MPD
MEMORY PROTECTION DEVICES

MEMORY PROTECTION DEVICES, INC.
Certified ISO9001:2015

Visit our Website for a complete
list of our products.
www.batteryholders.com
www.memoryprotectiondevices.com
We specialize in custom parts!
sales@memoryprotectiondevices.com

Memory Protection Devices Inc.
Product training document & Tips

MEMORY PROTECTION DEVICES, INC.

an ISO 9001:2015 company

Company Profile

MPD is one of the world's largest creators and suppliers of innovative and cost-effective battery and coin cell holders and contacts. We created the coin cell holder, and it is still the core of our product line. MPD also offers a full line of automotive plugs, cord sets and other components like fuse holders and power plugs, jacks and adapters. Another advanced concept introduced by MPD is our line of "Gliders", hybrid coin cell holders that combine the low cost of retainers with even higher reliability than standard coin cell battery holders. MPD is proud to be partnering with Microsoft to bring you the patented new Instaload technology. Gliders, SnapDragon and Instaload are the next chapter in the story of MPD's quest to make sure that battery holders are as technology-driven as the products in which they are used.

Established

Founded in 1980 as an electrical components supplier, MPD pioneered a global offshore manufacturing strategy that has led us to a leadership position in the portable power industry. Our experience and understanding of global economic trends empowers our customers with the advantage of working with a U.S. based company while enjoying the cost benefits of overseas manufacturing. Today, we offer electronic, metal, and plastic components and assemblies to customers around the world.

Products

Products and services include electronic design, prototypes and mass production for Battery holders, contacts and sockets and other power connection related products. Since 1980, Memory Protection Devices, Inc has been offering battery holders and contacts for lithium coin cells and alkaline cells. We offer products based on a range of standard products and custom proprietary solutions.

Intellectual Property Portfolio

1983 – Invented coin cell battery holder | US patent number 4487820

1983 – Invented lithium battery holder | US patent number 4495257

1999 – Invented 'Press to Eject' coin cell battery holder | US patent number 5922489

2010 – Licensed manufacturer of Microsoft's InstaLoad technology | US patent number 7527893

2011 – Invented low profile, covered coin cell battery holder | US Patent Number US-2012-0251864-A1 | German Patent Number DE-10-2012-102-706-A1

ISO 9001-2015 Certification

TUV Rheinland of N.A, Littleton, MA | Certificate Number: 74 300 3999

Typical Applications

MPD's products are utilized in solutions for telecommunications, test and measurement, instrumentation, medical, military and other applications.

Client Examples:

Automotive: Honda, Isuzu and Mercedes | IMDS ID: 99070

CEM: Benchmark, Flextronics, Jabil, and Plexus

Consumer Electronics: Apple, Dell and HP | Microsoft Partner

Distributor: Digi-Key Corp.

Medical: 8 out of the top 10 medical electronics manufacturers.

Military: Boeing Military, Lockheed Martin, Northrop Grumman, Raytheon and Rockwell | CAGE Code: 65249

Primary Bank

Bank of America

DUNS Number: 55-671-1018

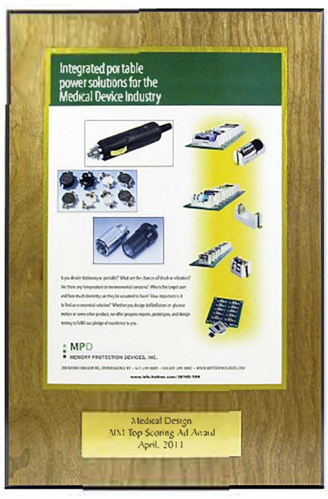
Credit References: Bank of America– New York City, NY, USA

Headquarters

MPD is headquartered in Farmingdale, New York, USA and has regional offices in Piscataway, New Jersey and in Fo Tan, Hong Kong and partners located in every key market.

Sites Operated

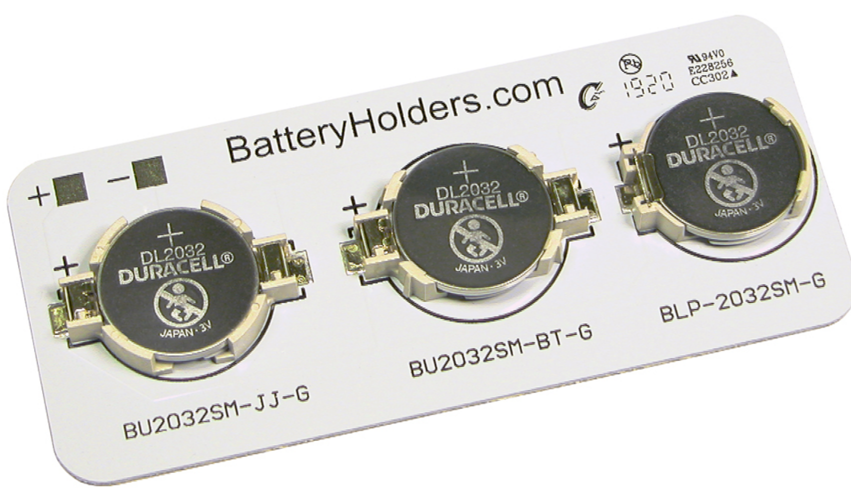
MemoryProtectionDevices.com	DC-Jacks.com	FuseHolders.com
BatteryHolders.com	DC-Plugs.com	12V-Parts.com
Battery-Contacts.com		SafetySensorBeams.com



Visit our Website for a complete list of our products.
www.batteryholders.com
www.memoryprotectiondevices.com
We specialize in custom parts!
sales@memoryprotectiondevices.com

Memory Protection Devices Inc.
Distributor product training document

INDEX



12 Volt Auto Cord Sets by Memory Protection Devices
Offering a complete line of 12 volt auto cord sets to provide an easy reliable way to power your products without the need for customization.
We have dozens of standard sets available to meet almost every application. Featuring a 12 V plug on one end and a standard DC plug on the other side and ready to power your product !

Here are some of our 12 Volt cable assemblies. These can also be used in garden equipment like powered sprinklers, powered hospital beds, various medical equipment that requires portable power and many other applications.

MPD can also make custom cable assemblies. Minimums are required. Inquire today! Ask any of our authorized distributors for a quote.

12 Volt plugs and sockets by Memory Protection Devices
Offering a complete line of 12 volt auto plugs and sockets to provide an easy reliable way to power your products without the need for customization.
We have dozens of standard sockets and plugs available to meet almost every application.

Here are some of our 12 Volt plugs and sockets in our standard line of products. These can be used to power your tool, toy, project, anywhere you require portable power.

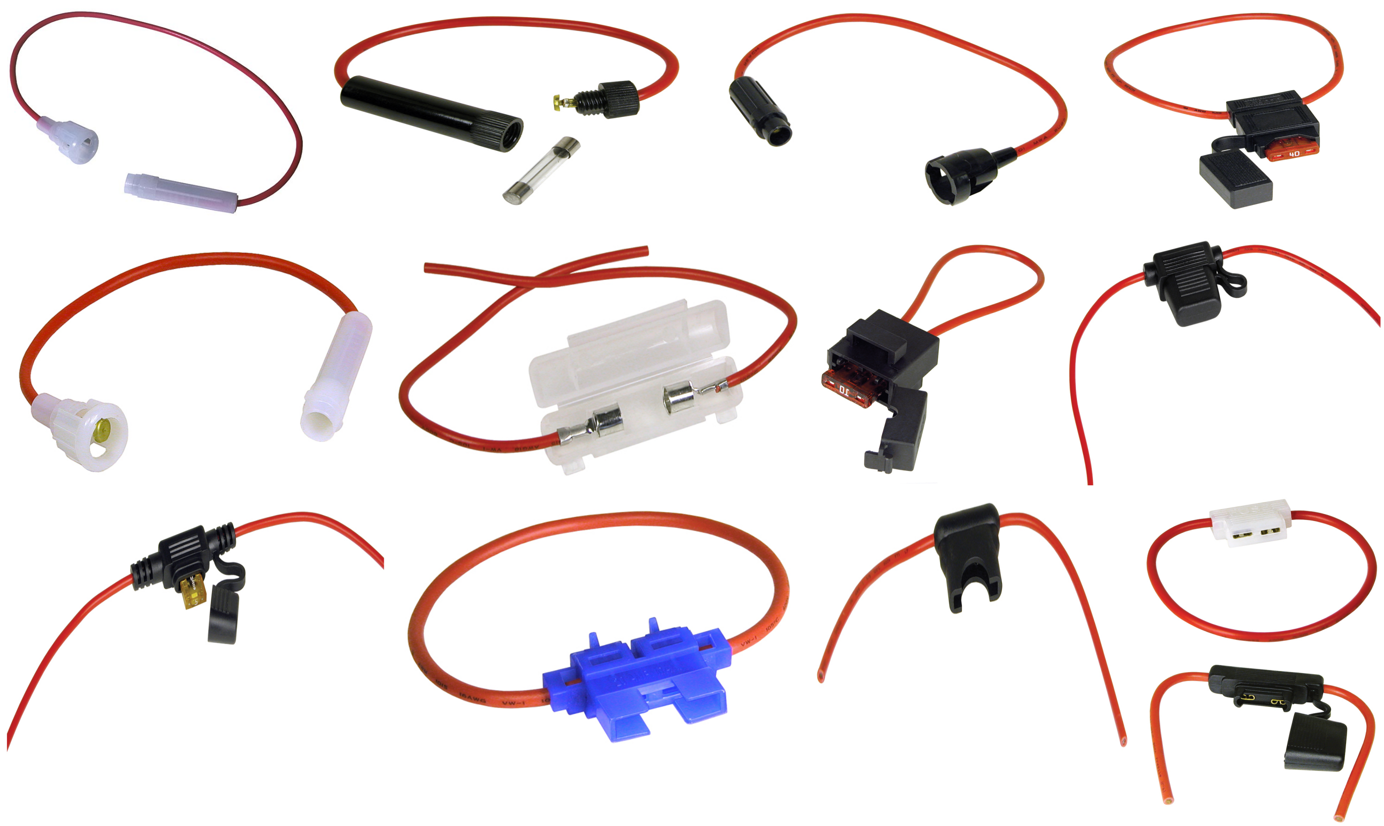
MPD can also cutomize your plug and/or socket with red or green led, with or without a fuse, from 1amp to 20amp, in a variety of resin to comply with UL94V-HB to V0 flame retardancy,American or European to fit 21mm or 22mm socket. Minimums are required. Inquire today! Ask any of our authorized distributors for a quote.


