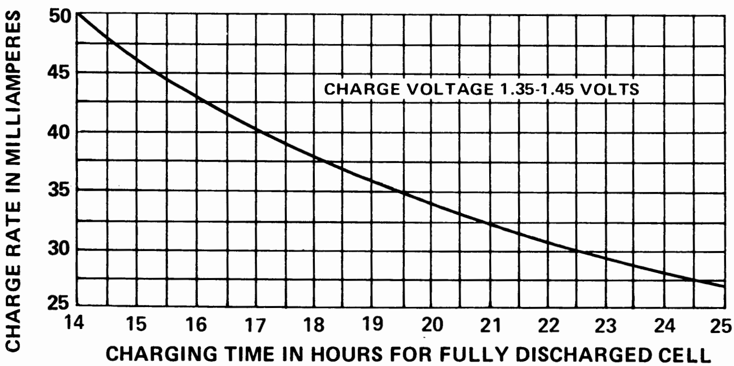


DEGREES	
F	C
–10	–23.3
0	–17.8
10	–12.2
20	–6.7
30	–1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9
130	54.4

Ranges of temperature applicable to operation of the BH500 (or BH500T) cell are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

CHARGE RATE VS. CHARGING TIME



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

Not recommended.

"EVEREADY" NO. BH500 CELL & BH500T

Internal Resistance

The internal resistance of a BH500 (or BH500T) cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged	Cell Discharged
100 milliohms	85 milliohms	220 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (no load)

The impedance of a BH500 (or BH500T) cell varies with state of charge and frequency, as follows:

	Impedance (milliohms)		
Frequency (Hz)	Cell Charged	Cell ½ Discharged	Cell Discharged
50	75	75	130
100	70	65	90
1000	65	55	55
10000	50	45	40

(Tolerance of ± 20% applies to above values)

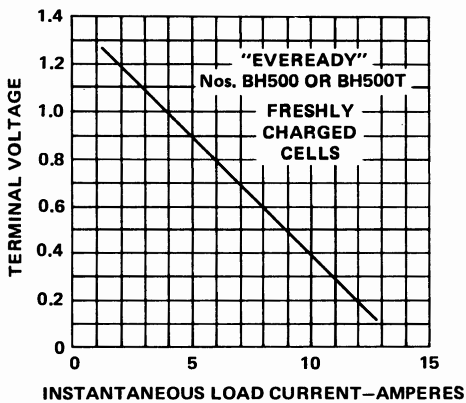
Polarity Reversal

The BH500 (or BH500T) cell can be reversed without damage for 5 hours at 50 milliamperes. This permits its use without hazard in series groups.

Pulse Discharge Capabilities
Pulse of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 25 ampere-seconds.
Average current over entire discharge period: Not to exceed 1.3 amperes.

Terminal Voltage vs. Load (for computing output power)



Soldering

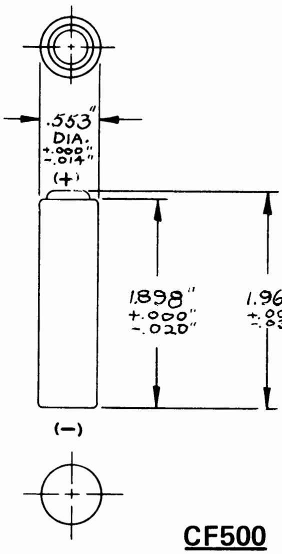
Do not make soldered connections to the BH500 cell. Use the BH500T cell for this purpose.

"EVEREADY" NO. CF500 CELL (Flat Contacts)
CF500T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-2 amperes

NOTE: See pages 393-401 for general information on Fast Charge cells.

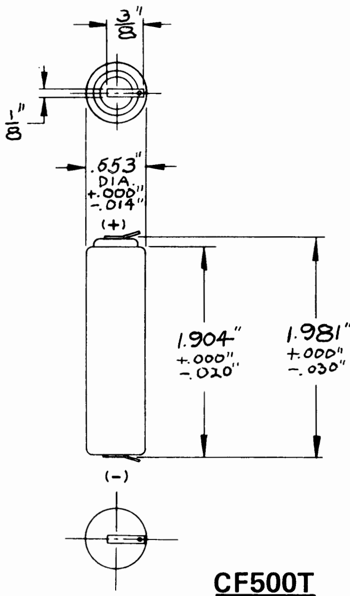
Inches		Millimeters
	.014	.36
	.020	.51
	.030	.76
1/8	.125	3.18
3/8	.375	9.53
	.553	14.1
	1.898	48.2
	1.904	48.4
	1.969	50.
	1.981	50.3



CF500
Flat Contacts

Dimensions are for labeled cells

NOTE: Starting June 1, 1976 the number for CF500 will be changed to CF15 and the number for CF500T to CF15T.



CF500T
Two Solder Tabs

SPECIFICATIONS

Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.0 volt) .... 500 milliampere-hours
(Rated at 500 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.8 oz. (22.7 grams)
Volume (by displacement) .... 0.42 cubic inch (6.9 cubic centimeters)
Cell .... One cylindrical (ANSI K40) (AA size) High Rate—Fast Charge

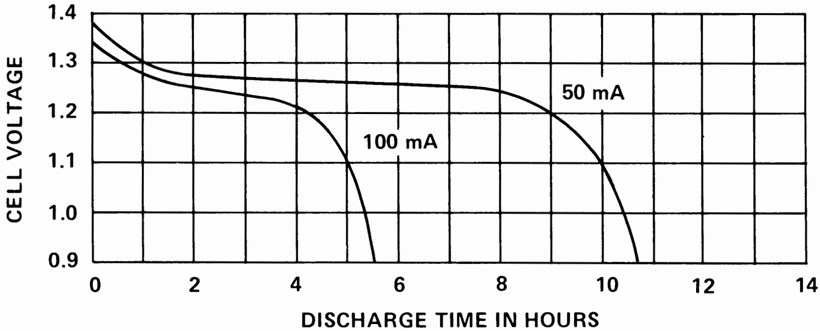
For service information see following pages

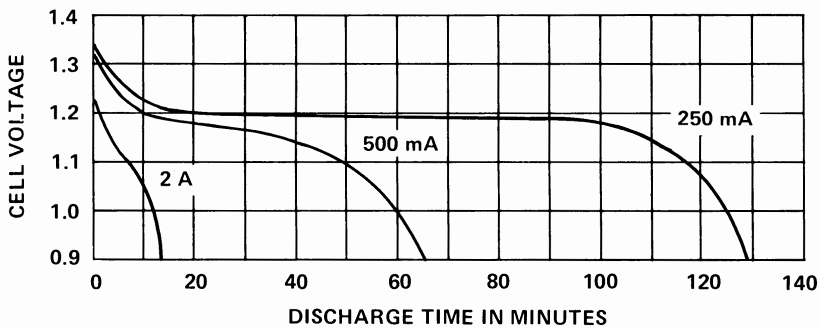
"EVEREADY" NOS. CF500 & CF500T

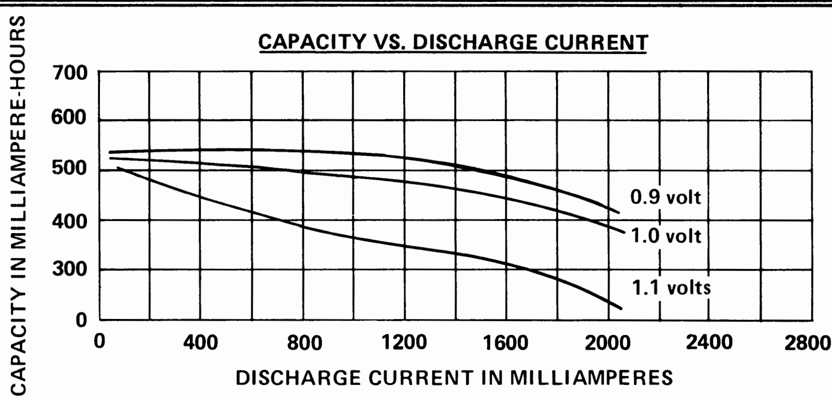
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves

The following performance curves assume the cells were fast charged at 175 milliamperes. A slight reduction in capacity will be experienced when charged at lower rates.







EXAMPLE: Assume an 800 milliampere discharge to a 1.0 volt endpoint. The CF500 (or CF500T) cell has a capacity of 500 milliampere-hours. (This provides a discharge time of 38 minutes).

"EVEREADY" NOS. CF500 & CF500T

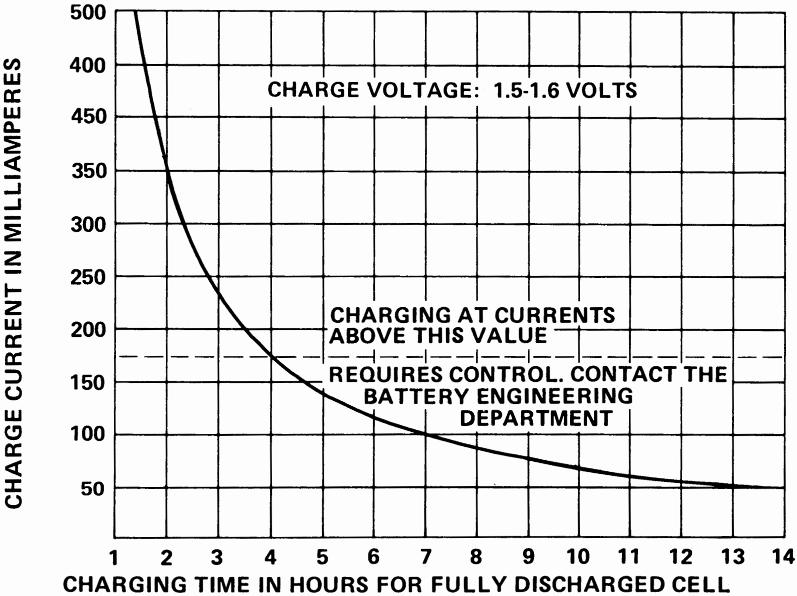
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CF500 or CF500T cell are:

Charge: +60°F to +113°F (15.6°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

Note: See pages 393-401 for general information on Fast Charge cells.



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 10 to 17 mA.
NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 12.5mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 17 to 50 mA.

High Rate Charge

To charge cells for immediate use, charge at 50 to 170 mA. Occasional overcharging for up to three days at these rates will not adversely affect cell performance.

"EVEREADY" NOS. CF500 & CF500T

High Rate Charge with Control

To charge cells as quickly as possible charge at 170 to 500 mA with proper charge control device. Overcharging, which might harm the cells is prevented by the charge control device.

Internal Resistance

The internal resistance of a CF500 or CF500T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
27 milliohms	30 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (no load)

The impedance of a charged CF500 or CF500T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cells)
50	21
1000	19
10000	19

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 40 ampere-seconds
Average current over entire discharge period: Not to exceed 2 amperes

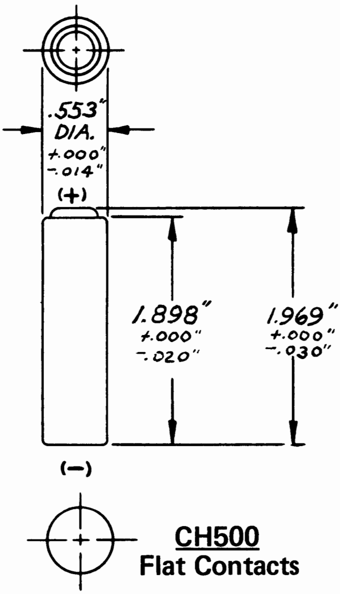
"EVEREADY" NO. CH500 CELL (Flat Contacts)
CH500T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-2 amperes

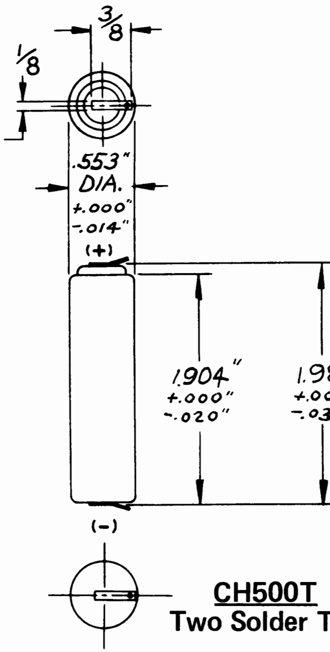
DIMENSIONS ARE FOR LABELED CELLS.

Inches		Millimeters
	.014	.36
	.020	.51
	.030	.76
1/8	.125	3.18
3/8	.375	9.53
	.553	14.1
	1.898	48.2
	1.904	48.4
	1.969	50.
	1.981	50.3

NOTE: Starting June 1, 1976 the number for CH500 will be changed to CH15 and the number for CH500T to CH15T.



CH500
Flat Contacts



CH500T
Two Solder Tabs

SPECIFICATIONS

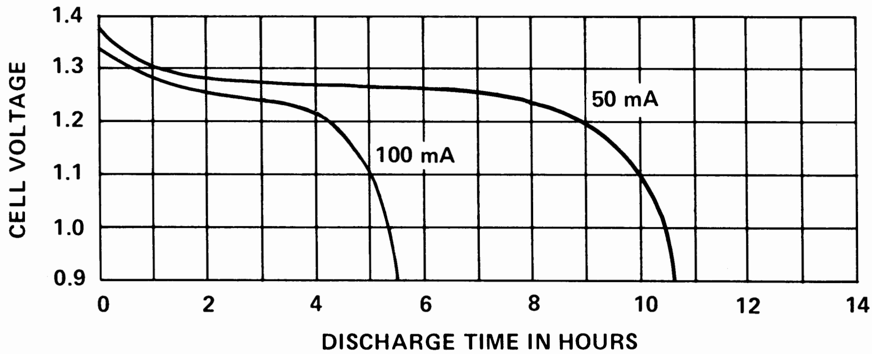
Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.0 volt) .... 500 milliampere-hours
(Rated at 500 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 0.8 oz. (22.7 grams)
Volume (by displacement) .... 0.42 cubic inches (6.9 cubic centimeters)
Cell .... One cylindrical (ANSI K40) (AA size) High Rate

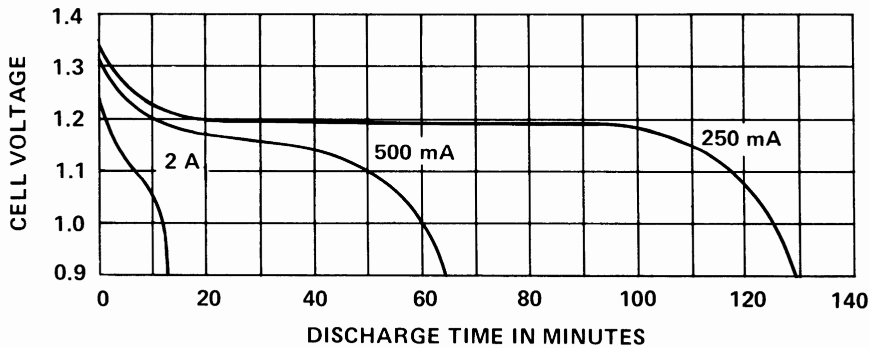
For service information see following pages

"EVEREADY" NOS. CH500 & CH500T

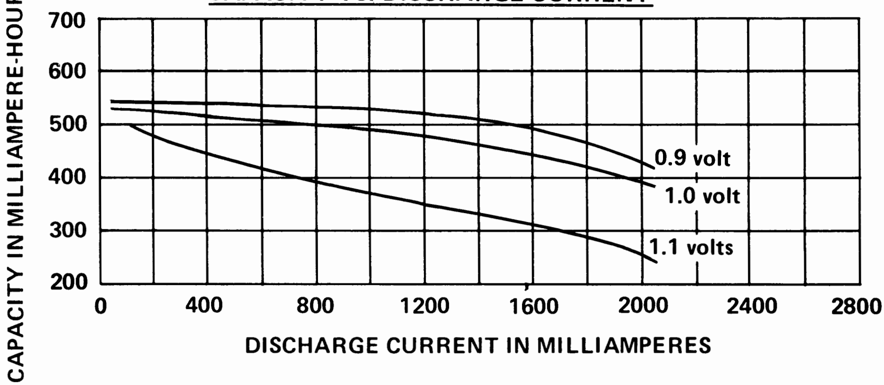
Average Performance Characteristics at 70°F(21.1°C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume an 800 milliampere discharge to a 1.0 volt endpoint. The CH500 or CH500T cell has a capacity of 500 milliampere-hours. (This provides a discharge time of 38 minutes.)

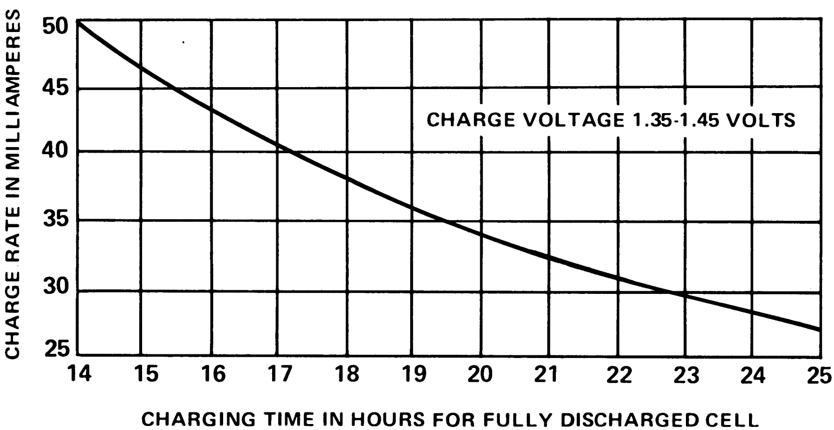
"EVEREADY" NOS. CH500 & CH500T

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH500 or CH500T cell are:

Charge: +32° F to +113° F (0° C to 45° C)
Discharge: – 4° F to +113° F (–20° C to 45° C)
Storage: –40° F to +140° F (–40° C to 60° C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service charge at 10 to 17 milliamperes.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 12.5 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 17 to 50 mA.

"EVEREADY" NOS. CH500 & CH500T

Internal Resistance

The internal resistance of a CH500 or CH500T cell varies with state of charge as follows:

Cell Charged	Cell ½ Discharged
27 milliohms	30 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a charged CH500 or CH500T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	21
1000	19
10000	19

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

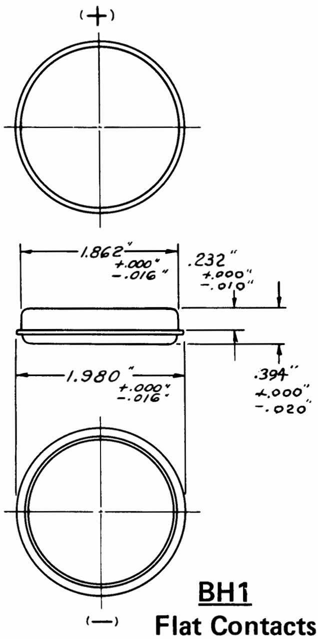
Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 40 ampere-seconds
Average current over entire discharge period: not to exceed 2 amperes

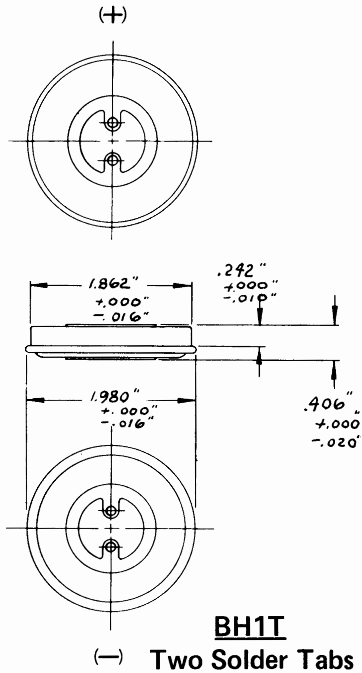
"EVEREADY" NO. BH1 CELL (Flat Contacts)
BH1T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-500 milliamperes

Inches	Millimeters
.010	.25
.016	.41
.020	.51
.232	5.89
.242	6.15
.394	10.
.406	10.3
1.862	47.3
1.980	50.3



BH1
Flat Contacts



BH1T
Two Solder Tabs

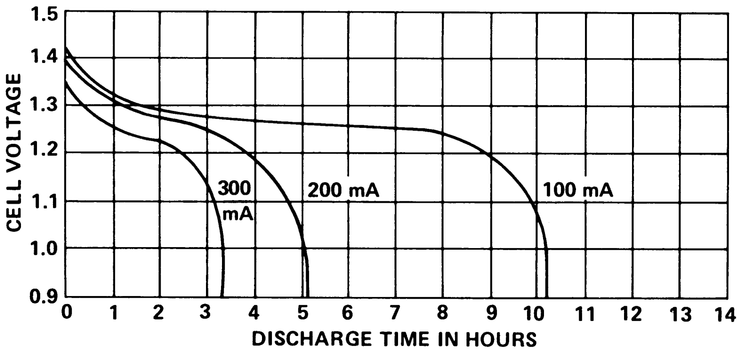
SPECIFICATIONS

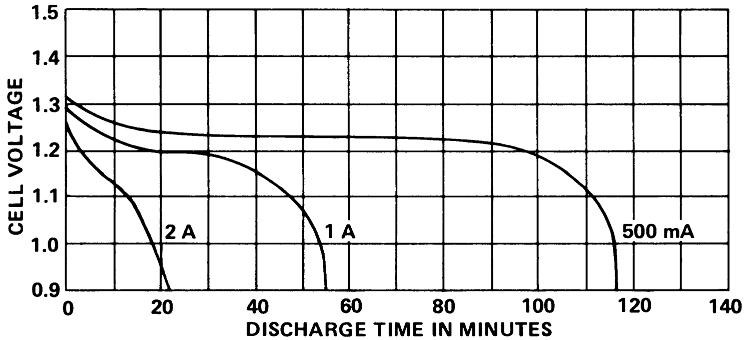
Voltage Taps .... —, + 1.2
Average Service Capacity (to 1.1 volts) .... 1 ampere-hour
(Rated at 100 milliamperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 2 oz. (56.7 grams)
Volume (by displacement) .... 0.85 cubic inch (13.9 cubic centimeters)
Cell .... One button (ANSI K65) [High Rate (molded electrode)]

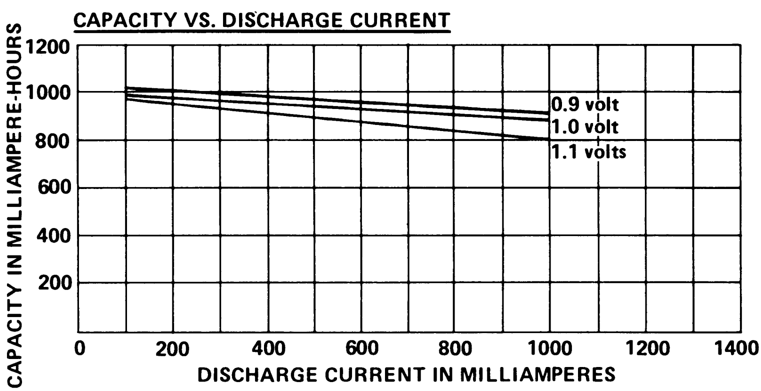
For service information see following pages

"EVEREADY" NOS. BH1 & BH1T

Average Performance Characteristics at 70°F (21.1°C) Typical Discharge Curves



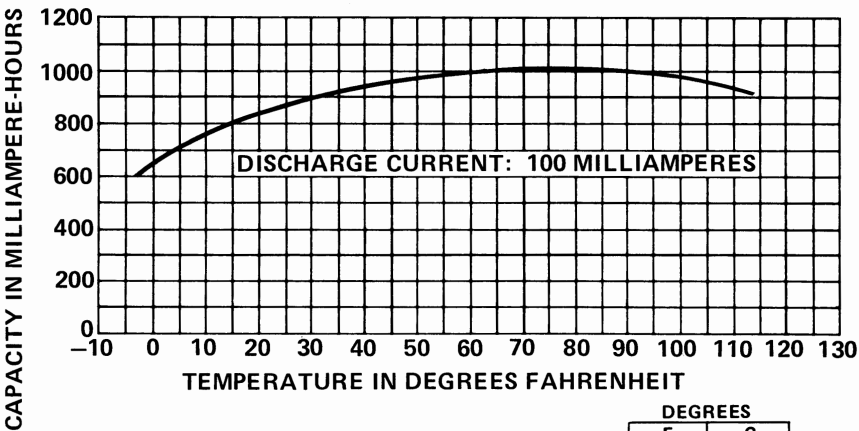




EXAMPLE: Assume an 800 milliampere discharge to a 1.0 volt endpoint. The BH1 & BH1T cells have a capacity of 900 milliampere-hours. (This provides a discharge time of 1.13 hours.)

"EVEREADY" NOS. BH1 & BH1T

CAPACITY VS. TEMPERATURE



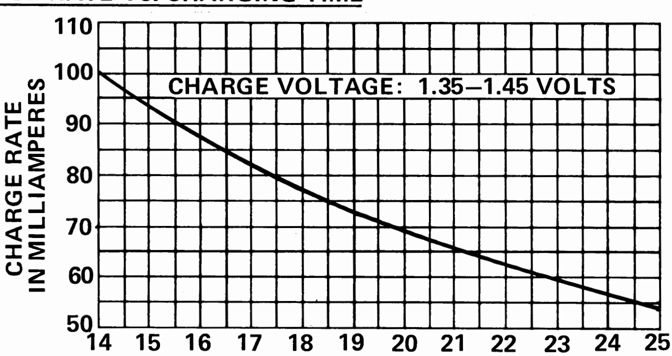
DEGREES

F	C
–10	–23.3
0	–17.8
10	–12.2
20	–6.7
30	–1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3

Ranges of temperature applicable to operation of the BH1 (or BH1T) cell are:

Charge: $+32^{o}$F to $+113^{o}$F (0^{o}C to 45^{o}C)
Discharge: -4^{o}F to $+113^{o}$F (-20^{o}C to 45^{o}C)
Storage: -40^{o}F to $+140^{o}$F (-40^{o}C to 60^{o}C)

CHARGE RATE VS. CHARGING TIME



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

Not recommended.

"EVEREADY" NOS. BH1 & BH1T

Internal Resistance

The internal resistance of a BH1 (or BH1T) cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged	Cell Discharged
60 milliohms	50 milliohms	150 milliohms

(Tolerance of ±20% applies to above values)

Impedance (No Load)

The impedance of a BH1 (or BH1T) cell varies with state of charge and frequency, as follows:

	IMPEDANCE (milliohms)		
Frequency (Hz)	Cell Charged	Cell ½ Discharged	Cell Discharged
50	26	28	60
100	24	26	45
1000	21	21	21
10000	21	20	20

(Tolerance of ±20% applies to above values)

Polarity Reversal

The BH1 (or BH1T) cell can be reversed without damage for 5 hours at 100 milliamperes. This permits its use without hazard in series groups.

Pulse Discharge Capabilities

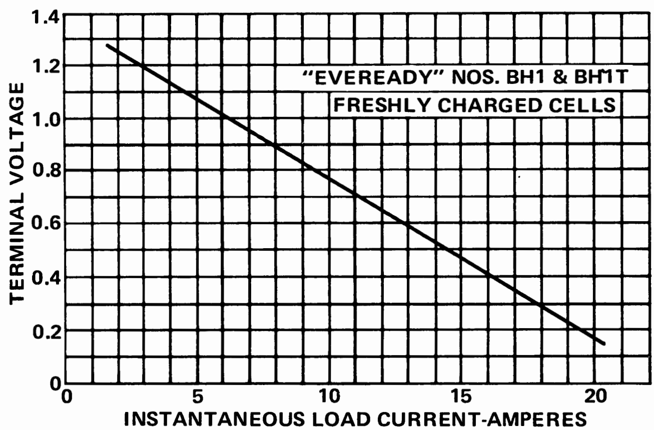
Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)

Discharge per pulse: Not to exceed 50 ampere-seconds

Average current over entire discharge period: Not to exceed 2.5 amperes

Terminal Voltage vs. Load (FOR COMPUTING OUTPUT POWER)



Soldering

Do not solder connections to the BH1 cell. Use the BH1T cell for this purpose.

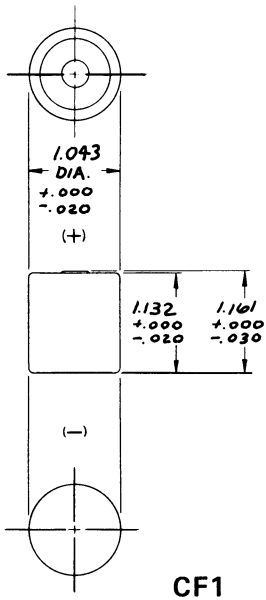
"EVEREADY" NO. CF1 CELL (Flat Contacts)

CF1T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-4 amperes

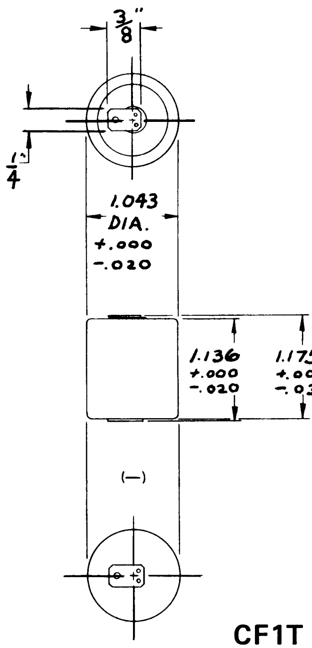
NOTE: See pages 393-401 for general information on Fast Charge cells.

Inches		Millimeters
	.020	.51
	.030	.76
1/4	.250	6.35
3/8	.375	9.53
	1.043	26.5
	1.132	28.8
	1.136	28.9
	1.161	29.5
	1.175	29.9



CF1
Flat Contacts

Dimensions are for labeled cells



CF1T
Two Solder Tabs

SPECIFICATIONS

Voltage Taps .... —, + 1.2
Average Service Capacity (to 1.0 volt) .... 1 ampere-hour
(Rated at 1 ampere)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 1.8 oz. (51 grams)
Volume (by displacement) .... 0.89 cubic inch (14.6 cubic centimeters)
Cell.. One cylindrical High Rate—Fast Charge

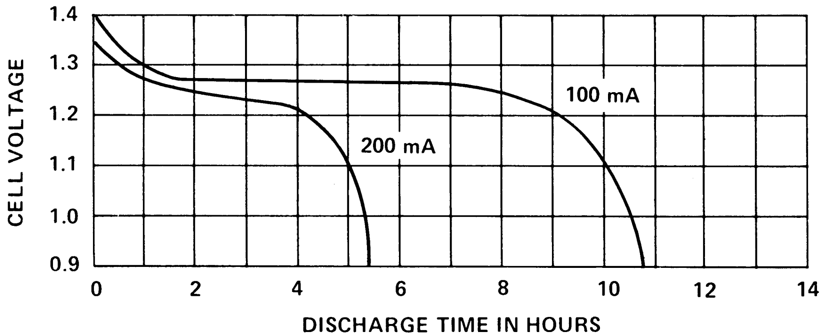
For service information see following pages

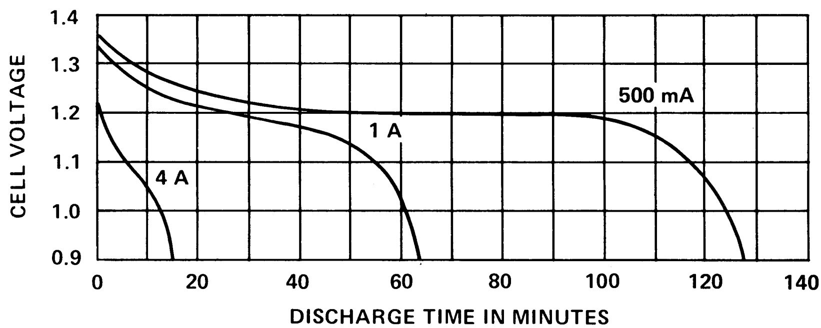
"EVEREADY" NOS. CF1 & CF1T

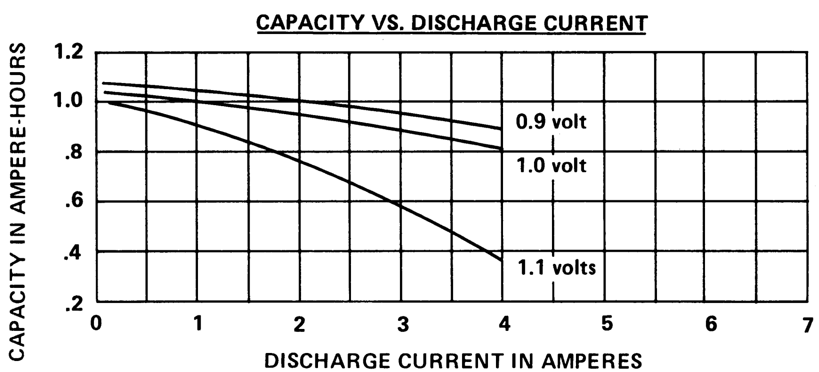
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves

The following performance curves assume the cells were fast charged at 350 milliamperes. A slight reduction in capacity will be experienced when charged at lower rates.







EXAMPLE: Assume a 2 ampere discharge to a 0.9 volt endpoint. The CF1 and CF1T cells have a capacity of 1 ampere hour. (This provides a discharge time of 30 minutes.)

"EVEREADY" NOS. CF1 & CF1T

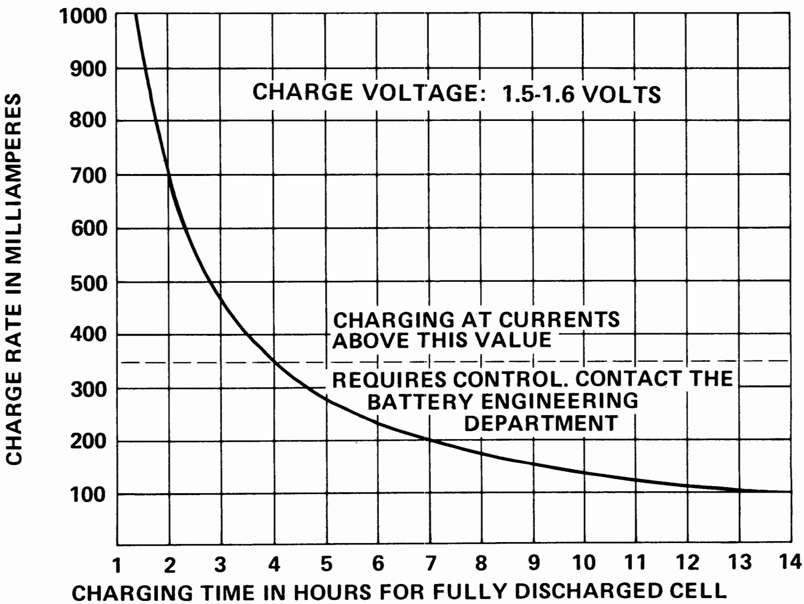
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CF1 or CF1T cell are:

Charge:	**+60° F to +113° F (15.6°C to 45°C)**
Discharge:	**– 4° F to +113° F (–20°C to 45°C)**
Storage:	**–40° F to +140° F (–40°C to 60°C)**

Charge Rate vs. Charging Time

NOTE: See pages 393-401 for general information on Fast Charge cells.



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 20 to 33 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 25 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 33 to 100 mA.

High Rate Charge

To charge cells for immediate use, charge at 100 to 333 mA. Occasional overcharging for up to three days at these rates will not adversly affect cell performance.

"EVEREADY" NOS. CF1 & CF1T

High Rate Charge with Control

To charge cells as quickly as possible charge at 333 to 1000 mA with proper charge control device, Overcharging, which might harm the cells, is prevented by the charge control device.

Internal Resistance

The internal resistance of a CF1 or CF1T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
17 milliohms	21 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (no load)

The impedance of a charged CF1 or CF1T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	13
1000	12
10000	23

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulse of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: not to exceed 100 ampere-seconds.

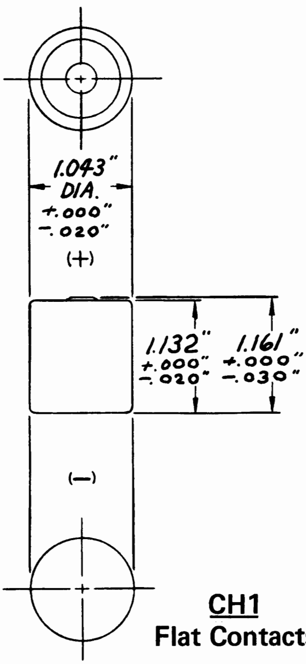
Average current over entire discharge period: not to exceed 4 amperes.

"EVEREADY" NO. CH1 CELL (Flat Contacts)
CH1T CELL (Two Solder Tabs)

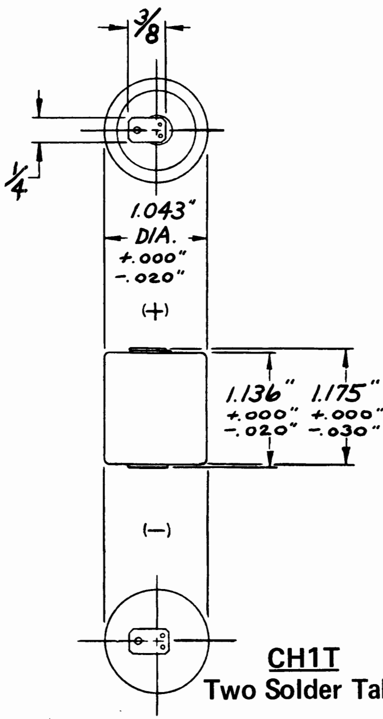
Type: Nickel-Cadmium
Suggested Current Range: 0-4 amperes

DIMENSIONS ARE FOR LABELED CELLS.

Inches		Millimeters
	.020	.51
	.030	.76
1/4	.250	6.35
3/8	.375	9.53
	1.043	26.5
	1.132	28.8
	1.136	28.9
	1.161	29.5
	1.175	29.9



CH1
Flat Contacts



CH1T
Two Solder Tabs

SPECIFICATIONS

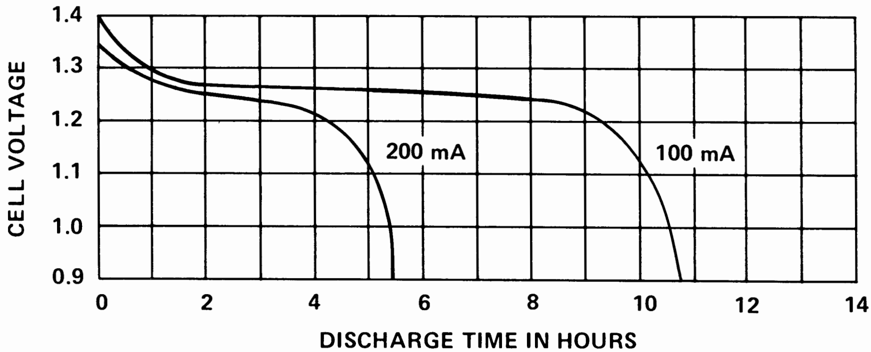
Voltage Taps .... —. + 1.2
Average Service Capacity (to 1.0 volt) .... 1 ampere-hour
(Rated at 1 ampere)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 1.8 oz. (51 grams)
Volume (by displacement) .... 0.89 cubic inch (14.6 cubic centimeters)
Cell .... One cylindrical—High Rate

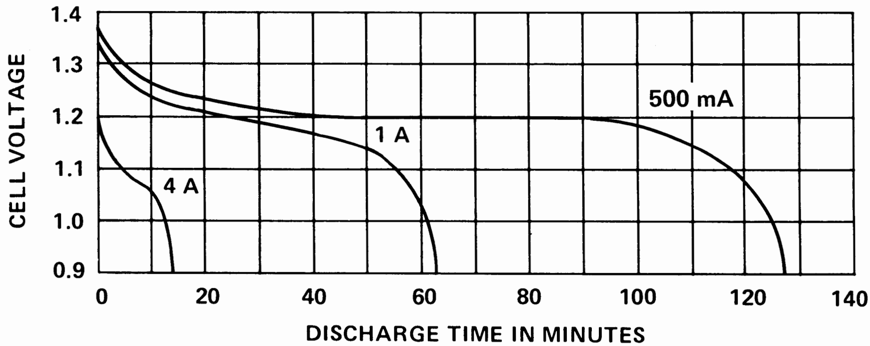
For service information see following pages

"EVEREADY" NOS. CH1 & CH1T

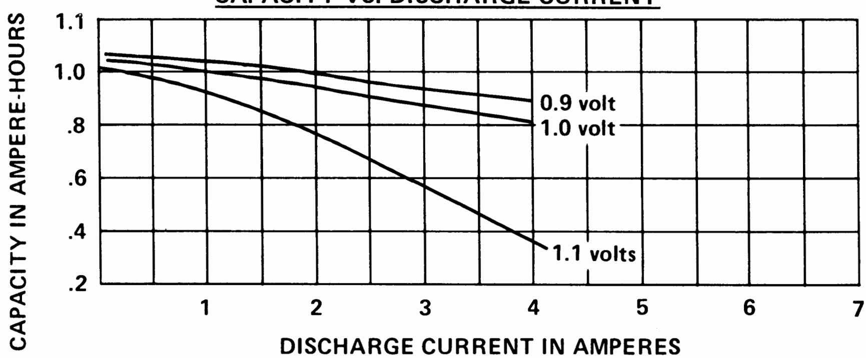
Average Performance Characteristics at 70° F(21.1° C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 0.9 volt endpoint. The CH1 and CH1T cells have a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

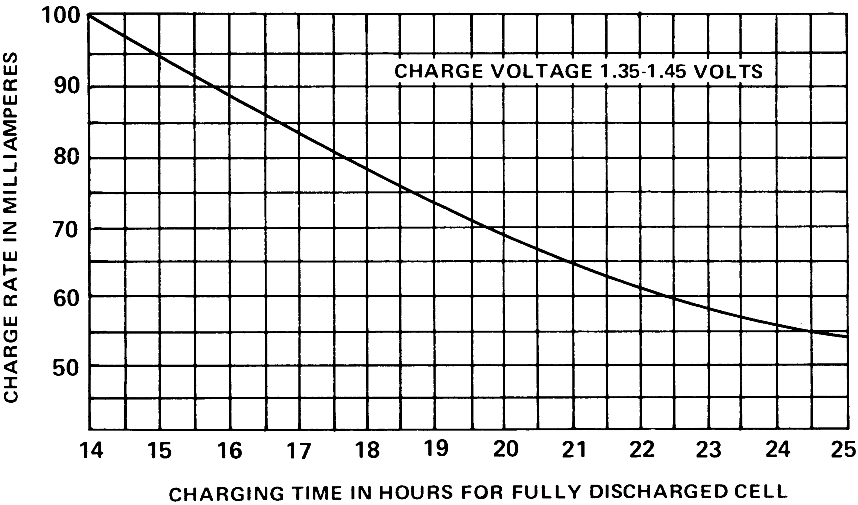
"EVEREADY" NOS. CH1 & CH1T

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH1 or CH1T cell are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 20 to 33 milliamperes.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 25 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 33 to 100 mA.

"EVEREADY" NOS. CH1 & CH1T

Internal Resistance

The internal resistance of a CH1 or CH1T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
17 milliohms	21 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No load)

The impedance of a charged CH1 or CH1T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	13
1000	12
10000	23

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulse of 5 seconds or less

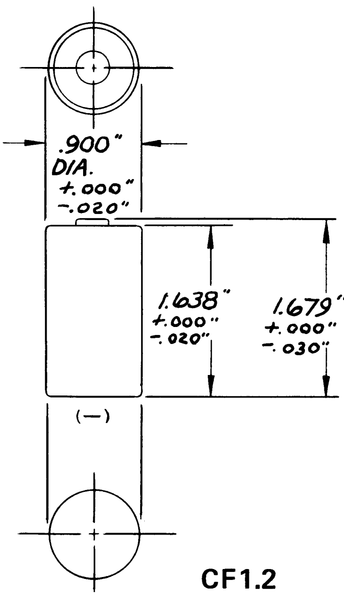
(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 100 ampere-seconds
Average current over entire discharge period: Not to exceed 4 amperes.

"EVEREADY" NO. CF1.2 CELL (Flat Contacts)
CF1.2T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-4.8 amperes

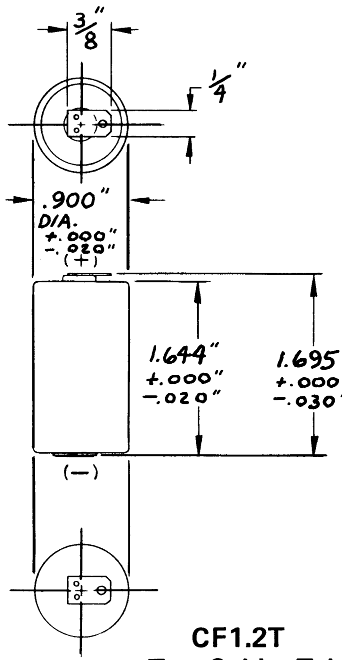
NOTE: See pages 393-401 for general information on Fast Charge cells.

Inches		Millimeters
	.020	.51
	.030	.76
1/4	.250	6.35
3/8	.375	9.53
	.900	22.9
	1.638	41.6
	1.644	41.8
	1.679	42.7
	1.695	43.1



CF1.2
Flat Contacts

Dimensions are for labeled cells



CF1.2T
Two Solder Tabs

SPECIFICATIONS

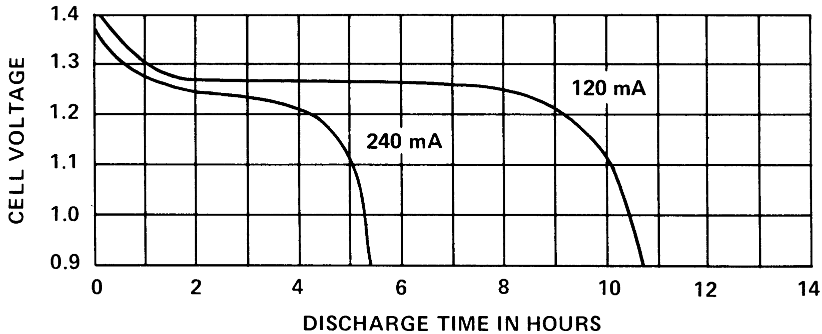
Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.0 volt) .... 1.2 ampere-hours
(Rated at 1.2 amperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 1.9 oz. (53.9 grams)
Volume (by displacement) .... 0.96 cubic inch (15.7 cubic centimeters)
Cell .... One cylindrical (ANSI K60) High Rate—Fast Charge

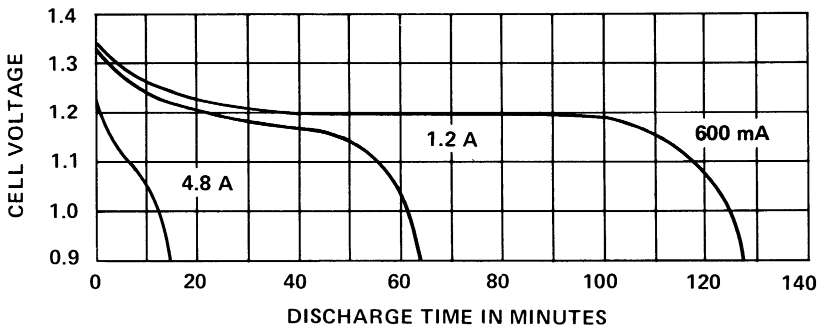
For service information see following pages

"EVEREADY" NOS. CF1.2 & CF1.2T

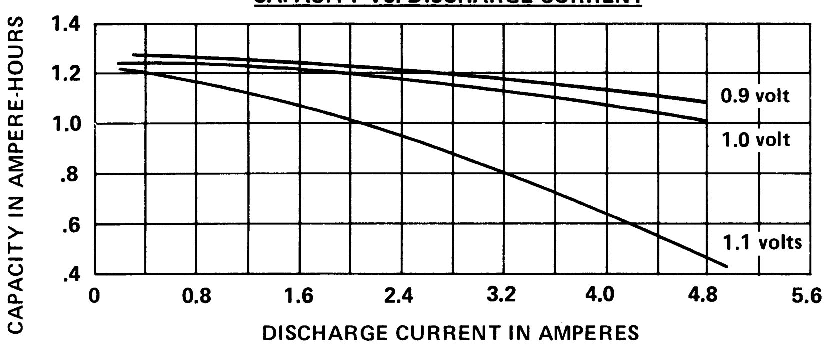
Average Performance Characteristics at 70°F (21.1°C)
Typical Discharge Curves

The following performance curves assume the cells were fast charged at 420 milliamperes. A slight reduction in capacity will be experienced when charged at lower rates.





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 1.1 volt endpoint. The CF1.2 (or CF1.2T) cell has a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

"EVEREADY" NOS. CF1.2 & CF1.2T

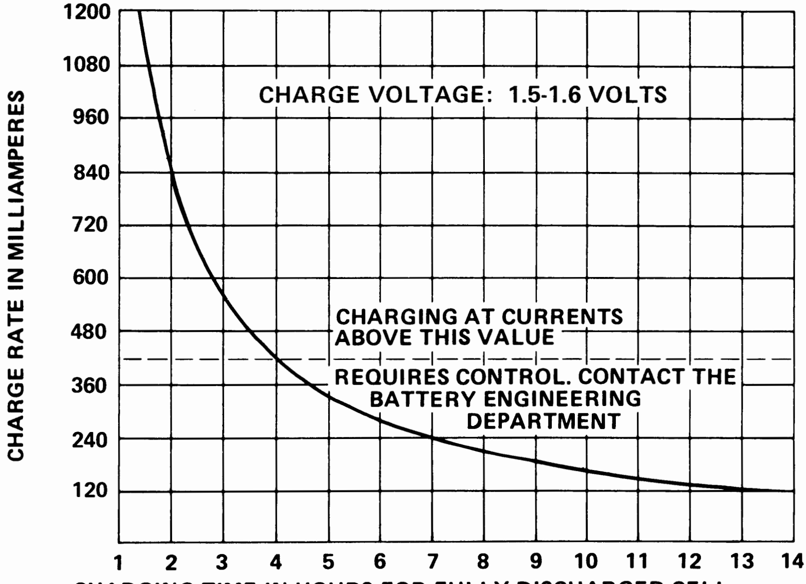
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CF1.2 or CF1.2T cell are:

Charge:	+60°F to +113°F (15.6°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

Note: See pages 393-401 for general information on Fast Charge cells.



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 24 to 40 mA.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 30mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 40 to 120 mA.

High Rate Charge

To charge cells for immediate use, charge at 120 to 400 mA. Occasional over-charging for up to three days at these rates will not adversely affect cell performance.

"EVEREADY" NOS. CF1.2 & CF1.2T

High Rate Charge with Control

To charge cells as quickly as possible charge at 400 to 1200 mA.with proper charge control device. Overcharging, which might harm the cells, is prevented by the charge control device.

Internal Resistance

The internal resistance of a CF1.2 or CF1.2T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
17 milliohms	21 milliohms

(Tolerance of ±20% applies to above values)

Impedance (No Load)

The impedance of a charged CF1.2 or CF1.2T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	17
1000	17
10000	31

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulse of 5 seconds or less

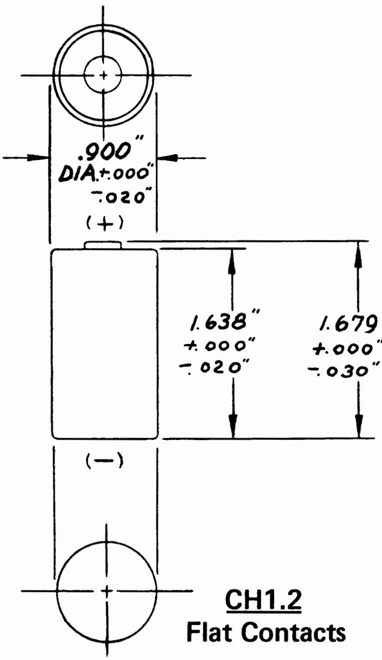
(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 100 ampere-seconds
Average current over entire discharge period: Not to exceed 5 amperes

"EVEREADY" NO. CH1.2 CELL (Flat Contacts)
CH1.2T CELL (Two Solder Tabs)

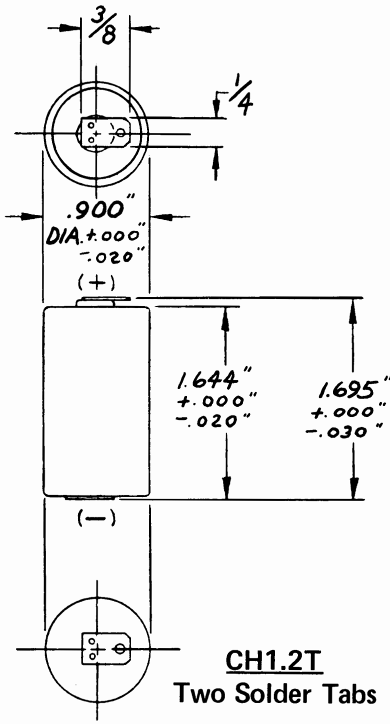
Type: Nickel-Cadmium
Suggested Current Range: 0-4.8 amperes

DIMENSIONS ARE FOR LABELED CELLS.

Inches		Millimeters
	.020	.51
	.030	.76
1/4	.250	6.35
3/8	.375	9.53
	.900	22.9
	1.638	41.6
	1.644	41.8
	1.679	42.7
	1.695	43.1



CH1.2
Flat Contacts



CH1.2T
Two Solder Tabs

SPECIFICATIONS

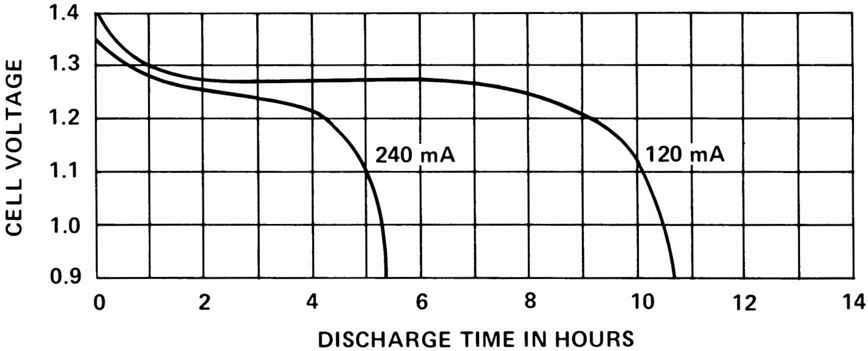
Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.0 volt)............................... 1.2 ampere-hours
(Rated at 1.2 amperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 1.9 oz. (53.9 grams)
Volume (by displacement) .... 0.96 cubic inches (15.7 cubic centimeters)
Cell... One cylindrical (ANSI K60)—High Rate

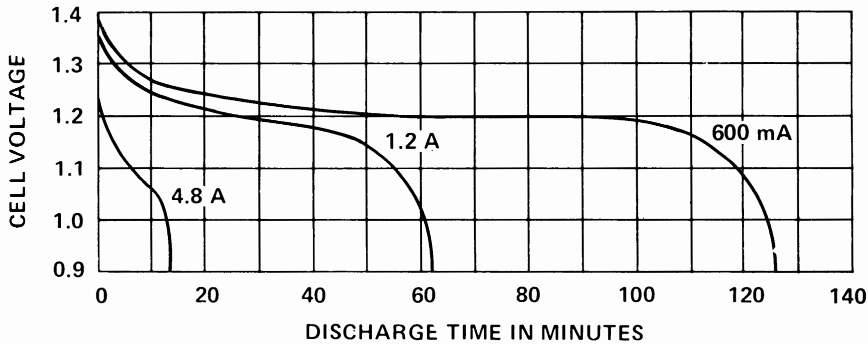
For service information see following pages

"EVEREADY" NOS. CH1.2 & CH1.2T

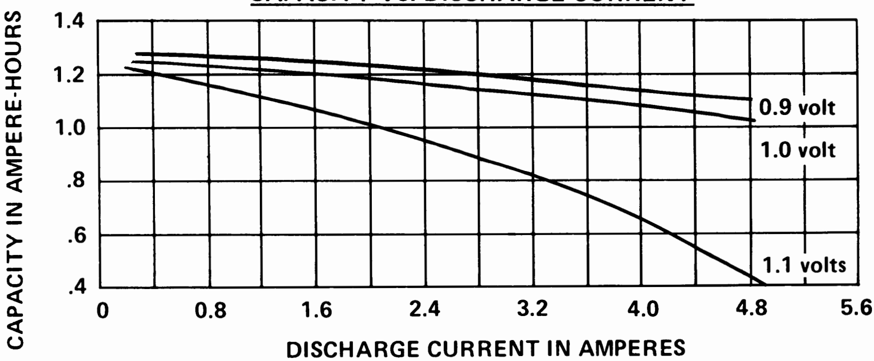
Average Performance Characteristics at 70° F (21.1° C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 1.1 endpoint. The CH1.2 or CH1.2T cell has a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

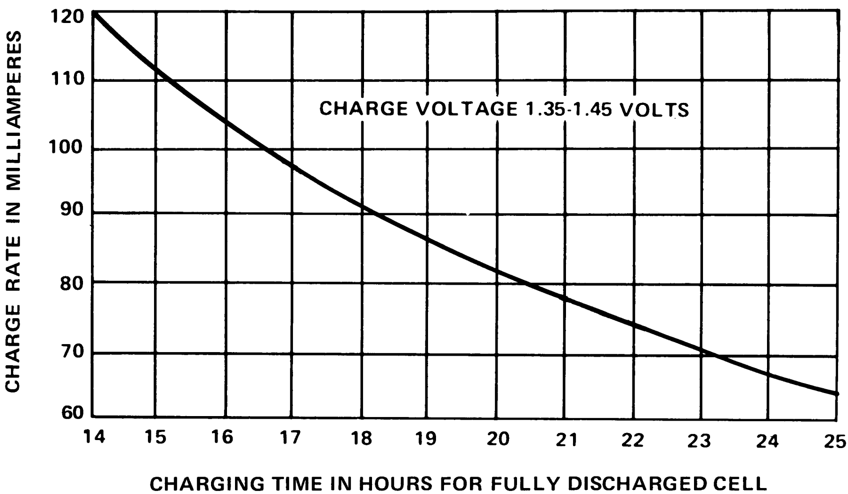
"EVEREADY" NOS. CH1.2 & CH1.2T

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH1.2 or CH1.2T cell are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: −4°F to +113°F (−20°C to 45°C)
Storage: −40°F to +140°F (−40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service charge at 24 to 40 milliamperes.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 30 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 40 to 120 mA.

"EVEREADY" NOS. CH1.2 & CH1.2T

Internal Resistance

The internal resistance of a CH1.2 or CH1.2T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
16 milliohms	20 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a charged CH1.2 or CH1.2T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	16
1000	16
10000	30

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 100 ampere-seconds

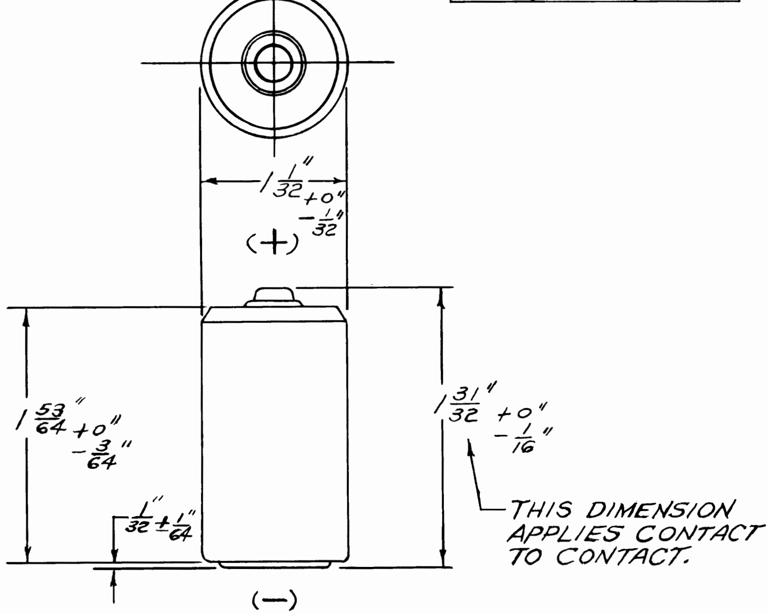
Average current over entire discharge period: Not to exceed 5 amperes

"EVEREADY" NO. CH1.2/C CELL

Type: Nickel Cadmium
Suggested Current Range: 0-4.8 amperes

NOTE: Starting June 1, 1976 the number for this cell will be changed from CH1.2/C to CH35.

Inches		Millimeters
1/64	.016	.40
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
1 1/32	1.03	26.2
1 53/64	1.83	46.4
1 31/32	1.97	50



SPECIFICATIONS

Voltage Taps .... −, + 1.2

Average Service Capacity (to 1.0 volt) .... 1.2 ampere-hours
(Rated at 1.2 amperes)

Terminals .... Flat Contacts

Average Weight .... 1.95 oz. (55.2 grams)

Volume .... 1.53 cubic inches (25.1 cubic centimeters)

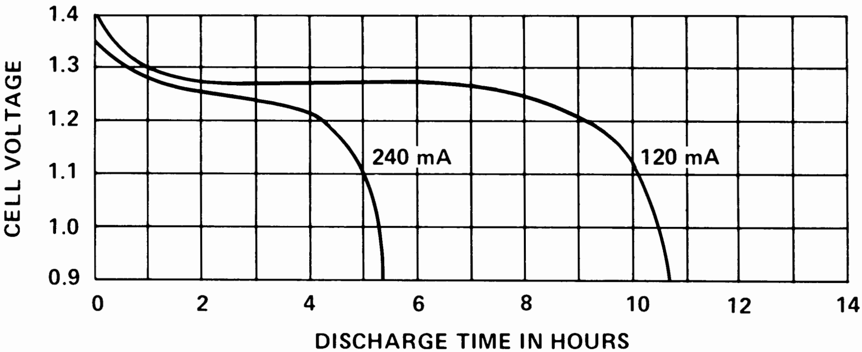
Cell .... One cylindrical (ANSI K60 in ANSI "C" size container) — High Rate

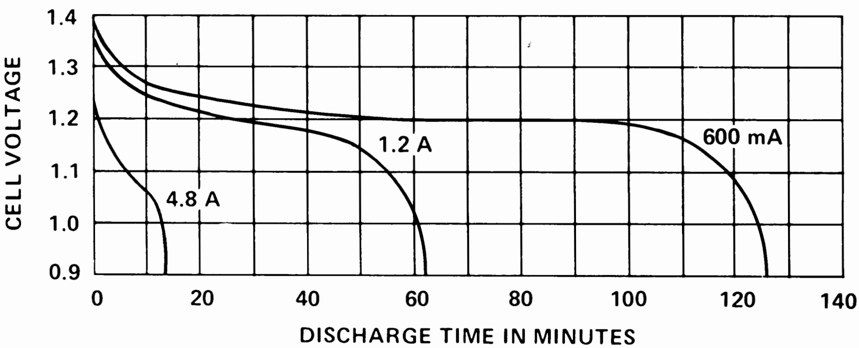
For service information see following pages

"EVEREADY" NO. CH1.2/C

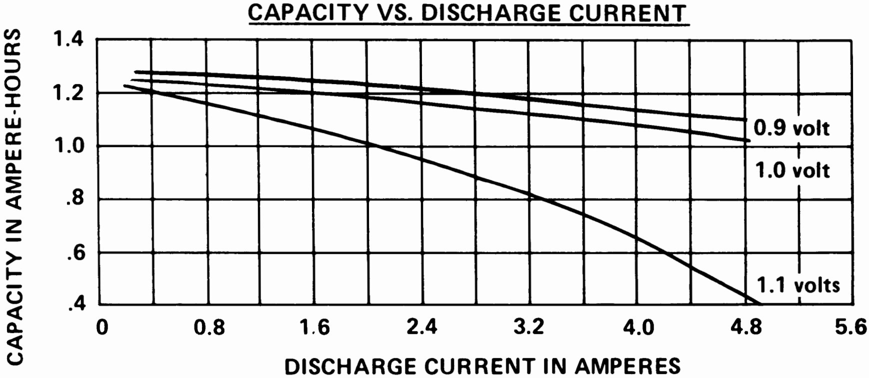
Average Performance Characteristics at 70° F(21.1° C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 1.1 endpoint. The CH1.2/C cell has a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

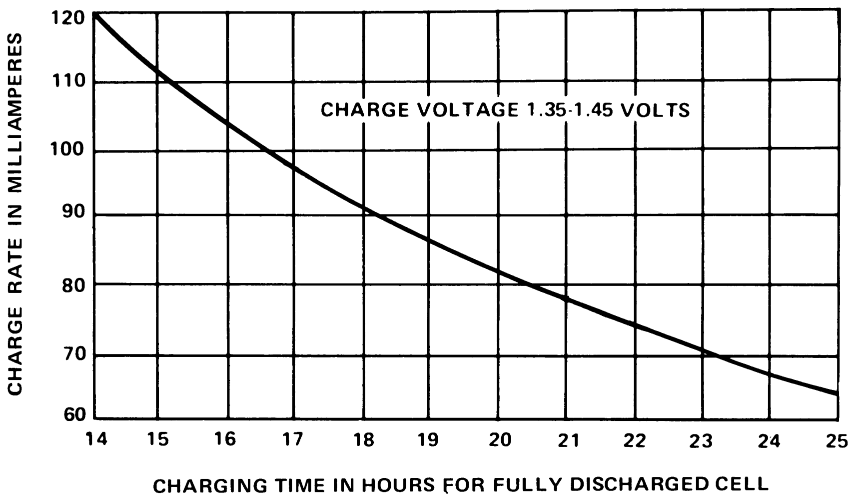
"EVEREADY" NO. CH1.2/C

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH1.2/C cell are:

Charge: +32° F to +113° F (0° C to 45° C)
Discharge: –4° F to +113° F (–20° C to 45° C)
Storage: –40° F to +140° F (–40° C to 60° C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service charge at 24 to 40 milliamperes.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 30 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 40 to 120 mA.

"EVEREADY" NO. CH1.2/C

Internal Resistance

The internal resistance of a CH1.2/C cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
16 milliohms	20 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a charged CH1.2/C cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	16
1000	16
10000	30

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)

Discharge per pulse: Not to exceed 100 ampere-seconds

Average current over entire discharge period: Not to exceed 5 amperes

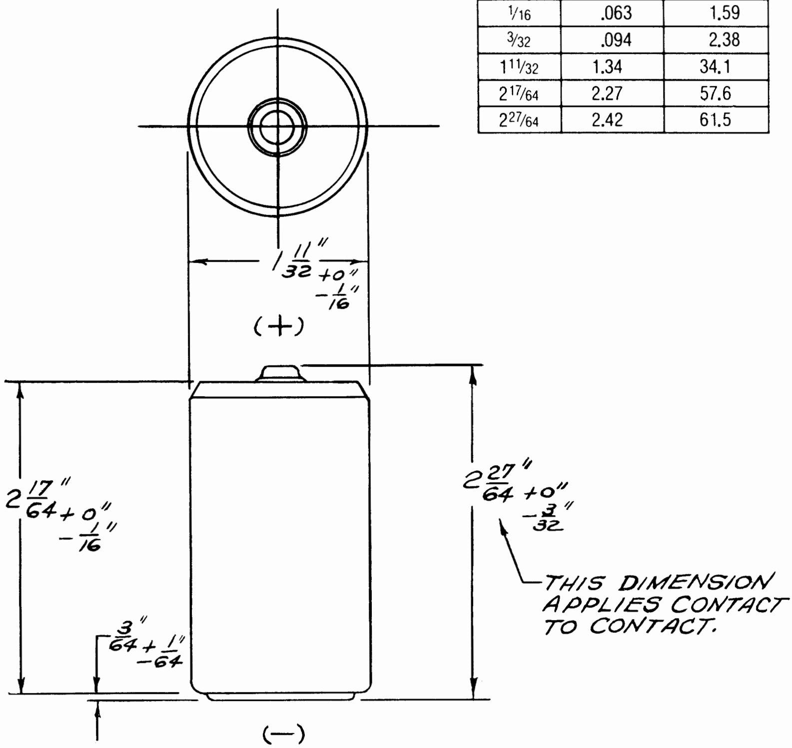
"EVEREADY" NO. CH1.2/D CELL

Type: Nickel-Cadmium

Suggested Current Range: 0-4.8 amperes

NOTE: Starting June 1, 1976 the number for this cell will be changed from CH1.2/D to CH50.

Inches		Millimeters
1/64	.016	.40
3/64	.047	1.19
1/16	.063	1.59
3/32	.094	2.38
1 11/32	1.34	34.1
2 17/64	2.27	57.6
2 27/64	2.42	61.5



SPECIFICATIONS

Voltage Taps .... −, + 1.2

Average Service Capacity (to 1.0 volt)................................ 1.2 ampere-hours
(Rated at 1.2 amperes)

Terminals .... Flat Contacts

Average Weight .... 2.2 oz. (62.5 grams)

Volume ....3.2 cubic inches (52.4 cubic centimeters)

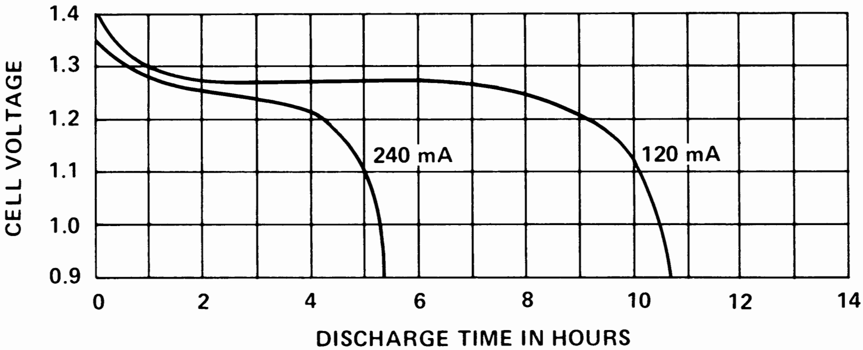
Cell .... One cylindrical (ANSI K60 in ANSI "D" size container) — High Rate

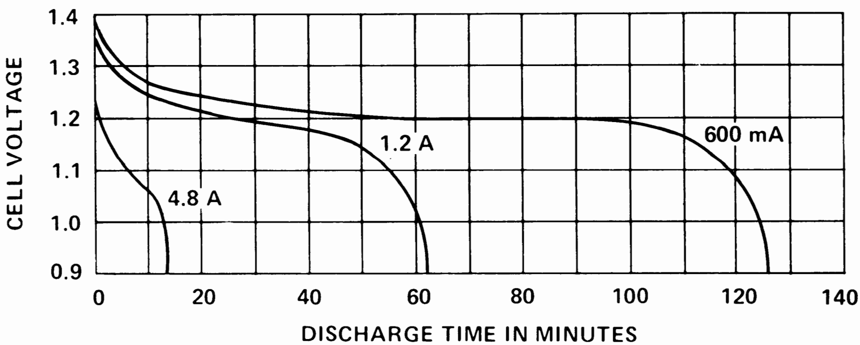
For service information see following pages

"EVEREADY" NO. CH1.2/D

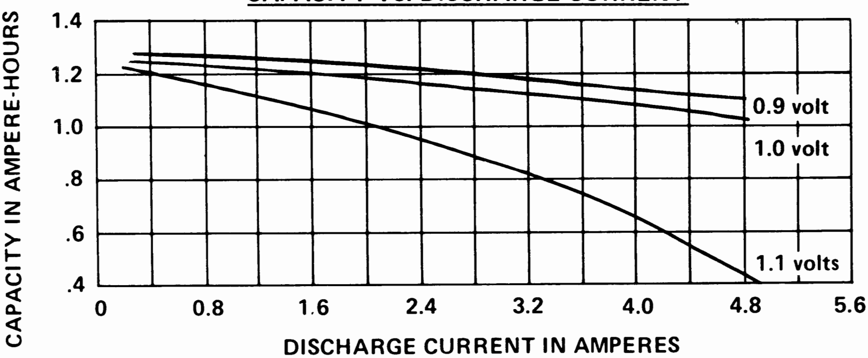
Average Performance Characteristics at 70° F(21.1° C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 1.1 endpoint. The CH1.2/D cell has a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

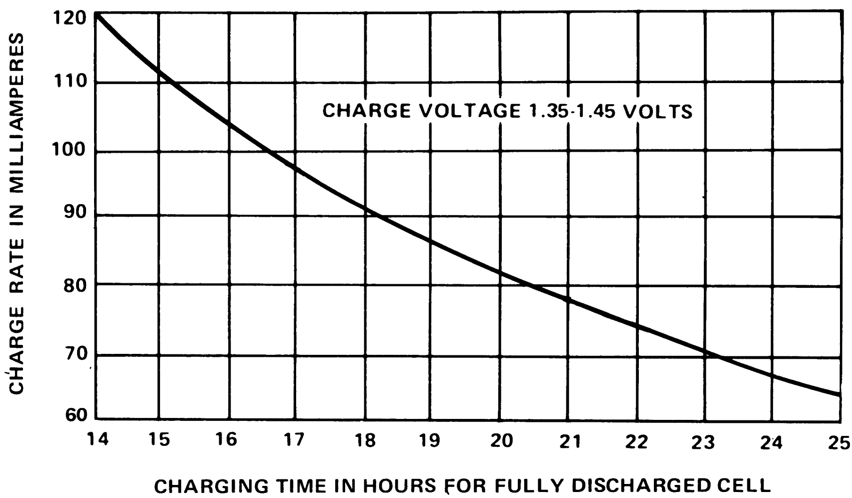
"EVEREADY" NO. CH1.2/D

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH1.2/D cell are:

Charge: +32° F to +113° F (0°C to 45°C)
Discharge: −4° F to +113° F (−20°C to 45°C)
Storage: −40° F to +140° F (−40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service charge at 24 to 40 milliamperes.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 30 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 40 to 120 mA.

"EVEREADY" NO. CH1.2/D

Internal Resistance

The internal resistance of a CH1.2/D cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
16 milliohms	20 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a charged CH1.2/D cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	16
1000	16
10000	30

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 100 ampere-seconds

Average current over entire discharge period: Not to exceed 5 amperes

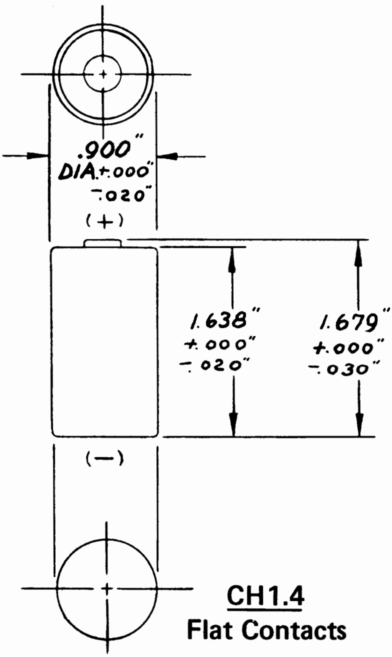
"EVEREADY" NO. CH1.4 CELL (Flat Contacts)
CH1.4 T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-6 amperes

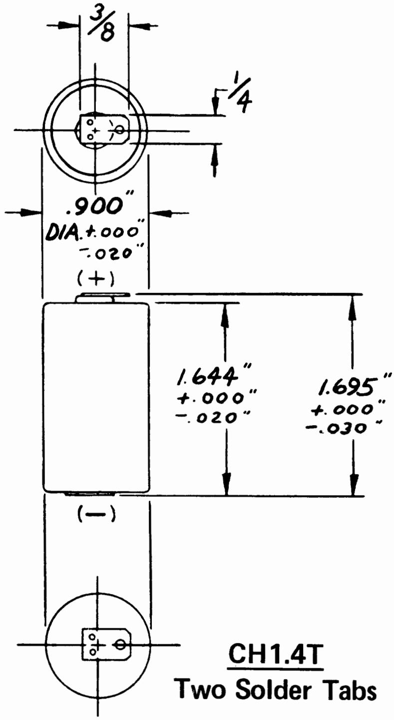
DIMENSIONS ARE FOR LABELED CELLS.

Inches		Millimeters
	.020	.51
	.030	.76
1/4	.250	6.35
3/8	.375	9.53
	.900	22.9
	1.638	41.6
	1.644	41.8
	1.679	42.7
	1.695	43.1

NOTE: Data are tentative. Cells presently available on a sample basis. Can be made available for large scale applications.



CH1.4
Flat Contacts



CH1.4T
Two Solder Tabs

SPECIFICATIONS

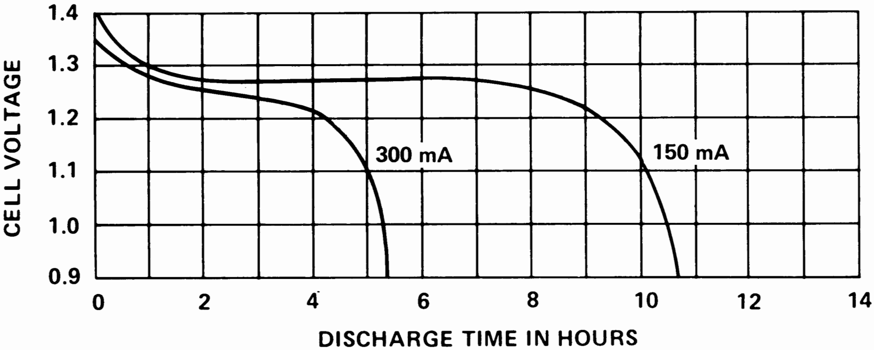
Voltage Taps .... —, + 1.2
Average Service Capacity (to 1.0 volt) .... 1.4 ampere-hours
(Rated at 1.5 amperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 1.94 oz. (55 grams)
Volume (by displacement) .... 0.96 cubic inches (15.7 cubic centimeters)
Cell .... One cylindrical (ANSI K60)—High Rate

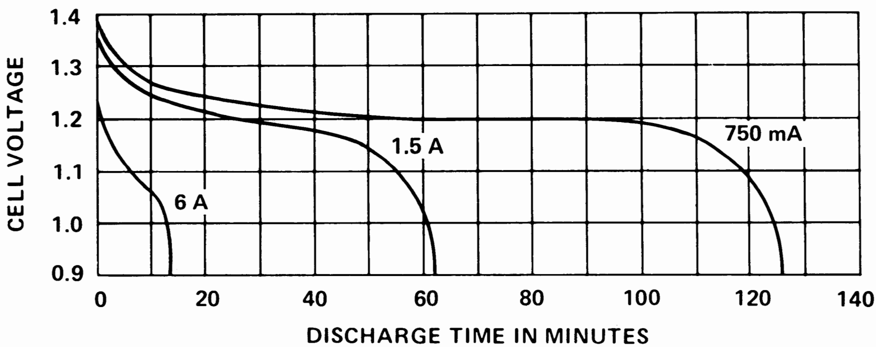
For service information see following pages

"EVEREADY" NOS. CH1.4 & CH1.4T

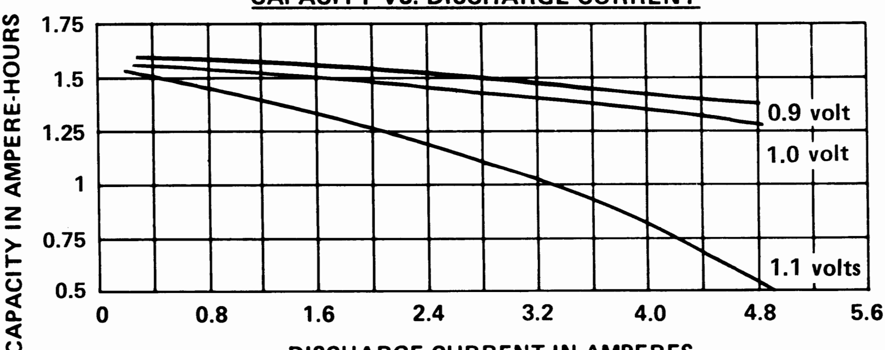
Average Performance Characteristics at 70° F(21.1° C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 1.1 endpoint. The CH1.4 or CH1.4T cell has a capacity of 1.25 ampere-hours. (This provides a discharge time of 38 minutes.)

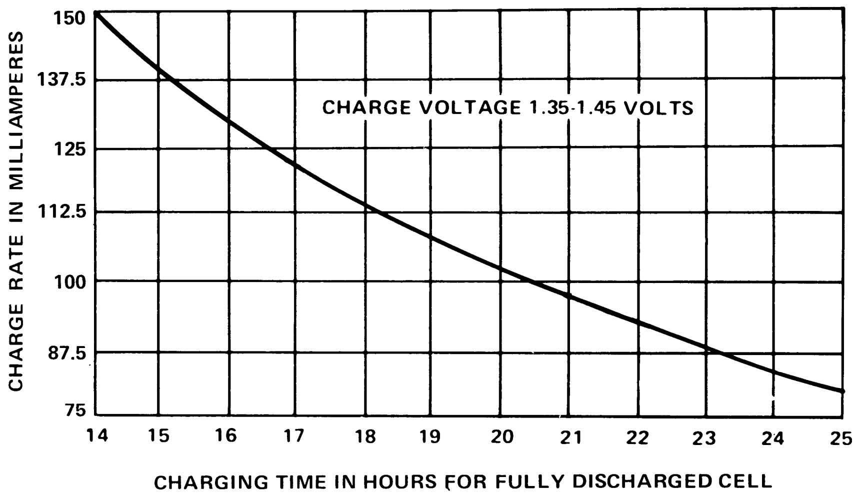
"EVEREADY" NOS. CH1.4 & CH1.4T

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH1.4 or CH1.4T cell are:

Charge: +32° F to +113° F (0°C to 45°C)
Discharge: –4° F to +113° F (–20°C to 45°C)
Storage: –40° F to +140° F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service charge at 30 to 50 milliamperes.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 37.5 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little degradation, charge at 50 to 150 mA.

"EVEREADY" NOS. CH1.4 & CH1.4T

Internal Resistance

The internal resistance of a CH1.4 or Ch 1.4T cell varies with state of charge, as follows:

Cell Charged	Cell ½ Discharged
16 millohms	20 millohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of a charged CH1.4 or CH1.4T cell varies with frequency. as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	16
1000	16
10000	30

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 100 ampere-seconds

Average current over entire discharge period: Not to exceed 5 amperes

"EVEREADY" NO. CH1.8 CELL (Flat Contacts)

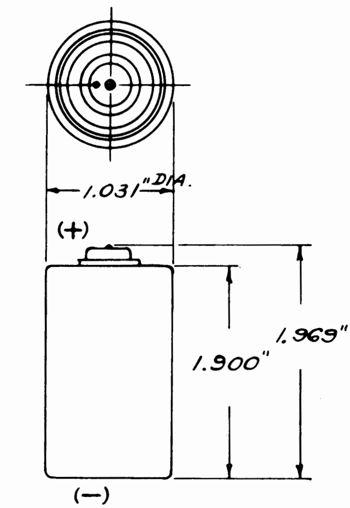
CH1.8T CELL (Two Solder Tabs)

Type: Nickel-Cadmium

Suggested Current Range: 0-1.1 amperes

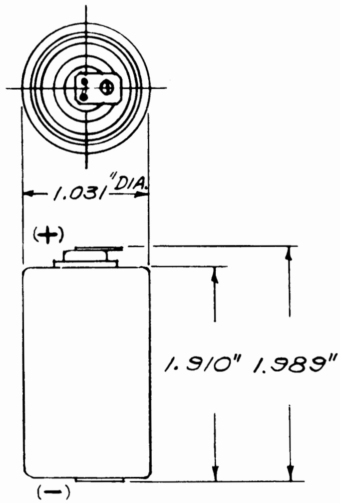
Dimensions are for labeled cells

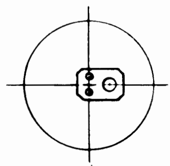
Inches	Millimeters
1.031	26.2
1.900	48.3
1.910	48.5
1.969	50
1.989	50.5



DIMENSIONS - MAXIMUM

CH1.8
Flat Contacts





CH1.8T
Two Solder Tabs

DIMENSIONS - MAXIMUM

SPECIFICATIONS

Voltage Taps .... −, + 1.2

Average Service Capacity (to 1.1 volts) .... 1.8 ampere-hours
(Rated at 180 milliamperes)

Terminals .... Flat contacts or two solder tabs

Average Weight .... 2.3 oz. (65.2 grams)

Volume (by displacement)...........1.35 cubic inches (22.1 cubic centimeters)

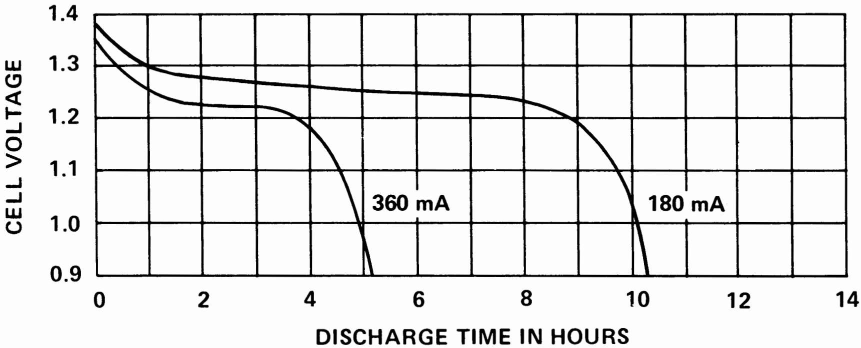
Cell .... One cylindrical (ANSI K70) High Rate

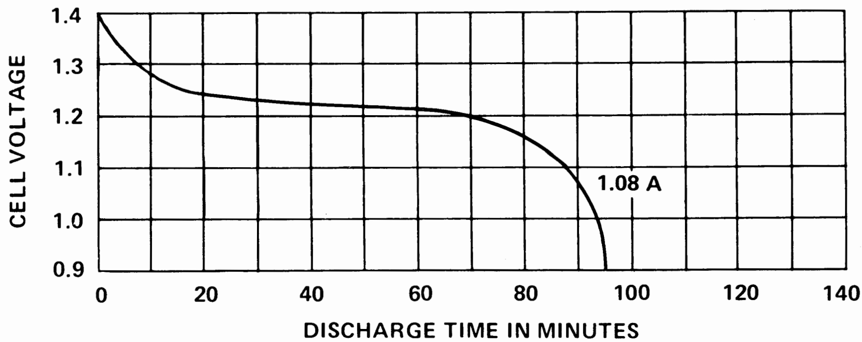
For service information see following pages

"EVEREADY" NOS. CH1.8 & CH1.8T

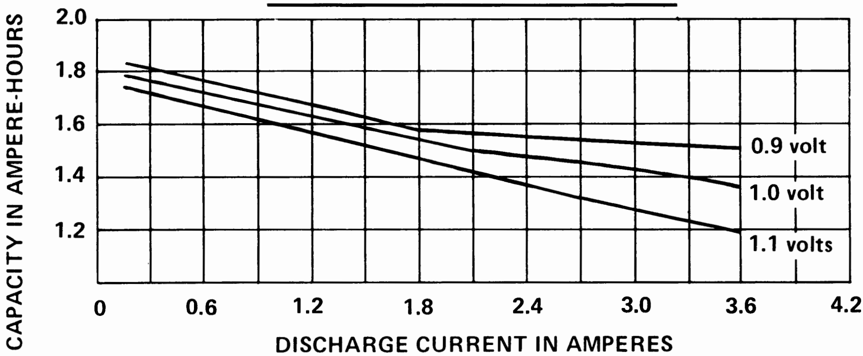
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 3.3 ampere discharge to a 1.0 volt endpoint. The CH1.8 (or CH1.8T) cell has a capacity of 1.4 ampere-hours. (This provides a discharge time of 26 minutes).

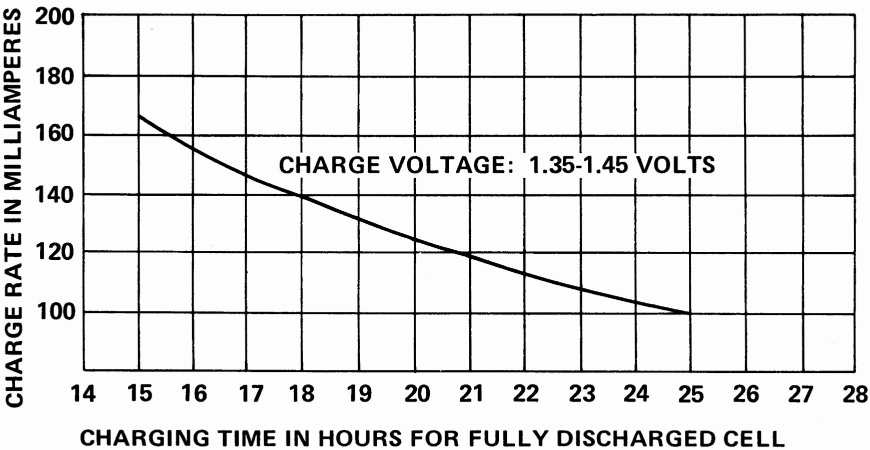
"EVEREADY" NOS. CH1.8 & CH1.8T

Operating and Storage Temperatures

Ranges of temperatures applicable to operation of the CH1.8 or CH1.8 T cell are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 36 to 60 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 45mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 60 to 180 mA.

"EVEREADY" NOS. CH1.8 & CH1.8T

Internal Resistance

The internal resistance of a CH1.8 or CH1.8T cell varies with state of charge, as follows.

Cell Charged	Cell ½ Discharged
16 milliohms	20 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (no load)

The impedance of a charged CH1.8 or CH1.8T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	17.5
1000	16.0
10000	15.8

(Tolerance of ± 20% applies to above values)

Polarity Reversal

The CH1.8 or CH1.8T cell can be reversed without damage for 5 hours at 180 milliamperes. This permits its use without hazard in series groups.

Pulse Discharge Capabilities

Pulses of 5 seconds or less

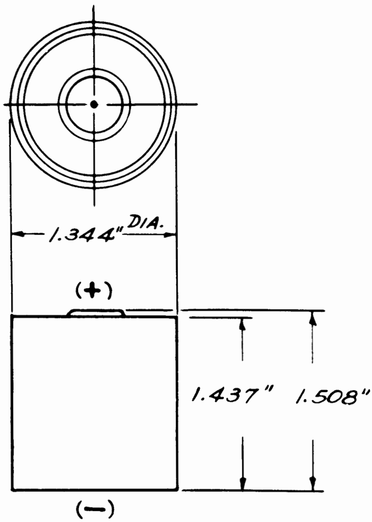
(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 100 ampere-seconds
Average current over entire discharge period: Not to exceed 4 amperes

"EVEREADY" NO. CH2.2 CELL (Flat Contacts)
CH2.2T CELL (Two solder tabs)

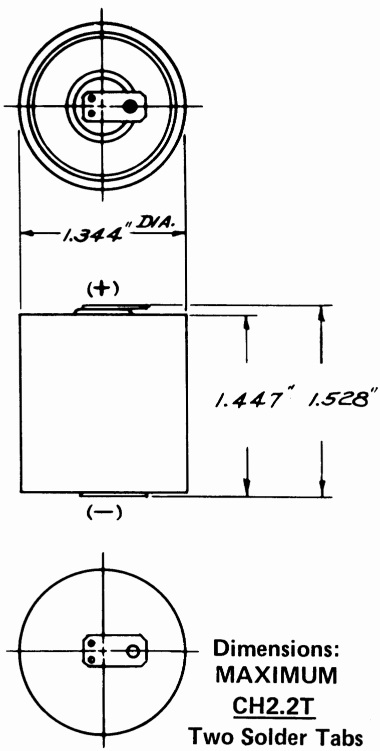
Type: Nickel-Cadmium

Suggested Current Range: 0-1.1 amperes **Dimensions are for labeled cells**

Inches	Millimeters
1.344	34.1
1.437	36.5
1.447	36.8
1.508	38.3
1.528	38.8



Dimensions: MAXIMUM
CH2.2
Flat Contacts



Dimensions: MAXIMUM
CH2.2T
Two Solder Tabs

SPECIFICATIONS

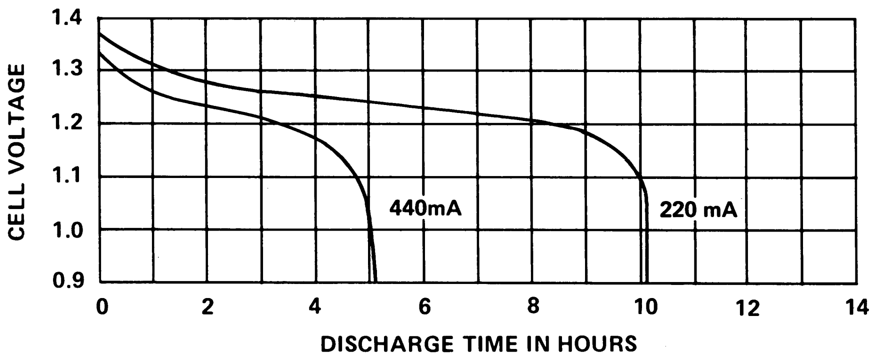
Voltage Taps .... −, + 1.2
Average Service Capacity (to 1.1 volts)........................ 2.2 ampere-hours
(Rated at 220 milliamperes)
Terminals ....Flat contacts or two solder tabs
Average Weight .... 3.2 oz. (90.7 grams)
Volume (by displacement).......... 1.82 cubic inches (29.8 cubic centimeters)
Cells .... One cylindrical (ANSI K80) High Rate

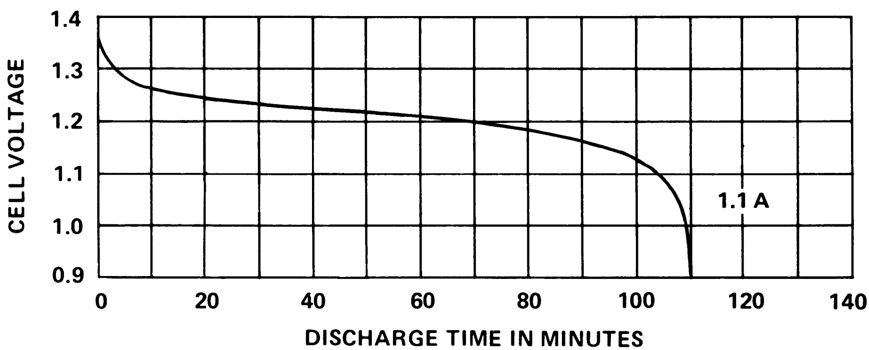
For service information see following pages

"EVEREADY" NOS. CH2.2 & CH2.2T

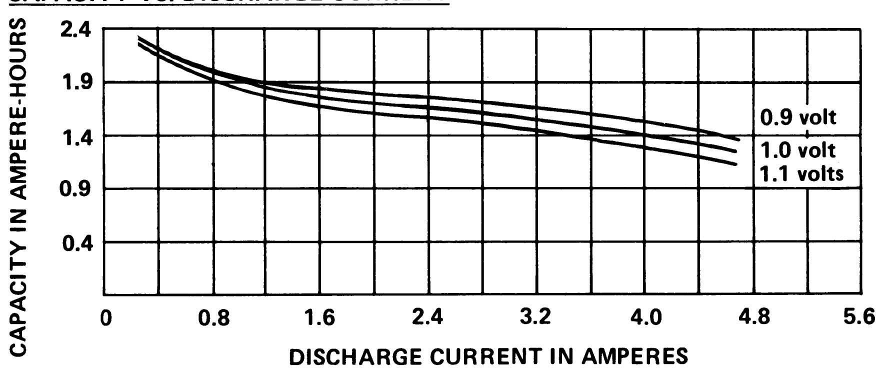
Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 4 ampere discharge to a 1.0 volt endpoint. The CH2.2 (or CH2.2T) cell has a capacity of 1.4 ampere-hours. (This provides a discharge time of 21 minutes.)