12V
MARINE
12V
1
iPad
3.4A
2
12 VOLT OUTLET

Memory Protection Devices Inc.
Distributor product training document

In-line Fuse Holder Series

In-line Fuse holders are an excellent product used in many products on the market today needing to prevent and control the flow/surges of electrical power, like a breaker circuit. The fuse will disconnect or blow to prevent power from continuing to flow once reaching amperage above the fuse rating. Thus, preventing any possible damage to the product. These are widely use in the automotive industries and industrial machine sector.



Memory Protection Devices Inc.
Distributor product training document

DC Jacks & DC Plugs Series

DC connector (or **DC plug**, for one common type of connector) is an electrical connector for supplying direct current (DC) power.

A **DC jack** is a component used in many electronic devices that allows a steady power source to be plugged in. ... Unlike AC plugs, which are uniform and regulated on a country-by-country basis, **DC** jacks and plugs, which are technically referred to as coaxial power connectors, are generally not standardized.

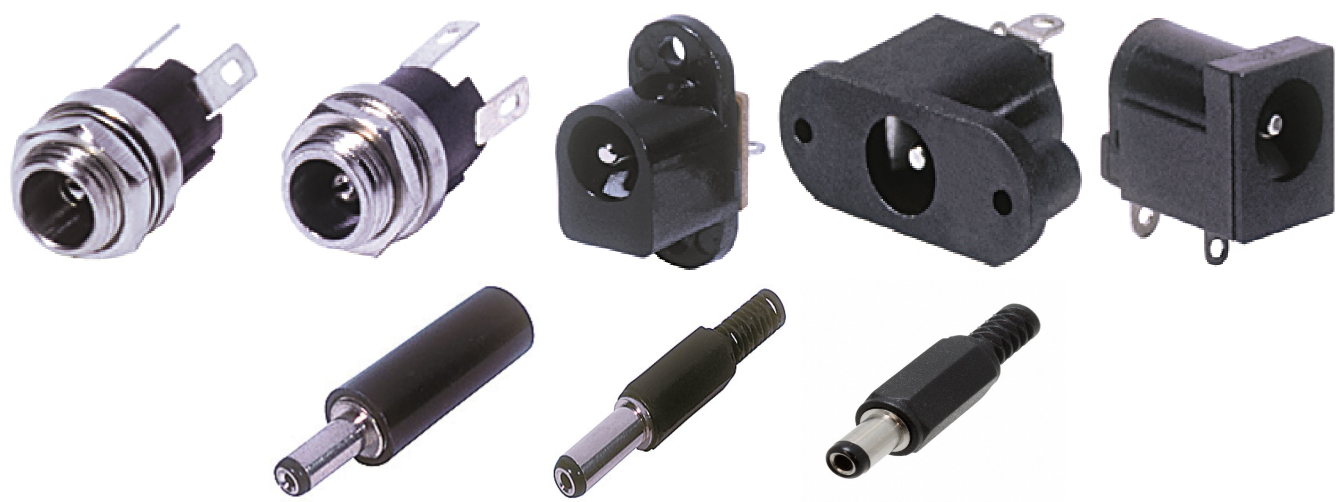
You have finished the initial phases of your new design and are anxious to see the project through to completion, but a few tasks remain, including the selection of the low voltage dc input power connector. Specifying the proper dc power connector is not a complex task and can be completed quickly and painlessly. Selecting one of the more commonly used models is often the best choice for power supply connections as these connectors are inexpensive and readily available.

Low voltage dc power connectors, often referred to as barrel connectors, have both current and voltage ratings specified by the manufacturer. These ratings ensure reliability when using these connectors in power delivery applications. Both the jack and the plug of barrel connectors feature one exposed conductor and a second recessed conductor. A benefit of the recessed second conductor is that it is difficult to accidentally create a short between the two conductors. Additionally, there should be little concern that sensitive components will be damaged by plugging a power connector into an incorrect receptacle since barrel connectors are almost exclusively used to supply power to electronic devices.

While there is not an absolute standard for the definition of barrel power connectors, the electronics industry has drifted towards common usage of the terms jack, plug and receptacle. The jack typically receives power and is mounted in the appliance, either on a PCB or in the chassis. The plug is most often located on the electrical cord and supplies power from the power supply. A receptacle is also mounted on a power cord and receives power from a mating plug.

The definitions of gender for dc power connectors are less standardized than the definitions of jacks, plugs and receptacles. Some in the industry avoid declaring male and female when discussing connectors, while many engineers, following the conventions of the RF connector industry, have accepted the center pin configuration for defining the gender of barrel power connectors. The connector with the center pin is accepted as male and the mating connector is accepted as female. Users should be aware that there are standardized jack and plug combinations in which the center pin is in the jack for some and in the plug for others.

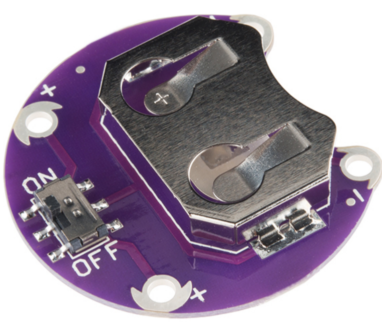
The selection process for low voltage dc power connectors should be quick and painless. Design engineers can select from a wide range of dc power jack mounting styles depending upon the physical requirements of their design. Care should be taken when specifying the pin and barrel diameters and barrel lengths to ensure mechanical compatibility between the selected plugs and jacks.



Memory Protection Devices Inc.
Distributor product training document

PCB/Main board applications

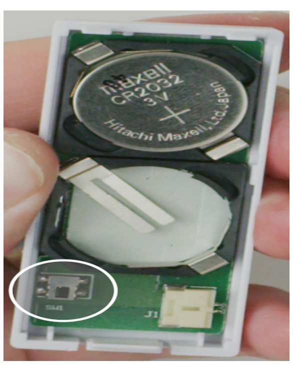
Coin cell holders and coin cell retainers/straps are commonly used on PCB main boards on a variety of electronic products such as, medical equipment like glucose meters, computers main pcb to keep ROM active, toys, cameras, and many other products. These come in multiple sizes, shapes and style. Selecting the proper one for your application is the key. We have prepared a guide, located in the appendix section, that will help you. There is also a document in that section about soldering/bonding that will be of help. Our website also contains more information and datasheets for every product we manufacture. Do not hesitate to review our websites.



Memory Protection Devices Inc.
Distributor product training document

PCB/Main board applications

Coin cell holders and coin cell retainers/straps and battery holders, are commonly used on PCB main boards on a variety of electronic products such as, medical equipment like glucose meters, computers main pcb to keep ROM active, toys, cameras, and many other products. These come in multiple sizes, shapes and style. Selecting the proper one for your application is the key. We have prepared a guide, located in the appendix section, that will help you. There is also a document in that section about soldering/bonding that will be of help. Our website also contains more information and datasheets for every product we manufacture. Do not hesitate to review our websites.



Memory Protection Devices Inc.
Distributor product training document

9 Volt applications

9 Volt Batteries are beneficial for all types of electric devices that need superb **voltage** and current for running their devices in a fast ways. They are also used for one more important work and that is to backup the power which is needed for electronic clocks to keep time.

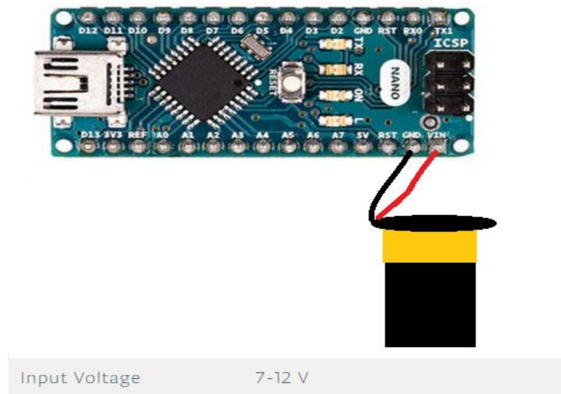
9 Volt Batteries are used in the below defined electric devices –

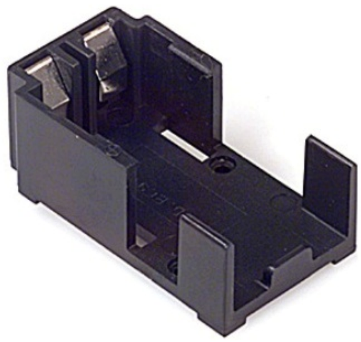
- Clocks
- Smoke Detectors
- Walkie Talkies
- Radios and many more

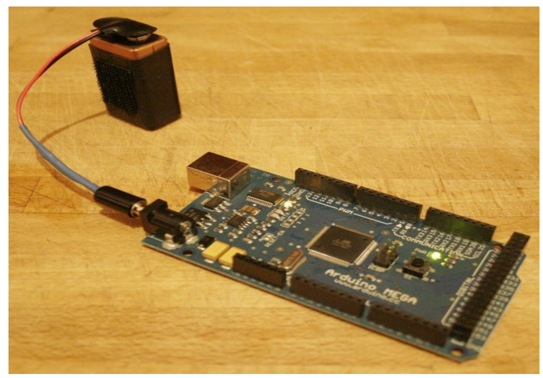
The use of this battery is done by people to satisfy their daily needs and run their electronic devices. That's why it is always very important to contact a reputed company for buying these batteries. Choosing the battery from a well respected company will never let you down and provide the best product.