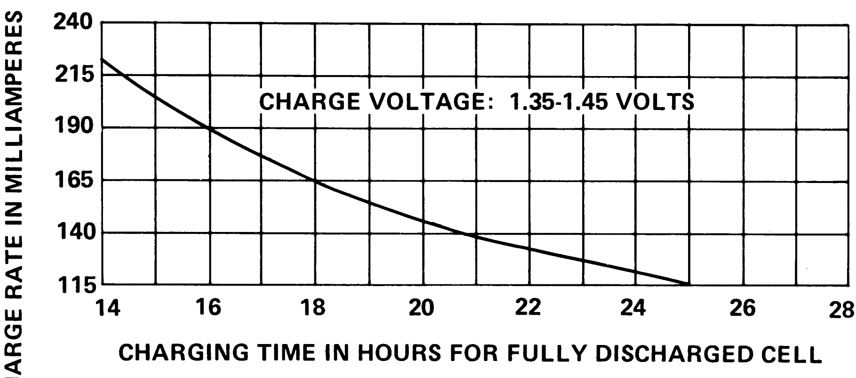
"EVEREADY" NOS. CH2.2 & CH2.2T

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH2.2 or CH2.2T cell are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (-20°C to 45°C)
Storage:	–40°F to +140°F (-40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 44 to 73 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 55mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 73 to 220 mA.

Internal Resistance

The internal resistance of a CH2.2 or CH2.2T cell varies with state of charge, as follows:

Cell charged	**Cell½ Discharged**
14 milliohms	16 milliohms

(Tolerance of ± 20% applies to above values)

"EVEREADY" NOS. CH2.2 & CH2.2T

Impedance (No Load)

The impedance of a charged CH2.2 or CH2.2T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	16.0
1000	15.1
10000	14.8

(Tolerance of ± 20% applies to above values)

Polarity Reversal

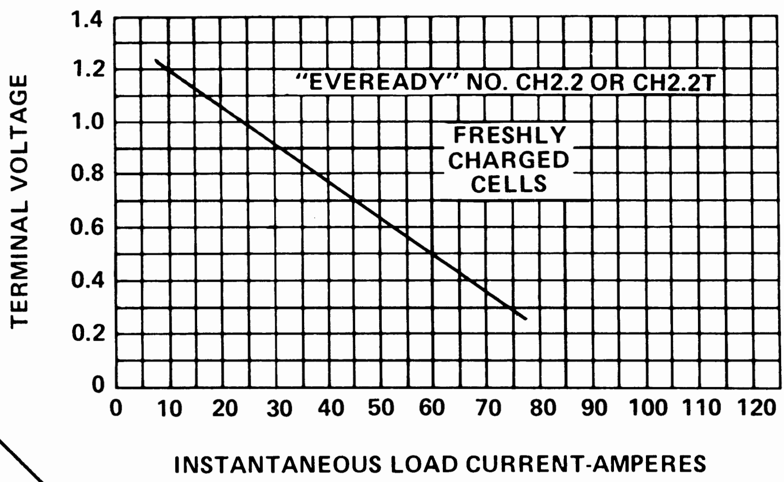
The CH2.2 or CH2.2T cell can be reversed without damage for 5 hours at 220 milliamperes. This permits its use without hazard in series groups.

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 200 ampere-seconds.
Average current over entire discharge period: Not to exceed 7 amperes

Terminal Voltage vs. Load
(For Computing Output Power)



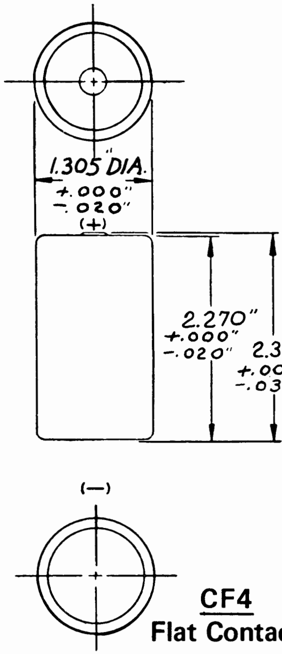
"EVEREADY" NO. CF4 CELL (Flat Contacts)
CF4T CELL (Two Solder Tabs)

Type: Nickel-Cadmium
Suggested Current Range: 0-10 amperes

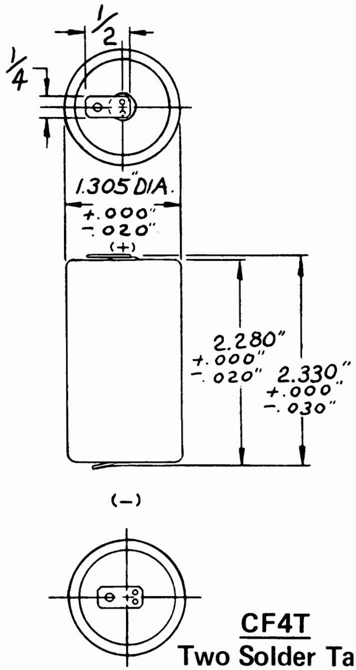
NOTE: See pages 393-401 for general information on Fast Charge cells.

Inches		Millimeters
	.020	.51
	.030	.76
1/4	.250	6.35
1/2	.500	12.7
	1.305	33.2
	2.270	57.7
	2.280	57.9
	2.310	58.7
	2.330	59.2

Dimensions are for labeled cells



CF4
Flat Contacts



CF4T
Two Solder Tabs

SPECIFICATIONS

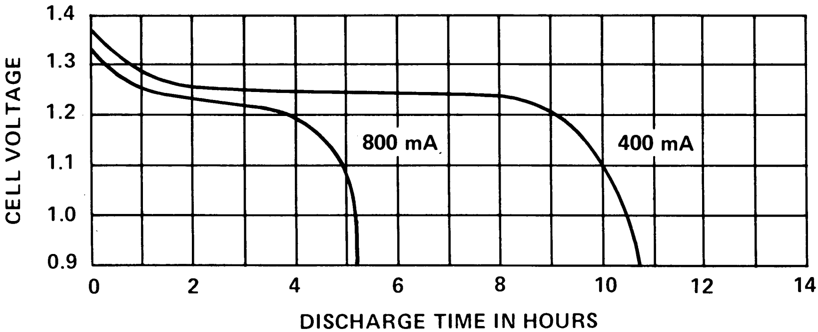
Voltage Taps .... –, + 1.2
Average Service Capacity (to 1.0 volt) .... 4 ampere-hours
(Rated at 4 amperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 5.4 oz. (153 grams)
Volume (by displacement) .... 2.98 cubic inches (48.8 cubic centimeters)
Cell ....One cylindrical (ANSI K90) (D Size)
High Rate—Fast Charge

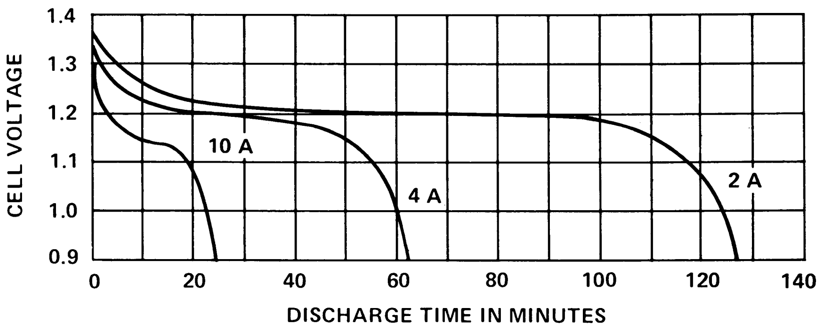
For service information see following pages

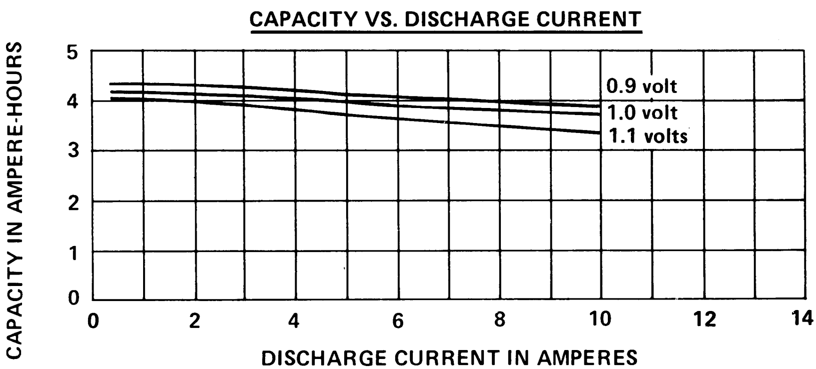
"EVEREADY" NOS. CF4 & CF4T

Average Performance Characteristics at 70°F (21.1°C)
Typical Discharge Curves

The following performance curves assume the cells were fast charged at 1.4 amperes. A slight reduction in capacity will be experienced when charged at lower rates.







EXAMPLE: Assume a 5 ampere discharge to a 1.0 volt endpoint. The CF4 or CF4T cell has a capacity of 4 ampere-hours. (This provides a discharge time of 48 minutes.)

"EVEREADY" NOS. CF4 & CF4T

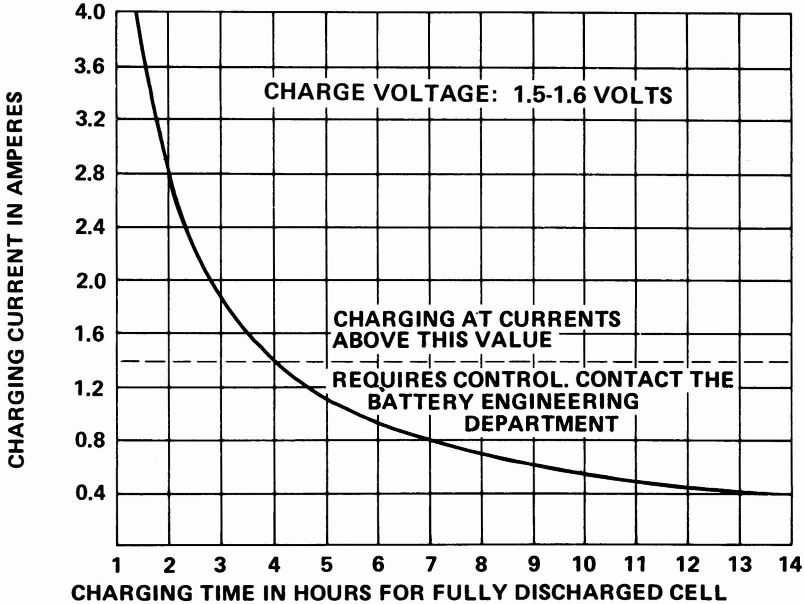
Operating & Storage Temperatures

Ranges of temperature applicable to operation of the CF4 or CF4T cell are:

Charge: +60°F to +113°F (15.6°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

NOTE: See pages 393-401 for general information on Fast Charge cells.



For partially discharged battery, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 80 to 133 mA.

NOTE: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 100mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 133 to 400 mA.

High Rate Charge

To charge cells for immediate use, charge at 400 mA to 1.33 A. Occasional overcharging for up to three days at these rates will not adversely affect cell performance, providing temperature of cells remains below 120°F. Otherwise a charge control device is necessary.

"EVEREADY" NOS. CF4 & CF4T

High Rate Charge with Control

To charge cells as quickly as possible charge at 1.33 A to 2A with proper charge control device. Overcharging, which might harm the cells, is prevented by the charge control device.

Internal Resistance

The internal resistance of a CF4 or CF4T cell varies with state of charge,as follows:

Cell Charged	Cell ½ Discharged
9 milliohms	9.3 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (no load)

The impedance of a charged CF4 or CF4T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	7.9
1000	8.0
10000	9.5

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

Pulse of 5 seconds or less

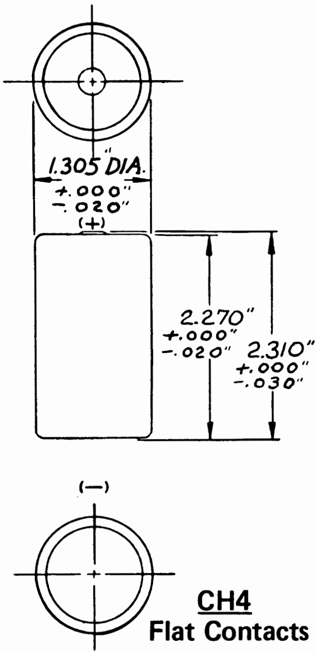
(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 200 ampere-seconds.
Average current over entire discharge period: Not to exceed 10 amperes

"EVEREADY" NO. CH4 CELL (Flat Contacts)
CH4T CELL (Two Solder Tabs)

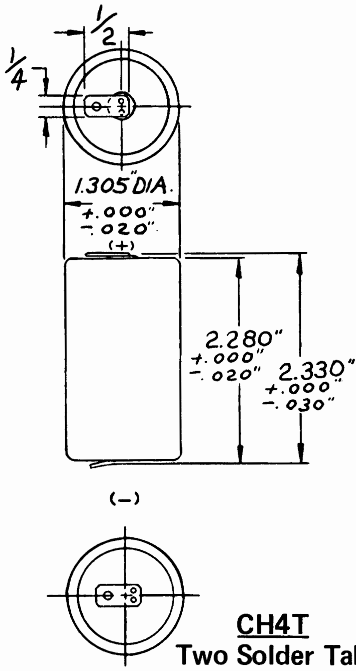
Type: Nickel-Cadmium
Suggested Current Range: 0-10 amperes

DIMENSIONS ARE FOR LABELED CELLS.

Inches		Millimeters
	.020	.51
	.030	.76
1/4	.250	6.35
1/2	.500	12.7
	1.305	33.2
	2.270	57.7
	2.280	57.9
	2.310	58.7
	2.330	59.2



CH4
Flat Contacts



CH4T
Two Solder Tabs

SPECIFICATIONS

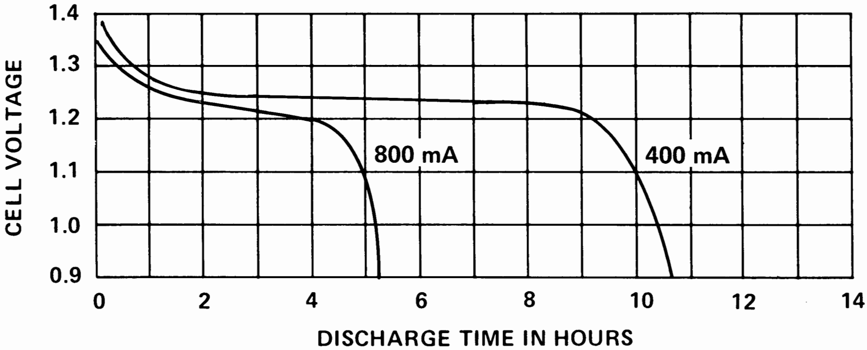
Voltage Taps ....–, + 1.2
Average Service Capacity (to 1.0 volt)................................ 4 ampere-hours
(Rated at 4 amperes)
Terminals .... Flat contacts or two solder tabs
Average Weight .... 5.4 oz. (153 grams)
Volume (by displacement) .... 2.98 cubic inches (48.8 cubic centimeters)
Cell .... One cylindrical (ANSI K90) (D size) High Rate

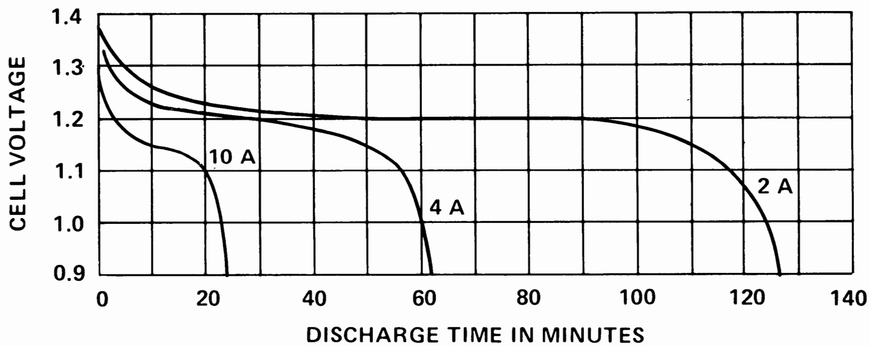
For service information see following pages

"EVEREADY" NOS. CH4 & CH4T

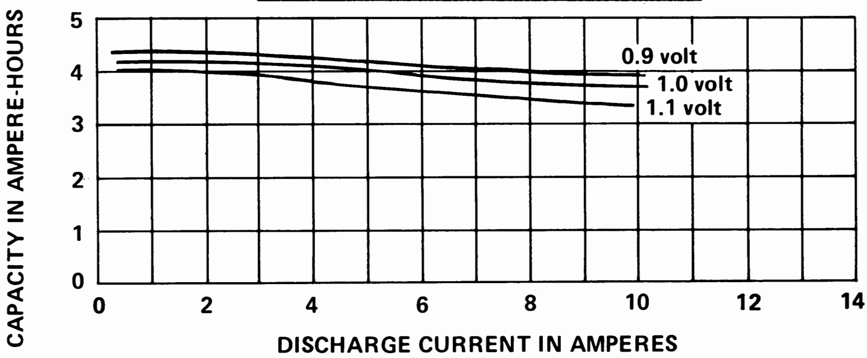
Average Performance Characteristics at 70° F(21.1°C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to 1.1 volt endpoint. The CH4 or CH4T cell has a capacity of 4 ampere-hours. (This provides a discharge time of 2 hours.)

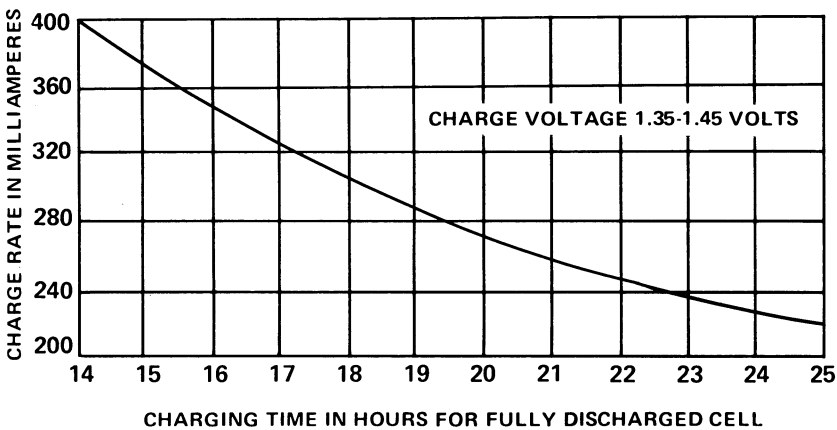
"EVEREADY" NOS. CH4 & CH4T

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the CH4 or CH4T cell are:

Charge: +32° F to +113° F (0° C to 45° C)
Discharge: – 4° F to +113° F (–20° C to 45° C)
Storage: –40° F to +140° F (–40° C to 60° C)

Charge Rate vs. Charging Time



For partially discharged cells, reduce time or current porportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 80 to 133 mA.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 100 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 133 to 400 mA.

"EVEREADY" NOS. CH4 & CH4T

Internal Resistance

The internal resistance of a CH4 or CH4T cell varies with state of charge,as follows:

Cell Charged	Cell ½ Discharged
9 milliohms	9.3 milliohms

(Tolerance of ± 20% applies to above values)

Impedance (No Load)

The impedance of charged CH4 or CH4T cell varies with frequency, as follows:

Frequency (Hz)	Impedance (milliohms) (for charged cell)
50	7.9
1000	8.0
10000	9.5

(Tolerance of ± 20% applies to above values)

Pulse Discharge Capabilities

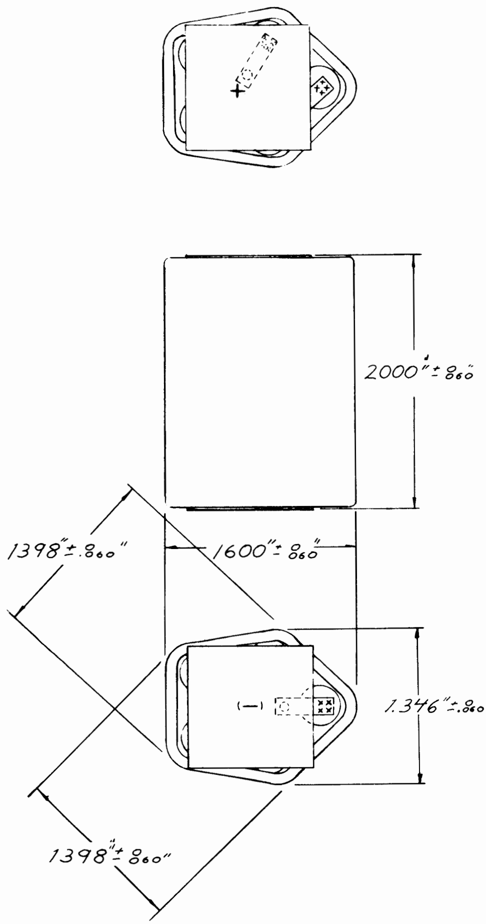
Pulse of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 200 ampere-seconds.
Average current over entire discharge period: Not to exceed 10 amperes.

"HERCULES" NO. HS4172 BATTERY

Type: Nickel-Cadmium

Suggested Current Range: 0-2 amperes



Inches	Millimeters
.060	1.52
1.346	34.2
1.398	35.5
1.600	40.6
2.000	50.8

SPECIFICATIONS

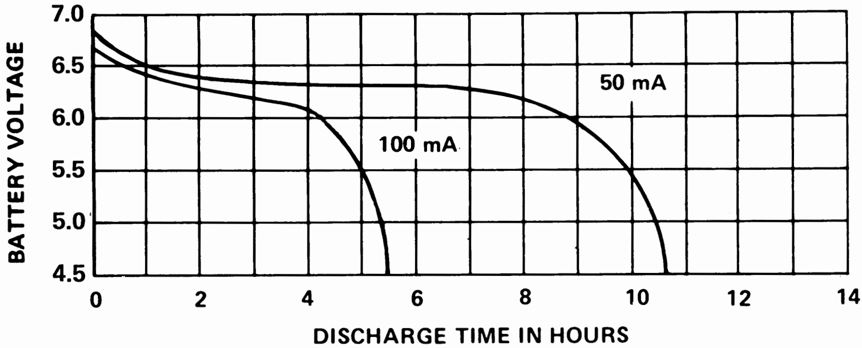
Voltage Taps..—, +6
Average Service Capacity (to 5 volts)...........................500 milliampere-hours
(Rated at 500 milliamperes)
Terminals ....Two Solder Tabs
Average Weight..3.9 oz. (111 grams)
Cells.....................Five cylindrical (CH500) (ANSI K40) High Rate in series

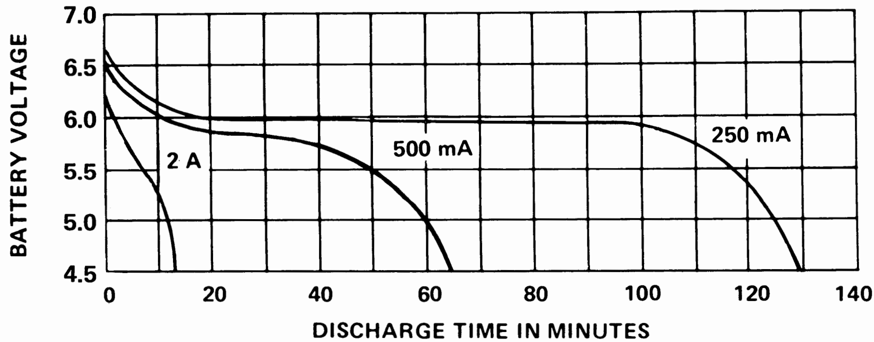
For service information see following pages

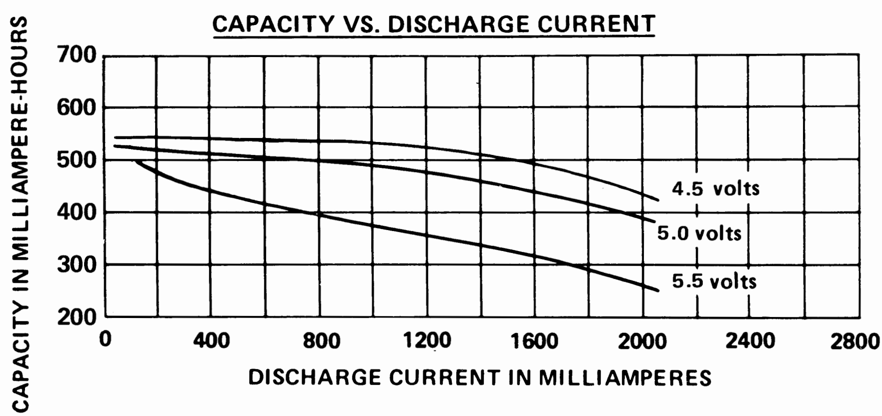
"HERCULES" NO. HS4172

Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves







EXAMPLE: Assume an 800 milliampere discharge to a 5 volt endpoint. The HS4172 battery has a capacity of 500 milliampere-hours. (This provides a discharge time of 38 minutes.)

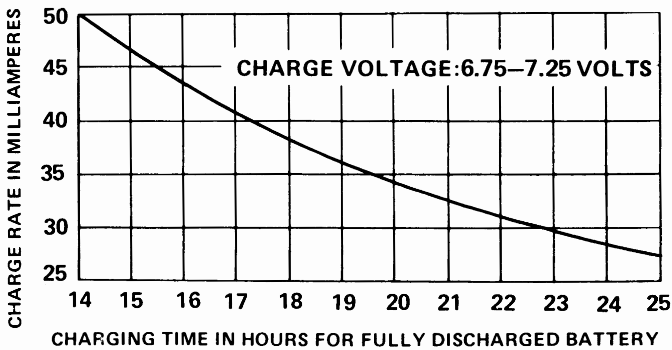
"HERCULES" NO. HS4172

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4172 battery are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged battery, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 10-17 milliamperes.

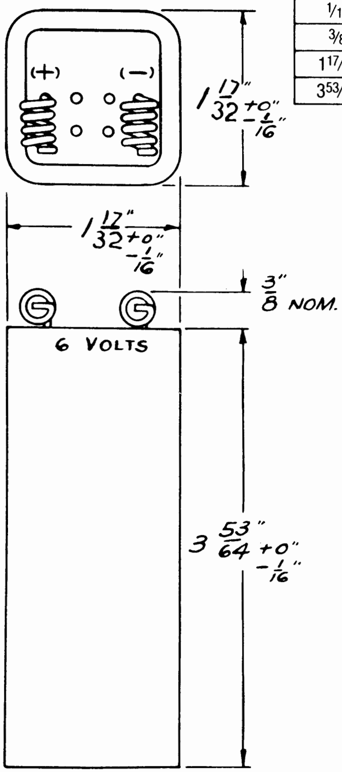
NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 12.5 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge battery and maintain a fully charged battery with little battery degradation, charge at 17 to 50 mA.

"EVEREADY" NO. N67 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-450 milliamperes



Inches		Millimeters
1/16	.063	1.59
3/8	.375	9.53
1 17/32	1.53	38.9
3 53/64	3.83	97.2

PLASTIC CASE

SPECIFICATIONS

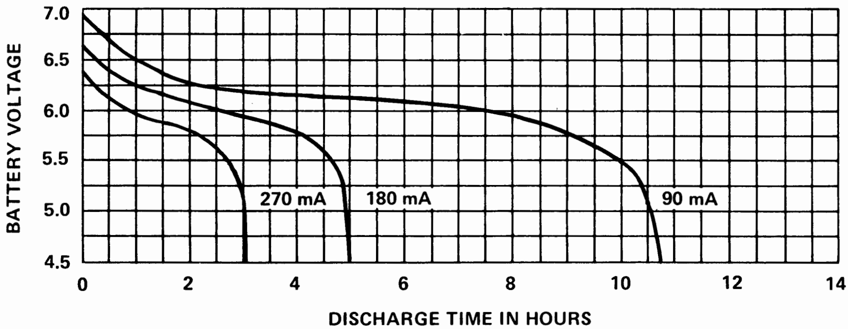
Voltage Taps .... −, + 6
Average Service Capacity (to 5.5 volts) .... 900 milliampere-hours
(Rated at 90 milliamperes)
Terminals .... Wire leads
Average Weight .... 8.3 oz. (235 grams)
Cells .... Five cylindrical (C900) (standard molded electrode) in series

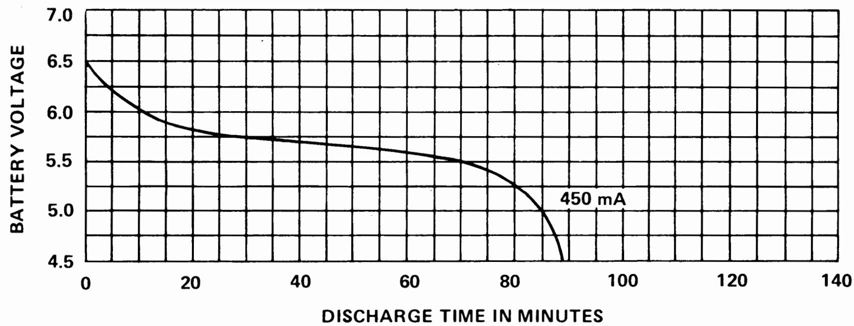
For service information see following pages

"EVEREADY" NO. N67

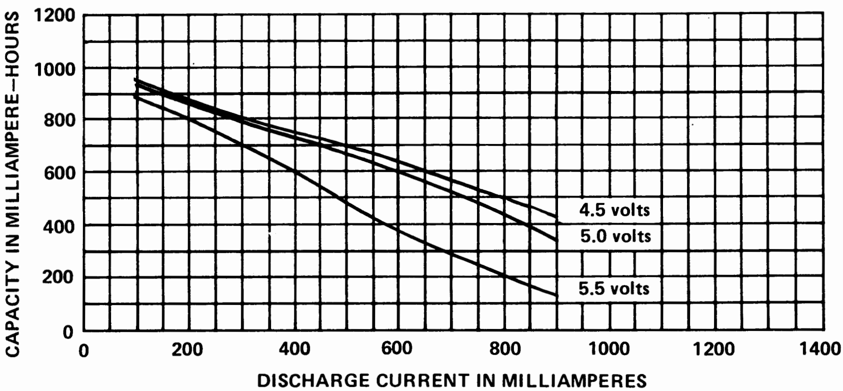
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves





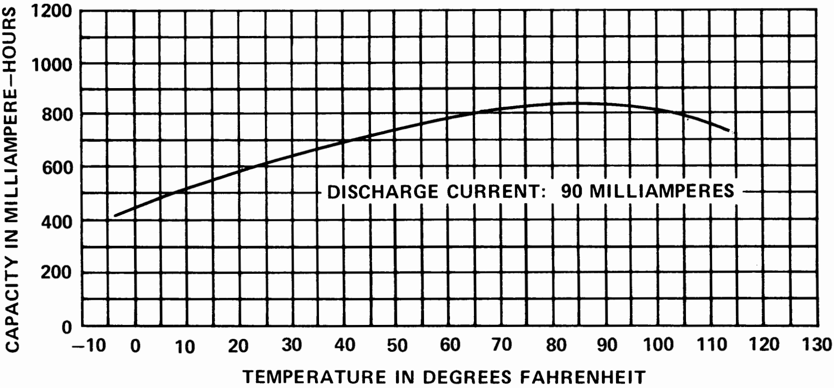
CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 200 milliampere discharge to a 5.5 volt endpoint. The N67 battery has a capacity of 800 milliampere-hours. (This provides a discharge time of 4 hours.)

"EVEREADY" NO. N67

Capacity vs. Temperature

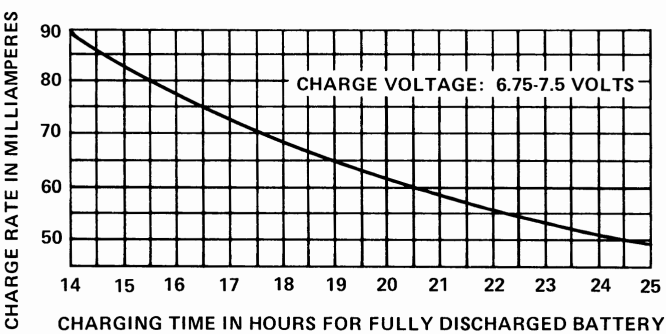


DEGREES	
F	C
–10	–23.3
0	–17.8
10	–12.2
20	–6.7
30	–1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9

Ranges of temperature applicable to operation of the N67 battery are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged batteries, reduce time or current proportionally.

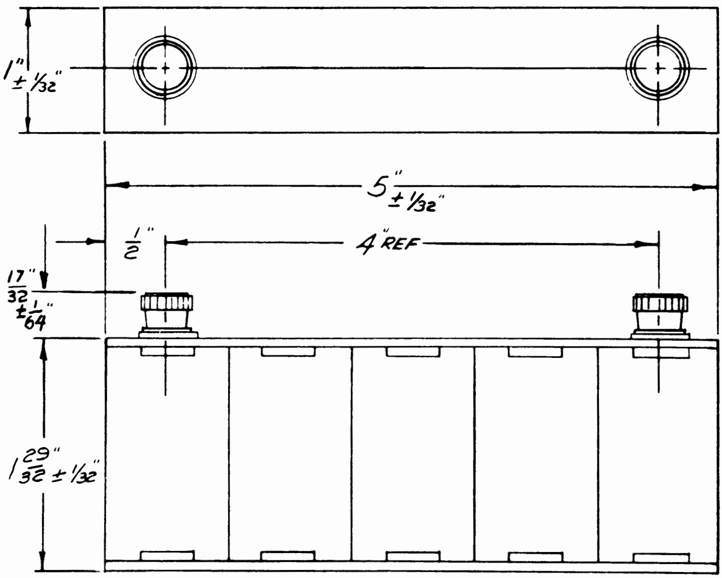
Trickle Charge

Not recommended.

"EVEREADY" NO. N91 BATTERY

Type: Nickel- Cadmium
Suggested Current Range: 0-4.8 amperes

Inches		Millimeters
1/64	.016	.40
1/32	.031	.79
1/2	.500	12.7
17/32	.531	13.5
1	1	25.4
1 29/32	1.91	48.4
4	4	102
5	5	127



Plastic Case
Terminals: #6-32 Knurls (Insulated)

SPECIFICATIONS

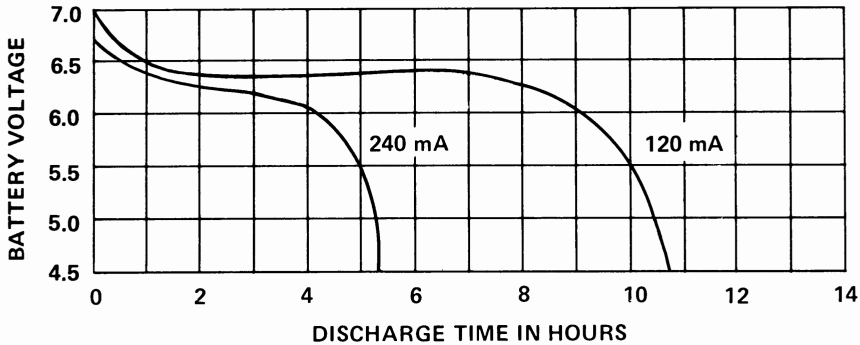
Voltage Taps .... –, + 6
Average Service Capacity (to 5.0 volts) .... 1.2 ampere-hours
(Rated at 1.2 amperes)
Terminals .... Screw—No. 6-32 with knurled plastic nuts
Average Weight .... 10 oz. (284 grams)
Cells .... Five cylindrical (CH1.2) (ANSI K60) High Rate in series

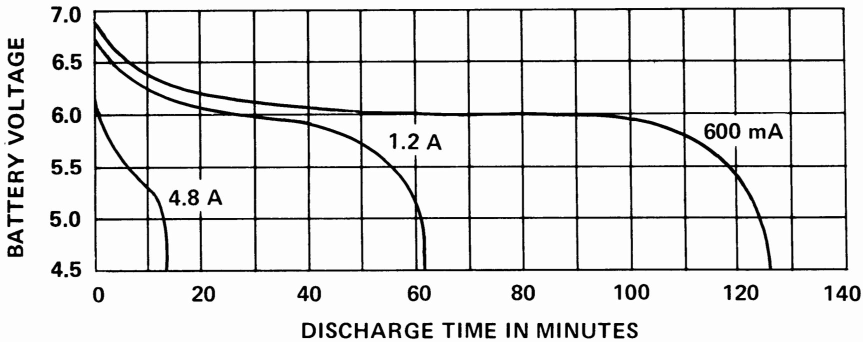
For service information see following pages

"EVEREADY" NO. N91

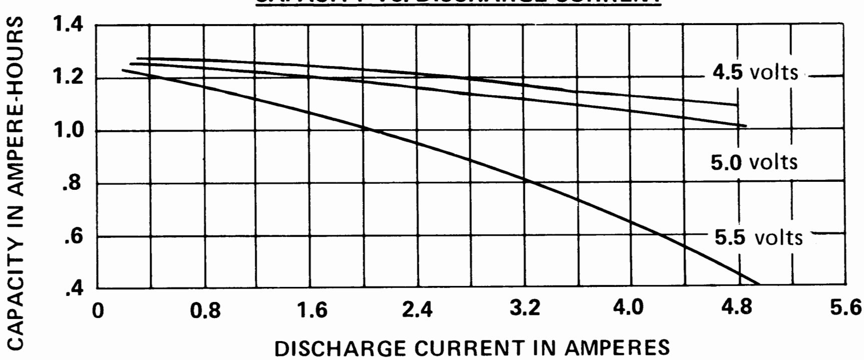
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 5.5 volt endpoint. The N91 battery has a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

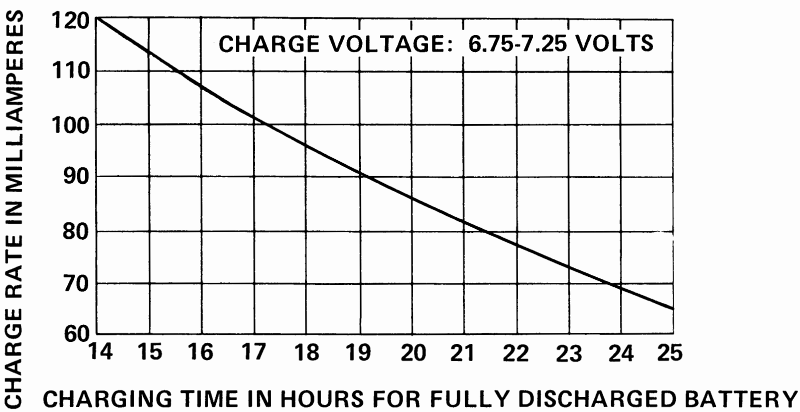
"EVEREADY" NO. N91

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the N91 battery are:

Charge:	+32° F to +113° F (0° C to 45° C)
Discharge:	– 4° F to +113° F (–20° C to 45° C)
Storage:	–40° F to +140° F (–40° C to 60° C)

Charge Rate vs. Charging Time



For partially discharged batteries reduce time or current proportionally

Trickle Charge

To maintain a fully charged battery for standby service, charge at 24 to 40 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 30 mA will bring a discharged battery up to 85% capacity.

Normal Charge

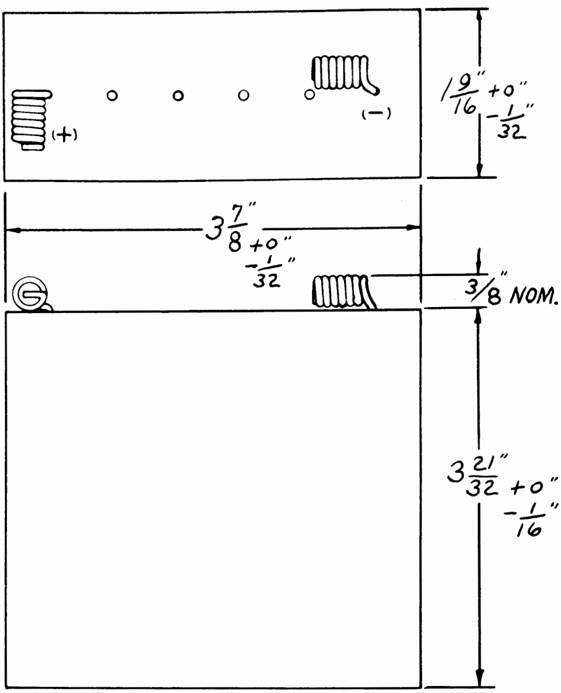
To charge batteries and maintain a fully charged battery with little battery degradation, charge at 40 to 120 mA.

"EVEREADY" NO. N70 BATTERY

Type: Nickel-Cadmium

Suggested Current Range: 0-750 milliamperes

Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
3/8	.375	9.53
1 9/16	1.56	39.7
3 21/32	3.66	92.9
3 7/8	3.88	98.4



PLASTIC CASE

SPECIFICATIONS

Voltage Taps .... −, + 6

Average Service Capacity (to 5.5 volts) .... 1.5 ampere-hours
(Rated at 150 milliamperes)

Terminals .... Wire leads

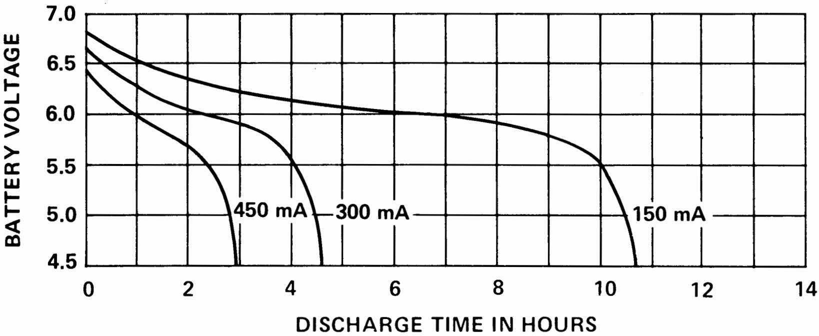
Average Weight .... 1 lb. 12 oz. (794 grams)

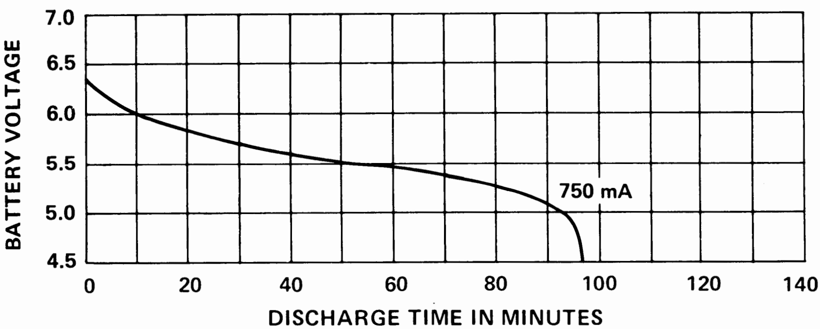
Cells .... Five rectangular (pocket plate) in series

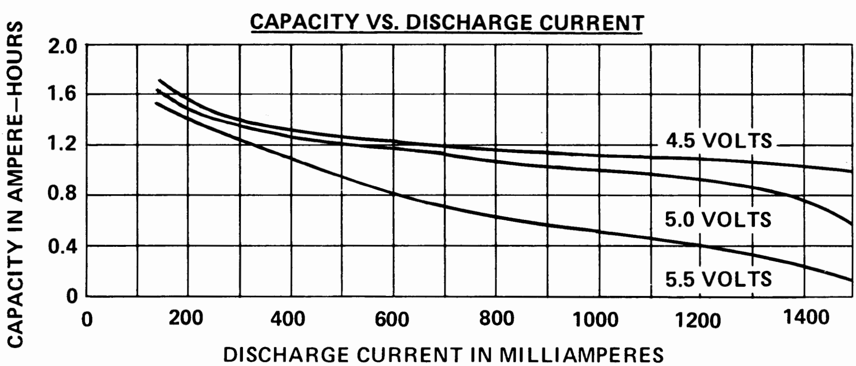
For service information see the following pages

"EVEREADY" NO. N70

Average Performance Characteristics at 70°F (21.1°C)
Typical Discharge Curves



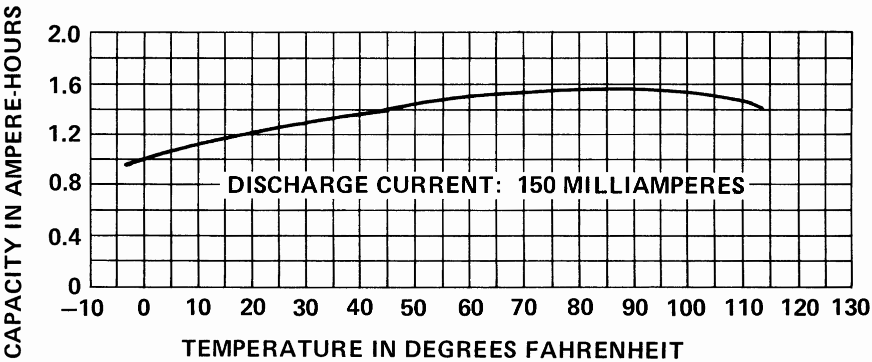




EXAMPLE: Assume an 800 milliampere discharge to a 4.5 volt endpoint. The N70 battery has a capacity of 1.2 ampere-hours. (This provides a discharge time of 1.5 hours.)

"EVEREADY" NO. N70

CAPACITY VS. TEMPERATURE

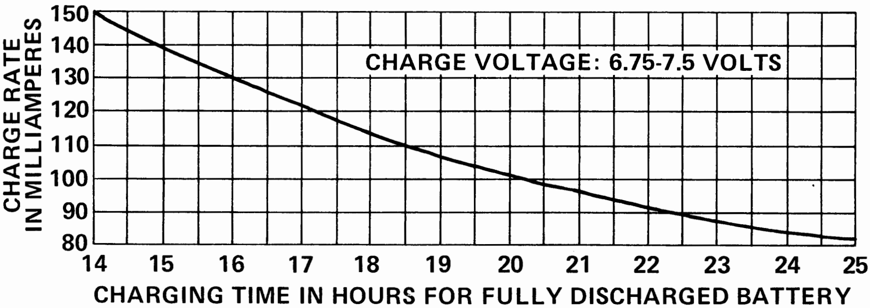


DEGREES	
F	C
−10	−23.3
0	−17.8
10	−12.2
20	−6.7
30	−1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9
130	54.4

Ranges of temperature applicable to operation of the N70 battery are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

CHARGE RATE VS. CHARGING TIME



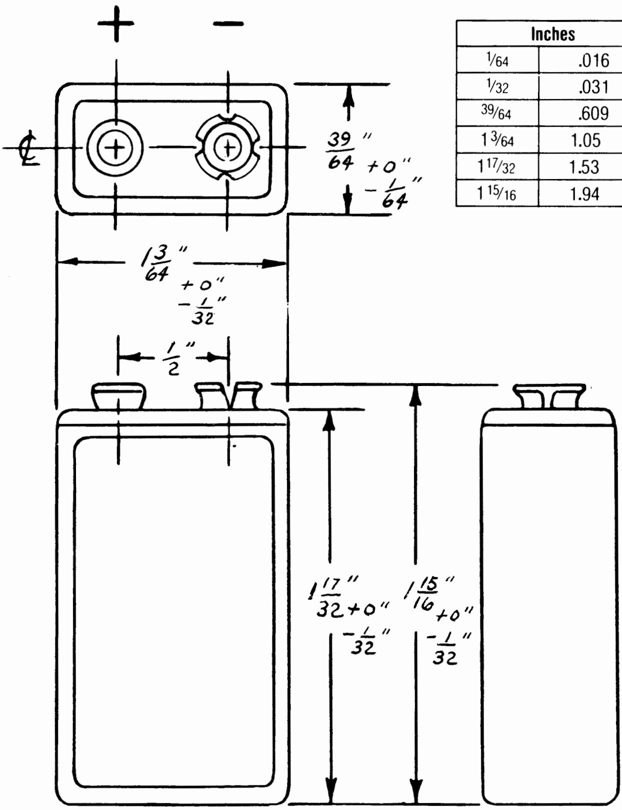
For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

Not recommended.

"EVEREADY" NO. N88 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-45 milliamperes



Inches		Millimeters
1/64	.016	.40
1/32	.031	.79
39/64	.609	15.5
1 3/64	1.05	26.6
1 17/32	1.53	38.9
1 15/16	1.94	49.2

Plastic Jacket

SPECIFICATIONS

Voltage Taps .... −, + 8.4

Average Service Capacity (to 7.7 volts) .... 90 milliampere-hours
(Rated at 9 milliamperes)

Terminals .... Miniature snap

Average Weight .... 1.5 oz. (42.5 grams)

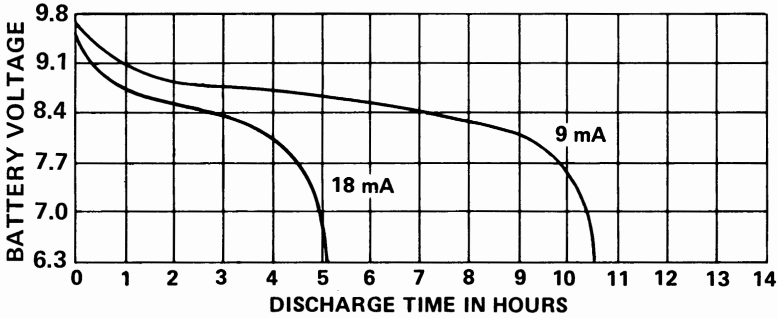
Cells ....Seven oval button (OB90) (standard molded electrode) in series

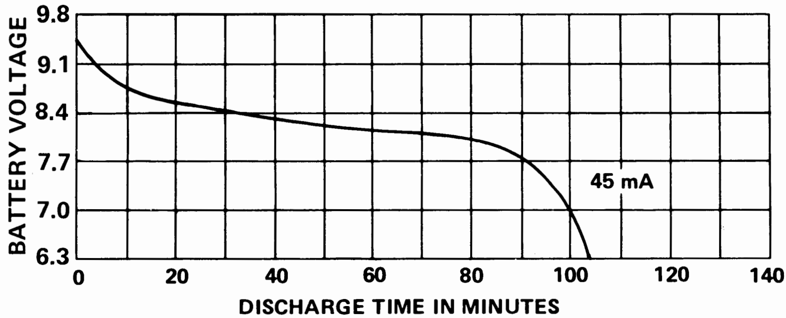
For service information see reverse side of this sheet

"EVEREADY" NO. N88

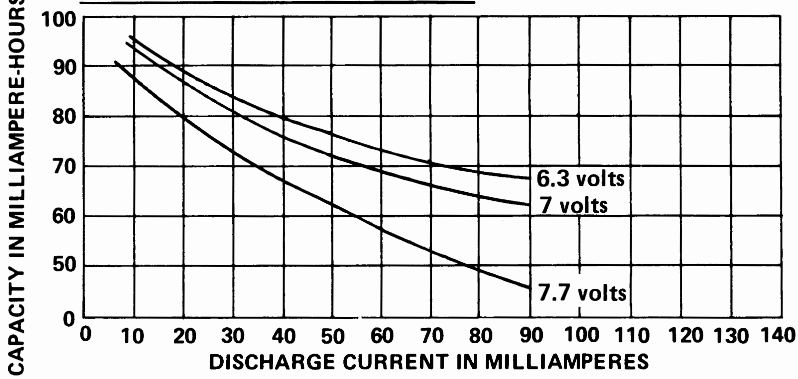
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves





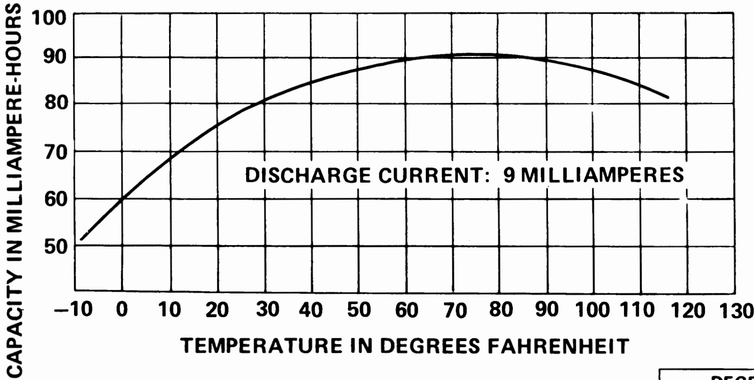
CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 35 milliampere discharge to a 7.7 volt endpoint. The N88 battery has a capacity of 70 milliampere-hours. (this provides a discharge time of 2 hours.)

"EVEREADY" NO. N88

CAPACITY VS. TEMPERATURE

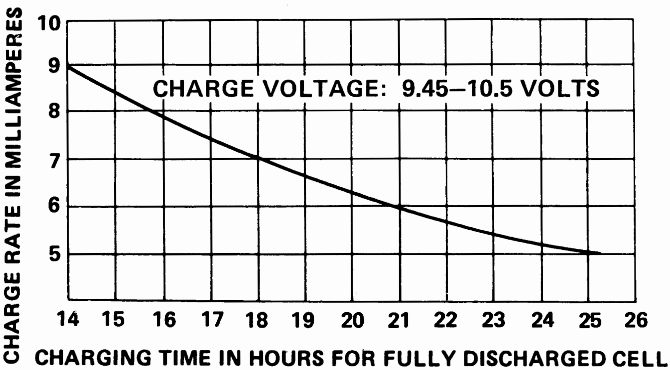


DEGREES	
F	C
–10	–23.3
0	–17.8
10	–12.2
20	–6.7
30	–1.1
40	4.4
50	10
60	15.6
70	21.1
80	26.7
90	32.2
100	37.8
110	43.3
120	48.9

Ranges of temperature applicable to operation of the N88 battery are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (-20°C to 45°C)
Storage: –40°F to +140°F (-40°C to 60°C)

CHARGE RATE VS. CHARGING TIME



For partially discharged cells, reduce time or current proportionally.

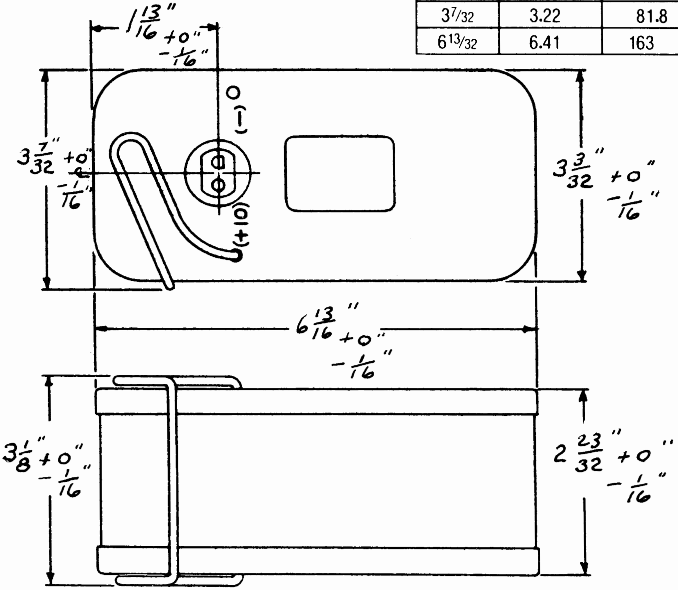
Trickle Charge

Not recommended.

"EVEREADY" NO. 1007 POWER PACK

Type: Nickel-Cadmium
Suggested Current Range: 0-10 amperes

Inches		Millimeters
1/16	.063	1.59
1 13/16	1.81	46
2 23/32	2.72	69.1
3 3/32	3.09	78.6
3 1/8	3.13	79.4
3 7/32	3.22	81.8
6 13/32	6.41	163



Stainless Steel Case

Miller Electric Co. No's.
Socket—No. 765-1
Mating Plug—No. 650-1
Union Carbide Plug and Cable Assem.—No. 07867
(Cable Length—47" ± ½")

SPECIFICATIONS

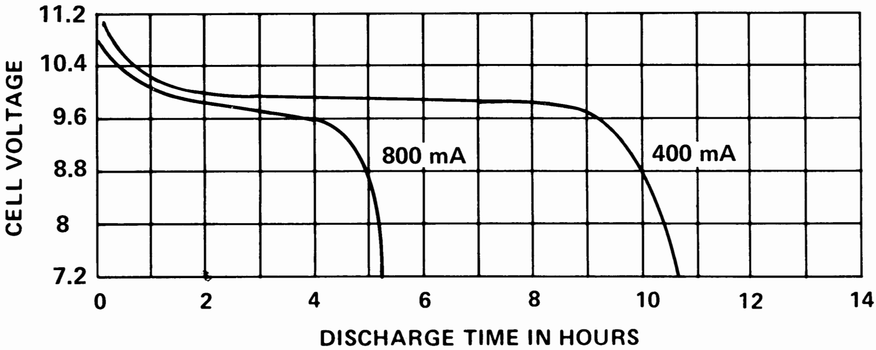
Voltage Taps .... –, + 9.6
Average Service Capacity (to 8 volts) .... 4 ampere-hours
(Rated at 4 amperes)
Terminals .... Socket
Average Weight .... 3 lbs. 13 oz. (1.73 kilograms)
Cells .... Eight cylindrical (CH4) (ANSI K90) High Rate in series

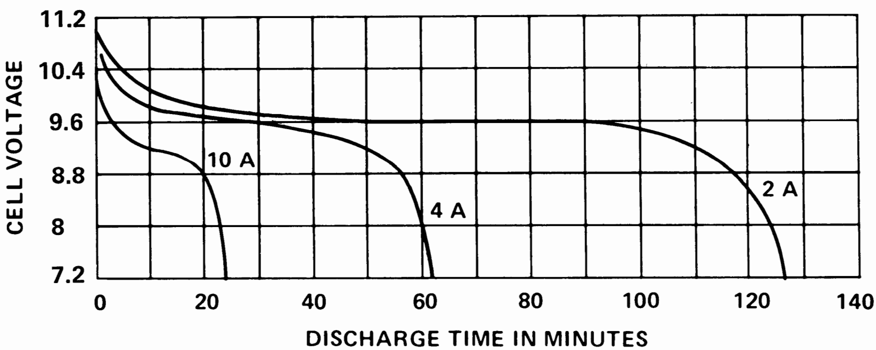
For service information see following pages

"EVEREADY" NO. 1007

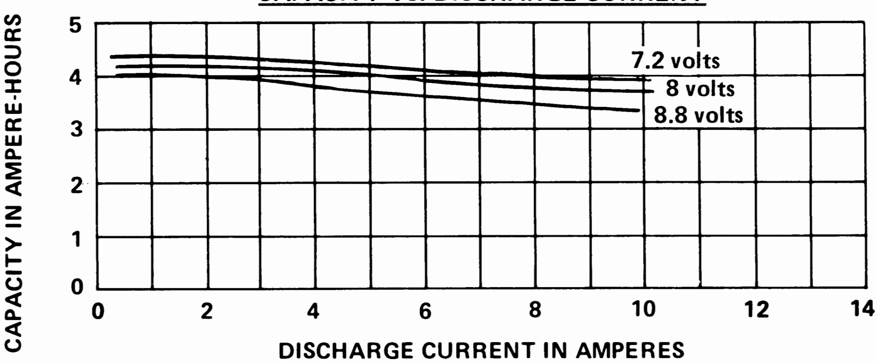
Average Performance Characteristics at 70° F(21.1°C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to an 8.8 endpoint. The 1007 battery has a capacity of 4 ampere-hours. (This provides a discharge time of 2 hours).

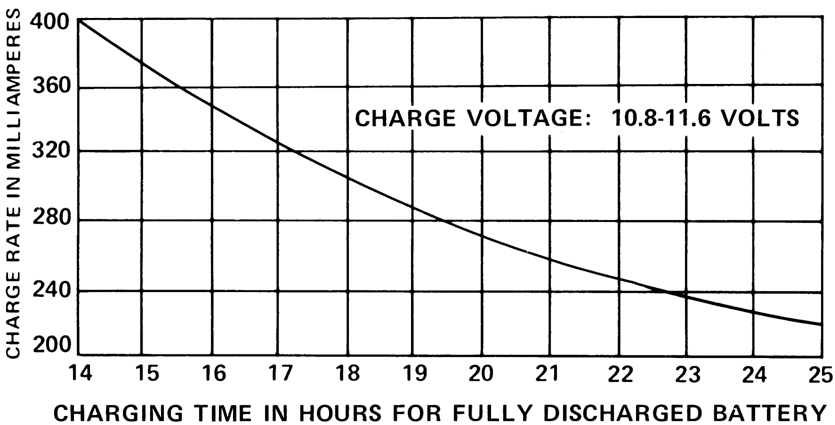
"EVEREADY" NO. 1007

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the 1007 battery:

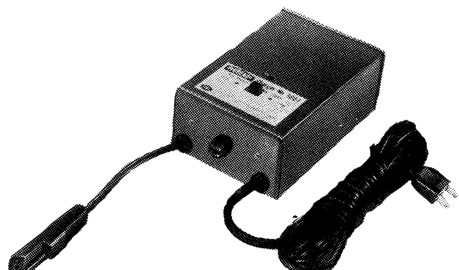
Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged batteries reduce time or current proportionally.

The "Eveready" No. 1807 charger, illustrated, is recommended for use with the No. 1007 Power Pack. The charger converts 117 volt ac to 10-12 volt dc & is two rate, charging at either 400 or 200 milliamperes. It has a pilot light charge indicator and fuse protection.



No. 1807 Charger

Trickle Charge

To maintain a fully charged battery for standby service, charge at 80 to 133mA.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 100mA will bring a discharged battery up to 85% capacity.

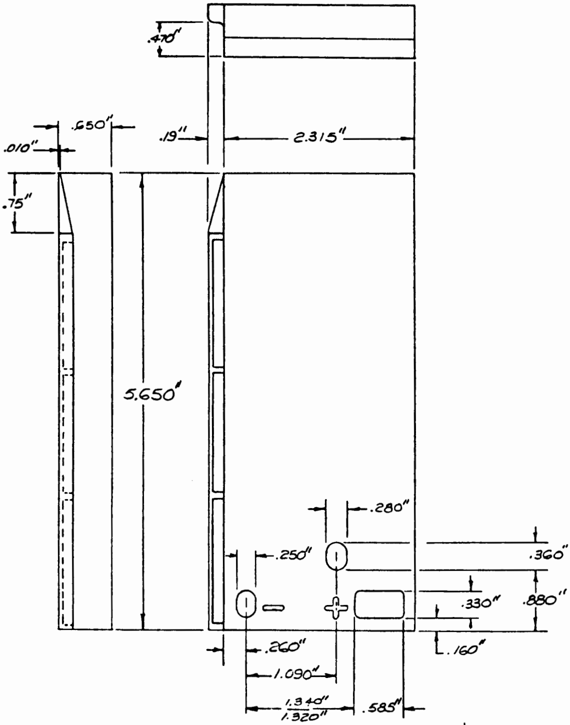
Normal Charge

To charge batteries and maintain a fully charged battery with little battery degradation, charge at 133 to 400 mA.

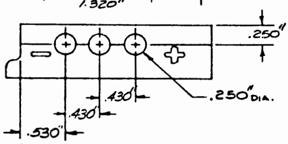
"HERCULES" NO. HS4151 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-2 amperes

NOTE: See pages 393-401 for general information on Fast Charge batteries.



Inches	Millimeters
.010	.25
.160	4.06
.19	4.83
.250	6.35
.260	6.6
.280	7.11
.330	8.38
.360	9.14
.430	10.9
.470	11.9
.530	13.5
.585	14.9
.650	16.5
.75	19.1
.880	22.4
1.090	27.7
1.320	33.5
1.340	34
2.315	58.8
5.650	144



PLASTIC CASE

NOTE: Third Terminal—Thermistor for Fast Charge thermal control. Contact Union Carbide for specific information.

SPECIFICATIONS

Voltage Taps .... –, + 12
Average Service Capacity (to 10 volts) .... 500 milliampere-hours
(Rated at 500 milliamperes)
Terminals .... Flat Recessed
Average Weight .... 8.5 oz. (241 grams)
Cells ....Ten cylindrical (CF500) (ANSI K40) (AA size)
High Rate-Fast Charge in series

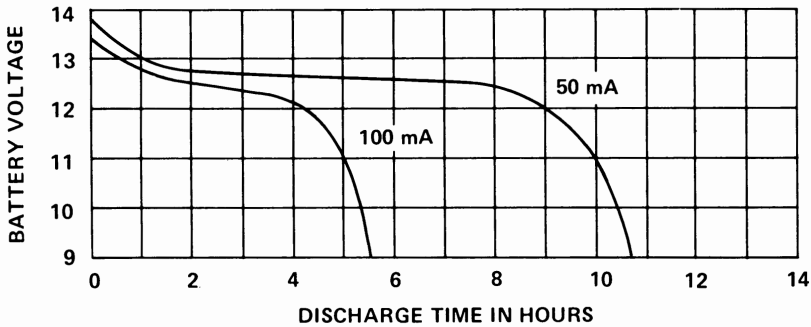
For service information see following pages

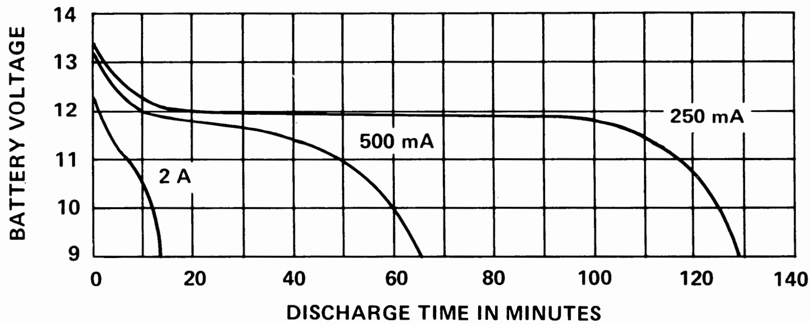
"HERCULES" NO. HS4151

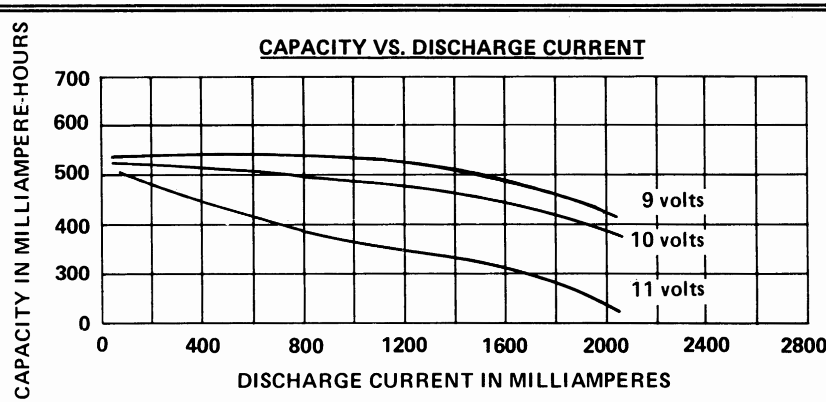
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves

The following performance curves assume the batteries were fast charged at 175 milliamperes. A slight reduction incapacity will be experienced when charged at lower rates.







EXAMPLE: Assume an 800 milliampere discharge to a 10 volt endpoint. The HS4151 battery has a capacity of 500 milliampere-hours. (This provides a discharge time of 38 minutes.)

"HERCULES" NO. HS4151

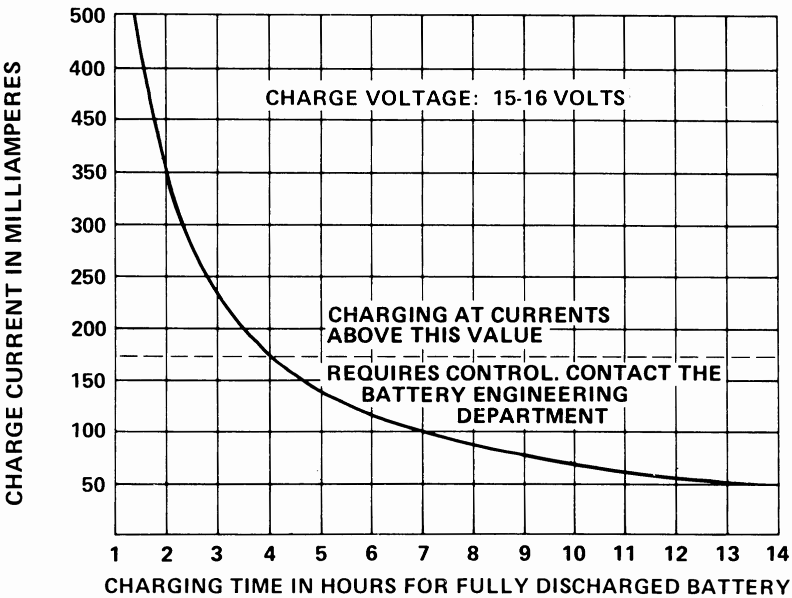
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4151 battery are:

Charge:	+60°F to +113°F (15.6°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

Note: See pages 393-401 for general information on Fast Charge batteries.



For partially discharged batteries, reduce time or current proportionally.

"HERCULES" NO. HS4151

Trickle Charge

To maintain a fully charged battery for standby service, charge at 10 to 17 mA.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 12.5 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge batteries and maintain a fully charged battery with little battery degradation, charge at 17 to 50 mA.

High Rate Charge

To charge batteries for immediate use, charge at 50 to 170 mA. Occasional overcharging for up to three days at these rates will not adversely affect battery performance.

High Rate Charge with Control

To charge batteries as quickly as possible charge at 170 to 500 mA with proper charge control device. Overcharging, which might harm the batteries is prevented by the charge control device.

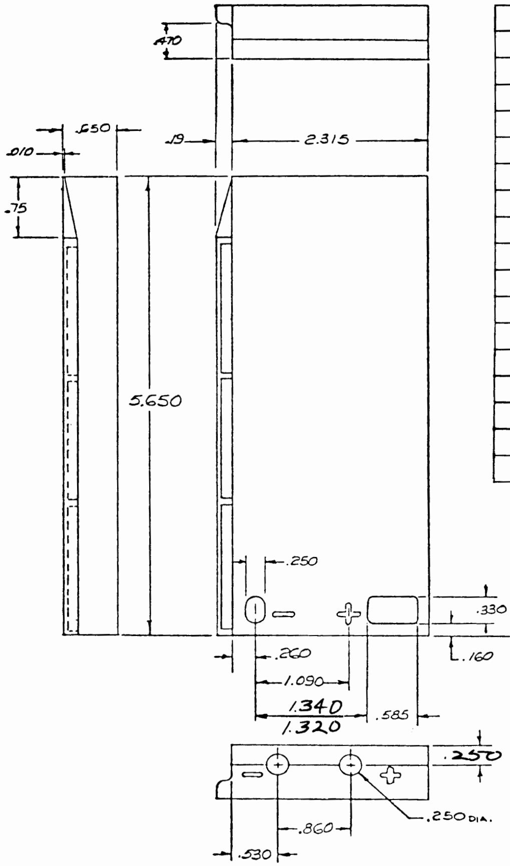
Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 40 ampere-seconds
Average current over entire discharge period: Not to exceed 2 amperes

"HERCULES" NO. HS4153 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-2 amperes



Inches	Millimeters
.010	.25
.160	4.06
.19	4.83
.250	6.35
.260	6.6
.330	8.38
.470	11.9
.530	13.5
.585	14.9
.650	16.5
.75	19.1
.860	21.8
1.090	27.7
1.320	33.5
1.340	34
2.315	58.8
5.650	144

PLASTIC CASE

SPECIFICATIONS

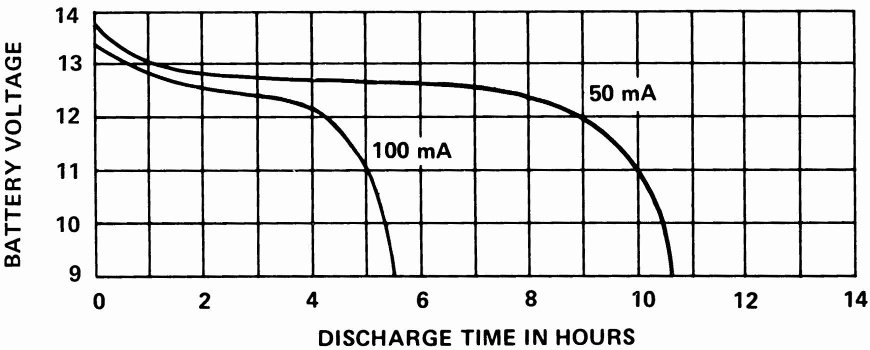
Voltage Taps .... –, + 12
Average Service Capacity (to 10 volts) .... 500 milliampere-hours
(Rated at 500 milliamperes)
Terminals.. Flat Recessed
Average Weight .... 9 oz. (255 grams)
Cells ....10 cylindrical (CH500) (ANSI K40) (AA size)
High Rate in series

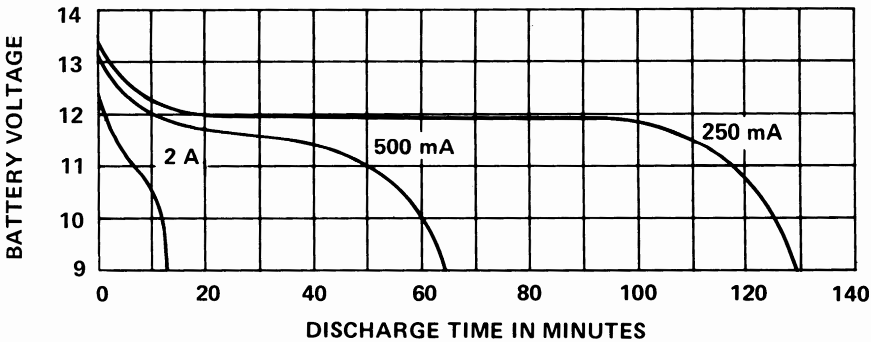
For service information see following pages

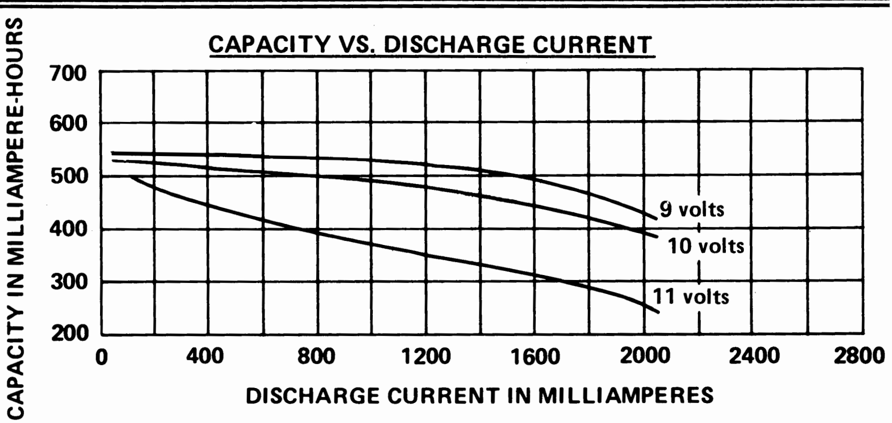
"HERCULES" NO. HS4153

Average Performance Characteristics at 70°F(21.1°C)

Typical Discharge Curves







EXAMPLE: Assume an 800 milliampere discharge to a 10 volt endpoint. The HS4153 battery has a capacity of 500 milliampere-hours. (This provides a discharge time of 38 minutes.)

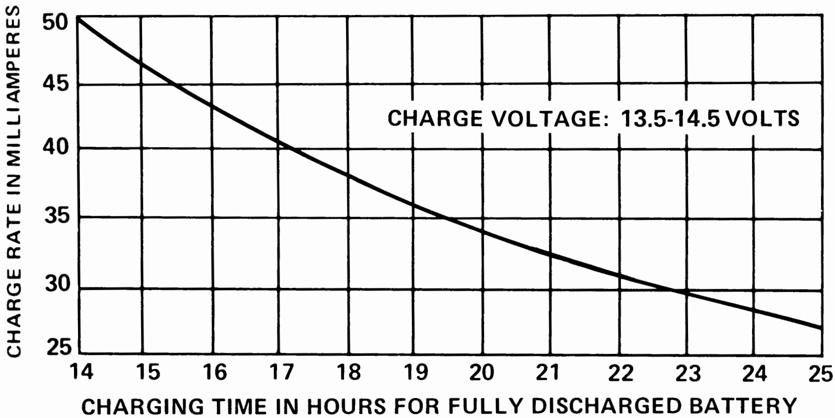
"HERCULES" NO. HS4153

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4153 battery are:

Charge: +32° F to +113° F (0° C to 45° C)
Discharge: – 4° F to +113° F (–20° C to 45° C)
Storage: –40° F to +140° F (–40° C to 60° C)

Charge Rate vs. Charging Time



For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service charge at 10 to 17 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 12.5 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge batteries and maintain a fully charged battery with little battery degradation, charge at 17 to 50 mA.

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)

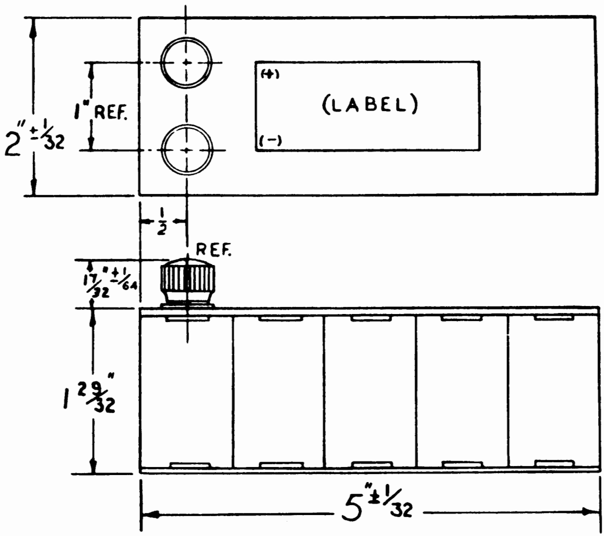
Discharge per pulse: Not to exceed 40 ampere-seconds

Average current over entire discharge period: not to exceed 2 amperes

"EVEREADY" NO. N86 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-4.8 amperes

Inches		Millimeters
1/64	.016	.40
1/32	.031	.79
1/2	.500	12.7
17/32	.531	13.5
1	1	25.4
1 29/32	1.91	48.4
2	2	50.8
5	5	127



PLASTIC CASE
TERMINALS: #6-32 KNURLS (INSULATED)

SPECIFICATIONS

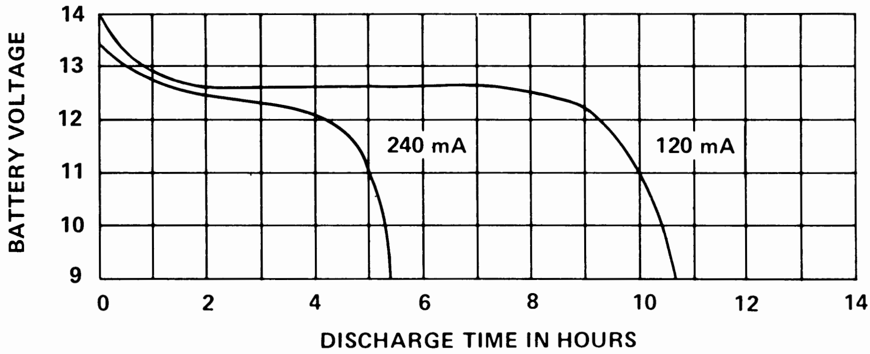
Voltage Taps .... −, + 12
Average Service Capacity (to 10 volts) .... 1.2 ampere-hours
(Rated at 1.2 amperes)
Terminals .... Screw-No. 6-32 with knurled plastic nuts
Average Weight .... 1 lb. 4 oz. (567 grams)
Cells .... 10 cylindrical (CH1.2) (ANSI K60) High Rate in series

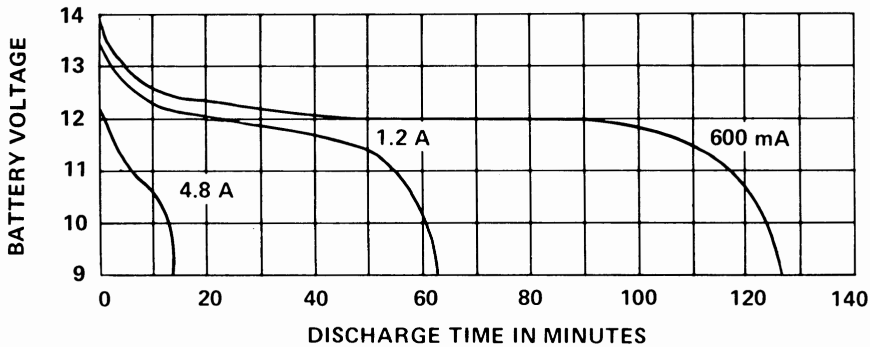
For service information see following pages

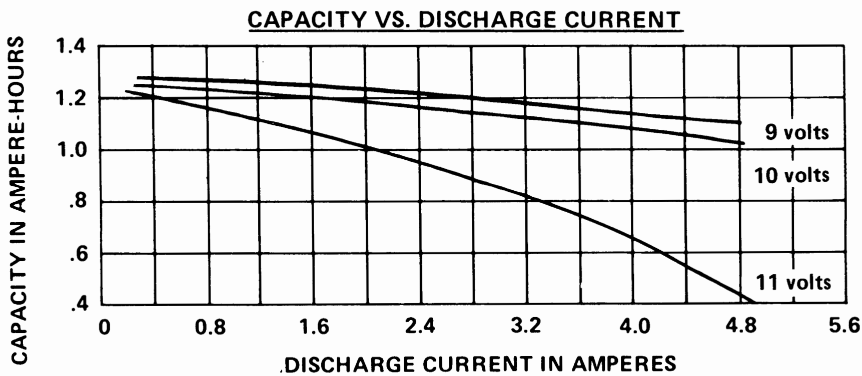
"EVEREADY" NO. N86

Average Performance Characteristics at 70° F (21.1° C)

Typical Discharge Curves







EXAMPLE: Assume a 2 ampere discharge to an 11 volt endpoint. The N86 battery has a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

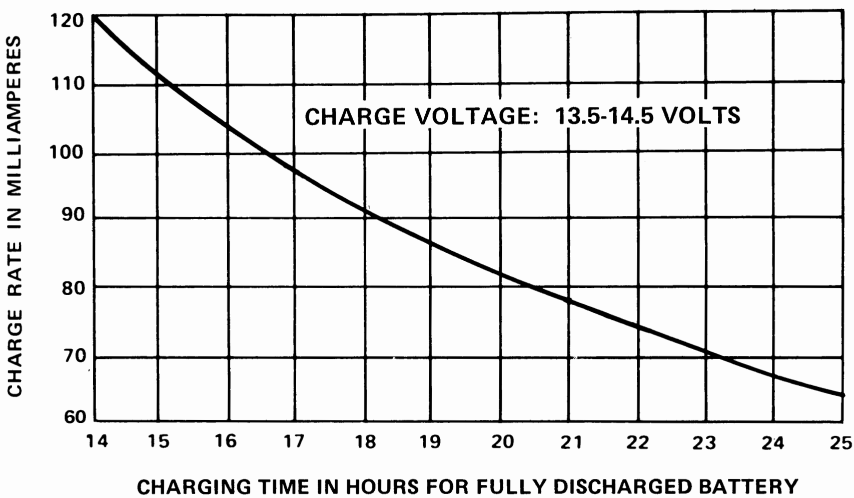
"EVEREADY" NO. N86

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the N86 battery are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	−4°F to +113°F (−20°C to 45°C)
Storage:	−40°F to +140°F (−40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service charge at 24 to 40 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 30 mA will bring a discharged battery up to 85% capacity.

Normal Charge

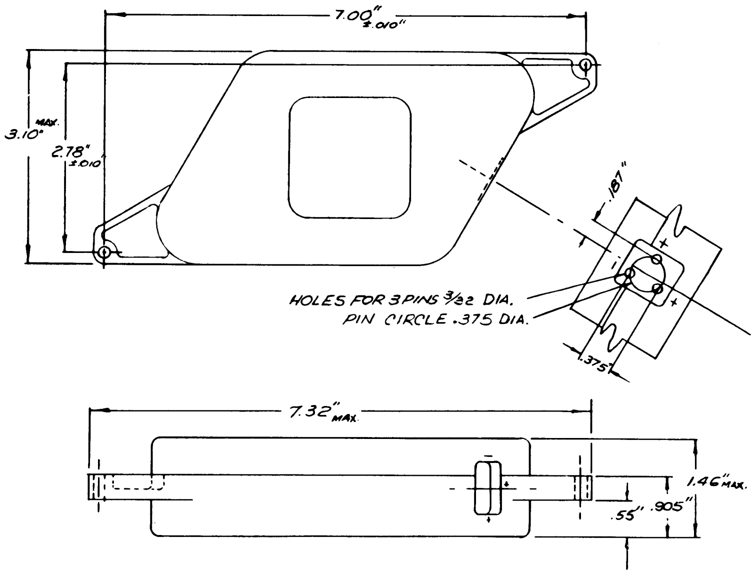
To charge batteries and maintain a fully charged battery with little battery degradation, charge at 40 to 120 mA.

"EVEREADY" NO. N65 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-4 amperes

PLASTIC CASE

Inches		Millimeters
	.010	.25
3/32	.094	2.38
	.187	4.75
	.375	9.53
	.55	14
	.905	23
	1.46	37.1
	2.78	70.6
	3.10	78.7
	7.00	178
	7.32	186



SPECIFICATIONS

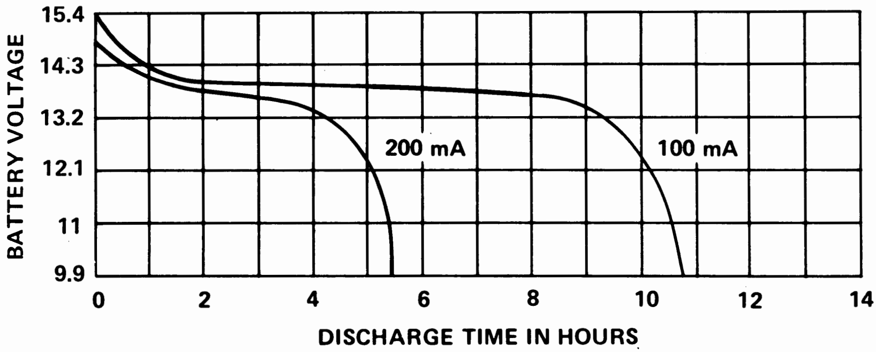
Voltage Taps .... –, + 13.2
Average Service Capacity (to 11 volts) .... 1 ampere-hour
(Rated at 1 ampere)
Terminals.. Socket
Average Weight .... 1 lb. 11 oz. (765 grams)
Cells.............................. Eleven cylindrical (CH1) High Rate in series

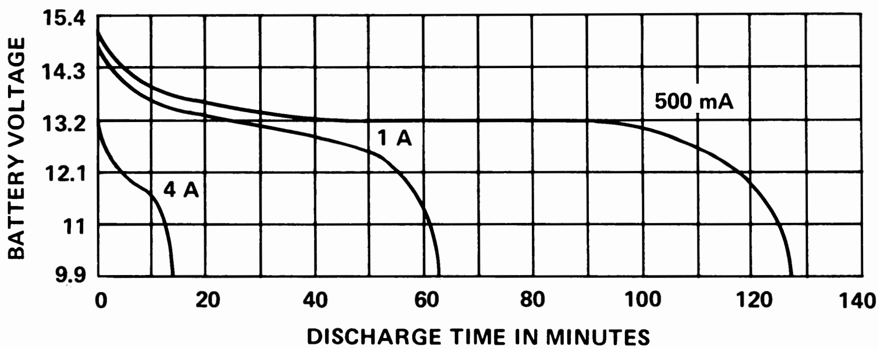
For service information see following pages

"EVEREADY" NO. N65

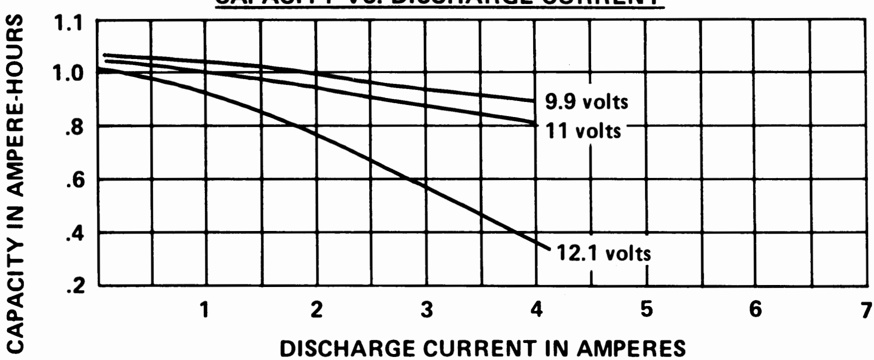
Average Performance Characteristics at 70° F(21.1°C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 9.9 volt endpoint. The N65 battery has a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

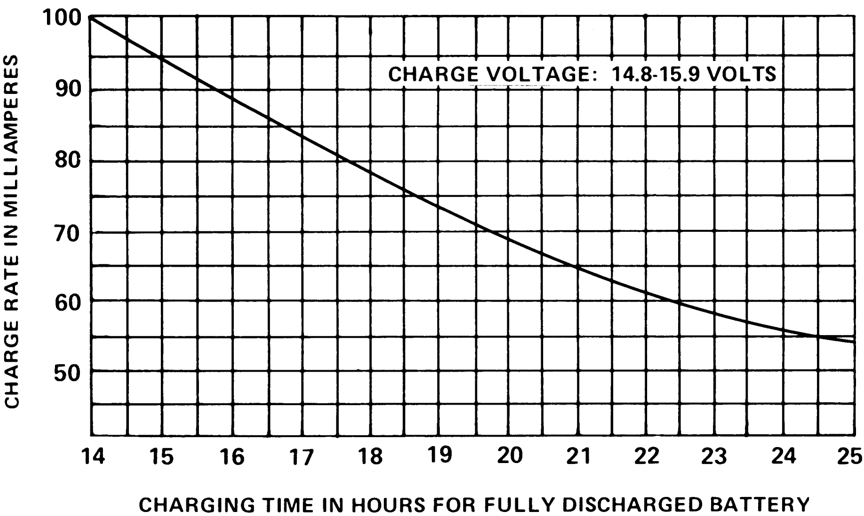
"EVEREADY" NO. N65

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the N65 battery are:

Charge: $+32^\circ F$ to $+113^\circ F$ ($0^\circ C$ to $45^\circ C$)
Discharge: $-4^\circ F$ to $+113^\circ F$ ($-20^\circ C$ to $45^\circ C$)
Storage: $-40^\circ F$ to $+140^\circ F$ ($-40^\circ C$ to $60^\circ C$)

Charge Rate vs. Charging Time



For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 20 to 33 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 25 mA will bring a discharged battery up to 85% capacity.