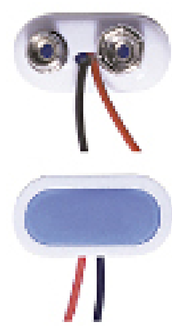
Below defined are the various benefits of using a 9 Volt Batteries:-

- Best performance and voltage for electric devices to run
- Compatible to support all portable electric devices
- Famous for providing backup in electric clocks
- Provides long term running in all types of electric devices


Input Voltage
7-12 V







MEMORY PROTECTION DEVICES, INC.
Certified ISO9001:2015

Visit our Website for a complete
list of our products.
www.batteryholders.com
www.memoryprotectiondevices.com
We specialize in custom parts!
sales@memoryprotectiondevices.com

Battery Holder Design and Selection Guide

To meet customer requirements, designers continue to push the limits of system performance, size, power consumption and cost. Often these limits are extended without a clear understanding of the many nuances of battery cavity design and its role in a system. In a best-case scenario, the outcome is user dissatisfaction with performance and usability. Worst-case scenarios include catastrophic system failures leading to recalls, higher costs, and potentially serious injury.

With a better understanding of battery-cavity electrical and mechanical properties, physical sizing, and materials, such scenarios can be avoided. Going further, with a firm grounding in cavity-design principles and selection, designers can better understand how to optimize their systems in almost all directions, including performance, size, and cost, without compromising safety and reliability.

Pushing the battery-to-system boundaries

Despite the proliferation of electronic systems, from consumer gadgets and smartphones to industrial, transportation, military, aerospace and medical applications, standard battery performance continues to lag requirements in terms of capacity and shelf life. Lithium-ion (Li-ion) chemistries have largely replaced alkaline and nickel-cadmium (NiCad) chemistries due to their inherently higher capacity and low self-discharge, leading to longer shelf life. Though they are well understood, Li-ion chemistries are close to their theoretical density limits. For more on Li-ion standards and testing, see UL 1642.

For system designers, further improvements in performance, longevity, reliability and safety can be achieved through a more "holistic" approach to battery integration, starting at the point at which the battery meets the system: the battery cavity.

First contact: battery-to-cavity

The battery's first point of contact with the system, literally, is with the contacts of the battery cavity. Much innovation has taken place at this juncture to minimize electrical resistance and galvanic corrosion, while balancing reliable contact and small form factor with user accessibility and safety (Figure 1).

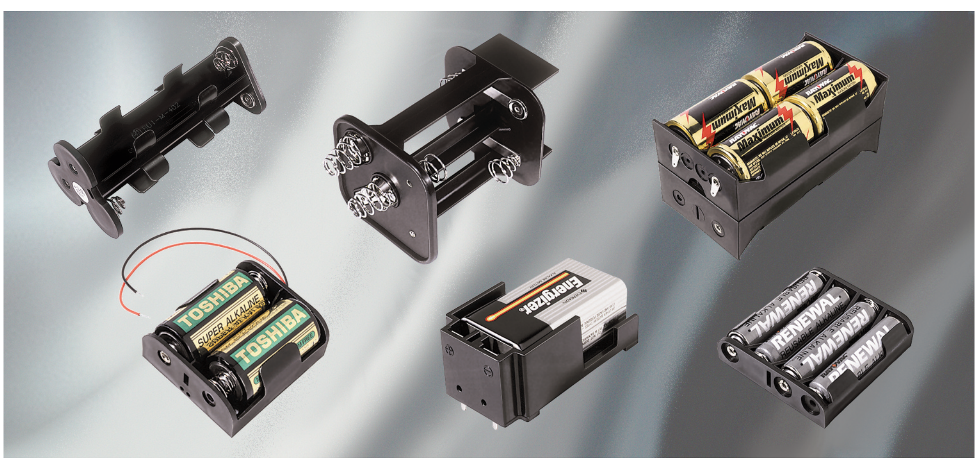


Figure 1
When given due consideration early in the design cycle, the battery cavity can help optimize a system for performance, low power, size, cost, and reliability.
(Image source: BatteryHolders.com)

Electrical resistance and galvanic corrosion: Battery manufacturers have spent many years researching the best materials to use for the battery contacts. While gold plating combines low resistance with the highest tolerance of metal-on-metal contact in extreme environments, nickel-plated contacts give the best balance between cost, corrosion resistance, and electrical conductivity. To avoid galvanic corrosion, battery-cavity contacts therefore also need to use nickel-plating, usually over stainless steel.

Galvanic corrosion occurs when two dissimilar metals make contact in the presence of an electrolyte, such as moisture. When considering contact metals, consult the anodic index (Figure 2)

Metallurgical Category	Anodic Index (V)
Gold, solid and plated: Gold-platinum alloy	0.00
Rhodium-plated on silver-plated copper	0.05
Silver, solid or plated, Monel metal. High nickel-copper alloys	0.15
Nickel, solid or plated; titanium and alloys, Monel	0.30
Copper, solid or plated; low brasses or bronzes; silver solder, German silvery high copper-nickel alloys; nickel-chromium alloys	0.35
Brass and bronzes	0.40
High brasses and bronzes	0.45
18% chromium-type corrosion-resistant steels	0.50
Chromium-plated, tin-plated; 12% chromium-type corrosion-resistant steels	0.60
Tin-plated; tin-lead solder	0.65
Lead, solid or plated; high lead alloys	0.70
Aluminum, wrought alloys of the 2000 Series	0.75
Iron, wrought, gray or malleable, plain carbon and low alloy steels	0.85
Aluminum, wrought alloys other than 2000 Series aluminum, cast alloys of the silicon type	0.90
Aluminum, cast alloys other than silicon type,cadmium, plated or chromite	0.95
Hot-dip-zinc plate; galvanized steel	1.20
Zinc, wrought; zinc-base die-casting alloys; zinc-plated	1.25
Magnesium and magnesium-base alloys, case or wrought	1.75
Beryllium	1.85

Figure 2
The anodic index shows the electro potential of different metals. Ideally, two metals in contact should not have a difference of more than 0.25 V. For harsh environments and military applications, a difference of <0.15 is recommended.

(Data source: EngineersEdge)

Depending upon the application and the customer's reliability requirements, it's worth considering upgrading from nickel-plated contacts to a more noble metal, such as gold. For example, if the system is intended for extreme climates, such as a military system outdoors in a rain forest, gold contacts are advisable.

Galvanic corrosion can eventually lead to loss of electrical contact, but before that happens, the increasing resistance, or loss of conductivity, can drain the battery more quickly than expected. For consumers, this is an irritant, but for military or medical applications, it can have more serious consequences.

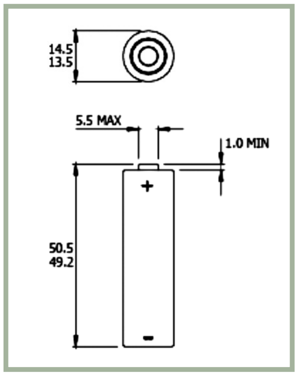
That said, some level of resistivity in contact metal is unavoidable. The natural resistivity of gold, for example, is 2.4 x 10-8 Ω. Copper, aluminum, and nickel have resistivities of 1.7 x 10-8, 2.8 x 10-8, and 7 x 10-8 Ω, respectively. Designers of ultra-low-power applications will need to factor in losses due to contact conductor resistance over time.

Battery contact stability: Under certain circumstances, a battery cavity's contact can physically disengage from the battery completely, causing complete system failure. This can happen for a number of reasons, including:

- Cavity-to-battery size mismatch.
- Vibration.
- Poorly designed contact mechanism.
- User intervention, such as contact damage or battery not inserted fully.

Many of these can be prevented early in the design process. For example, don't design or select a battery cavity or holder based on a particular brand of battery. The reason is that battery companies may market batteries of a standard specific size, such as AA or 18650 for Li-ion rechargeables (18 mm by 65 mm), as being capable of longer life (good, better, best). Instead of being an improvement in the chemistry, this often translates to different physical sizes (standard, larger, largest) that may not be noted in the advertisement.
As a result, customers may buy what should be the same-size battery from a different brand, and find it doesn't fit.

Individual drawings of our products are available online at www.battery-contacts.com



Instead, design the cavity around IEC/ANSI standard specifications (Figure 3).

Figure 3
To ensure a good battery fit, design to IEC/ANSI standard sizes (AA shown) instead of to a particular brand of battery. Dimensions in millimeters.

(Image source: IEC/ANSI)

The IEC standards also accommodate slight variations in battery style, such as negative contacts that may be either slightly protruding or slightly recessed. The battery cavity must be a good structure for both.

Ventilation and positioning: The structure of the cavity must also factor in ventilation. This is required to accommodate the build-up of gas in a battery. This can occur for a number of reasons, including:

- Oxidation of zinc prompting the release of hydrogen from the electrolyte.
- When a battery is discharged below a safe cut-off level.
- Faulty charging (current reversed or battery inserted backwards).

Venting generally results from poor charge/discharge circuitry or user error. These are unavoidable, so battery manufacturers accommodate venting from the battery itself. The amount of venting required depends on the chemistry. For example, a 2/3A lithium battery generates <0.2 ml of methane during over-discharge or overcharge. An AA alkaline battery generates <0.05 ml/day through oxidation, and 20 ml through over-discharge/charge. Consult the battery manufacturer for their specific ventilation specifications, as it can vary depending upon chemistry, battery size, and the materials.

For small underwater or waterproof systems, such as a simple flashlight, ventilation becomes an interesting challenge. This is met through the use of an enclosure made from a gas-permeable material, such as polypropylene or polyethylene. If the design requirements are for a different type of enclosure material, such as metal, it may be possible to assign a certain portion or area of the enclosure to a gas-permeable material.

This is where it's useful to have the battery-manufacturer's venting specifications, as the size and thickness of the material will depend on the amount of gas to be vented. For example, a 2-mm-thick patch of polypropylene measuring 0.07 cm2 will suffice for each AA alkaline battery used.

If enough hydrogen gas builds up in a waterproof battery compartment it can become explosive. If it isn't possible to use a venting material, another option is to use hydrogen catalyst pellets. These react with the hydrogen to produce water vapor.