Normal Charge

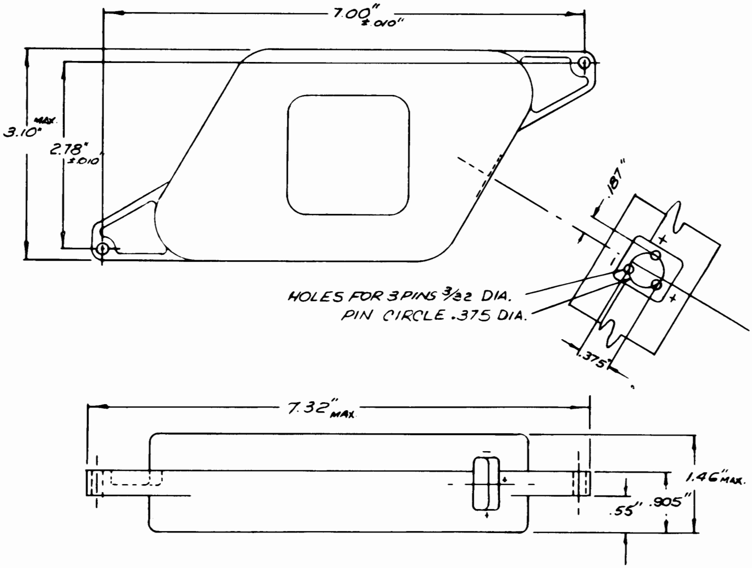
To charge batteries and maintain a fully charged battery with little battery degradation, charge at 33 to 100 mA.

"HERCULES" NO. HS4280 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-4 amperes

PLASTIC CASE

Inches		Millimeters
	.010	.25
3/32	.094	2.38
	.187	4.75
	.375	9.53
	.55	14
	.905	23
	1.46	37.1
	2.78	70.6
	3.10	78.7
	7.00	178
	7.32	186



SPECIFICATIONS

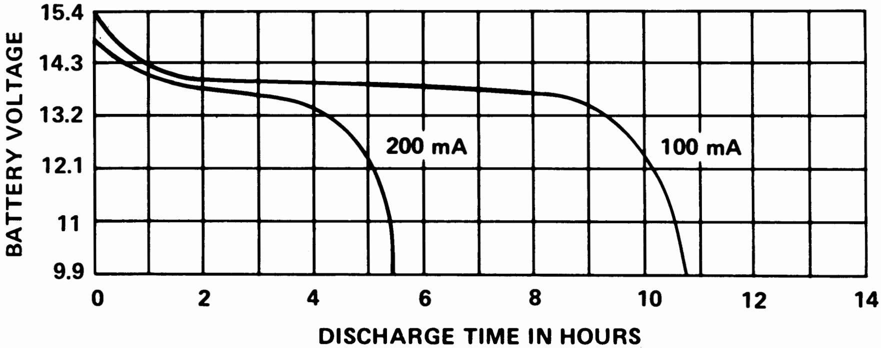
Voltage Taps .... –, + 13.2
Average Service Capacity (to 11 volts) .... 1 ampere-hour
(Rated at 1 ampere)
Terminals.. Socket
Average Weight .... 1 lb. 11 oz. (765 grams)
Cells.................................... Eleven cylindrical (CH1) High Rate in series

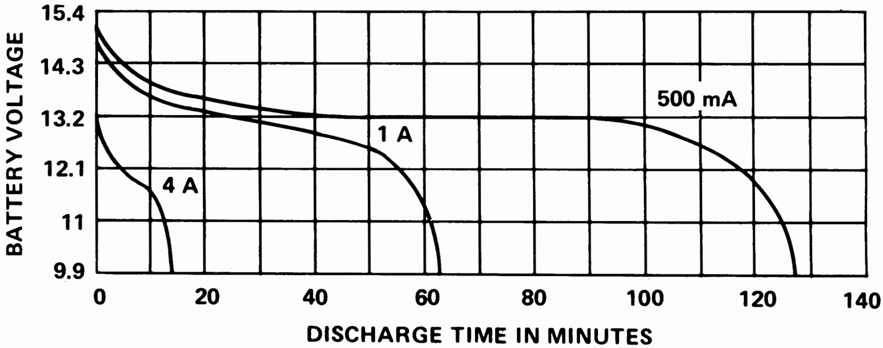
For service information see following pages

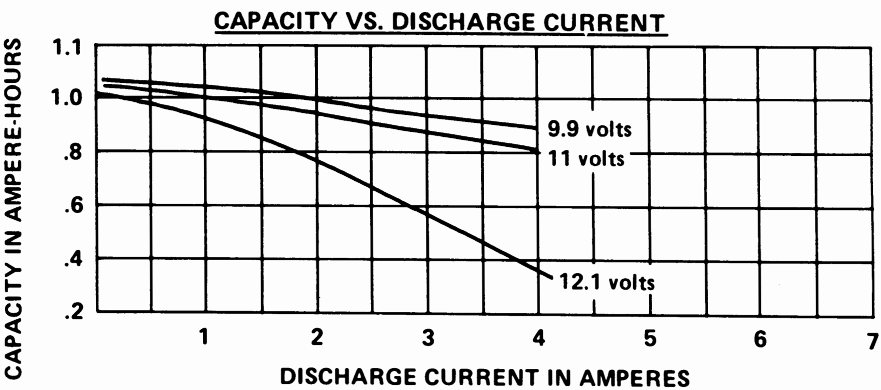
"HERCULES" NO. HS4280

Average Performance Characteristics at 70° F (21.1° C)

Typical Discharge Curves







EXAMPLE: Assume a 2 ampere discharge to a 9.9 volt endpoint. The HS4280 battery has a capacity of 1 ampere-hour. (This provides a discharge time of 30 minutes.)

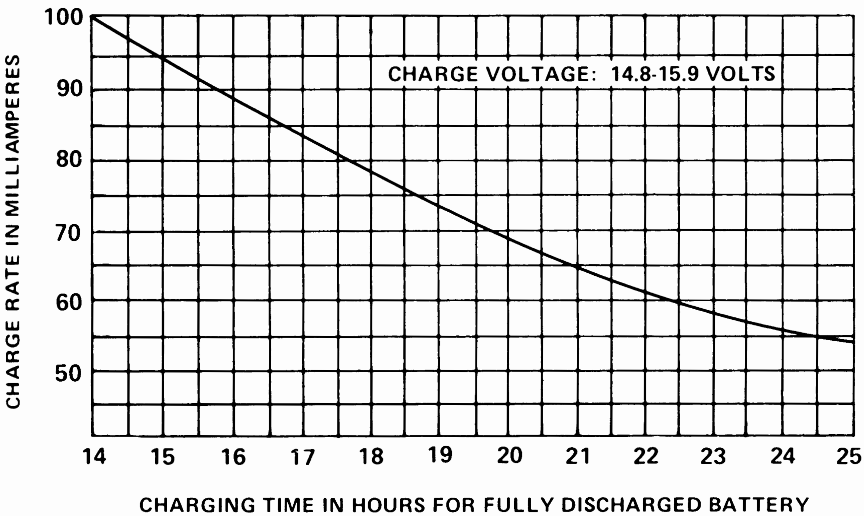
"HERCULES" NO. HS4280

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4280 battery are:

Charge: +32°F to +113°F (0°C to 45°C)
Discharge: – 4°F to +113°F (–20°C to 45°C)
Storage: –40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 20 to 33 milliamperes.

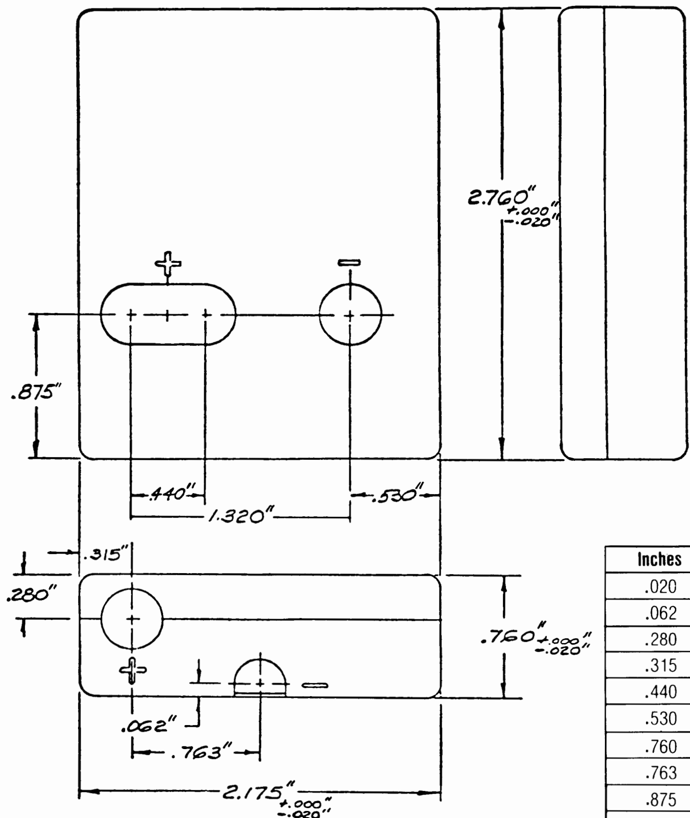
NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 25 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge batteries and maintain a fully charged battery with little battery degradation, charge at 33 to 100 mA.

"HERCULES" NO. HS4130 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-900 milliamperes



Inches	Millimeters
.020	.51
.062	1.58
.280	7.11
.315	8
.440	11.2
.530	13.5
.760	19.3
.763	19.4
.875	22.2
1.320	33.5
2.175	55.3
2.760	70.1

PLASTIC CASE

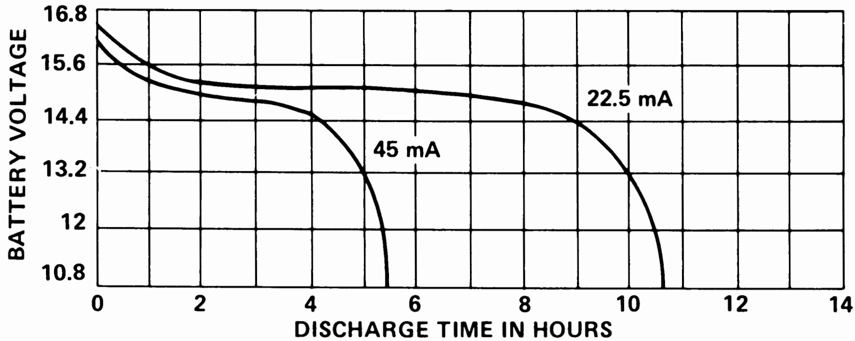
SPECIFICATIONS

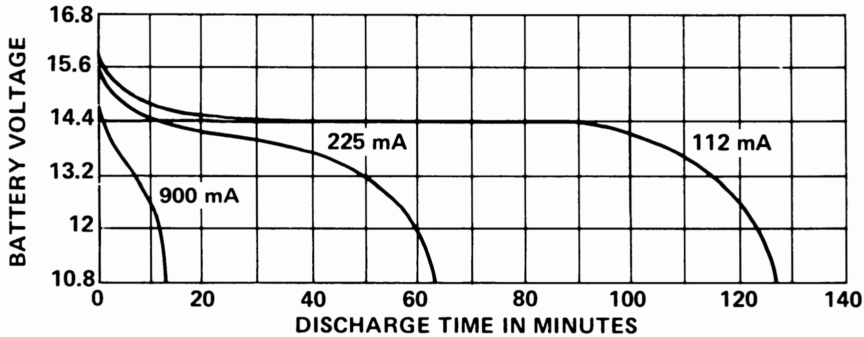
Voltage Taps .... −, + 14.4
Average Service Capacity (to 12 volts) .... 225 milliampere-hours
(Rated at 225 milliamperes)
Terminals .... Flat Recessed
Average Weight .... 5 oz. (142 grams)
Cells .... Twelve cylindrical (CH225) High Rate in series

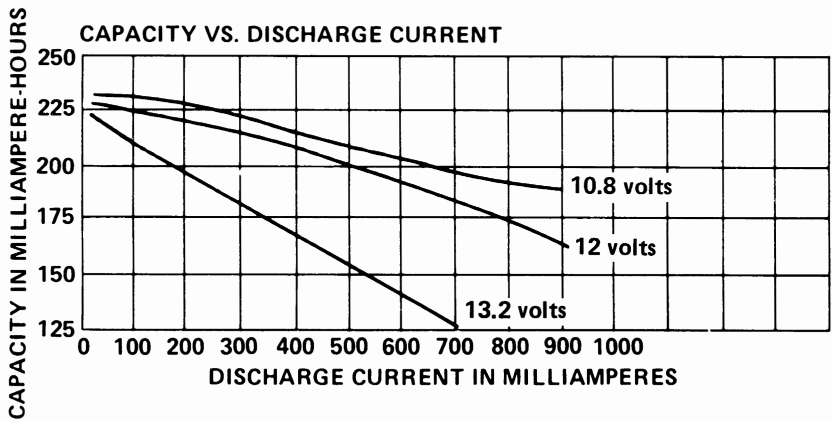
For service information see following pages

"HERCULES" NO. HS4130

Average Performance Characteristics at 70°F (21.1°C) Typical Discharge Curves







EXAMPLE: Assume a 500 milliampere discharge to a 12 volt endpoint. The HS4130 battery has a capacity of 200 milliampere-hours. (This provides a discharge time of 24 minutes.)

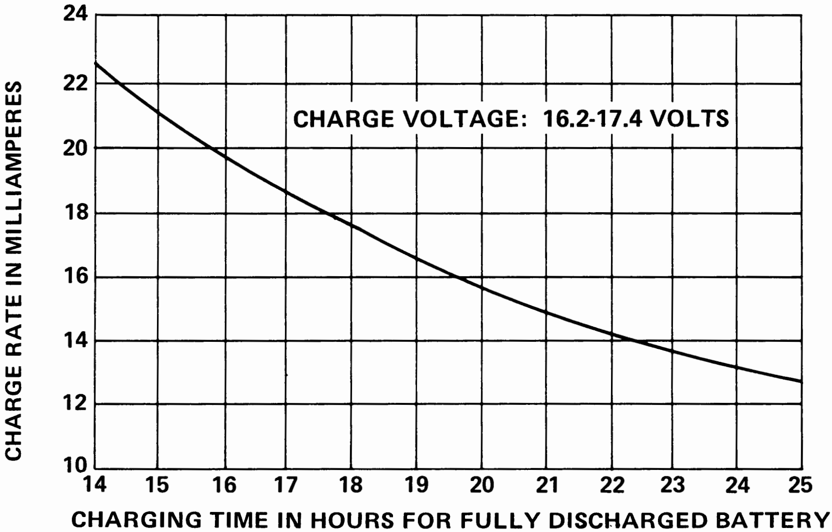
"HERCULES" NO. HS4130

Operating & Storage Temperatures

Ranges of temperature applicalbe to operation of the HS4130 battery are:

Charge:	$+32^{\circ}$F to $+113^{\circ}$F (0°C to 45°C)
Discharge:	-4°F to $+113^{\circ}$F (-20°C to 45°C)
Storage:	-40°F to $+140^{\circ}$F (-40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged batteries reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 4.5 to 7.5 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 5.6 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge batteries and maintain a fully charged battery with little battery degradation, charge at 7.5 to 22.5 mA.

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)

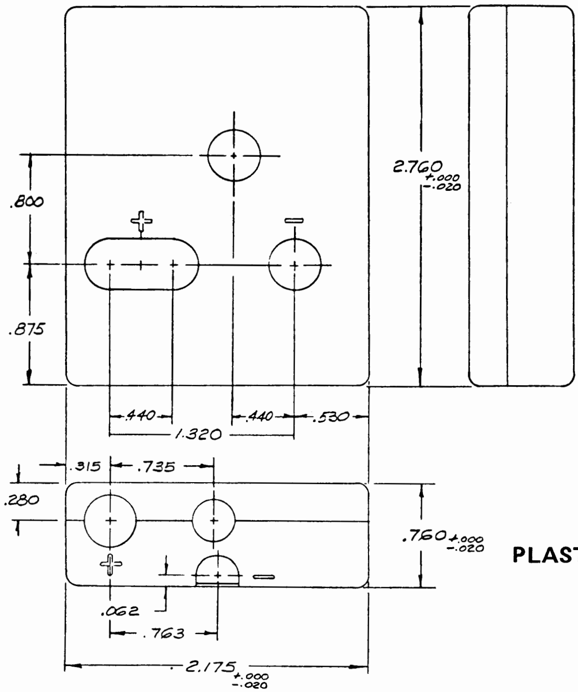
Discharge per pulse: Not to exceed 18 ampere-seconds.
Average current over entire discharge period: Not to exceed 750 milliamperes

"HERCULES" NO. HS4080 BATTERY

14.4
VOLTS

Type: Nickel-Cadmium
Suggested Current Range: 0-900 milliamperes

NOTE: See page 393-401 for general information on Fast Charge batteries.



Inches	Millimeters
.020	.51
.062	1.58
.280	7.11
.315	8
.440	11.2
.530	13.5
.735	18.7
.760	19.3
.763	19.4
.800	20.3
.875	22.2
1.320	33.5
2.175	55.3
2.760	70.1

PLASTIC CASE

NOTE: Third terminal—thermistor for Fast Charge thermal control. Contact Union Carbide for specific information.

SPECIFICATIONS

Voltage Taps .... −, + 14.4
Average Service Capacity (to 12 volts) .... 225 milliampere-hours
(Rated at 225 milliamperes)
Terminals .... Flat Recessed
Average Weight .... 5 oz. (142 grams)
Cells .... Twelve cylindrical (CF225) High Rate-Fast Charge in series

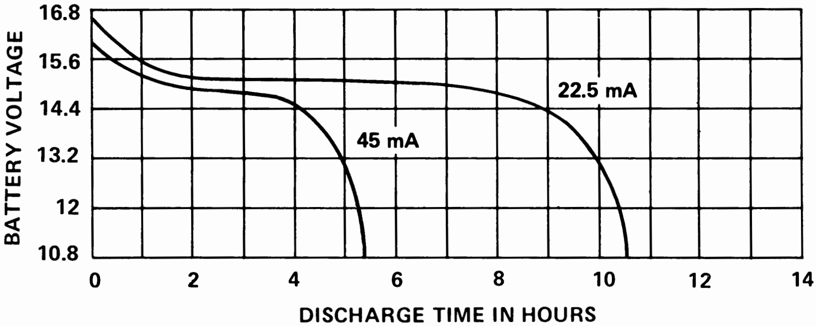
For service information see following pages

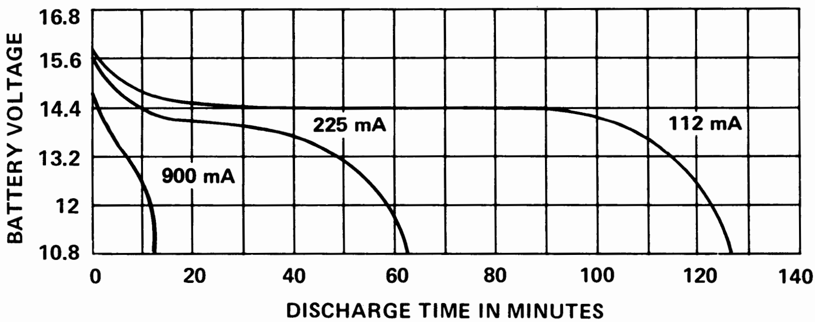
"HERCULES" NO. HS4080

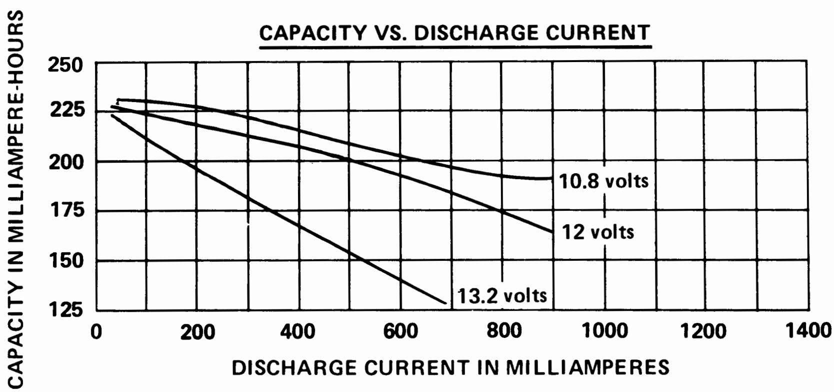
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves

The following performance curves assume the batteries were fast charged at 75 milliamperes. A slight reduction in capacity will be experienced when charged at lower rates.







EXAMPLE: Assume a 500 milliampere discharge to a 12 volt endpoint. The HS4080 battery has a capacity of 200 milliampere-hours. (This provides a discharge time of 24 minutes.)

"HERCULES" NO. HS4080

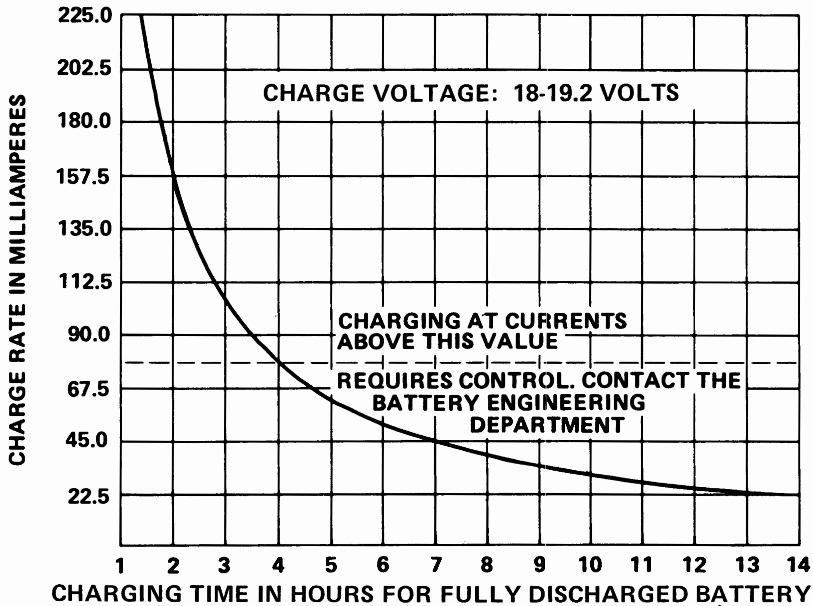
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4080 battery are:

Charge:	+60°F to +113°F (15.6°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

Note: See pages 393-401 for general information on Fast Charge cells.



For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 4.5 to 7.5 mA.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 5.6 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge batteries and maintain a fully charged battery with little battery degradation, charge at 7.5 to 22.5 mA.

High Rate Charge

To charge batteries for immediate use, charge at 22.5 to 75 mA. Occasional overcharging for up to three days at these rates will not adversely affect battery performance.

"HERCULES" NO. HS4080

High Rate Charge with Control

To charge batteries as quickly as possible charge at 75 to 225 mA with proper charge control device. Overcharging, which might harm the batteries, is prevented by the charge control device.

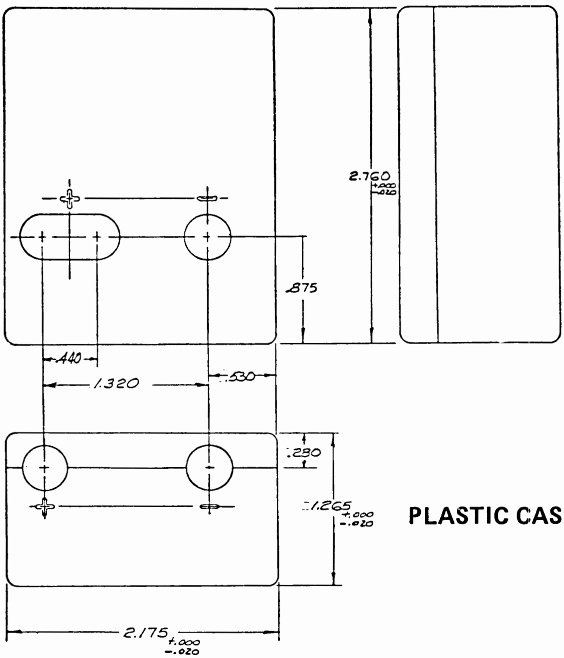
Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 18 ampere-seconds
Average current over entire discharge period:
not to exceed 750 milliamperes

"HERCULES" NO. HS4125 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-1.8 amperes



PLASTIC CASE

Inches	Millimeters
.020	.51
.280	7.11
.440	11.2
.530	13.5
.875	22.2
1.265	32.1
1.320	33.5
2.175	55.3
2.760	70.1

SPECIFICATIONS

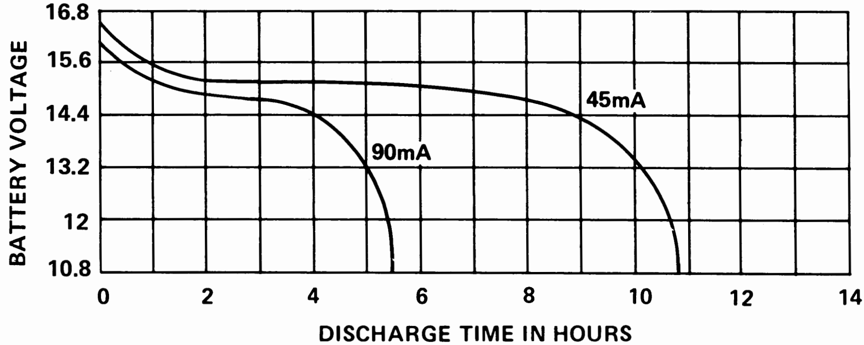
Voltage Taps .... –, + 14.4
Average Service Capacity (to 12 volts) .... 450 milliampere-hours
(Rated at 450 milliamperes)
Terminals .... Flat Recessed
Average Weight.. 9 oz. (255 grams)
Cells .... Twelve cylindrical (CH450) High Rate in series

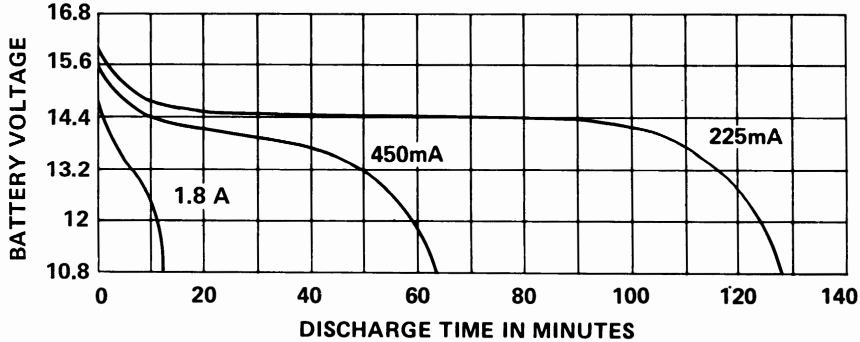
For service information see following pages

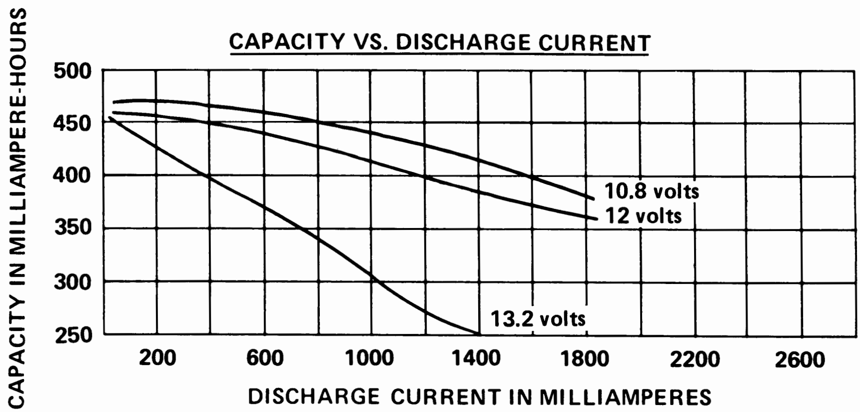
"HERCULES" NO. HS4125

Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves







EXAMPLE: Assume a 1600 milliampere discharge to a 10.8 volt endpoint. The HS4125 battery has a capacity of 400 milliampere-hours. (This provides a discharge time of 15 minutes.)

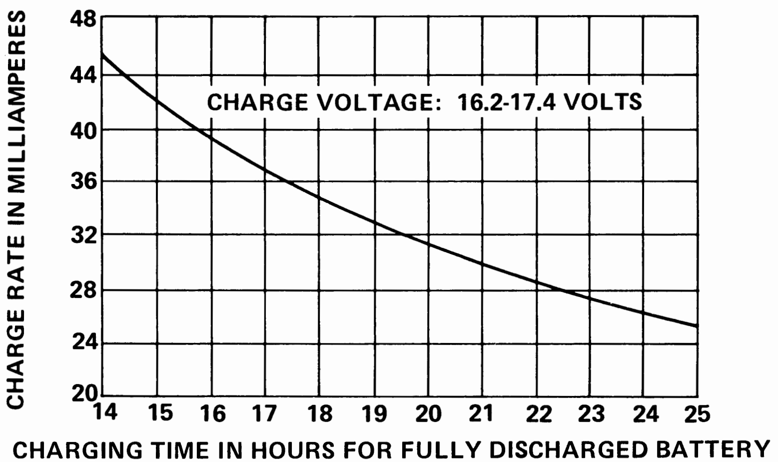
"HERCULES" NO. HS4125

Operating & Storage Temperatures

Ranges of temperature applicable to operation of the HS4125 battery are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 9 to 15 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 11.3 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge batteries and maintain a fully charged battery with little battery degradation, charge at 15 to 45 mA.

Pulse Discharge Capabilities

Pulses of 5 seconds or less

(Pulses spaced evenly over entire discharge period)

Discharge per pulse: Not to exceed 36 ampere-seconds.

Average current over entire discharge period: Not to exceed 1.5 amperes.

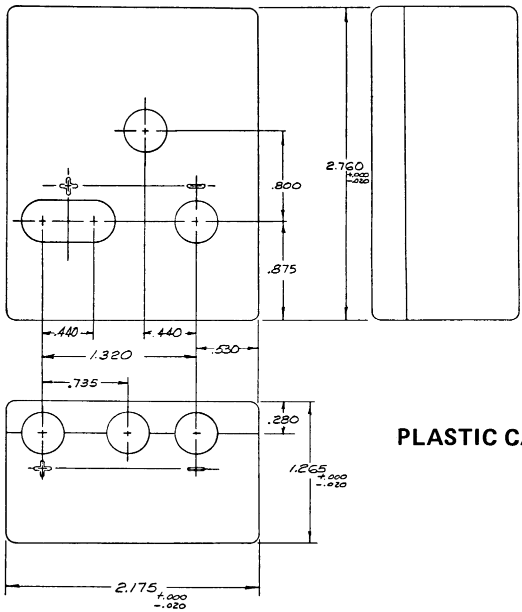
"HERCULES" NO. HS4081 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-1.8 amperes

NOTE: See page 393-401 for general information on Fast Charge batteries.

NOTE: Third terminal—thermistor for fast charge thermal control. Contact Union Carbide for specific information.

Inches	Millimeters
.020	.51
.280	7.11
.440	11.2
.530	13.5
.735	18.7
.800	20.3
.875	22.2
1.265	32.1
1.320	33.5
2.175	55.3
2.760	70.1



PLASTIC CASE

SPECIFICATIONS

Voltage Taps .... –, + 14.4
Average Service Capacity (to 12 volts) .... 450 milliampere-hours
(Rated at 450 milliamperes)
Terminals .... Flat Recessed
Average Weight .... 9 oz. (255 grams)
Cells..................Twelve cylindrical (CF450) High Rate-Fast Charge in series

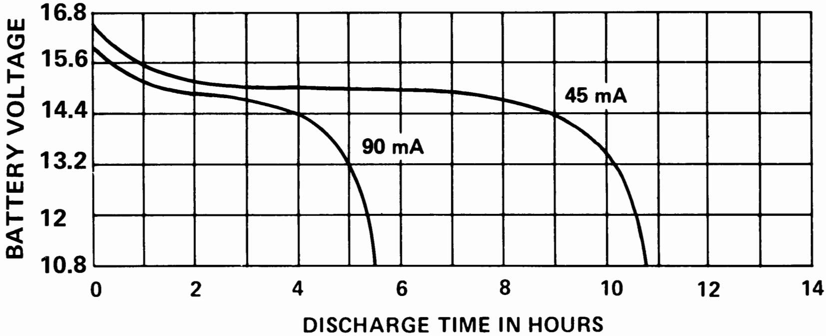
For service information see following pages

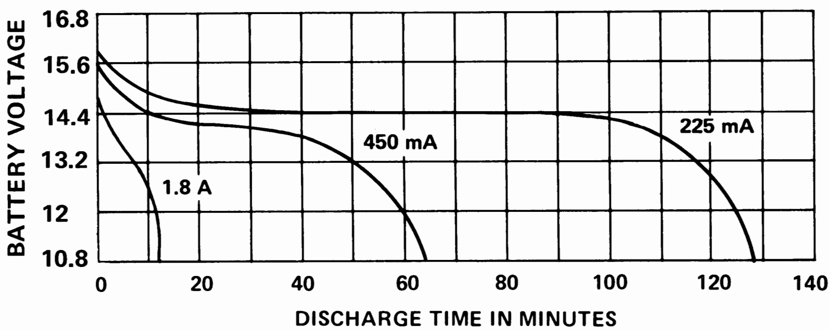
"HERCULES" NO. HS4081

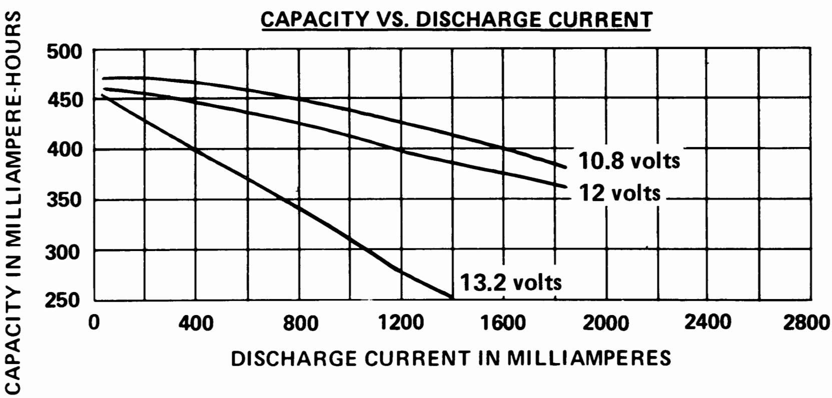
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves

The following performance curves assume the batteries were fast charged at 150 milliamperes. A slight reduction in capacity will be experienced when charged at lower rates.







EXAMPLE: Assume a 400 milliampere discharge to a 13.2 volt endpoint. The HS4081 battery has a capacity of 400 milliampere-hours. (This provides a discharge time of 1 hour.)

"HERCULES" NO. HS4081

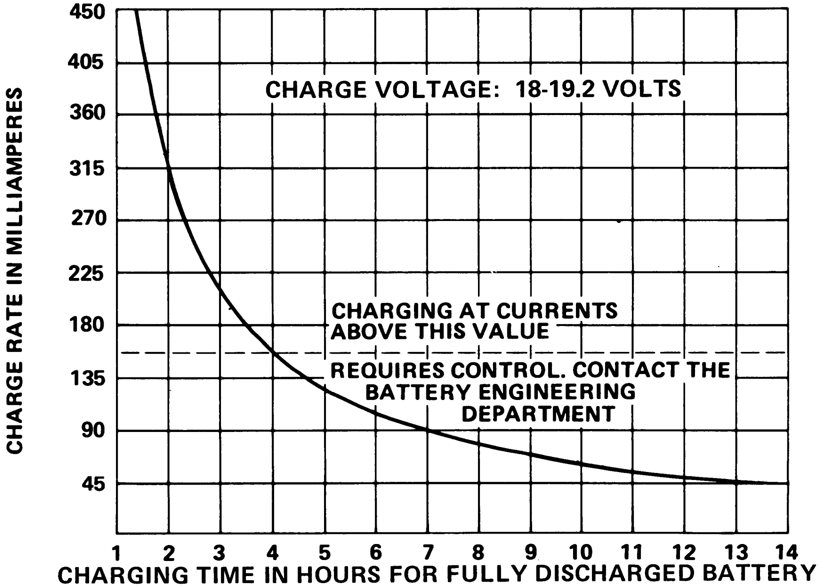
Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4081 battery are:

Charge:	+60°F to +113°F (15.6°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time

Note: See pages 393-401 for general information on Fast Charge cells.



For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 9 to 15 mA.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 11.3 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge batteries and maintain a fully charged battery with little battery degradation, charge at 15 to 45 mA.

High Rate Charge

To charge batteries for immediate use, charge at 45 to 150 mA. Occasional overcharging for up to three days at these rates will not adversely affect battery performance.

"HERCULES" NO. HS4081

High Rate Charge with Control

To charge batteries as quickly as possible charge at 150 to 450 mA, with proper charge control device. Overcharging, which might harm the batteries, is prevented by the charge control device.

Pulse Discharge Capabilities

Pulses of 5 seconds or less

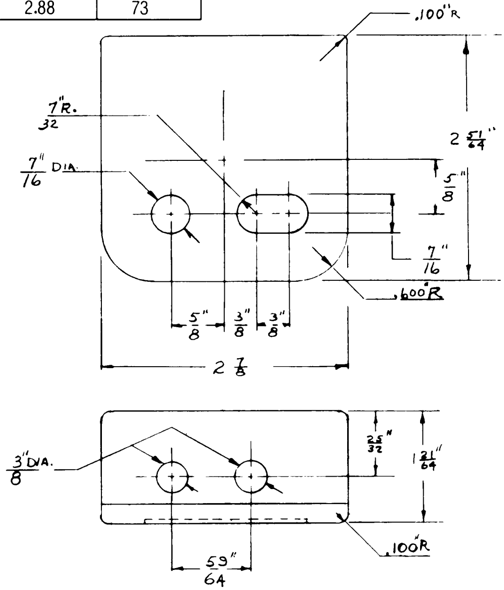
(Pulses spaced evenly over entire discharge period)
Discharge per pulse: Not to exceed 36 ampere-seconds.
Average current over entire discharge period: Not to exceed 1.5 amperes.

"HERCULES" NO. HS4068 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-2 amperes

Inches		Millimeters
	.100	2.54
7/32	.219	5.56
3/8	.375	9.53
7/16	.438	11.1
	.600	15.2
5/8	.625	15.9
25/32	.781	19.8
59/64	.922	23.4
1 21/64	1.33	33.7
2 51/64	2.8	71
2 7/8	2.88	73

PLASTIC CASE



SPECIFICATIONS

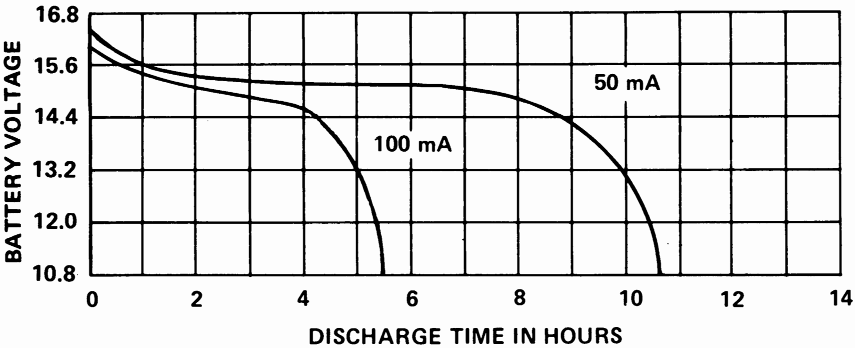
Voltage Taps .... –, + 14.4
Average Service Capacity (to 12 volts) .... 500 milliampere-hours
(Rated at 500 milliamperes)
Terminals .... Flat, recessed
Average Weight.. 12 oz. (340 grams)
Cells ....Twelve cylindrical (CH500) (ANSI K40) High Rate in series

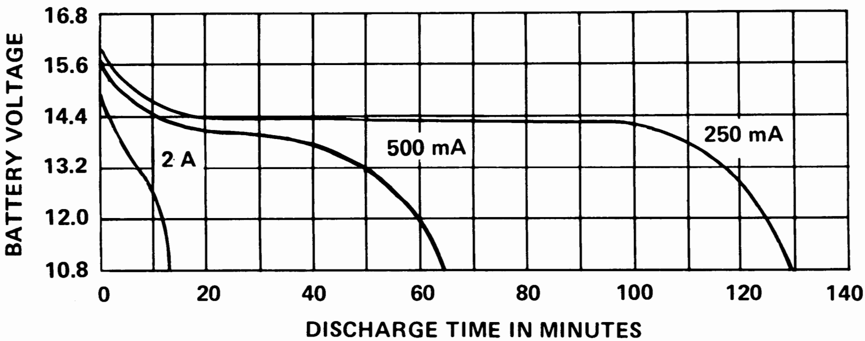
For service information see following pages

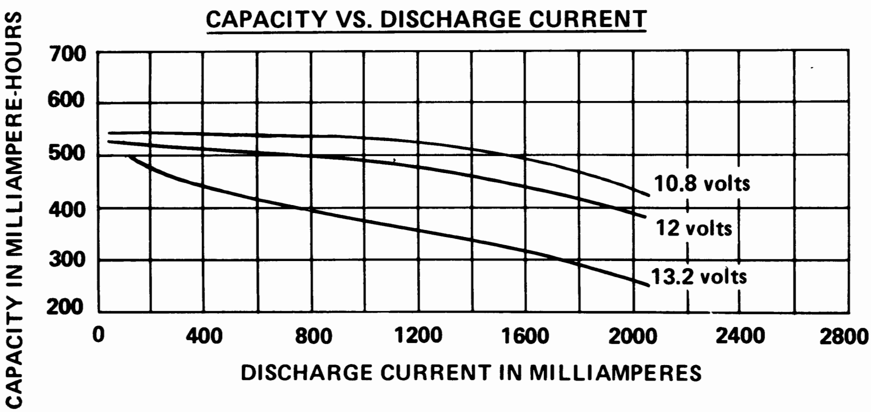
"HERCULES" NO. HS4068

Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves







EXAMPLE: Assume an 800 milliampere discharge to a 12 volt endpoint. The HS4068 battery has a capacity of 500 milliampere-hours. (This provides a discharge time of 38 minutes.)

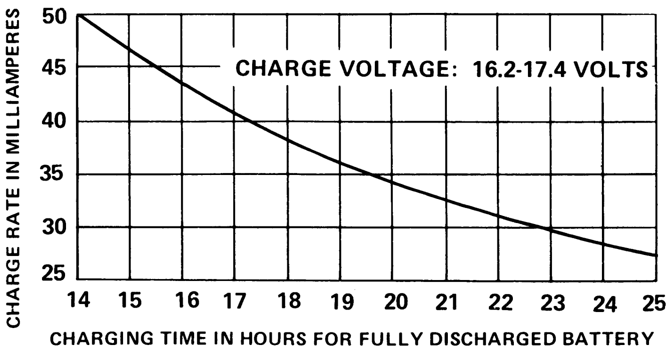
"HERCULES" NO. HS4068

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4068 battery are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged battery, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 10-17 milliamperes.

NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 12.5 mA will bring a discharged battery up to 85% capacity.

Normal Charge

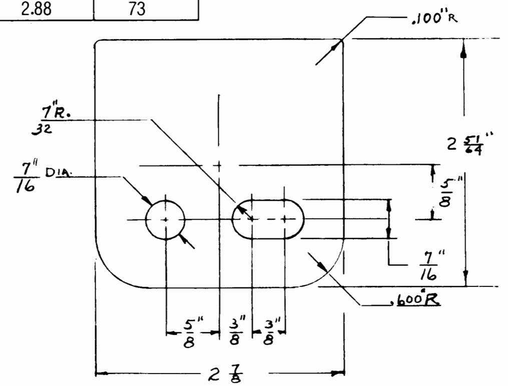
To charge battery and maintain a fully charged battery with little battery degradation, charge at 17 to 50 mA.

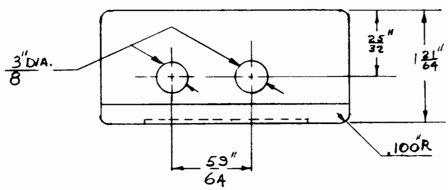
"EVEREADY" NO. N64 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-2 amperes

Inches		Millimeters
	.100	2.54
7/32	.219	5.56
3/8	.375	9.53
7/16	.438	11.1
	.600	15.2
5/8	.625	15.9
25/32	.781	19.8
59/64	.922	23.4
1 21/64	1.33	33.7
2 51/64	2.8	71
2 7/8	2.88	73

PLASTIC CASE





SPECIFICATIONS

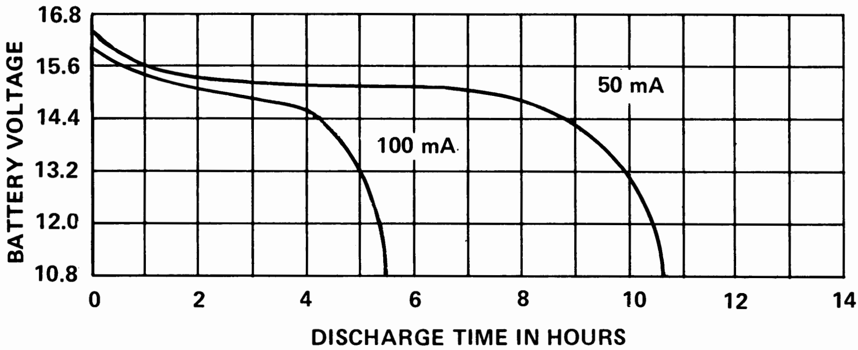
Voltage Taps .... –, + 14.4
Average Service Capacity (to 12 volts) .... 500 milliampere-hours
(Rated at 500 milliamperes)
Terminals .... Flat, recessed
Average Weight.. 12 oz. (340 grams)
Cells ....Twelve cylindrical (CH500) (ANSI K40) High Rate in series

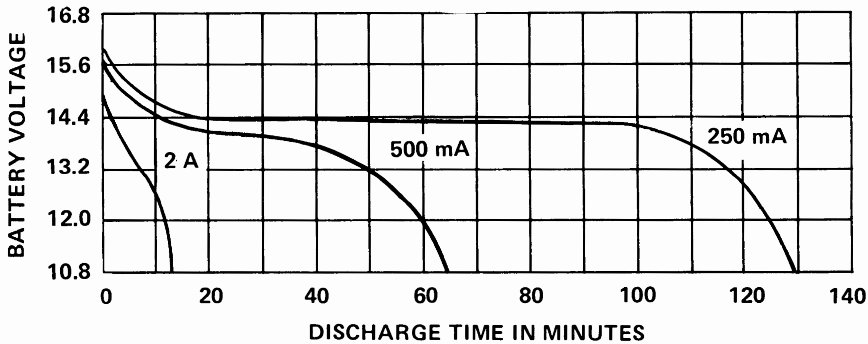
For service information see following pages

"EVEREADY" NO. N64

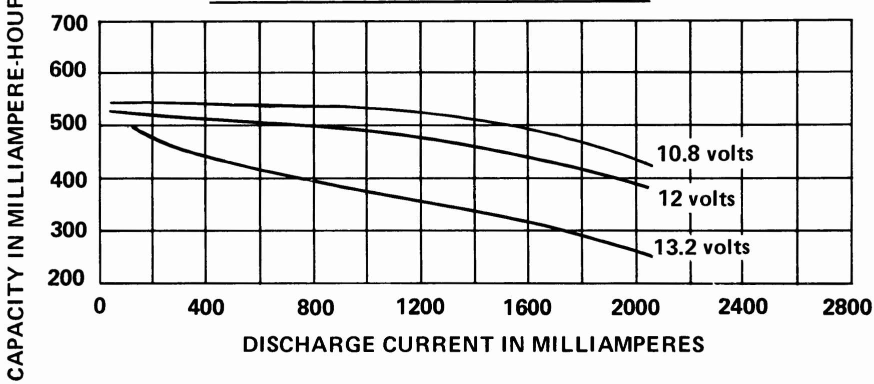
Average Performance Characteristics at 70°F (21.1°C)

Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume an 800 milliampere discharge to a 12 volt endpoint. The N64 battery has a capacity of 500 milliampere-hours. (This provides a discharge time of 38 minutes.)

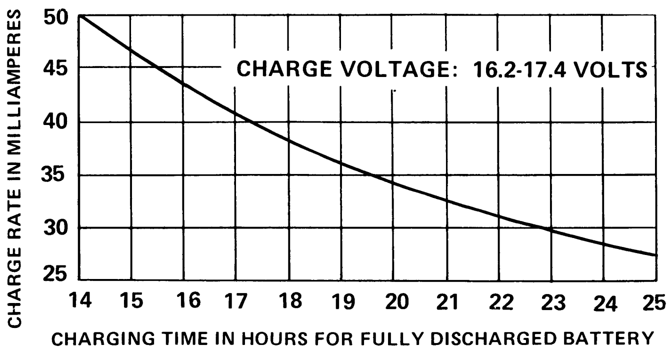
"EVEREADY" NO. N64

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the N64 Battery are:

Charge:	+32°F to +113°F (0°C to 45°C)
Discharge:	– 4°F to +113°F (–20°C to 45°C)
Storage:	–40°F to +140°F (–40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged battery, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged battery for standby service, charge at 10-17 milliamperes.

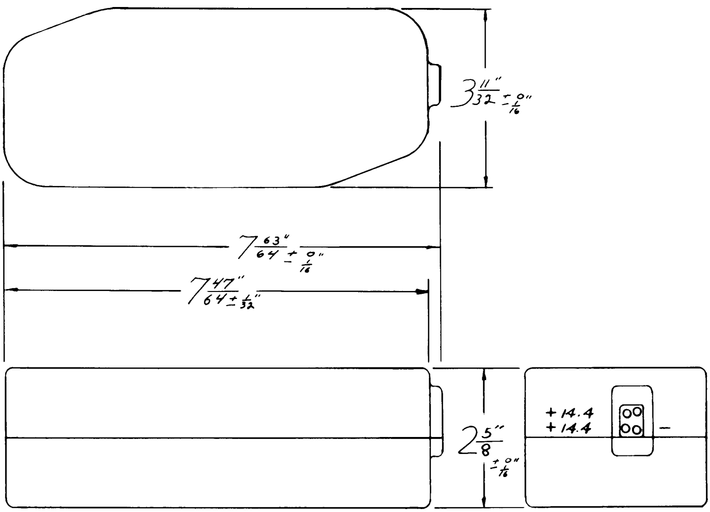
NOTE: Trickle charge shown will maintain a fully charged battery at 100% capacity. A trickle charge of 12.5 mA will bring a discharged battery up to 85% capacity.

Normal Charge

To charge battery and maintain a fully charged battery with little battery degradation, charge at 17 to 50 mA.

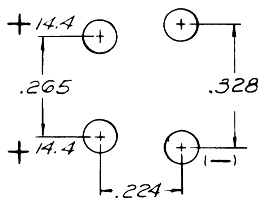
"HERCULES" NO. HS4073 BATTERY

Type: Nickel-Cadmium
Suggested Current Range: 0-10 amperes



PLASTIC CASE

Inches		Millimeters
1/32	.031	.79
1/16	.063	1.59
	.224	5.69
	.265	6.73
	.328	8.33
2 5/8	2.63	66.7
3 11/32	3.34	84.9
7 47/64	7.73	197.
7 63/64	7.98	203.



TOP VIEW OF SOCKET
SHOWING DIMENSIONS AND
TERMINAL VOLTAGES.

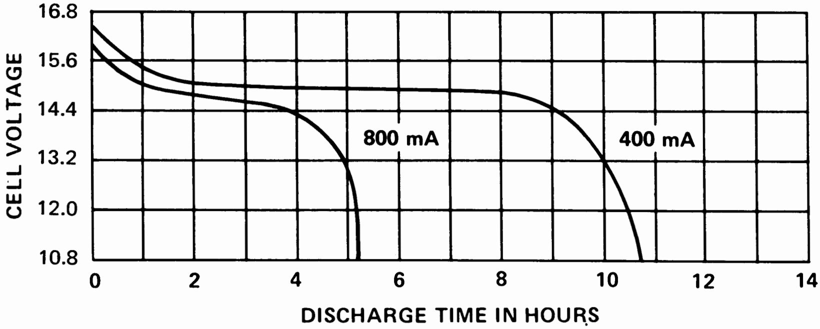
SPECIFICATIONS

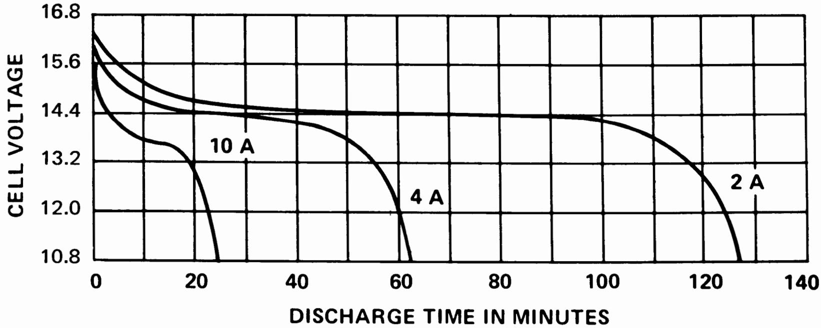
Voltage Taps .... −, +14.4
Average Service Capacity (to 12 volts) .... 4 ampere-hours
(Rated at 4 amperes)
Terminals .... Socket
Average Weight .... 4 lbs. 13 oz. (2.18 kilograms)
Cells .... Twelve cylindrical (CH4) (ANSI K90) (D size) High Rate in series

For service information see following pages

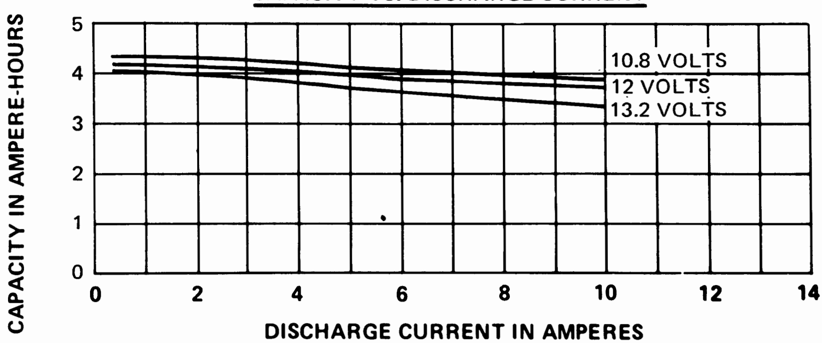
"HERCULES" NO. HS4073

Average Performance Characteristics at 70°F (21.1°C)
Typical Discharge Curves





CAPACITY VS. DISCHARGE CURRENT



EXAMPLE: Assume a 2 ampere discharge to a 13.2 volt endpoint. The HS4073 battery has a capacity of 4 ampere-hours. (This provides a discharge time of 2 hours.)

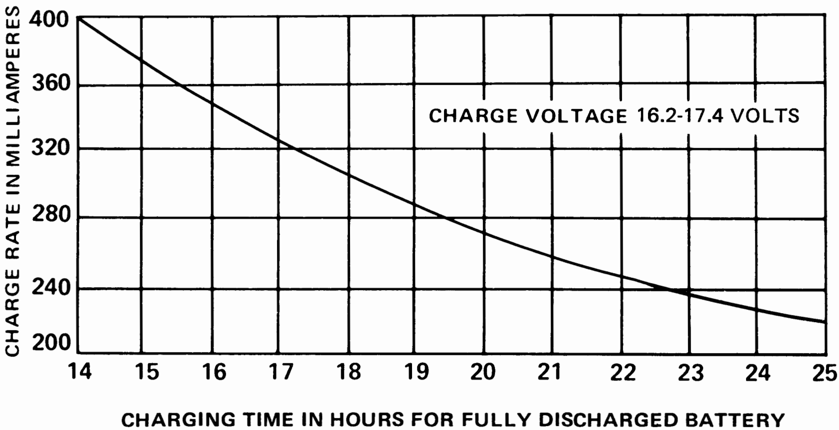
"HERCULES" NO. HS4073

Operating and Storage Temperatures

Ranges of temperature applicable to operation of the HS4073 battery are:

Charge: $+32^{\circ}$F to $+113^{\circ}$F (0°C to 45°C)
Discharge: -4°F to $+113^{\circ}$F (-20°C to 45°C)
Storage: -40°F to $+140^{\circ}$F (-40°C to 60°C)

Charge Rate vs. Charging Time



For partially discharged batteries, reduce time or current proportionally.

Trickle Charge

To maintain a fully charged cell for standby service, charge at 80 to 133 mA.

Note: Trickle charge shown will maintain a fully charged cell at 100% capacity. A trickle charge of 100 mA will bring a discharged cell up to 85% capacity.

Normal Charge

To charge cells and maintain a fully charged cell with little cell degradation, charge at 133 to 400 mA.

NICKEL-CADMIUM BATTERY CHARGERS

Charging Methods

Constant current charging is recommended for sealed nickel-cadmium batteries. The 10 hour rate should not normally be exceeded. Fourteen hours charging at this rate will fully charge the battery. It is necessary to put back 140% of the ampere-hour capacity removed because of battery charge acceptance efficiencies. It is possible under certain conditions to charge at rates higher than the 10 hour rate. Any problem of this type should be referred to your Union Carbide Battery Products Division Sales Office.

Using Fast Charge cells, high rate charging with thermal sensing of end-of-charge temperature rise is now practical. This system employs minimum cost circuitry for one hour high rate charging. The use of a thermal cutout for fast charge control also permits various modes of operation. The charge can be terminated and locked out. Or, the current can be reduced to a sustaining rate and maintained at this rate. Or, by selection of the control element, the current will cycle on and off and keep the battery at full charge. Requests for a specific type of battery and "bench type" charger circuitry for experimental use to suit your application should be referred to your Union Carbide Battery Products Division Sales Office.

Transformer Charge Circuits

Suitable circuit component values for charging either one or two "Eveready" nickel-cadmium cells and multiple cell batteries are given in Table R. The values were determined using circuit configurations of Figures 30 and 31. For commercial use, the series limiting resistance R, indicated in Figures 30 and 31, may be "wound in" by proper design of transformer secondary. The diode of the half-wave circuit (and in some instances the full-wave bridge) may be connected and mounted under external wrapping of the transformer winding. This technique provides a complete circuit in a single package minimizing mounting and connecting operations for final circuit assembly.

To provide transformers having rectifiers and resistance as integral parts the various manufacturers may request somewhat different parameters.

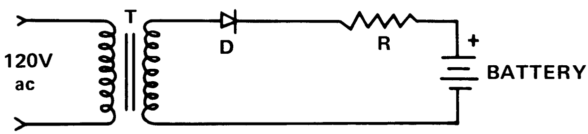


FIGURE 30 – TRANSFORMER AND HALF-WAVE RECTIFIER

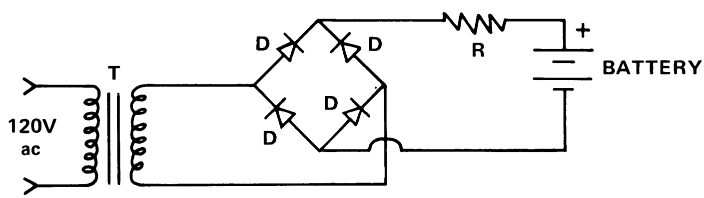


FIGURE 31 – TRANSFORMER AND FULL-WAVE BRIDGE RECTIFIER

TABLE R

"Eveready" Battery Number	Description	Trans-former T	Recti-fier D	Charge Current (Charge for 14 Hours At This Current)	Charge Current (Charge for 4 Hours At This Current)	Circuit Figure Number	Resistance R To Charge One Cell (or Battery)		Resistance R To Charge Two Cells In Series	
							Ohms	Watts	Ohms	Watts
BH1 (&BH1T)	Single Cell	A	M	100mA		33	22	1	15	1
CF1 (&CF1T)	Single Cell	A	M		350mA	33	4.7	2	2.7	1
CH1 (&CH1T)	Single Cell	A	M	100mA		33	22	1	15	1
CF1.2 (&CF1.2T)	Single Cell	B or C	M		420mA	33	4.7	2	3.3	2
CH1.2 (&CH1.2T)	Single Cell	A	M	120mA		33	18	1	15	1
CH1.2/C	Single Cell	A	M	120mA		33	18	1	15	1
CH1.2/D	Single Cell	A	M	120mA		33	18	1	15	1
CH1.5 (&CH1.5T)	Single Cell	A	M	150mA		33	15	2	10	1
CH1.8 (&CH1.8T)	Single Cell	A	M	180mA		33	11	1	7	1
CH2.2 (&CH2.2T)	Single Cell	A	M	220mA		33	8.2	2	5.6	2
CF4 (&CF4T)	Single Cell	D or E	U		1400mA	34	2.2	10	1.8	10
CH4 (&CH4T)	Single Cell	B or C	M	400mA		33	4.7	2	3.3	2
B20 (&B20T)	Single Cell	A	M	2mA		33	1200	½	1000	½
B50 (&B50T)	Single Cell	A	M	5mA		33	560	½	390	½
N64	Battery (12 CH500 cells in series)	F or G	M	50mA		33	120	½		
N65	Battery (11 CH1 cells in series)	F or G	M	100mA		33	56	1		
N67	Battery (5 C900 cells in series)	F or G	M	90mA		33	100	2		
N70	Battery (5 rectangular cells in series [1.5 Ah])	F or G	M	150mA		33	68	3		
N86	Battery (10 CH1.2 cells in series)	F or G	M	120mA		33	56	2		
N88	Battery (7 OB90 cells in series)	F	M	9mA		33	930	½		

TABLE R (con't)

"Eveready" Battery Number	Description	Trans-former T	Recti-fier D	Charge Current (Charge for 14 Hours At This Current)	Charge Current (Charge for 4 Hours At This Current)	Circuit Figure Number	Resistance R To Charge One Cell (or Battery)		Resistance R To Charge Two Cells In Series	
							Ohms	Watts	Ohms	Watts
OB90 (&OB90T)	Single Cell	A	M	9mA		33	270	½	200	½
N91	Battery (5 CH1.2 cells in series)	F	M	120mA		33	75	5		
B150 (&B150T)	Single Cell	A	M	15mA		33	180	½	120	½
CF150 (&CF150T)	Single Cell	A	M		50mA	33	47	1	33	1
CH150 (&CH150T)	Single Cell	A	M	15mA		33	150	½	120	½
B225 (&B225T)	Single Cell	A	M	22.5mA		33	120	½	100	½
BH225 (&BH225T)	Single Cell	A	M	22.5mA		33	100	½	82	½
CF225 (&CF225T)	Single Cell	A	M		75mA	33	33	1	22	1
CH225 (&CH225T)	Single Cell	A	M	22.5mA		33	100	½	82	½
CF450 (&CF450T)	Single Cell	A	M		150mA	33	15	1	10	1
CH450 (&CH450T)	Single Cell	A	M	45mA		33	56	1	39	1
BH500 (&BH500T)	Single Cell	A	M	50mA		33	47	1	33	1
CF500 (&CF500T)	Single Cell	A	M		175mA	33	12	3	8.2	3
CH500 (&CH500T)	Single Cell	A	M	50mA		33	47	1	33	1
1007	Battery (8 CH4 cells in series)	F or G	M	400mA		33	15	5		

NOTE: Do not use center tap leads on the above transformers (Except F). The center tap wire should be removed or taped to eliminate possible shorts. For charging information on button cell stacks contact your Union Carbide Application Sales Field Manager.

LEGEND FOR TABLE R

TRANSFORMERS

Designation	Make and Type No.	Primary	Secondary
A	Stancor P-6465 (or equivalent)	120 volts	6.3 volts 0.6 ampere
B	Stancor P-6134 (or equivalent)	120 volts	6.3 volts 1.2 amperes
C	Triad F-14X (or equivalent)	120 volts	6.3 volts 1.2 amperes
D	Stancor P-6466 (or equivalent)	120 volts	6.3 volts 3.0 amperes
E	Triad F-16X (or equivalent)	120 volts	6.3 volts 3.0 amperes
F	Stancor P-6469 (or equivalent)	120 volts	25.2 volts 1.0 ampere
G	Triad F-45X (or equivalent)	120 volts	24.0 volts 1.0 ampere

RECTIFIERS

M	1N2069 SI Diode	0.75 ampere	200 volts PIV
S	1N4720 SI Diode	3 amperes	100 volts PIV
U	Motorola MDA 970-2 Si Bridge (or equivalent)	4 amperes	100 volts PIV

Transformerless Charge Circuits

Though the transformer type circuit offers versatility and desired isolation of battery terminals and ac power line there are other circuit configurations which are practical for special applications.

The division or proportioning of the charge source voltage and current values may be obtained by reactive or resistive networks. The former has the advantage of being heatless. The reactance type charger of Figure 32 provides a constant current to batteries of 1-5 series connected cells.

This circuit has advantage of simplicity, light weight, no heat, and can be used with variable number of cells. This type circuit is used quite widely in applications having batteries and charger built in and inaccessible to the user.

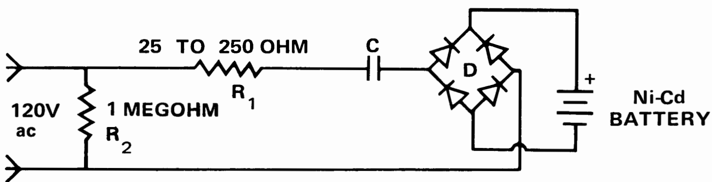


FIGURE 32 — REACTANCE CHARGER

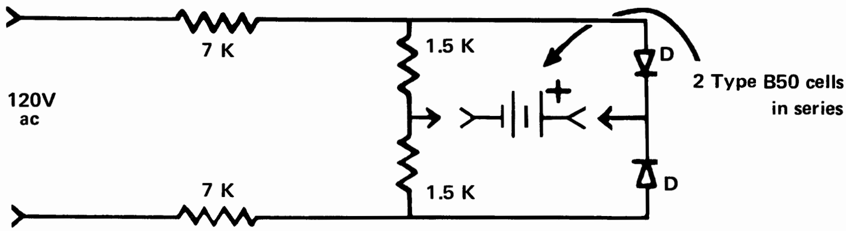
This circuit usually takes the form of full-wave bridge rectification. The bridge circuit shown will deliver about 40 milliamperes per microfarad (value of capacitor, C) to the battery. See Table S for suggested capacitor values for use with various "Eveready" batteries. Newer selenium bridge rectifiers and Mylar dielectric capacitors make practical charge currents in excess of 100 mA per cubic inch volume.

TABLE S
VALUES FOR CAPACITOR "C" IN FIGURE 32

"Eveready" Battery Number	Number of Cells in Series	Charge Current (10 Hour Rate)	Nominal C
B20 or B20T	1 only	2 mA	0.05 μF
B50 or B50T	1 to 5	5 mA	0.12 μF
OB90 or OB90T	1 to 5	9 mA	0.24 μF
B150, B150T, CH150, CH150T	1 to 5	15 mA	0.37 μF
B225, B225T, BH225, BH225T CH225, CH225T	1 to 5	22.5 mA	0.56 μF
CH450, CH450T	1 to 5	45 mA	1.12 μF
BH500, BH500T, CH500, CH500T	1 to 5	50 mA	1.25 μF

The value of R_1 is not critical since it is a current limiting resistor to restrict initial "surge" when the circuit is energized. The value of R_1 may range from 25-250 ohms. This resistor is often omitted with use of more recent improved components. The bleeder resistor R_2 provides a discharge path for the capacitor, removing possible shock hazard across ac prongs when removed from the receptacle.

For circuits having large capacitance values (higher current rating) the rectifier may be burned out if the battery is removed when the circuit is connected to the 120 V ac supply.



D–1N2069 SILICON DIODE (OR EQUIVALENT)

FIGURE 33 – RESISTANCE CHARGER

The resistance type charger shown in Figure 33 can also be used to provide a constant current to batteries of series connected cells.

The circuit values shown will provide a charging current of approximately 4.5 milliamperes for two type B50 cells connected in series. This charger will not be damaged if it is connected to the ac power line with the batteries removed.

By changing the resistor values, single cells or three to five cells in series could be charged.

Higher currents requiring high wattage resistors would not be practical because of the excessive heat that would be produced.

CAUTION! **CAUTION!** **CAUTION!**

All parts of the transformer-less circuits, including the battery and battery connections, must be insulated to eliminate the hazard of electric shocks.

Small button cells, such as those used in hearing aids, may be readily charged from flashlight cells, lantern batteries or six inch cells. Fig. 34 is shown by way of example. This circuit will charge one number B50 cell at approximately 5 milliamperes. Additional cells may be charged, as shown by the broken lines.

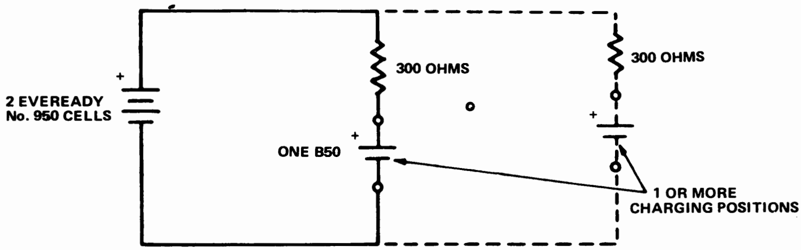


FIGURE 34 –CHARGING FROM PRIMARY BATTERIES

Transformer Type Charger Design

Published design data for battery charging circuits, or dc power supplies with battery load, usually assumes perfect transformers and rectifiers. Often these data do not provide for the series resistive element to limit current and prevent excessive changes in the charge current due to ac source voltage variations. The following design method and equations have been developed to overcome these limitations.

The common types of single phase charging circuits and equations are shown in Figure 35.

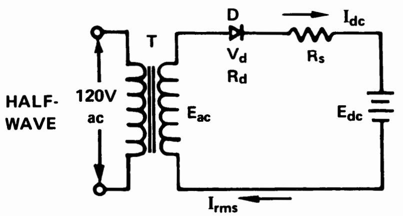
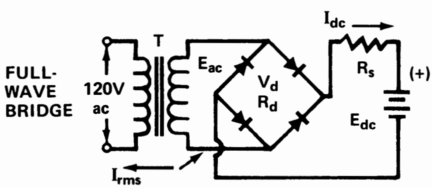
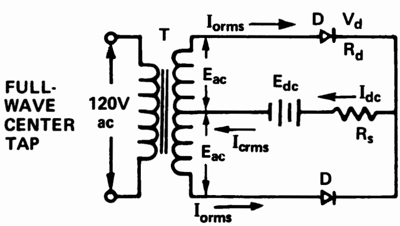
CIRCUIT	DESIGN EQUATIONS
	$E_{ac} = K(E_{dc} + nV_d) + MI_{dc}R$ (1) $R = R_s + R_t + nR_d$ (2) $I_{rms} = FI_{dc}$ (3)
	$E_{ac} = K(E_{dc} + 2nV_d) + \frac{M}{2} I_{dc}R$ (4) $R = R_s + R_t + 2nR_d$ (5) $I_{rms} = 0.707\ FI_{dc}$ (6)
	$E_{ac} = K(E_{dc} + nV_d) + \frac{M}{2} I_{dc}R$ (7) $R = R_s + R_t + nR_d$ (8) $I_{orms} = \frac{F}{2} I_{dc}$ (9) $I_{crms} = 0.707\ FI_{dc}$ (10)

FIGURE 35 –NICKEL CADMIUM BATTERY TRANSFORMER TYPE CHARGING CIRCUITS AND EQUATIONS

The symbols in Figure 35 are as follows:

E_{dc} = Battery voltage during charge.
I_{dc} = *Average* charging current in amperes.
E_{ac} = *Open circuit* rms voltage of the secondary winding.
R = Total circuit resistance.
R_t = Transformer winding resistances referred to secondary.
R_d = Rectifier dynamic resistance. (See Table T)
R_s = Series current limiting resistor.
V_d = Rectifier forward threshold voltage. (See Table T)
n = Number of rectifier cells in series per leg.
K = dc voltage equation factor. (See Table U and Figure 36)
M = dc current equation factor. (See Table U and Figure 36)
F = Current form factor = Ratio of I_{rms} to I_{dc} (See Table U and Figure 36)

The terms of the design equations of Figure 35 will be taken in order for further definition. The value of E_{dc} or battery voltage varies with state of charge, temperature, type of nickel-cadmium cell construction and charge rate. These variations are less significant to constant current circuit operation than to other charge methods.

The value of E_{dc} for a fully charged nickel-cadmium battery is between 1.35 and 1.45 volts per cell for a 10 hour charge rate at room temperature. However, 1.5 volts/cell may be used for charger design calculations.

The charging current, I_{dc}, is chosen to fit the specific application. The usage cycle, charge and discharge times of the particular device dictate the charge rate. The 10 hour rate is the highest recommended charge current for the more common nickel-cadmium cells.

To maintain minimum charge current change with line voltage variations, the ratio of E_{ac} to E_{dc} should be as large as possible. This, however, results in relatively high power losses and heat dissipation in the series current limiting resistor. For practical reasons ratios of 1.5 to 2.5 are satisfactory with the lower ratios being used for full-wave rectification in applications above one ampere.

Referring to equation 2, 5, and 8 of Figure 35 note that the value of R is the sum of three separate resistances. The value R_t, resistance of the transformer, must be determined from manufacturers specifications or by direct measurements of representative samples, and the value of R_d may be found in Table T.

The value of the series limiting resistance (R_s) must be determined from the formulas in Figure 35. The purpose of R_s is to limit current. The value of R_s is normally high compared to the other resistances in the circuit and in essence controls the current value since it constitutes the load on the power supply.

The power dissipation in R_s varies as the square of rms current flow. For calculating the wattage rating of R_s, equations 3, 6 and 10 of Figure 35 express relationship of I_{rms} to I_{dc}.

Typical values of rectifier forward threshold voltage (V_d) and rectifier dynamic resistance (R_d) for design equations of Figure 35 are shown in Table T, The current and peak inverse voltage rating of the rectifier must be adequate for desired circuit performance.

TABLE T

RECTIFIERS—MATERIALS AND CHARACTERISTICS

	V_d	R_d
Germanium	0.35	0
Silicon	0.80	0

The equation factors K, M and F are functions of the current conduction angle. Their values are based on the ratio of E_{ac}, the open circuit rms voltage of the transformer secondary, to the sum of the battery voltage and the forward threshold voltage of the rectifiers. The ac to dc voltage ratio must first be calculated from the following formula, then the values of K, M and F can be read directly from Figure 36.

TABLE U

ac: dc VOLTAGE RATIOS

Type of Circuit	Formula
Half-Wave and Full-Wave Center Tap	$\dfrac{E_{ac}}{E_{dc} + n\,V_d}$
Full-Wave Bridge	$\dfrac{E_{ac}}{E_{dc} + 2nV_d}$

Choice of Transformer Type Circuit

The half-wave rectification circuits, equations 1, 2 and 3 of Figure 35, are generally used only for low current applications, on the order of 0.5 ampere or less. At higher currents, transformer efficiency is low and special core design is required due to the large direct current polarization effect.

The full-wave rectifiers may be bridge or center tap connection. The bridge connection is quite popular because of its flexibility, simplicity and use of a more economical transformer design. However, economics may dictate a choice between transformer cost vs. the total rectifier cost, the bridge connection requiring two additional diodes.

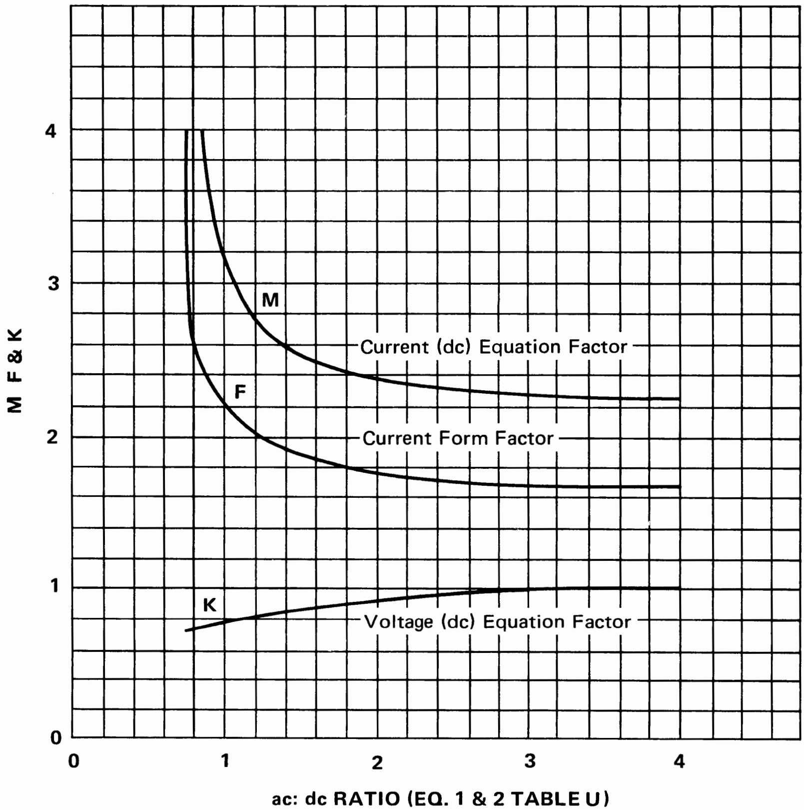


FIGURE 36 – DESIGN EQUATION FACTORS VS. ac: dc RATIO

Other considerations in the selection of the charge circuit configuration are the usage cycle, charger location, heat dissipation and transformer power rating, overall size, cost, etc. The half-wave circuit produces additional heat in the transformer core material due to the saturating effect of the dc polarizing current. The physical dimensions of the transformer used with half-wave rectification may be larger than those of a transformer using the full-wave bridge connection for the same power rating.

Examples

The following examples demonstrate the use of the equations, tables and graphs in the design of constant current chargers.

Example I

A circuit is required to charge two CH500 nickel-cadmium cells in series at the 10 hour rate. This is assumed to be for experimental use which does not justify procurement of a special transformer.

The CH500 is a cylindrical high rate cell rated at 0.5 ampere-hour capacity. $I = \frac{Ah}{h} = \frac{0.5}{10} = 0.05$ ampere (I_{dc}). End of charge voltage at 10 hour rate is estimated to be 1.45 volts per cell, 2 x 1.45 = 2.90 (E_{dc}). An ac/dc ratio of about 2 is desired. A stock filament transformer with a secondary rating of 6.3 volt, 0.6 ampere is selected (Stancor type P-6465 or equivalent.) Measurements of the open circuit output voltage and winding resistance give the following values:

With primary input voltage of 120V ac the open circuit secondary volts=7.5Vrms

$$\text{Turns ratio } N = \frac{V_{pri}}{V_{sec}} = \frac{120}{7.5} = 16$$

Winding Resistances (cold) Pri. = 195 ohms
Sec. = 1.3 ohms

Total resistance (cold) referred to secondary

$$R_t = R_{sec} + \frac{R_{pri}}{N^2} = 1.3 + \frac{195}{(16)^2} = 2.1 \text{ ohms}$$

The hot resistance for a power transformer at rated output will be about 10 percent higher than the cold resistance. However, this transformer will be operating below rated capacity and a 5 percent increase is assumed. This gives a value R (hot) = 2.1 x 1.05 = 2.2 ohms.

Since the charging current is considered low, the half wave circuit is chosen. A suitable rectifier is the low cost 1N2069 silicon type rated at 0.75A dc and 200 peak inverse voltage (PIV).

The diodes may be of any type having adequate current and PIV ratings.

The PIV rating should be equal to or greater than the peak value of the power transformer secondary voltage plus the battery voltage,

$$\sqrt{2}(E_{ac}) + E_{dc}$$

From Table T, $V_d = 0.80$ volt and $R_d = 0$ for silicon rectifier

Equation 1, Table U, is used to obtain the ac:dc ratio. Half-wave rectification was chosen, hence one diode used and $n = 1$.

$$\frac{E_{ac}}{E_{dc} + nV_d} = \frac{7.5}{2.90 + (1 \times 0.8).} = 2.03$$

From Figure 36, $K = 0.92$
$M = 2.40$
$F = 1.76$

Rearranging Equation (1) Figure 35 to solve for R gives:

$$R = \frac{E_{ac} - K\,(E_{dc} + nV_d)}{M\,I_{dc}}$$

$$= \frac{7.5 - 0.92\,(2.90 + 1 \times 0.8)}{2.4 \times 0.05} = 34 \text{ ohms}$$

and $R_s = R - R_t - n\,R_d = 34 - 2.2 - 0 = 31.8$ ohms

From Equation 3 Figure 35 the secondary rms current is:

$$I_{rms} = FI_{dc} = 1.76 \times 0.05 = 0.088 \text{ A}$$

Example II

A circuit is required to charge four CH1.2 nickel-cadmium cylindrical cells in series at the 10 hour rate or I_{dc} of 0.12 ampere. E_{dc} will be about 6 volts. The full wave center tap circuit will be used for this design example. The specific application may dicatate the best circuit configuration.

An ac:dc ratio of 2 is assumed for the transformer secondary voltage. This means two secondary windings of approximately 12 volts, (2x6 = 12 volts) or a 24 volt center tapped secondary winding. For this first trial design, standard diodes will be used. The current rating should be selected to provide safe temperature during operation. Heat sinks may or may not be required. The non-conducting rectifier will see a PIV equal to the peak value of the full secondary winding less the forward voltage drop of the conducting rectifier. Neglecting the rectifier drop the PIV will be:

$$2E_{ac}\sqrt{2} = 2 \times 12 \times \sqrt{2} = 34 \text{ volts}$$

Common diodes have ratings in excess of this value.

From table T, $V_d = 0.8$ volt

And $R_d = 0$ for silicon type

From equation 1 of table U the ac:dc ratio is:

$$\frac{E_{ac}}{E_{dc} + n\,V_d} = \frac{12}{6 + (1 \text{x} .8)} = 1.76$$

From Figure 36 and ac:dc ratio of 1.76

$K = 0.9$
$M = 2.42$
$F = 1.8$

Rearranging Equation 7 Figure 35 to solve for R gives:

$$R = \frac{E_{ac} - K\,(E_{dc} + n\,V_d)}{\frac{M}{2}\,I_{dc}}$$

$$= \frac{12 - 0.9\,(\,6 + 1 \times .8\,)}{\frac{2.42}{2} \times .12} = 41 \text{ ohms}$$

Rearranging Equation 8, Figure 35

$R_s = R - nR_d - R_t = 41 - 1 \times 0 - R_t = \underline{41 - R_t \text{ ohms}}$

Total resistance R_t may be determined by the turns ratio and winding resistances (for the primary and half of the secondary) given in the transformer design data or by measurement of a sample. Measured value may be adjusted for operating temperature where warranted.

From equation 10, Figure 35, the rms current in the center leg is:

$I_{rms} = 0.707\ F\ I_{dc} = 0.707 \times 1.8 \times .12 = .153$ ampere

The series resistance power rating must handle I^2R or $(.153)^2\,(41 - R_t)$

The transformer secondary power is approximately

$E_{ac} \times I_{rms} = 12 \times .153 = 1.84$ watts

Note: A better design may be provided by the full wave bridge circuit. Though the number of diodes required is doubled the transformer may be less expensive and somewhat smaller.

Example III

A circuit is required to charge four CF1.2 nickel-cadmium cylindrical cells in series at the one hour rate or I_{dc} of 1.2 amperes. E_{dc} will be about 6.4 volts.

Again an ac:dc ratio of 2 is indicated for the transformer secondary voltage. This means two secondary windings of approximately 12 volts, (2x6.4 = 12.8 volts) or a 24 volt center tapped secondary winding. For this first trial design, standard diodes will be used. The current rating should be selected to provide safe temperature during operation. Heat sinks may or may not be required. The non-conducting rectifier will see a PIV equal to the peak value of the full secondary winding less the forward voltage drop of the conducting rectifier. Neglecting the rectifier drop the PIV will be:

$$2\, E_{ac} \sqrt{2} = 2 \times 12 \times \sqrt{2} = 34 \text{ volts}$$

Common diodes have ratings in excess of this value.
From Table T, V_d = 0.8 volt
And R_d = 0 for silicon type
From equation 1 of table U, the ac:dc ratio is:

$$\frac{E_{ac}}{E_{dc} + n\, V_d} = \frac{12}{6.4 + (1 \times .8)} = 1.67$$

From Figure 36, and ac:dc ratio of 1.67

K = 0.89
M = 2.42
F = 1.8

Rearranging Equation 7 Figure 35 to solve for R gives:

$$R = \frac{E_{ac} - K\,(E_{dc} + n\,V_d)}{\frac{M}{2}\,I_{dc}}$$

$$= \frac{12 - 0.89\,(6.4 + 1 \times .8)}{\frac{2.42}{2} \times 1.2} = 3.9 \text{ ohms}$$

Rearranging Equation 8, Figure 35

$R_s = R - n\,R_d - R_t = 3.9 - 1 \times 0 - R_t = \underline{3.9 - R_t \text{ ohms}}$

Total resistance R_t may be determined by the turns ratio and winding resistances (for the primary and half of the secondary) given in the transformer design data or by measurement of a sample. Measured value may be adjusted for operating temperature where warranted.

From equation 10, Figure 35, the rms current in the center leg is:

$I_{rms} = 0.707\ F\ I_{dc} = 0.707 \times 1.8 \times 1.2 = 1.53$ amperes

The series resistance power rating must handle $I^2 R$ or $(1.53)^2 (3.9 - R_t)$

The transformer secondary power is approximately

$E_{ac} \times I_{rms} = 12 \times 1.5 = 18$ watts

Note: A better design may be provided by the full wave bridge circuit. Though the number of diodes required is doubled the transformer may be less expensive and somewhat smaller.

CAUTION: Positive charge termination is required using 1C charge rates. Refer to section, pages 591-597.

FAST CHARGE NICKEL-CADMIUM BATTERY CHARGERS

The "Eveready" Fast Charge cells, CF types, enable recharging at currents up to the one hour rate using simple control methods. Essentially full rated discharge capacity is obtained.

As the charge rate is increased, and charge time decreased, the size, weight and cost of the charge circuit components are also increased. With higher capacity cells the circuit layout and housing for adequate heat dissipation are important considerations. The heat generated by the cells, however, provides a means of detecting full charge conditions and effecting charge termination.

Sample circuits with component values utilizing both the simple thermostat and thermistor sensors are discussed in the following sections. These circuits are based upon stock components and are intended for experimental use only. The cell grouping and number of cells (battery voltage) shown in tables were chosen to give the designer the option of changing the number of cells in the battery with a minimum of change in control circuitry.

The effectiveness of the sensor and control circuitry depends on cell packaging and heat dissipation from cells. The cell heat is proportional to wattage input, hence, activation of the sensors may be marginal or impossible with one or two cells of the low capacity designs such as the CF150 or CF225. In some instances these have been omitted from the tables since factors such as cell packaging, component tolerances or overall economics may determine the practicability of use.

In the case of the high capacity CF4 cell, charging currents greater than 2 amperes are not practical due to excessive heat buildup.

Bimetallic Thermostat Sensors

The bimetallic thermostat, such as used in the appliance industry, provides a very effective temperature sensing and switching means for charge control.

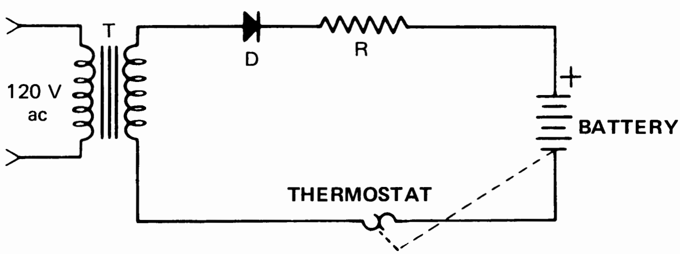
The thermostat may be mounted on or adjacent to any portion of a cell or battery which will transmit heat from the cell to the heat sensitive activating member of the thermostat. Often the bare end of a cell can makes a very convenient surface for mounting and provides a large area thermal contact.

The thermostat should be connected in the charge circuit so that discharge current does not flow through the thermostat contacts. This preserves contacts and inadvertent disconnect of load in the event ambient temperature is high. Of course, connection in the load circuit may be desirable and with selection of adequate contact current rating, discharge protection is also provided in the event of short circuit or other undesired condition. However, immediate discharge after charge would not be possible with this type connection.

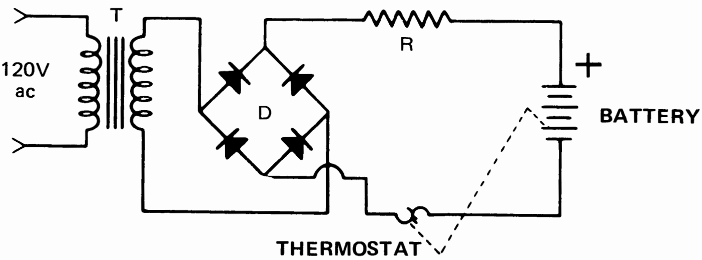
The component values given in Table V are for bench testing only. These values were determined in circuit configurations of Figures 37 & 38. Wattage ratings of resistors have been selected to compromise physical size and standard stock values. The standard resistor may be designed for an operating surface temperature of several hundred degrees F. The total surface, material, rating, mounting and heat sink as well as enclosure will all have a bearing on temperature rise. Care should be exercised when working with high wattage components exposed, such as breadboard circuits, to avoid serious burns. Surface temperatures can be decreased by using higher rating and larger physical dimensions for components. In using smaller resistance values or low current values it is not uncommon to double the calculated wattage value. The size and rating must be selected for the specific application.

The charge time will vary with the charge rate and the packaging of cells and sensor. The component values given are for a one hour charge rate and should activate charge control in approximately one hour and twenty minutes. Caution should be exercised on the first cycles and the charge terminated manually if the thermostat fails to activate. Extended overcharge at the one hour rate will damage the cells.

The basic circuit of Figures 37 & 38 is the common constant current type generally recommended for nickel-cadmium battery chargers. The wattage ratings, physical size and weight of components are greater for fast charge circiuts. No special precautions need be exercised in construction and use other than perhaps with regard to the temperature rise of current limiting resistors mentioned previously. Separate resistors are shown since it becomes impractical to wind in resistance in the secondary of the transformer as is often done with small low rate chargers. As indicated by the dotted line the thermostat might well be mounted direct to a cell can and become an integral part of the battery.



HALF-WAVE RECTIFICATION
FIGURE 37



FULL-WAVE BRIDGE RECTIFICATION
FIGURE 38

Solid State Thermistor Sensor

The thermistor offers a small, relatively inexpensive temperature sensor which may be easily and conveniently incorporated into basic battery designs. The control circuitry and switching means utilizing the resistance change with temperature change may take many forms and will be dictated largely by the economics of the application.

FAST CHARGE CIRCUIT – THERMISTOR SENSOR

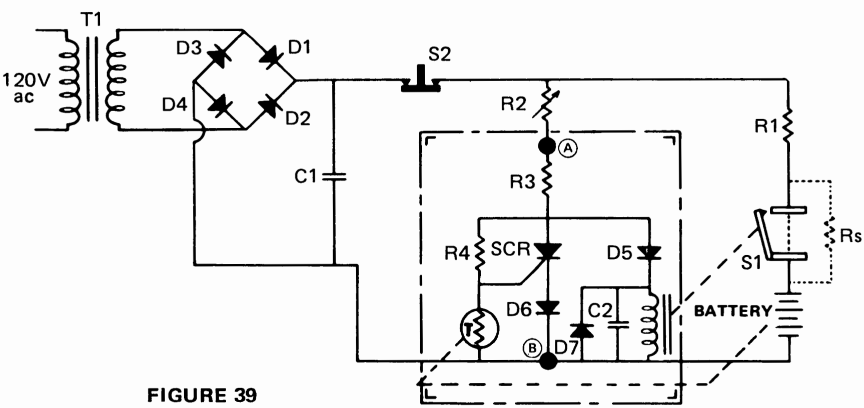


FIGURE 39

See Table W for values with exceptions:

SCR – Motorola MR4442 or equivalent
D5, 6, 7 –IN2070
R3 – 5 ohms 1 watt
C2 – .01 μF 500 V dc
Relay - S1 – Potter Brumfield MR3D-6 V dc
T – Thermistor, Positive Temp. Coeff.
S2 – Momentary switch for resetting control circuit

TABLE V

"Eveready" Battery Number	Number of Cells	Circuit Figure Number	1 Hour Charge Rate (Maximum)	Transformer T	Rectifier D	Limiting Resistance R	
						OHMS	WATTS
CF225	3	41	225 mA	H	M	34	2
	4	41	225 mA	H	M	27	5
	5	41	225 mA	H	M	25	5
	6	41	225 mA	H	M	19	3
CF450	2	41	450 mA	A	M	4.7	3
	2	41	450 mA	H	M	18	10
	3	41	450 mA	H	M	16	10
	4	41	450 mA	H	M	13	10
	5	41	450 mA	H	M	11	10
	6	41	450 mA	H	M	10	10
CF500	2	41	500 mA	A	M	3.9	3
	2	41	500 mA	H	M	16	10
	3	41	500 mA	H	M	15	10
	4	41	500 mA	H	M	13	10
	5	41	500 mA	H	M	10	10
	6	41	500 mA	H	M	9	10
CF1	1	41	1 ampere	H	S	10	25
	2	41	1 ampere	H	S	8	25
	3	41	1 ampere	H	S	7.5	20
	4	41	1 ampere	H	S	5	20
CF1.2	1	41	1.2 amperes	H	S	7.5	25
	2	41	1.2 amperes	H	S	6.8	25
	3	41	1.2 amperes	H	S	5	20
	4	41	1.2 amperes	H	S	4	20
CF4	1	41	2 amperes*	J	U	7	50
	2	41	2 amperes*	J	U	6	50
	3	41	2 amperes*	J	U	5	40
	4	41	2 amperes*	J	U	4	30

* Charge rate limited by heat buildup

LEGEND FOR TABLE V

Transformers

Designation	Make & Type Number	Primary	Secondary	
A	Stancor P-6465 (or equivalent)	120 volts	6.3 volts	0.6 ampere
H	Triad F-25X (or equivalent)	120 volts	12.6 volts	1.5 amperes
J	Triad F-47U (or equivalent)	120 volts	18 volts	3 amperes

Rectifiers

M	1N2069 Si Diode	0.75 ampere	200 volts	PIV
S	1N4720 Si Diode	3 amperes	100 volts	PIV
U	Motorola MDA970-2 Si Bridge	4 amperes	100 volts	PIV

Any Comparable Rectifier May Be Used

TABLE W

Transformer: Stancor P-6469 **Diodes D1 - D4:** Int. Rectifier 1N2070 **Capacitor C1:** 1000 μF 50Vdc

	1 Cell				2 Cells				3 Cells				4 Cells				5 Cells			
	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h
CF225	132	130	390	1318	126	130	390	1215	120	130	390	1150	113	130	390	1100	108	130	390	1000
CF450	58	130	390	532	55	130	390	525	52	130	390	500	50	130	390	480	47	130	390	500
CF500	52	130	390	560	50	130	390	540	47	130	390	520	44	130	390	500	41	130	390	470

Transformer: Triad F-25X **Diodes D1 - D4:** Int. Rectifier 1N2070 **Capacitor C1:** 1000 μF 50Vdc

	1 Cell				2 Cells				3 Cells				4 Cells				5 Cells			
	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h
CF225	64	54	390	625	58	54	390	562	52	54	390	518	46	54	390	464	40	54	390	416
CF450	29	54	390	300	26	54	390	274	23	54	390	247	20	54	390	222	17	54	390	203
CF500	26	54	390	264	23	54	390	247	20	54	390	226	18	54	390	203	15	54	390	183

Transformer: Stancor RT-204 **Diodes D1 - D4:** Motorola MDA970-2 **Capacitor C1:** 1500 μF 500Vdc

	1 Cell				2 Cells				3 Cells				4 Cells				5 Cells			
	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h	R_1	R_2	R_4	R_s 10h
CF1	32	140	680	334	30	140	680	610	29	140	680	281	27	140	680	273	25	140	680	255
CF1.2	24	140	680	226	23	140	680	467	22	140	680	213	21	140	680	209	20	140	680	200
CF4	18	140	680	74	17	140	680	154	16	140	680	69.5	15	140	680	65	14	140	680	60.5

The circuit of Figure 39 with component values of Table W is intended for bench or experimental use. The modular construction concept (a conventional power supply, a control circuit and battery-sensor combination) was chosen to provide as versatile a circuit for the designer as possible. The battery voltage and capacity can be changed with minimum change in the control module. It is hoped that this concept will be advantageous to designers investigating preliminary device designs.

The components are selected from stock items and values. The transformer, for example, is chosen to provide sufficient voltage and current for a particular group of cells having a range of capacities. This circuit is workable with components indicated for a specific cell and battery voltage in the temperature range of 105° F to 120° F (40.6° C to 48.9° C).

As the thermistor (mounted adjacent to one cell of battery) heats, the resistance changes which in turn varies the voltage divider consisting of thermistor (positive temperature coefficient) and Resistor R_4 and turns the SCR "on". Conduction of the SCR bypasses the coil of the control relay and contacts in the charge circuit open, cutting off the charge current. The control circuit will not reset until the supply circuit is temporarily interrupted (switch S_2) and the thermistor has cooled sufficiently to reset the divider.

The control module using a switching relay requires 6 volts between points A and B. The transformer voltage varies with load, or current, hence to maintain the desired control voltage requires adjustment or change in the value of R_2. The voltage between A and B can drop to 5 volts and the circuit will still be operative. Adjust R_2 to obtain 6 volts between points A and B when the basic power supply is changed. The relay contacts should be closed, and the SCR not conducting as would be the case when the thermistor is "cold," that is, no cell heat.

When the cell type and capacity is changed the limiting resistance R_1 must be adjusted, with indicated power supply components, to obtain the desired charge rate. If a sustaining charge is desired the value of the resistor R_s shunting the relay contacts is selected to give the desired rate. As an example, and for convenience, the values for a 10 hour charge rate ($R_{s_{10}}$) are given in the table.

The selection of the temperature cutoff value may depend upon the usage pattern of the intended device, the ambient temperature when charging, the basic device design, cell packaging etc. A temperature cutoff of about 110° F (43.3° C) is generally suggested. The tolerances on the temperature sensors may require some degree of adjustment in component values from lot to lot. The variations encountered with the small lot of test samples of the thermistor required adjustment of R_4 over a range of 390-560 ohms with a thermistor resistance of about 800 ohms at the circuit cutoff temperature of 110° F (43.3° C).

Note that no wattage ratings are given for the resistors. In the interest of space these are omitted since the required rating can be readily calculated from I^2R inasmuch as a filtered power supply is shown. Only the rating of R_1 and R_S is of concern. All other resistors may be of the common 1 watt variety. All component values are based on the 1 hour rate.* As an example, the calculation of wattage rating of R_1 for a CF500 cell would be $(.5)^2xR$ (ohms), the resistance depending upon transformer characteristics and number of cells. From Table W, for a 3 cell battery R_1 is 20 ohms with a Triad F-25X, the calculated wattage rating would be 0.25 x 20 = 5 watts. In practice it is not uncommon to double the calculated wattage value for better heat dissipation and to help keep surface temperatures within reason for safety.

*Except for CF4 which is limited by heat buildup to 2 amperes.

CAUTION! CAUTION! CAUTION!

"Eveready" Fast Charge cells and batteries should not be continually overcharged at high rates. Undesirable cell degradation or heat build up damage will occur if batteries are left on high rate chargers.

Specific guidelines, based on extensive laboratory testing are as follows:

Trickle Charge

To maintain a fully charged cell for standby service, charge at the 30 hour to 50 hour rate.

Normal Charge

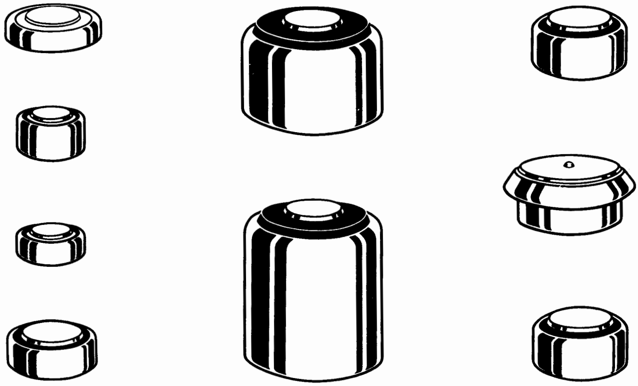
To charge cells and maintain a fully charged cell with little cell degradation, charge at the 10 hour to 30 hour rate.

High Rate Charge

To charge "Eveready" Fast Charge cells for immediate use, charge at 3 hour to the 10 hour rate. Occasional overcharging for up to three days at these rates will not adversly effect cell performance.

High Rate Charge with Control

To charge "Eveready" Fast Charge cells as quickly as possible charge at the 1 hour to 3 hour rate with proper charge control device. Overcharging, which might harm the cells, is prevented by the charge control device. It is also possible to charge at rates up to the 15 minute rate with specific charge control techniques. Your Union Carbide Application Sales Field Manager can supply this information.



Mercuric Oxide Batteries

MERCURIC OXIDE BATTERIES

General Features: The mercuric oxide battery consists essentially of a depolarizing mercuric oxide cathode, an anode of pure amalgamated zinc, and a concentrated aqueous electrolyte of potassium hydroxide or sodium hydroxide. The voltage is 1.35 volts for a mercury cell with a depolarizer of 100 percent mercuric oxide and 1.4 volts for a cell with a mixture of mercuric oxide and manganese dioxide.

Utilization of active materials is 80% to well over 90%. Recommended drains are given for each cell type.

The fundamental components of the mercuric oxide cell are a pressed mercuric oxide cathode (in sleeve or pellet form) and pressed cylinders, or pellets, of powdered zinc or a gelled mixture of electrolyte and zinc. In steel enclosures these provide precise mechanical assemblies having maximum dimensional stability and marked improvements in performance over dry batteries of the Leclanché (carbon-zinc) type.

MECHANICAL CONSTRUCTION

Cells are currently produced in two different designs using either flat or cylindrical electrodes. Electrochemically both cells are the same, differing only in case design and internal electrode arrangements.

1. Depolarizing cathodes of mercuric oxide, to which a small percentage of graphite is added, are shaped as illustrated in Figure 40, and either consolidated to the cell case (for flat electrode types), or pressed into the cases of the cylindrical types.

2. Anodes are formed of amalgamated zinc powder of high purity, in either flat or cylindrical shapes.

3. A permeable barrier of specially selected material prevents migration of any solid particles in the cell, thereby contributing effectively to long shelf and service life.

4. Insulating and sealing gaskets are molded of nylon, polyethylene or neoprene, depending on the application for which the cell or battery will be used.

5. Inner cell tops are plated with materials which provide an internal surface to which zinc will form a zinc amalgam bond.

6. Cell cases and outer tops of nickel or gold plated steel are used to resist corrosion, to provide greatest passivity to internal cell materials and to insure good electrical contact.

7. An outer, nickel-plated, steel jacket is generally used for single cells. This outer jacket is a necessary component for the "self-venting construction" used

on some cells which provides a means of releasing excessive gas in the cell. Venting occurs if operating abnormalities such as reverse currents or short circuits, produce excessive gas in the cell.

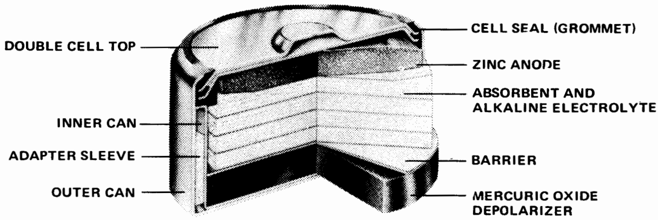
At moderately high pressures, the cell top is displaced upwards against the external crimped edge of the outer jacket, tightening that portion of the seal and relieving the portion between the top and the inner steel cell case. Venting will then occur in the space between the internal cell container and the outer steel jacket. Should any cell electrolyte be carried into this space, it will be retained by the safety absorbent ring. Corrosive materials, therefore, are not carried with the escaping gas through the vent hole at the bottom of the outer steel jacket. After venting excessive gas and reducing the internal pressure, the cell stabilizes and reseats the top seal, continuing normal operation in the circuit.

It should be noted that the polarity of some individual mercuric oxide cells is reversed from that of Leclanché types.

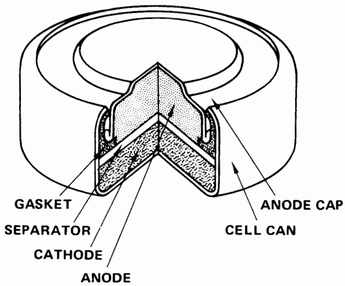
Characteristics and features of the mercuric oxide electrochemical mechanical system in the present state of the art include:

- High capacity-to-volume ratio results in several times the capacity of other primary cells (other than silver oxide) in the same volume, or proportionally reduced volume for the same capacity.
- Flat discharge characteristic.
- Higher sustained voltage under load.
- Relatively constant ampere-hour capacity.
- Low and substantially constant internal impedance.
- No recuperation required; therefore, the same capacity is obtained in either intermittent or continuous usage.
- Good high temperature characteristics.
- Good resistance to shock, vibration and acceleration.
- Electrically welded or pressure intercell connections.
- Single or double steel case encapsulation.
- Chemically balanced - all zinc is converted at end of life.
- Automatic vent.

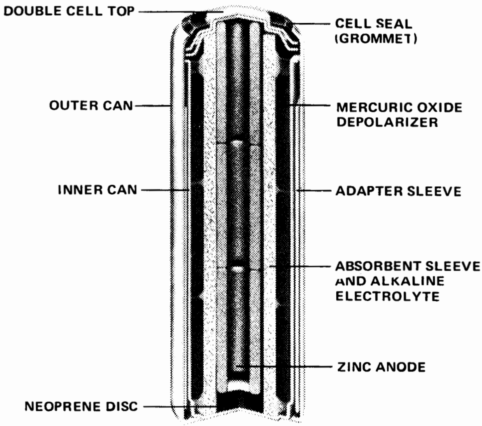
Cutaway views of flat and cylindrical cells are shown in Figure 40.



FLAT PELLET STRUCTURE



GELLED ANODE STRUCTURE



CYLINDRICAL STRUCTURE

FIGURE 40

CROSS SECTION VIEW FLAT AND CYLINDRICAL TYPE MERCURIC-OXIDE CELLS

Current "Eveready" battery types are available in voltages ranging from 1.35 to 97.2V and in capacities ranging from 16 mAh to 28 Ah.

PERFORMANCE:

The ampere-hour capacity of mercury cells is relatively unchanged with variation of discharge schedule and to some extent with variation of discharge current. They have a relatively flat discharge characteristic, Figure 41.

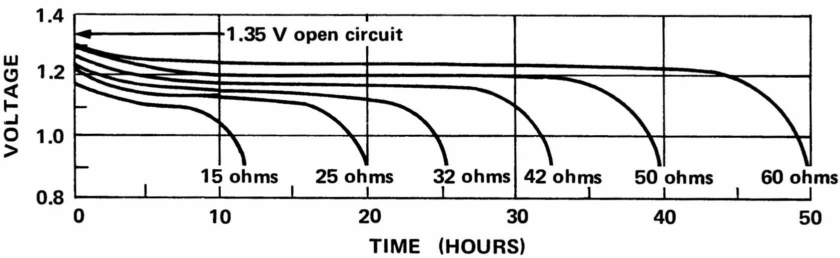


FIGURE 41 – Typical voltage-discharge characteristics of mercuric-oxide cells under continuous load conditions at 70°F (21.1°C). At 1.25 V, equivalent current drains for the resistances are: 15 ohms, 83 mA; 25 ohms, 50 mA; 32 ohms, 40 mA; 42 ohms, 30 mA; 50 ohms, 25 mA; 60 ohms, 20 mA.

Mercuric-oxide batteries have been widely used as secondary standards of voltage because of the higher order of voltage maintenance and ability to withstand mechanical and electrical abuses. For use as reference sources in regulated power supplies, radiation detection meters, portable potentiometers, electronic computers, voltage recorders and similar equipment, desirable features are:

1. Voltage Stability vs. Time—Over long periods of time, regulation within 0.5% is maintained; for shorter periods, regulation of 0.1% may be realized.

2. Short-Circuit Currents—Momentary short circuits will cause no permanent damage with almost complete recovery of full open circuit EMF within minutes.

3. Heavy Load Currents—Depending on the type of cell used, high drains without damage can be obtained. Recovery to full open circuit EMF is rapid.

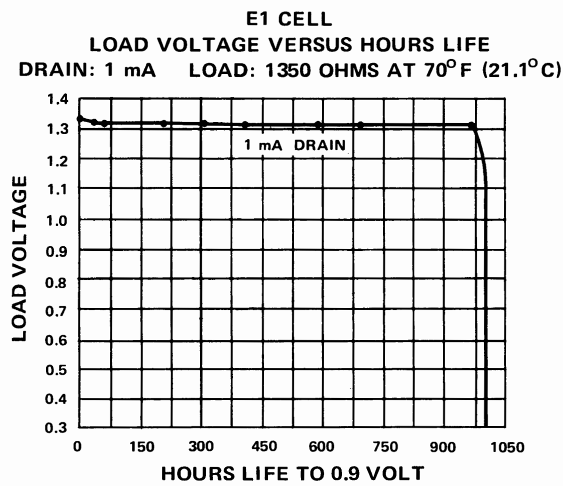


FIGURE 42

MERCURIC-OXIDE CELL LOAD VOLTAGE VS. TIME AT CONSTANT LOAD

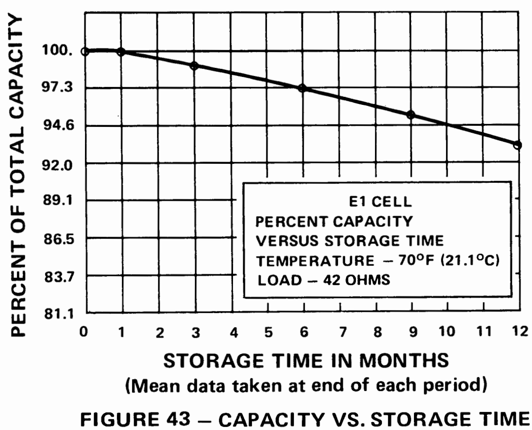


FIGURE 43 – CAPACITY VS. STORAGE TIME

The service capacity of mercuric oxide batteries after one year of storage at 70° F (21.1° C) is generally more than 90 percent of the capacity of a fresh battery.

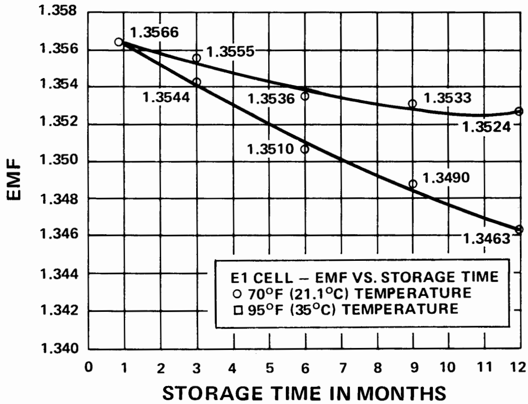


FIGURE 44 MERCURIC-OXIDE EMF VS. STORAGE TIME

Mercuric-oxide batteries are available with two formulations designed for different field usage. In general the 1.35V cells, or batteries using these cells, are recommended for voltage reference sources and for use in applications where higher than normal temperatures may be encountered. The 1.4V cells, or batteries made up of these cells, are used for commercial applications of all types other than the two just mentioned. The 1.4V cells should be used for long-term continuous low-drain applications if a very flat voltage characteristic is not needed.

WIDE TEMPERATURE RANGE

Stabilized battery characteristics are unaffected by the high temperatures encountered in applications such as subsurface oil well survey instruments.

The mercuric-oxide cell has good high-temperature characteristics. It can be used up to 130°F (54.4°C), and operation at 200°F (93.3°C) is possible for a few hours.

In general, mercuric-oxide batteries do not perform well at low temperatures. However, recent developments have produced several popular cell sizes which have good low temperature characteristics. For the other mercuric-oxide batteries not in this group there is a severe loss of capacity at about 40°F (4.4°C) and near 32°F (0°C) the mercuric-oxide cell gives very little service except at light current drains.

The following life curve shows typical performance of the cylindrical mercuric-oxide battery E12, over the temperature range of −10°F (−23.3°C) to +160°F (71.1°C) for current drains encountered in many applications. Figure 46 indicates that voltage depression is slight at low temperatures when drains are 100 microamperes or less in the large cell types, or when intermittent drains of this order are used with smaller cells.

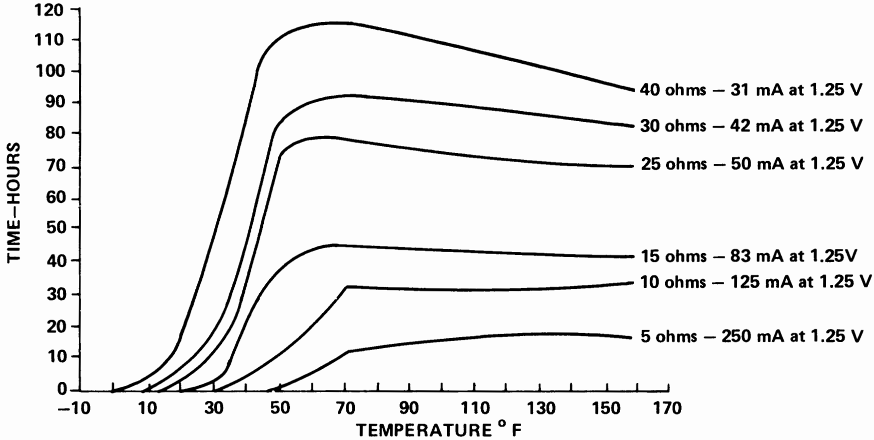


FIGURE 45
LIFE VS. TEMPERATURE – E12 (3.6 AMPERE–HOURS)

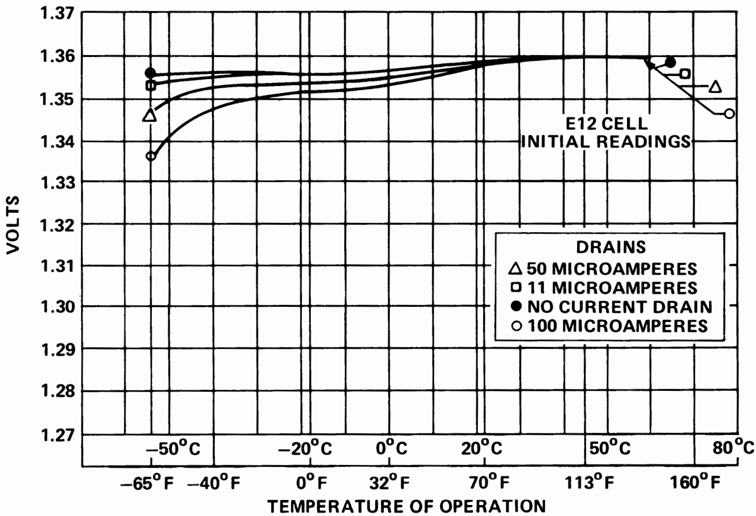


FIGURE 46
MERCURIC OXIDE CELL EMF VS. TEMPERATURE AT LIGHT LOADS

DEGREES			
F	C	F	C
–10	–23.3	80	26.7
0	–17.8	90	32.2
10	–12.2	100	37.8
20	– 6.7	110	43.3
30	– 1.1	120	48.9
40	4.4	130	54.4
50	10	140	60
60	15.6	150	65.6
70	21.1	160	71.1

Battery Numbers (In Order of Increasing Ampere-Hour Capacity)	Suggested Current Range (Milli-amperes)	Service Capacity (Milli-ampere-Hours)	Service Capacity Rated at (Milli-amperes)	Maximum Dimensions							
				Diameter		Length		Width		Height	
				Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters

1.35 and 1.4 VOLT BATTERIES

Battery	Current Range	Capacity	Rated at	Dia. Inches	Dia. mm	Length Inches	Length mm	Width Inches	Width mm	Height Inches	Height mm
E212E	0-1	16	.75	.225	5.72					.130	3.3
E312	0-5	45	.85	.310	7.87					.140	3.56
E312E	0-5	45	.85	.310	7.87					.140	3.56
325	0-0.1	50	.104	.310	7.87					.143	3.63
388	0-0.07	65	.0675	.348	8.84					.130	3.3
E400	0-7	80	1.5	.455	11.6					.135	3.43
E400N	0-7	80	1.5	.455	11.6					.135	3.43
387	0-0.1	80	0.104	.455	11.6					.137	3.48
E13	0-5	85	.85	.310	7.87					.210	5.33
E13E	0-5	85	.85	.310	7.87					.210	5.33
323	0-0.1	95	0.104	.310	7.87					.210	5.33
E575E	0-10	105	1.28	.455	11.6					.138	3.51
343	0-0.1	120	0.104	.455	11.6					.138	3.51
E520	0-10	130	5	.495	12.6					.286	7.26
354	0-0.2	150	0.208	.455	11.6					.163	4.14
E41	0-10	160	1.29	.455	11.6					.165	4.19
E41E	0-10	160	1.29	.455	11.6					.165	4.19
E675E	0-10	190	2.2	.455	11.6					.210	5.33
E675	0-10	215	2.05	.455	11.6					.210	5.33
EP675E	0-10	215	2.2	.455	11.6					.210	5.33
313	0-0.2	220	0.208	.455	11.6					.210	5.33
EPX675	0-2	220	1	.455	11.6					.210	5.33
EPX625	0-5	250	5	.615	15.6					.238	6.05
EPX13	0-5	250	5	.615	15.6					.238	6.05
E625N	0-20	250	5	.615	15.6					.238	6.05
E625	0-20	350	7	.615	15.6					.238	6.05
E450	0-30	350	7	.455	11.6					.570	14.5
E630	0-20	350	5	.615	15.6					.238	6.05
EPX640	0-5	500	5	.625	15 9					.440	11.2
E640	0-50	500	10	.625	15.9					.440	11.2
E640N	0-50	500	10	.625	15.9					.440	11.2
E401	0-75	800	16	.455	11.6					1.130	28.7
E401E	0-75	800	16	.455	11.6					1.130	28.7
E401N	0-75	800	16	.455	11.6					1.130	28.7
EP401E	0-75	1000	25	.453	11.5					1.140	29
EPX1	0-5	1000	1	.625	15.9					.645	16.4
E1	0-100	1000	20	.625	15.9					.645	16.4
E1N	0-100	1000	20	.625	15.9					.645	16.4
E601	0-80	1800	76	.625	15.9					1.140	29
E3	0-60	2200	42	.985	25					.660	16.8
E502	0-200	2400	48	.540	13.7					1.950	49.5
E502E	0-200	2400	48	.540	13.7					1.950	49.5
E9	0-200	2500	50	.560	14.2					1.969	50
E4	0-80	3400	68	1.195	30.4					.660	16.8
E12	0-250	3800	83	.625	15.9					1.963	49.9
E12N	0-250	3800	83	.625	15.9					1.963	49.9
E42	0-1A	14Ah	280	1.195	30.4					2.390	60.7
E42N	0-1A	14Ah	280	1.195	30.4					2.390	60.7
E302651	0-1A	14Ah	250	1-5/16	33.3					2-7/16	61.9
E302157	0-2A	28Ah	500			2-1/2	63.5	1-3/8	34.9	4-1/4	108

2.7 and 2.8 VOLT BATTERIES

Battery	Current Range	Capacity	Rated at	Dia. Inches	Dia. mm	Length Inches	Length mm	Width Inches	Width mm	Height Inches	Height mm
EPX14	0-5	250	5	.665	16.9					.607	15.4
E152	0-30	350	5	.485	12.3					1.139	28.9
E132	0-100	1000	20	.662	16.8					1.295	32.9
E132N	0-100	1000	20	.662	16.8					1.295	32.9
E302702	0-60	2200	42	1-1/8	28.6					1-5/8	41.3

OXIDE BATTERIES

Battery Numbers (In Order of Increasing Ampere-Hour Capacity)	Number and Size of Cells		Typical Use	Weight of Battery		Terminals	Approximate Volume of Body of Battery		Voltage Taps
	Number	Size		Ounces	Grams		Cubic Inches	Cubic Centi-meters	
1.35 and 1.4 VOLT BATTERIES									
E212E	1	212	Hearing Aids	.01	.28	Flat Contacts	.005	.08	–,+1.35
E312	1	4-31141	Instruments	.03	.85	Flat Contacts	.008	.13	–,+1.4
E312E	1	4-31141	Hearing Aids	.03	.85	Flat Contacts	.008	.13	–,+1.4
325	1	5-31141	Watches	.03	.85	Flat Contacts	.008	.13	–,+1.35
388	1	5-34122	Watches	.035	.997	Flat Contacts	.012	.2	–,+1.35
E400	1	400	Instruments, Hearing Aids	.05	1.42	Flat Contacts	.02	.33	–,+1.4
E400N	1	400	Instruments	.05	1.42	Flat Contacts	.02	.33	–,+1.35
387	1	400	Watches	.048	1.36	Flat Contacts	.021	.34	–,+1.35
E13	1	4-31201	Instruments	.04	1.13	Flat Contacts	.011	.18	–,+1.4
E13E	1	4-31201	Hearing Aids	.04	1.13	Flat Contacts	.011	.18	–,+1.4
323	1	5-31202	Watches	.05	1.42	Flat Contacts	.015	.25	–,+1.35
E575E	1	4-45131	Hearing Aids	.05	1.42	Flat Contacts	.018	.3	–,+1.4
343	1	5-45131	Watches	.06	1.7	Flat Contacts	.019	.31	–,+1.35
E520	1	520	Miscellaneous	.07	1.98	Flat Contacts	.05	.82	–,+1.4
354	1	5-45161	Watches	.07	1.98	Flat Contacts	.023	.38	–,+1.35
E41	1	4-45161	Instruments	.07	1.98	Flat Contacts	.02	.33	–,+1.4
E41E	1	4-45161	Hearing Aids	.07	1.98	Flat Contacts	.02	.33	–,+1.4
E675E	1	4-45211	Hearing Aids	.09	2.55	Flat Contacts	.029	.48	–,+1.4
E675	1	4-45212	Instruments	.09	2.55	Flat Contacts	.029	.48	–,+1.4
EP675E	1	4-45212	Hearing Aids	.09	2.55	Flat Contacts	.029	.48	–,+1.4
313	1	5-45211	Watches	.09	2.55	Flat Contacts	.029	.48	–,+1.35
EPX675	1	4-45213	Electric Eye	.09	2.55	Flat Contacts	.029	.48	–,+1.35
EPX625	1	625	Photographic Light Meter (Low Temperature EPX13)	.15	4.25	Flat Contacts	.07	1.15	–,+1.35
EPX13	1	625	Photographic Light Meter	.15	4.25	Flat Contacts	.07	1.15	–,+1.35
E625N	1	625	Instruments	.15	4.25	Flat Contacts	.07	1.15	–,+1.35
E625	1	625	Instruments, Hearing Aids	.15	4.25	Flat Contacts	.07	1.15	–,+1.4
E450	1	450	Instruments	.18	5.1	Flat Contacts	.09	1.48	–,+1.35
E630	1	630	Radio, Hearing Aids	.17	4.8	Flat Contacts	.07	1.15	–,+1.4
EPX640	1	640	Electric Eye	.28	7.94	Flat Contacts	.13	2.13	–,+1.35
E640	1	640	Radio, Hearing Aids	.28	7.94	Flat Contacts	.13	2.13	–,+1.4
E640N	1	640	Radio	.28	7.94	Flat Contacts	.13	2.13	–,+1.35
E401	1	401"N"	Instruments, Radio	.42	11.9	Flat Contacts	.18	2.95	–,+1.4
E401E	1	401"N"	Hearing Aids	.42	11.9	Flat Contacts	.18	2.95	–,+1.4
E401N	1	401"N"	Instruments	.42	11.9	Flat Contacts	.18	2.95	–,+1.35
EP401E	1		Hearing Aids	.44	12.5	Flat Contacts	.19	3.1	–,+1.4
EPX1	1	1	Electric Eye (Low Temperature)	.43	12.2	Flat Contacts	.2	3.28	–,+1.35
E1	1	1	Instruments	.43	12.2	Flat Contacts	.177	2.9	–,+1.4
E1N	1	1	Instruments	.43	12.2	Flat Contacts	.177	2.9	–,+1.35
E601	1	601	Instruments	.78	22	Flat Contacts	.34	5.57	–,+1.35
E3	1	3	Instruments	1	28.4	Flat Contacts	.5	8.2	–,+1.35
E502	1	502"AA"	Instruments	1.02	29	Flat Contacts	.43	7.1	–,+1.35
E502E	1	502"AA"	Hearing Aids	1.02	29	Flat Contacts	.43	7.1	–,+1.4
E9	1	502"AA"	Radio	1.05	29.8	Flat Contacts	.45	7.37	–,+1.4
E4	1	4	Instruments	1.5	42.5	Flat Contacts	.73	12	–,+1.35
E12	1	12"A"	Instruments	1.4	40	Flat Contacts	.57	9.34	–,+1.4
E12N	1	12"A"	Instruments (Voltage Reference)	1.4	40	Flat Contacts	.57	9.34	–,+1.35
E42	1	42"D"	Instruments	5.9	167	Flat Contacts	2.9	47.5	–,+1.4
E42N	1	42"D"	Instruments (Voltage Reference)	5.9	167	Flat Contacts	2.9	47.5	–,+1.35
E302651	1	42"D"	Instruments	6.14	174	Special Leads	2.9	47.5	–,+1.35
E302157	2	42"D"	Radiation Equipment	13.5	383	Socket	13.4	220	–,+1.35
2.7 and 2.8 VOLT BATTERIES									
EPX14	2	625	Photographic (With Cadmium Sulfide Cell)	.3	8.5	Flat Contacts	.2	3.28	–,+2.7
E152	2	450	Instruments	.4	11.3	Flat Contacts	.19	3.1	–,+2.8
E132	2	1	Transistor Applications, Hearing Aids	.94	26.7	Flat Contacts	.397	6.5	–,+2.8
E132N	2	1	Transistor Applications	.94	26.7	Flat Contacts	.397	6.5	–,+2.7
E302702	2	3	Geophysical	2	56.7	Wire Leads	1.3	21.3	–,+2.7

Battery Numbers (In Order of Increasing Ampere-Hour Capacity)	Suggested Current Range (Milliamperes)	Service Capacity (Milliampere-Hours)	Service Capacity Rated at (Milliamperes)	Maximum Dimensions: Diameter Inches	Diameter Millimeters	Length Inches	Length Millimeters	Width Inches	Width Millimeters	Height Inches	Height Millimeters
4.05 and 4.2 VOLT BATTERIES											
EPX29	0-1	160	1	.475	12.1					.680	17.3
EPX25	0-5	250	5	.660	16.8					.845	21.5
E153	0-30	350	5	.485	12.3					1.708	43.4
E163	0-50	500	10	.662	16.8					1.306	33.2
E303496	0-50	500	15	.655	16.6					1.330	33.8
E133	0-100	1000	20	.662	16.8					1.945	49.4
E133N	0-100	1000	20	.662	16.8					1.945	49.4
E303236	0-100	1000	30	.628	16					1.930	49
E233	0-60	2200	42	1.025	26					1.990	50.6
E233N	0-60	2200	42	1.025	26					1.990	50.6
5.4 and 5.6 VOLT BATTERIES											
EPX23	0-10	110	2	.600	15.2					.787	20
EPX32	0-50	500	10	.675	17.2					1.767	44.9
E164	0-50	500	10	.662	16.8					1.743	44.3
E164N	0-50	500	10	.662	16.8					1.743	44.3
EPX4	0-50	500	10	.662	16.8					1.965	49.9
E134	0-100	1000	20	.662	16.8					2.595	65.9
E134N	0-100	1000	20	.662	16.8					2.595	65.9
E234N	0-60	2200	42	1.015	25.8					2-5/8	66.7
E302351	0-60	2200	42	1-1/16	27					2-5/8	66.7
E302904	0-80	3400	63	1-11/32	34.1					2-15/16	74.6
6.75 and 7 VOLT BATTERIES											
E175	0-10	180	2.2	.495	12.6					1-3/32	27.8
E115N	0-20	250	5	.660	16.8					1.320	33.5
E302435	0-20	250	5	11/16	17.5					1-1/2	38.1
E115	0-20	350	5	.670	17					1.320	33.5
E145	0-20	350	5	.650	16.5					1.205	30.6
E165	0-50	500	10	.662	16.8					2.180	55.4
E165N	0-50	500	10	.662	16.8					2.180	55.4
E135	0-100	1000	20	.662	16.8					3.245	82.4
E135N	0-100	1000	20	.662	16.8					3.245	82.4
E302497	0-60	2200	42	1.039	26.4					4-3/16	106
E235N	0-60	2200	42	1.015	25.8					3-5/16	84.1
E302642	0-80	2400	63	1-9/32	32.5					2-5/8	66.7
E302905	0-80	3400	63	1-11/32	34.1					3-9/16	90.5
8.1 and 8.4 VOLT BATTERIES											
E146X	0-30	575	15			1.031	26.2	.656	16.7	1.750	44.5
E126	0-40	600	12	.73	18.5					2	50.8
E286	0-50	750	15	1	25.4					1.94	49.3
E136	0-100	1000	20	.662	16.8					3.895	98.9
E136N	0-100	1000	20	.662	16.8					3.895	98.9
E236N	0-60	2200	42	1.015						3.906	
E303145	0-250	3600	83			2-3/16	55.6	27/32	21.4	4-7/16	113
9.45 and 9.8 VOLT BATTERIES											
E303219	0-10	160	5	.515	13.1					1-5/8	41.3
E177	0-10	215	2.05	35/64	13.9					1-29/32	48.4
E302250	0-20	250	5	11/16	17.5					1-29/32	48.4
E137	0-100	1000	30	.662	16.8					4.545	115
E137N	**0-100**	**1000**	**30**	**.662**	**16.8**					4.545	115
E302478	0-80	2400	63	1-1/4	31.8					3-5/8	92.1
E302907	0-80	3400	63	1-11/32	34.1					4-7/8	124
10.8 and 11.2 VOLT BATTERIES											
E302358	0-20	250	5	3/4	19.1					2-3/16	55.6
E302908	0-80	3400	63	1-11/32	34.1					5-9/16	141
E303394	0-250	3600	83			2-1/2	63.5	1-3/4	44.5	2.280	57.9

Battery Numbers (In Order of Increasing Ampere-Hour Capacity)	Number and Size of Cells		Typical Use	Weight of Battery		Terminals	Approximate Volume of Body of Battery		Voltage Taps
	Number	Size		Ounces	Grams		Cubic Inches	Cubic Centi-meters	

4.05 and 4.2 VOLT BATTERIES

EPX29	3	675	Electric Eye (Movie Camera)	.26	7.25	Flat Contacts	.11	1.81	–,+4.05
EPX25	3	625	Electric Eye (Movie Camera)	.49	13.9	Flat Contacts	.28	4.59	–,+4.05
E153	3	450	Instruments	.6	17	Flat Contacts	.22	3.61	–,+4.2
E163	3	640	Transistor Applications	.9	25.5	Flat Contacts	.44	7.2	–,+4.2
E303496	3	640	Paging Device	.87	24.7	Flat Contacts	.45	7.37	–,+4.2
E133	3	1	Radio	1.42	40.3	Flat Contacts	.65	10.7	–,+4.2
E133N	3	1	Instruments	1.42	40.3	Flat Contacts	.65	10.7	–,+4.05
E303236	3	1	Paging System	1.28	36.3	Flat Contacts	.6	9.83	–,+4.2
E233	3	3	Radio	3.15	89.3	Flat Contacts	1.6	26.2	–,+4.2
E233N	3	3	Instruments	3.15	89.3	Negative Recessed Flat Contacts	1.6	26.2	–,+4.05

5.4 and 5.6 VOLT BATTERIES

EPX23	4	575	"B-C" Flash	.27	7.75	Flat Contacts	.21	3.44	–,+5.6
EPX32	4	640	Still Camera	1.1	31.2	Flat Contacts	.61	10	–,+5.6
E164	4	640	Radio	1.2	34	Flat Contacts	.61	10	–,+5.6
E164N	4	640	Instruments	1.2	34	Flat Contacts	.61	10	–,+5.4
EPX4	4	640	Camera	1.2	34	Flat Contacts	.68	11.1	–,+5.6
E134	4	1	Instruments	1.89	53.6	Flat Contacts	.8	13.1	–,+5.6
E134N	4	1	Instruments	1.89	53.6	Flat Contacts	.9	14.8	–,+5.4
E234N	4	3	Instruments	4.2	119	Flat Contacts	2.13	34.9	–,+5.4
E302351	4	3	Fire Alarm	4.5	128	Flat Contacts	2.3	37.7	–,+5.4
E302904	4	4	Meter	6	170	Wire Leads	3.6	59	–,+5.4

6.75 and 7 VOLT BATTERIES

E175	5	675	Radio	.42	11.9	Flat Contacts Negative Recessed	.22	3.6	–,+7
E115N	5	625	Instruments	.71	20	Flat Contacts	.44	7.2	–,+6.75
E302435	5	625	Radiation Equipment	.75	21.3	Flat Contacts	.53	8.7	–,+6.75
E115	5	625	Instruments	.71	20	Flat Contacts	.44	7.2	–,+7
E145	5	625	Transistor Devices	.7	19.8	Flat Contacts	.4	6.56	–,+7
E165	5	640	TV Tuner	1.5	42.5	Flat Contacts	.73	12	–,+7
E165N	5	640	Instruments	1.5	42.5	Flat Contacts	.73	12	–,+6.75
E135	5	1	Instruments	2.37	67.2	Flat Contacts	1.12	18.4	–,+7
E135N	5	1	Instruments	2.37	67.2	Flat Contacts	1.12	18.4	–,+6.75
E302497	5	3	Test Equipment	6	170	Screw	3	49.2	–,+6.75
E235N	5	3	Instruments	5.25	149	Flat Contacts	2.56	42	–,+6.75
E302642	5	4Z	Fire Alarm	6	170	Flat Contacts	3.1	51	–,+7
E302905	5	4	Test Equipment	9	255	Wire Leads	4.5	73.7	–,+6.75

8.1 and 8.4 VOLT BATTERIES

E146X	6	635	Radio	1.8	51	Miniature Snap	1.1	18	–,+8.4
E126	6	660	Radio	1.65	46.8	Flat Contacts, Negative Recessed	.84	13.8	–,+8.4
E286	6	822	Radio	2.72	77	Snaps	1.52	24.9	–,+8.4
E136	6	1	Instruments	2.86	81	Flat Contacts	1.35	22	–,+8.4
E136N	6	1	Instruments	2.86	81	Flat Contacts	1.35	22	–,+8.1
E236N	6	3	Instruments	6.3	179	Flat Contacts	2.4	39.3	–,+8.1
E303145	6	12	Depth Finder	9.34	265	Snaps	8.3	136	–,+8.4

9.45 and 9.8 VOLT BATTERIES

E303219	7	675	Garage Door Opener	1	28.4	Flat Contacts	.34	5.6	–,+9.8
E177	7	4-45212	Radio	.85	24	Miniature Snap	.359	5.9	–,+9.8
E302250	7	625	Radiation Equipment	1	28.4	Tabs	.68	11.1	–,+9.45
E137	7	1	Instruments	3.34	94.7	Flat Contacts	1.58	25.9	–,+9.8
E137N	7	1	Instruments	3.34	94.7	Flat Contacts	1.58	25.9	–,+9.45
E302478	7	4Z	Recorder	9	255	Flat Contacts	4.4	72.1	–,+9.8
E302907	7	4	Instruments	11.6	329	Wire Leads	6.6	108	–,+9.45

10.8 and 11.2 VOLT BATTERIES

E302358	8	625	Radiation Equipment	1.3	36.9	Wire Leads	.78	12.8	–,+10.8
E302908	8	4	Radiation Equipment	12	340	Wire Leads	7.1	116	–,+10.8
E303394	8	12	Tape Recorder	14	397	Snaps	7.7	126	–,+11.2

Battery Numbers (In Order of Increasing Ampere-Hour Capacity)	Suggested Current Range (Milliamperes)	Service Capacity (Milliampere-Hours)	Service Capacity Rated at (Milliamperes)	Maximum Dimensions							
				Diameter		Length		Width		Height	
				Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
12.6 VOLT BATTERIES											
E169	0-50	500	15	.662	16.8					3.997	102
E289	0-50	750	15	1	25.4					2-13/32	61.1
15.4 VOLT BATTERY											
E303462	0-250	2200	50			2.12	53.9	2.14	54.4	1.8	45.7
16.2 and 16.8 VOLT BATTERIES											
E302362	0-20	250	5	3/4	19.1					3-5/32	80.2
E303314	0-250	2200	50			2.85	72.4	2.81	71.4	1.32	33.5
27 VOLT BATTERY											
E302580	0-80	3400	63			2-23/32	69.1	2-23/32	69.1	3-29/32	99.2
29.7 VOLT BATTERY											
E302579	0-20	250	5			1-13/32	35.7	3/4	19.1	3-3/16	81
47.25 VOLT BATTERY											
E302465	0-100	1000	30	2-1/8	54					3-3/4	95.3
97.2 VOLT BATTERY											
E302462	0-100	1000	30			2-13/16	71.4	1-17/32	38.9	6-13/32	163

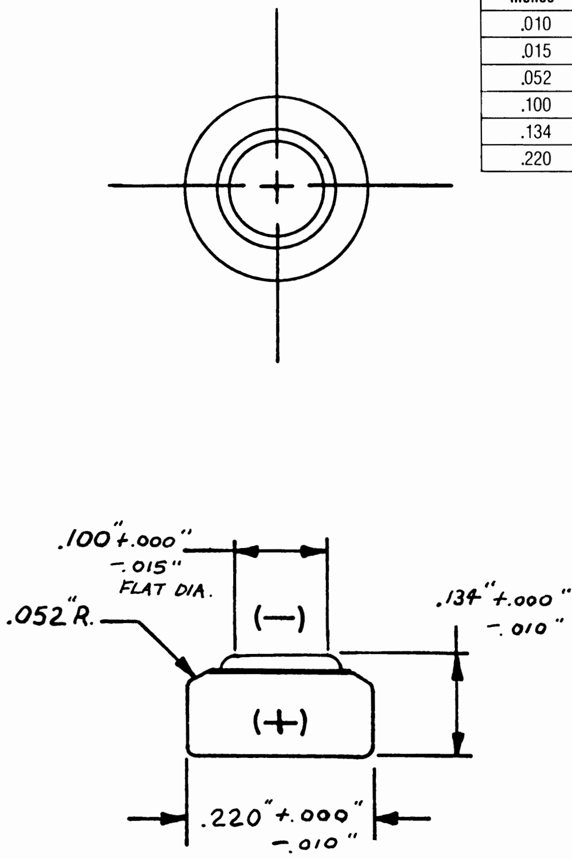
Battery Numbers (In Order of Increasing Ampere-Hour Capacity)	Number and Size of Cells		Typical Use	Weight of Battery		Terminals	Approximate Volume of Body of Battery		Voltage Taps
	Number	Size		Ounces	Grams		Cubic Inches	Cubic Centimeters	
12.6 VOLT BATTERIES									
E169	9	640	Instruments	2.7	76.5	Flat Contacts	1.37	23	–,+12.6
E289	9	822	Transceiver	3.6	102	Snaps	2.18	35.7	–,+12.6
15.4 VOLT BATTERY									
E303462	11	15 "AA" Low Temper-pature Cell	Transceiver	13	369	Recessed Flat	8.16	134	–,+15.4
16.2 and 16.8 VOLT BATTERIES									
E302362	12	625	Radiation Equipment	1.8	51	Wire Leads	1.13	18.5	–,+16.2
E303314	12	15 "AA" Low Temper-ature Cell	Transceiver	12.8	363	Recessed Flat Contacts	9.5	156	–,+16.8
27 VOLT BATTERY									
E302580	20	4	Instruments	33.6	953	Socket	28.8	472	–,+27
29.7 VOLT BATTERY									
E302579	22	625	Test Equipment	5	142	Wire Leads	2.9	47.5	–,+29.7
47.25 VOLT BATTERY									
E302465	35	1	Geophysical	17	482	Wire Leads	12.1	198	–,+47.25
97.2 VOLT BATTERY									
E302462	72	1	Transmitter "B"	32	907	Wire Leads	25.6	420	–,+97.2

NOTE: To provide the best contact to the terminals of Mercuric Oxide batteries, it is recommended that the device contacts be made of a spring material such as phosphor bronze or beryllium copper which will maintain a contact force of at least fifty grams for an extended period of time. The contact should be plated with about 0.0002" nickel (continuous) followed by a minimum of 0.00002" gold. The reliability of the contact can be further increased by subdividing the main contact member into two, three or more individual points or prongs such as the tines of a fork.

"EVEREADY" NO. E212E CELL

Type: Mercuric Oxide
ANSI Designation: M4
Suggested Current Range: 0-1 milliampere

Inches	Millimeters
.010	.25
.015	.38
.052	1.32
.100	2.54
.134	3.4
.220	5.59



SPECIFICATIONS

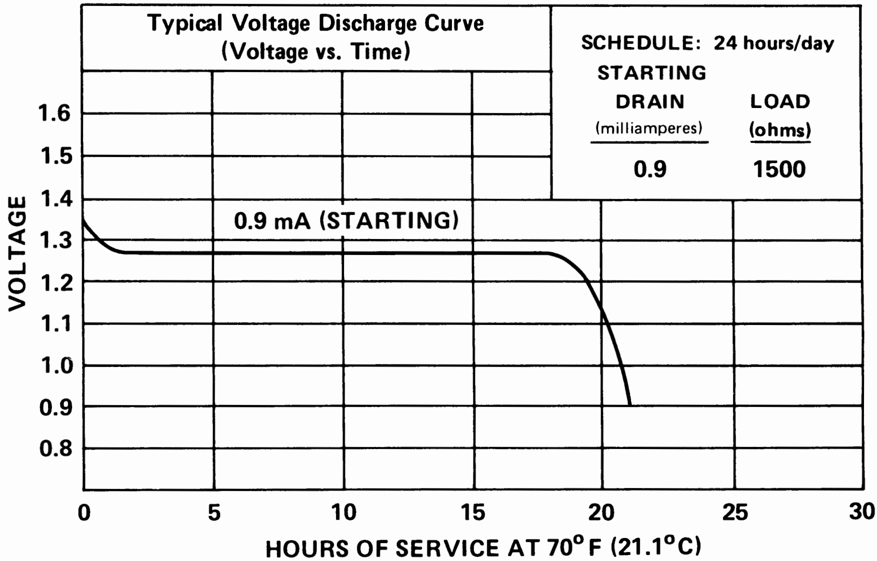
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 16 milliampere-hours
(Rated capacity at 0.9 milliampere)
Terminals .... Flat Contacts
Average Weight .... 0.01 oz. (0.33 gram)
Volume(by displacement)............ 0.005 cubic inch (0.08 cubic centimeter)
Cell .... One (ANSI M4)

For service information see reverse side of this sheet

"EVEREADY" NO. E212E

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V
24 hours/day	0.9	1500	20
	1.1	1250	16

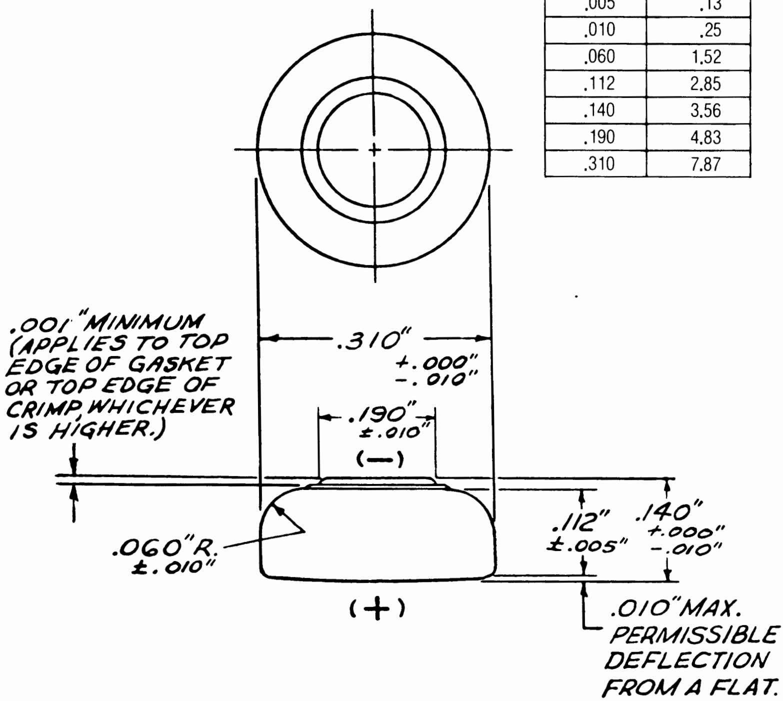


"EVEREADY" NO. E312 CELL

1.4 VOLTS

Type: Mercuric Oxide
ANSI Designation: M5
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.001	.03
.005	.13
.010	.25
.060	1.52
.112	2.85
.140	3.56
.190	4.83
.310	7.87



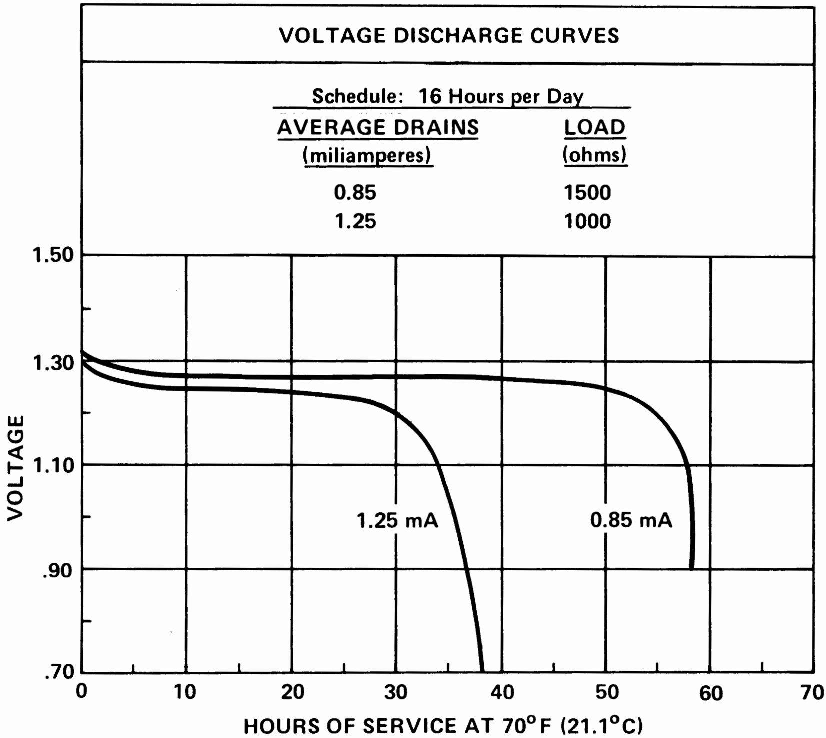
SPECIFICATIONS

Voltage Taps .... –, + 1.4
Average Service Capacity (to 0.9 volt) .... 45 milliampere-hours
(Rated capacity at 0.85 milliampere)
Terminals .... Flat Contacts
Average Weight .... 0.03 oz. (0.85 gram)
Volume (by displacement) .... 0.008 cubic inch (0.13 cubic centimeter)
Cell Size .... One No. 4-31141 (ANSI M5)

For service information see reverse side of this sheet

"EVEREADY" NO. E312

Estimated Average Hours Service at 70°F (21.1°C)



Impedance

The impedance of these cells on open circuit and during useful discharge typically varies from 5-20 ohms. This applies over a frequency range of 40-10,000 hertz and at the current drains shown above.

Service vs. Temperature

For following conditions:

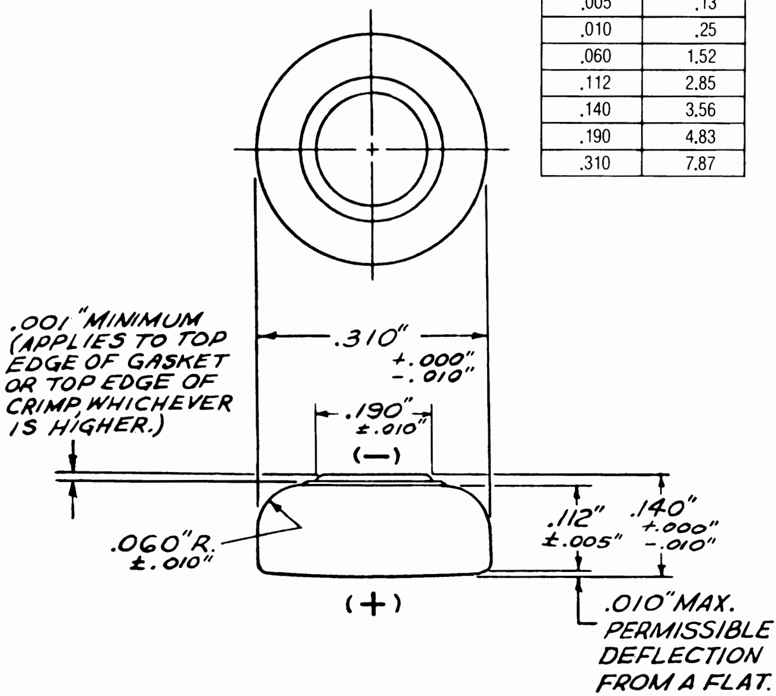
Starting Drain: 0.7 milliampere
Load: 2000 ohms
Discharge Schedule: 16 hours/day

Temperature	% of 70°F Service vs. Temperature 0.9V	1.2V
70°F	100	100
40°F	95	70

"EVEREADY" NO. E312E CELL

Type: Mercuric Oxide
ANSI Designation: M5
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.001	.03
.005	.13
.010	.25
.060	1.52
.112	2.85
.140	3.56
.190	4.83
.310	7.87



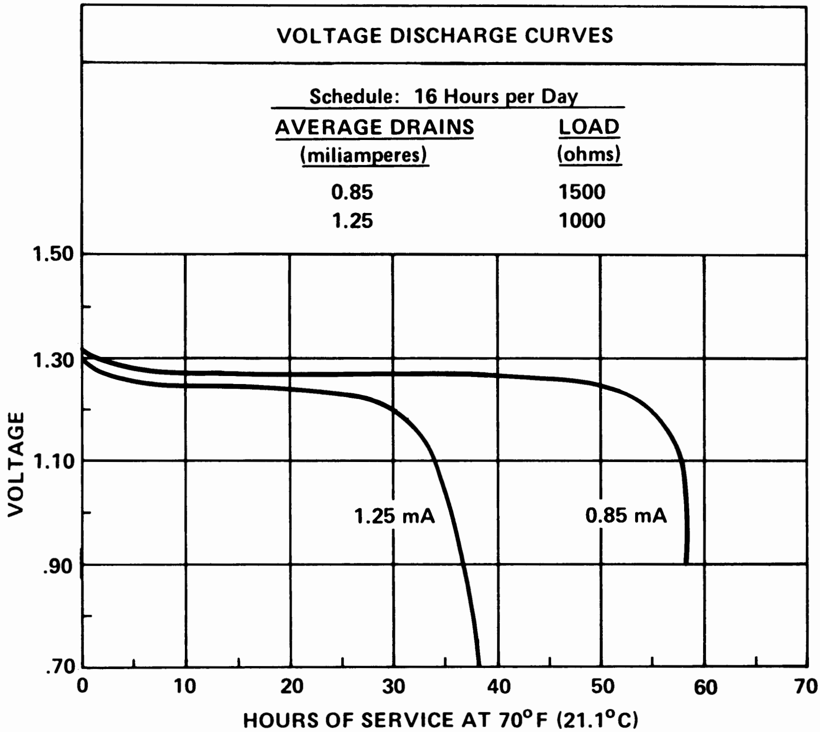
SPECIFICATIONS

Voltage Taps .... –, + 1.4
Average Service Capacity (to 0.9 volt) .... 45 milliampere-hours
(Rated capacity at 0.85 milliampere)
Terminals .... Flat Contacts
Average Weight .... 0.03 oz. (0.85 gram)
Volume (by displacement) .... 0.008 cubic inch (0.13 cubic centimeter)
Cell Size .... One No. 4-31141 (ANSI M5)

For service information see reverse side of this sheet

"EVEREADY" NO. E312E

Estimated Average Hours Service at 70°F (21.1°C)



Impedance

The impedance of these cells on open circuit and during useful discharge typically varies from 5-20 ohms. This applies over a frequency range of 40-10,000 hertz and at the current drains shown above.

Service vs. Temperature

For following conditions:

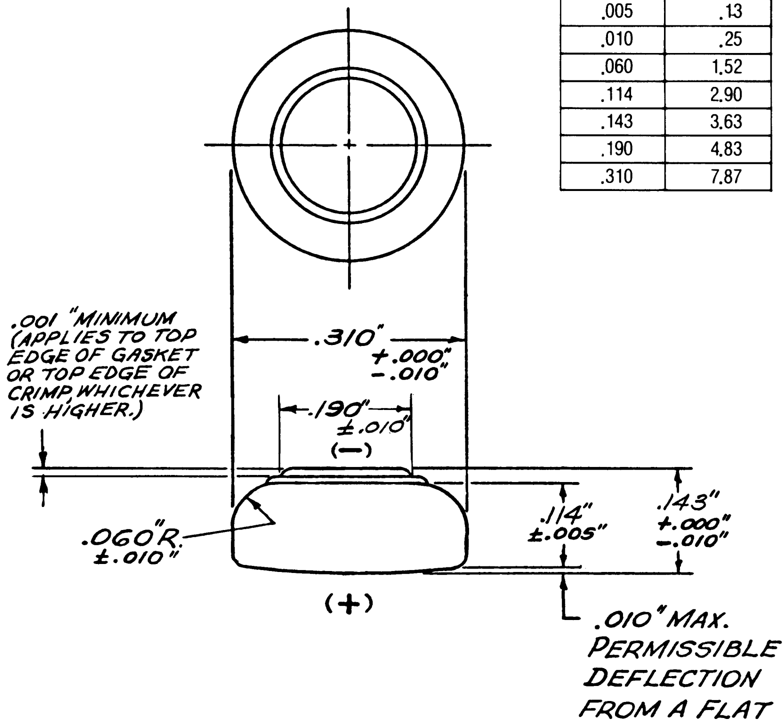
Starting Drain: 0.7 milliampere
Load: 2000 ohms
Discharge Schedule: 16 hours/day

Temperature	% of 70°F Service vs. Temperature 0.9V	1.2V
70°F	100	100
40°F	95	70

"EVEREADY" NO. 325 CELL

Type: Mercuric Oxide
ANSI Designation: WM5
IEC Designation: MR41
Suggested Current Range: 0-100 microamperes

Inches	Millimeters
.001	.03
.005	.13
.010	.25
.060	1.52
.114	2.90
.143	3.63
.190	4.83
.310	7.87



SPECIFICATIONS

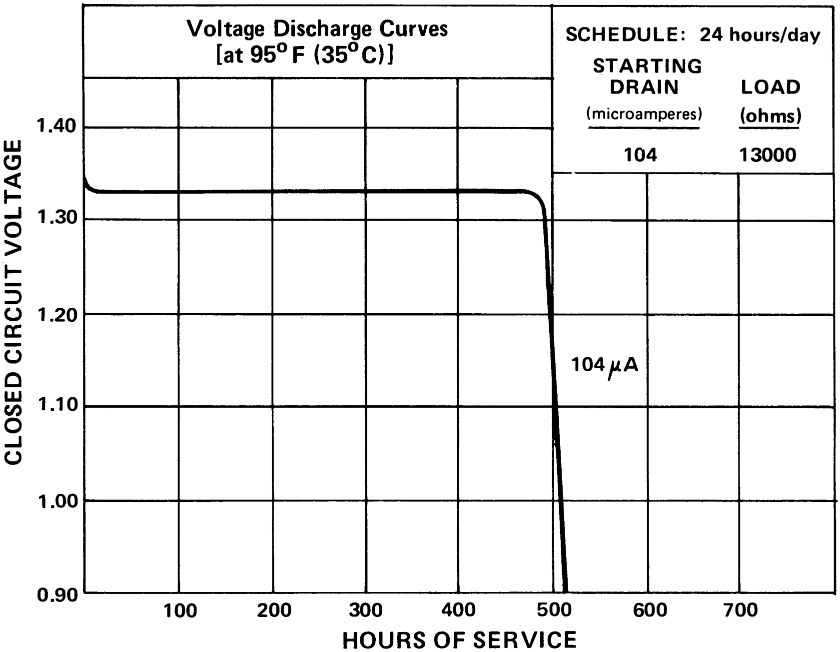
Voltage Taps .... −, + 1.35
Average Service Capacity (to 1.2 volts) .... 50 milliampere-hours
(Rated capacity at 13,000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.03 oz. (0.85 gram)
Volume (by displacement) .... 0.008 cubic inch (0.13 cubic centimeter)
Cell Size .... One No. 5-31141

For service information see reverse side of this sheet

"EVEREADY" NO. 325

Estimated Average Service at 95° F (35° C)

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.2V
24 hours/day	104	13,000	540 hours
	5.4	250,000	14 months



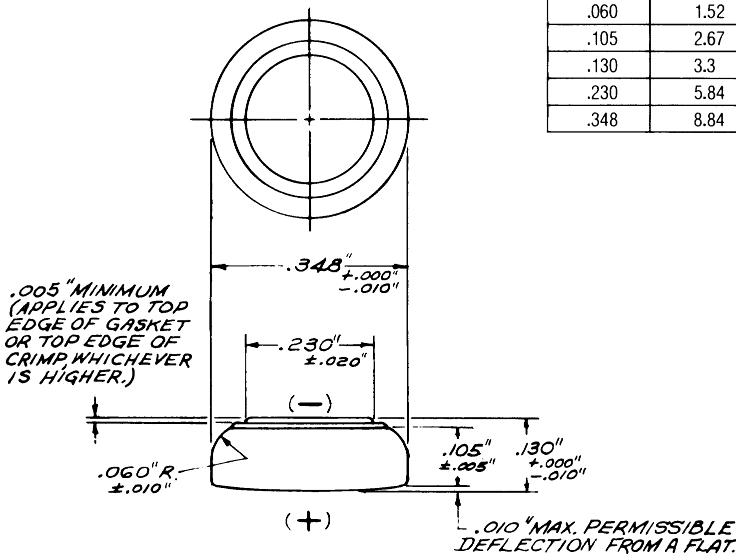
IMPEDANCE

Approximate open circuit impedance at 1000 Hz: 65 ohms average

"EVEREADY" NO. 388 CELL

Type: Mercuric Oxide
Suggested Current Range: 0-70 microamperes

Inches	Millimeters
.005	.13
.010	.25
.020	.51
.060	1.52
.105	2.67
.130	3.3
.230	5.84
.348	8.84



SPECIFICATIONS

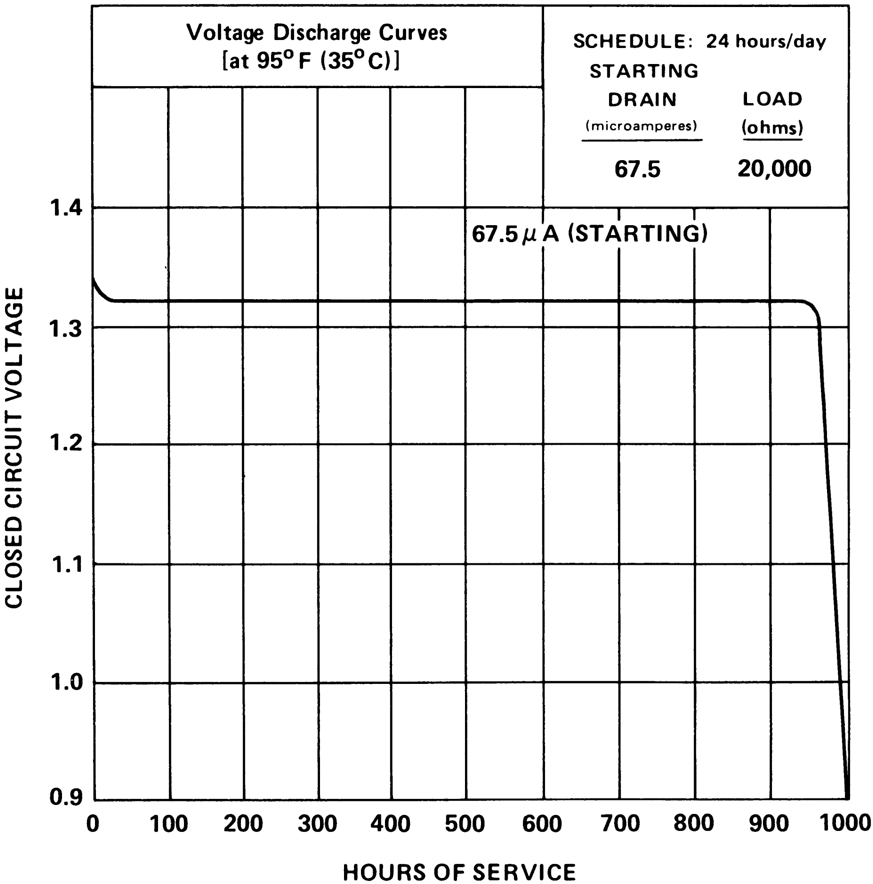
Voltage Taps .... −, + 1.35
Average Service Capacity (to 1.2 volts)........................ 65 milliampere-hours
(Rated capacity at 20,000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.035 oz. (0.997 gram)
Volume (by displacement)............ 0.012 cubic inch (0.2 cubic centimeter)
Cell Size .... One No. 5-34122

For service information see reverse side of this sheet

"EVEREADY" NO. 388

Estimated Average Service at 95°F (35°C)

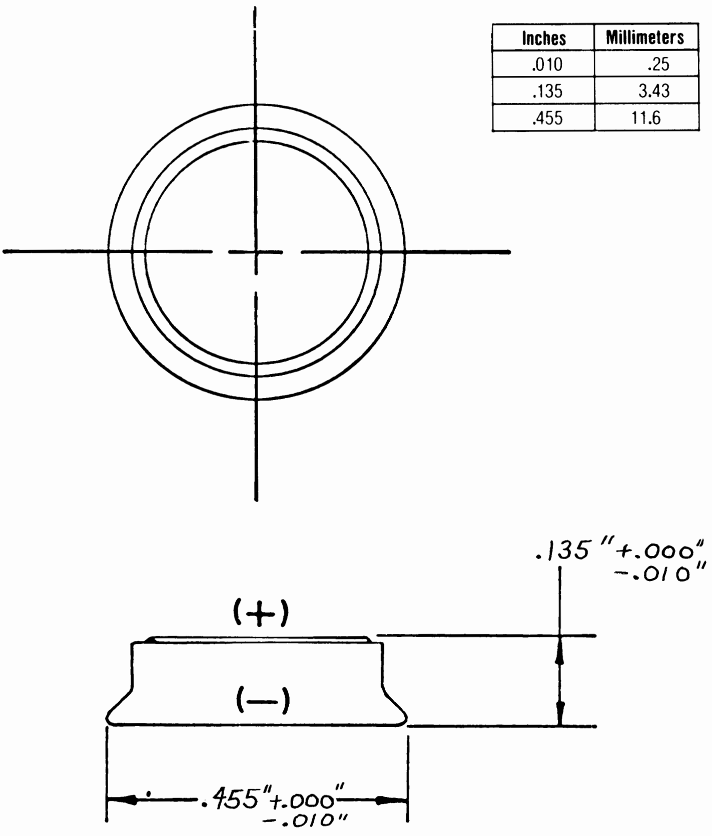
SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.2V
24 hours/day	67.5	20,000	1000	980 hours



"EVEREADY" NO. E400 CELL

Type: Mercuric -Oxide
ANSI Designation: M10
IEC Designation: MR08
Suggested Current Range: 0-7 milliamperes

Inches	Millimeters
.010	.25
.135	3.43
.455	11.6



SPECIFICATIONS

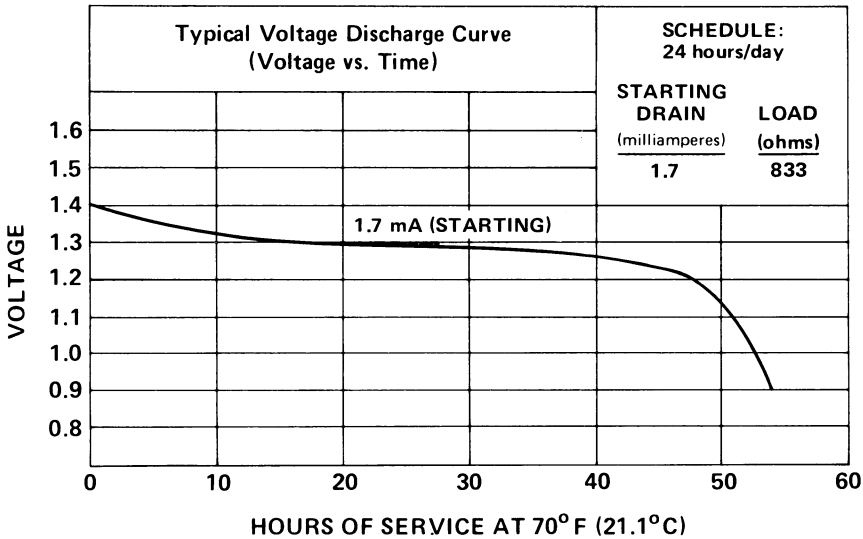
Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 80 milliampere-hours
(Rated capacity at 1.5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.05 oz. (1.42 grams)
Volume .... 0.02 cubic inch (0.33 cubic centimeters)
Cell .... One (ANSI M10)

For service information see reverse side of this sheet

"EVEREADY" NO. E400

Estimated Average Hours Service at 70°F (21.1°C)

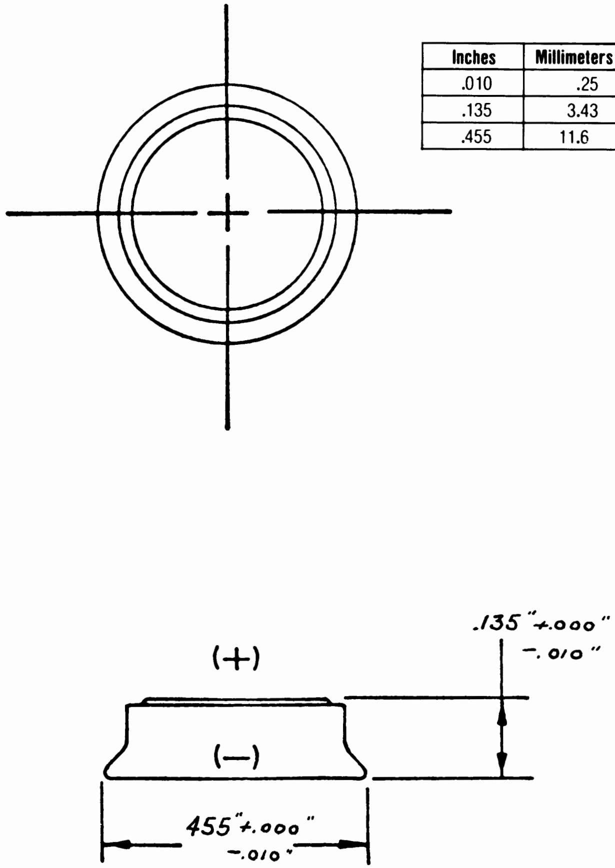
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	1.1	1250	74.3	73.9	73.1
	1.7	833	54.1	53.6	51.9
	2.2	625	36.2	35.4	33.1
	3.3	417	25	24.1	22.1



1.35
VOLTS

"EVEREADY" E400N CELL

Type: Mercuric Oxide
ANSI Designation: M10
IEC Designation: MR08
Suggested Current Range: 0-7 milliamperes



Inches	Millimeters
.010	.25
.135	3.43
.455	11.6

SPECIFICATIONS

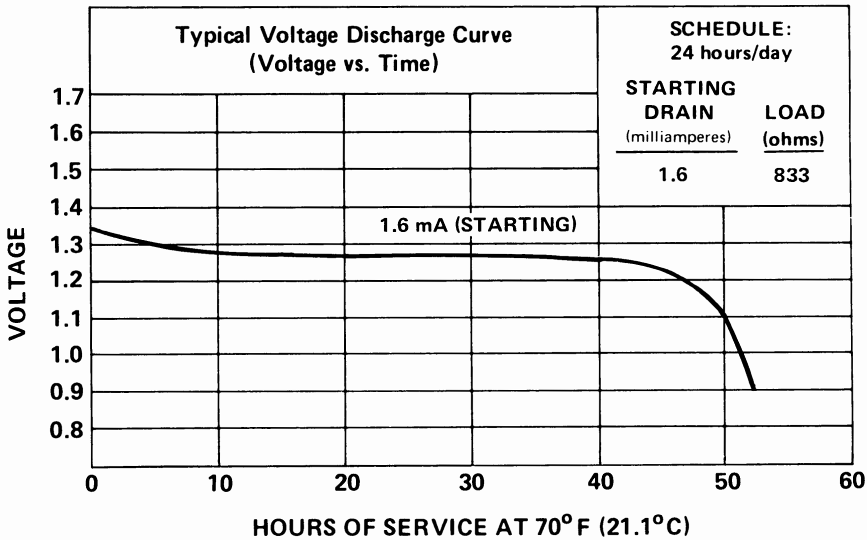
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 80 milliampere-hours
(Rated capacity at 1.5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.05 oz. (1.42 grams)
Volume .... 0.02 cubic inch (0.33 cubic centimeters)
Cell.. One (ANSI M10)

For service information see reverse side of this sheet

"EVEREADY" E400N

Estimated Average Hours Service at 70° F (21.1°C)

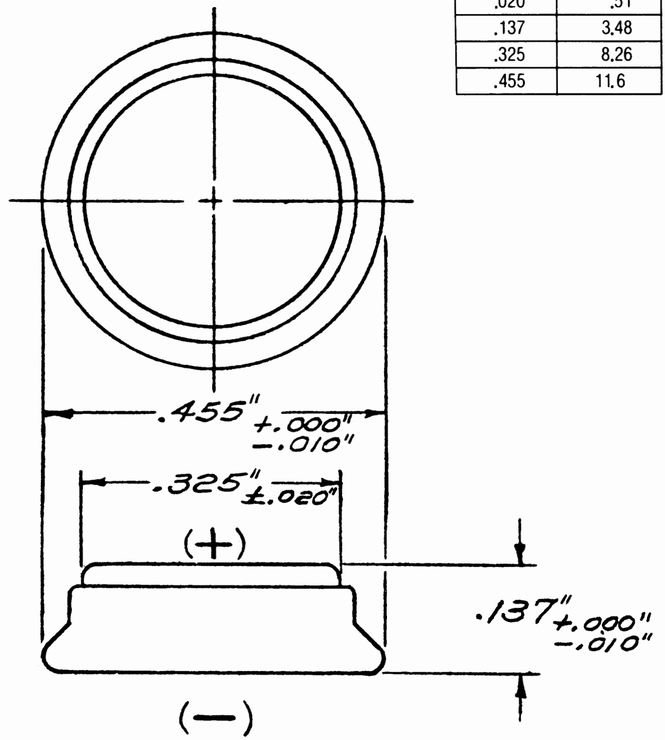
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	1.1	1250	75.9	75.2	73.9
	1.6	833	51.7	51.2	49
	2.2	625	36	35.2	34
	3.2	417	15.1	14.9	13.1



"EVEREADY" NO. 387 CELL

Type: Mercuric Oxide
Suggested Current Range: 0-100 microamperes

Inches	Millimeters
.010	.25
.020	.51
.137	3.48
.325	8.26
.455	11.6



SPECIFICATIONS

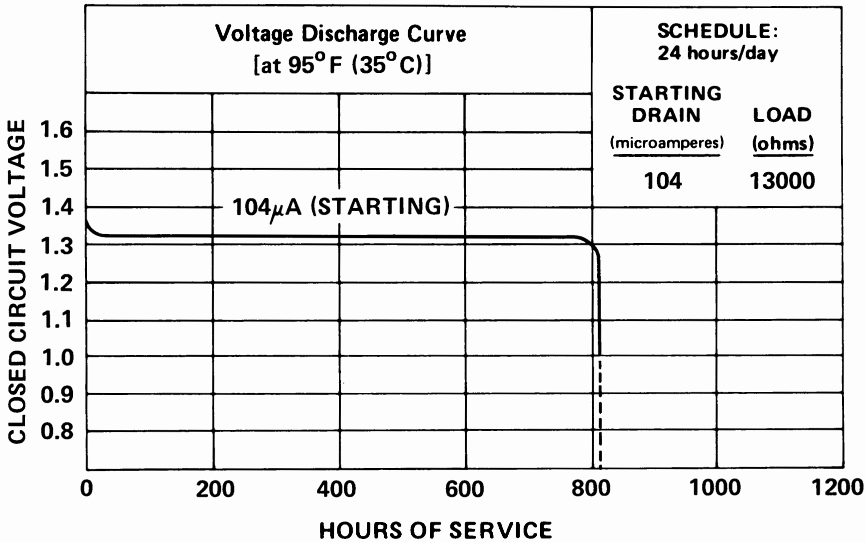
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 80 milliampere-hours
(Rated capacity at 13000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.048 oz. (1.36 grams)
Volume .... 0.021 cubic inch (0.34 cubic centimeter)

For service information see reverse side of this sheet

"EVEREADY" NO. 387

Estimated Average Service at 95°F (35°C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.0V
24 hours/day	104	13000	800 hours

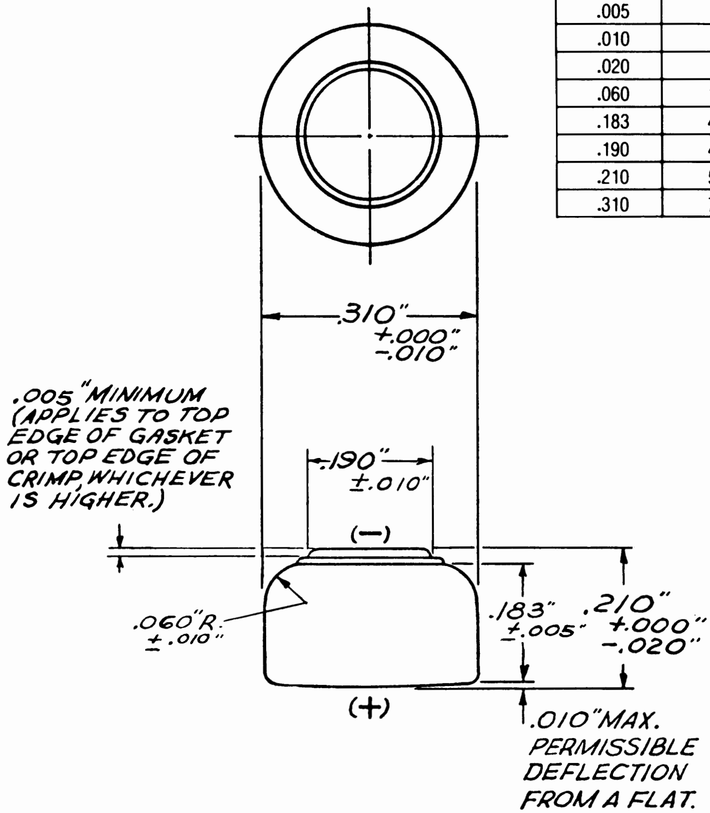


"EVEREADY" NO. E13 CELL

1.4
VOLTS

Type: Mercuric Oxide
ANSI Designation: M6
IEC Designation: MR48
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.005	.13
.010	.25
.020	.51
.060	1.52
.183	4.65
.190	4.83
.210	5.33
.310	7.87



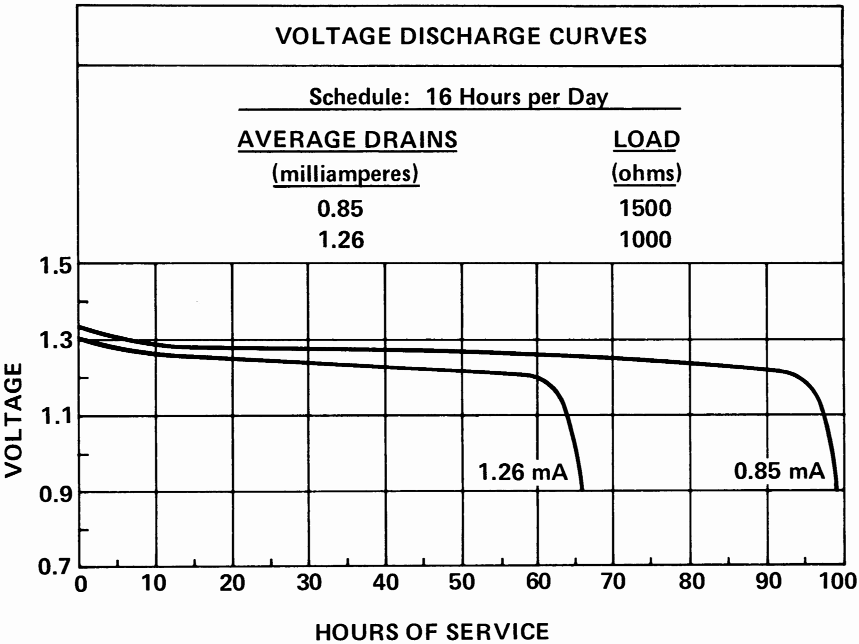
SPECIFICATIONS

Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt)........................ 85 milliampere-hours
(Rated capacity at 0.85 milliampere)
Terminals .... Flat Contacts
Average Weight.. 0.04 oz. (1.13 grams)
Volume (by displacement) .... 0.011 cubic inch (0.18 cubic centimeter)
Cell .... One No. 4-31201 (ANSI M6)

For service information see reverse side of this sheet

"EVEREADY" NO. E13

Estimated Average Hours Service at 70°F (21.1°C)



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 8–15 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

SERVICE VS. TEMPERATURE

For following conditions:

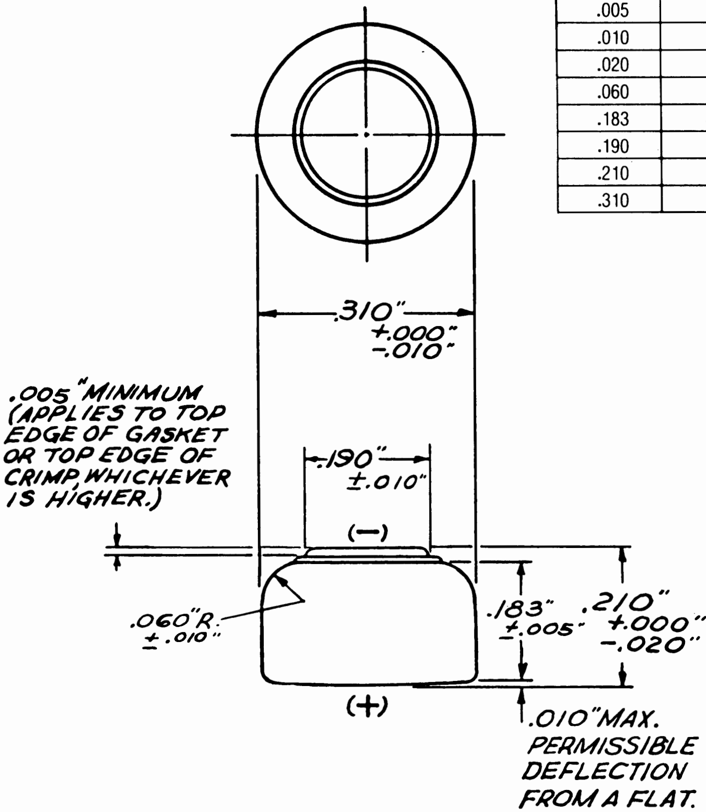
Average Drain: 0.85 milliampere
Load: 1500 ohms
Discharge Schedule: 16 hours/day

Temperature	% of 70°F Service vs. Temperature 0.9V	1.2V
70° F (21.1° C)	100	100
40° F (4.4° C)	95	70

"EVEREADY" NO. E13E CELL

Type: Mercuric Oxide
ANSI Designation: M6
IEC Designation: MR48
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.005	.13
.010	.25
.020	.51
.060	1.52
.183	4.65
.190	4.83
.210	5.33
.310	7.87



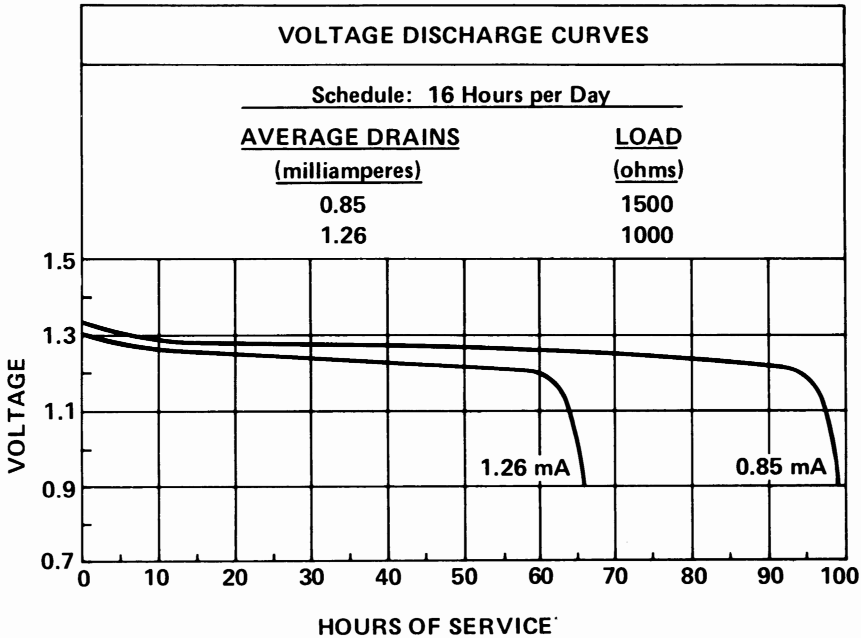
SPECIFICATIONS

Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt)........ 85 milliampere-hours
(Rated capacity at 0.85 milliampere)
Terminals .... Flat Contacts
Average Weight........ 0.04 oz. (1.13 grams)
Volume (by displacement) .... 0.011 cubic inch (0.18 cubic centimeter)
Cell .... One No. 4-31201 (ANSI M6)

For service information see reverse side of this sheet

"EVEREADY" NO. E13E

Estimated Average Hours Service at 70°F (21.1°C)



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 8–15 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

SERVICE VS. TEMPERATURE

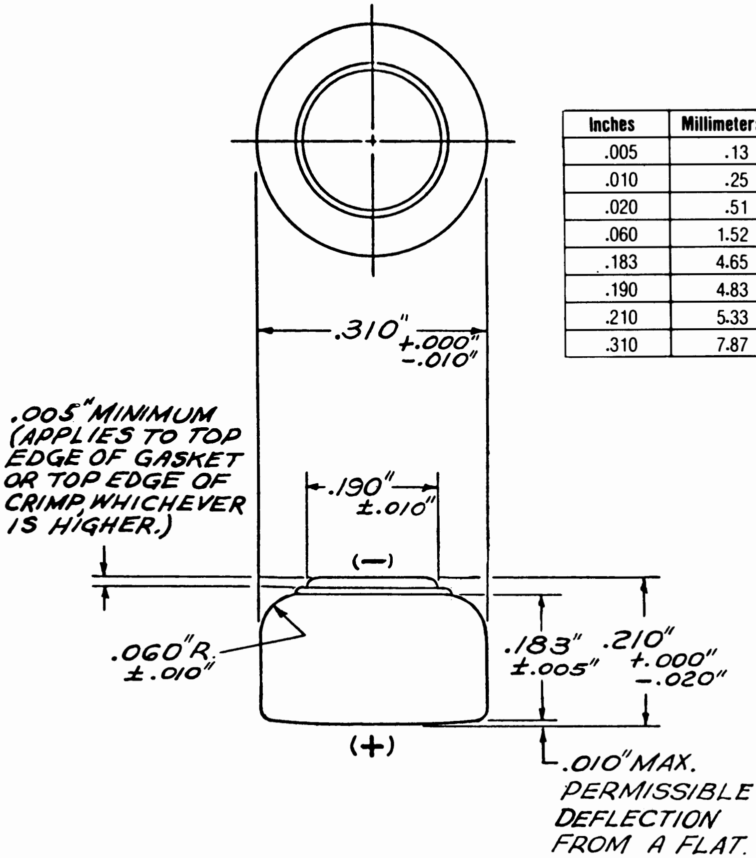
For following conditions:

Average Drain: 0.85 milliampere
Load: 1500 ohms
Discharge Schedule: 16 hours/day

Temperature	% of 70°F Service vs. Temperature	
	0.9V	1.2V
70° F (21.1° C)	100	100
40° F (4.4° C)	95	70

"EVEREADY" NO. 323 CELL

Type: Mercuric Oxide
ANSI Designation: WM6
IEC Designation: MR48
Suggested Current Range: 0-100 microamperes



Inches	Millimeters
.005	.13
.010	.25
.020	.51
.060	1.52
.183	4.65
.190	4.83
.210	5.33
.310	7.87

SPECIFICATIONS

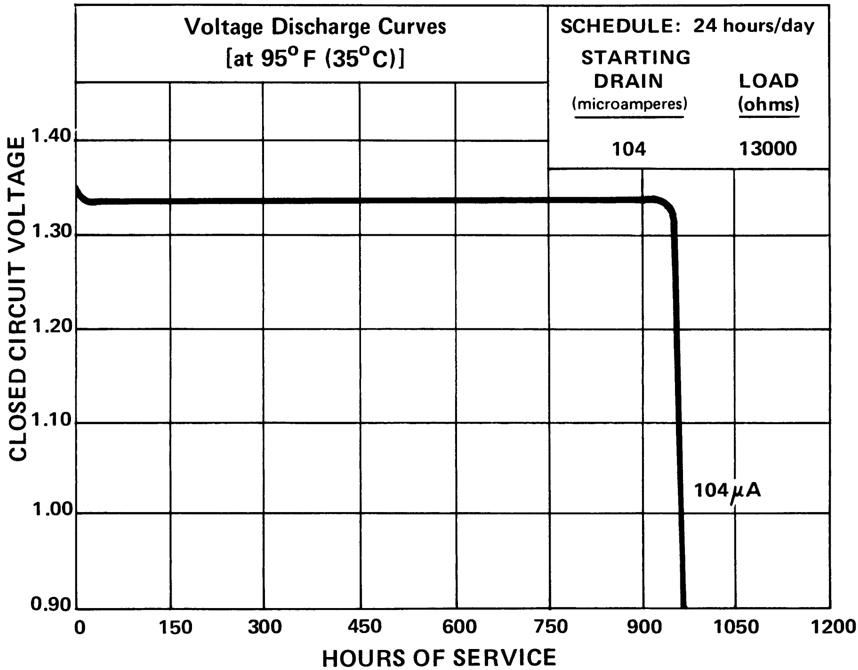
Voltage Taps .... −, + 1.35
Average Service Capacity (to 1.2 volts) .... 95 milliampere-hours
(Rated capacity at 13,000 ohm load)
Terminals........ Flat Contacts
Average Weight .... 0.05 oz. (1.42 grams)
Volume (by displacement) .... 0.015 cubic inch (0.25 cubic centimeter)
Cell Size........ One No. 5-31202