Ventilation is also tightly coupled with positioning: a cavity may allow venting, but that's not much good if the cavity itself is placed too closely to the surrounding board or system elements. For safety reasons alone, the cavity should be well isolated from the surrounding electronic components. The battery's metal container for the chemicals is an active part of the circuitry.

In addition, heat from the electronic components can affect the battery state and lifespan, and if gassing occurs, liquids may also be leaked from the battery that can cause short circuits or otherwise destroy electronic components.

Ensuring reliable contact

For many reasons, this deserves its own section, as all is for naught if the battery can't maintain contact with the battery. Overuse, abuse, vibration, and user inattention when installing batteries can all be contributing factors to poor cavity-to-battery contact.

This has resulted in many innovations in the area of battery-cavity contacts and battery structures in general.

However, designers should start at the structure of the contacts: are they spring, fixed point, pressure contacts, or a mix? Here is a simple rule of thumb to use when choosing:

- *Good:* One spring and one fixed point (a flat spot).
- *Better:* One pressure contact.
- *Best:* Two pressure contacts: one on each end.

Of course, cost can be a factor. A spring contact costs $0.03 or $0.04, while pressure contacts cost $0.04. However, for high-reliability designs, lifespan must be considered: spring contacts last 6 or 7 years, while pressure contacts easily outlast most system designs.

Another factor to consider is mobility and vibration: if the device is going to be bounced around, pressure contacts are advisable to reduce the likelihood of break/make contact bounce. Here's a quick list of common contact types:

- *Miniature snap terminals:* Recommended when the battery will be changed often.
- *Printed circuit board pins:* Used when the battery is a permanent component.
- *0.005" flat nickel tab stock:* Used for a permanent soldered connection.
- *Single point spring or clip:* For use with miniature cells or a low current drain.
  Material must provide a spring pressure of 50 to 80 grams (0.49 to 0.78 N) on small button cells.
  (Caution should be taken to prevent denting cells with excessive pressure.)
- *Multiple point contact:* Here, the contact point is divided into several individual points or prongs.
  This approach is recommended for higher current drains. For larger cylindrical cells, a pressure of 150 to 175 grams (1.47 to 1.72 N) is recommended.
- *Standard Electrical Connector:* Terminals made by a contact manufacturer.

Prismatic batteries have a more challenging contact requirement, in that the battery contacts need to have enough travel to penetrate the recess while having sufficient contact pressure to minimize contact resistance. A minimum travel of 2.5 mm and a minimum force of 200 grams are used to ensure reliable performance in high-drain devices.

Along with having low resistance and compatible on the anodic index with the nickel-plated battery contacts, the cavity must also maintain their structural integrity over long periods and many battery remove-insert cycles. This ability to resist permanent set is a feature of pressure contacts, but all contacts may be subject to some degree to the various failure modes, such as temperature-related stress relaxation and fretting wear. Fretting wear is a result of small-amplitude oscillations that cause a build-up of oxide and increased resistance.

While there are many contact types, designers should start with nickel-plated, cold-rolled steel contacts, which have the added advantage of being highly solderable. This is useful at the other end, where the contact is soldered to the pc-board surface-mount reflow solder processes. However, for some designers in the prototyping stage, being able to solder a power supply lead to an empty cavity contact can also be quite useful.

Designers can go to extremes to maximize contact integrity; this must also be balanced with the need to allow access by users to replace batteries. Getting this balance right is tricky and is an on-going area of innovation by battery-cavity designers. For example, the Snap Dragon coin-cell battery holder holds the battery tightly in place with a snap-on cover (Figure 4).

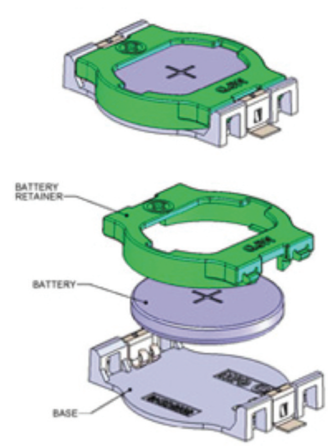


Figure 4: *Battery cavities are an on-going area of innovation as suppliers work with system designers to meet increasingly demanding applications. The Snap Dragon, for example, keeps coin-cell batteries tightly in place, while still allowing easy user access. (Image source: BatteryHolders.com)*

However, users get ready access by snapping back the cover and simply removing the battery. It adds only 1 mm to the total height of the coin cell, its LCP base is suited to solder-reflow processes, and its polypropylene cover is strong, yet flexible enough for many battery-replacement cycles.

Designing for careless users

As one of the system interfaces to the user, battery-cavity designers need to factor in user accessibility, error, and carelessness. This translates to making cavities accessible, but also applying nuances such as ribbons beneath the batteries so users don't require a tool to remove the batteries, which puts the contact's plating at risk.

Also, it's important to clearly label battery cavities so the user doesn't insert the wrong batteries, or insert the right batteries backwards. This can cause accidental battery charging in serial or parallel configurations. Often, labels or inscriptions aren't enough, so it is mandatory to have terminals that prevent reverse installation.

If a designer chooses to not have terminals to prevent reverse insertion, it's advisable to limit the number of cells: the more cells there are, the shorter the time to venting of a cell that is being accidentally charged. A good guide is to allow the user enough time to check whether or not the device is working, and then adjust the battery placement as needed. With four cells, one cell being charged by other three takes 2 minutes to vent.

Engineering devices for human factors

Glucose meters, thermometers or wearable drug delivery systems are examples of some portable medical devices. These devices must be designed according to FDA regulations (FDA-21) with a need for human factors assessed such as age and functional capabilities that could impact the safe and effective use of the device. Designing for safe and effective use is difficult, given the many ways a human can accidentally or purposely misuse or abuse a device. In fact, it's so difficult and so varied that figuring out and accounting for the human factor is a discipline unto itself, called human factors engineering (HFE). To help, the FDA publishes a document of non-binding recommendations for designers of medical devices, called, "Applying Human Factors and Usability Engineering to Medical Devices." In it, the FDA defines HFE as the application of knowledge about human behavior, abilities, limitations, and other characteristics of medical device users. It covers everything from mechanical design to documentation. However, as any designer knows, it can be summed up as Murphy's Law: when it comes to the human factor, what can go wrong, will go wrong, and designers need to account for every conceivable misstep. The FDA guide is therefore a good resource, but each application and user is different, and that must be factored in.

Selecting a battery cavity vendor

It's important to understand the nuances of battery cavities, but often it's not a company's or a designer's value add. It's wise to take this understanding and apply it toward selecting a good vendor. The right vendor typically has a strong track record of meeting the demands of challenging markets and applications, such as military and space. Check their background and ask for samples.

Also, a good provider will be able to guide a designer to what's needed if it's off the shelf, or help with a custom design if the need arises. Find out by calling them directly and vetting their technical abilities and domain knowledge.

Finally, a battery cavity supplier should already understand the designer's target market as well as the designer does. For example, if the application is medical, they should know "insider" requirements such as the plastic material not supporting organic growth.

Conclusion

Designers are under constant pressure to reduce size, cost, and power consumption, while improving performance, safety, and reliability. Enabled by a good understanding of battery cavity design and options, and by working with a knowledgeable supplier, it's possible to incorporate the battery cavity holistically into a system design to better meet all of these objectives.

MPD
MEMORY PROTECTION DEVICES
MEMORY PROTECTION DEVICES, INC.
Certified ISO9001:2015
Visit our Website for a complete list of our products.
www.batteryholders.com
www.memoryprotectiondevices.com
We specialize in custom parts!
sales@memoryprotectiondevices.com

Attaching and Fastening Battery Holders

Though there are many ways to securely attach a battery holder to a device, there are three main ways which MPD would recommend: soldering, bonding, and fastening. All of these can be reliable methods when done correctly, however any of them can also fail or damage your battery holder when not done properly. Depending on the device which the battery holder is being used for, one method will likely be the most obvious choice to use in most applications.

Soldering is the most common choice, namely due to the growing popularity of coin cell batteries and automated assembly processes. The two main automated methods of soldering are wave and reflow soldering. Though with the lead-free movement sweeping the globe, soldering has become more difficult and generally requires higher temperatures, so many of our newest battery holders have been made to resist much higher temperatures in order to ensure a high strength soldering can be done with lead-free solders, and our battery holders which are compatible with lead-free solder are marked so on our website. It is also worth noting here that typical coin cells should never be put through a reflow solder process, as the high temperatures damage the cells and can even cause them to explode in extreme cases. Hand soldering is also possible, but care must be taken to not bring the soldering iron too close to the plastic of the battery holder as this can damage the plastic.

Bonding includes the use of both adhesives and double-sided tapes (typically, automotive tapes are used). Although fasteners used to be preferred to bonding for more secure attachments that were also more resistant to environmental conditions, the recent, rapid advances in adhesives make them a strong competitor. Modern bonding technologies can provide an extremely strong attachment, as well as the necessary resistance to environmental conditions necessary for most applications. Even though fasteners still provide a more reliable attachment, many prefer the cost effectiveness of bonding with either industrial-grade adhesives or double-sided tape.

Fastening battery holders typically means using machine screws to create a very strong attachment. Many of our battery holders come with recesses or eyelets for use with machine screws, the sizes of which can be found on the datasheets of the appropriate parts. However, due to the labor-intensive process of fastening, most find it better to solder or bond battery holders instead. However, in cases where reliability is of the highest importance it is possible to use both bonding and fastening to create extremely strong attachments.

Selecting Coin Cell Holders

Key Criteria Needed to Make Smart Holder Selections

While breakthrough technologies continue to grab headlines, components like the coin cell holders often get overlooked, despite their critical role in a device's operation. Holders can fail due to issues like vibrations, shocks, heat, humidity, and corrosion, and design engineers face growing challenges in developing power management solutions to handle these real world conditions. With the following criteria and advice, engineers can achieve the product reliability they need at the costs they want.

A well-designed coin cell holder must resist shocks and vibrations while remaining flexible enough to allow easy battery replacements. Unfortunately, these two criteria are in conflict, as better battery retention almost always leads to tougher battery removal. The best coin cell holders have features designed to ease battery removal, which allows for the use of stronger plastics while keeping battery replacements simple.