For service information see reverse side of this sheet

"EVEREADY" NO. 323

Estimated Average Service at 95° F (35° C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.2V
24 hours/day	104	13,000	950 hours
	10.3	130,000	13 months



IMPEDANCE

Approximate open circuit impedance at 1000 Hz: 65 ohms average

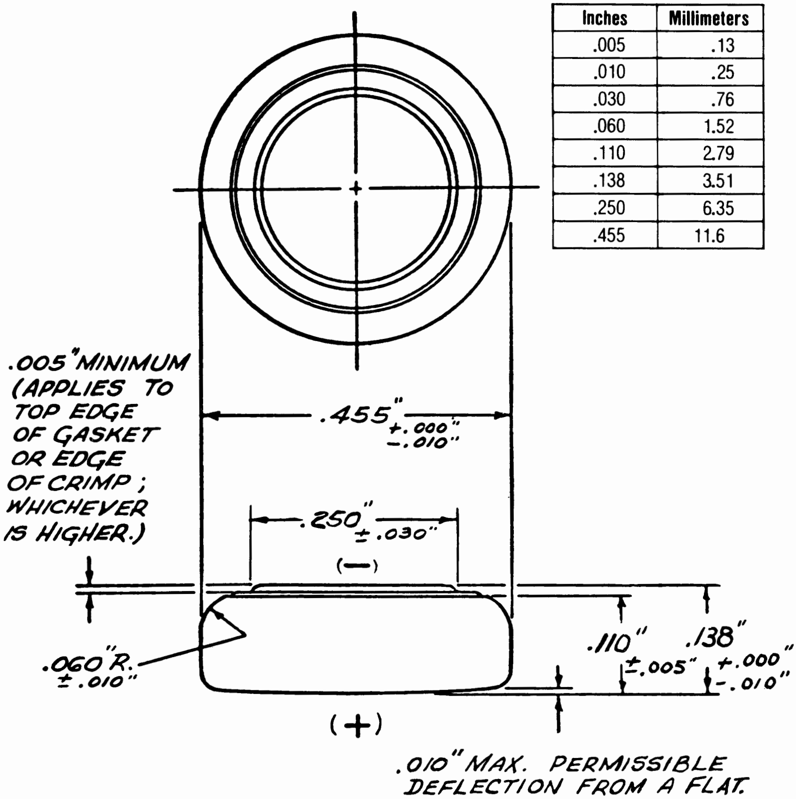
"EVEREADY" NO. E575E CELL

Type: Mercuric Oxide

ANSI Designation: M8

Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.010	.25
.030	.76
.060	1.52
.110	2.79
.138	3.51
.250	6.35
.455	11.6



SPECIFICATIONS

Voltage Taps .... −, + 1.4

Average Service Capacity (to 0.9 volt) .... 105 milliampere-hours
(Rated capacity at 1.28 milliamperes)

Terminals .... Flat Contacts

Average Weight .... 0.05 oz. (1.42 grams)

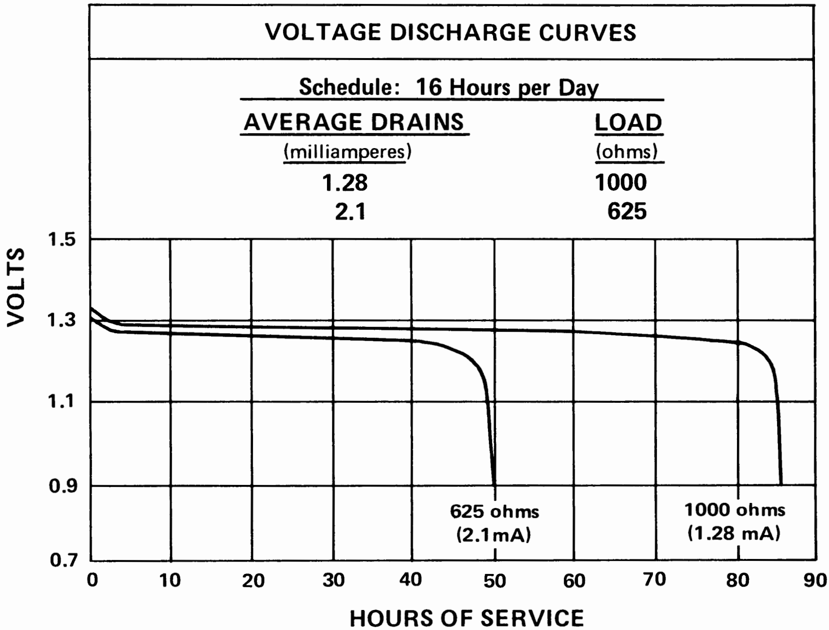
Volume (by displacement) .... 0.018 cubic inch (0.3 cubic centimeter)

Cell Size .... One No. 4-45131 (ANSI M8)

For service information see reverse side of this sheet

"EVEREADY" NO. E575E CELL

Estimated Average Service at 70° F (21.1°C)



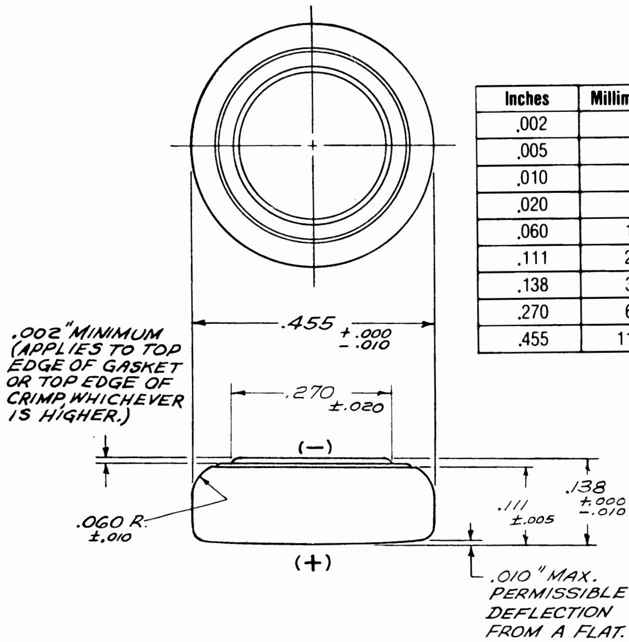
Impedance

The impedance of these cells on open circuit and during useful discharge typically varies from 3–9 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

1.35
VOLTS

"EVEREADY" NO. 343 CELL

Type: Mercuric Oxide
ANSI Designation: WM10
IEC Designation: MR42
Suggested Current Range: 0-100 microamperes



Inches	Millimeters
.002	.05
.005	.13
.010	.25
.020	.51
.060	1.52
.111	2.82
.138	3.51
.270	6.86
.455	11.6

SPECIFICATIONS

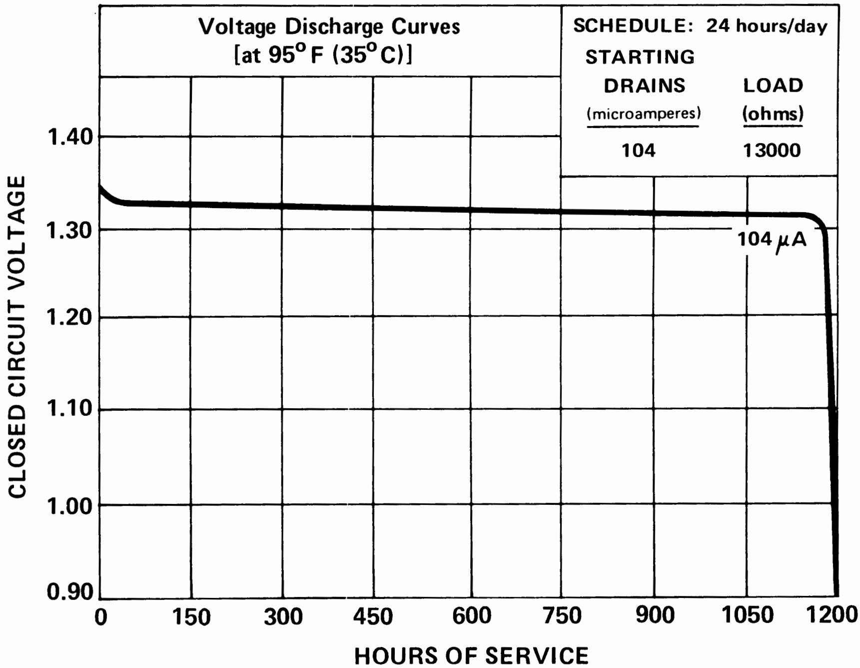
Voltage Taps .... −, + 1.35
Average Service Capacity (to 1.2 volts) .... 120 milliampere-hours
(Rated capacity at 13,000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.06 oz. (1.7 grams)
Volume (by displacement) .... 0.019 cubic inch (0.31 cubic centimeter)
Cell Size .... One No. 5-45131

For service information see reverse side of this sheet

"EVEREADY" NO. 343

Estimated Average Service at 95°F (35°C)

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	CUTOFF VOLTAGE 1.2V
24 hours/day	104	13,000	1200 hours	1170 hours
	10.3	130,000	16 months (estimated)	15.8 months (estimated)



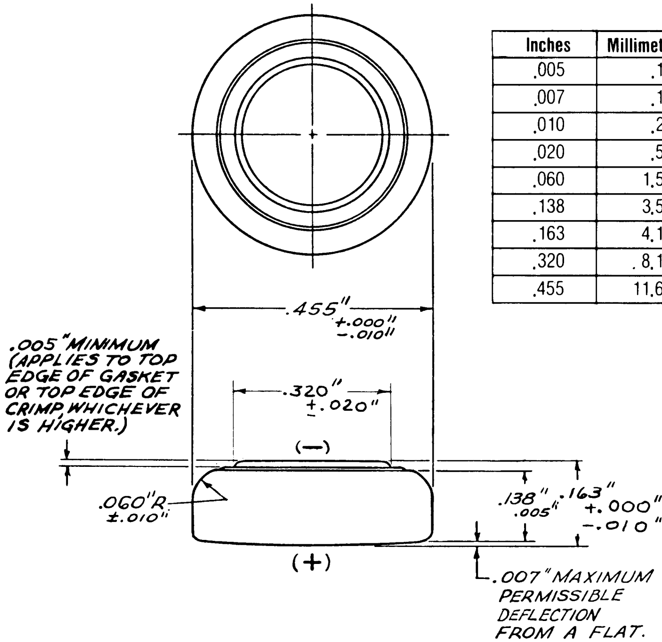
IMPEDANCE

Approximate open circuit impedance at 1000 Hz: 80 ohms average

"EVEREADY" NO. 354 CELL

1.35 VOLTS

Type: Mercuric Oxide
IEC Designation: MR43
Suggested Current Range: 0-200 microamperes



Inches	Millimeters
.005	.13
.007	.18
.010	.25
.020	.51
.060	1.52
.138	3.51
.163	4.14
.320	8.13
.455	11.6

SPECIFICATIONS

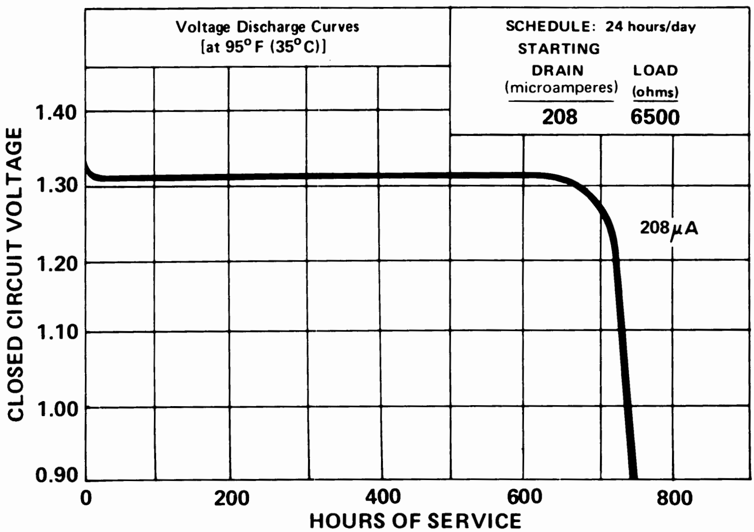
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 150 milliampere-hours
(Rated capacity at 6,500 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.07 oz. (1.98 grams)
Volume (by displacement) .... 0.023 cubic inch (0.38 cubic centimeter)
Cell Size .... One No. 5-45161

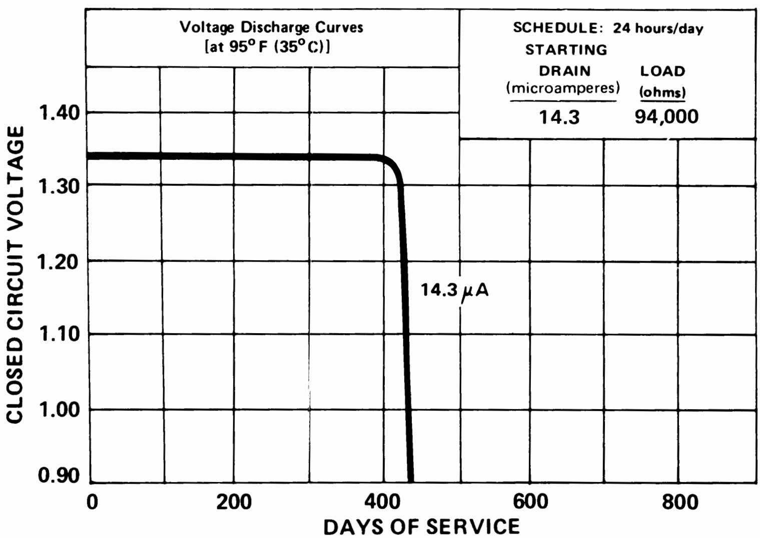
For service information see reverse side of this sheet

"EVEREADY" NO. 354

Estimated Average Service at 95° F (35° C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	CUTOFF VOLTAGE 1.2V
24 hours/day	208	6,500	730 hours	710 hours
	14.3	94,000	14 months	13.8 months



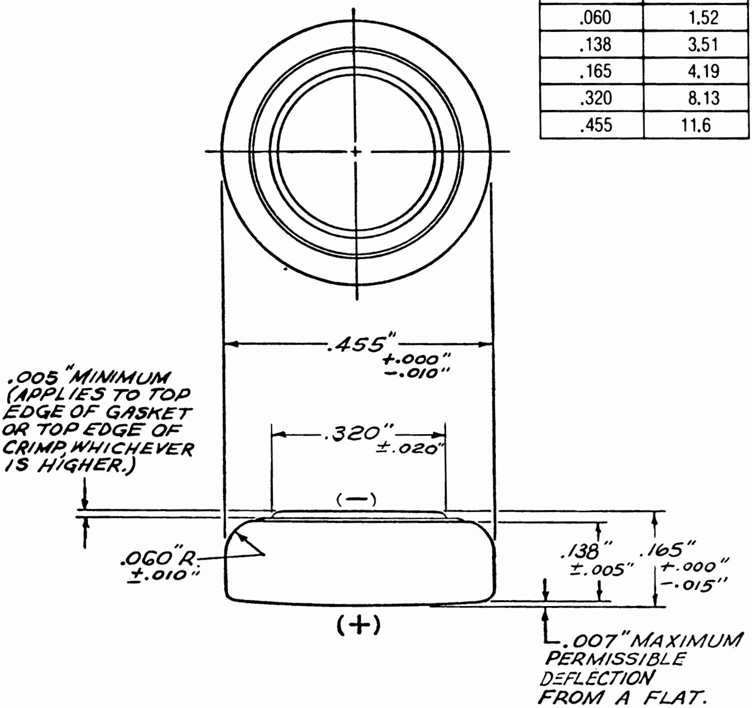


1.4
VOLTS

"EVEREADY" NO. E41 CELL

Type: Mercuric Oxide
ANSI Designation: M11
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.020	.51
.060	1.52
.138	3.51
.165	4.19
.320	8.13
.455	11.6



SPECIFICATIONS

Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 160 milliampere-hours
(Rated capacity at 1.29 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.07 oz. (1.98 grams)
Volume (by displacement) .... 0.02 cubic inch (0.33 cubic centimeter)
Cell .... One No. 4-45161 (ANSI M11)

For service information see reverse side of this sheet

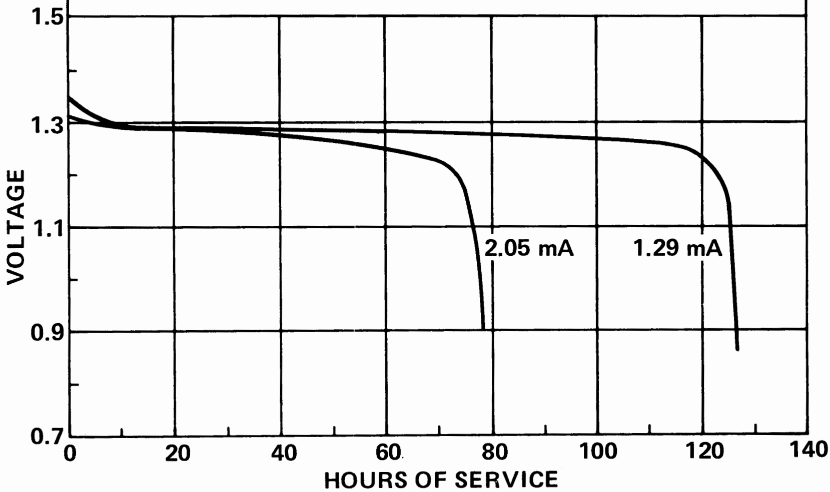
"EVEREADY" NO. E41

Estimated Average Hours Service at 70° F (21.1° C)

VOLTAGE DISCHARGE CURVES

Schedule: 16 Hours per Day

AVERAGE DRAINS (milliamperes)	LOAD (ohms)
1.29	1000
2.05	625



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 3–9 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

SERVICE VS. TEMPERATURE

For following conditions:

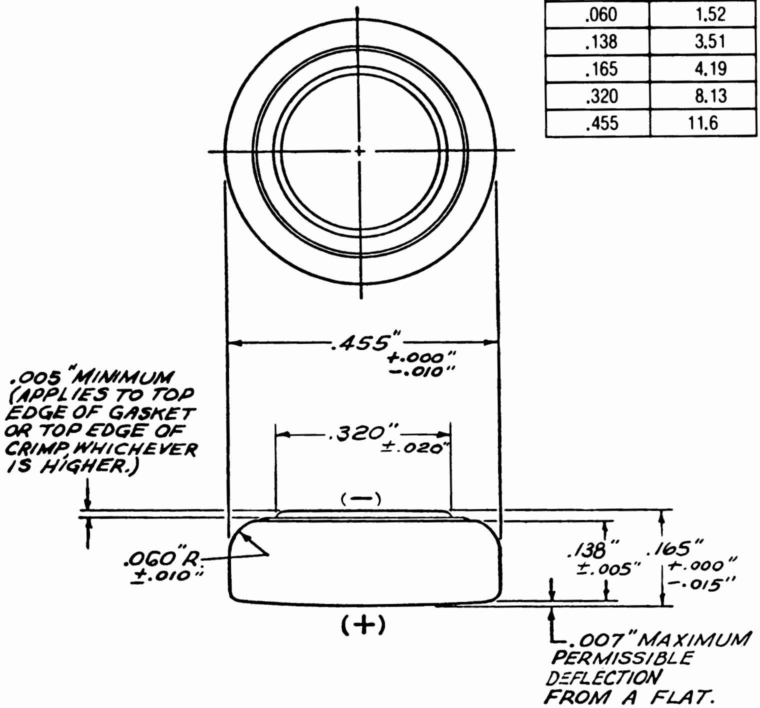
Average Drain: 1.29 milliamperes
Load: 1000 ohms
Discharge Schedule: 16 hours/day

Temperature	% of 70° F (21.1° C) Service vs. Temperature 0.9V	1.2V
70° F (21.1° C)	100	100
40° F (4.4° C)	95	70

"EVEREADY" NO. E41E CELL

Type: Mercuric Oxide
ANSI Designation: M11
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.020	.51
.060	1.52
.138	3.51
.165	4.19
.320	8.13
.455	11.6



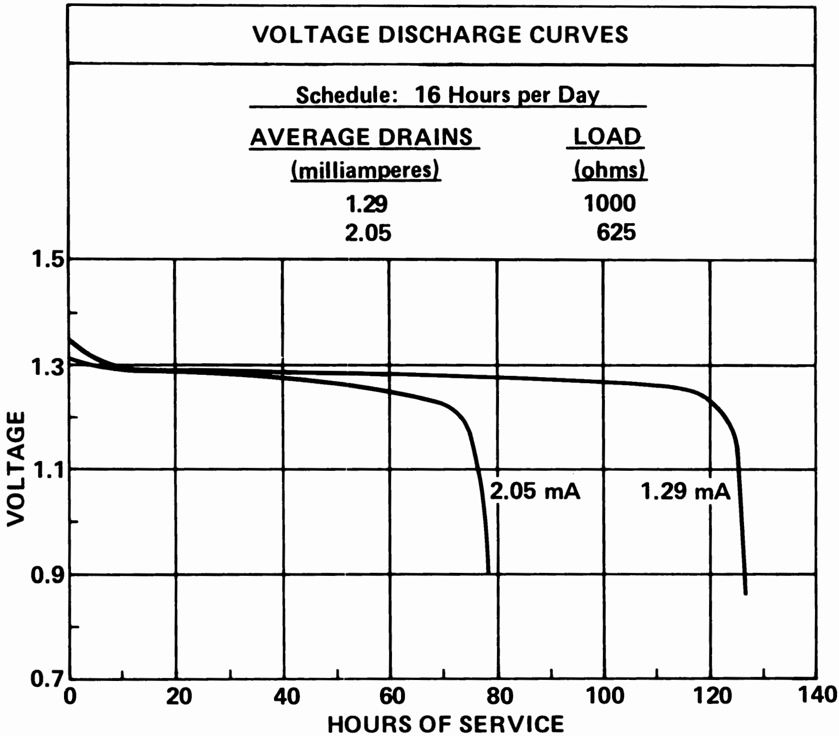
SPECIFICATIONS

Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 160 milliampere-hours
(Rated capacity at 1.29 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.07 oz. (1.98 grams)
Volume (by displacement) .... 0.02 cubic inch (0.33 cubic centimeter)
Cell .... One No. 4-45161 (ANSI M11)

For service information see reverse side of this sheet

"EVEREADY" NO. E41E

Estimated Average Hours Service at 70° F (21.1° C)



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 3–9 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

SERVICE VS. TEMPERATURE

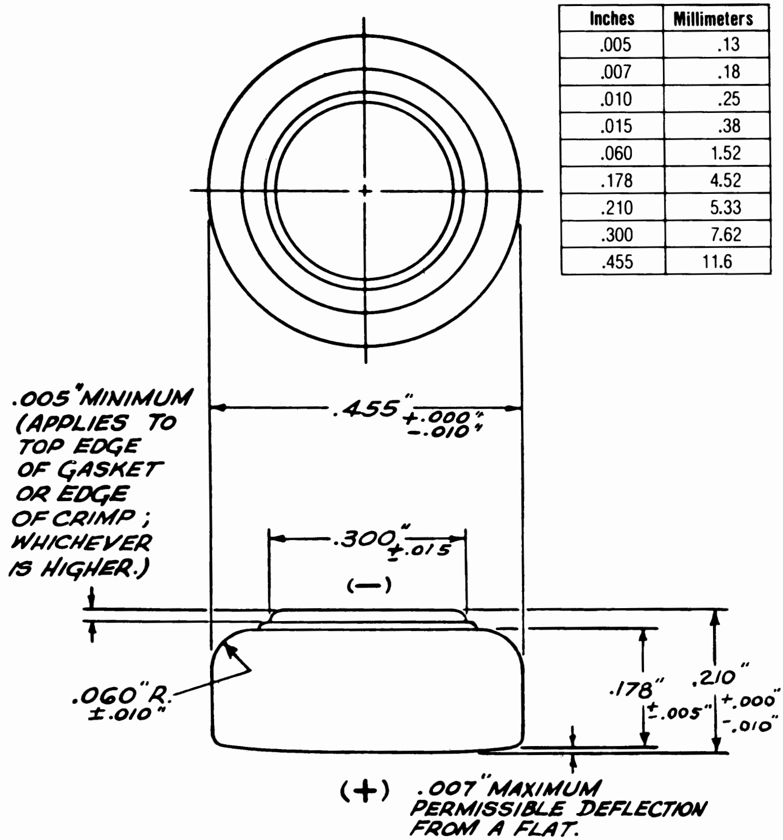
For following conditions:

Average Drain: 1.29 milliamperes
Load: 1000 ohms
Discharge Schedule: 16 hours/day

Temperature	% of 70° F Service vs. Temperature 0.9V	1.2V
70° F (21.1°C)	100	100
40° F (4.4° C)	95	70

"EVEREADY" NO. E675E CELL

Type: Mercuric Oxide
ANSI Designation: M15
Suggested Current Range: 0-10 milliamperes



Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.060	1.52
.178	4.52
.210	5.33
.300	7.62
.455	11.6

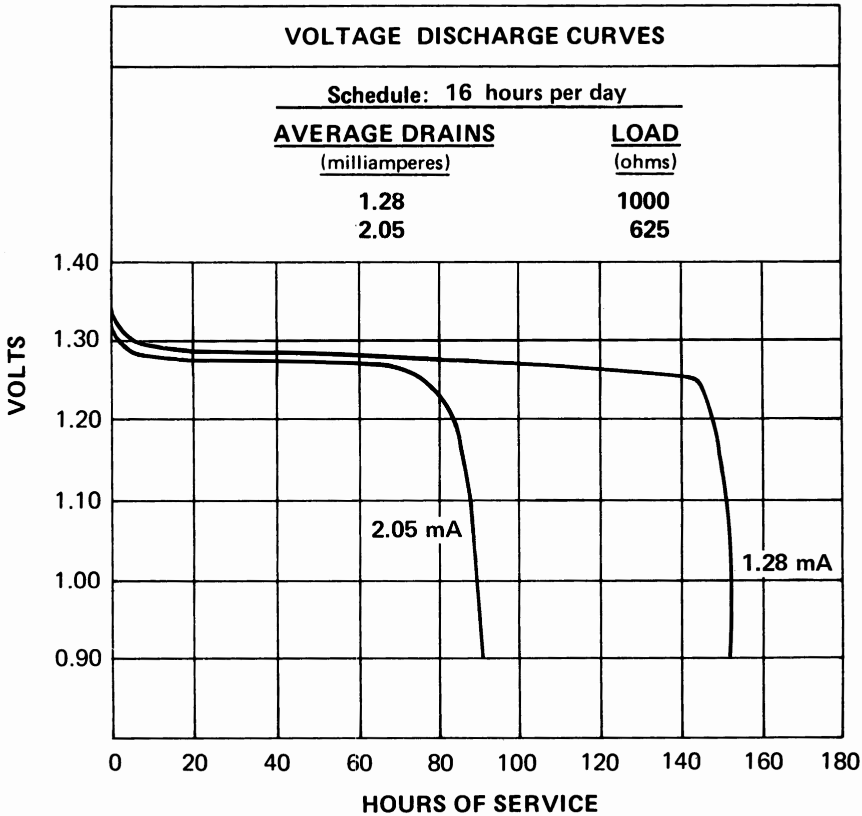
SPECIFICATIONS

Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 190 milliampere-hours
(Rated capacity at 625 ohms)
Terminals .... Flat Contacts
Average Weight .... 0.09 oz. (2.55 grams)
Volume (by displacement) .... 0.029 cubic inch (0.48 cubic centimeter)
Cell Size .... One No. 4-45211 (ANSI M15)

For service information see reverse side of this sheet

"EVEREADY" NO. E675E

Estimated Average Service at 70°F (21.1°C)

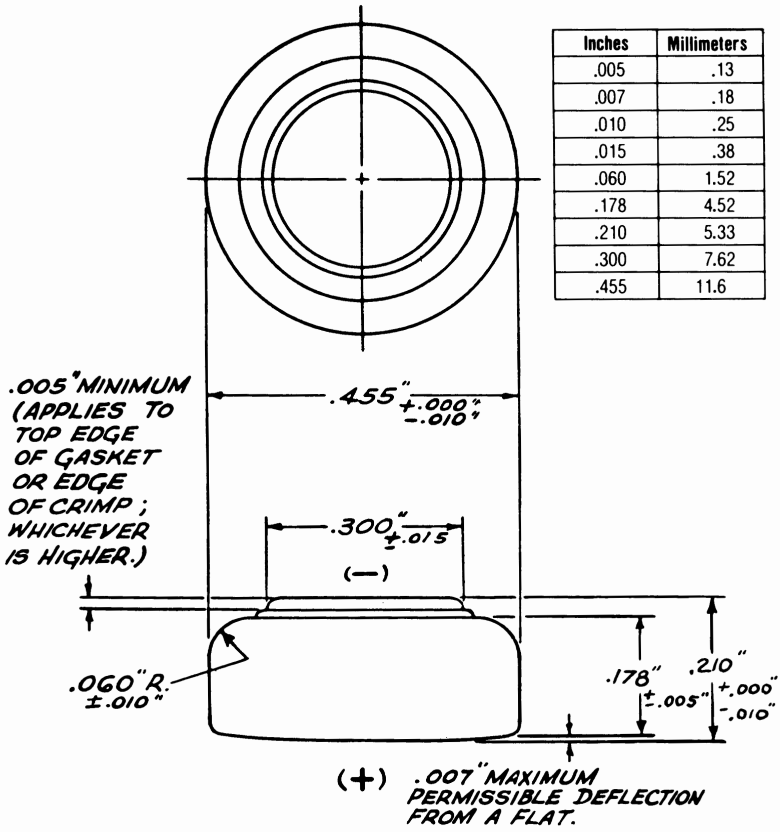


Impedance

The impedance of these cells on open circuit and during useful discharge typically varies from 3-12 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

"EVEREADY" NO. E675 CELL

Type: Mercuric Oxide
ANSI Designation: M15
Suggested Current Range: 0-10 milliamperes



Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.060	1.52
.178	4.52
.210	5.33
.300	7.62
.455	11.6

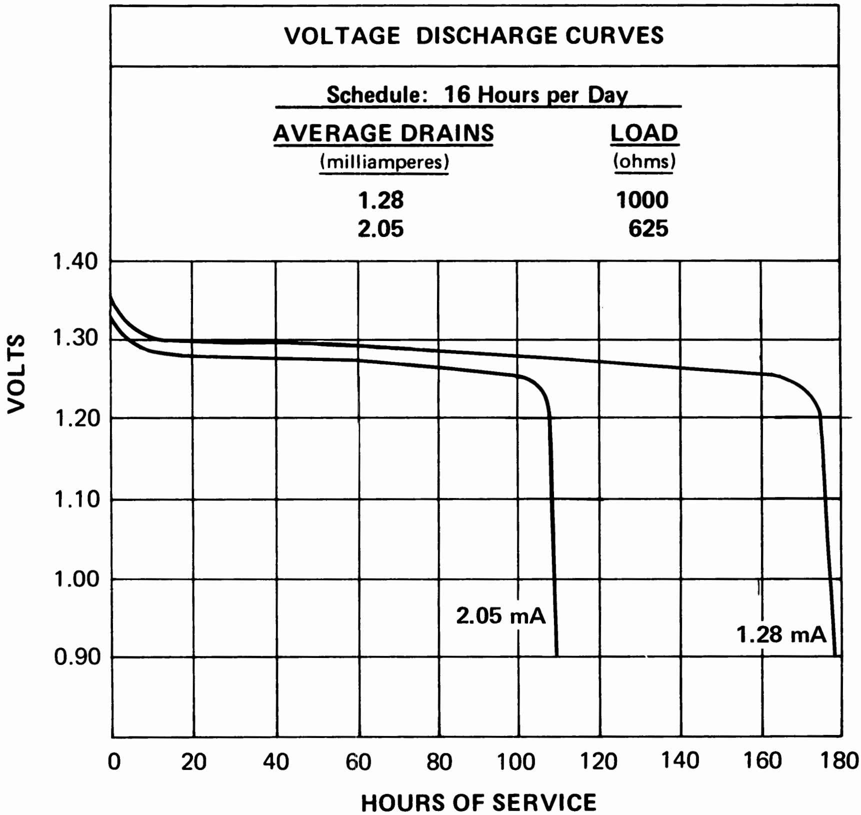
SPECIFICATIONS

Voltage Taps.......... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 215 milliampere-hours
(Rated capacity at 2.05 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.09 oz. (2.55 grams)
Volume (by displacement).......... 0.029 cubic inch (0.48 cubic centimeter)
Cell .... One No. 4-45212 (ANSI M15)

For service information see reverse side of this sheet

"EVEREADY" NO. E675

Estimated Average Service at 70° F (21.1° C)



Impedance

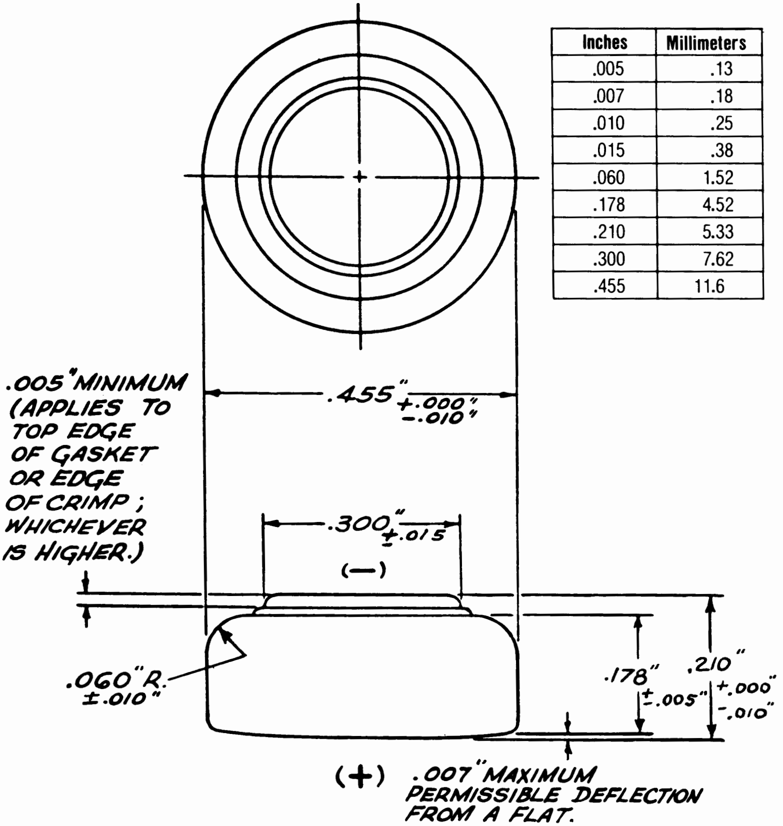
The impedance of these cells on open circuit and during useful discharge typically varies from 3-12 ohms. This applies over a frequency range of 40—5000 hertz and at the current drains shown above.

"EVEREADY" NO. EP675E CELL

Type: Mercuric Oxide

ANSI Designation: M15

Suggested Current Range: 0-10 milliamperes



Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.060	1.52
.178	4.52
.210	5.33
.300	7.62
.455	11.6

SPECIFICATIONS

Voltage Taps .... −, + 1.4

Average Service Capacity (to 0.9 volt) ....215 milliampere-hours

(Rated capacity at 625 ohms)

Terminals .... Flat Contacts

Average Weight .... 0.09 oz. (2.55 grams)

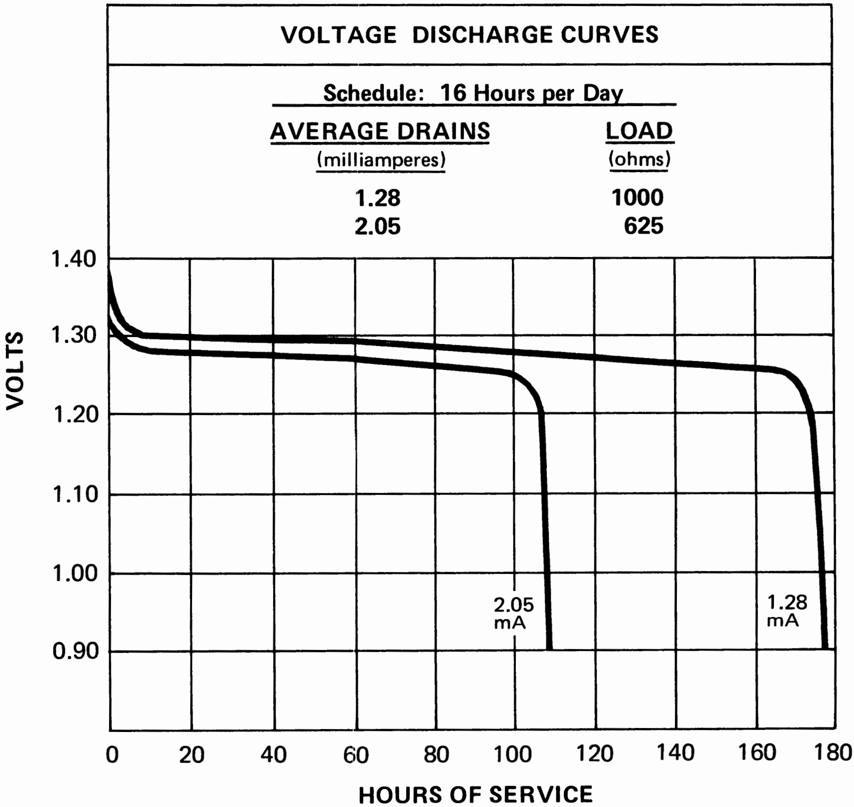
Volume (by displacement) .... 0.029 cubic inch (0.48 cubic centimeter)

Cell Size .... One No. 4-45212 (ANSI M15)

For service information see reverse side of this sheet

"EVEREADY" NO. EP675E

Estimated Average Service at 70° F (21.1°C)



Impedance

The impedance of these cells on open circuit and during useful discharge typically varies from 3-12 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

SERVICE VS. TEMPERATURE

For following conditions:

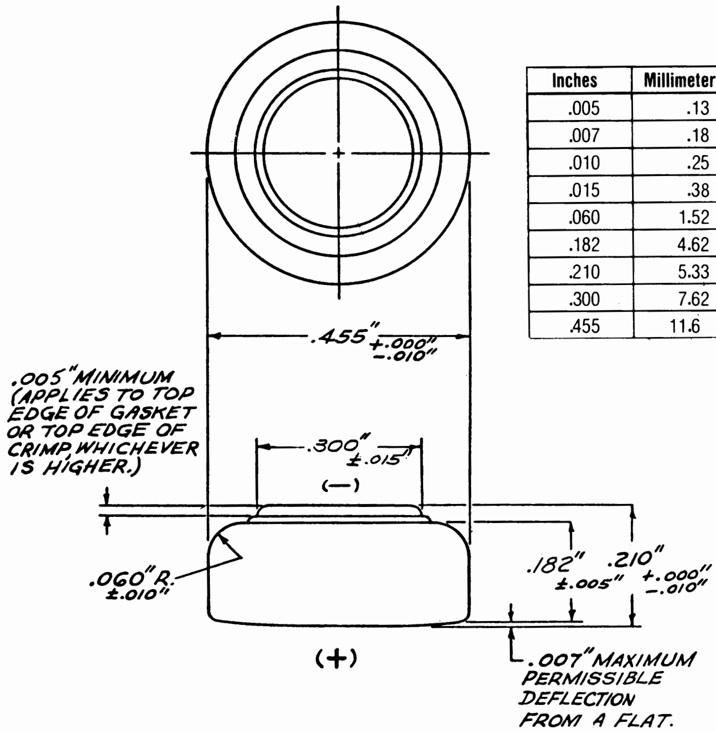
Average Drains:	1.28 and 2.05 milliamperes
Loads:	1000 and 625 ohms
Discharge Schedule:	16 hours/day

Temperature	% of 70° F Service vs. Temperature 0.9V	1.2V
70° F (21.1° C)	100	100
40° F (4.4° C)	95	70

"EVEREADY" NO. 313 CELL

1.35 VOLTS

Type: Mercuric Oxide
ANSI Designation: WM15
IEC Designation: MR44
Suggested Current Range: 0-200 microamperes



Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.060	1.52
.182	4.62
.210	5.33
.300	7.62
.455	11.6

SPECIFICATIONS

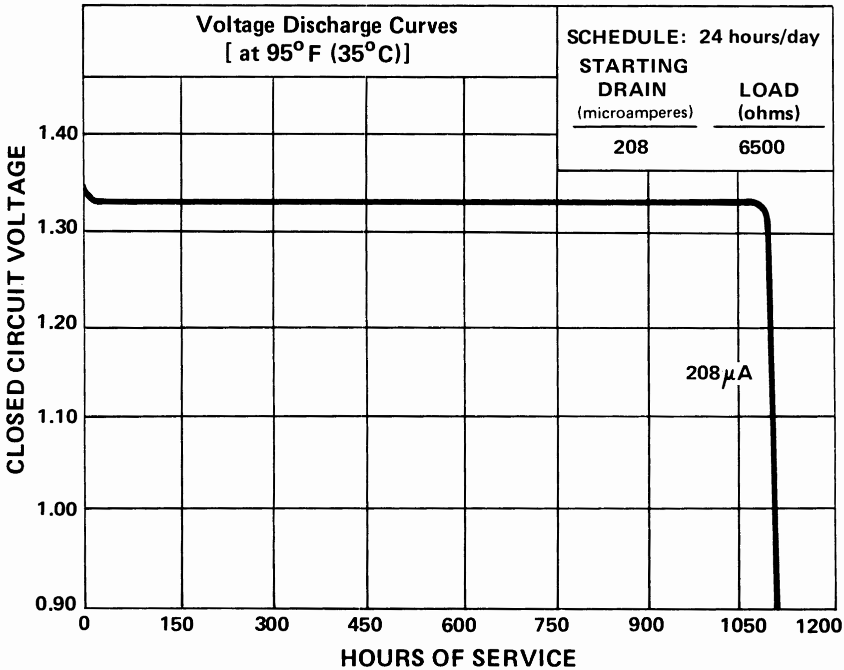
Voltage Taps .... −, + 1.35
Average Service Capacity (to 1.2 volts) .... 220 milliampere-hours
(Rated capacity at 6,500 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.09 oz. (2.55 grams)
Volume (by displacement) .... 0.029 cubic inch (0.48 cubic centimeter)
Cell Size .... One No. 5-45211

For service information see reverse side of this sheet

"EVEREADY" NO. 313

Estimated Average Service at 95°F (35°C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.2V
24 hours/day	208	6,500	1100 hours
	14.3	94,000	21 months



IMPEDANCE

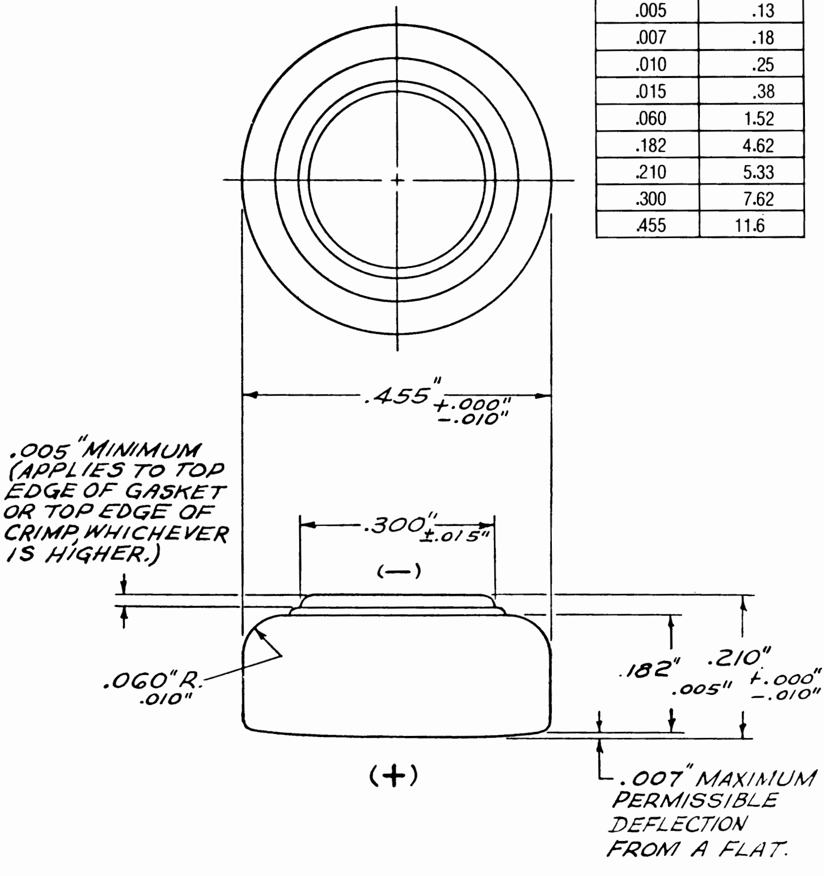
Approximate open circuit impedance at 1000 Hz: 25 ohms average

"EVEREADY" NO. EPX675 CELL

1.35 VOLTS

Type: Mercuric Oxide
ANSI Designation: M15
IEC Designation: MR-07
Suggested Current Range: 0-2 milliamperes

DESIGNED SPECIFICALLY FOR PHOTO USE



Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.060	1.52
.182	4.62
.210	5.33
.300	7.62
.455	11.6

SPECIFICATIONS

Voltage Taps .... –, + 1.35
Average Service Capacity (to 0.9 volt)........................ 220 milliampere-hours
(Rated capacity at 1 milliampere)
Terminals .... Flat Contacts
Average Weight .... 0.09 oz. (2.55 grams)
Volume (by displacement) ....0.029 cubic inch (0.48 cubic centimeter)
Cell .... One No. 4-45213 (ANSI M15)

For service information see reverse side of this sheet

"EVEREADY" NO. EPX675

Estimated Average Hours Service at 70°F (21.1°C)

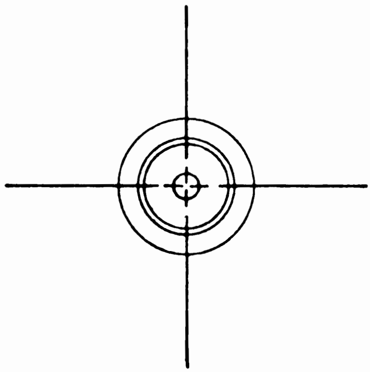
SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	CUTOFF VOLTAGE 1.2V
24 hours/day	540	2500	430	425

1.35
VOLTS

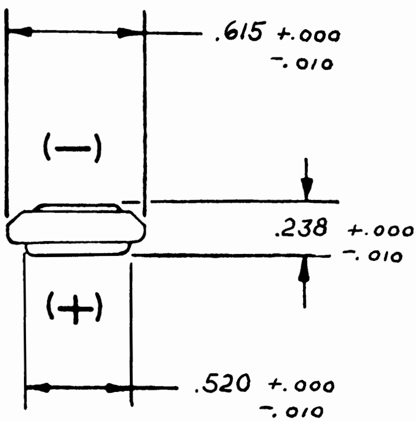
"EVEREADY" No. EPX625 CELL

Type: Mercuric Oxide
ANSI Designation: M20
IEC Designation: MR9
Suggested Current Range: 0-5 milliamperes

DESIGNED SPECIFICALLY FOR PHOTO USE



Inches	Millimeters
.010	.25
.238	6.05
.520	13.2
.615	15.6



SPECIFICATIONS

Voltage Taps .... –, + 1.35
Average Service Capacity (to 0.9 volt) .... 250 milliampere-hours
(Rated capacity at 5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.15 oz. (4.25 grams)
Volume .... 0.07 cubic inch (1.15 cubic centimeters)
Cell .... One (ANSI M20)

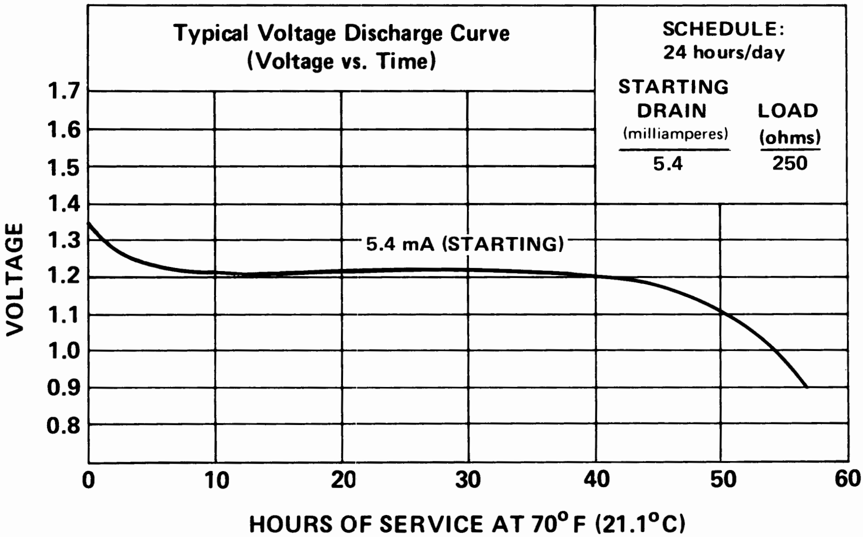
For service information see reverse side of this sheet

"EVEREADY" No. EPX625

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V
24 hours/day	1	1350	280
	5.4	250	58

THIS CELL IS DESIGNED FOR INTERMITTENT, LOW DRAIN USE IN CAMERA LIGHT METERS.

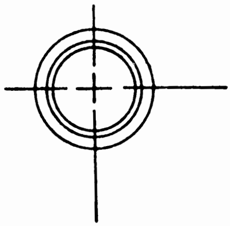


1.35
VOLTS

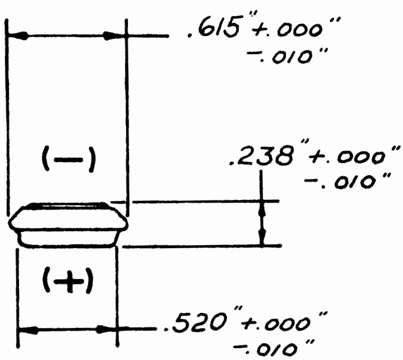
"EVEREADY" NO. EPX13 CELL

Type: Mercuric Oxide
ANSI Designation: M20
IEC Designation: MR9
Suggested Current Range: 0-5 milliamperes

DESIGNED SPECIFICALLY FOR PHOTO USE



Inches	Millimeters
.010	.25
.238	6.05
.520	13.2
.615	15.6



SPECIFICATIONS

Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 250 milliampere-hours
(Rated capacity at 5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.15 oz. (4.25 grams)
Volume .... 0.07 cubic inch (1.15 cubic centimeters)
Cell .... One (ANSI M20)

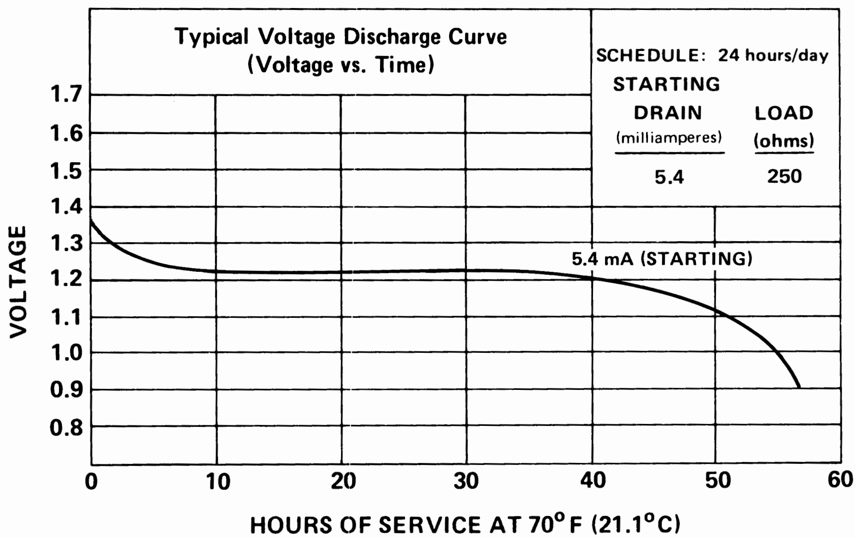
For service information see reverse side of this sheet

"EVEREADY" NO. EPX13

Estimated Average Hours Service at 70°F (21.1°C)

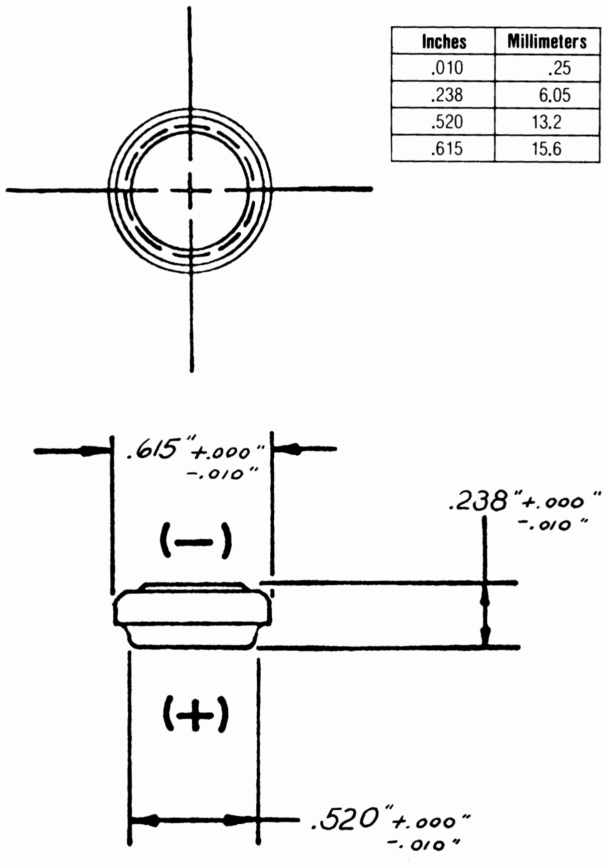
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V
24 hours/day	1	1350	280
	5.4	250	58

THIS CELL IS DESIGNED FOR INTERMITTENT, LOW DRAIN USE IN CAMERA LIGHT METERS.



"EVEREADY" NO. E625N CELL

Type: Mercuric Oxide
ANSI Designation: M20
IEC Designation: MR9
Suggested Current Range: 0-20 milliamperes



Inches	Millimeters
.010	.25
.238	6.05
.520	13.2
.615	15.6

SPECIFICATIONS

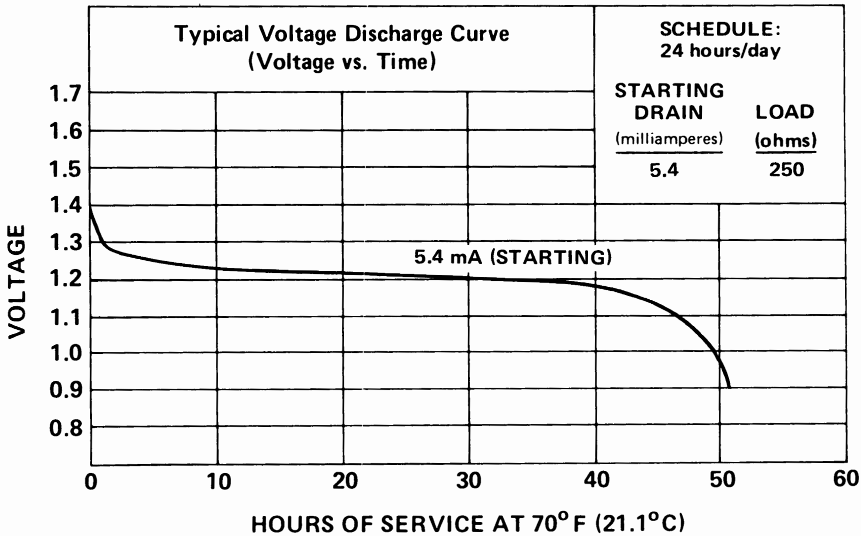
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt).......... 250 milliampere-hours
(Rated capacity at 5 milliamperes)
Terminals .... Flat Contacts
Average Weight.......... 0.15 oz. (4.25 grams)
Volume .... 0.07 cubic inch (1.15 cubic centimeters)
Cell .... One (ANSI M20)

For service information see reverse side of this sheet

"EVEREADY" NO. E625N

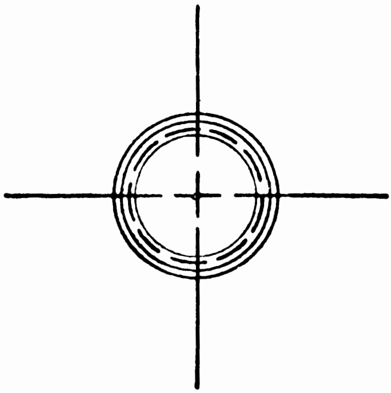
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	5.4	250	50.9	49.5	47.3
	11	125	24.1	23.6	22.2
	16	83	15	14.6	11.9

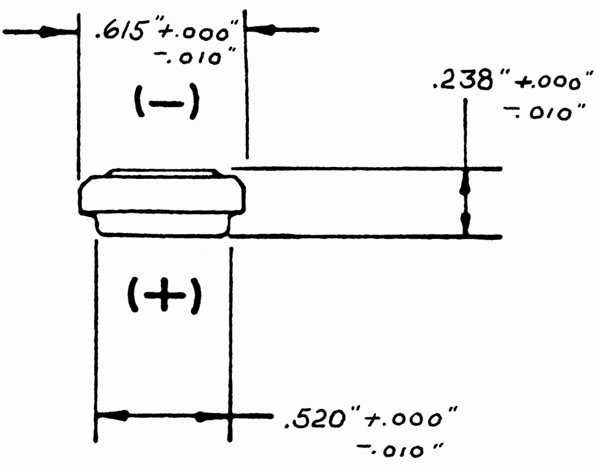


"EVEREADY" No. E625 CELL

Type: Mercuric Oxide
ANSI Designation: M20
IEC Designation: MR9
Suggested Current Range: 0-20 milliamperes



Inches	Millimeters
.010	.25
.238	6.05
.520	13.2
.615	15.6



SPECIFICATIONS

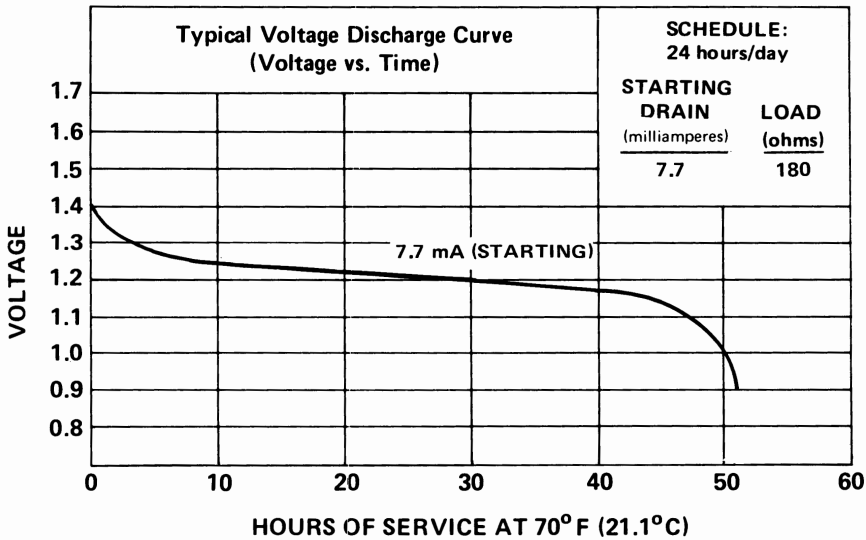
Voltage Taps .... —, + 1.4
Average Service Capacity (to 0.9 volt) .... 350 milliampere-hours
(Rated capacity at 7 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.15 oz. (4.25 grams)
Volume .... 0.07 cubic inch (1.15 cubic centimeters)
Cell .... One (ANSI M20)

For service information see reverse side of this sheet

"EVEREADY" No. E625

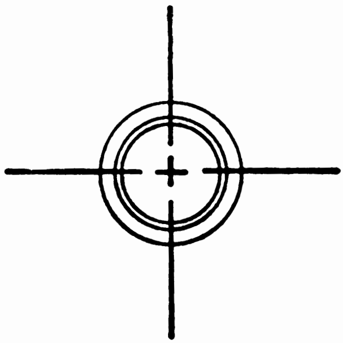
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	5.6	250	70.1	68.8	66.4
	7.7	180	51.3	50.9	47.8
	11	125	31.8	30.1	25
	17	83	18	16.5	13.1

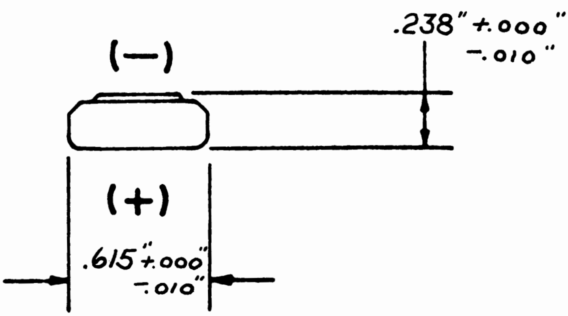


"EVEREADY" No. E630 CELL

Type: Mercuric Oxide
ANSI Designation: M20
IEC Designation: MR9
Suggested Current Range: 0-20 milliamperes



Inches	Millimeters
.010	.25
.238	6.05
.615	15.6



SPECIFICATIONS

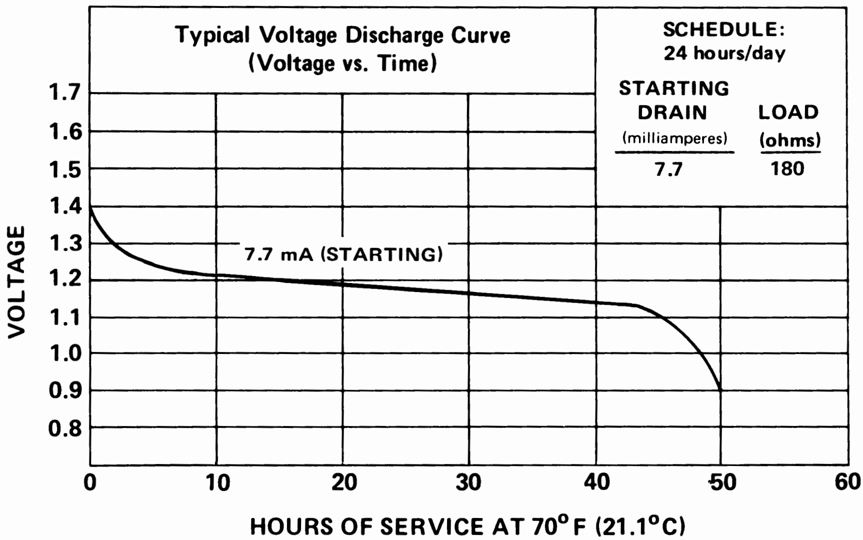
Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 350 milliampere-hours
(Rated capacity at 5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.17 oz. (4.8 grams)
Volume .... 0.07 cubic inch (1.15 cubic centimeters)
Cell .... One (ANSI "M20")

For service information see reverse side of this sheet

"EVEREADY" No. E630

Estimated Average Hours Service at 70° F (21.1°C)

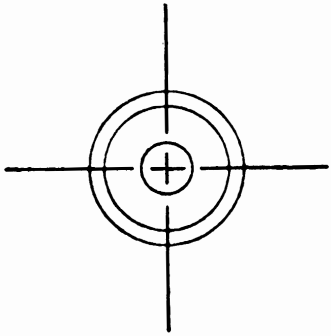
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	5.6	250	67	65.7	61.8
	7.7	180	49.8	48.7	45.9
	11	125	31.3	30	26.1
	17	83	18.7	16.9	12.8



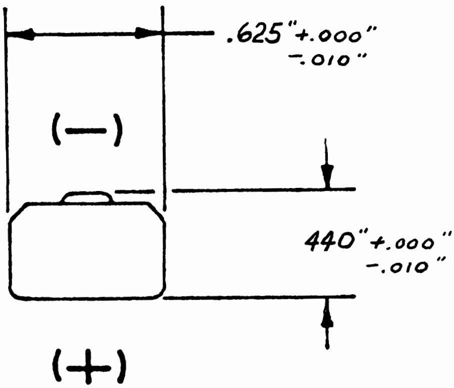
"EVEREADY" No. EPX640 CELL

Type: Mercuric Oxide
ANSI Designation: M30
Suggested Current Range: 0-5 milliamperes

DESIGNED SPECIFICALLY FOR PHOTO USE



Inches	Millimeters
.010	.25
.440	11.2
.625	15.9



SPECIFICATIONS

Voltage Taps .... —, + 1.35
Average Service Capacity (to 0.9 volt) .... 500 milliampere-hours
(Rated capacity at 5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.28 oz. (7.94 grams)
Volume .... 0.13 cubic inch (2.13 cubic centimeters)
Cell .... One (ANSI M30)

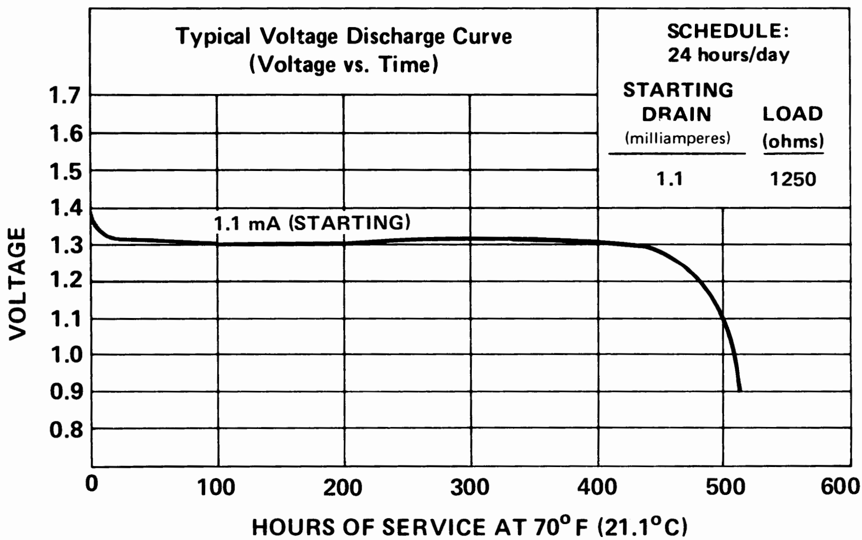
For service information see reverse side of this sheet

"EVEREADY" No. EPX640

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	1.1	1250	510	505	495

THIS CELL IS DESIGNED FOR INTERMITTENT LOW DRAIN USE.

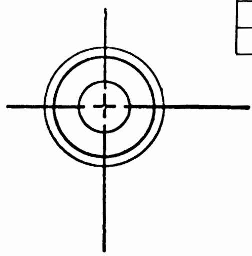


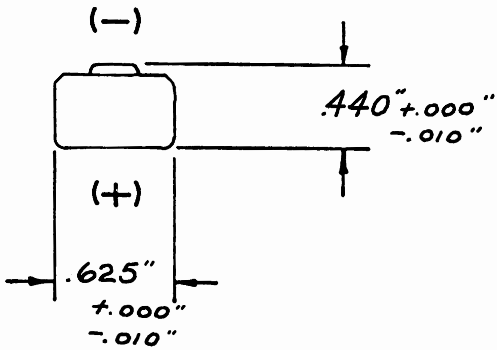
"EVEREADY" NO. E640 CELL

1.4
VOLTS

Type: Mercuric Oxide
ANSI Designation: M30
Suggested Current Range: 0-50 milliamperes

Inches	Millimeters
.010	.25
.440	11.2
.625	15.9





SPECIFICATIONS

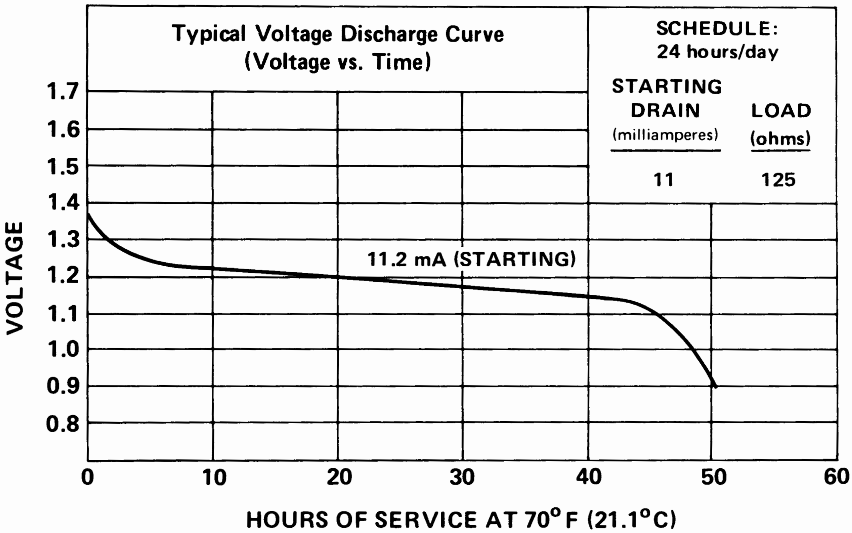
Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 500 milliampere-hours
(Rated capacity at 10 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.28 oz. (7.94 grams)
Volume .... 0.13 cubic inch (2.13 cubic centimeters)
Cell.. One (ANSI M30)

For service information see reverse side of this sheet

"EVEREADY" NO. E640

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	11.2	125	50.8	48.7	46.5
	16.9	83	33	31.9	29.9
	28	50	22	19	8.1

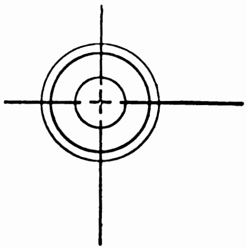


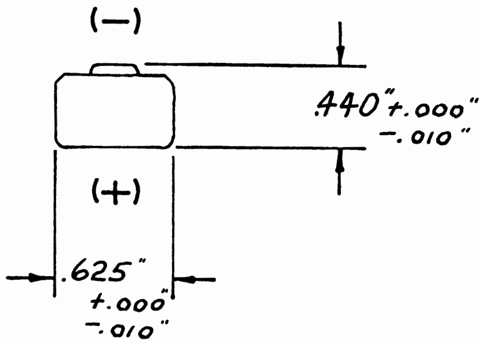
"EVEREADY" NO. E640N CELL

1.35
VOLTS

Type: Mercuric Oxide
ANSI Designation: M30
Suggested Current Range: 0-50 milliamperes

Inches	Millimeters
.010	.25
.440	11.2
.625	15.9





SPECIFICATIONS

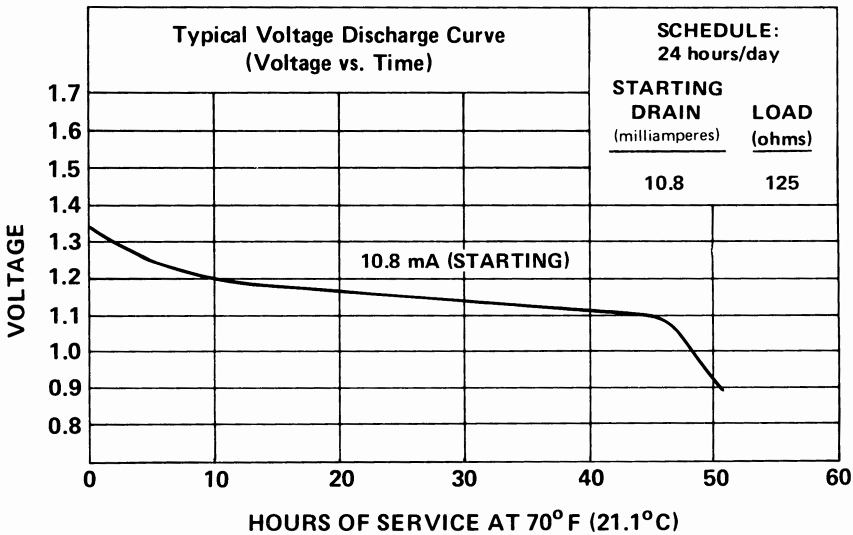
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 500 milliampere-hours
(Rated capacity at 10 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.28 oz. (7.94 grams)
Volume .... 0.13 cubic inch (2.13 cubic centimeters)
Cell.. One (ANSI "M30")

For service information see reverse side of this sheet

"EVEREADY" NO. E640N

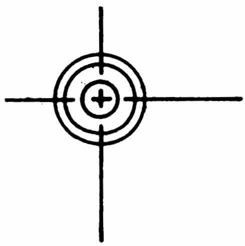
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	10.8	125	51	48.6	46
	16.3	83	33.2	32	30
	27	50	15.8	14	7.5

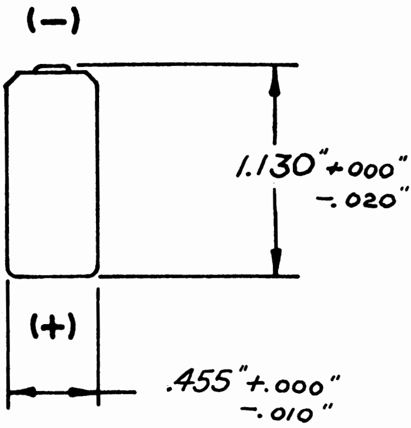


"EVEREADY" NO. E401 CELL

Type: Mercuric Oxide
ANSI Designation: M35
IEC Designation: MR1
Suggested Current Range: 0-75 milliamperes



Inches	Millimeters
.010	.25
.020	.51
.455	11.6
1.130	28.7



SPECIFICATIONS

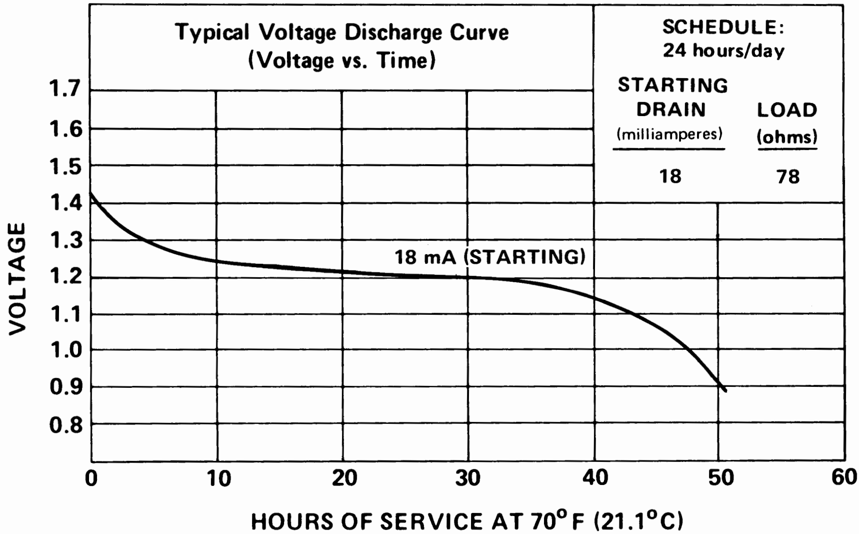
Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt)...................... 800 milliampere-hours
(Rated capacity at 16 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.42 oz. (11.9 grams)
Volume.. 0.177 cubic inch (2.9 cubic centimeters)
Cell .... One (approximate size "N") (ANSI "M35")

For service information see reverse side of this sheet

"EVEREADY" NO. E401

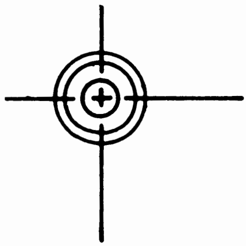
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	14	100	69.8	65.5	61.2
	18	78	50.7	47.3	43.3
	28	50	32.2	31	29.2
	56	25	11.7	11.5	8.8

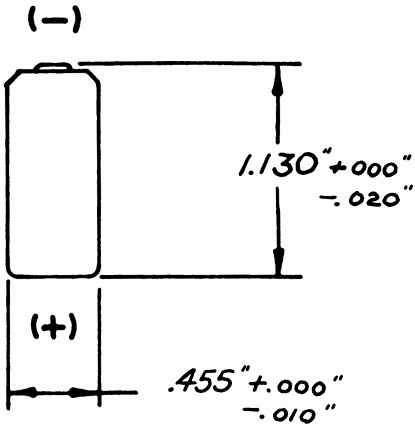


"EVEREADY" NO. E401E CELL

Type: Mercuric Oxide
ANSI Designation: M35
IEC Designation: MR1
Suggested Current Range: 0-75 milliamperes



Inches	Millimeters
.010	.25
.020	.51
.455	11.6
1.130	28.7



SPECIFICATIONS

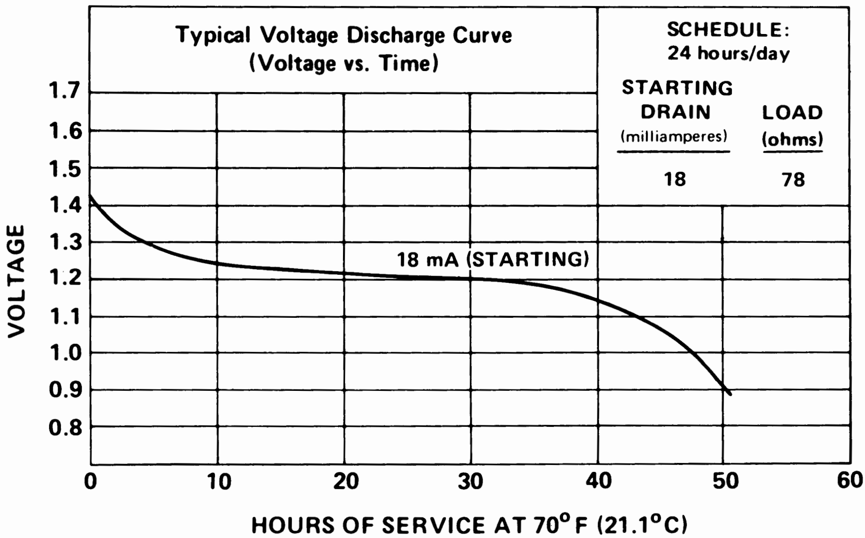
Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 800 milliampere-hours
(Rated capacity at 16 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.42 oz. (11.9 grams)
Volume .... 0.18 cubic inch (2.95 cubic centimeters)
Cell .... One (approximate size "N") (ANSI "M35")

For service information see reverse side of this sheet

"EVEREADY" NO. E401E

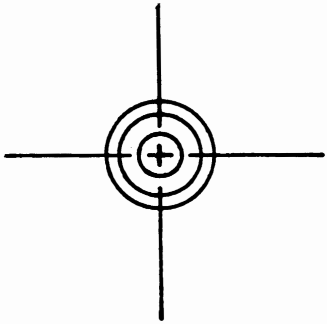
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	14	100	69.8	65.5	61.2
	18	78	50.7	47.3	43.3
	28	50	32.2	31	29.2
	56	25	11.7	11.5	8.8

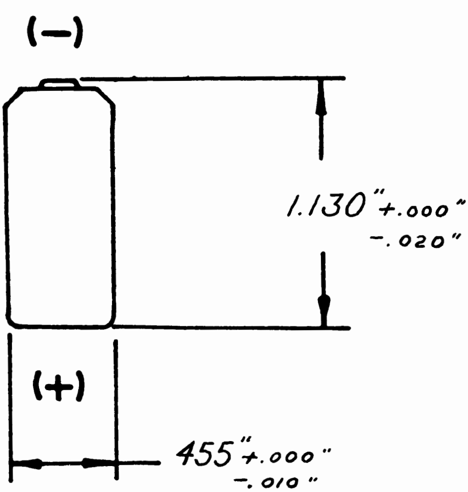


"EVEREADY" NO. E401N CELL

Type: Mercuric Oxide
ANSI Designation: M35
IEC Designation: MR1
Suggested Current Range: 0-75 milliamperes



Inches	Millimeters
.010	.25
.020	.51
.455	11.6
1.130	28.7



SPECIFICATIONS

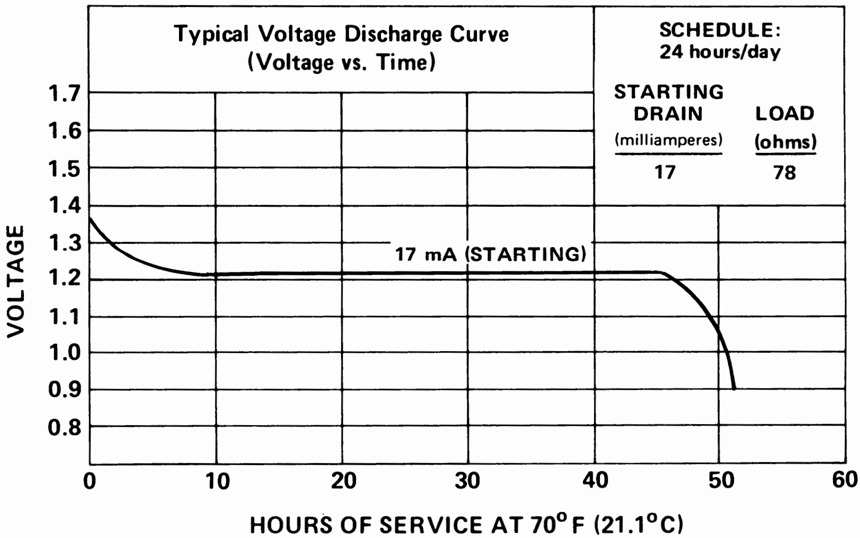
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt)...................... 800 milliampere-hours
(Rated capacity at 16 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.42 oz. (11.9 grams)
Volume.................................. 0.18 cubic inch (2.95 cubic centimeters)
Cell .... One (approximate size "N") (ANSI M35)

For service information see reverse side of this sheet

"EVEREADY" NO. E401N

Estimated Average Hours Service at 70° F (21.1°C)

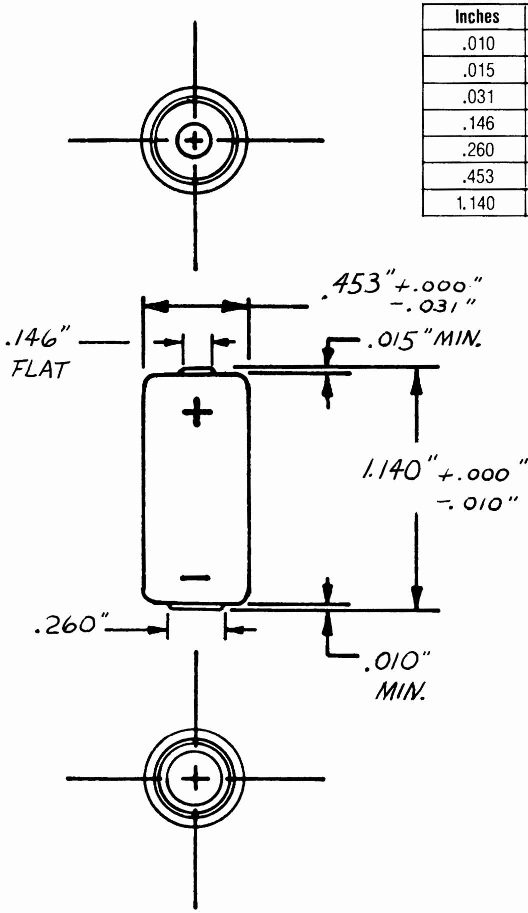
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	13.5	100	68.9	68.2	67.7
	17	78	50.8	50.3	49.4
	45	30	12.7	12.5	10.1
	54	25	7.7	6.9	2.8



"EVEREADY" NO. EP401E CELL

Type: Mercuric Oxide
Suggested Current Range: 0-75 milliamperes

Inches	Millimeters
.010	.25
.015	.38
.031	.79
.146	3.71
.260	6.6
.453	11.5
1.140	29



SPECIFICATIONS

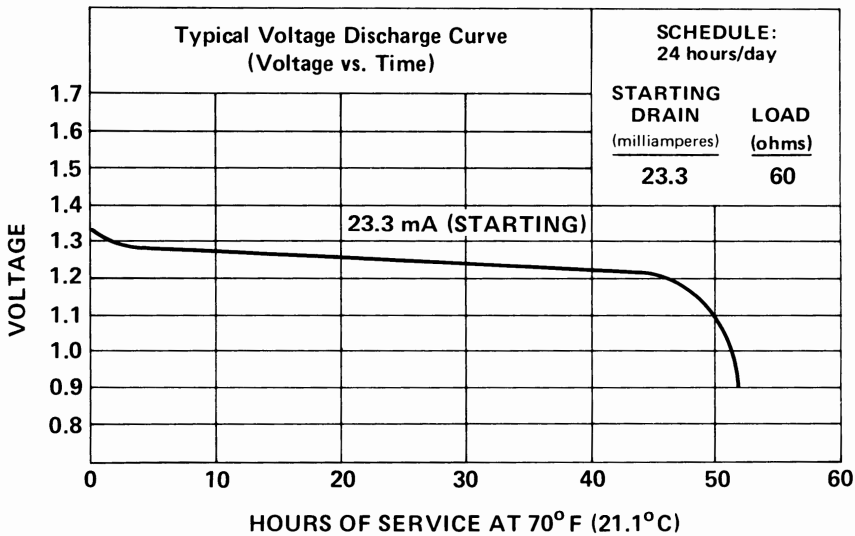
Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 1 ampere-hour
(Rated capacity at 25 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.44 oz. (12.5 grams)
Volume .... 0.19 cubic inch (3.1 cubic centimeters)
Cell .... One (approximate size "N")

For service information see reverse side of this sheet

"EVEREADY" NO. EP401E

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	5.6	250	206	205	204
	9.3	150	124	121	116
	16.9	83	71.2	70.9	70
	23.3	60	52	51.8	50
	56	25	22.5	22.2	20
	93.3	15	13.8	12.5	10

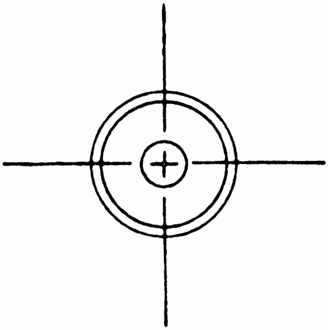


"EVEREADY" No. EPX1 CELL

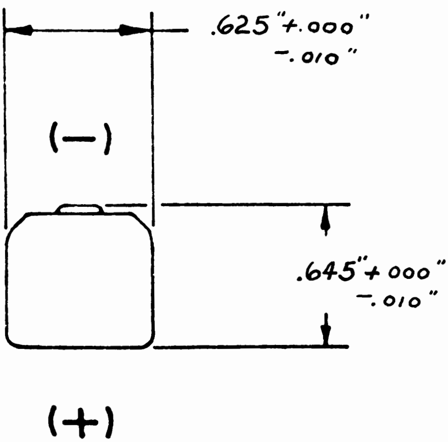
1.35
VOLTS

Type: Mercuric Oxide
ANSI Designation: M40
IEC Designation: MR7
Suggested Current Range: 0-5 milliamperes

DESIGNED SPECIFICALLY FOR PHOTO USE



Inches	Millimeters
.010	.25
.625	15.9
.645	16.4



SPECIFICATIONS

Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 1000 milliampere-hours
(Rated capacity at 1 milliampere)
Terminals .... Flat Contacts
Average Weight .... 0.43 oz. (12.2 grams)
Volume .... 0.20 cubic inch (3.28 cubic centimeters)
Cell .... One (ANSI M40)

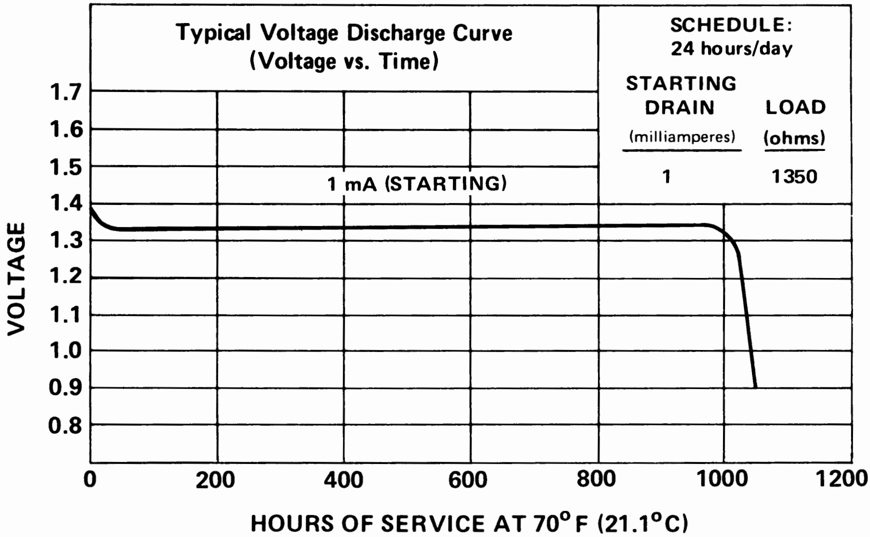
For service information see reverse side of this sheet

"EVEREADY" No. EPX1

Estimated Average Hours Service at 70° F (21.1°C)

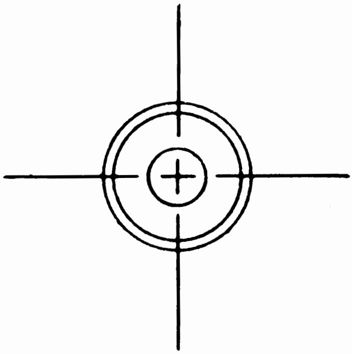
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V
24 hours/day	1	1350	1056

THIS CELL IS DESIGNED FOR INTERMITTENT, LOW DRAIN USE IN CAMERA LIGHT METERS.

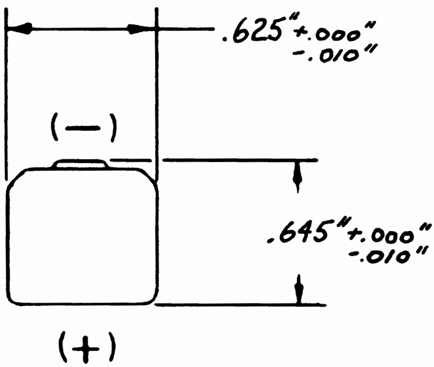


"EVEREADY" NO. E1 CELL

Type: Mercuric Oxide
ANSI Designation: M40
IEC Designation: MR7
Suggested Current Range: 0-100 milliamperes



Inches	Millimeters
.010	.25
.625	15.9
.645	16.4



SPECIFICATIONS

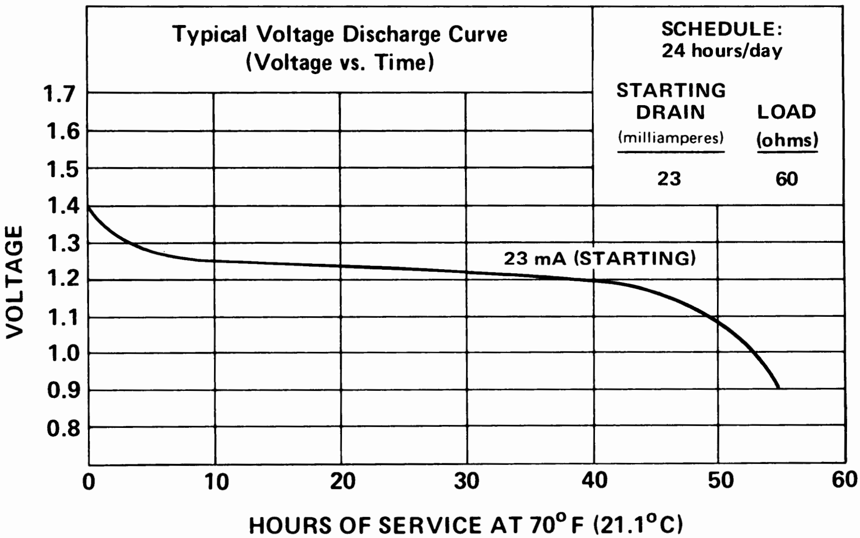
Voltage Taps .... –, + 1.4
Average Service Capacity (to 0.9 volt) ....1000 milliampere-hours
(Rated capacity at 20 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.43 oz. (12.2 grams)
Volume (by displacement) .... 0.177 cubic inch (2.9 cubic centimeters)
Cell.. One (ANSI "M40")

For service information see reverse side of this sheet

"EVEREADY" NO. E1

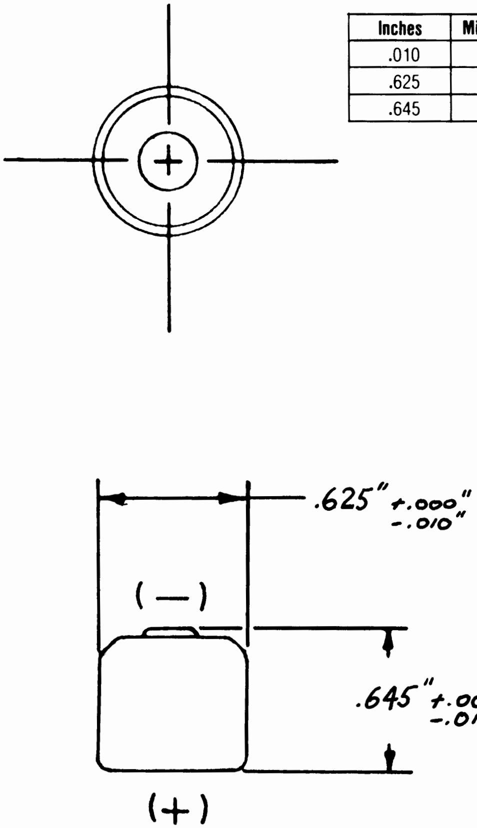
Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	23	60	55.5	53.8	49
	28	50	48.1	46.2	35.5
	33	42	39.5	37.5	28
	39	36	38	34.8	27.7



"EVEREADY" NO. E1N CELL

Type: Mercuric Oxide
ANSI Designation: M40
Suggested Current Range: 0-100 milliamperes



Inches	Millimeters
.010	.25
.625	15.9
.645	16.4

SPECIFICATIONS

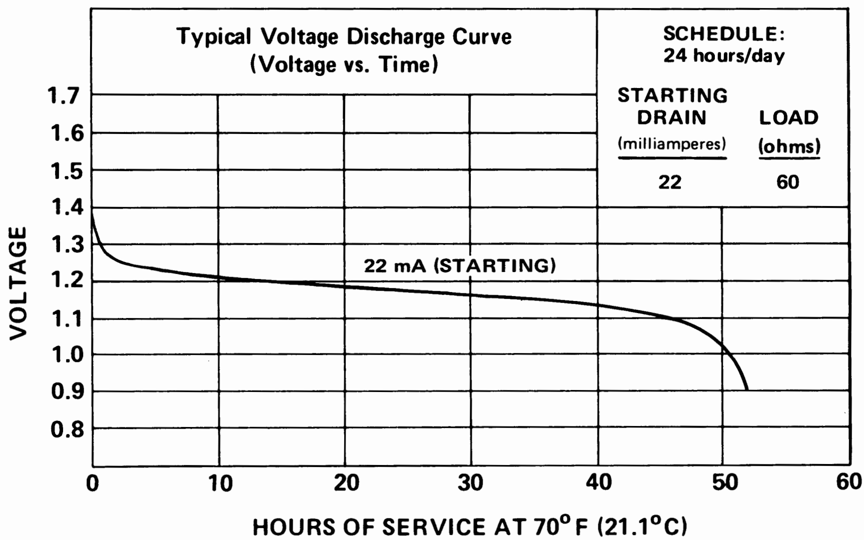
Voltage Taps .... —, + 1.35
Average Service Capacity (to 0.9 volt) .... 1000 milliampere-hours
(Rated capacity at 20 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.43 oz. (12.2 grams)
Volume (by displacement) .... 0.177 cubic inch (2.9 cubic centimeters)
Cell .... One (ANSI "M40")

For service information see reverse side of this sheet

"EVEREADY" NO. E1N

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	22	60	52.6	51.8	42
	27	50	44.1	43.8	34
	32	42	35.1	34.6	29
	37	36	31.7	30	18

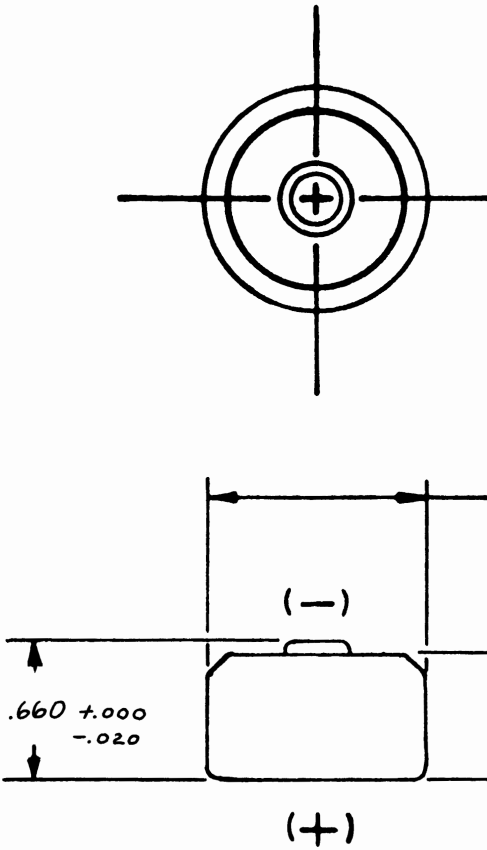


1.35
VOLTS

"EVEREADY" NO. E3 CELL

Type: Mercuric Oxide
ANSI Designation: M60
IEC Designation: MR17
Suggested Current Range: 0-60 milliamperes

Inches	Millimeters
.010	.25
.020	.51
.591	15.
.660	16.8
.985	25.



SPECIFICATIONS

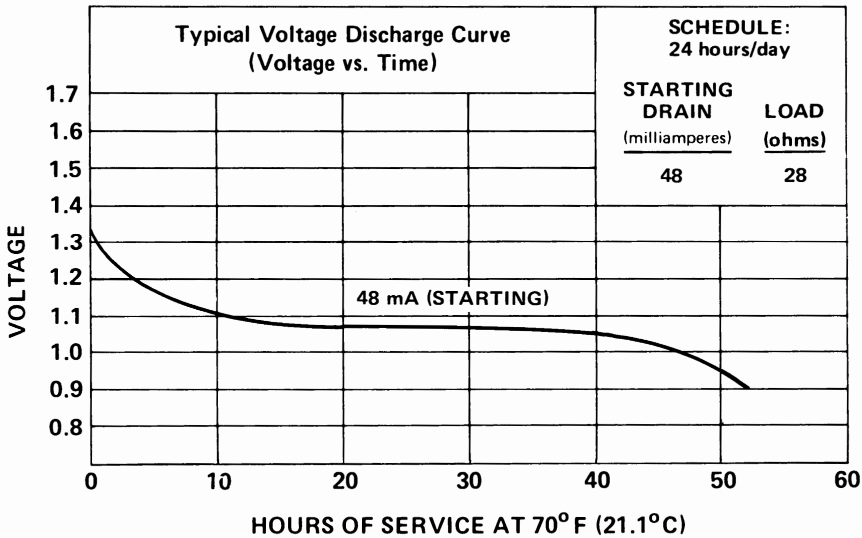
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 2200 milliampere-hours
(Rated capacity at 42 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 1 oz. (28.4 grams)
Volume .... 0.5 cubic inch (8.2 cubic centimeters)
Cell .... One (ANSI M60)

For service information see reverse side of this sheet

"EVEREADY" NO. E3

Estimated Average Hours Service at 70°F (21.1°C)

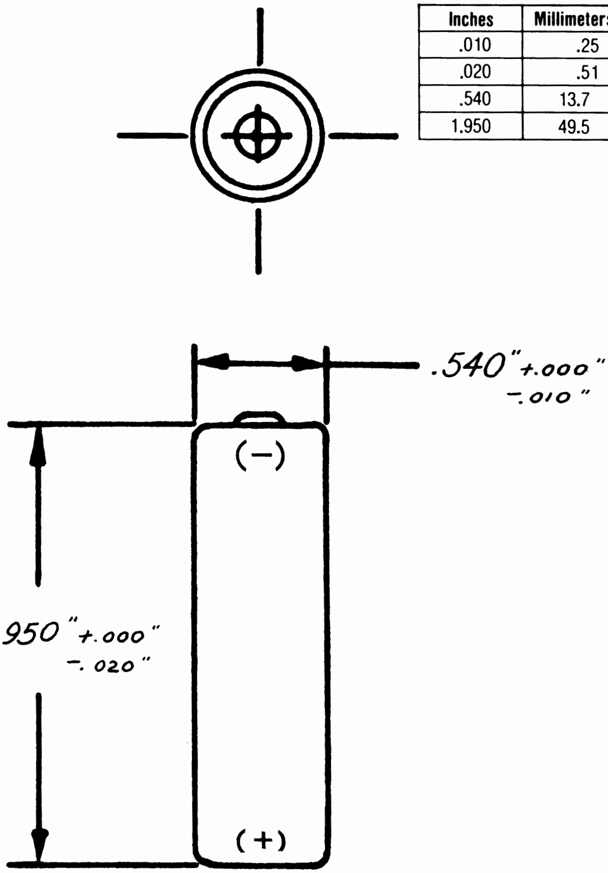
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	22.5	60	125	124	114
	27	50	107	105	92
	34	40	84.4	78.3	52
	45	30	53.6	47.4	18.1
	48	28	52.2	47.4	17.5



"EVEREADY" NO. E502 CELL

Type: Mercuric Oxide
ANSI Designation: M55
IEC Designation: MR6
Suggested Current Range: 0-200 milliamperes

Inches	Millimeters
.010	.25
.020	.51
.540	13.7
1.950	49.5



SPECIFICATIONS

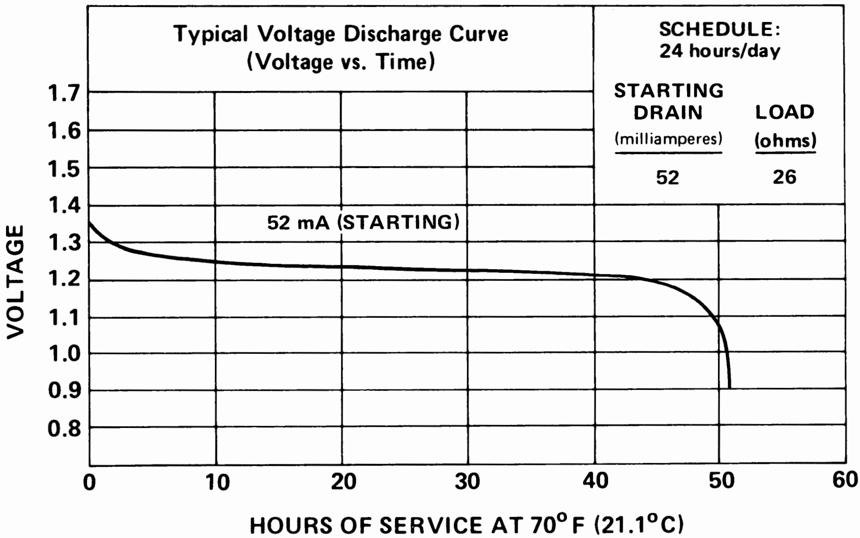
Voltage Taps .... –, + 1.35
Average Service Capacity (to 0.9 volt) .... 2400 milliampere-hours
(Rated capacity at 48 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 1.02 oz. (29 grams)
Volume (by displacement) .... 0.44 cubic inch (7.2 cubic centimeters)
Cell.. One (size "AA") (ANSI "M55")

For service information see reverse side of this sheet

"EVEREADY" NO. E502

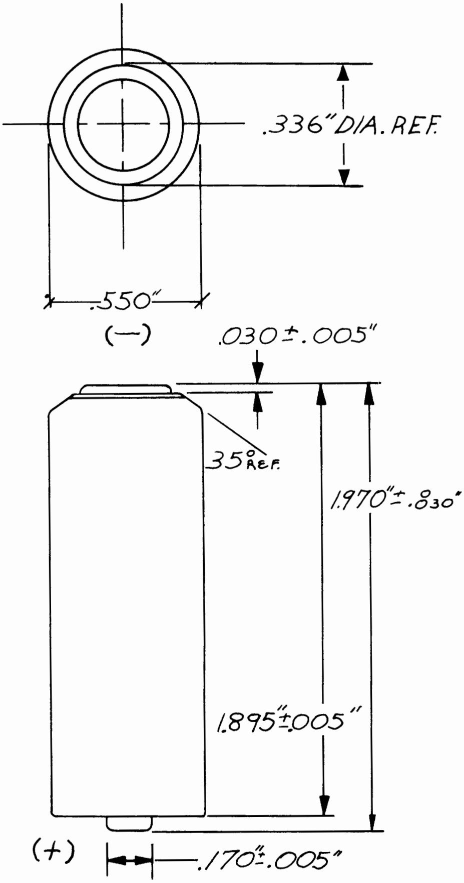
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	16	83	171	167	155
	27	50	105	104	95.2
	52	26	50.8	50.2	49.8



"EVEREADY" NO. E502E BATTERY

Type: Mercuric Oxide
ANSI Desigantion: M55
IEC Designation: MR6
Suggested Current Range: 0-200 milliamperes



Inches	Millimeters
.005	.13
.030	.76
.170	4.32
.336	8.53
.550	14.
1.895	48.1
1.970	50.

DIMENSIONS ARE FOR LABELED CELL

SPECIFICATIONS

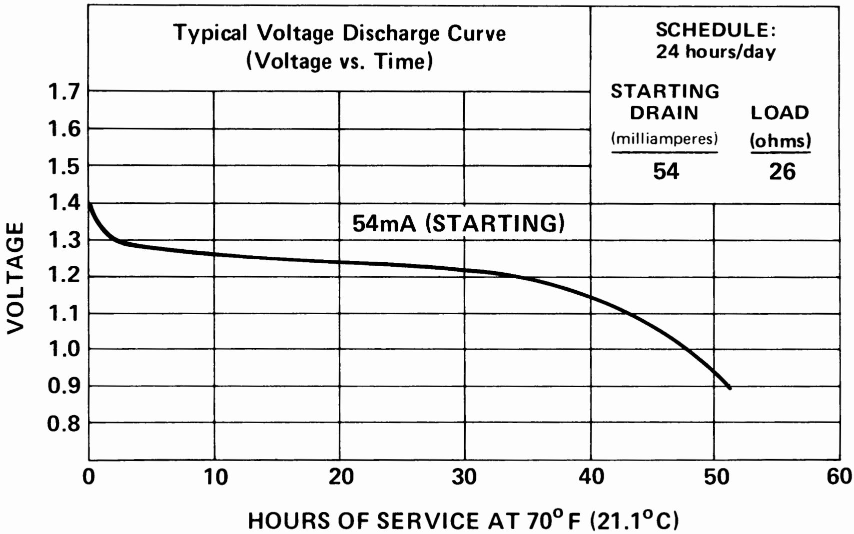
Voltage Taps .... –, + 1.4
Average Service Capacity (to 0.9 volt) .... 2400 milliampere-hours
(Rated capacity at 48 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 1.05 oz. (29.8 grams)
Volume (by displacement) .... 0.45 cubic inch (7.4 cubic centimeters)
Cell .... One (Size "AA") (ANSI "M55")

For service information see reverse side of this sheet

"EVEREADY" NO. E502E

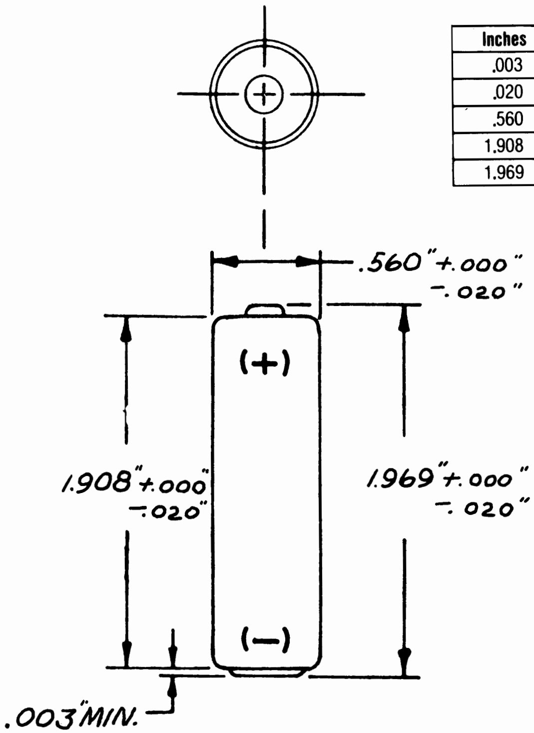
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/ day	17	83	174	165	154
	28	50	105	100	93.6
	54	26	51.2	47.9	42.7



"EVEREADY" NO. E9 CELL

Type: Mercuric Oxide
ANSI Designation: M55
IEC Designation: MR6
Suggested Current Range: 0-200 milliamperes



Inches	Millimeters
.003	.08
.020	.51
.560	14.2
1.908	48.5
1.969	50.0

SPECIFICATIONS

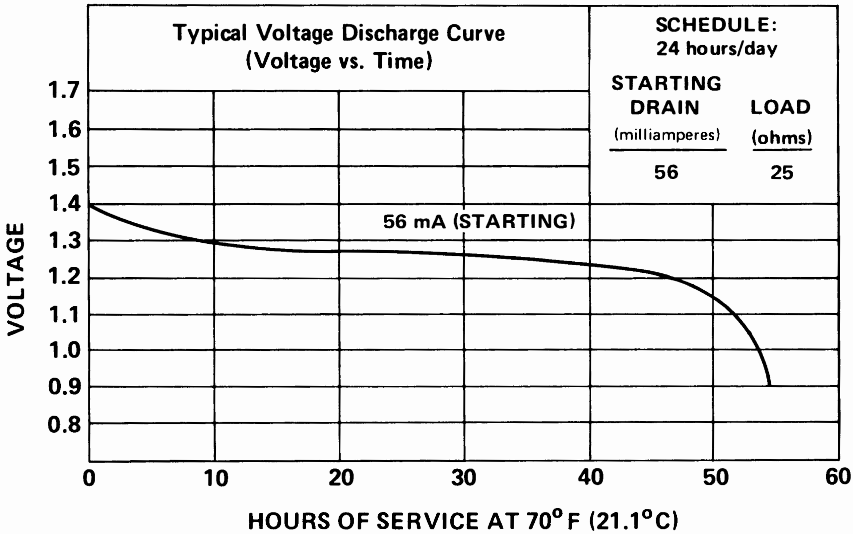
Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 2500 milliampere-hours
(Rated capacity at 50 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 1.05 oz. (29.8 grams)
Volume .... 0.45 cubic inch (7.37 cubic centimeters)
Cell .... One "AA" (ANSI "M55")

For service information see reverse side of this sheet

"EVEREADY" NO. E9

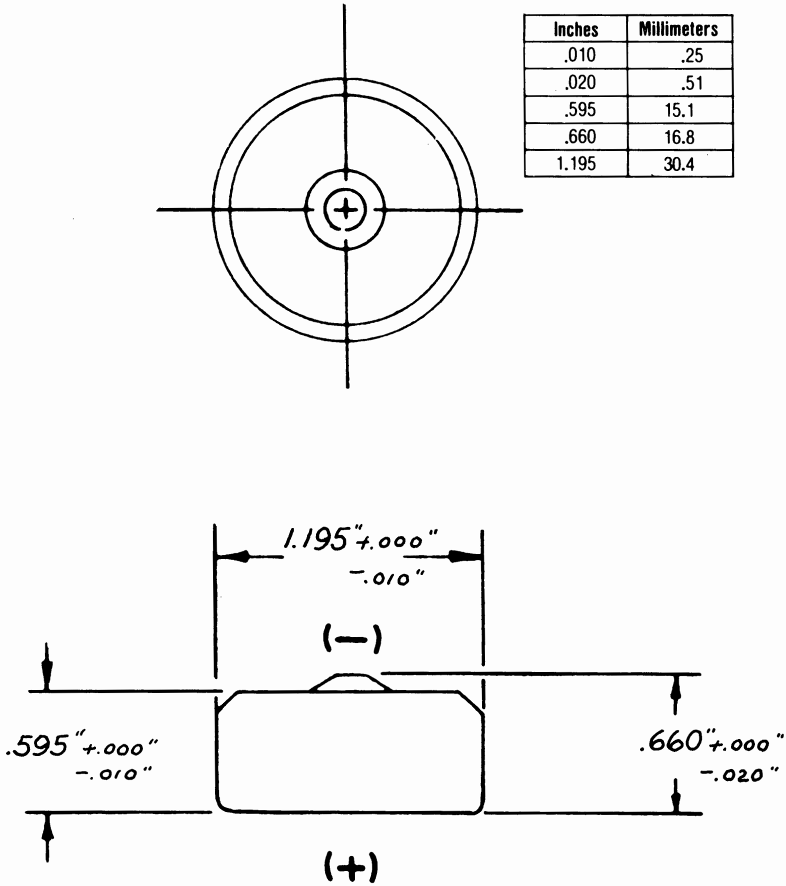
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	16.9	83	180	179	175
	28	50	102	100	98
	56	25	55	54	52



"EVEREADY" NO. E4 CELL

Type: Mercuric Oxide
Suggested Current Range: 0-80 milliamperes



Inches	Millimeters
.010	.25
.020	.51
.595	15.1
.660	16.8
1.195	30.4

SPECIFICATIONS

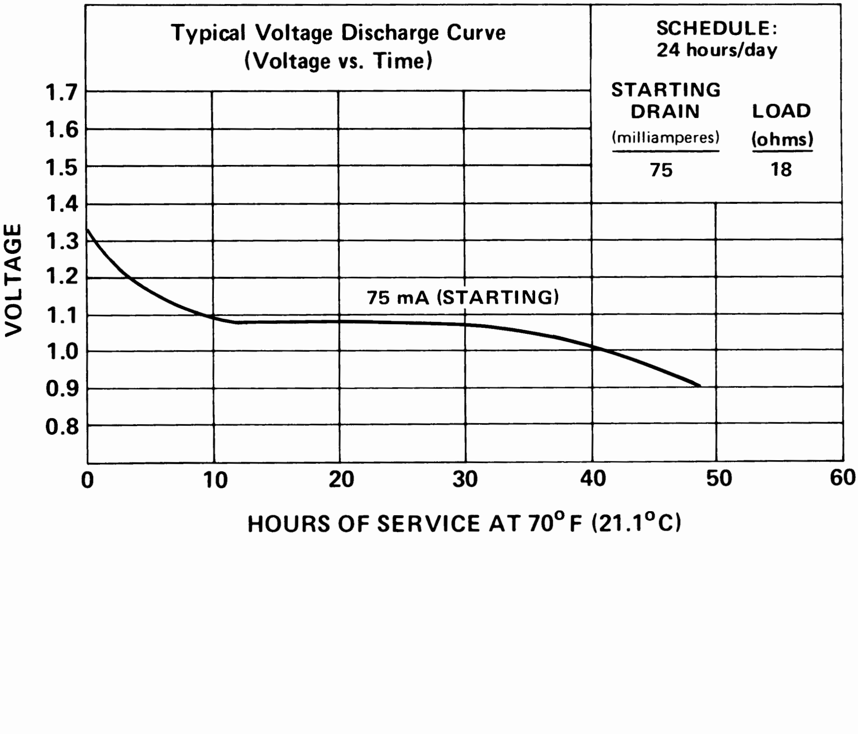
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 3400 milliampere-hours
(Rated capacity at 68 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 1.5 oz. (42.5 grams)
Volume .... 0.73 cubic inch (12 cubic centimeters)

For service information see reverse side of this sheet

"EVEREADY" NO. E4

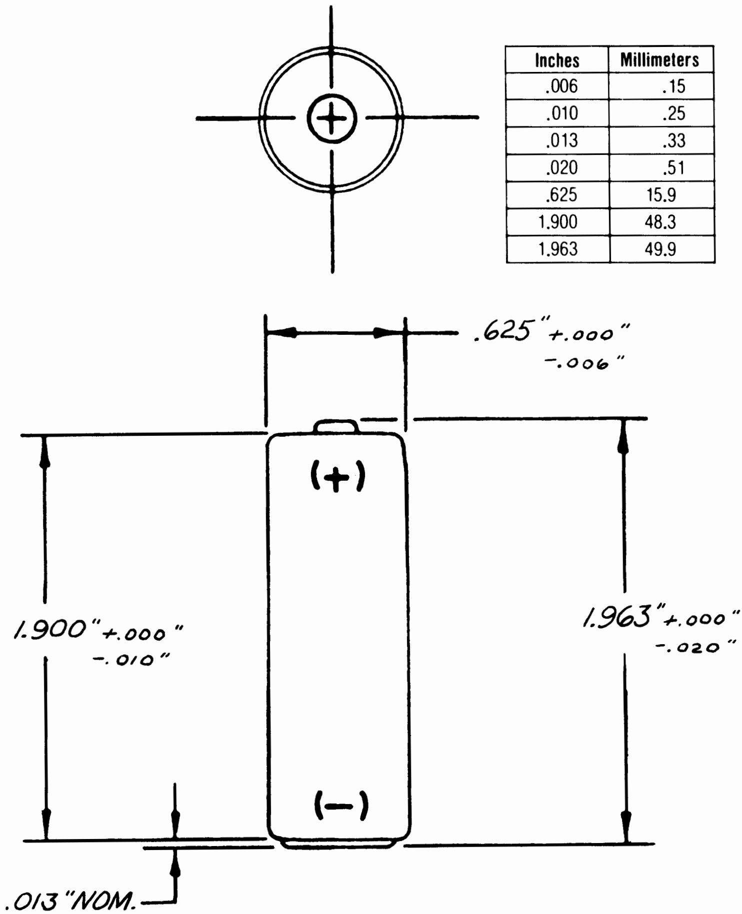
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	34	40	124	123	103
	45	30	94	87	77
	75	18	48	40	7.9
	90	15	38	26	5.3



"EVEREADY" NO. E12 CELL

Type: Mercuric Oxide
ANSI Designation: M70
Suggested Current Range: 0-250 milliamperes



Inches	Millimeters
.006	.15
.010	.25
.013	.33
.020	.51
.625	15.9
1.900	48.3
1.963	49.9

SPECIFICATIONS

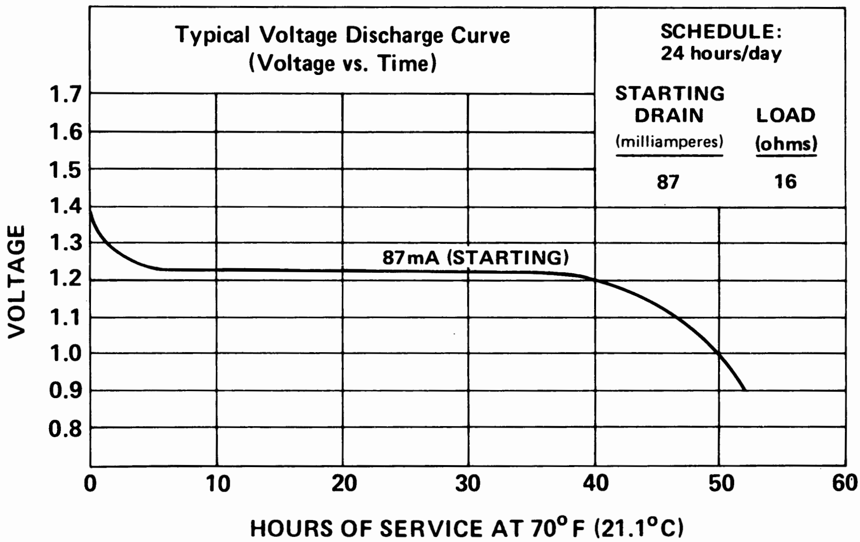
Voltage Taps .... −, + 1.4
Average Service Capacity (to 0.9 volt) .... 3800 milliampere-hours
(Rated Capacity at 83 milliamperes)
Terminals .... Flat Contacts
Average Weight.. 1.4 oz. (40 grams)
Volume (by displacement) .... 0.57 cubic inch (9.34 cubic centimeters)
Cell .... One (ANSI "M70")

For service information see reverse side of this sheet

"EVEREADY" NO. E12

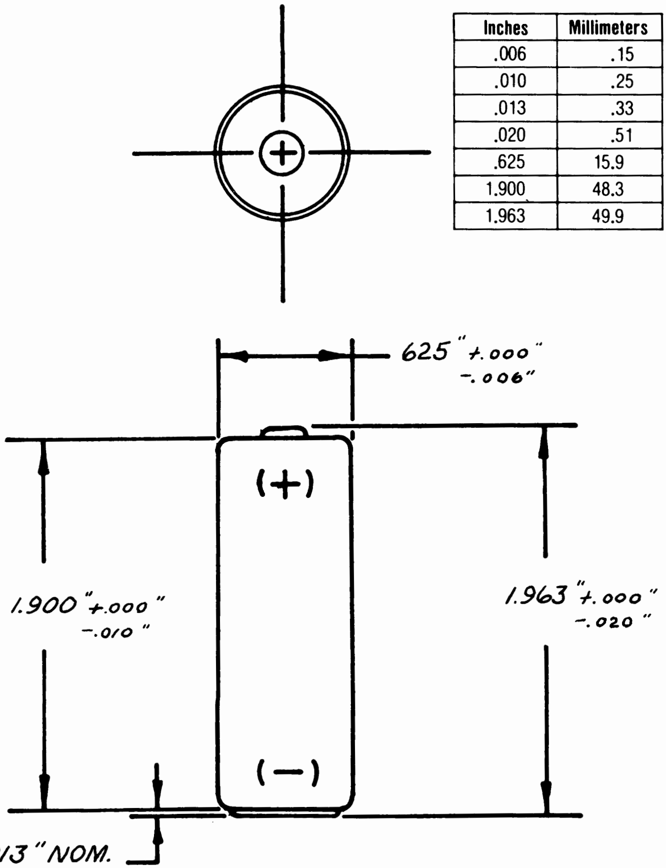
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	44	32	100	95	91
	56	25	81	78	75
	70	20	62	59	55
	87	16	53	49	47
	140	10	33	31	28



"EVEREADY" NO. E12N CELL

Type: Mercuric Oxide
ANSI Designation: M70
Suggested Current Range: 0-250 milliamperes



Inches	Millimeters
.006	.15
.010	.25
.013	.33
.020	.51
.625	15.9
1.900	48.3
1.963	49.9

SPECIFICATIONS

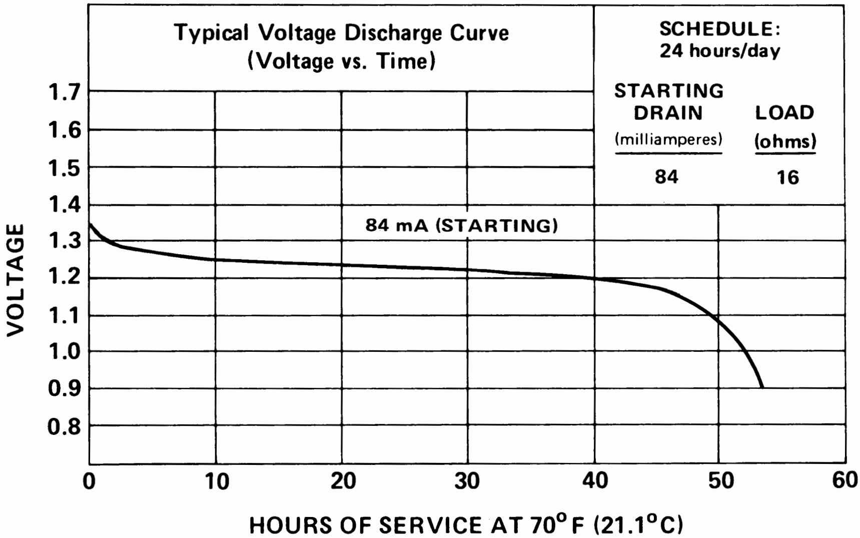
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 3800 milliampere-hours
(Rated capacity at 83 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 1.4 oz. (40 grams)
Volume (by displacement) .... 0.57 cubic inch (9.34 cubic centimeters)
Cell .... One (ANSI "M70")

For service information see reverse side of this sheet

"EVEREADY" NO. E12N

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	42	32	100	99.5	99
	54	25	78.7	78.5	77.5
	67	20	63.5	63	61
	84	16	53.3	52.5	49.5
	135	10	33.5	31.5	27

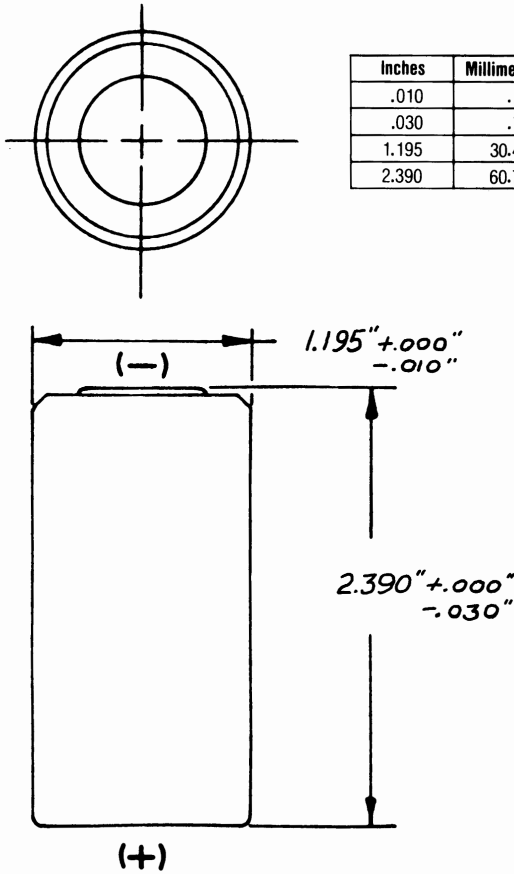


"EVEREADY" NO. E42 CELL

Type: Mercuric Oxide

ANSI Designation: M100

Suggested Current Range: 0-1000 milliamperes



Inches	Millimeters
.010	.25
.030	.76
1.195	30.4
2.390	60.7

SPECIFICATIONS

Voltage Taps .... –, + 1.4

Average Service Capacity (to 0.9 volt) .... 14,000 milliampere-hours
(Rated capacity at 280 milliamperes)

Terminals........ Flat Contacts

Average Weight .... 5.9 oz. (167 grams)

Volume .... 2.9 cubic inches (47.5 cubic centimeters)

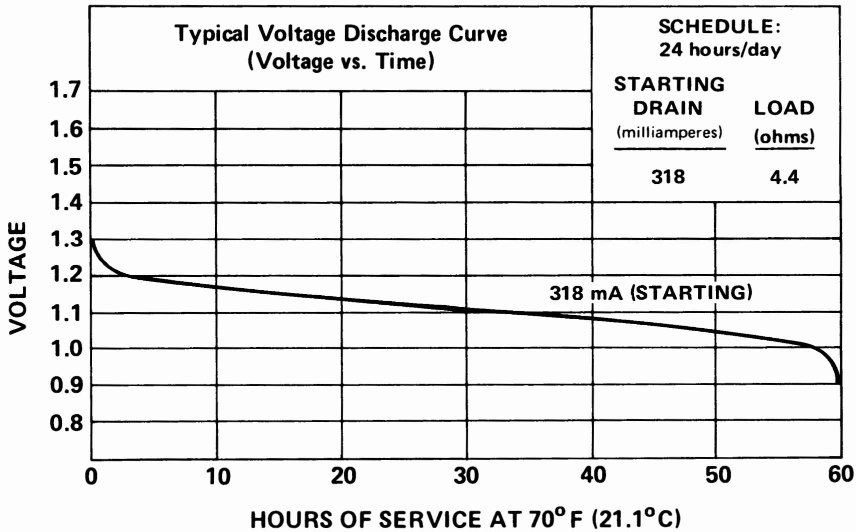
Cell .... One "D" (ANSI "M100")

For service information see reverse side of this sheet

"EVEREADY" NO. E42 CELL

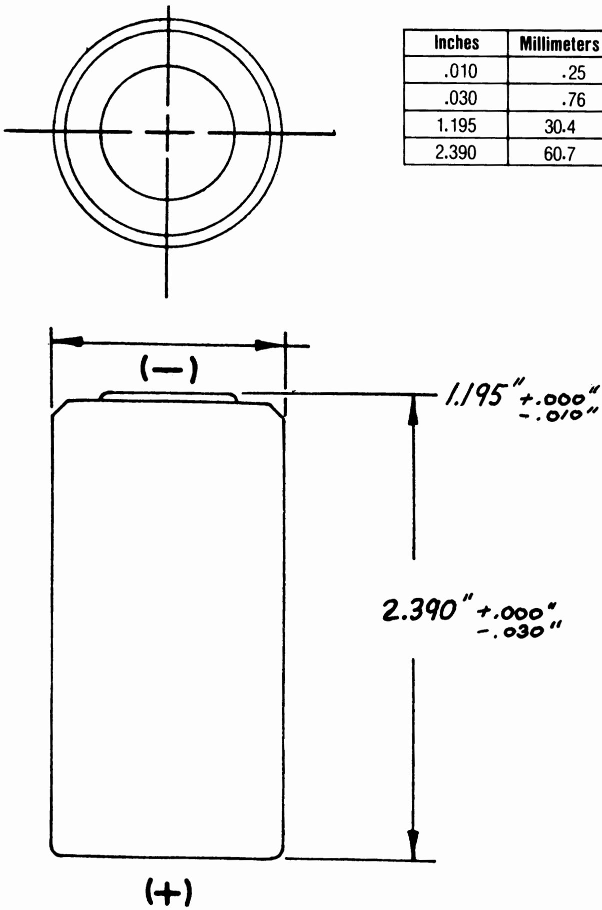
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	318	4.4	60	57.5	29
	560	2.5	28.9	20.8	4.8
	700	2	22.5	9	1.6
	1120	1.25	7.5	2.7	1



"EVEREADY" NO. E42N CELL

Type: Mercuric Oxide
ANSI Designation: M100
Suggested Current Range: 0-1000 milliamperes



Inches	Millimeters
.010	.25
.030	.76
1.195	30.4
2.390	60.7

SPECIFICATIONS

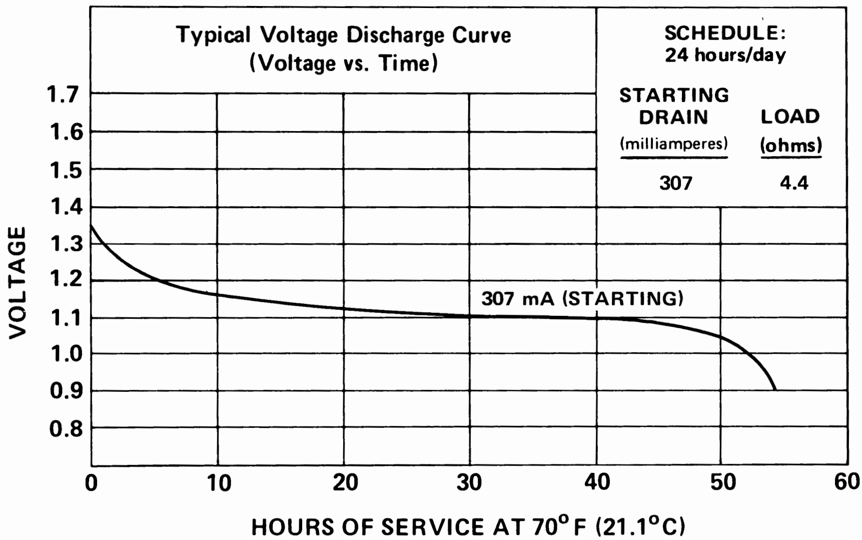
Voltage Taps .... −, + 1.35
Average Service Capacity (to 0.9 volt) .... 14,000 milliampere-hours
(Rated capacity at 280 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 5.9 oz. (167 grams)
Volume .... 2.9 cubic inches (47.5 cubic centimeters)
Cell .... One "D" (ANSI "M100")

For service information see reverse side of this sheet

"EVEREADY" NO. E42N

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	307	4.4	54.7	52.6	32
	540	2.5	29.4	25.5	4.7
	675	2	20.6	15.2	4.8
	1080	1.25	8.6	3.2	1

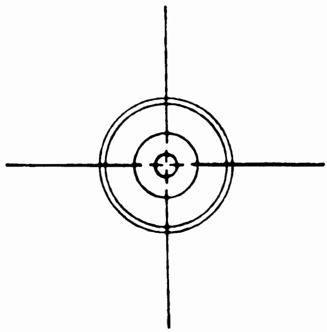


2.7
VOLTS

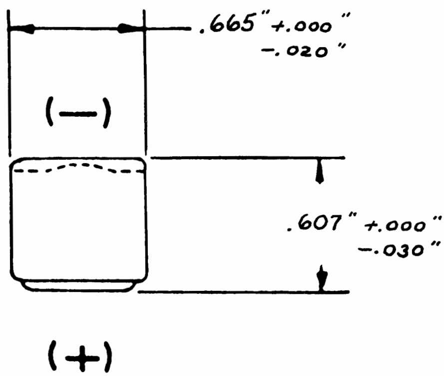
"EVEREADY" No. EPX14 BATTERY

Type: Mercuric Oxide
Suggested Current Range: 0-5 milliamperes

DESIGNED SPECIFICALLY FOR PHOTO USE



Inches	Millimeters
.020	.51
.030	.76
.607	15.4
.665	16.9



SPECIFICATIONS

Voltage Taps .... –, + 2.7
Average Service Capacity (to 1.8 volts)...................... 250 milliampere-hours
(Rated Capacity at 5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.3 oz. (8.5 grams)
Volume .... 0.2 cubic inch (3.28 cubic centimeters)
Cells .... Two ANSI "M20" in series

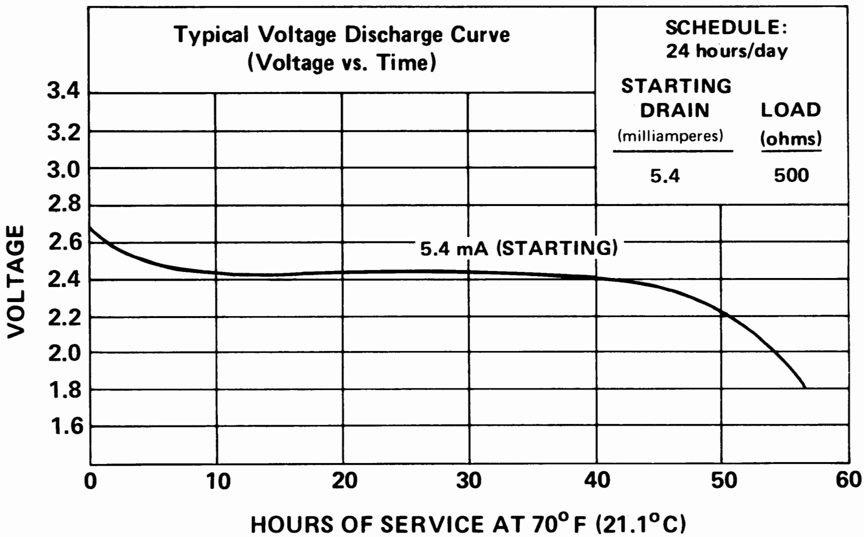
For service information see reverse side of this sheet

"EVEREADY" No. EPX14

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.8V
24 hours/day	0.98	2750	280
	5.4	500	58

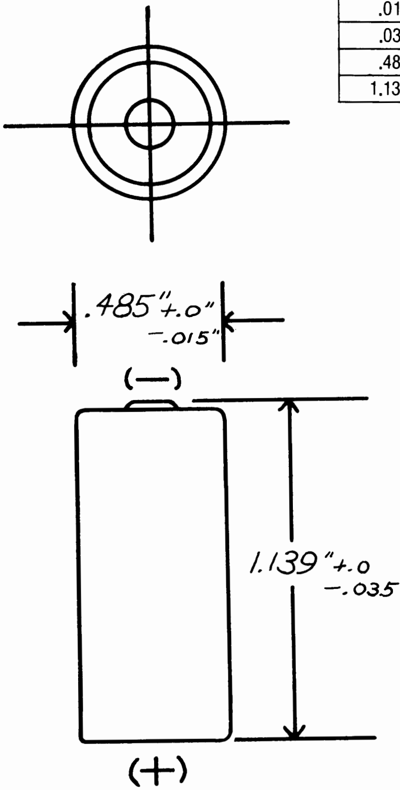
THIS BATTERY IS DESIGNED FOR INTERMITTENT, LOW DRAIN USE IN CAMERA LIGHT METERS.



"EVEREADY" NO. E152 BATTERY

2.8
VOLTS

Type: Mercuric Oxide
Suggested Current Range: 0-30 milliamperes



Inches	Millimeters
.015	.38
.035	.89
.485	12.3
1.139	28.9

SPECIFICATIONS

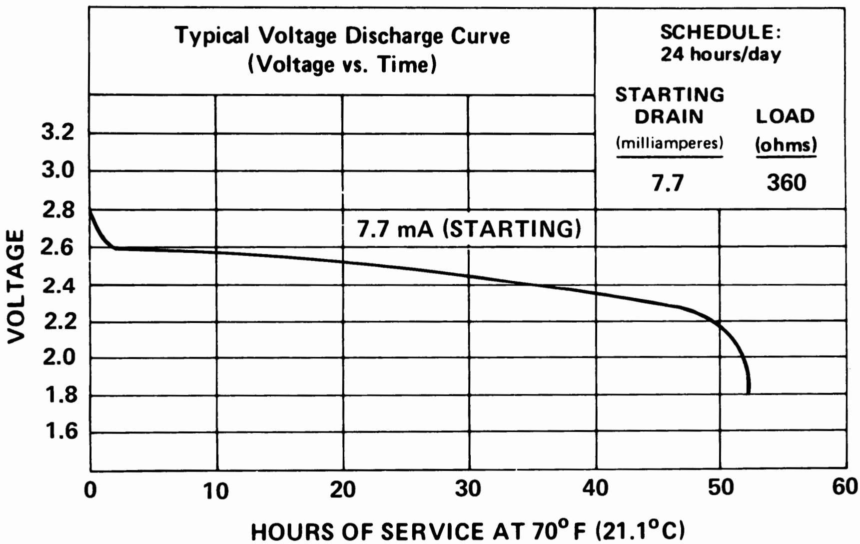
Voltage Taps .... −, + 2.8
Average Service Capacity (to 1.8 volts) .... 350 milliampere-hours
(Rated capacity at 7 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.4 oz. (11.3 grams)
Volume.. 0.19 cubic inch (3.1 cubic centimeters)
Cells .... Two (ANSI "M25") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E152

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.8V	2V	2.2V
24 hours/day	5.6	500	75.8	75.6	74.7
	7.7	360	52.7	52.1	49.9
	11.2	250	32	31.7	29.5
	22.4	125	12.8	12.2	10.5

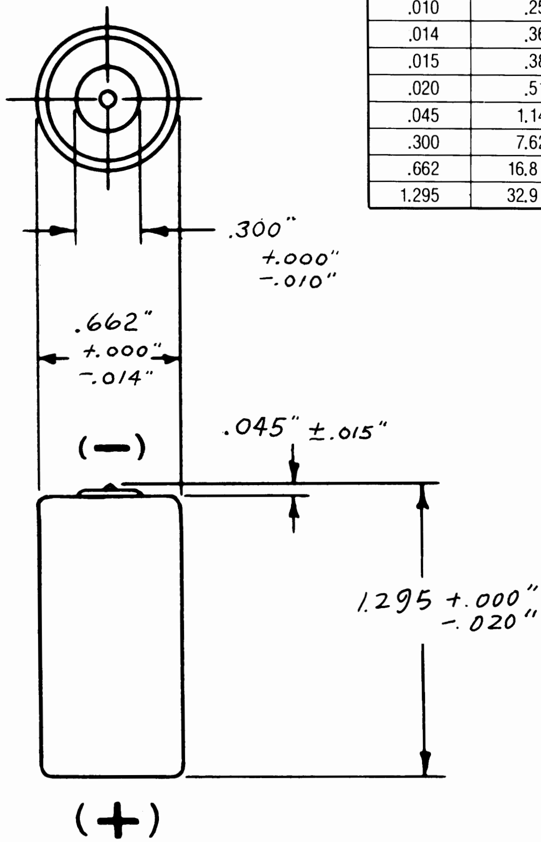


"EVEREADY" NO. E132 BATTERY

2.8
VOLTS

Type: Mercuric Oxide
Suggested Current Range: 0-100 milliamperes

Inches	Millimeters
.010	.25
.014	.36
.015	.38
.020	.51
.045	1.14
.300	7.62
.662	16.8
1.295	32.9



SPECIFICATIONS

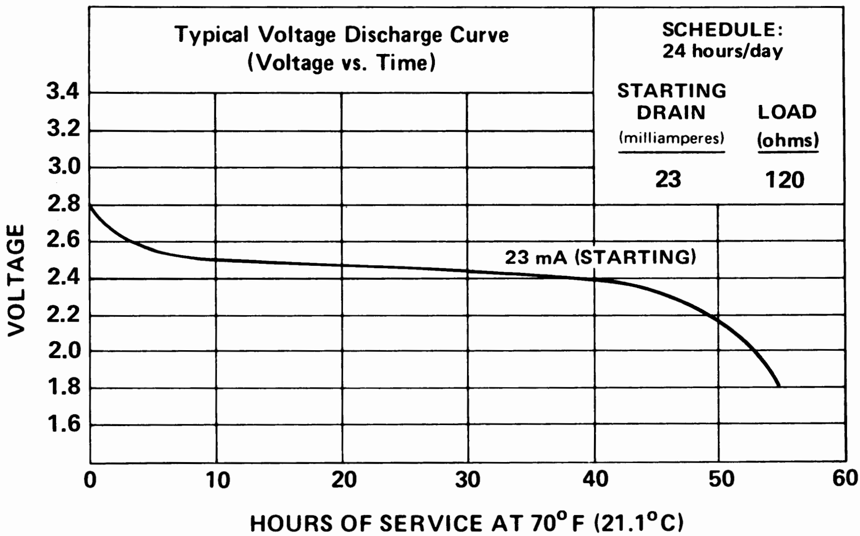
Voltage Taps .... −, + 2.8
Average Service Capacity (to 1.8 volts).................... 1000 milliampere-hours
(Rated capacity at 20 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.94 oz. (26.7 grams)
Volume (by displacement)............. 0.397 cubic inch (6.5 cubic centimeters)
Cells ....Two (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E132

Estimated Average Hours Service at 70° F (21.1°C)

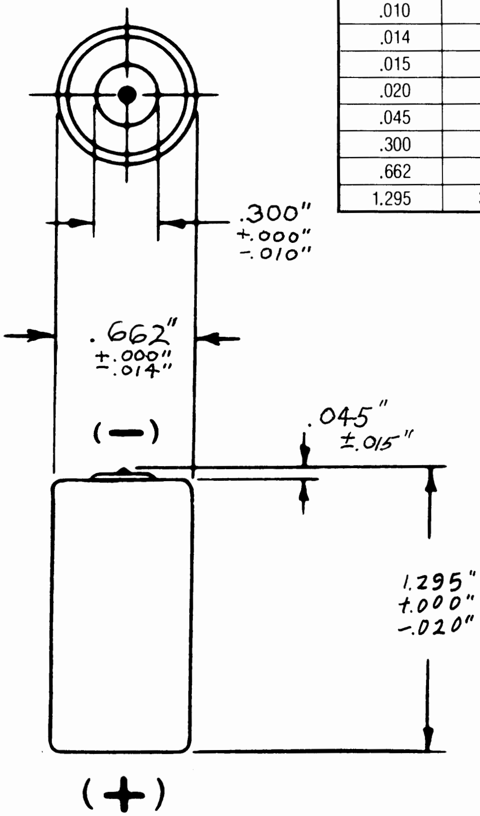
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.8V	2.0V	2.2V
24 hours/day	23	120	55.5	53.8	49
	28	100	48.1	46.2	35.5
	33	84	39.5	37.5	28
	39	72	38	34.8	27.7



"EVEREADY" NO. E132N BATTERY

Type: Mercuric Oxide
Suggested Current Range: 0-100 milliamperes

Inches	Millimeters
.010	.25
.014	.36
.015	.38
.020	.51
.045	1.14
.300	7.62
.662	16.8
1.295	32.9



SPECIFICATIONS

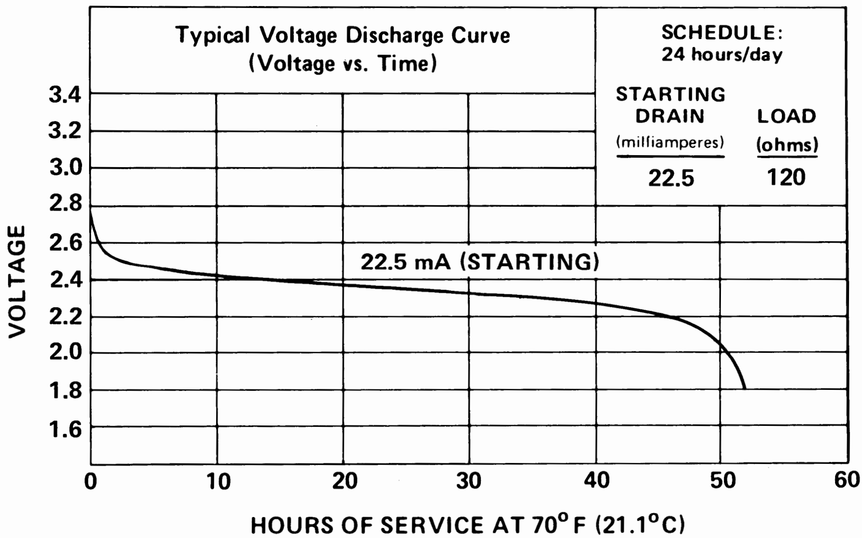
Voltage Taps .... −, + 2.7
Average Service Capacity (to 1.8 volts) .... 1000 milliampere-hours
(Rated capacity at 20 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.94 oz. (26.7 grams)
Volume (by displacement) .... 0.397 cubic inch (6.5 cubic centimeters)
Cells .... Two (ANSI M40) in series

For service information see reverse side of sheet

"EVEREADY" NO. E132N

Estimated Average Hours Service at 70° F (21.1°C)

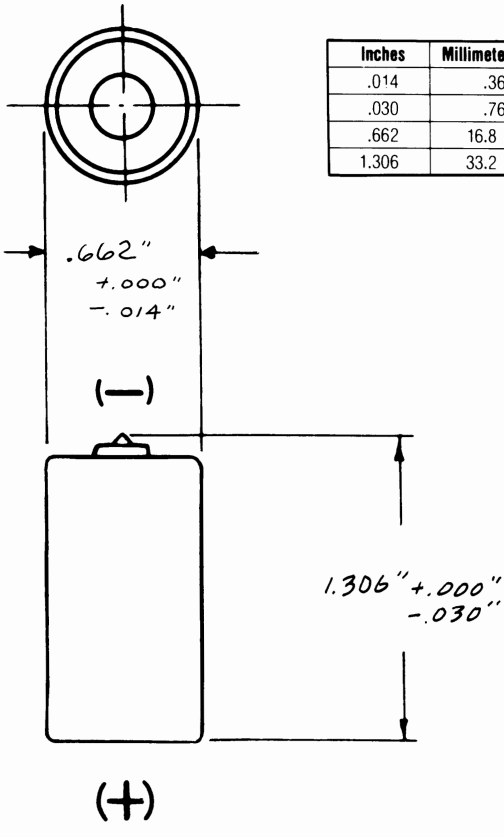
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.8V	2.0V	2.2V
24 hours/day	22.5	120	52.6	51.8	42
	27	100	44.1	43.8	34
	32	84	35.1	34.6	29
	37.5	72	31.7	30	18



"EVEREADY" NO. E163 BATTERY

Type: Mercuric Oxide

Suggested Current Range: 0-50 milliamperes



Inches	Millimeters
.014	.36
.030	.76
.662	16.8
1.306	33.2

SPECIFICATIONS

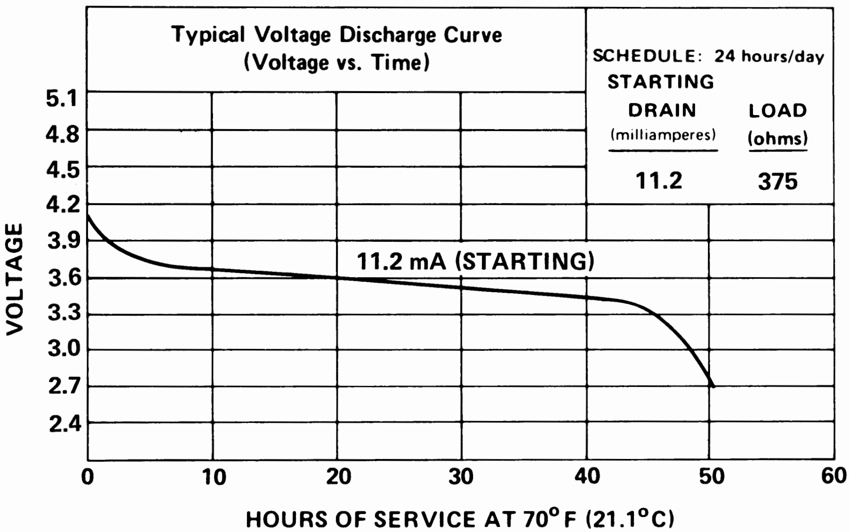
Voltage Taps.. –, + 4.2
Average Service Capacity (to 2.7 volts)..................... 500 milliampere-hours
(Rated capacity at 10 milliamperes)
Terminals.. Flat Contacts
Average Weight .... 0.9 oz. (25.5 grams)
Volume... 0.44 cubic inch (7.2 cubic centimeters)
Cells.. Three (ANSI "M30") in series

For service information see reverse side of sheet

"EVEREADY" NO. E163

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.7V	3.0V	3.3V
24 hours/day	11.2	375	50.8	48.7	46.5
	16.9	249	33	31.9	29.9
	28	150	22	19	8.1

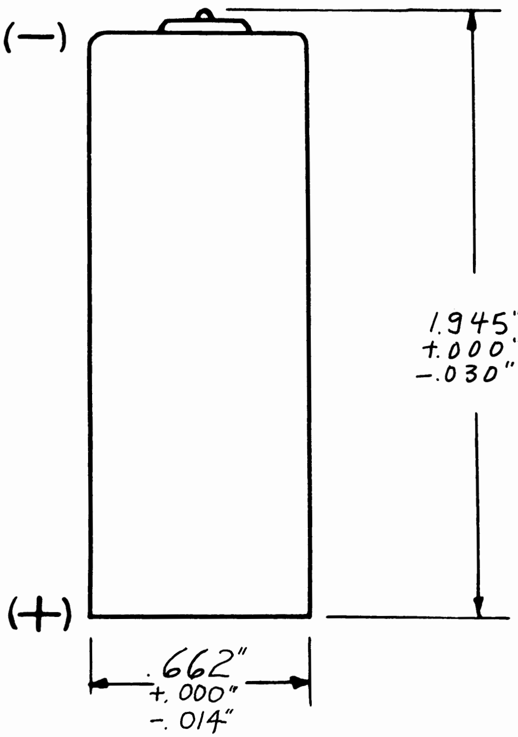


"EVEREADY" NO. E133 BATTERY

Type: Mercuric Oxide

Suggested Current Range: 0-100 milliamperes

Inches	Millimeters
.014	.36
.030	.76
.662	16.8
1.945	49.4



SPECIFICATIONS

Voltage Taps .... −, + 4.2

Average Service Capacity (to 2.7 volts) .... 1000 milliampere-hours
(Rated capacity at 20 milliamperes)

Terminals .... Flat Contacts

Average Weight .... 1.42 oz. (40.3 grams)

Volume .... 0.65 cubic inch (10.7 cubic centimeters)

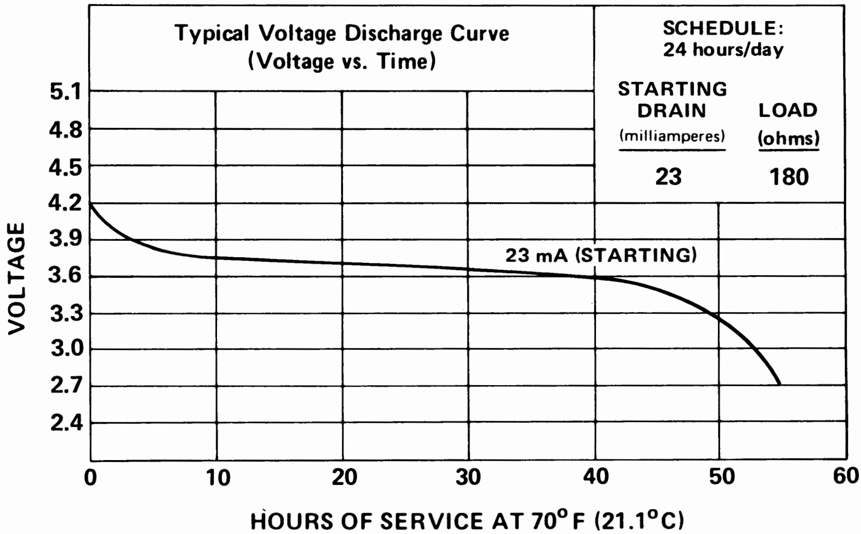
Cells .... Three (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E133

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.7V	3.0V	3.3V
24 hours/day	23	180	55.5	53.8	49
	28	150	48.1	46.2	35.5
	33	126	39.5	37.5	28
	39	108	38	34.8	27.7

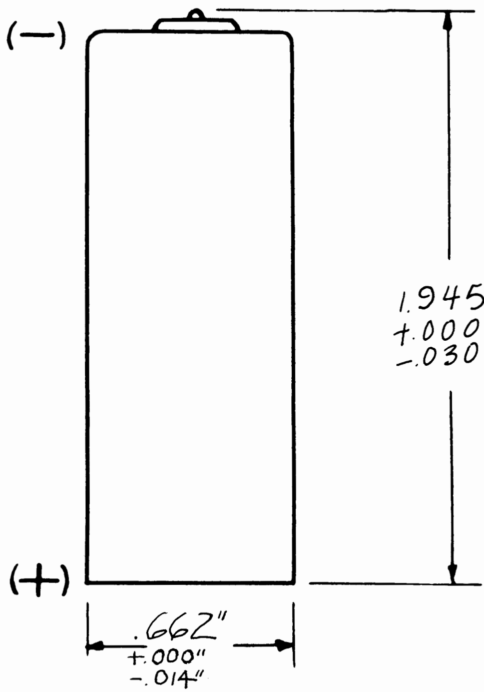


"EVEREADY" NO. E133N BATTERY

4.05
VOLTS

Type: Mercuric Oxide
Suggested Current Range: 0-100 milliamperes

Inches	Millimeters
.014	.36
.030	.76
.662	16.8
1.945	49.4



SPECIFICATIONS

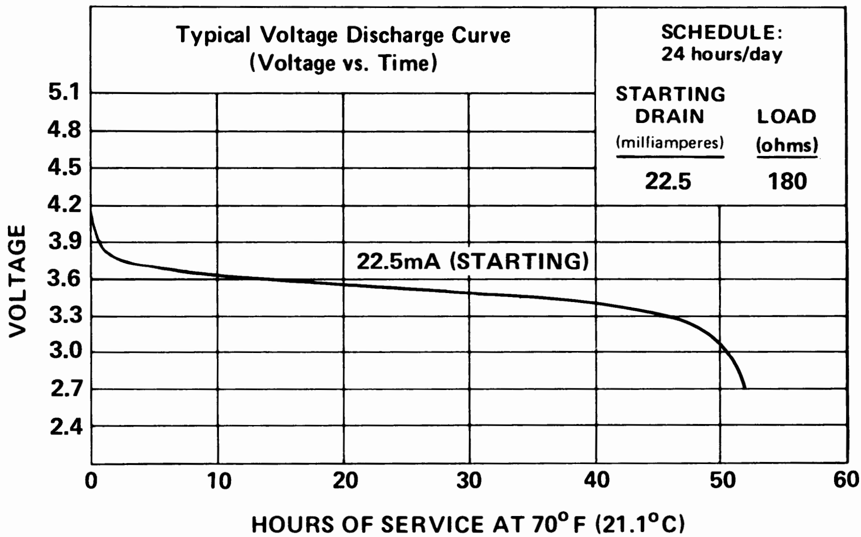
Voltage Taps .... —, + 4.05
Average Service Capacity (to 2.7 volts) .... 1000 milliampere-hours
(Rated capacity at 20 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 1.42 oz. (40.3 grams)
Volume .... 0.65 cubic inch (10.7 cubic centimeters)
Cells .... Three (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E133N BATTERY

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.7V	3.0V	3.3V
24 hours/day	22.5	180	52.6	51.8	42
	27	150	44.1	43.8	34
	32	126	35.1	34.6	29
	37.5	108	31.7	30	18

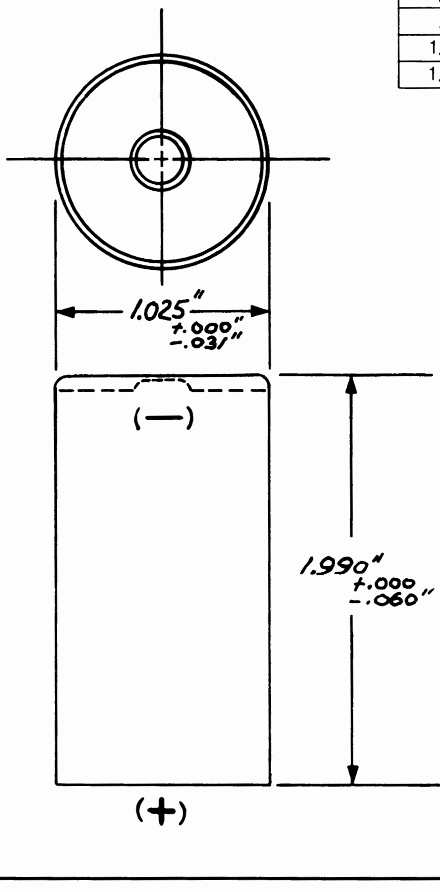


4.2
VOLTS

"EVEREADY" NO. E233 BATTERY

Type: Mercuric Oxide
Suggested Current Range: 0-60 milliamperes

Inches	Millimeters
.031	.79
.060	1.52
1.025	26
1.990	50.6



SPECIFICATIONS

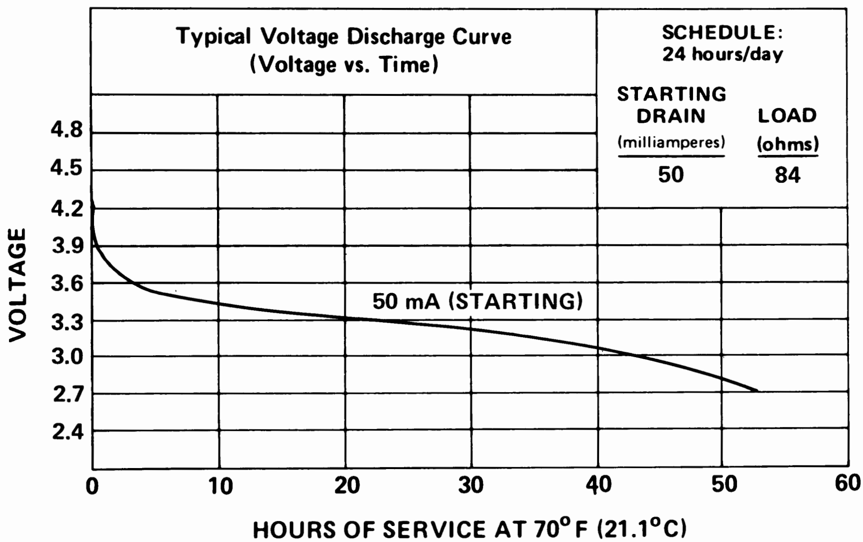
Voltage Taps .... –, + 4.2
Average Service Capacity (to 2.7 volts) .... 2200 milliampere-hours
(Rated capacity at 42 milliamperes)
Terminals .... Flat Contacts (negative recessed)
Average Weight .... 3.15 oz. (89.3 grams)
Volume ....1.6 cubic inches (26.2 cubic centimeters)
Cells .... Three (ANSI M60) in series

For service information see reverse side ot this sheet

"EVEREADY" NO. E233

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 2.7V	3.0V	3.3V
24 hours/day	23	180	122	120	96
	28	150	103	99	78
	35	120	83.5	74	42
	46.6	90	54.6	45	18
	50	84	53	44	17.4

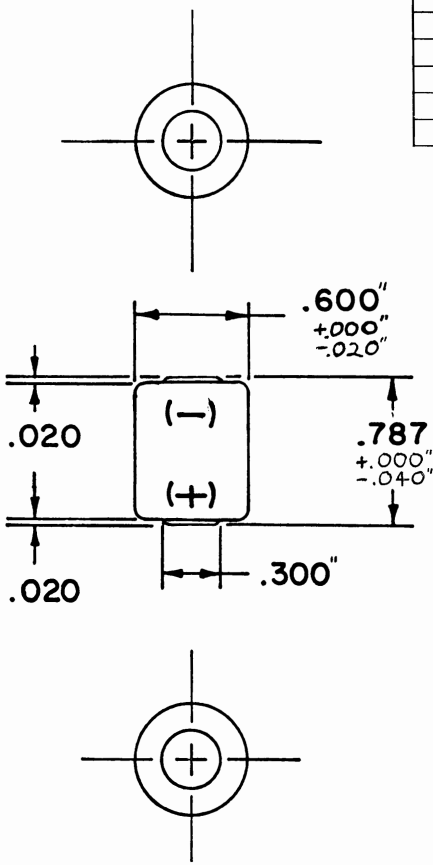


"EVEREADY" NO. EPX23 BATTERY

Type: Mercuric Oxide

Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.020	.51
.040	1.02
.300	7.62
.600	15.2
.787	20



SPECIFICATIONS

Voltage Taps .... −, + 5.6

Average Service Capacity (to 3.6 volts) .... 110 milliampere-hours
(Rated capacity at 2 milliamperes)

Terminals .... Flat Contacts

Average Weight .... 0.27 oz. (7.75 grams)

Volume .... 0.21 cubic inch (3.44 cubic centimeters)

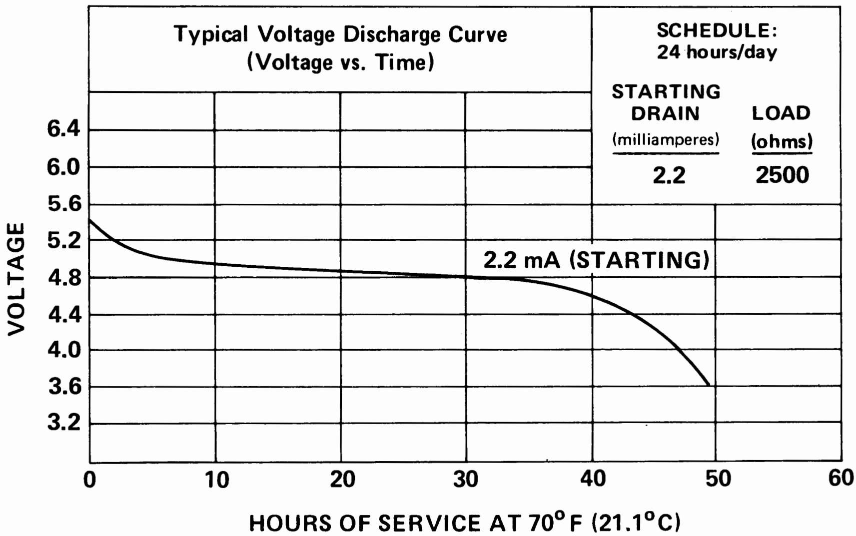
Cells .... Four (ANSI M8) in series

For service information see reverse side of this sheet

"EVEREADY" NO. EPX23

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	4.0V	4.4V
24 hours/day	1.7	3340	66.3	64.8	61.7
	2.2	2500	49	47.2	42.8
	3.2	1720	35	33	30.1
	5.6	1000	16.5	16	15

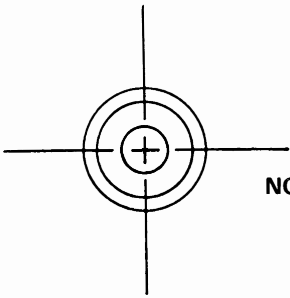


"EVEREADY" NO. EPX 32 BATTERY

5.6
VOLTS

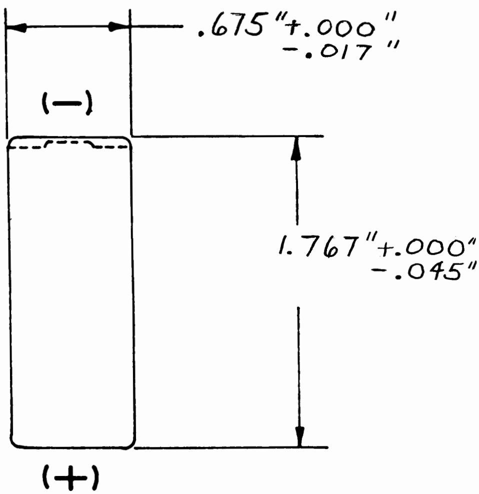
Type: Mercuric Oxide

Suggested Current Range: 0-50 milliamperes



Inches	Millimeters
.017	.43
.045	1.14
.675	17.2
1.767	44.9

NOTES: CHECK UNION CARBIDE REGARDING AVAILABILITY OF THIS BATTERY.



SPECIFICATIONS

Voltage Taps .... —, + 5.6

Average Service Capacity (to 3.6 volts) ....500 milliampere-hours
(Rated capacity at 10 milliamperes)

Terminals.. Flat Contacts

Average Weight ....1.1 oz. (31.2 grams)

Volume .... 0.61 cubic inch (10 cubic centimeters)

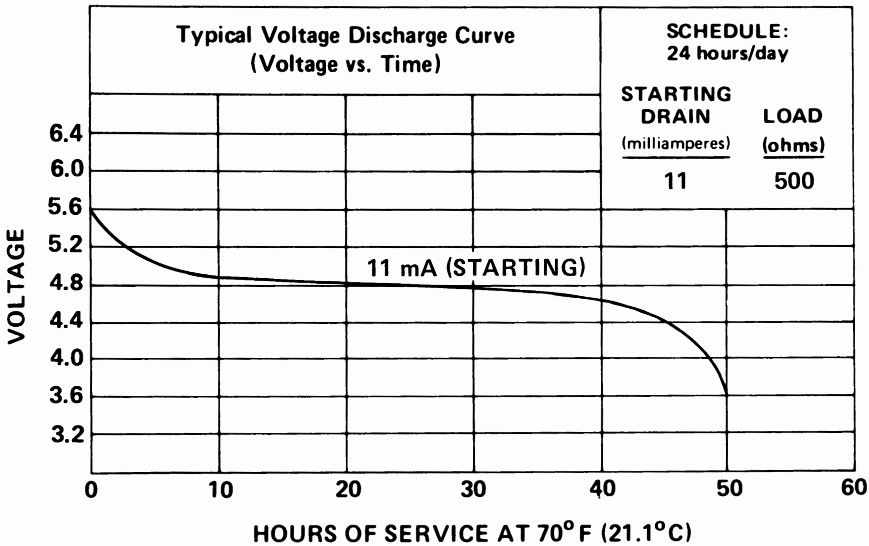
Cells .... Four (ANSI M30) in series

For service information see reverse side of this sheet

"EVEREADY" NO. EPX 32

Estimated Average Hours Service at 70° F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	4.0V	4.4V
24 hours/day	11	500	50.8	48.7	46.5
	17	332	33	31.9	29.9
	28	200	22	19.1	8.1

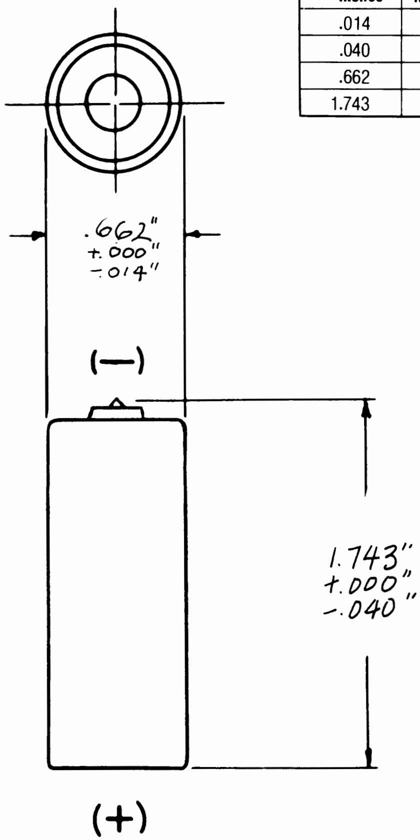


"EVEREADY" NO. E164 BATTERY

Type: Mercuric Oxide

Suggested Current Range: 0-50 milliamperes

Inches	Millimeters
.014	.36
.040	1.02
.662	16.8
1.743	44.3



SPECIFICATIONS

Voltage Taps.. —, + 5.6

Average Service Capacity (to 3.6 volts).................. 500 milliampere-hours
(Rated capacity at 10 milliamperes)

Terminals.. Flat Contacts

Average Weight.. 1.2 oz. (34 grams)

Volume.. 0.61 cubic inch (10 cubic centimeters)

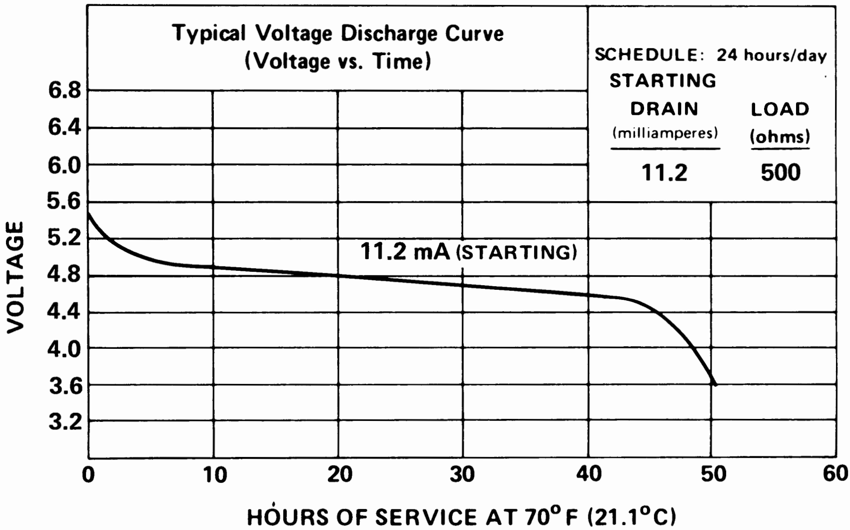
Cells.. Four (ANSI "M30") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E164

Estimated Average Hours Service at 70° F (21.1°C)

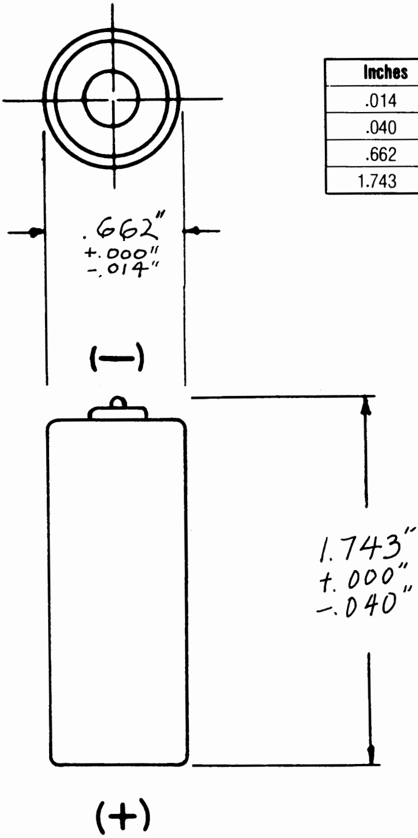
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	4.0V	4.4V
24 hours/day	11.2	500	50.8	48.7	46.5
	16.9	332	33	31.9	29.9
	28	200	22	19	8.1



"EVEREADY" NO. E164N BATTERY

Type: Mercuric Oxide

Suggested Current Range: 0-50 milliamperes



Inches	Millimeters
.014	.36
.040	1.02
.662	16.8
1.743	44.3

SPECIFICATIONS

Voltage Taps.. −, + 5.4

Average Service Capacity (to 3.6 volts)...................... 500 milliampere-hours
(Rated capacity at 10 milliamperes)

Terminals.. Flat Contacts

Average Weight.. 1.2 oz. (34 grams)

Volume.. 0.61 cubic inch (10 cubic centimeters)

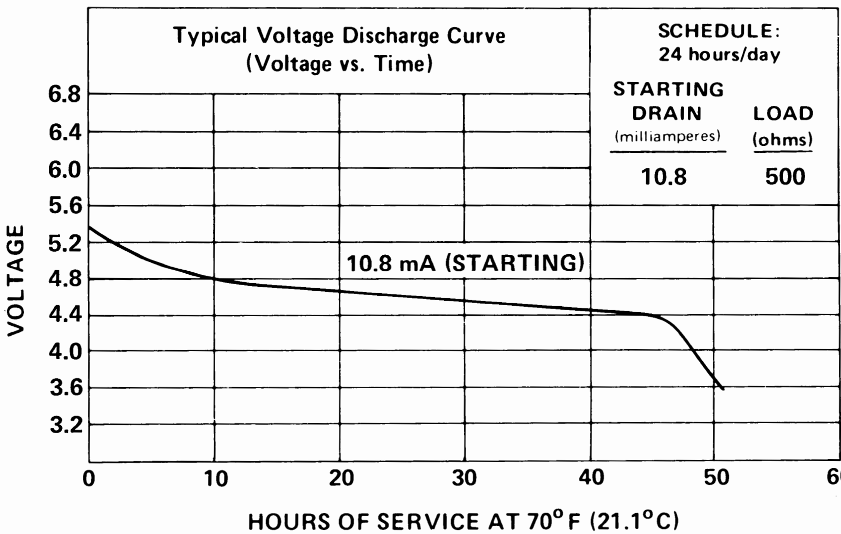
Cells.. Four (ANSI "M30") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E164N

Estimated Average Hours Service at 70° F (21.1°C)

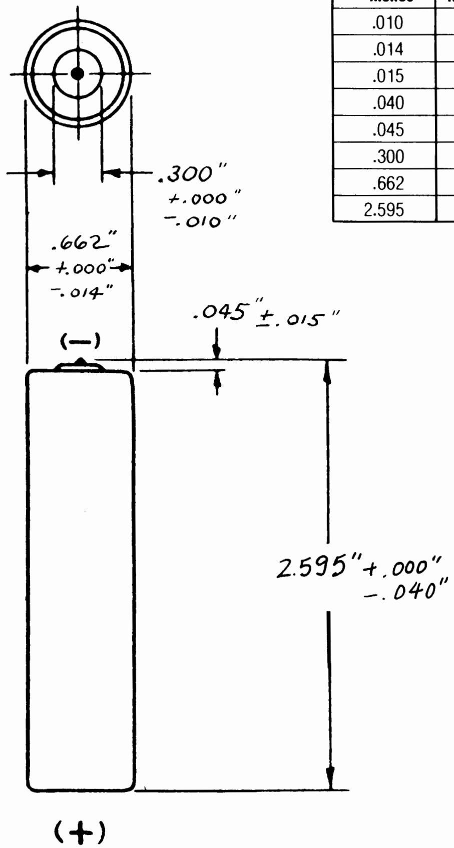
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	4.0V	4.4V
24 hours/day	10.8	500	51	48.6	46
	16.3	332	33.2	32	30
	27	200	15.8	14	7.5



"EVEREADY" NO. E134 BATTERY

Type: Mercuric Oxide

Suggested Current Range: 0-100 milliamperes



Inches	Millimeters
.010	.25
.014	.36
.015	.38
.040	1.02
.045	1.14
.300	7.62
.662	16.8
2.595	65.9

SPECIFICATIONS

Voltage Taps .... —, + 5.6

Average Service Capacity (to 3.6 volts)........ 1000 milliampere-hours
(Rated capacity at 20 milliamperes)

Terminals .... Flat Contacts

Average Weight .... 1.89 oz. (53.6 grams)

Volume .... 0.80 cubic inch (13.1 cubic centimeters)

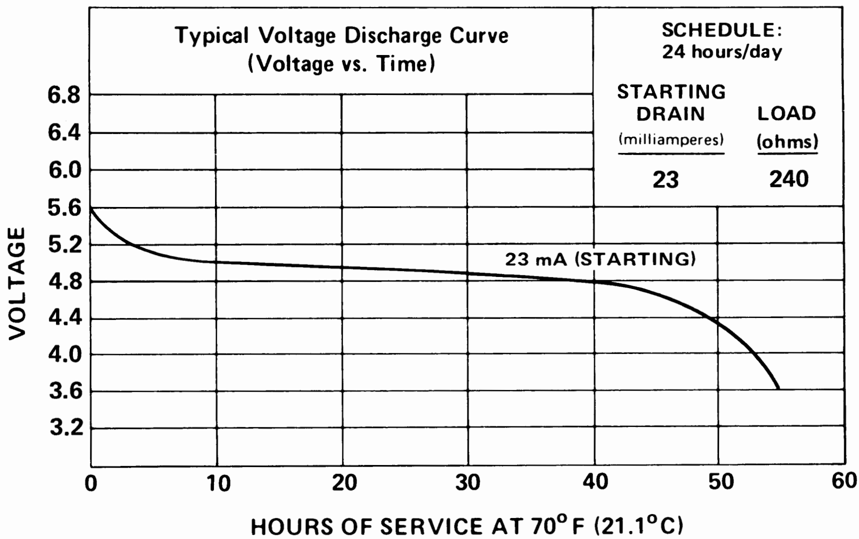
Cells .... Four (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E134

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	4.0V	4.4V
24 hours/day	23	240	55.5	53.8	49
	28	200	48.1	46.2	35.5
	33	168	39.5	37.5	28
	39	144	38	34.8	27.7

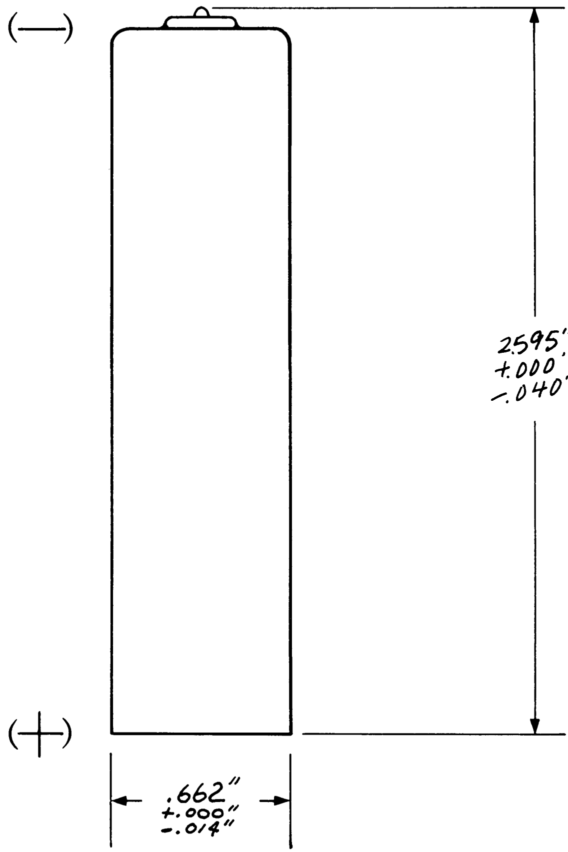


"EVEREADY" NO. E134N BATTERY

5.4 VOLTS

Type: Mercuric Oxide

Suggested Current Range: 0-100 milliamperes



Inches	Millimeters
.014	.36
.040	1.02
.662	16.8
2.595	65.9

SPECIFICATIONS

Voltage Taps .... –, + 5.4

Service Capacity (to 3.6 volts) .... 1000 milliampere-hours
(Rated capacity at 20 milliamperes)

Terminals .... Flat Contacts

Average Weight .... 1.89 oz. (53.6 grams)

Volume .... 0.9 cubic inch (14.8 cubic centimeters)

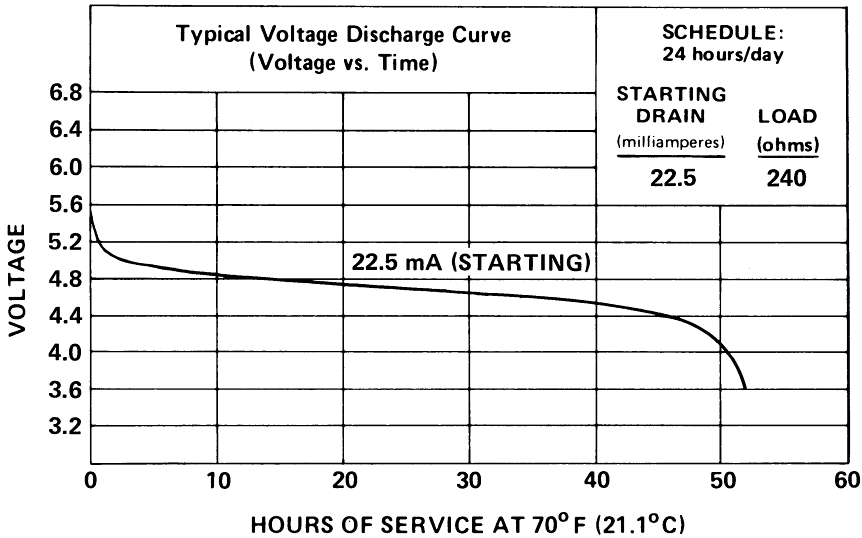
Cells .... Four (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E134N

Estimated Average Hours Service at 70° F (21.1°C)

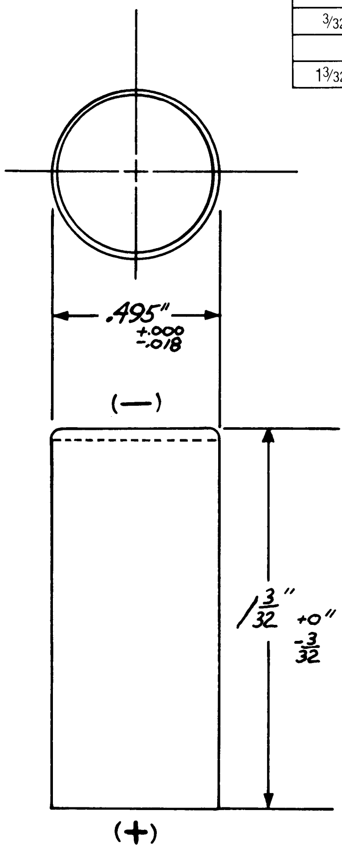
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V	4.0V	4.4V
24 hours/day	22.5	240	52.6	51.8	42
	27	200	44.1	43.8	34
	32	168	35.1	34.6	29
	37.5	144	31.7	30	18



"EVEREADY" NO. E175 BATTERY

Type: Mercuric Oxide
Suggested Current Range: 0-10 milliamperes

Inches		Millimeters
	.018	.46
3/32	.094	2.38
	.495	12.6
1 3/32	1.09	27.8



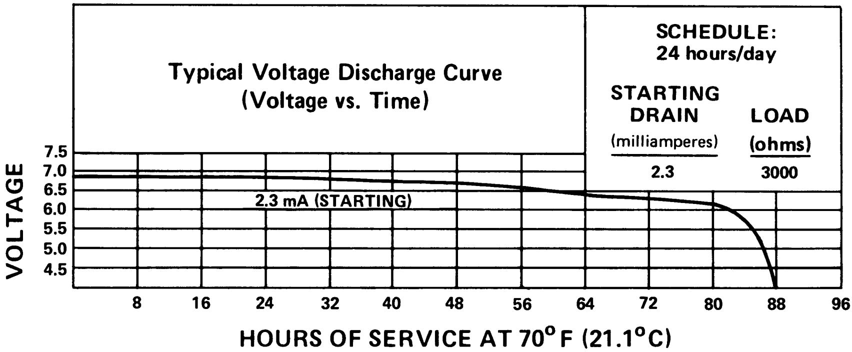
SPECIFICATIONS

Voltage Taps .... —, + 7
Average Service Capacity (to 4.5 volts) .... 180 milliampere-hours
(Rated capacity at 2.2 milliamperes)
Terminals .... Flat Contacts (negative recessed)
Average Weight .... 0.42 oz. (11.9 grams)
Volume .... 0.22 cubic inch (3.6 cubic centimeters)
Cells .... Five (ANSI M15) in series

For service information see reverse side of this sheet

"EVEREADY" NO. E175

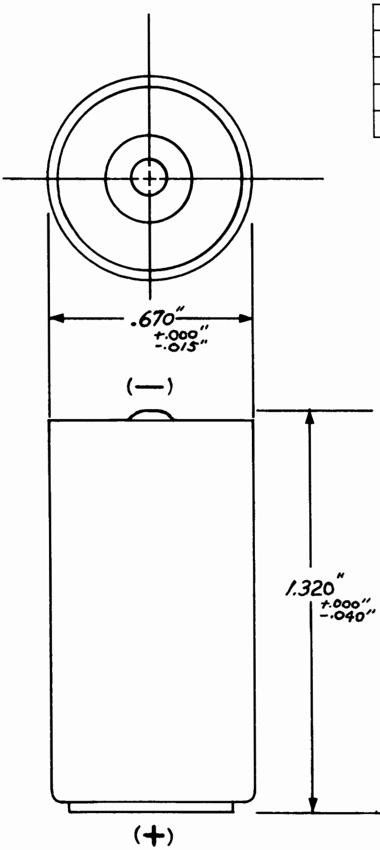
Estimated Average Hours Service at 70°F (21.1°C)



"EVEREADY" NO. E115 BATTERY

Type: Mercuric Oxide
Suggested Current Range: 0-20 milliamperes

Inches	Millimeters
.015	.38
.040	1.02
.670	17
1.320	33.5



SPECIFICATIONS

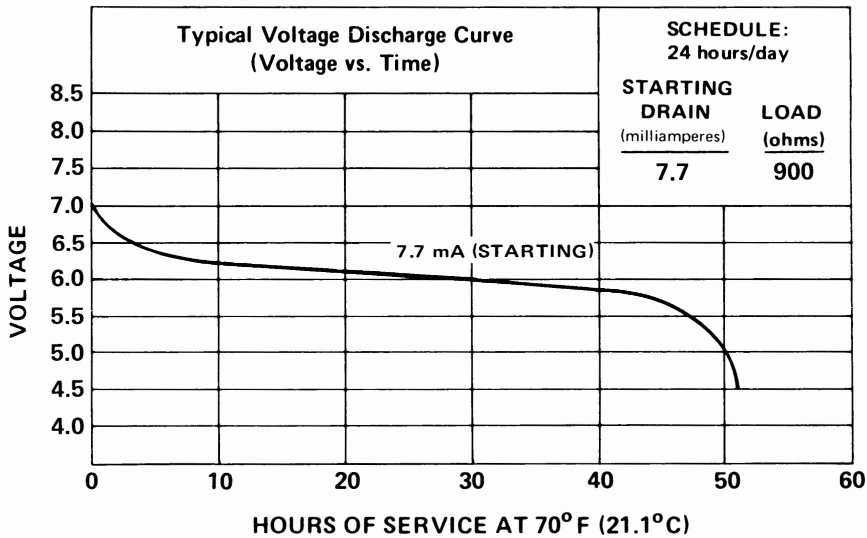
Voltage Taps .... —, + 7
Average Service Capacity (to 4.5 volts) .... 350 milliampere-hours
(Rated capacity at 5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.71 oz. (20 grams)
Volume .... 0.44 cubic inch (7.2 cubic centimeters)
Cells .... Five (ANSI M20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. E115