Durability is especially important for applications where frequent battery replacements may be needed over the product's expected lifespan. If a coin cell holder's contacts have an especially strong grip, the increased wear and tear on the contacts during battery insertions and removals can cause significant harm to the metal. If an application will require relatively frequent cell changes, find out the cycle count that the holder has been tested for. It is also worth noting that a large number of replacements will lead to more instances of end users inserting batteries with the polarities reversed, so holders with built-in reverse polarity protection features would be beneficial as well.

Products exposed to excessive heat and humidity, caustic chemicals, or airborne pollutants can often have problems associated with corrosion build-up, which can negatively impact electrical and retention performance. To minimize these effects, some holders are constructed from corrosion-resistant materials, such as LCP and gold. The presence of electrochemically dissimilar metals can further increase corrosion problems due to galvanic corrosion. For coin cell holders, this can be minimized through the use of either nickel- or gold-plated contacts. Gold and similar metals are especially useful as they are not only highly conductive, but also provide a smoother surface with a smaller frictional insertion force, resulting in easier battery replacements for the elderly and disabled. All other things held constant, a holder with gold-flashed contacts will have a smaller battery insertion force than one with tin- or nickel-plating.

Another little known fact is that competing brands of batteries can differ substantially in terms of dimensional specifications. For example, according to ANSI and IEC standards a CR2032 coin cell can vary in height by ±0.3 mm, or almost 10% of its total height. Therefore, it is critical that a coin cell holder be adaptable to normal height variances while not accepting incompatible batteries, but it is of course completely unacceptable to have a connection that is too loose, as it compromises electrical performance and battery retention. This is less of an issue if the cells are factory installed and designers have control over the battery brand that is used, but if the end user can purchase a replacement cell, the full range of battery sizes should be supported.

Soldering processes also influence the choice of a coin cell holder. For example, a coin cell holder for use in lead-free reflow soldering should be made of a high quality plastic, like LCP, that offers exceptional dielectric strength at temperatures of at least 280°C. By contrast, wave soldering processes require less rugged materials, which allows for the use of PBT or nylon. These materials offer strong dielectric strengths, as well as resistances to chemicals and solvents, a broad service temperature range with excellent thermal cycling performance, and excellent insulating properties.

Although making a smart coin cell holder selection based on available information is a start, testing is always the most crucial step. Comprehensive product test data should be requested to ensure that the coin cell holder meets or exceeds the EIA-540J0AB standard, and that superior quality raw materials were used. Furthermore, samples should be requested so that in situ testing can be done with prototypes to ensure that a coin cell holder is right for a given application.

JAN 2020

SMD BATTERY HOLDER DESIGN GUIDE V1

BY TOM BLAHA
PRESIDENT
MEMORY PROTECTION DEVICES

1.1 - PURPOSE

This document describes the engineering design guidelines for surface mount device (SMD) battery holders. Principles included in this document are intended to impart features, techniques, and processes to fabricate consistent and durable holders that optimize leverage industry standards and best practices while reducing manufacturing risk. Due to the many variations of SMD battery holder applications, this guide is not to be assumed comprehensive but rather is meant to cover a wide range of topics frequently encountered by design engineers. Reference specific industry standards and personnel for help with unique applications, product requirements, or process constraints.

1.2 - INTENDED USER AND MAINTENANCE RESPONSIBILITY

This guide is intended to be used by engineers and manufacturing personnel responsible for product design, development, and fabrication battery holders for surface mount applications. The document should be maintained by engineering management or a design engineering technical lead. This discipline ensures that the user is privy to and can readily add updates to manufacturing techniques, design principles, or standards.

1.3 - SCOPE

The topics covered in this document cover the component specifications and assembly of the holder itself. It also covers the manufacturing process and steps required to fabricate the SMD battery holder. Raw material specifications, fixturing and tooling requirements, or battery features are not in the scope of this document. The units of measure used in this guide, unless explicitly stated otherwise, are Imperial: distance in inches, temperature in degrees Fahrenheit, pressure in psi, mass in lbm, and time in seconds, and force in lbf.

SECTION 2: KEY DEFINITION, STANDARD, AND PROCESS OVERVIEWS

2.1 DEFINITIONS/ACRONYMS

The topics covered in this document cover the component specifications and assembly of the holder itself. It also covers the manufacturing process and steps required to fabricate the SMD battery holder. Raw material specifications, fixturing and tooling requirements, or battery features are not in the scope of this document. The units of measure used in this guide, unless explicitly stated otherwise, are Imperial: distance in inches, temperature in degrees Fahrenheit, pressure in psi, mass in lbm, and time in seconds, and force in lbf.

a. SMD - surface mount device, assembled using proven surface mount technology

b.SMT - surface mount technology, comprises the suite of soldering and mounting components onto the printed circuit board (PCB)

c.Solder - a low-melting filler metal such as silver, lead, or tin, used to join dissimilar metals; can also refer to the act of applying solder to join metals

d. Stencil - thin sheet of material, such as stainless steel, used to apply solder paste to the PCB. The stencil contains a hole pattern that defines appropriate spacing for solder paste application

e. Surface tension - force on a liquid's surface that reduces the surface area by the bulk fluid pulling the surface molecules toward it; it inhibits the solder paste from flowing into the aperture of an excessively thick stencil

f. Inspection/solder joint integrity techniques - solder joints are inspected visually; characteristics of a good solder joint are bright, shiny metal, clean and smooth, with apparent solder wetting that covers the wire

g. Battery cavity - where the battery sits in the holder

2.2 IPC-7351 SURFACE MOUNT DESIGN REQUIREMENTS AND LAND PATTERN STANDARD

IPC drafted standards for surface mount design in 1995. The standards relate Design for Manufacturability to Design for Environment and focus on the performance of the final product with minimal time to market. The contents of the full standard, which contains mainly quantitative specifications, can be applied with the qualitative guidance in this document to scope SMD Design.

Highlights from IPC-7351 include:

a. Dimensioning

   i. All dimensions are basic (no tolerance included) - tolerance is defined by specific manufacturer and application
   ii. At its maximum dimensions, the component form must be maintained
   iii. Maximum part dimensions dictate the position dimensions

b. Land Pattern Naming Convention

   i. Land pattern name consists of a prefix for the type of device, a pin pitch, provision for one or two nominal lead spans, and several pins

c. Grid-based Component Positioning

   i. To enable uniform test-node accessibility and to maintain predictable routing channels, grid spacing should be at least 0.5mm between centers

2.3 SOLDER JOINT STRENGTH TEST FOR 260C REFLOW

For 260c flow, three solder pastes can be used: SAC-305, REL61, and REL22. The acceptable pastes were subjected to increasing loads until the failure point. The solder blends withstood loads between 10 and 25 kg during a five-sample per part number test, with two-part numbers tested for each solder paste type.

The SAC-305 paste averaged 17.8 and 11.6kg for each part number before failing, while REL61 withstood 12.4 and 14.2kg. Rel22 failed at 18 and 10.8 kg. Rel22 had the highest magnitude but most comprehensive range of strength test average performance.

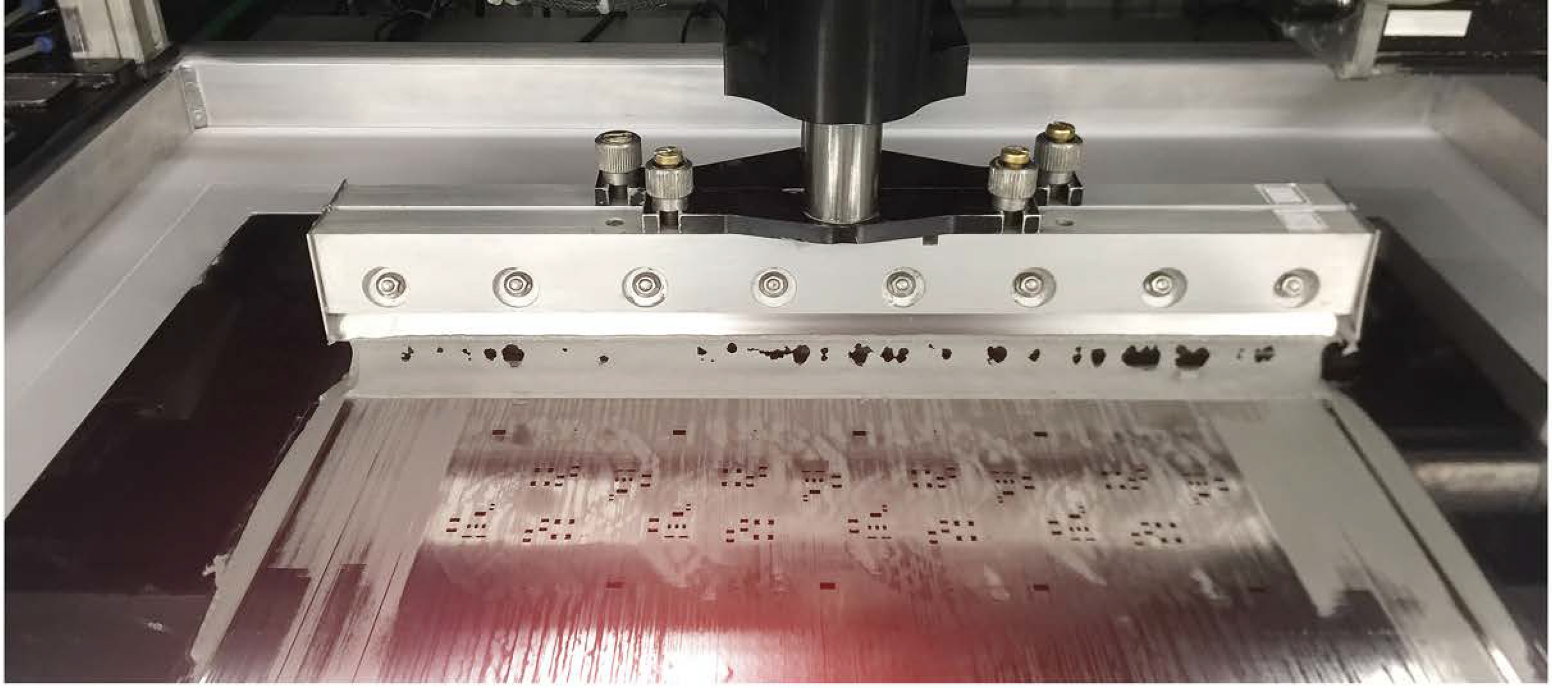
SECTION 3: GENERAL DESIGN STANDARDS

3.1 STENCIL THICKNESS

The topics covered in this document cover the component specifications and assembly of the holder itself. It also covers the manufacturing process and steps required to fabricate the SMD battery holder. Raw material specifications, fixturing and tooling requirements, or battery features are not in the scope of this document. The units of measure used in this guide, unless explicitly stated otherwise, are Imperial: distance in inches, temperature in degrees Fahrenheit, pressure in psi, mass in lbm, and time in seconds, and force in lbf.