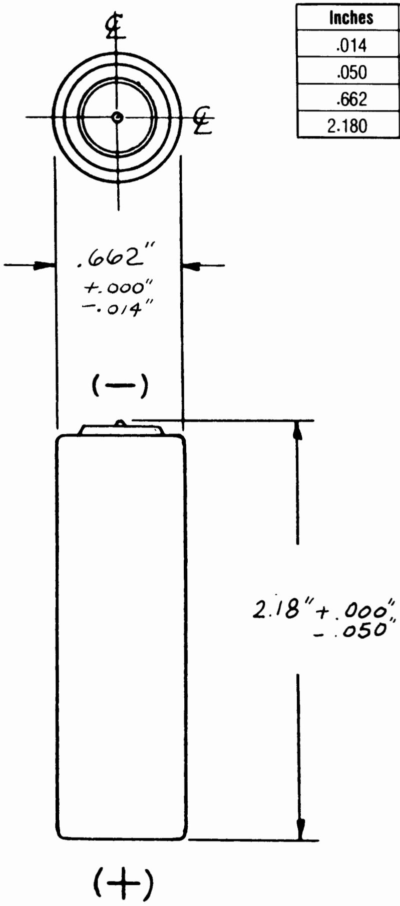
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.5V	CUTOFF VOLTAGE 5.0V	CUTOFF VOLTAGE 5.5V
24 hours/day	5.6	1250	70.1	68.8	66.4
	7.7	900	51.3	50.9	47.8
	11.2	625	31.8	30.1	25
	17	415	18	16.5	13.1



"EVEREADY" NO. E165 BATTERY

Type: Mercuric Oxide
Suggested Current Range: 0-50 milliamperes



Inches	Millimeters
.014	.36
.050	1.27
.662	16.8
2.180	55.4

SPECIFICATIONS

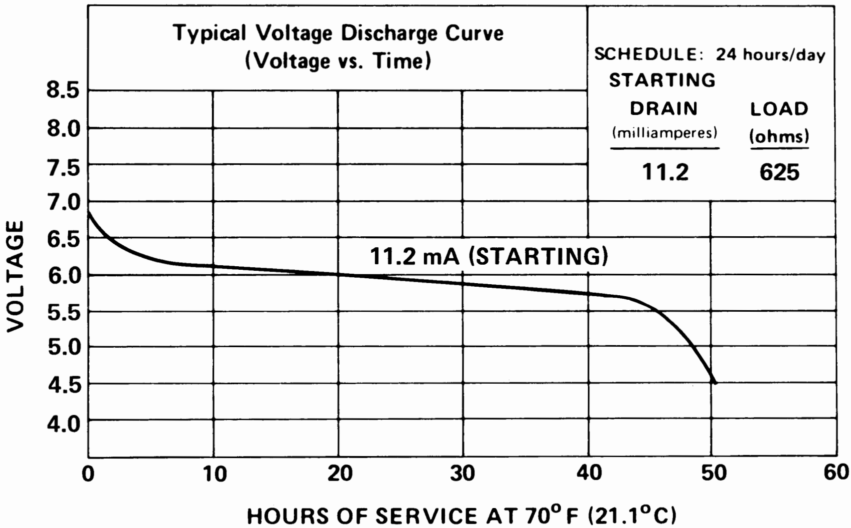
Voltage Taps .... −, + 7
Average Service Capacity (to 4.5 volts) .... 500 milliampere-hours
(Rated capacity at 10 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 1.5 oz. (42.5 grams)
Volume .... 0.73 cubic inch (12 cubic centimeters)
Cells .... Five (ANSI "M30") in series

For service information see reverse side of sheet

"EVEREADY" NO. E165

Estimated Average Hours Service at 70°F (21.1°C)

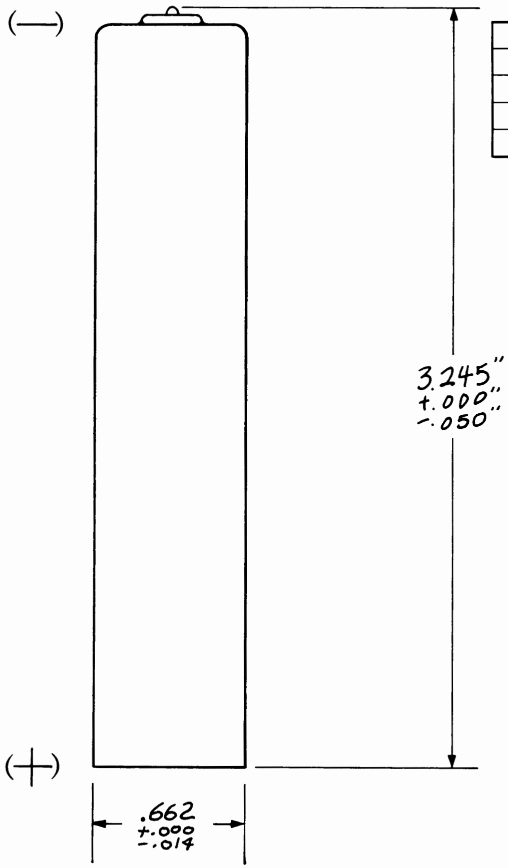
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.5V	5.0V	5.5V
24 hours/day	11.2	625	50.8	48.7	46.5
	16.9	415	33	31.9	29.9
	28	250	22	19	8.1



"EVEREADY" NO. E135 BATTERY

Type: Mercuric Oxide

Suggested Current Range: 0-100 milliamperes



Inches	Millimeters
.014	.36
.050	1.27
.662	16.8
3.245	82.4

SPECIFICATIONS

Voltage Taps .... –, + 7

Service Capacity (to 4.5 volts) .... 1000 milliampere-hours
(Rated capacity at 20 milliamperes)

Terminals .... Flat Contacts

Average Weight .... 2.37 oz. (67.2 grams)

Volume .... 1.12 cubic inches (18.4 cubic centimeters)

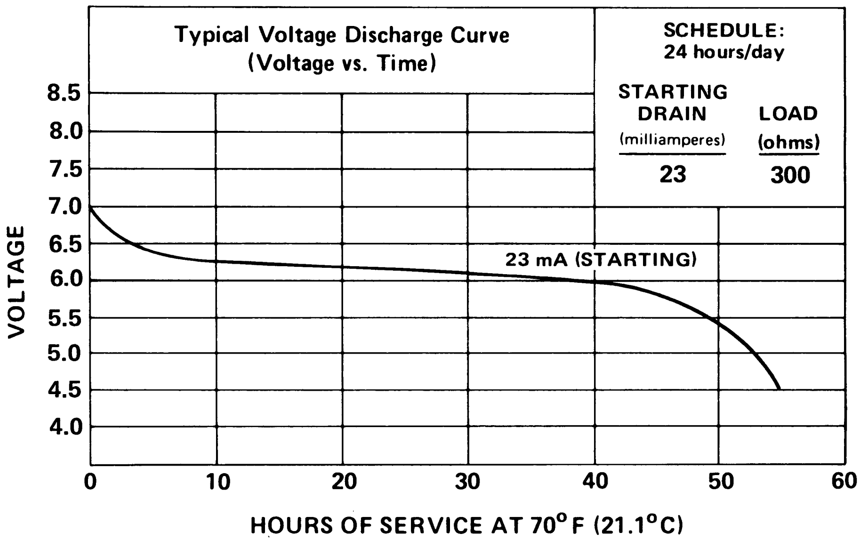
Cells .... Five (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E135

Estimated Average Hours Service at 70° F (21.1°C)

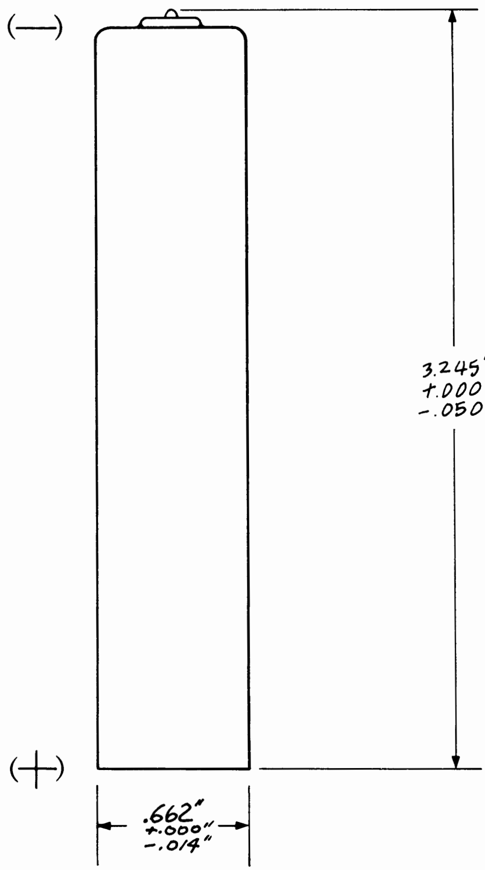
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.5V	5.0V	5.5V
24 hours/day	23	300	55.5	53.8	49
	28	250	48.1	46.2	35.5
	33	210	39.5	37.5	28
	39	180	38	34.8	27.7



"EVEREADY" NO. E135N BATTERY

6.75
VOLTS

Type: Mercuric Oxide
Suggested Current Range: 0-100 milliamperes



Inches	Millimeters
.014	.36
.050	1.27
.662	16.8
3.245	82.4

SPECIFICATIONS

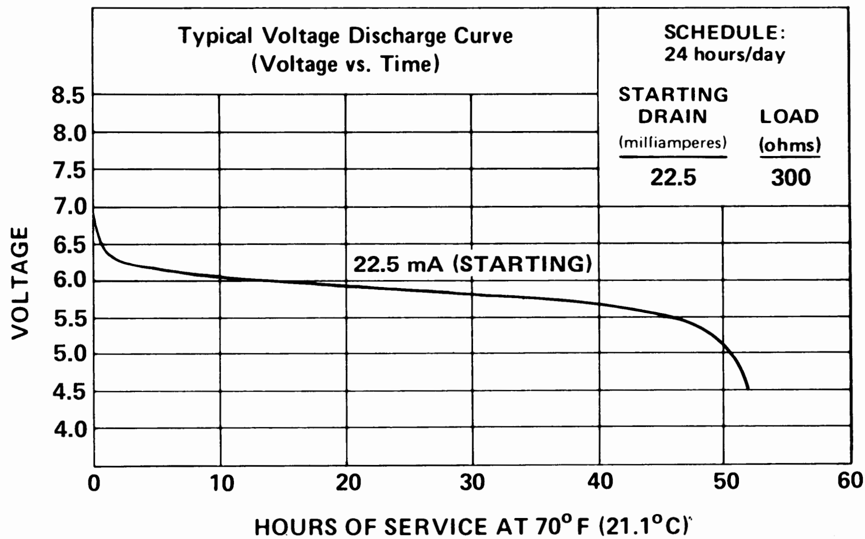
Voltage Taps .... —, + 6.75
Service Capacity (to 4.5 volts)................................ 1000 milliampere-hours
(Rated capacity at 20 milliamperes)
Terminals .... Flat Contacts
Average Weight.. 2.37 oz. (67.2 grams)
Volume .... 1.12 cubic inches (18.4 cubic centimeters)
Cells .... Five (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E135N

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.5V	5.0V	5.5V
24 hours/day	22.5	300	52.6	51.8	42
	27	250	44.1	43.8	34
	32	210	35.1	34.6	29
	37.5	180	31.7	30	18

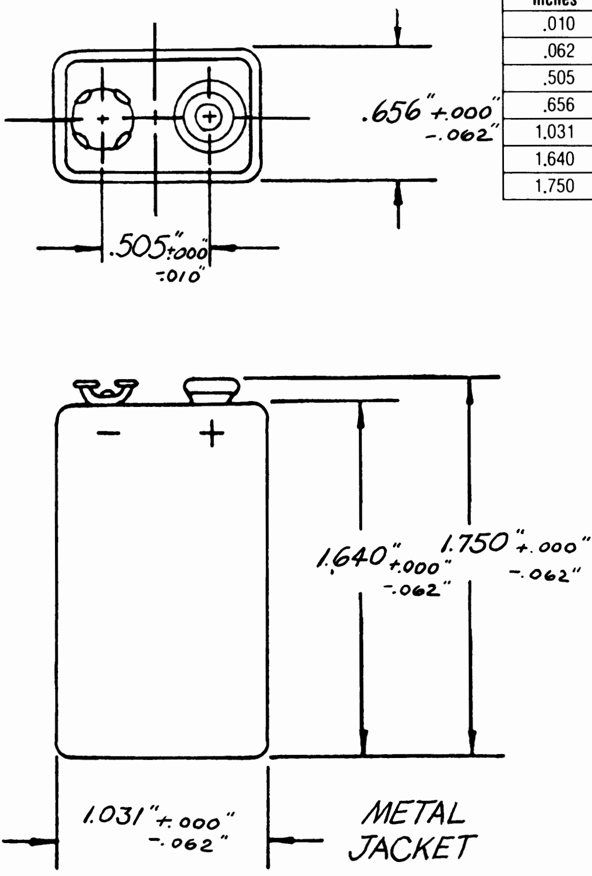


"EVEREADY" NO. E146X BATTERY

Type: Mercuric Oxide

Suggested Current Range: 0-30 milliamperes

Inches	Millimeters
.010	.25
.062	1.58
.505	12.8
.656	16.7
1.031	26.2
1.640	41.7
1.750	44.5



SPECIFICATIONS

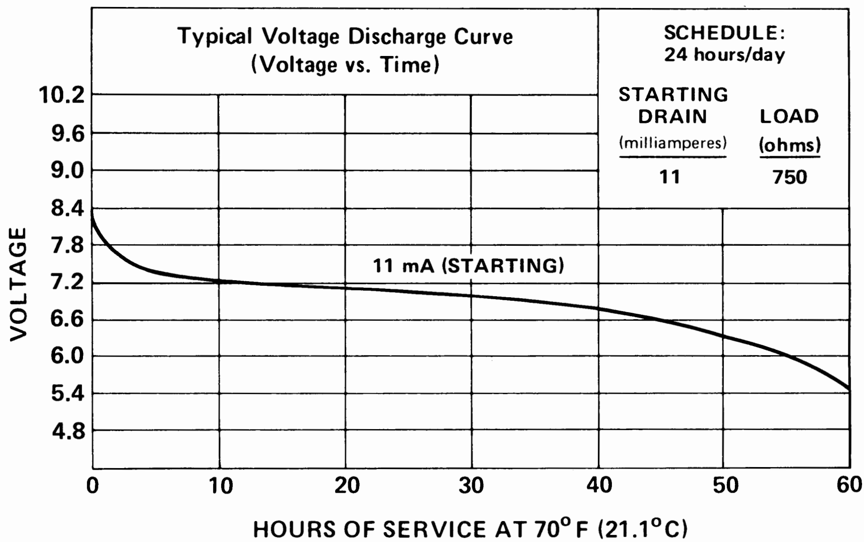
Voltage Taps .... −, + 8.4
Average Service Capacity (to 5.4 volts) .... 575 milliampere-hours
(Rated capacity at 15 milliamperes)
Terminals .... Miniature Snap
Average Weight .... 1.8 oz. (51 grams)
Volume .... 1.1 cubic inches (18 cubic centimeters)
Cells .... Six in series
Jacket .... Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. E146X

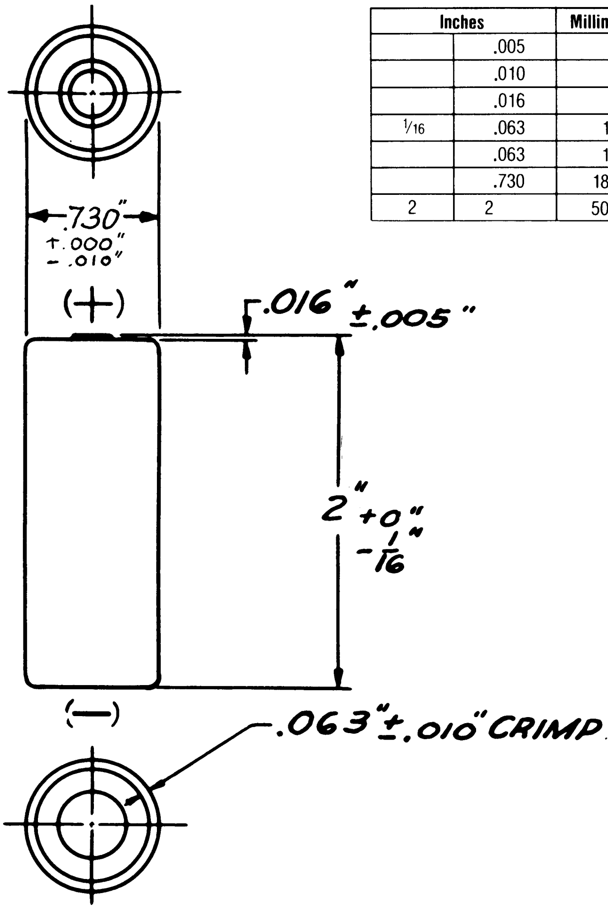
Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 5.4V	6.0V	6.6V
24 hours/day	11	750	60	54	44
	16.8	500	36	28	15
	28	300	19	15	5



"EVEREADY" NO. E126 BATTERY

Type: Mercuric Oxide
Suggested Current Range: 0-40 milliamperes



Inches		Millimeters
	.005	.13
	.010	.25
	.016	.41
1/16	.063	1.59
	.063	1.6
	.730	18.5
2	2	50.8

SPECIFICATIONS

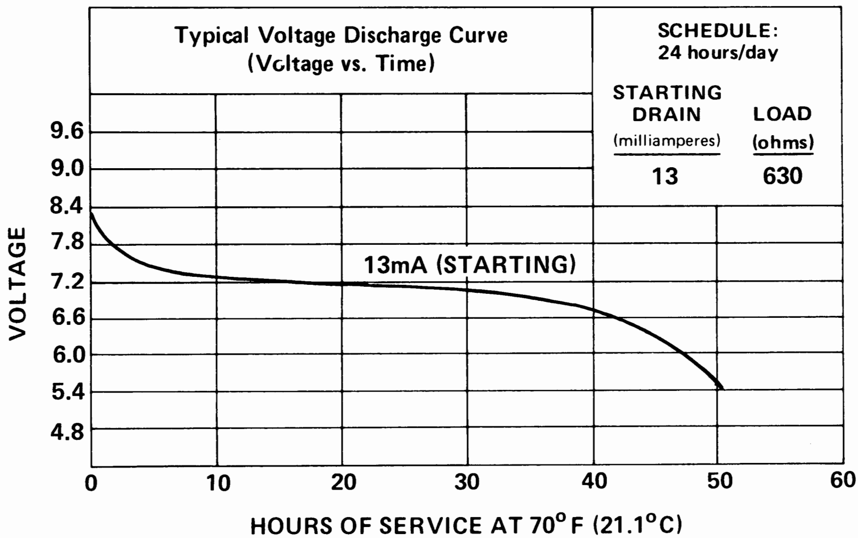
Voltage Taps .... −, + 8.4
Average Service Capacity (to 0.9 volt) .... 600 milliampere-hours
(Rated capacity at 12 milliamperes)
Terminals .... Flat contacts, negative recessed
Average Weight .... 1.65 oz. (46.8 grams)
Volume .... 0.84 cubic inch (13.8 cubic centimeters)
Cells .... Six No. 660 (ANSI "M26") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E126

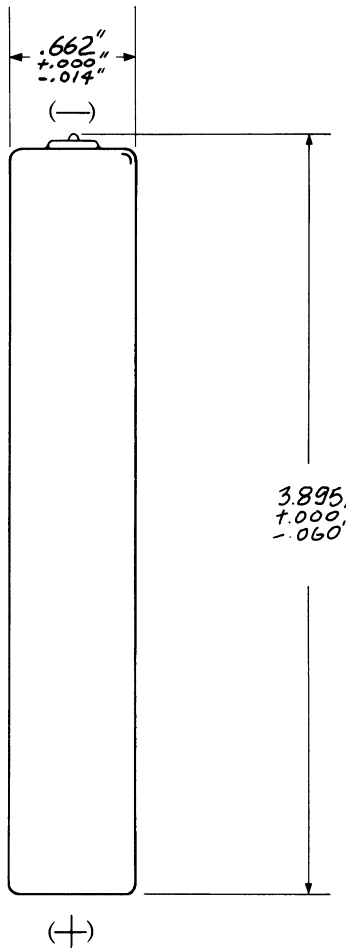
Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 5.4V	6.0V	6.6V
24 hours/day	11	750	67	63.7	57.2
	13	630	50	46.7	40.8
	17	498	43	39.7	32.4
	28	300	25	19.7	5



"EVEREADY" NO. E136 BATTERY

Type: Mercuric Oxide
Suggested Current Range: 0-100 milliamperes



Inches	Millimeters
.014	.36
.060	1.52
.662	16.8
3.895	98.9

SPECIFICATIONS

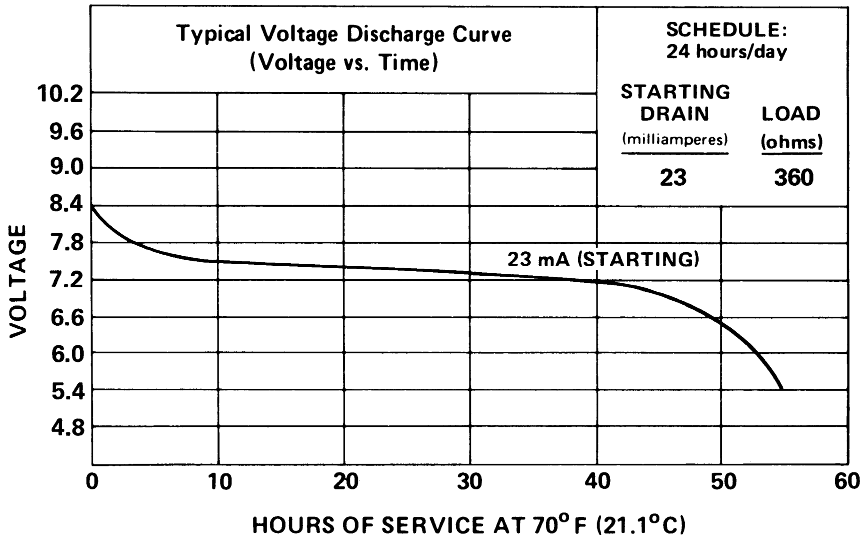
Voltage Taps .... –, + 8.4
Service Capacity (to 5.4 volts) ....1000 milliampere-hours
(Rated capacity at 20 milliamperes)
Terminals .... Flat Contacts
Average Weight ....2.86 oz. (81 grams)
Volume ....1.35 cubic inches (22 cubic centimeters)
Cells .... Six (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E136

Estimated Average Hours Service at 70° F (21.1° C)

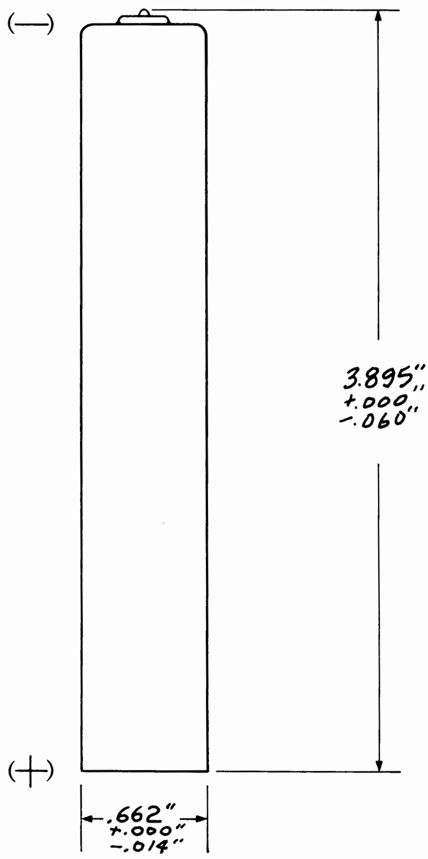
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 5.4V	6.0V	6.6V
24 hours/day	23	360	55.5	53.8	49
	28	300	48.1	46.2	35.5
	33	252	39.5	37.5	28
	39	216	38	34.8	27.7



"EVEREADY" NO. E136N BATTERY

8.1
VOLTS

Type: Mercuric Oxide
Suggested Current Range: 0-100 milliamperes



Inches	Millimeters
.014	.36
.060	1.52
.662	16.8
3.895	98.9

SPECIFICATIONS

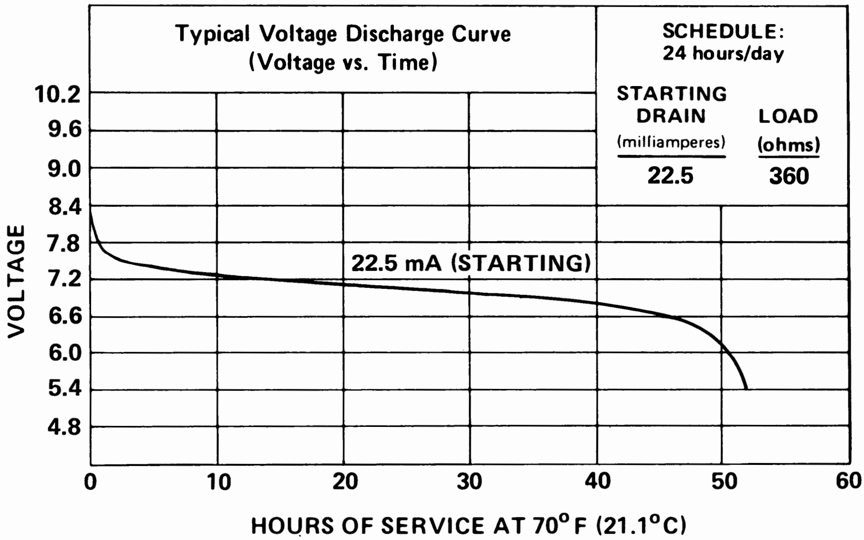
Voltage Taps .... –, + 8.1
Service Capacity (to 5.4 volts) .... 1000 milliampere-hours
(Rated capacity at 20 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 2.86 oz. (81 grams)
Volume .... 1.35 cubic inches (22 cubic centimeters)
Cells .... Six (ANSI "M40") in series

For service information see reverse side of this sheet

"EVEREADY" NO. E136N

Estimated Average Hours Service at 70° F (21.1° C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 5.4V	6.0V	6.6V
24 hours/day	22.5	360	52.6	51.8	42
	27	300	44.1	43.8	34
	32	252	35.1	34.6	29
	37.5	216	31.7	30	18

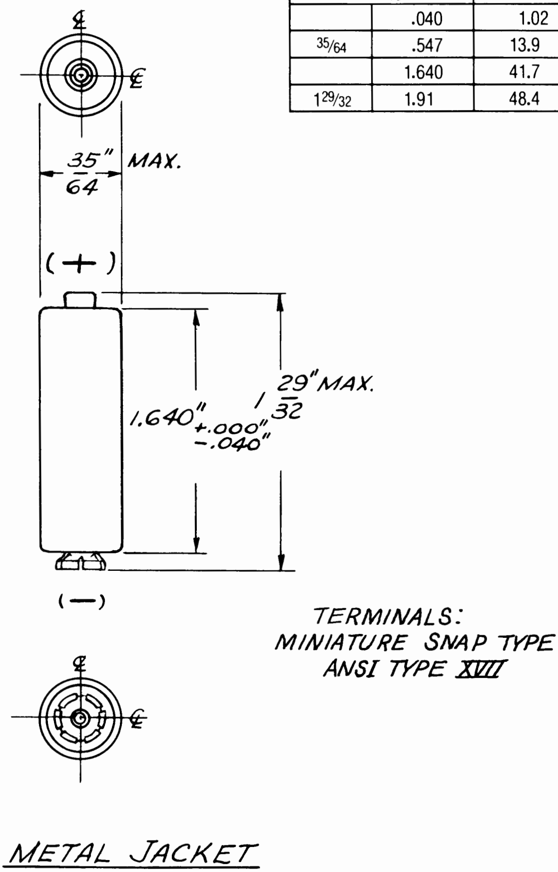


"EVEREADY" NO. E177 BATTERY

9.8
VOLTS

Type: Mercuric Oxide
Suggested Current Range: 0-10 milliamperes

	Inches	Millimeters
	.040	1.02
35/64	.547	13.9
	1.640	41.7
1 29/32	1.91	48.4



SPECIFICATIONS

Voltage Taps .... –, + 9.8
Average Service capacity (to 6.3 volts) .... 215 milliampere-hours
(Rated capacity at 2.05 milliamperes)
Terminals .... Miniature Snap
Average Weight .... 0.85 oz. (24 grams)
Volume .... 0.359 cubic inch (5.9 cubic centimeters)
Cells .... Seven No 4-45212 (ANSI M15) in series
Jacket .... Metal (See cautionary statement on page 2)

For service information see reverse side of this sheet

"EVEREADY" NO. E177

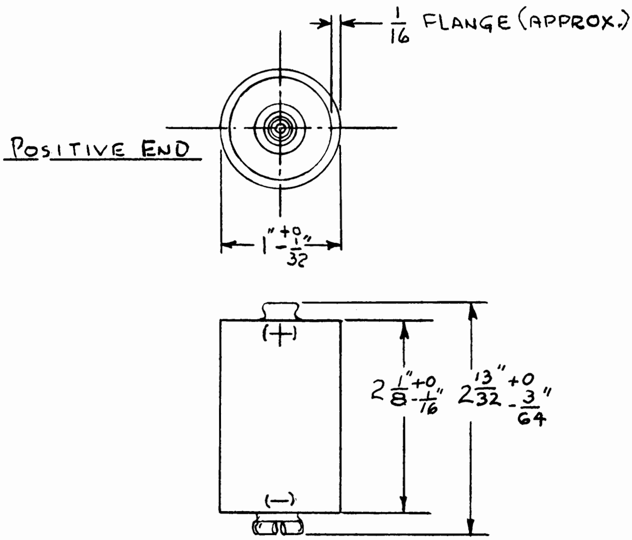
Estimated Average Hours Service at 70°F (21.1°C)

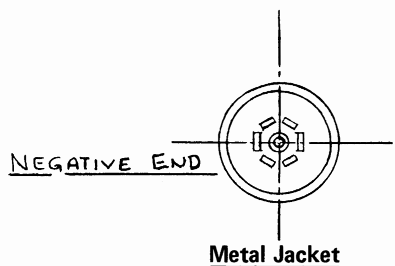
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 4.2V	5.4V	6.6V
2 hours/day	5.4	1800	44	43	42
4 hours/day	9.8	1000	25	23	21
2 hours/day	17.5	560	13	12	10.5

"EVEREADY" NO. E289 BATTERY

12.6
VOLTS

Type: Mercuric Oxide
Suggested Current Range: 0-50 milliamperes





Inches		Millimeters
1/32	.031	.79
3/64	.047	1.19
1/16	.063	1.59
1	1	25.4
2 1/8	2.13	54
2 13/32	2.41	61.1

SPECIFICATIONS

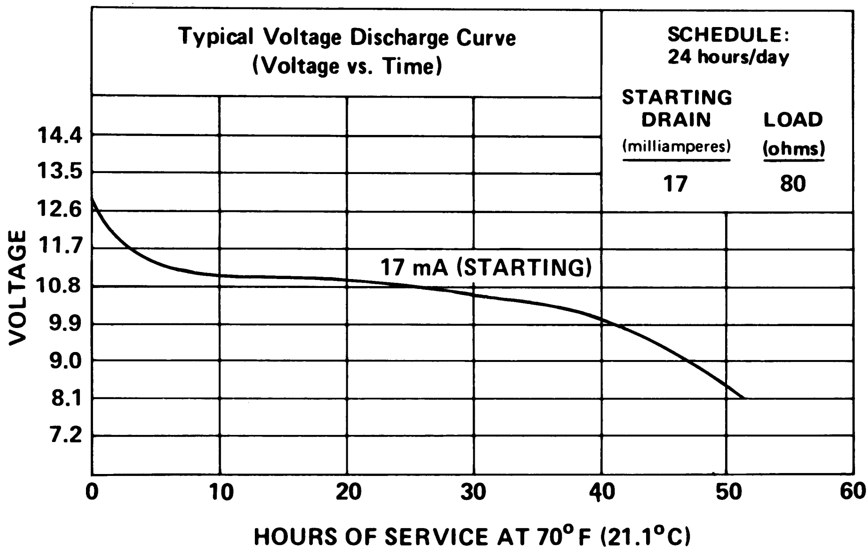
Voltage Taps .... −, + 12.6
Average Service Capacity (to 8.1 volts) .... 750 milliampere-hours
(Rated capacity at 15 milliamperes)
Terminals .... Snap
Average Weight .... 3.6 oz. (102 grams)
Volume .... 2.18 cubic inches (35.7 cubic centimeters)
Cells .... Nine in series

For service information see reverse side of this sheet

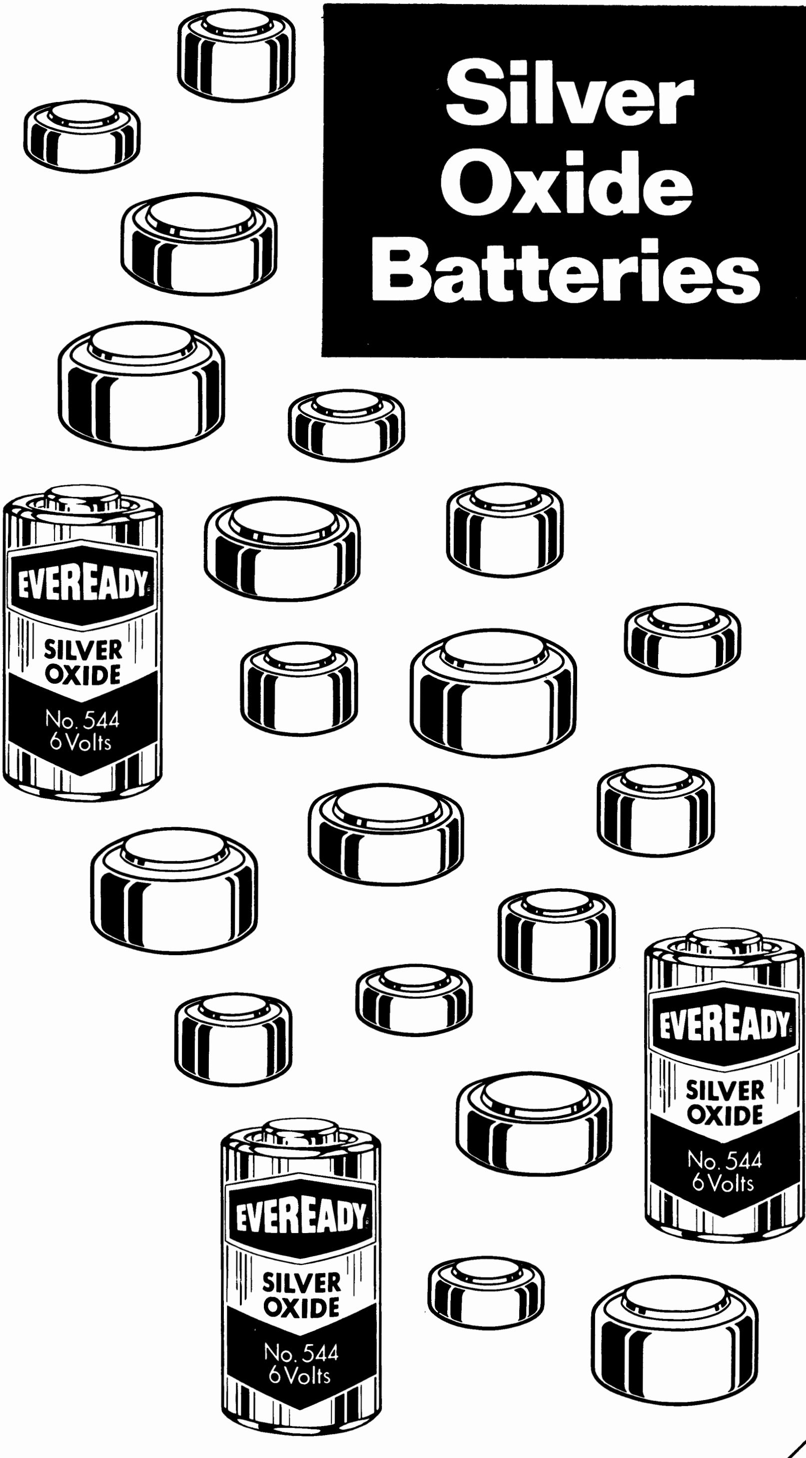
"EVEREADY" NO. E289

Estimated Average Hours Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.0V	1.1V
24 hours/day	17.5	720	51.5	47.5	41.5
	28	450	29	25.5	20.2
	40	315	19	17	12.5
	56	225	12	9.5	4.6



Silver Oxide Batteries



SILVER OXIDE BATTERIES

The silver oxide-alkaline-zinc (Ag_2O-KOH-Zn) primary battery is a major contribution to miniature power sources. It is the result of a research and development program of many years.

"Eveready" silver oxide batteries provide a higher voltage than mercuric oxide batteries. They offer a flat voltage characteristic. Silver oxide batteries have good low temperature characteristics. Their impedance is low and uniform.

The silver oxide battery operates at 1.5V while mercury batteries operate at about 1.3V. Present types are available in 1.5V cells in capacities of 35 to 210 mAh. A 6 volt battery rated at 190 milliampere-hours is also obtainable. Maximum current output ranges up to 100 mA.

The silver oxide battery consists of a depolarizing silver oxide cathode, a zinc anode of high surface area and a highly alkaline electrolyte. The electrolyte is potassium hydroxide in hearing aid batteries. This is used to obtain maximum power density at hearing aid current drains. The electrolyte in watch batteries may be either sodium hydroxide or potassium hydroxide. Mixtures of silver oxide and manganese dioxide may be tailored to provide a flat discharge curve or increased service hours.

Silver oxide batteries are well suited, for example, for use in hearing aids, instruments, photoelectric exposure devices, electronic watches and as reference voltage sources.

A cutaway of a silver oxide cell is shown in Figure 47.

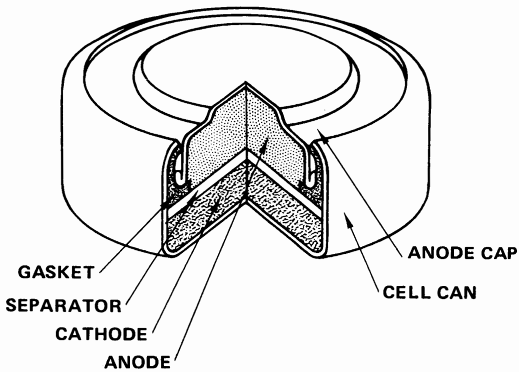


FIGURE 47
CUTAWAY VIEW—SILVER OXIDE CELL

The manner in which the cell is designed results in high volumetric efficiency. An effective radial seal is a unique feature of the construction. This patented radial seal, developed in the late 1950's, results in cells which are excellent in protection against the incidence of salting. Briefly, the radial sealing system incorporates the use of a nylon gasket and a top which is a gold-plated bi-clad, stainless steel anode cup which serves as the negative terminal. The cathode cup is usually a nickel plated steel can which serves as the positive terminal.

The radial seal is formed during the final stages of cell manufacturing. The cell can is subjected to an operation that actually reduces the diameter of the can. This process tightly squeezes the nylon gasket against the bi-clad stainless steel top, creating the initial radial seal.

The above operation is possible because a stainless steel anode top can withstand the extreme pressure during the diameter reducing operation. Secondly, the selection of nylon is important because nylon, after being squeezed, tries to regain its original position.

Once the can diameter is reduced, a secondary seal is effected by crimping the edge of the can over the gasket. Again the use of a nylon gasket is significant since nylon will continue to exert pressure as a result of the second sealing operation.

The radial seal technique is highly effective in providing excellent protection against the incidence of salting, and is found on those silver oxide and mercuric oxide batteries that we produce.

The open circuit voltage of the silver oxide cell is 1.6 volts. The operating voltage at typical current drains is 1.5 volts, compared to 1.3 volts for mercuric oxide cells.

The impedance of silver oxide batteries for hearing aid use is low and consistent. It does not rise appreciably until after the voltage of the battery has fallen below a useful operating level.

Silver oxide cells have excellent service maintenance [generally 90% after one year of storage at 70° F (21.1° C)].

Because of the relatively large surface area of the anode, "Eveready" silver oxide cells exhibit good low temperature performance characteristics.

TABLE X

"EVEREADY" SILVER OXIDE BATTERIES

Battery Numbers (in Order of Increasing Ampere-Hour Capacity)	Suggested Current Range (Milli-amperes)	Service Capacity (Milli-ampere-Hours)	Service Capacity Rated at (Milli-amperes)	Maximum Dimensions			
				Diameter		Height	
				Inches	Millimeters	Inches	Millimeters
1.5 VOLT BATTERIES							
384	0-0.06	35	0.1	0.310	7.87	0.143	3.63
S312	0-5	38	1	0.310	7.87	0.140	3.56
S312E	0-5	38	1	0.310	7.87	0.140	3.56
392	0-5	38	0.1	0.310	7.87	0.140	3.56
309	0-0.1	60	0.1	0.310	7.87	0.210	5.33
S13	0-5	75	1.07	0.310	7.87	0.210	5.33
S13E	0-5	75	1.07	0.310	7.87	0.210	5.33
393	0-5	75	0.1	0.310	7.87	0.210	5.33
301	0-0.1	100	0.1	0.455	11.6	0.160	4.06
S41	0-10	120	1.6	0.455	11.6	0.165	4.19
S41E	0-10	120	1.6	0.455	11.6	0.165	4.19
386	0-10	120	0.25	0.455	11.6	0.165	4.19
303	0-0.24	165	0.25	0.455	11.6	0.220	5.59
S76	0-10	190	2.56	0.455	11.6	0.211	5.36
S76E	0-10	190	2.56	0.455	11.6	0.211	5.36
357	0-10	190	0.25	0.455	11.6	0.211	5.36
355	0-10	210	0.25	0.610	15.5	0.190	4.83
6 VOLT BATTERY							
544	0-10	190	2.5	0.510	13	0.990	25.2

TABLE Y

"EVEREADY" SILVER OXIDE BATTERIES

Battery Numbers (in Order of Increasing Ampere-Hour Capacity)	Number & Size of Cells		Typical Use	Weight of Battery		Terminals	Approximate Volume of Battery		Voltage Taps
	Number	Size		Ounces	Grams		cubic inches	cubic centi-meters	
1.5 VOLT BATTERIES									
384	1	7-31141	Watches	0.02	0.57	Flat Contacts	0.008	0.13	–,+1.5
S312	1	6-31141	Transistor Applications	0.02	0.57	Flat Contacts	0.01	0.16	–,+1.5
S312E	1	6-31141	Hearing Aids	0.02	0.57	Flat Contacts	0.01	0.16	–,+1.5
392	1	6-31142	Watches	0.02	0.57	Flat Contacts	0.01	0.16	–,+1.5
309	1	7-31201	Watches	0.04	1.13	Flat Contacts	0.013	0.21	–,+1.5
S13	1	6-31201	Transistor Applications	0.04	1.13	Flat Contacts	0.011	0.18	–,+1.5
S13E	1	6-31201	Hearing Aids	0.04	1.13	Flat Contacts	0.011	0.18	–,+1.5
393	1	6-31202	Watches	0.04	1.13	Flat Contacts	0.011	0.18	–,+1.5
301	1	7-45161	Watches	0.06	1.7	Flat Contacts	0.023	0.38	–,+1.5
S41	1	6-45161	Microminiature Lamps	0.06	1.7	Flat Contacts	0.02	0.33	–,+1.5
S41E	1	6-45161	Hearing Aids	0.06	1.7	Flat Contacts	0.02	0.33	–,+1.5
386	1	6-45163	Watches	0.06	1.7	Flat Contacts	0.02	0.33	–,+1.5
303	1	7-45215	Watches	0.09	2.55	Flat Contacts	0.031	0.51	–,+1.5
S76	1	6-45201	Transistor Applications	0.08	2.3	Flat Contacts	0.029	0.48	–,+1.5
S76E	1	6-45201	Hearing Aids	0.08	2.3	Flat Contacts	0.029	0.48	–,+1.5
357	1	6-45202	Watches	0.08	2.3	Flat Contacts	0.029	0.48	–,+1.5
355	1	—	Watches	0.13	3.69	Flat Contacts	0.055	0.9	–,+1.5
6 VOLT BATTERY									
544	4	6-45201	Electronic Shutter and Light Meter	0.5	14.2	Flat Contacts	0.171	2.8	–, +6

NOTE: To provide the best contact to the terminals of Silver Oxide batteries, it is recommended that the device contacts be made of a spring material such as phosphor bronze or beryllium copper which will maintain a contact force of at least fifty grams for an extended period of time. The contacts should be plated with about 0.0002" nickel (continuous) followed by a minimum of 0.00002" gold. The reliability of the contact can be further increased by subdividing the main contact member into two, three or more individual points or prongs such as the tines of a fork.

"EVEREADY" NO. 384 CELL

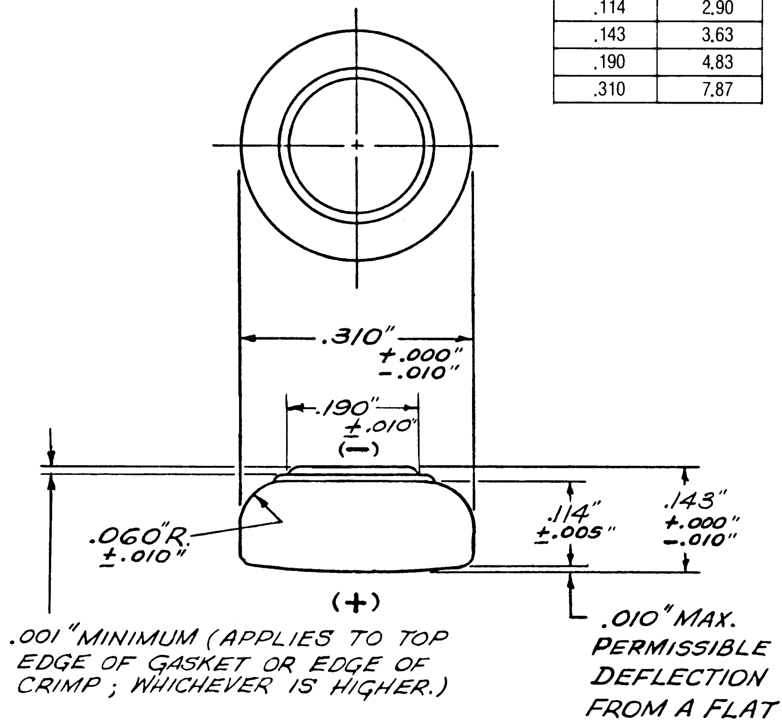
1.5 VOLTS

Type: Silver Oxide

IEC Designation: SR41

Suggested Current Range: 0—60 microamperes

Inches	Millimeters
.001	.03
.005	.13
.010	.25
.060	1.52
.114	2.90
.143	3.63
.190	4.83
.310	7.87



SPECIFICATIONS

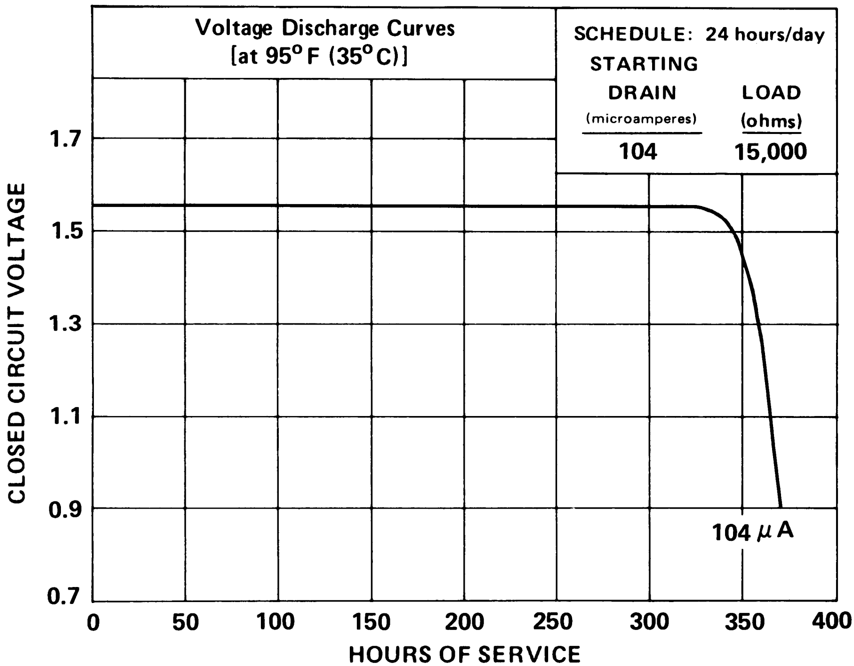
Voltage Taps .... −, + 1.5
Average Service Capacity (to 1.3 volts) .... 35 milliampere-hours
(Rated capacity at 15000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.02 oz. (0.57 gram)
Volume (by displacement)............ 0.008 cubic inch (0.13 cubic centimeter)
Cell .... One No. 7-31141

For service information see reverse side of this sheet

"EVEREADY" NO. 384

Estimated Average Service at 95°F (35°C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	1.3V
24 hours/day	104	15,000	370 hours	360 hours
	3.1	500,000		15 months (estimated)



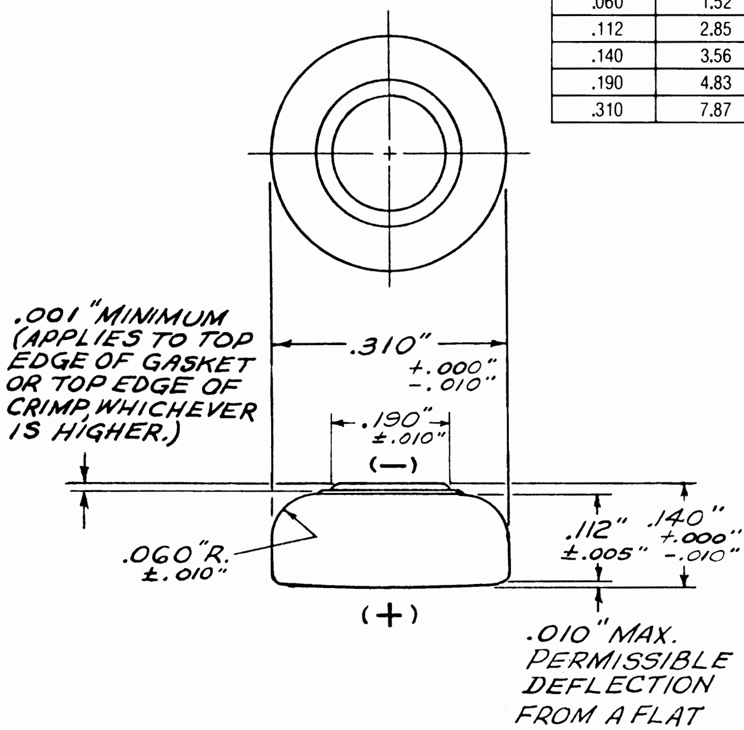
Impedance

Approximate open circuit impedance at 1000 Hz: 65 ohms average.

"EVEREADY" S312 CELL

Type: Silver Oxide
ANSI Designation: S4
IEC Designation: SR41
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.001	.03
.005	.13
.010	.25
.060	1.52
.112	2.85
.140	3.56
.190	4.83
.310	7.87



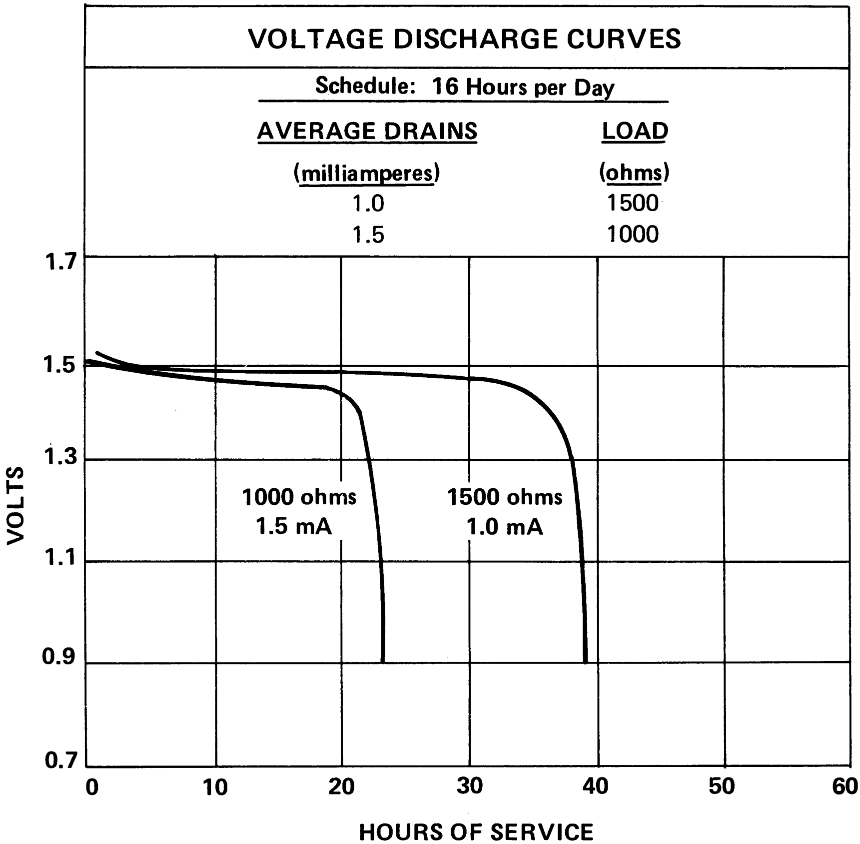
SPECIFICATIONS

Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt) .... 38 milliampere-hours
(Rated capacity at 1 milliampere)
Terminals .... Flat Contacts
Average Weight .... 0.02 oz. (0.57 gram)
Volume (by displacement) .... 0.01 cubic inch (0.16 cubic centimeter)
Cell .... One No. 6-31141 (ANSI S4)

For service information see reverse side of this sheet.

"EVEREADY" NO. S312

Estimated Average Hours Service at 70°F (21.1°C)



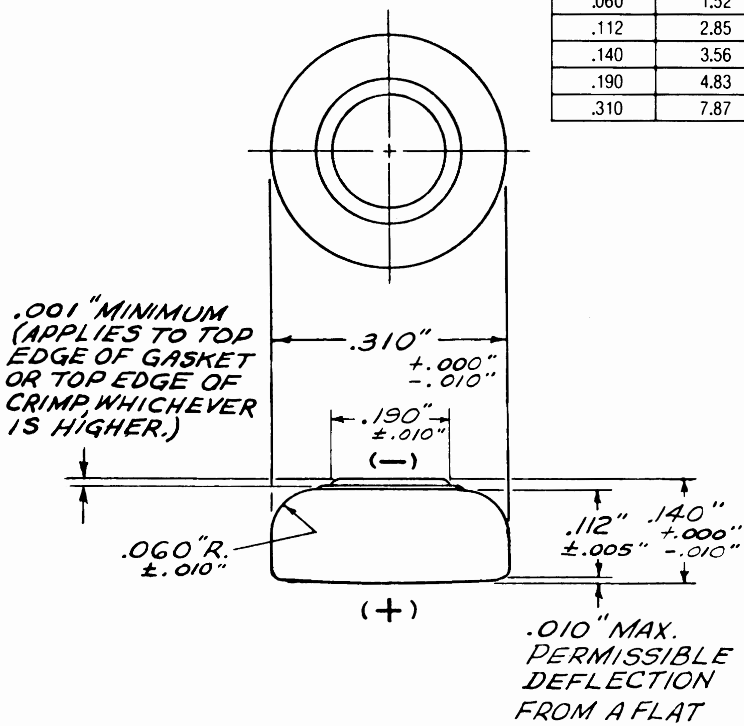
IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 5–18 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

"EVEREADY" NO. S312E CELL

Type: Silver Oxide
ANSI Designation: S4
IEC Designation: SR41
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.001	.03
.005	.13
.010	.25
.060	1.52
.112	2.85
.140	3.56
.190	4.83
.310	7.87



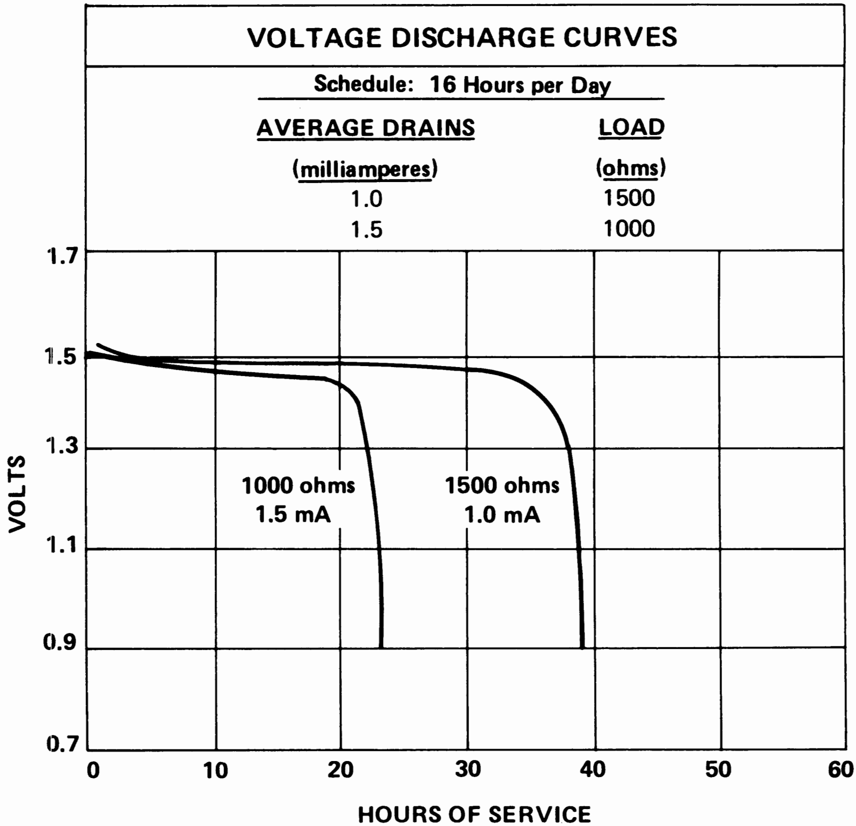
SPECIFICATIONS

Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt) .... 38 milliampere-hours
(Rated capacity at 1 milliampere)
Terminals .... Flat Contacts
Average Weight .... 0.02 oz. (0.57 gram)
Volume (by displacement) .... 0.01 cubic inch (0.16 cubic centimeter)
Cell Size .... One No. 6-31141 (ANSI S4)

For service information see reverse side of this sheet.

"EVEREADY" NO. S312E

Estimated Average Hours Service at 70°F (21.1°C)



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 5–18 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

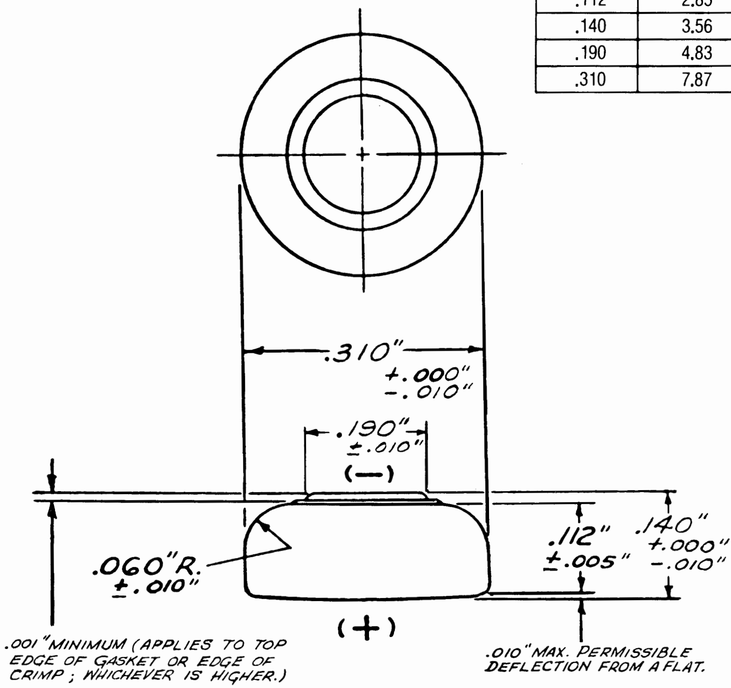
"EVEREADY" NO. 392 CELL

Type: Silver Oxide

IEC Designation: SR41

Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.001	.03
.005	.13
.010	.25
.060	1.52
.112	2.85
.140	3.56
.190	4.83
.310	7.87



SPECIFICATIONS

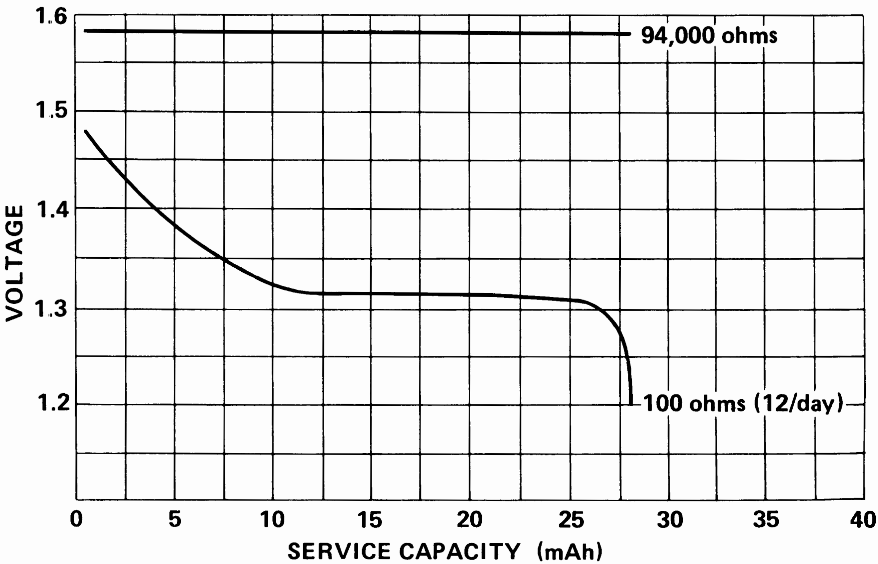
Voltage Taps .... —, + 1.5
Average Service Capacity (to 0.9 volt) .... 38 milliampere-hours
(Rated capacity at 15000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.02 oz. (0.57 gram)
Volume (by displacement) .... 0.01 cubic inch (0.16 cubic centimeter)
Cell .... One No. 6-31142

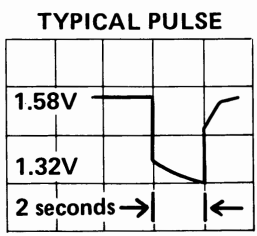
For service information see reverse side of this sheet

"EVEREADY" NO. 392

Preliminary Performance Data at 95°F (35°C)

Background: 94000 ohms continuous (IC simulated load 16.8 microamperes)
Pulse Width: 2 seconds
Pulse Frequency: 100 ohms @ 12/day (LCD backlight simulation)





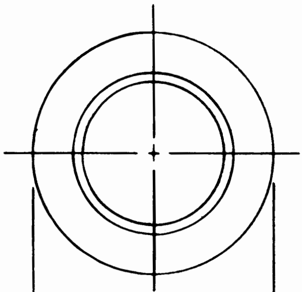
Estimated Service at 95°F (35°C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.3V
24hours/day	104	15000	370 hours

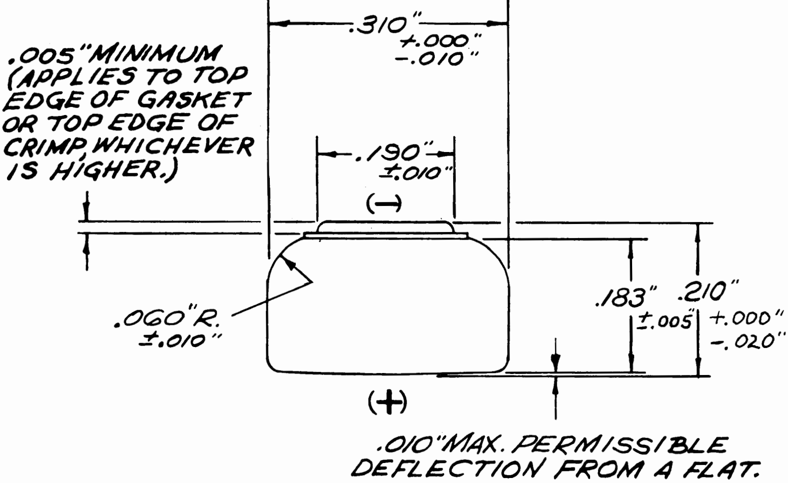
"EVEREADY" NO. 309 CELL

1.5 VOLTS

Type: Silver Oxide
ANSI Designation: WS5
IEC Designation: SR48
Suggested Current Range: 0-100 microamperes



Inches	Millimeters
.005	.13
.010	.25
.020	.51
.060	1.52
.183	4.65
.190	4.83
.210	5.33
.310	7.87



SPECIFICATIONS

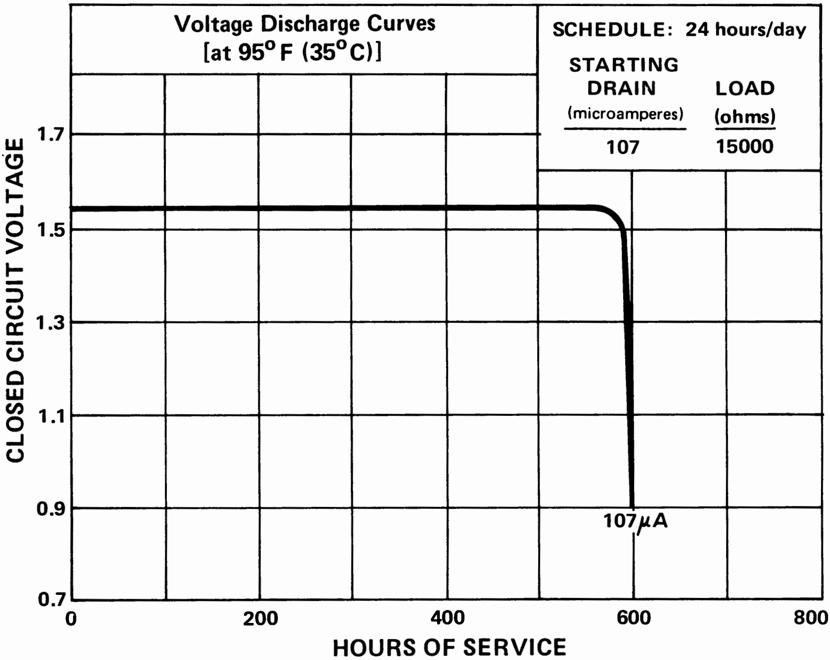
Voltage Taps .... −, + 1.5
Average Service Capacity (to 1.3 volts) .... 60 milliampere-hours
(Rated capacity at 15,000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.04 oz. (1.13 grams)
Volume (by displacement) .... 0.013 cubic inch (0.21 cubic centimeter)
Cell Size .... One No. 7-31201

For service information see reverse side of this sheet

"EVEREADY" NO. 309

Estimated Average Service at 95° F (35° C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.3V
24 hours/day	107	15,000	600 hours
	5.9	270,000	14 months



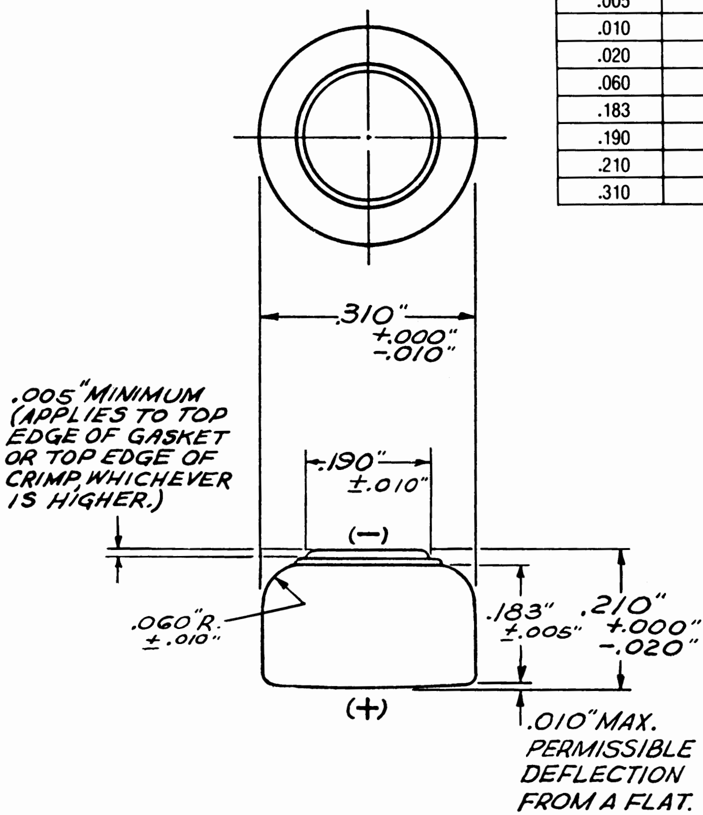
IMPEDANCE

Approximate open circuit impedance at 1000 Hz: 35 ohms average

"EVEREADY" NO. S13 CELL

Type: Silver Oxide
ANSI Designation: S5
IEC Designation: SR48
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.005	.13
.010	.25
.020	.51
.060	1.52
.183	4.65
.190	4.83
.210	5.33
.310	7.87



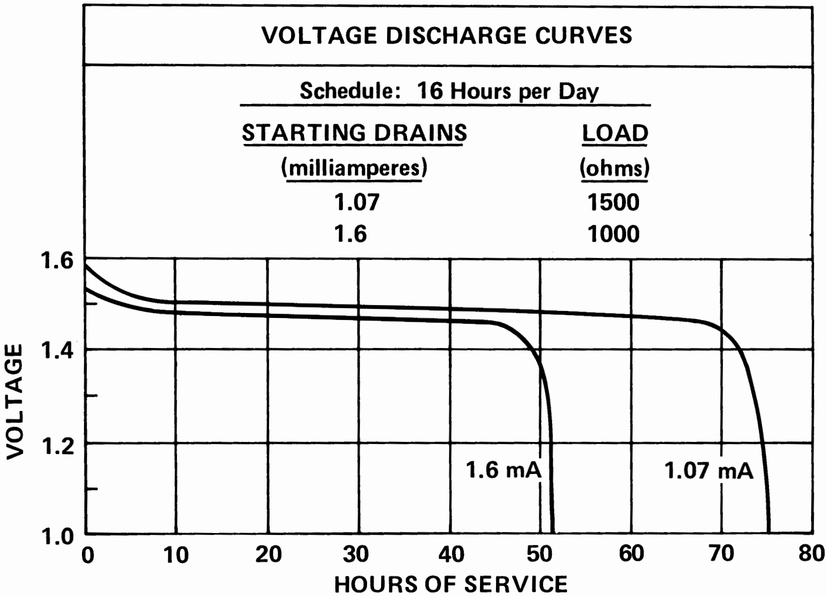
SPECIFICATIONS

Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt) .... 75 milliampere-hours
(Rated capacity at 1.07 milliamperes)
Terminals .... Flat Contacts
Average Weight.. 0.04 oz. (1.13 grams)
Volume (by displacement)............ 0.011 cubic inch (0.18 cubic centimeter)
Cell .... One No. 6-31201 (ANSI S5)

For service information see reverse side of this sheet

"EVEREADY" NO. S13

Estimated Average Hours Service at 70°F (21.1°C)



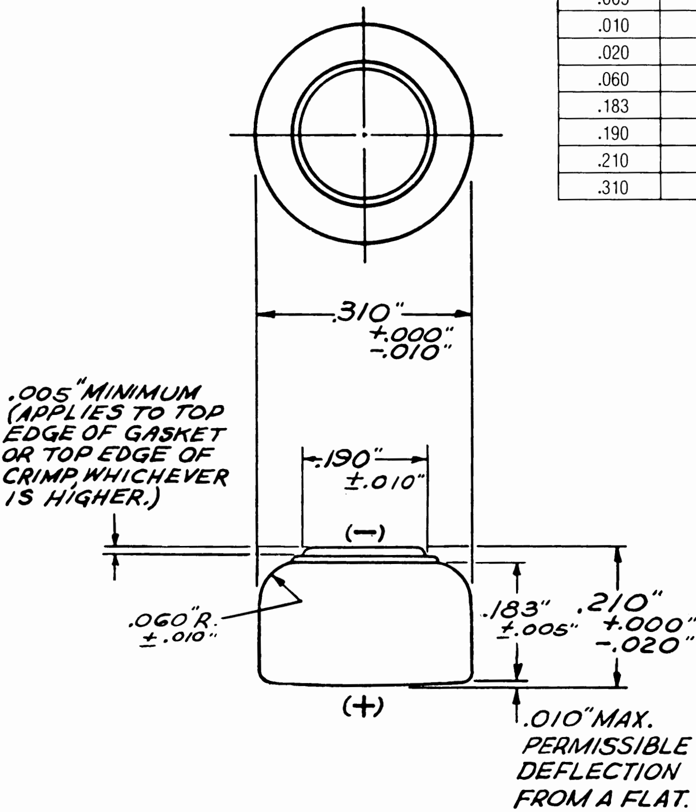
IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 8–20 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

"EVEREADY" NO. S13E CELL

Type: Silver Oxide
ANSI Designation: S5
IEC Designation: SR48
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.005	.13
.010	.25
.020	.51
.060	1.52
.183	4.65
.190	4.83
.210	5.33
.310	7.87



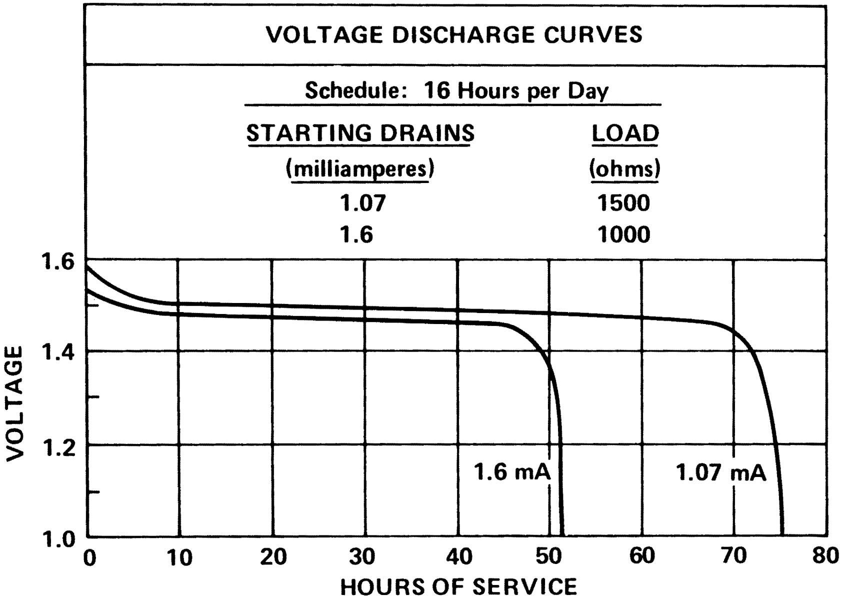
SPECIFICATIONS

Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt) .... 75 milliampere-hours
(Rated capacity at 1.07 milliamperes)
Terminals .... Flat Contacts
Average Weight.. 0.04 oz. (1.13 grams)
Volume (by displacement)............ 0.011 cubic inch (0.18 cubic centimeter)
Cell .... One No. 6-31201 (ANSI S5)

For service information see reverse side of this sheet

"EVEREADY" NO. S13E

Estimated Average Hours Service at 70°F (21.1°C)



IMPEDANCE

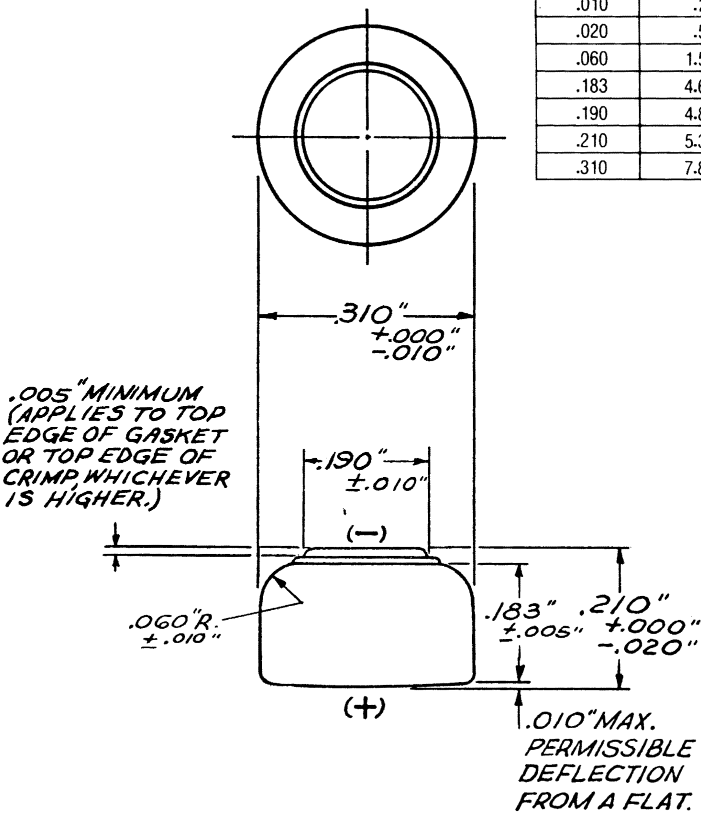
The impedance of these cells on open circuit and during useful discharge typically varies from 8–20 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

"EVEREADY" NO. 393 CELL

1.5 VOLTS

Type: Silver Oxide
ANSI Designation: WS5
Suggested Current Range: 0-5 milliamperes

Inches	Millimeters
.005	.13
.010	.25
.020	.51
.060	1.52
.183	4.65
.190	4.83
.210	5.33
.310	7.87



SPECIFICATIONS

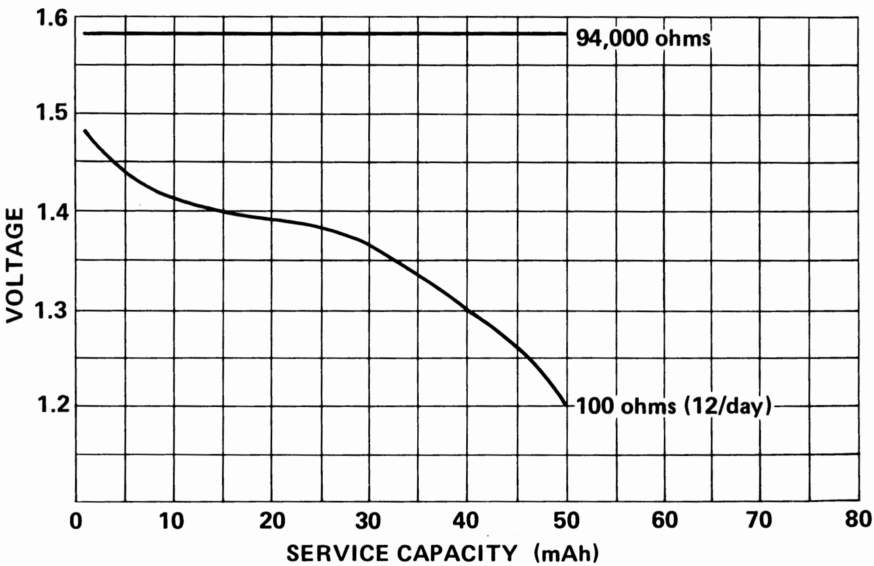
Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt) .... 75 milliampere-hours
(Rated capacity at 15000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.04 oz. (1.13 grams)
Volume (by displacement)............0.011 cubic inch (0.18 cubic centimeter)
Cell .... One No. 6-31202

For service information see reverse side of this sheet

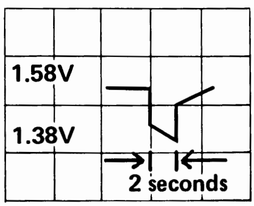
"EVEREADY" NO. 393

Preliminary Performance Data at 95°F (35°C)

Background: 94000 ohms continuous (IC simulated load 16.8 microamperes)
Pulse Width: 2 seconds
Pulse Frequency: 100 ohms @ 12/day (LCD backlight simulation)



TYPICAL PULSE



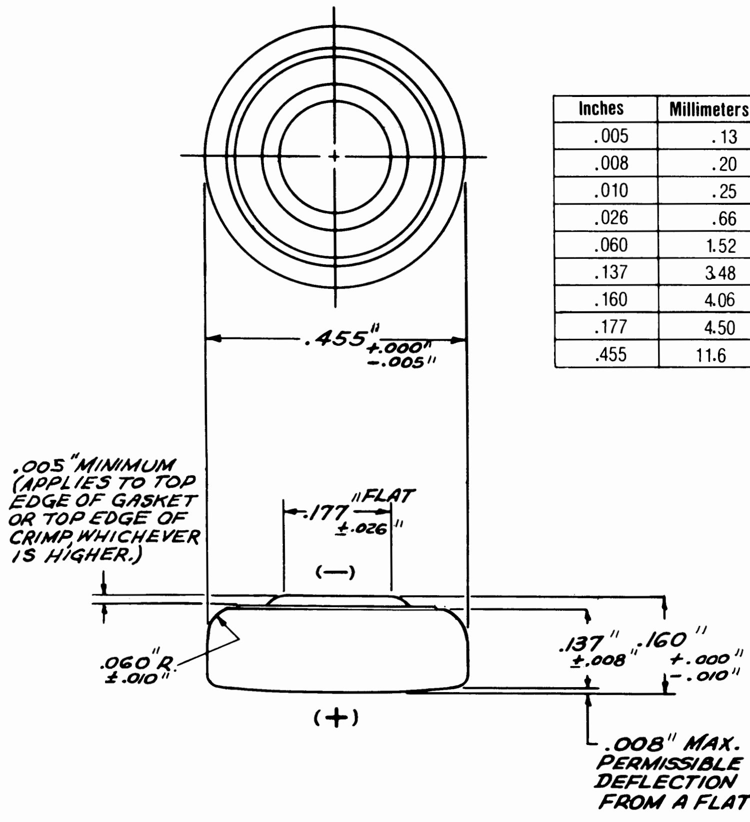
Estimated Service at 95°F (35°C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.3V
24 hours/day	104	15000	725 hours

"EVEREADY" NO. 301 CELL

1.5 VOLTS

Type: Silver Oxide
ANSI Designation: WS10
IEC Designation: SR43
Suggested Current Range: 0-100 microamperes



Inches	Millimeters
.005	.13
.008	.20
.010	.25
.026	.66
.060	1.52
.137	3.48
.160	4.06
.177	4.50
.455	11.6

SPECIFICATIONS

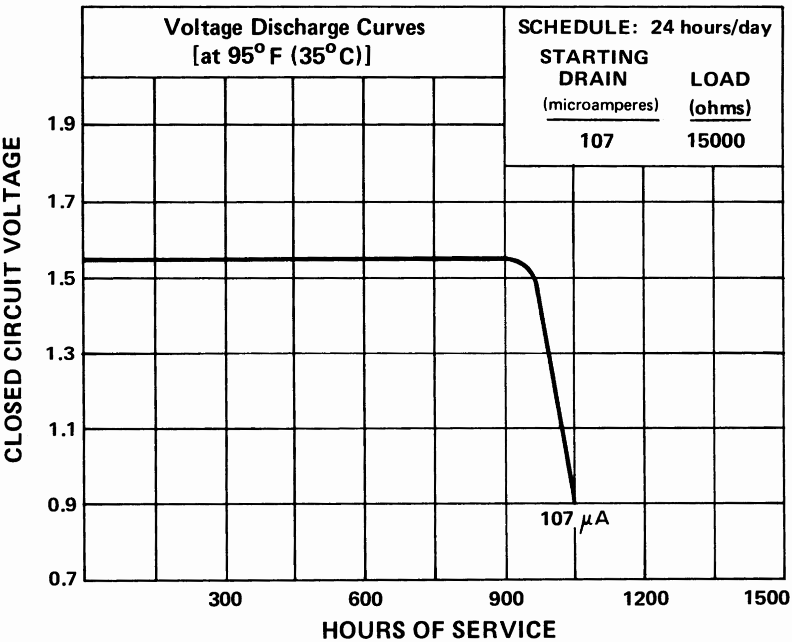
Voltage Taps .... −, + 1.5
Average Service Capacity (to 1.3 volts) .... 100 milliampere-hours
(Rated capacity at 15,000 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.06 oz. (1.7 grams)
Volume (by displacement) .... 0.023 cubic inch (0.38 cubic centimeter)
Cell Size .... One No. 7-45161

For service information see reverse side of this sheet

"EVEREADY" NO. 301

Estimated Average Service at 95°F (35°C)

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	CUTOFF VOLTAGE 1.3V
24 hours/day	10.6	150,000	12.5 months (estimated)	12 months (estimated)
	107	15,000	1050 hours	1000 hours



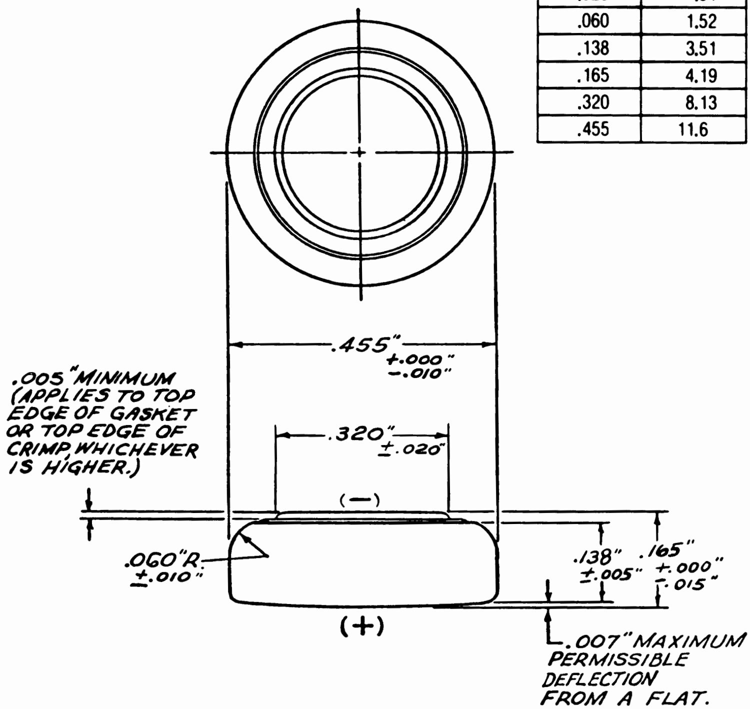
IMPEDANCE

Approximate open circuit impedance at 1000 Hz: 30 ohms average

"EVEREADY" NO. S41 CELL

Type: Silver Oxide
ANSI Designation: S10
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.020	.51
.060	1.52
.138	3.51
.165	4.19
.320	8.13
.455	11.6



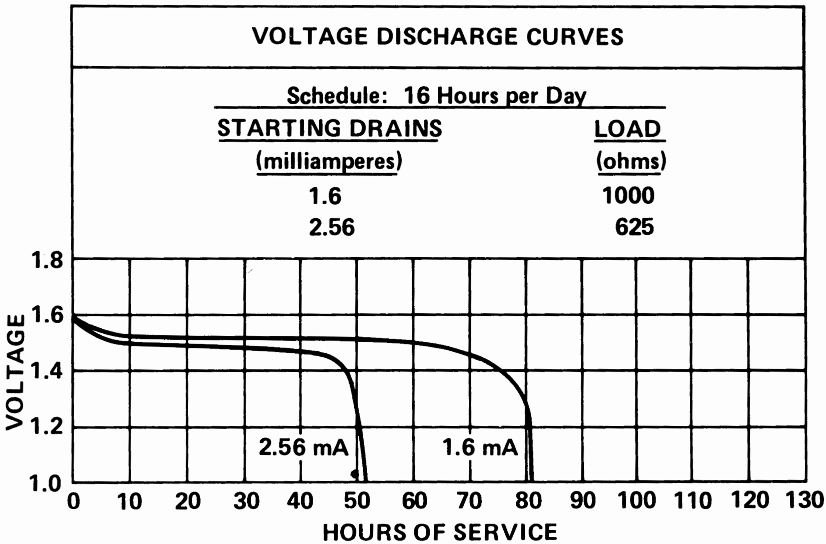
SPECIFICATIONS

Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt)........................120 milliampere-hours
(Rated capacity at 1.6 milliamperes)
Terminals.. Flat Contacts
Average Weight .... 0.06 oz. (1.7 grams)
Volume (by displacement).............. 0.02 cubic inch (0.33 cubic centimeter)
Cell .... One No. 6-45161 (ANSI S10)

For service information see reverse side of this sheet

"EVEREADY" NO. S41

Estimated Average Hours Service at 70°F (21.1°C)



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 3–12 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

Service vs. Temperature

For Following Conditions:

Starting Drain: 1.6 milliamperes
Load: 1000 ohms
Discharge Schedule: 16 hours/day
Cutoff: 1.3 volts

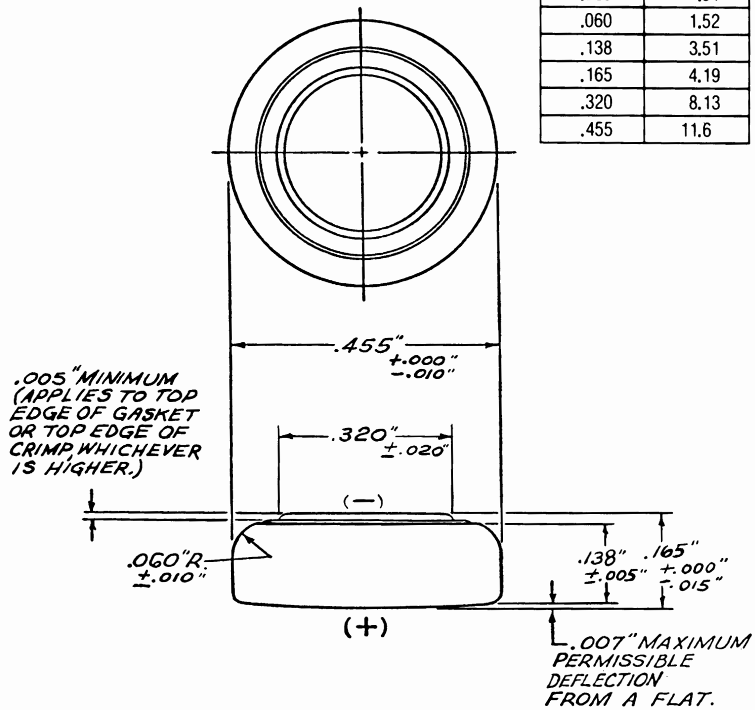
TEMPERATURE	% of 70°F (21.1°C) Service Vs. Temperature
70°F (21.1°C)	100%
32°F (0°C)	75%
0°F (–17.8°C)	35%
–20°F (–28.9°C)	7%

1.5 VOLTS

"EVEREADY" NO. S41E CELL

Type: Silver Oxide
ANSI Designation: S10
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.020	.51
.060	1.52
.138	3.51
.165	4.19
.320	8.13
.455	11.6



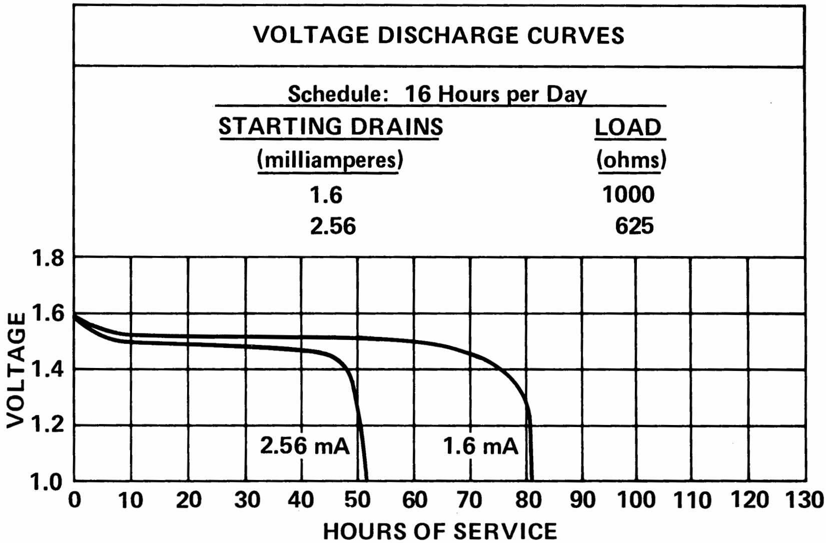
SPECIFICATIONS

Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt)........................ 120 milliampere-hours
(Rated capacity at 1.6 milliamperes)
Terminals.. Flat Contacts
Average Weight .... 0.06 oz. (1.7 grams)
Volume (by displacement).............. 0.02 cubic inch (0.33 cubic centimeter)
Cell .... One No. 6-45161 (ANSI S10)

For service information see reverse side of this sheet

"EVEREADY" NO. S41E

Estimated Average Hours Service at 70°F (21.1°C)



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 3—12 ohms. This applies over a frequency range of 40—5000 hertz and at the current drains shown above.