Guidelines for stencil design are as follows:

- Aspect ratio (W/T): for an aperture of length L, width W, and thickness T, the aspect ratio should be more than 1.5
- Area ratio (Area of aperture, L x W, divided by area of stencil walls bordering aperture, 2T[L+W]) should be more than 0.66
- For solder composition, a minimum of five (5) solder particles should fit into the smallest aperture width to ensure sufficient alloy flow



3.2 APERTURE DESIGN

The design of the aperture can minimize undesired solder bond characteristics like bridging and beading fo the paste. Designing the aperture to be generally 0.002" smaller than the pad provides a suitable gasket seal between the PCB and stencil. The IPC-7351 standard mentioned in section 2.2 provides additional guidelines for dimensioning surface mount pads.

3.3 STENCIL MATERIAL AND MOUNTING

While the aperture design has a strong influence on the dispersion of solder paste into the joint, the construction material and mounting strategy of the stencil also affect the solder release and subsequent integrity of the joint. While stainless steel is commonly used as a stencil material, nickel-based alloys benefit small-aperture designs, albeit at a cost premium up to 50% of the stainless value. For non-uniform solder applications, stencil designs can employ multiple thicknesses within a single piece to regulate the amount and location of solder flow.

Tailoring the shape and geometry of variable-thickness stencils provides greater control over the placement of the solder to make the joint. As long as the guidelines in section 3.1 are maintained, the shape of the aperture can be fit to the specific application.

The stencil mounting strategy depends on the scale of the end-use. For high-volume situations, permanently mounting the stencils provides a high level of precision. In applications requiring more flexibility, frame-less stencils use tension to offer a temporary, low-tooling strategy. It is essential to define the manufacturing process before selecting the mounting approach

3.4 STENCIL ALIGNMENT

Typical stencil thicknesses are on the order of thousands of an inch, alignment and placement of the stencils on the PCB are imperative. Accurately aligning the stencils ensures the solder flows where it is intended. The best design practice to ensure proper stencil alignment is to score or mark placement lines on both the stencil and the PCB. These marks are lined up on both components to ensure accurate alignment.

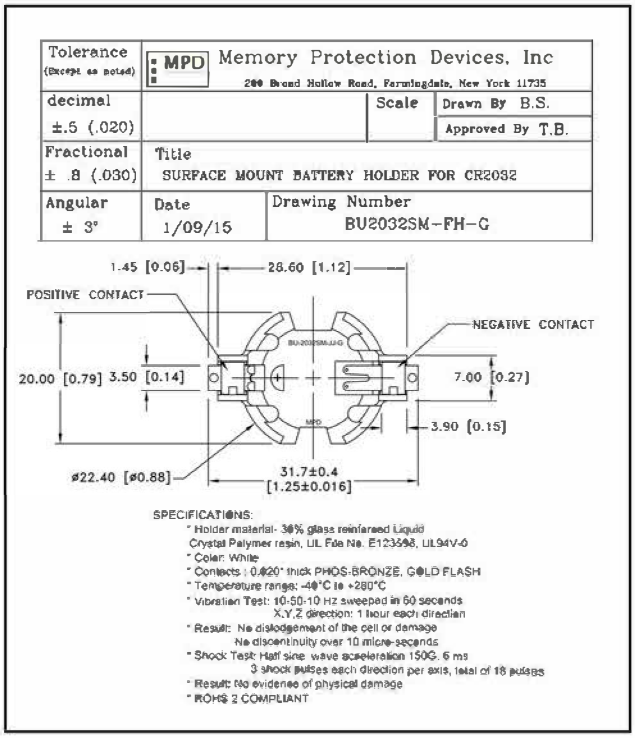
3.5 PCB DESIGN SPECIFICS

Typical stencil thicknesses are on the order of thousands of an inch, alignment and placement of the stencils on the PCB are imperative. Accurately aligning the stencils ensures the solder flows where it is intended. The best design practice to ensure proper stencil alignment is to score or mark placement lines on both the stencil and the PCB. These marks are lined up on both components to ensure accurate alignment.

3.6 BATTERY TO CAVITY CONTACT

Nickel-plated stainless steel provides the best solution to avoid galvanic corrosion while maintaining cost efficiency.

3.7 BATTERY CAVITY



3.7.1 Sizing Guidelines - holder cavity sizes should consider standard battery sizes to enable a brand-agnostic design. This approach designs against disengagement due to vibration failure, poor terminal contact, and failures due to human misuse

3.7.2 Ventilation and Position - due to the potential of gas release from zinc oxidation (electrolytic hydrogen release), low-level discharge, or faulty charging, the battery holder design should consider ventilation. The easiest venting method is to drill outgassing holes in the holder, though its proximity to other system components and enclosures may still allow the local gas concentration to reach its lower explosion limit (LEL, 4 vol% for hydrogen). The battery manufacturer may provide a specification, which is the best source of ventilation guidance. Catalyst pellets are another option to consume undesirable gas. These pellets consume the gas and react to form a non-harmful product.

3.7.3 Vibration Failure Mitigation - pressure contacts could be incorporated to reduce the impact of vibration. Common examples of common contact types are mini snap terminals, printed circuit board pins, thin-gauge flat nickel tab stock, spring clips, multiple point contacts, and standard electrical connectors. The vibration path could also incorporate bends in the vibration path, absorbing some of the resonant vibrations.

3.8 MISCELLANEOUS BEST PRACTICES

The thermal management of processor heat has a direct correlation on component performance. Because each application is very different, the design engineers should consider thermal management and heat dissipation paths when designing the PCB board. Passive and active cooling media may be applied to the board assembly, such as forced air or dielectric liquid.

The grade, thickness, and design of SMD holder material can also influence the assembly strategy. Conductive epoxies can mitigate excessive heat generation by accepting some of the process heat, though care should be taken to ensure the solder joint is not overheated.

SECTION 4: CONCLUSION AND ASSEMBLY CONSIDERATION

This document provides guidelines and best practices for the design of SMD components, along with quantitative specification values for key design features. Individually, stencil geometry, thickness, aperture, ratios within the stencil, PCB board, and system characteristics influence the solder joint and general part design and manufacture. It is just as important, though, to consider what the impact of a change to one of the features above has on the other system parameters. An in-depth risk assessment helps guide the system-level impact of a change to one of the design features.

Low Temperature Solder

P/N:	**BA2032**

Inquiry Date	**March 6th 2013**

Product / Product Family	Temperature Range	Comments	Material
BA2032 / CR2032 Battery Holder, PC Pins	-40°c to + 225°c	Low Temperature Soldering per JEDEC-J-STD-020, Note 4 for small volume PC Pins. 225 +0/-5°c.	Nylon 66

Note: The Pins that hold the battery down are subject to distortion and/or burning by some processes above this rating.

MPD
MEMORY PROTECTION DEVICES

Low Temperature Solder

P/N:	**BA2032SM**

Enquiry Date	**March 6th 2013**

Product / Product Family	Temperature Range	Comments	Material
BA2032SM / CR2032 Battery Holder, SMD Mounting.	-40°c to + 225°c	Low Temperature Soldering per JEDEC-J-STD-020, Note 4 for small volume SMD packages, 225 +0/-5°c.	Nylon 66

Notes: The small tabs that hold the battery down are subject to distortion and/or burning by some processes above this rating.

MPD
MEMORY PROTECTION DEVICES

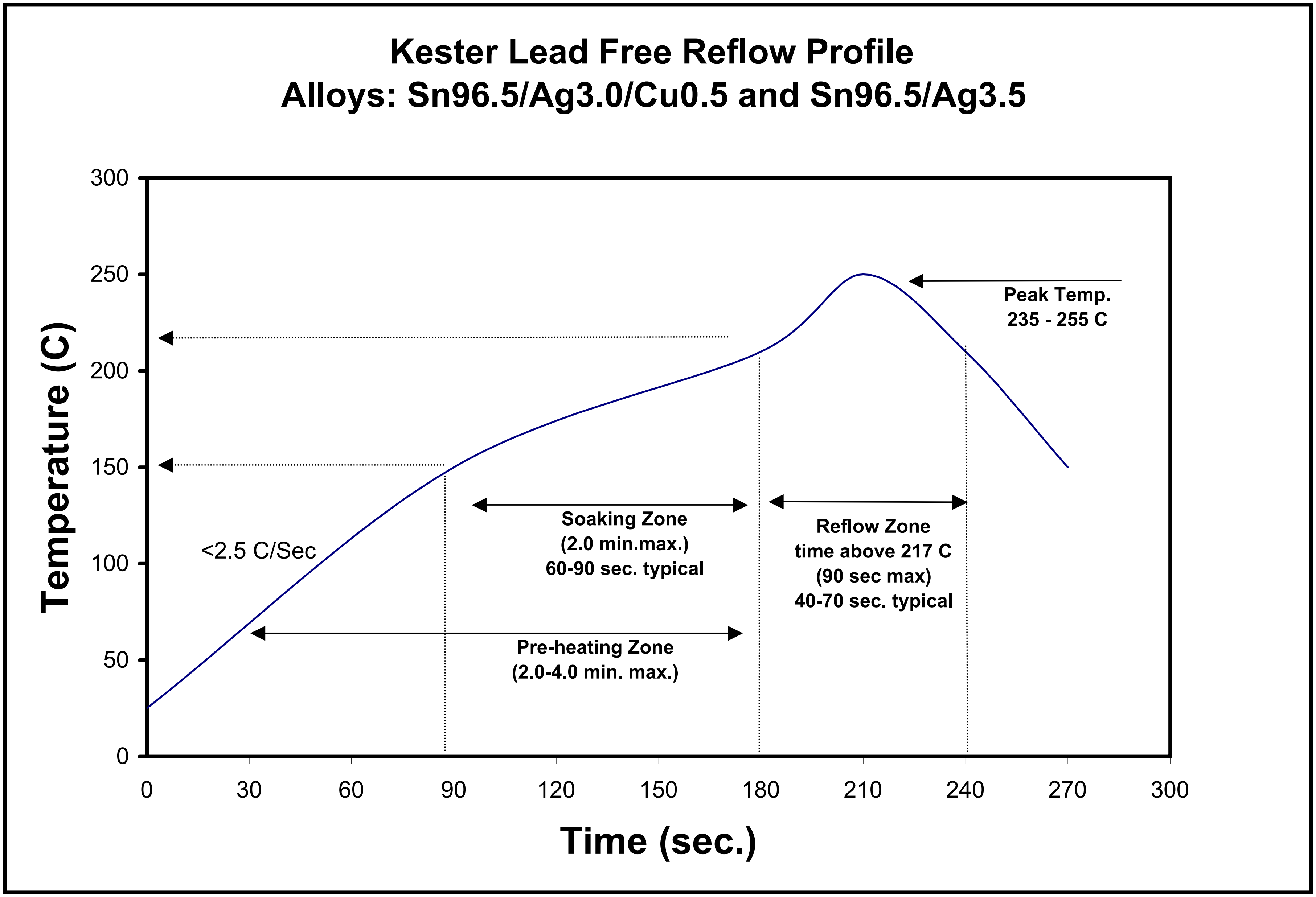
Hand Soldering Parameters

Hand Soldering Parameters

	Max Solder Iron Tip Temperature	Max Contact Time with Component Lead	Number of Heat Cycles
SnPb[1] soldering	300°C	20s	3
Pb-Free[2] soldering	350°C	20s	3

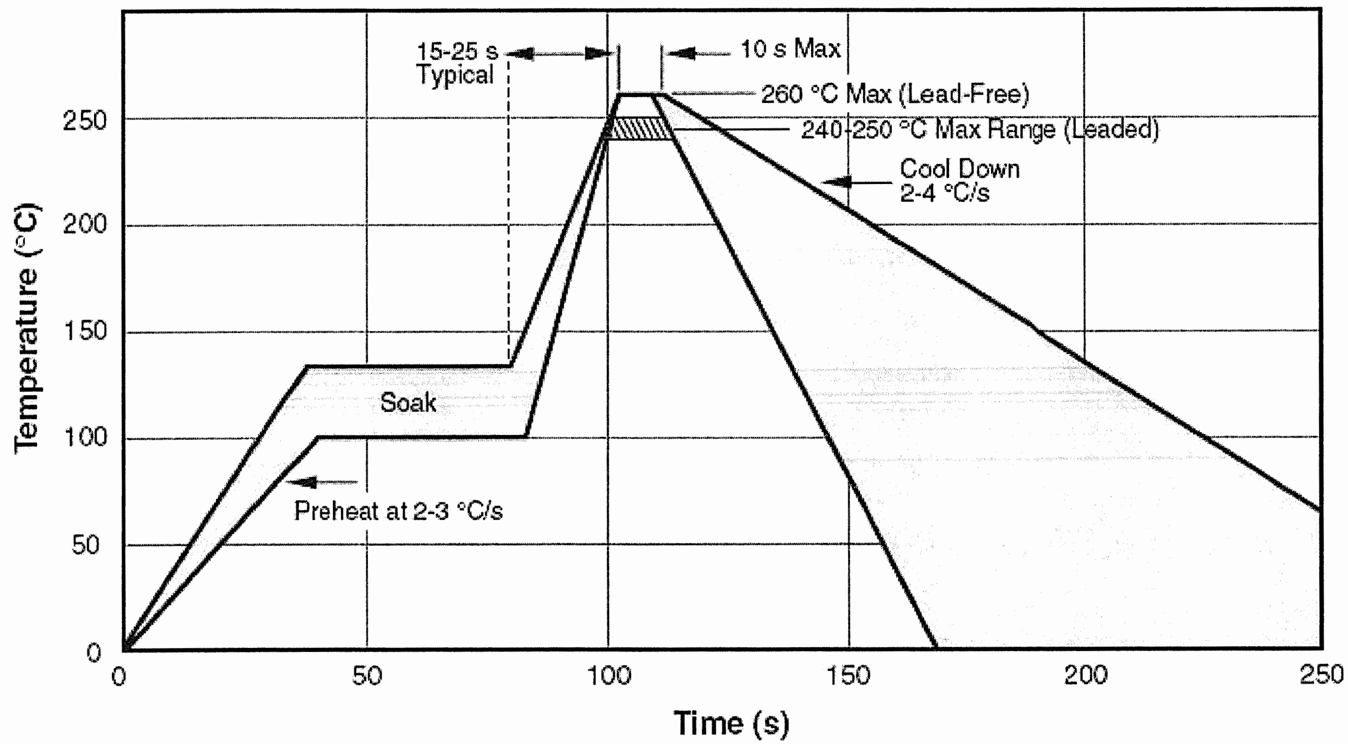
Notes:

1. For standard SnPb alloys; 63% Sn, 37% Pb; 60% Sn, 40% Pb; and 62% Sn, 36% Pb, 2% Ag.
2. If a component is compatible with Pb-free processing temperatures, the floor-life recommendation will be listed on the packaging label.



Kester Lead Free Reflow Profile
Alloys: Sn96.5/Ag3.0/Cu0.5 and Sn96.5/Ag3.5
300
250
200
150
100
50
0
Temperature (C)
0
30
60
90
120
150
180
210
240
270
300
Time (sec.)
Peak Temp.
235 - 255 C
<2.5 C/Sec
Soaking Zone
(2.0 min.max.)
60-90 sec. typical
Reflow Zone
time above 217 C
(90 sec max)
40-70 sec. typical
Pre-heating Zone
(2.0-4.0 min. max.)

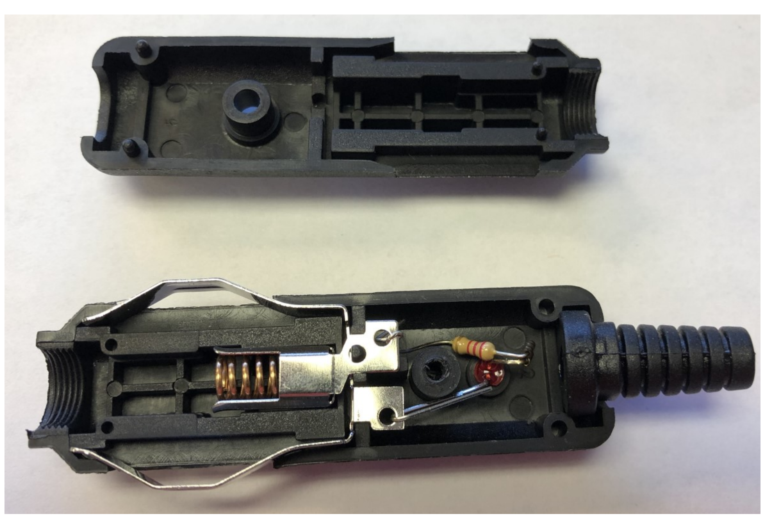
TYPICAL WAVE SOLDER PROFILE FOR LEADED AND LEAD-FREE THROUGH-HOLE PACKAGES



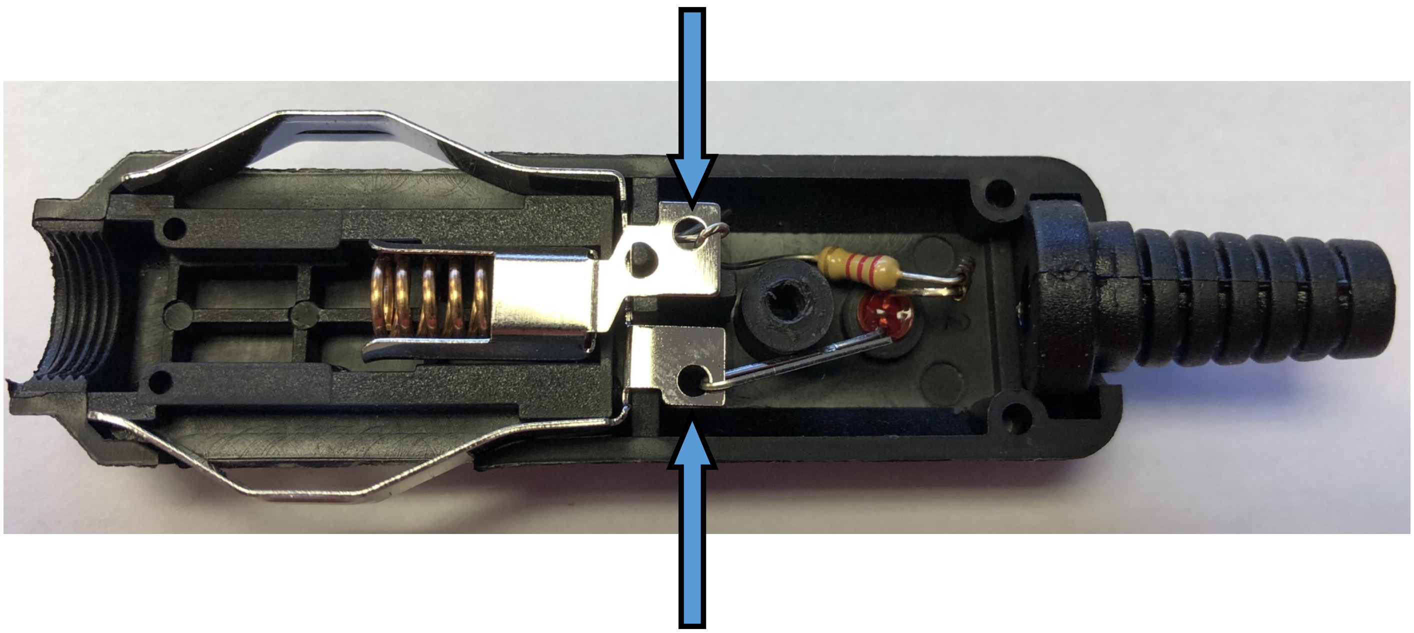
Installing and Soldering wire in APP-001-15AMP unit.