Service vs. Temperature

For Following Conditions:

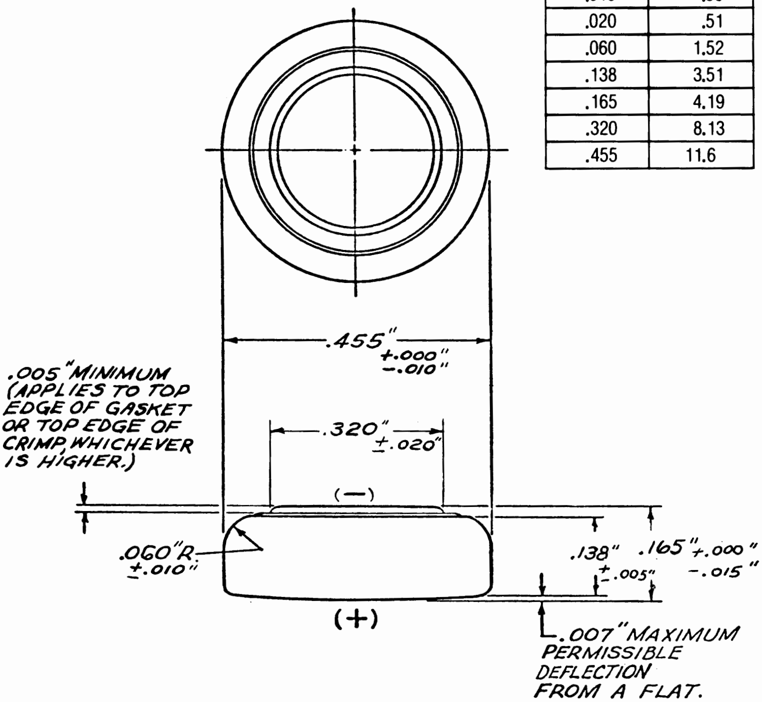
Starting Drain:	1.6 milliamperes
Load:	1000 ohms
Discharge Schedule:	16 hours/day
Cutoff:	1.3 volts

TEMPERATURE	% of 70°F (21.1°C) Service Vs. Temperature
70°F (21.1°C)	100%
32°F (0°C)	75%
0°F (−17.8°C)	35%
−20°F (−28.9°C)	7%

"EVEREADY" NO. 386 CELL

Type: Silver Oxide
ANSI Designation: WS10
IEC Designation: SR43
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.007	.18
.010	.25
.015	.38
.020	.51
.060	1.52
.138	3.51
.165	4.19
.320	8.13
.455	11.6



SPECIFICATIONS

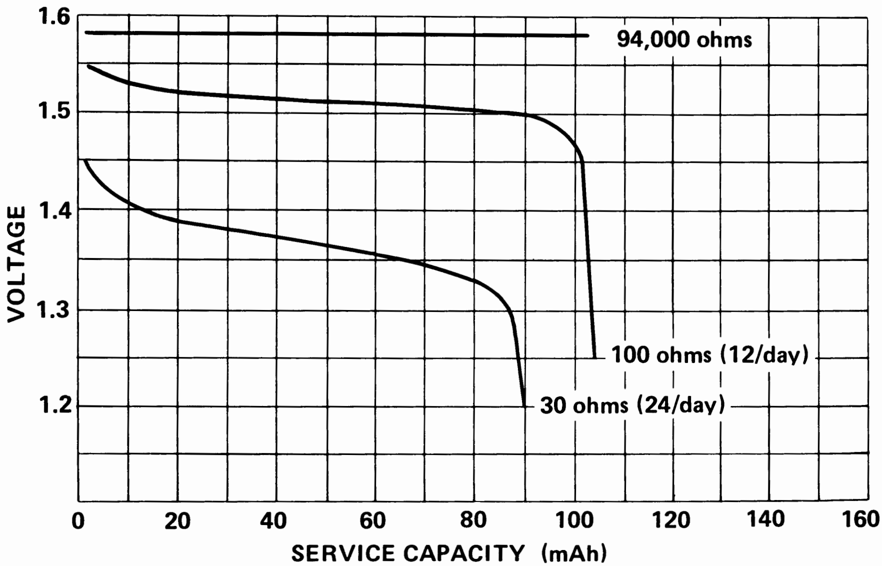
Voltage Taps .... −,+ 1.5
Average Service Capacity (to 0.9 volt) .... 120 milliampere-hours
(Rated capacity at 6500 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.06 oz. (1.7 grams)
Volume (by displacement) .... 0.02 cubic inch (0.33 cubic centimeter)
Cell .... One No. 6-45163

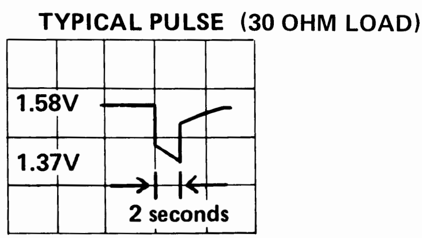
For service information see reverse side of this sheet

"EVEREADY" NO. 386

Preliminary Performance Data at 95°F (35°C)

Background: 94000 ohms continuous (IC simulated load 16.8 microamperes)
Pulse Width: 2 seconds
Pulse Frequency: 100 ohms @ 12/day (LCD backlight simulation)
30 ohms @ 24/day (LED simulation)





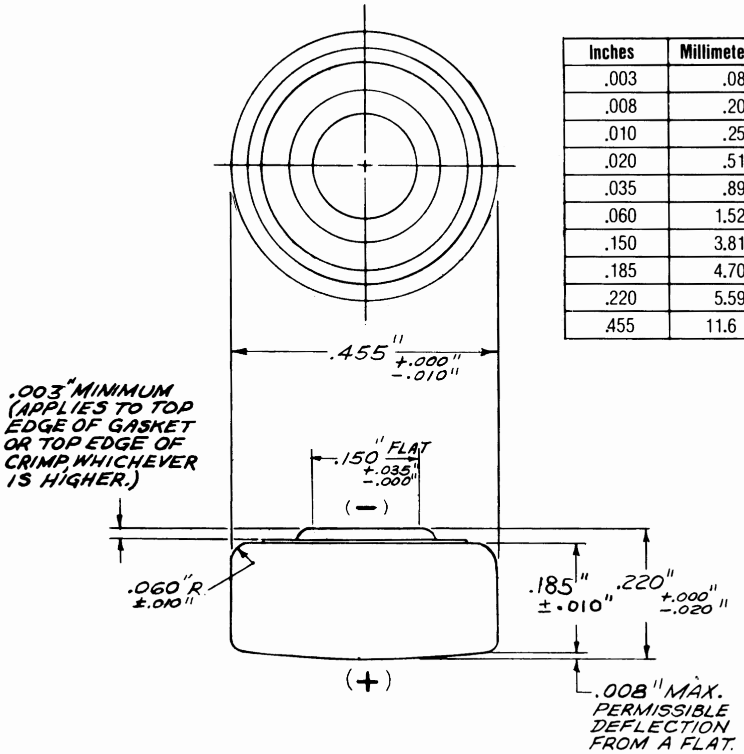
Estimated Service at 95°F (35°C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.3V
24 hours/day	240	6500	510 hours

"EVEREADY" NO. 303 CELL

(Formerly No. EPX77)
Type: Silver Oxide
ANSI Designation: WS16
IEC Designation: SR47
Suggested Current Range: 0-240 microamperes

Note: Replaces dimensionally and electrically discontinued Type No. EPX77



Inches	Millimeters
.003	.08
.008	.20
.010	.25
.020	.51
.035	.89
.060	1.52
.150	3.81
.185	4.70
.220	5.59
.455	11.6

SPECIFICATIONS

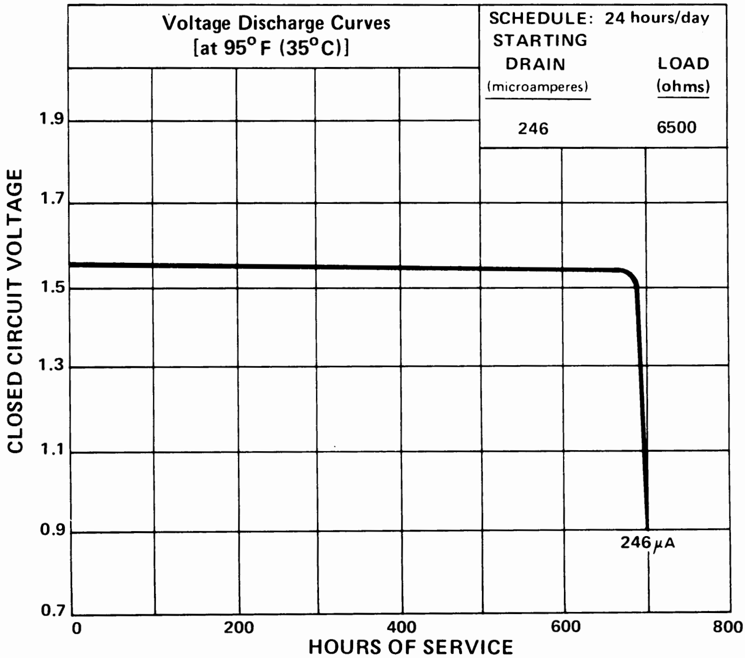
Voltage Taps .... −, + 1.5
Average Service Capacity (to 1.3 volts) .... 165 milliampere-hours
(Rated capacity at 6,500 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.09 oz. (2.55 grams)
Volume (by displacement) .... 0.031 cubic inch (0.51 cubic centimeter)
Cell Size .... One No. 7-45215

For service information see reverse side of this sheet

"EVEREADY" NO. 303 (formerly No. EPX77)

Estimated Average Service at 95°F (35°C)

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	CUTOFF VOLTAGE 1.3V
24 hours/day	17	94,000	13 months	12.8 months
	246	6,500	700 hours	685 hours



Service vs. Temperature

For Following Conditions:

Starting Drain: 205 microamperes
Load: 7800 ohms
Discharge Schedule: 24 hours/day
Cutoff: 1.3 volts

TEMPERATURE	% of 95°F Service Vs Temperature
113°F	94%
95°F	100%
70°F	95%
32°F	60%

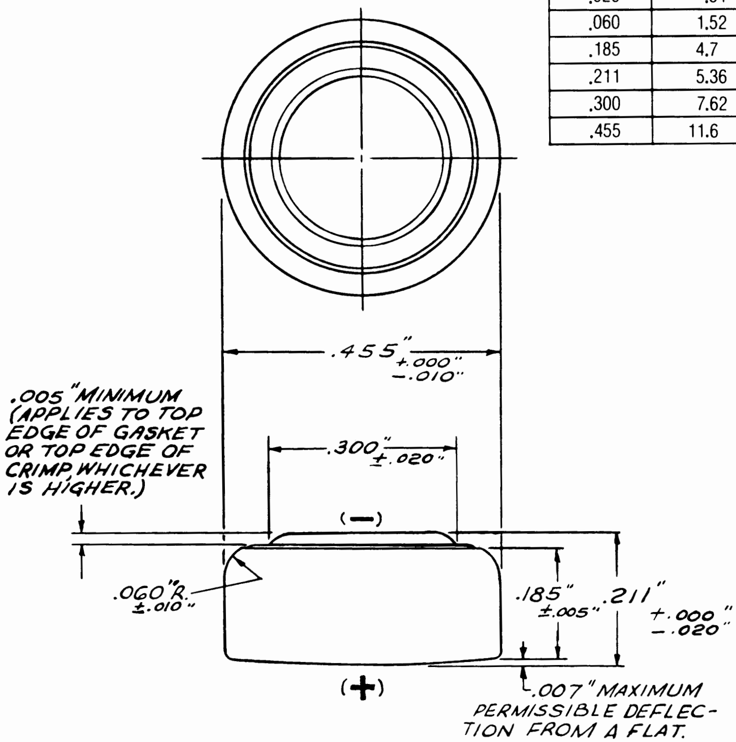
IMPEDANCE

Approximate open circuit impedance at 1000 Hz: 27 ohms average

"EVEREADY" NO. S76 CELL

Type: Silver Oxide
ANSI Designation: S15
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.007	.18
.010	.25
.020	.51
.060	1.52
.185	4.7
.211	5.36
.300	7.62
.455	11.6



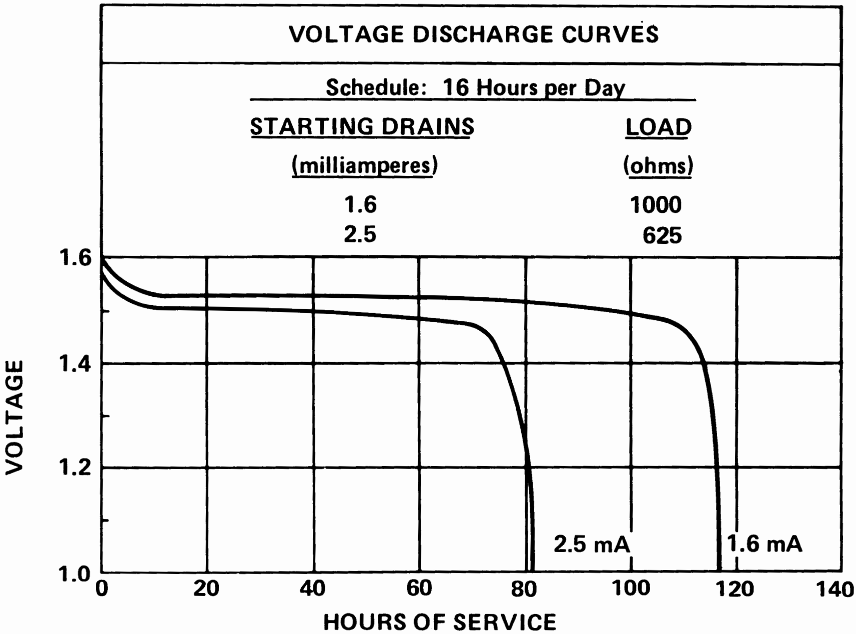
SPECIFICATIONS

Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt) .... 190 milliampere-hours
(Rated capacity at 2.56 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.08 oz. (2.3 grams)
Volume (by displacement) .... 0.029 cubic inch (0.48 cubic centimeter)
Cell .... One No. 6-45201 (ANSI S15)

For service information see reverse side of this sheet

"EVEREADY" NO. S76

Estimated Average Hours Service at 70°F (21.1°C)



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 3–12 ohms. This applies over a frequency range of 40–5000 hertz and at the current drains shown above.

Service vs. Temperature

For Following Conditions:

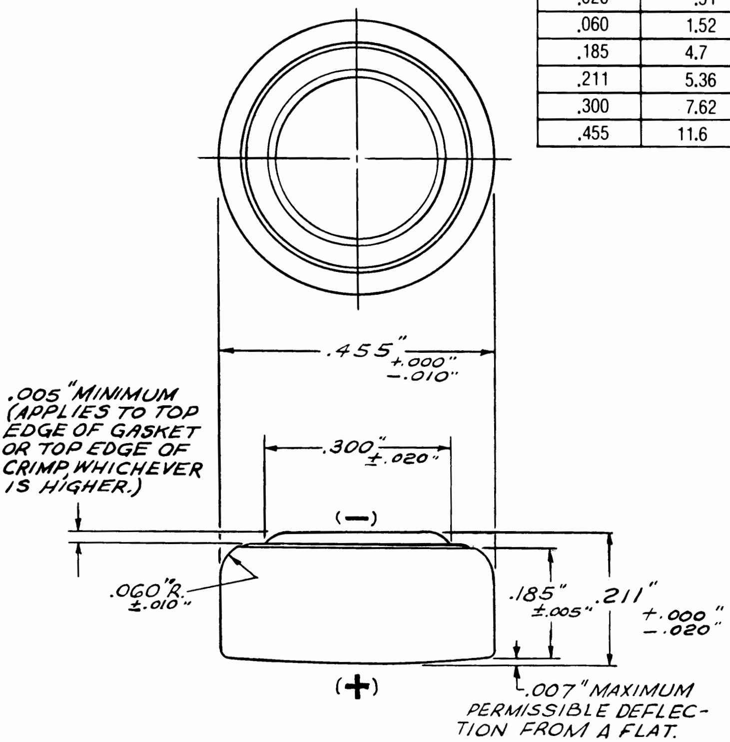
Starting Drain: 2.5 milliamperes
Load: 625 ohms
Discharge Schedule: 16 hours/day
Cutoff: 1.3 volts

TEMPERATURE	% of 70°F (21.1°C) Service Vs. Temperature
70°F (21.1°C)	100%
32°F (0°C)	70%
0°F (–17.8°C)	25%
–20°F (–28.9°C)	5%

"EVEREADY" NO. S76E CELL

Type: Silver Oxide
ANSI Designation: S15
Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.007	.18
.010	.25
.020	.51
.060	1.52
.185	4.7
.211	5.36
.300	7.62
.455	11.6



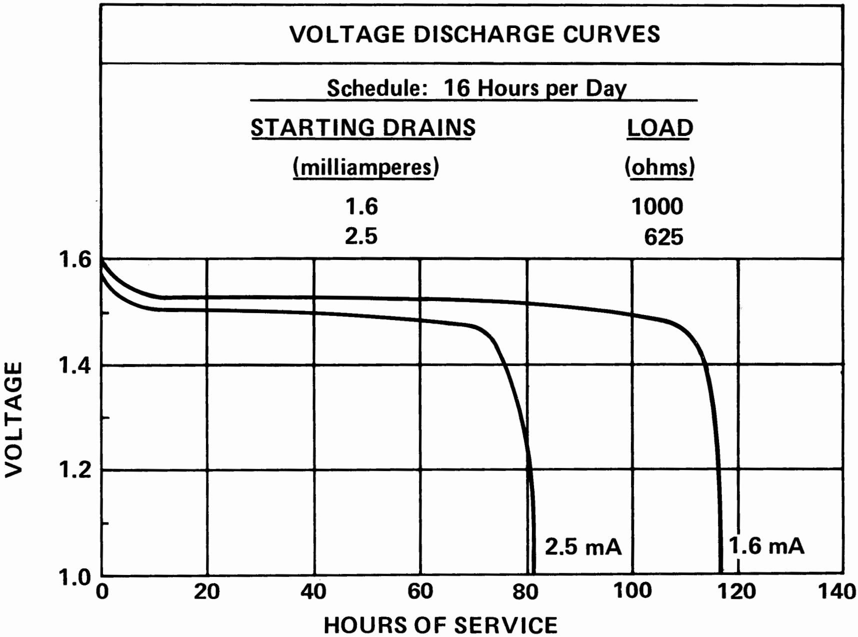
SPECIFICATIONS

Voltage Taps .... −, + 1.5
Average Service Capacity (to 0.9 volt) .... 190 milliampere-hours
(Rated capacity at 2.56 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.08 oz. (2.3 grams)
Volume (by displacement) .... 0.029 cubic inch (0.48 cubic centimeter)
Cell .... One No. 6-45201 (ANSI S15)

For service information see reverse side of this sheet

"EVEREADY" NO. S76E

Estimated Average Hours Service at 70°F (21.1°C)



IMPEDANCE

The impedance of these cells on open circuit and during useful discharge typically varies from 3—12 ohms. This applies over a frequency range of 40—5000 hertz and at the current drains shown above.

Service vs. Temperature

For Following Conditions:

Starting Drain: 2.5 milliamperes
Load: 625 ohms
Discharge Schedule: 16 hours/day
Cutoff: 1.3 volts

TEMPERATURE	% of 70°F (21.1°C) Service Vs. Temperature
70°F (21.1°C)	100%
32°F (0°C)	70%
0°F (−17.8°C)	25%
−20°F (−28.9°C)	5%

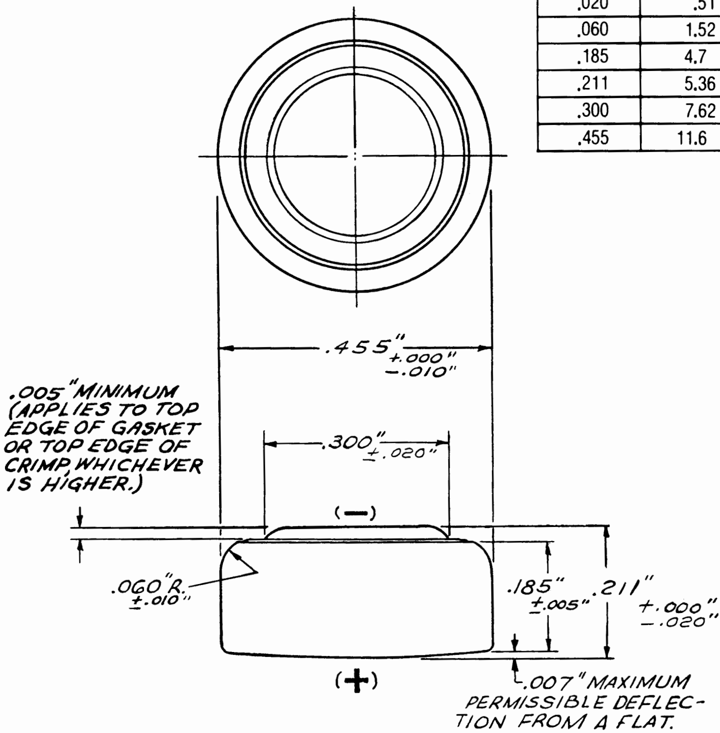
"EVEREADY" NO. 357 CELL

Type: Silver Oxide

IEC Designation: SR44

Suggested Current Range: 0-10 milliamperes

Inches	Millimeters
.005	.13
.007	.18
.010	.25
.020	.51
.060	1.52
.185	4.7
.211	5.36
.300	7.62
.455	11.6



SPECIFICATIONS

Voltage Taps .... −, + 1.5

Average Service Capacity (to 0.9 volt) .... 190 milliampere-hours
(Rated capacity at 6500 ohm load)

Terminals .... Flat Contacts

Average Weight .... 0.08 oz. (2.3 grams)

Volume (by displacement) .... 0.029 cubic inch (0.48 cubic centimeter)

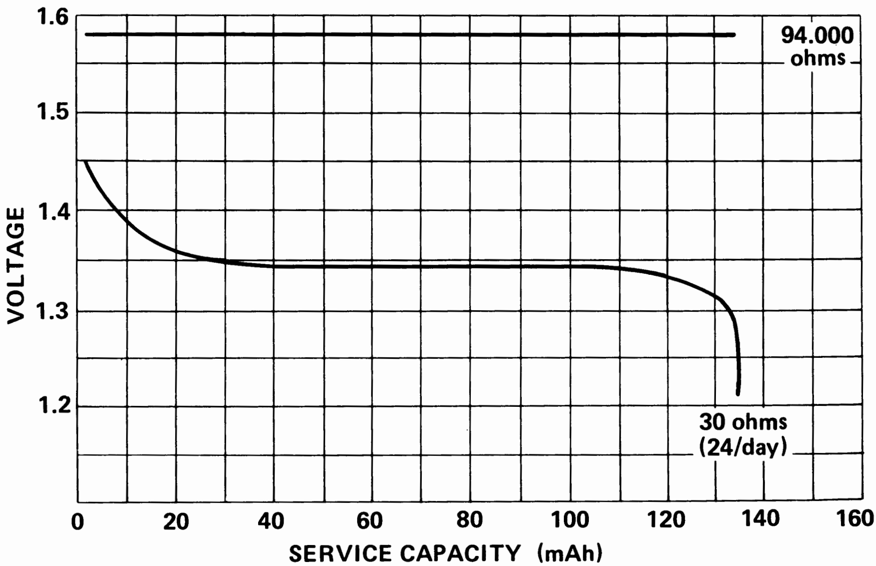
Cell .... One No. 6-45202

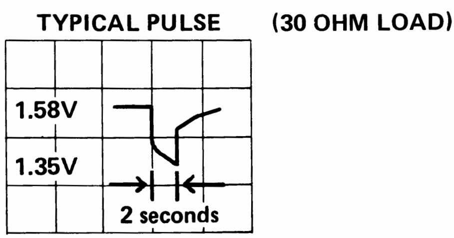
For service information see reverse side of this sheet

"EVEREADY" NO. 357

Preliminary Performance Data at 95°F (35°C)

Background: 94000 ohms continuous (IC simulated load 16.8 microamperes)
Pulse Width: 2 seconds
Pulse Frequency: 30 ohms @ 24/day (LED simulation)





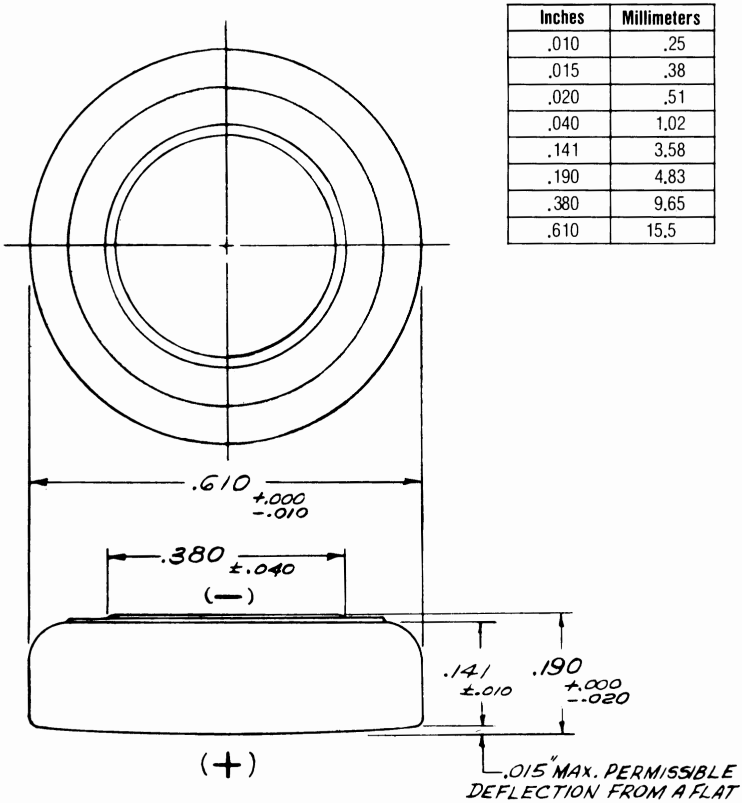
Estimated Service at 95°F (35°C)

SCHEDULE	STARTING DRAIN (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 1.3V
24 hours/day	240	6500	810 hours

"EVEREADY" NO. 355 CELL

1.5
VOLTS

Type: Silver Oxide
Suggested Current Range: 0-10 milliamperes



Inches	Millimeters
.010	.25
.015	.38
.020	.51
.040	1.02
.141	3.58
.190	4.83
.380	9.65
.610	15.5

Non-Magnetic Positive Can

SPECIFICATIONS

Voltage Taps .... —, + 1.5
Average Service Capacity (to 1.3 volts) .... 210 milliampere-hours
(Rated capacity at 6500 ohm load)
Terminals .... Flat Contacts
Average Weight .... 0.13 oz. (3.69 grams)
Volume .... 0.055 cubic inch (0.9 cubic centimeter)

For service information see reverse side of this sheet

"EVEREADY" NO. 355

Estimated Average Service at 95°F (35°C)

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUTOFF VOLTAGE 0.9V	CUTOFF VOLTAGE 1.3V
24 hours/day	246	6500	915 hours	905

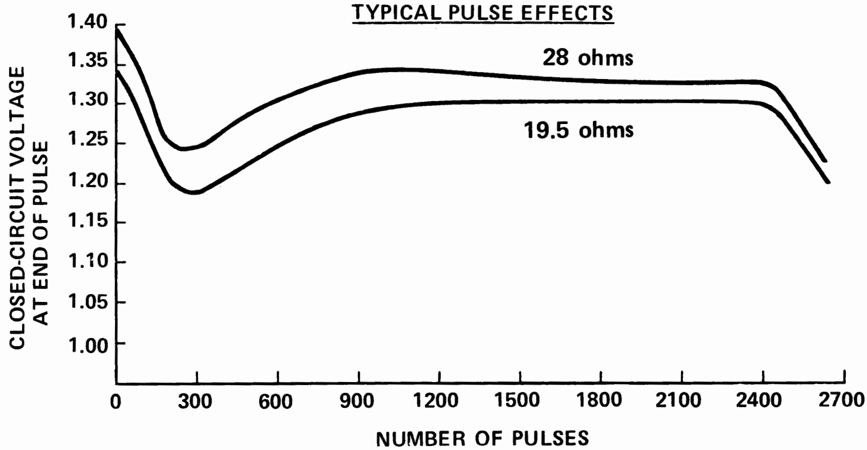
This battery was designed for use in continuous low drain — high pulse drain on demand.

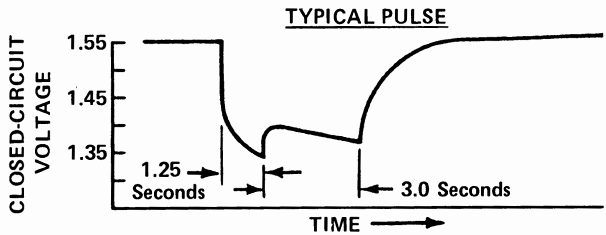
This high rate battery with a special formula and construction is ideally suited for use in watches with a light emitting diode display.

Maximum Suggested Pulse Drain: 100 mA

Shown below is the effect of high-rate pulse currents, such as those required by light-emitting diodes, on the battery closed-circuit voltage.

While a load of 330,000 ohms was continuously applied to the battery, additional loads of 19.5 ohms for 1.25 seconds, followed immediately by 28 ohms for 3 seconds were applied six times per hour for 16 hours every day. The curves show minimum battery voltage at the end of the pulses. Recuperation in battery voltage is illustrated by the typical pulse.





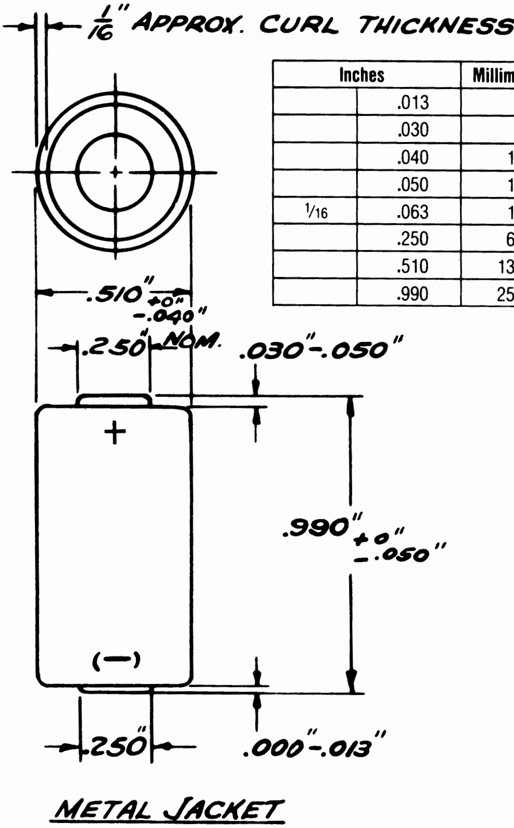
Impedance

Approximate open circuit impedance at 1000 Hz: Less than 4 ohms

"EVEREADY" NO. 544 BATTERY

6 VOLTS

Type: Silver Oxide
Suggested Current Range: 0-10 milliamperes



Inches		Millimeters
	.013	.33
	.030	.76
	.040	1.02
	.050	1.27
1/16	.063	1.59
	.250	6.35
	.510	13
	.990	25.2

SPECIFICATIONS

Voltage Taps .... −, + 6
Average Service Capacity (to 3.6 volts) .... 190 milliampere-hours
(Rated capacity at 2.5 milliamperes)
Terminals .... Flat Contacts
Average Weight .... 0.5 oz. (14.2 grams)
Volume (By displacement) .... 0.171 cubic inch (2.8 cubic centimeters)
Cells .... Four No. 6-45201 (ANSI S15) in series
Jacket.. Metal (See cautionary statement on page 4)

For service information see reverse side of this sheet

"EVEREADY" NO. 544

Estimated Average Service at 70°F (21.1°C)

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUTOFF VOLTAGE 3.6V
24 hours/day	2.5	2400	60 hours
1 second on, 11 seconds off, 8 hours/day, 5 days/week (Simulated Camera Application)	40	150	15300 pulses

BATTERY CHARGING

General Principles of Battery Charging

Batteries contain potential energy in chemical form and have the ability to convert this by electrochemical reactions into electrical energy to produce useful work in an external circuit. Certain batteries use electrochemical systems which are reversible and can accept electrical energy and transform it back into stored chemical energy. These are variously called, secondary, storage or rechargeable batteries.

There are many ways of charging secondary batteries. However, all charging circuits use the same basic principles and the amount of control over the charging current or voltage determines the circuit complexity.

The basic requirement for a battery charger is a source of direct current having a voltage higher than that of the fully charged battery. The positive terminal of the charging source is connected to the positive terminal of the battery so that the charging current is forced through the battery in the reverse direction. This is illustrated by Figure 48.

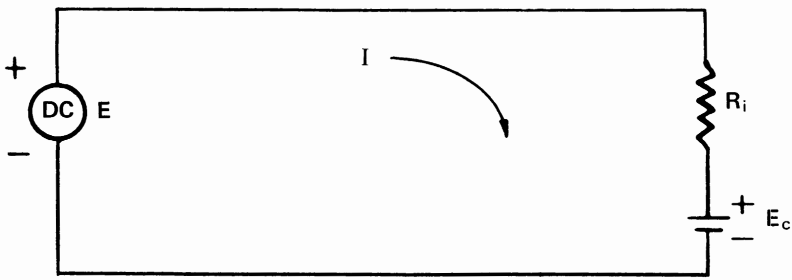


FIGURE 48 – ELEMENTARY CHARGING CIRCUIT

E = Impressed Voltage
I = Charging Current
R_i = Internal Battery Resistance
E_c = Battery Counter-electromotive Force

The basic electrical relations provide the following equation from Figure 48.

$$E = E_c + IR_i \qquad (1)$$

Therefore the current flowing at any given time is

$$I = \frac{E - E_c}{R_i} \qquad (2)$$

To have charge current (I) flowing thru the battery, E must be larger than E_c as shown by Equation (2). If battery voltage is greater than source voltage, no current will flow into the battery to charge it.

The battery voltage (E_c) varies during the charging process. For example, nickel-cadmium battery voltage will increase rapidly with time during early part of charge but will change less rapidly thereafter as full charge is reached. See Figure 49.

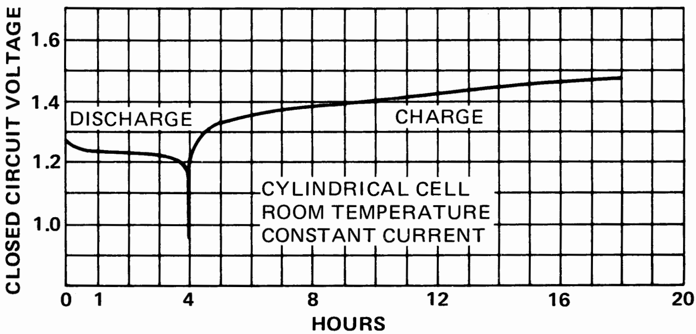


FIGURE 49
TYPICAL VOLTAGE OF NICKEL–CADMIUM DURING CHARGING AT 10 HOUR RATE

The alkaline-manganese dioxide rechargeable battery exhibits a different voltage character during charge. The voltage change is more gradual and total change is greater than that of the nickel cadmium battery. See Figure 50.

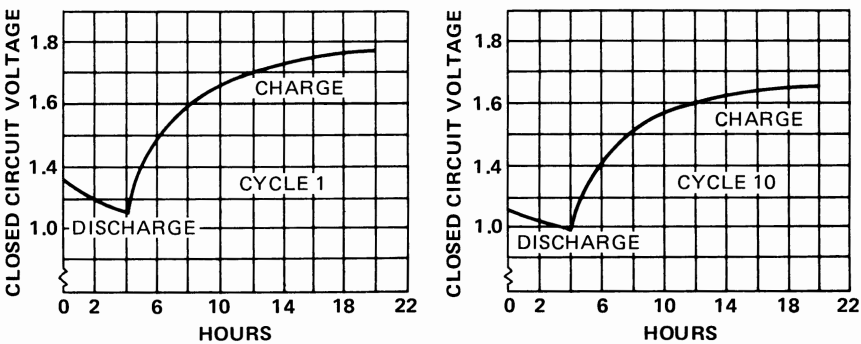


FIGURE 50
TYPICAL INDIVIDUAL DISCHARGE AND CHARGE CURVES FOR 'EVEREADY' ALKALINE–MANGANESE DIOXIDE RECHARGEABLE CELL.

The charge circuit design must be based on battery characteristics and usage. Important points are: the internal resistance of the battery (usually a fraction of an ohm), the initial and final charge current values, the battery voltage change during charge and the charge time desired. In addition, the effect of such variables as temperature and source voltage variations on battery parameters must be considered. Various circuitry may be used to minimize the effect of these variables and is discussed in the following sections relating to specific battery types.

Capacity

Capacity in ampere-hours of nickel-cadmium batteries is the product of the discharge current and the time in hours required to discharge a fully charged cell or battery to a chosen endpoint. The capacity rating of "Eveready" nickel-cadmium cells and batteries is based upon output in discharge at the 1 hour rate to an endpoint of 1.0V/cell for all cylindrical cells (except CH1.8 and CH2.2) and at the 10 hour rate to 1.1V/cell for button cells (and CH1.8 and CH2.2).

Discharge Rate

The discharge rate for nickel-cadmium batteries is the constant current in amperes which is just sufficient to discharge a fully charged cell or battery down to a chosen endpoint voltage (e.g. 1.1V/cell) precisely at the end of a specific continuous discharge period of time, e.g. 10 hours. This current is then the 10 hour rate for this battery. This current multiplied by 10 is the rated ampere-hour capacity.

Charge Rate

The charge rate for nickel-cadmium batteries is determined by dividing rated battery capacity in ampere-hours by the theoretical time, in hours, required at perfect charge efficiency to recharge the battery. Because of less than 100% charging efficiency, charge time at this rate should be chosen to replace 140% of the energy expected to be discharged from the battery. For example, the 20 hour rate in amperes is

equal to $\dfrac{\text{rated ampere-hours (e.g. to 1.1V at the 10 hour rate).}}{20}$ It is then necessary to charge 28 hours at the 20 hour rate in amperes.

Use of too low a charge rate or too short a charge time will not recharge the battery fully.

Charge rates in commercial use today range from the 15 minute rate to the 50 hour rate depending on the battery type employed and the intended use pattern of the battery operated device. Each of these applications should be discussed with your Union Carbide Application Sales Field Manager to make certain that proper safeguards are provided to prevent irreparable damage to the battery.

Charge Methods

There are three general methods of charging batteries; constant voltage, constant current, and taper current. For charging various types of sealed batteries, the recommended use of the three general methods is as follows:

1. Constant Voltage: not recommended for sealed nickel-cadmium batteries unless special control circuitry is employed. The behavior of the battery "on charge" voltage determines the practicality of this method.
2. Constant Current: recommended for sealed nickel-cadmium batteries, and may be used for sealed alkaline-manganese dioxide rechargeable batteries only if charge time is controlled by the user.
3. Taper Current: may be used with any of the battery systems, but also

requires control by the user. Special taper current charge designs are recommended for alkaline-manganese dioxide rechargeable batteries.

Constant Voltage Charging

The constant voltage method supplies a fixed voltage to the battery and limits the maximum battery "on charge" voltage to the source of supply voltage value. The charge current depends on the difference between fixed source voltage and varying battery voltage. At the start of charge battery voltage may be low and charge currents may be quite high. This can best be illustrated by an example using the circuit of Figure 48 and calculating the current using Equation (2). Consider a 4 ampere-hour cell having an internal resistance of 0.1 ohm being charged from a constant voltage source of 1.47 volts. At the start of charge the battery voltage is 1.27 volts and at the end of charge this increases to 1.45 volts. At the start of charge the current and charging rate will be

Current

$$I = \frac{E - E_c}{R_i} = \frac{1.47 - 1.27}{0.1} = 2 \text{ amperes}$$

Charge Rate

$$\frac{\text{ampere-hours}}{I} = \frac{4}{2} = 2 \text{ hour rate}$$

and at the end of charge

$$I = \frac{1.47 - 1.45}{0.1} = 0.2 \text{ ampere} \qquad \frac{4}{0.2} = 20 \text{ hour rate}$$

It is apparent from this example that a small change in source voltage E will result in a large change in current. Hence source voltage must be precisely correct and remain constant. In practice this requires a relatively expensive regulated voltage source which does not vary more than about ± 1 percent. Constant voltage chargers are not recommended for general use because of the high cost, circuit complexity and various associated technical problems.

Constant Current Charging

Constant current charging is the simplest method. It is accomplished by making the charging source voltage much greater than the battery voltage and limiting the current flow with a large value of series resistance. The series resistance value is large compared to battery resistance, hence controls the charge circuit making the effect of battery voltage change less significant to circuit operation. This is illustrated by the circuit of Figure 51.

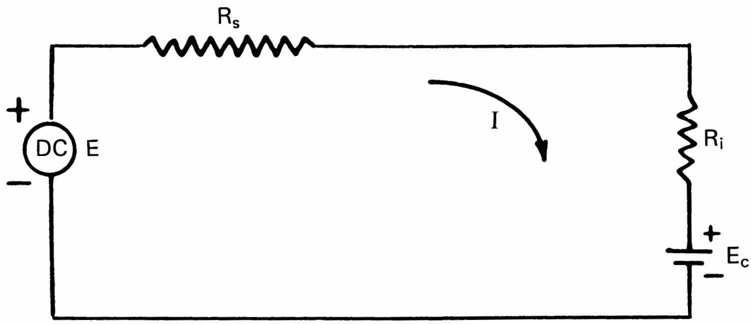


FIGURE 51 – CHARGING CIRCUIT WITH CURRENT LIMITING SERIES RESISTOR R_s

Equation (2) now becomes

$$I = \frac{E - E_c}{R_s + R_i} \qquad (3)$$

$$R_s = \frac{E - E_c}{I} - R_i \qquad (4)$$

If E is made large with respect to E_c, the current becomes relatively constant with respect to small battery voltage changes. Currents will also change less radically with source voltage variation. Assume that a nickel-cadmium 4 ampere-hour cell is to be charged at the 10 hour rate of 0.40 ampere from a 10 volt source. The value for the series resistor can be calculated from Equation (4) for the initial cell voltage of 1.27 volts and an internal resistance of 0.1 ohm.

$$R_s = \frac{10 - 1.27}{0.40} - 0.1 = 21.7 \text{ ohms}$$

From Equation (3) the current at the end of charge, when battery voltage has increased to 1.45 volts, will be

$$I = \frac{10 - 1.45}{21.7 + 0.1} = 0.39 \text{ ampere}$$

Thus the current will decrease only by 2.5 percent (.40 to .39 ampere) during charge compared to a tenfold decrease for the constant voltage charging example.

Taper Current Charging

In taper current charging the current is fairly high at the start of charge and tapers off to a lower value at the end of charge. With the exception of large industrial type automatically programmed chargers, the taper results from the battery voltage rise during charge. The degree of taper depends upon the voltage character of the battery during charge.

With proper circuit design taper current charging can be used with most of the common battery systems. This method, as does constant current, requires customer control to terminate charge. The degree of taper can be adjusted by numerous design methods but current is controlled by the battery voltage rise on charge. The taper may be accomplished by transformer design, making the transformer secondary voltage or power supply voltage about the same as the end of charge voltage of the battery. As battery voltage rises with charge and approaches source voltage value, the current is reduced or 'tapers'. Initial charge current must be limited in most cases since battery systems are not capable of efficiently accepting charge at extremely high rates. For example, the maximum initial current should be limited to about the 4 or 6 hour rate for the alkaline-manganese rechargeable battery when using a steep taper type charge circuit. The special taper current type circuit recommended for alkaline-manganese combines to a degree the features of constant current and constant voltage techniques. It must be remembered, however, that current variations result from both ac power source changes and battery "on charge" voltage variations.

Trickle Charging

Most of the rechargeable battery systems exhibit a self discharge characteristic. A cell when left on shelf, or open circuit, for long periods of time will gradually lose charge or capacity. In applications involving standby or emergency power it is often desirable to maintain a battery at peak charge condition. This is done by keeping the battery on a very low charge rate referred to as a trickle charge. In general terminology the charge rate may taper to a trickle rate or the circuit may be designed for a specific trickle rate to maintain battery at full capacity at all times. The trickle rate may vary with the battery system. Trickle charging for a nickel-cadmium battery is on the order of the 30-50 hour rate.

General Charging Circuits

The most common power source for recharging batteries is the 120 volt 60 Hz, single phase, alternating current household supply. As the name alternating current (ac) implies, the voltage polarity changes from positive to negative during each cycle and this causes the direction of current flow to reverse. Current flows in one direction half the time and in the opposite direction the other half of the time.

To utilize the common ac power for battery charging requires two steps. First the voltage must be stepped down or reduced to proper value for any given battery and second the current flow must be limited to one direction, direct current (dc), only. If an alternating current (ac) source is connected to a battery, the current will be charging the battery half of the time and discharging it during the other half cycle.

The step down or decrease in ac voltage from the power line is most commonly accomplished by the use of a transformer. Limiting the current flow to one direction is called rectification, and is accomplished by the use of one or more rectifiers, or diodes. The more common circuits are shown in Figures 52, 53 and 54. The manner of connecting depends on the desired type of rectification.

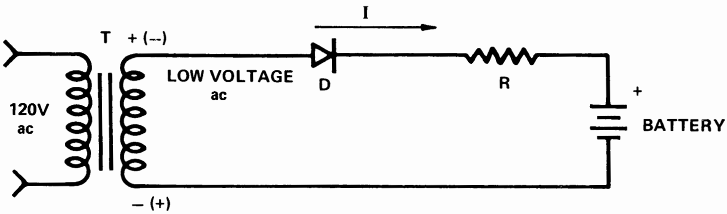


FIGURE 52 – HALF-WAVE RECTIFIER CIRCUIT USING VOLTAGE STEP-DOWN TRANSFORMER AND CURRENT LIMITING RESISTOR

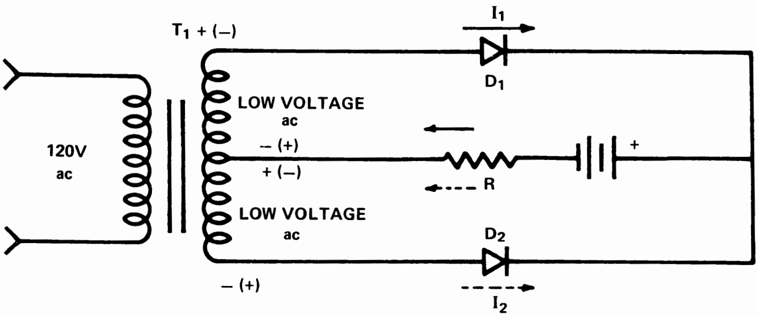


FIGURE 53 – FULL-WAVE RECTIFIER CIRCUIT USING VOLTAGE STEP-DOWN TRANSFORMER WITH CENTER TAPPED SECONDARY AND CURRENT LIMITING RESISTOR

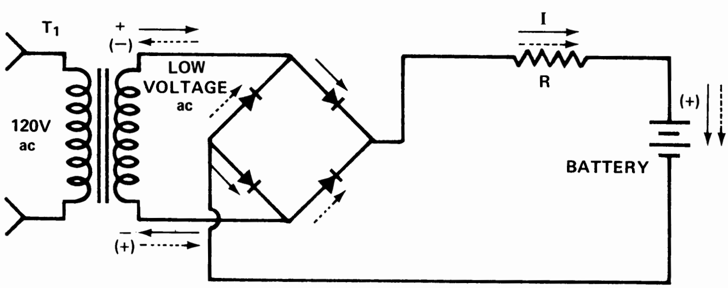


FIGURE 54 – FULL-WAVE BRIDGE CIRCUIT USING VOLTAGE STEP-DOWN TRANSFORMER AND CURRENT LIMITING RESISTOR

The rectification of the ac wave may be either half-wave or full-wave. Half-wave uses only one polarity (one half of the ac wave) whereas full-wave utilizes both halves or polarities of the ac voltage providing a higher charge current. The connection for full-wave rectification may take two forms, full-wave center tap or full-wave bridge. The half-wave and full-wave connections with current flow and polarities are as indicated in Figures 52, 53 and 54. Note that the alternate rectifiers or pairs of rectifiers in the full-wave connections are conducting on each half cycle but current flow thru the battery is in only one direction.

The value of the charging current depends on the difference between the transformer and battery voltages and the value of the resistance R. The voltage and current waveforms for half-wave and full-wave rectification are shown in Figures 55 and 56 respectively. The average of the current pulses represents the dc current that is charging the battery. Note that full-wave rectification gives two charging pulses per cycle instead of one as with half-wave, giving about twice the dc current.

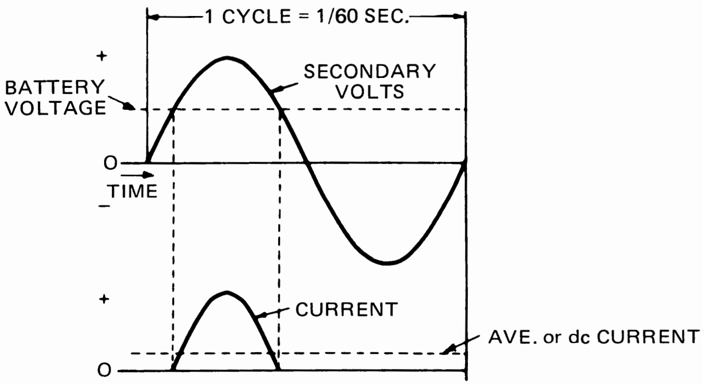


FIGURE 55 – VOLTAGE AND CURRENT WAVE FORMS FOR HALF-WAVE RECTIFICATION

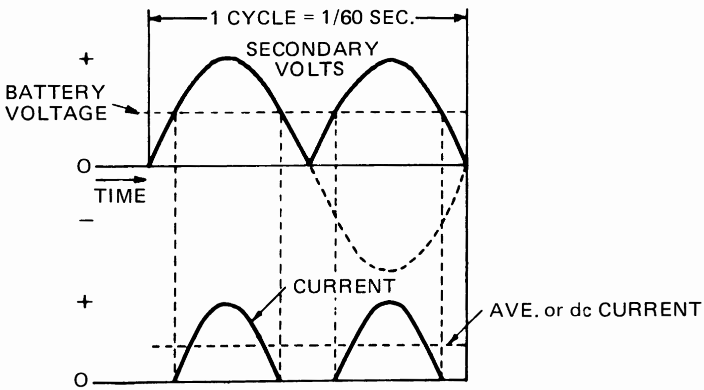


FIGURE 56 – VOLTAGE AND CURRENT WAVE FORMS FOR FULL-WAVE RECTIFICATION

These transformer type charge circuits are adequate for battery charging. Either half or full-wave rectification is satisfactory and no filtering or smoothing is necessary. These circuits offer a major advantage of isolation of the ac power line from the battery which eliminates electric shock hazards. A transformer type circuit is recommended in any application where the battery terminals or connections are accessible during charge and human contact is possible.

The transformer/half-wave rectifier circuit of Figure 52 is commonly used for charge currents in the range of 2-500 mA and may be designed for any reasonable number of series connected cells.

Advantages: Low cost, simplicity, minimum of parts and power line isolation.

Disadvantages: Relatively large size for low charge currents, (below 10 mA). Heat dissipation can be a problem at high currents.

Applications: Recommended wherever easy access to battery compartment is possible; toys; small household appliances such as toothbrushes, knives; power tools.

The transformer/full-wave rectifier circuits of Figures 53 and 54 are interchangeable as far as charging characteristics. In most cases a matter of economics determines whether the two extra rectifiers of the bridge circuits are used or the center tapped transformer of Figure 53.

Advantages: High efficiency at medium and high currents; power line isolation.

Disadvantages: Expensive for low currents; large size.

Applications: Used in applications where the charging current is higher than 500 mA.

Other methods using resistive or reactive voltage dividing networks may be used to reduce power line voltages to usable values. The capacitor/full-wave bridge circuit of Figure 57, commonly referred to as a reactance charger, is used for low charging currents (2-100 mA) where the charger is built into the end device along with nonremovable battery. It is essential to isolate all parts of the circuit, including battery and battery connections, from human contact to prevent electrical shock hazards.

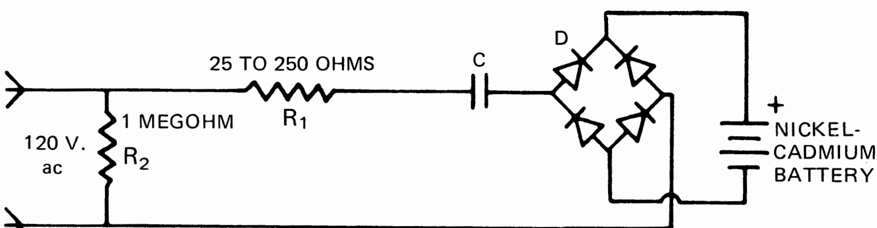


FIGURE 57 – CAPACITOR – FULL-WAVE BRIDGE RECTIFICATION (REACTANCE CHARGER)

The voltage is divided in proportion to the various circuit elements in series. In case of Figure 57 these are R (resistive) capacitor C (reactive) and battery which behaves as a combination of resistive and reactive elements. The battery impedance (the total effect of resistance and reactive components of the battery) is much smaller than the reactance of the capacitor hence most of the voltage appears across the capacitor. The current controlling element then is the capacitor. The current and voltage are out of phase (amplitudes are different at any given time) which provides heatless operation.

A series resistor R_1 is sometimes used to prevent surge currents from exceeding the rectifier ratings when the circuit is first energized. The parallel resistor R_2 provides a discharge path for the capacitor (C) when the charger is disconnected from the ac power receptable.

Advantages: Inexpensive, simple, nonheat producing, small size and light weight.

Disadvantages: Useful for low charge currents only. Potential shock hazard if proper design is not observed. Battery should not be disconnected while circuit is energized.

Applications: Small flashlights, radios, electric shavers, cigarette lighters, etc.

EXPERIMENTAL CHARGER COMPONENTS AND CIRCUITS

It is often necessary to charge batteries for use with proposed device design. With overall design not finalized, it is advantageous to have a charger which will provide selection of charge rates and voltages to match batteries of different capacities and number of cells. Such circuits can be readily constructed using standard transformers, diodes and resistors. The commercial type dc power supplies may also be used by adding limiting resistance as needed.

Transformers

Transformers usually comprise what are referred to as a primary and secondary winding. The windings are wound by various techniques around a magnetic material called the core. The voltage transformation is accomplished by magnetic coupling between windings. The windings or wire of the primary and secondary are electrically isolated which provides protection from possible contact with the ac powerlines.

Due to inefficiency and small losses inherent with inductive coupling the secondary voltage, when specified as open circuit voltage (OCV) with no load connected, may be somewhat different from closed circuit voltage (CCV) when load is connected and current is flowing. The difference in the OCV and CCV of the transformer secondary voltage depends on design and operating point relative to power rating. For practical purposes it is assumed that there is little difference in OCV and CCV of the secondary voltage, E_{ac}, used for circuit parameter estimates in these examples. The end of charge battery voltage will vary with different battery systems. For this purpose E_{dc} can be estimated as 1.45 volts/cell for nickel-cadmium and 1.75 volts/cell for alkaline-manganese. The rms current rating of the transformer secondary should be at least one and one half to two times the direct current (dc) charge current value.

Many power transformers are available as stock items. These may be obtained through various catalog listings or from wholesale and retail outlets in many sections of the country. Power transformers normally are listed giving primary voltage and frequency and the secondary voltage and current ratings. The ratio of E_{ac} (transformer secondary voltage) to E_{dc} (battery "on charge" voltage) need not be exact, but should be reasonably close to recommended values to prevent excessive charge current variations or excessive power dissipation. The transformer load regulation (variation of voltage with load current) is not a critical factor for most low voltage battery charging applications providing other circuit design parameters are met.

Some fundamental relationships for transformers are given below. The secondary voltage relative to the primary voltage varies as the ratio of the "turns" of the primary to "turns" of secondary winding. A turn is defined as one complete loop of wire around the core.

$$\frac{\text{(primary voltage)}}{\text{(secondary voltage)}} \quad \frac{Vpri}{Vsec} = \frac{Npri}{Nsec} \quad \frac{\text{(turns primary)}}{\text{(turns secondary)}}$$

Secondary current varies inversely as the turns ratio, N.

$$\frac{Isec}{Ipri} = \frac{Vpri}{Vsec} = \frac{Npri}{Nsec} = N$$

Both windings exhibit a dc resistance which is proportional to the length and inversely proportional to the diameter of the wire. The resistance of the independent windings interact in the magnetic transformation and the resultant resistance is determined to or "referred" to the secondary winding since the load circuit is connected to the secondary and this resistance affects circuit operation. The total resistance may be found from dc resistance measurements of the two windings and the turns ration B by

$$R_t \text{ (transformer resistance)} = R \text{ (secondary)}. + \frac{R \text{ (primary)}}{N^2}$$

The actual value of winding resistance also varies with temperature. The temperature of the transformer depends on operating point and power ratings. The resistance value should be corrected to compensate for relative operating point. This correction may vary up to 10% for cold to hot transformer.

A great advantage can be gained in applications requiring large guantities of chargers by having the transformer specially designed for the circuit in lieu of using a standard or stock item. In low current applications the limiting resistance can be built into the secondary winding and the small silicon diodes (rectifiers) connected direct to windings and "wrapped in" inside the protective covering of the windings. This simplifies assembly and provides a complete charging unit requiring only ac and dc connections.

The transformer manufacturer may request different parameters for design purposes. Basic specs include the voltage and frequency of the alternating current power source to primary, the desired open circuit voltage of the secondary, secondary load current, and load characteristics whether resistive or reactive. It may be advantageous to indicate intended usage patterns. The ratio of on time to off time for the charger may dicate the design since core losses etc. produce heat which must be dissipated.

Diodes

The ac is converted to dc by use of a rectifier, or diode. Diodes act like check valves in a water line, permitting flow in one direction but blocking it in the other. The circuit symbol used to represent a diode is shown in Figure 58. The arrow, or point of triangular symbol, points in the direction that current can flow. There are many types of rectifiers and diodes, but normally either selenium or silicon rectifiers and silicon or germanium diodes are used in small battery chargers. These three types are more or less interchangeable for most charger applications with the choice depending on cost, size, etc.

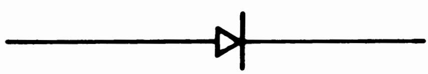


FIGURE 58 – CONVENTIONAL DIODE SYMBOL

The electrical characteristics of semi-conductor rectifiers or diodes can be approximated by an equivalent circuit consisting of an ideal rectifier in series with a counter emf and a resistance. This resistance is small in case of germanium and silicon type rectifiers and may often be neglected for practical circuit design.

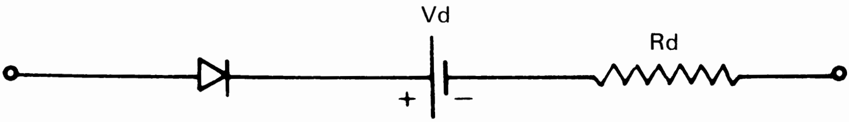


FIGURE 59 – EQUIVALENT CIRCUIT FOR A SEMI-CONDUCTOR RECTIFIER. V_d REPRESENTS COUNTER EMF DUE TO THRESHOLD VOLTAGE AND R_d IS DYNAMIC RESISTANCE

The diode may be any type providing it can handle the dc charge current and has a sufficient peak inverse voltage rating. Peak inverse voltage applied to the diode is the peak value of the ac voltage. $E_{ac}\sqrt{2}$, plus the battery voltage E_{dc}. Some common diode designations and ratings are given in Table Z for ready reference.

TABLE Z
DIODE RATINGS

	Max. Current	Peak Inverse Voltage
1N2069 Si Diode	0.75 amperes	200 volts
1N4720 Si Diode	3	200
Motorola MDA 970-2 Si Bridge (or equivalent)	4	100

Resistors

Common carbon or ceramic resistors are used in battery chargers to control the current flow or provide a fixed voltage drop at a given current flow. As mentioned above, it is possible in certain cases to build in the required resistance in the secondary winding of the transformer.

The ohmic value of the resistor is calculated for each individual charging circuit and is dependent on the values of the other components in the circuit and the desired charger output. To prevent overheating under continuous use condition, the power rating of the resistor should be determined using the rms current which is approximately 2 times the desired charge current, I_{dc}.

Charger Circuits

Constant current charger circuits can be used with most sealed rechargeable battery systems, provided charge rates and times are controlled, but in some cases may shorten cycle life. The half-wave or full-wave rectification is satisfactory and filtering is not normally required. Half-wave circuits are normally used for low current requirements and full-wave rectification for higher currents.

The following sample circuits and design guide lines are given for devising chargers for experimental or labortary use. The same basic design may also serve for commercial use by eliminating meters and replacing adjustable resistors with fixed resistors.

The circuits shown in Figures 60 and 61 have variable current limiting resistors and ammeters for adjusting charge current as desired. The meter must be a type having *average* current response and calibration. Any direct current moving coil meter with a suitable current range may be used. The half-wave circuit is suggested for charge currents to 500 mA and the full-wave bridge circuit for higher current values. The considerations for circuit component determinations follow each circuit diagram.

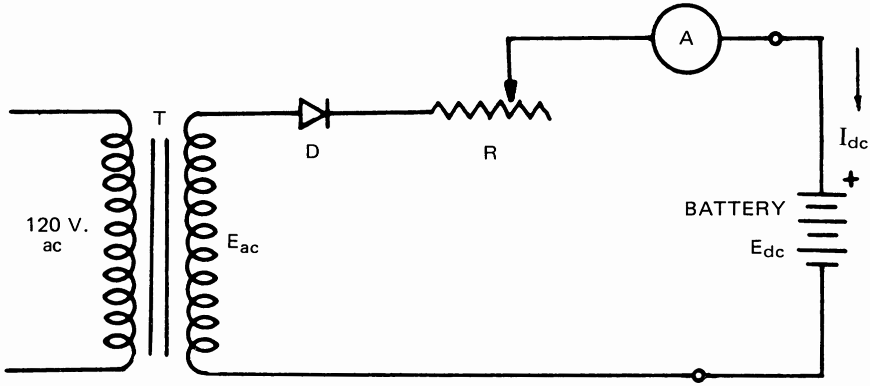


FIGURE 60 – HALF-WAVE CIRCUIT

The transformer (T) should be selected with an rms secondary voltage (E_{ac}) equal to at least twice the end of charge voltage (E_{dc}) of the battery. The rms current rating of the transformer secondary should be at least twice the dc charge current value. The diode (D) should be selected with a current rating sufficient to handle the dc charge current and a peak inverse voltage rating greater than the sum of the peak value of the transformer secondary voltage ($E_{ac}\sqrt{2}$) and the battery voltage (E_{dc}).

The value of the resistor (R) may be estimated by subtracting the battery voltage (E_{dc}) from the transformer secondary voltage (E_{ac}) and dividing this quantity by 2.5 I_{dc}. (2.5 times the dc charge current in amperes). The charge current is determined by cell capacity and charge time in hours and may vary with battery usage. It may be best for control purposes to split the resistance R into a fixed value resistor in series with a variable one. The fixed resistor will prevent unintentional zero setting of variable resistance which could result in excessive current values and damage to meter and battery. It should also be remembered that the resistance of the ammeter must be considered since it too is a series element.

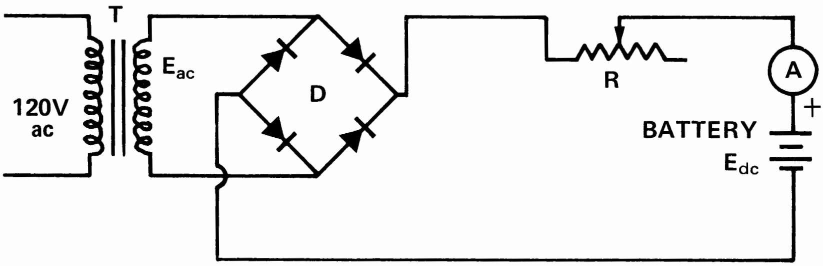


FIGURE 61 – FULL-WAVE BRIDGE CIRCUIT

The transformer (T) for circuit of Figure 61 should be selected with a secondary voltage (E_{ac}) equal to about twice the end of charge voltage (E_{dc}) of the battery. The rms current rating of the transformer secondary should be about 1.5 times the dc charge current value. The current ratio varies from the previous example since Figure 61 uses full-wave rectification versus half-wave of Figure 60.

The bridge rectifier (D) may be either a selenium bridge or one composed of germanium or silicon diodes. The important parameters of the components used are current and inverse voltage rating which are determined by desired charge rate and battery voltage. The peak inverse voltage (PIV) rating required for bridge connection is only half that of other connections since two diodes are conducting in series at all times.

The value of the resistor (R) may be estimated by subtracting the battery voltage E_{dc} from the secondary voltage E_{ac} and dividing this quantity by $1.25 \times I_{dc}$ (1.25 times the dc charge current in amperes). Note that the dc charge current is multiplied by 1.25 for the full-wave bridge circuit in Figure 61 and 2.5 for the half-wave circuit in Figure 60. This is due to the different shape of the wave forms encountered in these two circuits.

EXAMPLE:
A charge circuit for two CH1.2 nickel cadmium cells is desired. The ten hour charge rate is to be used which gives a full charge in 14 hours. Assume 1.5 volts cell end of charge battery voltage. The CH1.2 cell has rated capacity of 1.2 ampere-hours. The 10 hour rate is therefore: $\frac{1.2}{10} = 0.12$ ampere or 120 milliamperes.

Transformer

2 Cells X 1.5V = 3 volts battery voltage. An E_{ac} of 2 E_{dc} then gives 2 X 3 or 6 volt rms secondary voltage. (A common filament transformer would meet this voltage requirement. For example Stancor P6465, Triad F—14X or equivalent.)

Diode

The current rating and peak inverse voltage (PIV) rating are the important parameters. Many of the more common diodes have PIV ratings far in excess of the peak value of applied voltage in average battery charging applications. The common 1N2069 silicon diode (Table X) is adequate for a wide range of battery capacities and voltages.

Series Resistor

Assuming the secondary voltage of the selected transformer (E_{ac}) to be about 7.2V (the indicated 6 volt rating being at the rated load current value) and an end of charge battery voltage of 3 volts, the difference between these two values will be "dropped" across the resistor. The value of R is estimated by Ohm's Law:

$$R \text{ (ohms)} = \frac{\text{voltage}}{\text{current}}$$

$$R = (7.2V - 3V)/2.5\ (0.12 \text{ ampere})$$
$$R = \frac{4.2}{0.3} = 14 \text{ ohms}$$

The power rating:
Power (watts) = I^2R
$I_{rms} = \sim 2\ I_{dc} = 0.24$ ampere
$P = (0.24)^2 \times 14 = 0.0576 \times 14 = \sim 0.8$ watts

A 1 watt resistor should be adequate but common practice would be to overrate to prevent heating and a 2 watt or even 5 watt resistor might be used. Should the resistor be split using a variable and a fixed resistance the current remains the same through both resistors and the power rating will vary according to the individual resistance value.

BATTERY CROSS REFERENCE

"Eveready" Battery No.	Voltage	NEDA Number	"Bright Star"	"Burgess"	"General Electric"	"Gould"	"Gulton"
BH1	1.2				GB100		
BH1 Stack Series (2/BH1 thru 10/BH1)							
BH1T	1.2				GB100T		
BH1T Stack Series (2/BH1T thru 10/BH1T)							
CF1	1.2						
CF1T	1.2						
CH1	1.2				GCT1.0	1.0SC	
CH1T	1.2				GCT1.0ST	1.0SCL	
E1	1.4	1100M		Hg-1			
E1N	1.35			Hg-1R			
EPX1	1.35		BPX1				
CF1.2	1.2						
CF1.2T	1.2						
CH1.2	1.2			CD12	GCR1.0	1.2SC	R-125
CH1.2T	1.2			CD12L	GCR1.0ST	1.2SCL	
CH1.2/C	1.2				GC-2		
CH1.2/D	1.2				GC-3		
CH1.4	1.2						
CH1.4T	1.2						
CH1.8	1.2			CD14	GCT1.5 or GC2	2.0SC	R-190
CH1.8T	1.2			CD14L	GCT1.5ST	2.0SCL	
CH2.2	1.2			CD13	GCW2.0		
CH2.2T	1.2			CD13L	GCW2.0ST		
E3	1.3			Hg-3R			
CF4	1.2						
CF4T	1.2						
CH4	1.2			CD10	GCW3.5 orGC4	4.0SC	R-400
CH4T	1.2			CD10L	GCW3.5ST	4.0SCL	
E4	1.35			Hg-4R			
EPX4	5.4		BPX4	HPX4			
EA6	1.5		6 Alarm Screw				
EA6F	1.5	906	6Tel Clip	6 Tel.			
EA6FT	1.5		6 Alarm Clip & Wire				
EA6ST	1.5		6 Alarm screw & wire				
HS6	1.5	905	6 Ign.	6 Ign.			
IF6	1.5						
IS6	1.5	905	6 Ign.	6 Ign.			
IS6T	1.5						
E9	1.4	15M		Hg-9			
HS10S	6	915C	460S	F4BP			
E12	1.4	1101M		Hg-12			
E12N	1.35						
E13	1.4						
E13E	1.4			Hg-13E			
EPX13	1.35		BPX13	HPX13			
S13	1.5			13SO			
S13E	1.5			13SO			
EPX14	2.7		BPX14	HPX14			
HS15	1.5	15C	59	500			
B20	1.2			CD1		20B	
B20T	1.2			CD15		20BL	
EPX23	5.6		BPX23	HPX23			
EPX25	4.05		BPX25	HPX25			
EPX29	4.05		BPX29	HPX29			
EPX30	3		BPX30	APX30			
HS31	6	918C	158	TW1			
EPX32	5.6		BPX164				
HS35	1.5	14C	11M	700			

AND INTERCHANGEABLE NUMBERS

"Eveready" Battery No	IEC No.	"Mallory"	"RCA"	"Ray-O-Vac"	"Varta"	Military	Other
BH1					1000DKZ		
BH1 Stack Series (2/BH1 thru 10/BH1)							
BH1T							
BH1T Stack Series (2/BH1T thru 10/BH1T)							
CF1							
CF1T							
CH1					RS1		
CH1T							
E1	MR7	RM1	VS1	T1			HMP
E1N		RM1R		T1N		BA-1312/U	
EPX1		PX1		RPX1			HSP
CF1.2							
CF1.2T							
CH1.2					RS1.2		
CH1.2T							
CH1.2/C							
CH1.2/D							
CH1.4							
CH1.4T							
CH1.8					RS1.8	BB-416	
CH1.8T							
CH2.2					RS2		
CH2.2T							
E3		RM3R		3LA		BA-1330/U	
CF4							
CF4T							
CH4				626	RS4	BB-412	
CH4T							
E4		RM4R		4LA		BA-1228/U	
EPX4		PX4					
EA6	R40						
EA6F	R40		VS006C	6 Tel. Clip			
EA6FT	R40						
EA6ST	R40						
HS6	R40	M6X	VS006S	WM50			4701
IF6							
IS6	R40	M905	VS006S	6 Ign.Screw	2322	BA-23	
IS6T							
E9	MR6	ZM9	VS9	T9			
HS10S	4R25	M915		WM25			
E12		RM12	VS12	T12			
E12N		RM12R		T12N			
E13	MR-48			T13		BA-1328/U	
E13E	MR48	RM13H		R13	7106		
EPX13	MR09	PX13	VPX13	RPX13	7002		H-D
S13	SR48	MS13	VS1713	T13G			G5
S13E	SR48	MS13G		RS13G	7306		
EPX14		PX14		RPX14	239		H-2D
HS15		M15F	VS034A	WM40			
B20					20DK		
B20T							
EPX23	4F16	PX23		RPX23	434		
EPX25		PX25		RPX25			
EPX29		PX29		RPX29			
EPX30		PX30		RPX30			
HS31		M918					
EPX32		PX32					
HS35	R14			WM15		BA-42	

"Eveready" Battery No.	Voltage	NEDA Number	"Bright Star"	"Burgess"	"General Electric"	"Gould"	"Gulton"
T35	1.5						
E41	1.4						
E41E	1.4			Hg-41E			
S41	1.5			41SO			
S41E	1.5			41SO			
E42	1.4	13.M		Hg-42			
E42N	1.35			Hg-42R			
B50	1.2			CD2		50B	
B50T	1.2			CD2L		50BL	
HS50	1.5	13C	10M	800			
T50	1.5						
N64	14.4			CD64			
N65	13.2						
N67	6.0			CD30			
N70	6.0			CD31			
S76	1.5	1107SO	BPX76	76SO			
S76E	1.5			76SO			
EPX77 (See 303)	1.5						
N86	12					MP402	
N88	8.4						
E89	1.4						
E90	1.5	910A	7528	ALN			
HS90	6	908C	460	600			
OB90	1.2						
OB90T	1.2						
E91	1.5	15A	7524	AL9			
N91	6.0			CD200		MP401	
E92	1.5	24A	7526	AL7			
E93	1.5	14A	7522	AL1			
E95	1.5	13A	7520	AL2			
HS95	1.5	13A	7520	AL2			
E115	7			H115			
E115N	6.75			H115R			
E126	8.4	1611M		H126			
E132	2.8	1200M		H132			
E132N	2.7			H132R			
E133	4.2	1306M		H133			
E133N	4.05			H133N			
E134	5.6						
E134N	5.4			H134R			
E135	7						
E135N	6.75			H135R			
E136	8.4						
E136N	8.1			H136R			
E137	9.8						
E137N	9.45			H137R			
E145	7.0			H145			
E146X	8.4	1604M		H146X			
B150	1.2			CD3		150B	
B150 Stack Series (2/B150 thru 10/B150)							
B150T	1.2			CD3L		150B	
B150T Stack Series (2/B150T thru 10/B150T)							
CF150	1.2						
CF150T	1.2						
CH150	1.2						
CH150T	1.2						
HS150	1.5	13C	110C	1200			
E152	2.8			H152			
E153	4.2			H153			
E163	4.2	1305M		H163			

"Eveready" Battery No.	IEC No.	"Mallory"	"RCA"	"Ray-O-Vac"	"Varta"	Military	Other
T35							
E41	MR42			T41			
E41E	MR42	RM41H		R41	7108		
S41	SR41	MS41	VS1741	T41G			G12
S41E	SR41	MS41H		RS41G	7308		
E42	MR20	RM42		T42			
E42N		RM42R		T42N		BA-1030/U	
B50					50DK		
B50T							
HS50	R20	M13Y	VS2050	WM10		BA-30	
T50							
N64							
N65							
N67					5/900D		
N70					5/D		
S76	SR07	MS76	VS1776	RS76			G13
S76E	SR07	MS76H		RS76G	7301		
EPX77	SR07			RPX77			GS14
(See 303)							
N86							
N88					TR7/8		
E89							
E90	LR1	Mn9100	VS1073	810	7245		AM5
HS90	4R25	M916X		WM20		BA-200/U	
OB90					DK90		
OB90T							
E91	LR6	Mn1500	VS1334	815	7244	BA-3058	AM3
N91							
E92	LR03	Mn2400	VS1074	824	7239		AM4
E93	LR14	Mn1400	VS1335	814	7233	BA-3042	AM2
E95	LR20	Mn1300	VS1336	813	7232	BA-3030/ BA-3202U	AM1
HS95	LR20	Mn1300	VS1336	813	7232	BA-3030/ BA-3202/U	
E115		TR115		T115			
E115N		TR115R					
E126		TR126	VS126	T126			
E132		TR132	VS132	T132/R132			KM-2P
E132N		TR132R		T132N			
E133		TR133	VS133	T133			KM-3P
E133N		TR133R		T133N		BA-1098/U	
E134		TR134		T134			
E134N		TR134R		T134N			
E135		TR135		T135			
E135N		TR135R		T135N			
E136		TR136		T136			
E136N		TR136R		T136N			
E137		TR137					
E137N		TR137R					
E145		TR145		T145			
E146X		TR146X	VS146X	1604M		BA-1090/U	
B150					150DK		1500K
B150 Stack Series (2/B150 thru 10/B150)							
B150T							
B150T Stack Series (2/B150T thru 10/B150T)							
CF150							
CF150T							
CH150					151D		
CH150T							
HS150	R20	M13X		WM30	222		
E152		TR152					
E153		TR153					
E163		TR163	VS163	T163			KM3N

"Eveready" Battery No.	Voltage	NEDA Number	"Bright Star"	"Burgess"	"General Electric"	"Gould"	"Gulton"
E164	5.6	1404M		H164			
E164N	5.4			H164R			
E165	7	1500M		H165			
E165N	6.75			H165R			
E169	12.6	1901M		H169			
E175	7	1501M		H175			
E177	9	1606M		H177			
201	1.5						
206	9	1611		L6			
E212E	1.35			Hg-212E			
216	9	1604	0920	2U6			
B225	1.2			CD4	GB18	225B	
B225 Stack Series (2/B225 thru 10/B225)							
B225T	1.2			CD4L	GB18T	225BL	
B225T Stack Series (2/B225T thru 10/B225T)							
BH225	1.2					225BH	
BH225 Stack Series (2/BH225 thru 10/BH225)							
BH225T	1.2					225BHL	
BH225T Stack Series (2/BH225T thru 10/BH225T)							
CF225	1.2						
CF225T	1.2						
CH225	1.2					225SC	VO.180SC
CH225T	1.2					225SCL	
226	9	1600	0918	PM6			
228	12	1810		PM8			
E233	4.2	1300M		H233			
E233N	4.05						
E234N	5.4						
E235N	6.75						
E236N	8.1						
246	9	1602		2N6			
266	9	1605		M6			
276	9	1603		D6			
E286	8.4	1600M		H286			
E289	12.6	1810M		H289			
301	1.5						
303	1.5						
309	1.5						
E312	1.4			Hg-312			
E312E	1.4			Hg-312H			
S312	1.5						
S312E	1.5						
313	1.35						
323	1.35						
325	1.35						
333 (See 523)	4.5	1306A					
E340E	1.5			NE			
343	1.35						
W353	1.5	11		2F			
354	1.35						
355	1.5						
W356	3	*		2F2H			
357	1.5						
W357	3	901	863	4F2H			
384	1.5						
386	1.5						
387	1.4						
388	1.35						
392	1.5						
393	1.5						

"Eveready" Battery No.	IEC No.	"Mallory"	"RCA"	"Ray-O-Vac"	"Varta"	Military	Other
E164		TR164	VS164	T164			KM4N
E164N		TR164R					
E165		TR165	VS165	T165			KM5M
E165N		TR165R					
E169		TR169					
E175		TR175		T175			
E177		TR177	VS177	T177			WO6P
201							
206		M1611	VS327	T1611			VO6P
E212E		RM212H		R212			
216	6F22	M1604	VS323	1604	438		006P
B225					225DK		
B225 Stack							
Series (2/B225							
thru 10/B225)							
B225T							
B225T Stack							
Series (2/B225T							
thru 10/B225T)							
BH225					225DKZ		
BH225 Stack							
Series (2/BH225							
thru 10/BH225)							
BH225T							
BH225T Stack							
Series (2/BH225T							
thru 10/BH225T)							
CF225							
CF225T							
CH225							
CH225T							
226	6F25	M1600	VS300A	1600	29		R006
228			VS329				
E233		TR233	VS233	T233			
E233N		TR233R					
E234N		TR234R		T234N			
E235N		TR235R		T235N			
E236N		TR236R					
246	6F50-2	M1602	VS305	1602	28		S106
266		M1605	VS322	1605			S206
276	6F100	M1603	VS306	1603	439		306
E286		TR286					
E289		TR289		T289			
301	SR43	WS11		RW14	7308		
303	SR47	WS14		RW12			
309	SR48			RW18			
E312	MR41	RM312	VS312	T312			
E312E	MR41	RM312H		R312	7107		
S312				T312G			
S312E		MS312H		RS312G			
313	MR44	WH3		RW52	7081		
323	MR48	WH6		RW58	7086		
325	MR41	WH1		RW57			
333							003P
(See 523)							
E340E	R1	M901H		RN			
343	MR42	WH12NM/		RW56	7089		
		WH4					
W353			VS141	11		BA-802/U	
354	MR43	10R11		RW54			
355		10L129		RW25			
W356			VS136				
357	SR44	10L14		RW22			
W357						BA-225/U	
384	SR41	WS10		RW37			
386	SR43			RW24/			
				RW44			
387		W2					
388		10R10					
392				RW47			
393				RW48			

"Eveready" Battery No.	Voltage	NEDA Number	"Bright Star"	"Burgess"	"General Electric"	"Gould"	"Gulton"
E400	1.4	1106M		Hg-400			
E400N	1.35			Hg-400R			
E401	1.4	910M		Hg-401			
E401E	1.4			Hg-401H			
E401N	1.35			Hg-401R			
EP401E	1.4						
411	15	208		U10			
412	22.5	215	12P	U15			
413	30.0	210		U20			
415	45	213		U30			
416	67.5	217		UX45			
417	15	224		K10			
420	22.5	225		K15			
425P	22.5			XX15			
CF450	1.2						
CF450T	1.2						
CH450	1.2			450SC			
CH450T	1.2			450SC4			
E450	1.4		BPX450	Hg-450R			
455	45	*		XX30			
457	67.5	203		K45			
460	45		47P	K30P			
467	67.5	200	45N	XX45			
477	67.5	211		P45			
479	90	214		P60			
482	45	202	30-33	M30			
484	45	207		B30			
487	22.5,45		30-95	D30			
489	225	728	39P	XX150			
490	90	204	60N	V60			
491	240	729	24P	U160			
493	300	722		U200			
496	450	740					
497	180,510	741	51P	U320			
BH500	1.2				GB50	500BH	VO.500SC
BH500 Stack Series (2/BH500 thru 10/BH500)							
BH500T	1.2				GB50T	500BHL	
BH500T Stack Series (2/BH500T thru 10/BH500T)							
CF500	1.2						
CF500T	1.2						
CH500	1.2			CD6	GCF500	475SC	
CH500T	1.2			CD6L	GCF500ST	475SCL	
E502	1.35			Hg-502R			
E502E	1.4			Hg-502E			
504	15	220	15P	Y10			
505	22.5	221	22P	Y15			
509	6	908	460	F4M			
510F	6	917	460C	F4SC			
510S	6	**	460S	F4BP			
520	6	930A					
E520	1.4			Hg-520			
522	9	1604A					
523	4.5	1306A	7530	AL523/ APX21			
531	4.5	1307A	7529	APX19			
532	3	1308A	7531	APX24			
537	6						
538	4			HPX31			
539	6						
544	6	1406A		28SO			
560	7.5						

"Eveready" Battery No.	IEC No.	"Mallory"	"RCA"	"Ray-O-Vac"	"Varta"	Military	Other
E400		RM400	VS400	T400			H-B
E400N		RM400R		T400N			
E401		RM-401	VS401	T401			
E401E		RM401H		R401	7132		
E401N		RM401R		T401N		BA-1425/N	
EP401E		MP401H	VSP401	RP401			
411	10F20	M208	VS083			BA-331/U	010
412	15F20	M215	VS084	215	72	BA-261/U	015
413	20F20	M210	VS085		73	305/U	020
415			VS086				030L
416			VS318				045
417							
420							
425P						BA-232/U	
CF450							
CF450T							
CH450							
CH450T					452RS		
E450		RM450R					H-O
455	30F40		VS055			BA-56	
457			VS082			BA-314/U	130H
460		PX18	VS3204				145B
467	45F40	M200	VS016		57	BA-51	145
477			VS218				
479			VS219				
482			VS013			BA-59	
484	30R12		VS344			BA-223/U	
487							
489		PF489	VS789	N150			
490	60F40X		VS090		61	BA-805/U	
491		PF491	VS791	1010			0160
493			VS093			BA-291/U	
496				1013			
497		PF497	VS797	1012			0340
BH500					500DKZ		
BH500 Stack Series (2/BH500 thru 10/BH500)							
BH500T							
BH500T Stack Series (2/BH500T thru 10/BH500T)							
CF500							
CF500T							
CH500				615	500RS	BB-417	
CH500T					501RS		
E502		RM502R				BA-1058/U	
E502E		RM502H		R502			
504	10F15	M504	VS704	220	74	BA-332/U	W10
505	15F15	M505	VS705	221	75	BA-333/U	W15
509	4R23	M908	VS040C	941	430	BA-200/U	4FZ
510F	4R25			943			
510S	4R25	M915	VS040S	942		BA-803/U	4FN
520							
E520		RM520					
522		Mn1604	VS1323				
523		PX21	VS1149	RPX21	7251		
531		PX19	VS1337	RPX19	7252		
532		PX24	VS1339	RPX24	7253		
537					7250		
538		7R31		RPX31			
539		7K67					
544		PX28		RPX28			4G13
560			VS1560				

"Eveready" Battery No.	Voltage	NEDA Number	"Bright Star"	"Burgess"	"General Electric"	"Gould"	"Gulton"
561	15						
563	4.5						
564	13.5						
565	6						
E575E	1.4			Hg-575E			
E601	1.35			Hg-601R			
E625	1.4			Hg-625			
E625N	1.35			Hg-625R			
EPX625	1.35		BPX625	APX625			
E630	1.4	1104M		Hg-630			
E640	1.4	* 1105M		Hg-640			
EPX640	1.35		BPX640	APX640			
E640N	1.35						
646	69	914D		Z46HD			
E675	1.4						
E675E	1.4						
EP675E	1.4						
EPX675	1.35		BPX675				
703	4.5	*		532			
706	6	902		4F4H			
711	1.5	700		2FH (2FBP)			
714	4.5						
715	7.5	903	155	4F5H			
716	9	*	164	4F6H			
717	7.5	9	591	C5			
724	6	2		Z4			
731	6	918	158	TW1			
732	12		125	TW2			
735	1.5		464	410			
736	4.5	3		F3			
738	22.5,45	205	30-59	Z30			
742	1.5	4	462				
744	6	*	646				
750	3	704					
762S	22.5,45	709		5308			
763	22.5	710		4156			
773	1.5 to 7.5	*		5540			
778	3 to 225	708		5156SC			
781	4.5	*	03–17S	5360			
812	1.5	24P	58P	720			
815	1.5	15P		920			
EPX825	1.5		BPX825	APX825			
835	1.5	14P		120			
850	1.5	13P		220			
904	1.5	910F	20	310			
912	1.5	24F	58	7			
915	1.5	15F	59	910			
935	1.5	14F	11M	1			
950	1.5	13F	10M	2			
1007	9.6						
1015	1.5	15	0199	930			
1035	1.5	14	0198	130			
1050	1.5	13	0197	230			
1150	1.5	13C	10MC	210			
1209	6	908D	460	F4M			
1215	1.5	15D					
1222	9	1604D		2MN6			
1235	1.5	14D		100			
1250	1.5	13D		200			
1461	6	907	146	S461			
1463	12	922	187	2G8H			
1562	7.5	*					
1862	12						
2356N	9	1612		C6X			
2709N	9	1613					

"Eveready" Battery No.	IEC No.	"Mallory"	"RCA"	"Ray-O-Vac"	"Varta"	Military	Other
561			VS1561				
563			VS1563				
564			VS1564				
565							
E575E	R08	RM575H	VS575		7109		
E601		RM601R					
E625	R9	RM625	VS625	T625/R625	7102		
E625N		RM625R		T625N		BA-1006/U	
EPX625	R9	PX625		RPX625	7002		H-D
E630		RM630	VS630				
E640		RM640	VS640	T640			H-N
EPX640		PX640					HS-N
E640N		RM640R					
646				914D			
E675	R07	RM675	VS675	T675			
E675E	R07	RM675H		R675	7101		H-C
EP675E	R07	MP675H		RP675	7103		HS-C
EPX675	R07	PX675			7001		
703	3R12		VS346		201/ 210	BA-9	PM-2
706			VS103			BA-222/U	
711			VS101			BA-15A	
714							
715		M903	VS139	903		BA-804/U	
716		M904	VS140	904		BA-207/U	
717			VS065				5C5
724			VS068				
731	4F25-2	M918	VS317	918			
732			VS342	926			
735		M900	VS106	900	155	BA-35	
736	3R25		VS067				
738			VS015			BA-63	
742	R25-4		VS004	A4	480	BA-65	
744	4R25		VS345			BA-210/U	
750			VS134			BA-208	
762S			VS112				
763			VS102			BA-2	
773			VS029			BA-34	
778			VS131			BA-230/U	
781			VS028			BA-31	
812	R03			410			
815	R6	M15P	VS734	710			
EPX825		PX825	VS1340	RPX825	7201		
835	R14	M14P	VS735	110			AMF
850	R20	M13P	VS736	210		BA-202/U	
904	R1	M910F	VS073	716	245		UM5
912	R03	M24F	VS074	400			UM4
915	R6	M15F	VS034A	7AA	251	BA-58	UM3
935	R14	M14F	VS035A	1C	213	BA-42	UM2
950	R20	M13F	VS036	2D	212	BA-30	UM1
1007							
1015	R6	M15R	VS334	15	244		
1035	R14	M14R	VS335	14	233		
1050	R20	M13R	VS336	13	232		
1150	R20			3D			
1209	4R25			944			AM4F
1215	R6	M15HD		5AA	280		SUM3
1222	6F22			D1604			006PS
1235	R14	M14HD		4C	281		SUM2
1250	R20	M13HD		6D	282		SUM1
1461		M907	VS039	641		BA-249/U	
1463			VS340	922			
1562							
1862							
2356N			VS330				
2709N			VS339				

"Eveready" Battery No.	Voltage	NEDA Number	"Bright Star"	"Burgess"	"General Electric"	"Gould"	"Gulton"
2744N	6	920	646	F4BW			
2745N	6	924					
2746N	6	925					
2708N	12	923					
HS4068 (N64)	14.4						
HS4080	14.4						
HS4081	14.4						
HS4125	14.4						
HS4130	14.4						
HS4133	1.2						
HS4151	12.0						
HS4153	12.0						
HS4280 (N65)	13.2						
E302157	1.35			302157			
E302250	9.45			302250			
E302351	5.4			302351			
E302358	10.2			302358			
E302362	16.2			302362			
E302435	6.75			302435			
E302462	97.2			302462			
E302465	47.15			302465			
E302478	9.8			302478			
E302497	6.75			302497			
E302579	29.7			302579			
E302580	27			302580			
E302642	7			302642			
E302651	1.35			302651			
E302702	2.7			302702			
E302904	5.4			302904			
E302905	6.75			302905			
E302907	9.45			302907			
E302908	10.8			302908			
E303145	9.8	1614M		303145			
E303219	8.4			303219			
E303236	4.2	1309M		303236			
E303314	4.2	2200M		303314			
E303394	11.2			303394			
E303462	15.4	2100M		303462			
E303496	4.2			303496			

* NEDA numbers same as "Eveready" battery number on a different battery.

**Corresponding commercial types may have dimensional and constructional differences from the Military types shown. However, they are usually dimensionally and electrically interchangeable.

"Eveready" Battery No.	IEC No.	"Mallory"	"RCA"	"Ray-O-Vac"	"Varta"	Military	Other
2744N				920			
2745N	4R25						
2746N						BA-803/U	
2708N							
HS4068(N64)							(NLN623AA) 60D84735H01, R64
HS4080							(NLN6899A) 60D84641H01, H6899
HS4081							(NLN6900A) 60D84636H01, H6900
HS4125							(NLN6761A) 60D84642H01, H6761
HS4130							(NLN6682A) 60D84643H01, H6682
HS4133							(NLN6965A) 60C05104A, H6965
HS4151							(NLN8096A) 60D82387J01
HS4153							(NLN8002A) 60D82324J01 H8002
HS4280 (N65)							(NLN6267A) 60D82447G01
E302157		302157				BA-1277/U	
E302250		302250					
E302351		302351					
E302358		302358					
E302363		302362					
E302435		302435					
E302462		302462					
302465		302465					
302478		302478	VS302478				
302497		302497					
302579		302579					
302580		302580					
302642		302642					
302651		302651					
302702		302702					
302904		302904					
302905		302905					
302907		302907					
302908		302908					
303145		303145					
303219		303219					
303236		303236					
303314		303314	VS303314				
303394		303394					
303462		303462					
303496		303496					

AMERICAN NATIONAL STANDARD

SPECIFICATIONS FOR DRY CELLS & BATTERIES

American National Standard Specifications for Dry Cells and Batteries, ANSI C18.1 – 1972, is a publication of American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018. This standard is sponsored by the National Electrical Manufacturers Association and covers cell sizes, terminals, standard testing procedures and other useful battery information. It may be ordered from the American National Standards Institute.

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UNION CARBIDE CORPORATION
BATTERY PRODUCTS DIVISION
270 Park Avenue, New York, N.Y. 10017
In Canada: Union Carbide Canada Limited, Toronto

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BATTERY PRODUCTS DIVISION
270 PARK AVENUE, NEW YORK, N.Y. 10017