To open the unit (see right image) proceed by turning the unit over and removing the screw. Then twist off the round ring below the pin at the top of the unit. Remove the pin assembly, fuse and spring from the unit. Then remove the small ring from the plastic shell.

Now separate the unit in 2 half.



To solder the wire, first remove the strain relief from the unit. Fish your wire into the strain relief and put the strain back in the unit. Solder your wire to each side of the contacts. Finally re-assemble the unit.



MPD

MEMORY PROTECTION DEVICES

CR2032 - BC-2003

Battery Install & Removal

STEP 1– Make sure the retainer is soldered in place on your PCB board. Push battery in plus sign up.

STEP 2– Removal is done by pushing the battery from the back using a small flat head screwdriver.

CR2032 - BC-2005

Battery Install & Removal

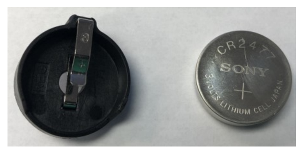
STEP 1– Make sure the retainer is soldered in place on your PCB board. Push battery in plus sign up.

STEP 2– Removal is done by pushing the battery from the back using a small flat head screwdriver.

CR2477 - BH1000G

BATTERY INSTALLATION

STEP 1– Take the BH1000G holder in your hand and proceed to install the battery into the unit.



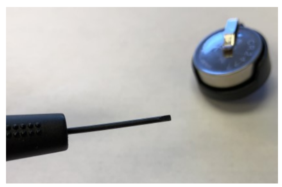
STEP 2– Using the side of the holder, proceed to slide the battery in position pushing slightly into the holder.

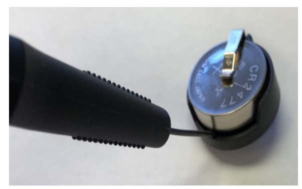
STEP 3– The battery should now be in the unit properly.

CR2477 - BH1000G

BATTERY REMOVAL

STEP 1– Using a small flat head screw driver, insert it under the battery in the front of the holder.



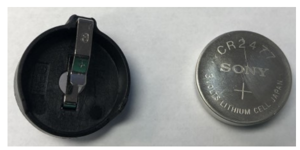


STEP 2– Gently lift and twist the battery to the side of the holder.

STEP 3– Pull the battery out of the holder.

CR2477/2450 - BH1000G/S BATTERY INSTALLATION

STEP 1– Take the BH1000G holder in your hand and proceed to install the battery into the unit.



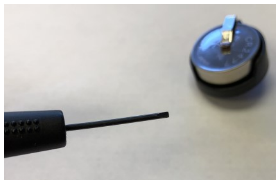
STEP 2– Using the side of the holder, proceed to slide the battery in position pushing slightly into the holder.

STEP 3– The battery should now be in the unit properly.

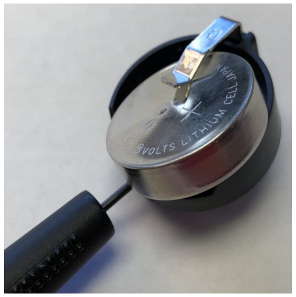
CR2450/2477 -BH1000S

BATTERY REMOVAL

STEP 1– Using a small flat head screw driver, insert it under the battery in the front of the holder.



STEP 2– Gently lift and twist the battery to the side of the holder.

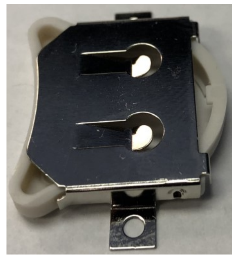
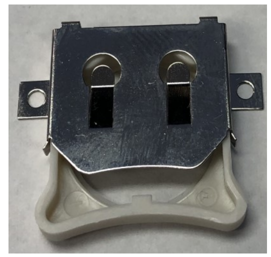


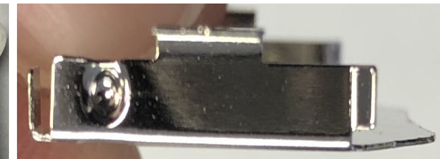
STEP 3– Pull the battery out of the holder.

CR1025 - BHX1-1025-PC

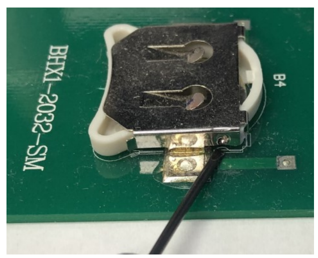
BATTERY INSTALL & REMOVAL

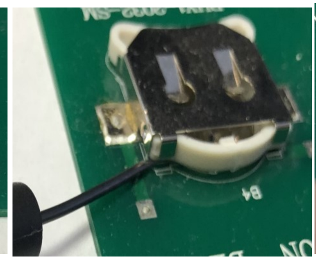
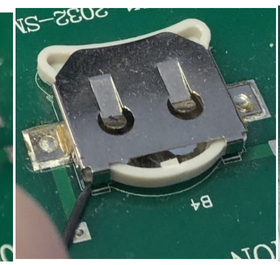
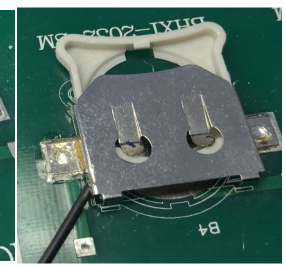
STEP 1– Once the tray is in a lock position, on the metal cage you will see a dimple on each side. That is the lock position.



STEP 2– To remove/unlock the tray, use a small flat head screw drive, position it to the side where the dimple is, in between the dimple and the metal leg you will see the plastic tray, put the head of the screw drive on the plastic tray and push gently on the tray. I will then push the tray backward thus removing it.



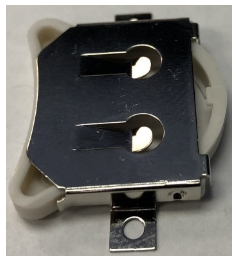
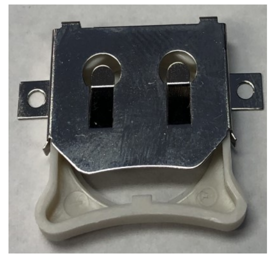
MPD
MEMORY PROTECTION DEVICES

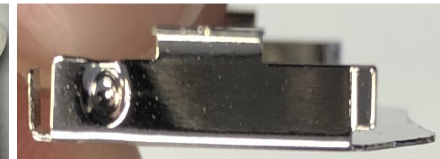
CR1025 -BHX1-1025-SM

MPD
MEMORY PROTECTION DEVICES

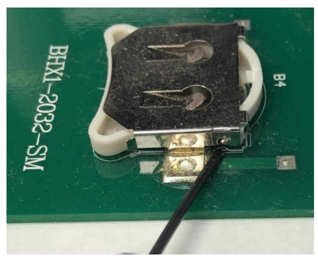
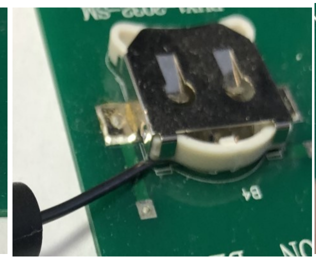
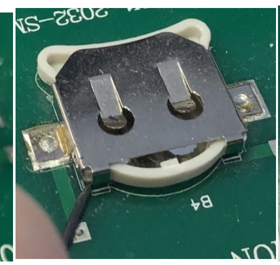
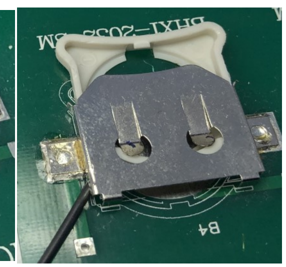
BATTERY INSTALL & REMOVAL

STEP 1– Once the tray is in a lock position, on the metal cage you will see a dimple on each side. That is the lock position.



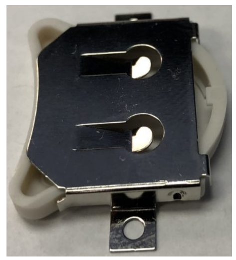
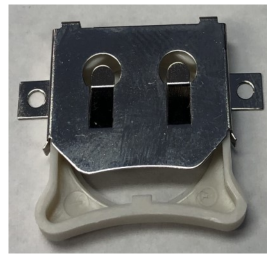
STEP 2– To remove/unlock the tray, use a small flat head screw drive, position it to the side where the dimple is, in between the dimple and the metal leg you will see the plastic tray, put the head of the screw drive on the plastic tray and push gently on the tray. I will then push the tray backward thus removing it.

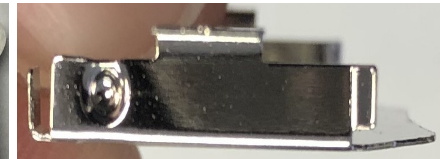





CR2032 - BHX1-2032-PC

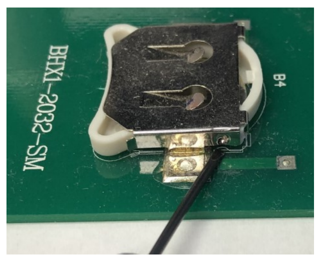
BATTERY INSTALL & REMOVAL

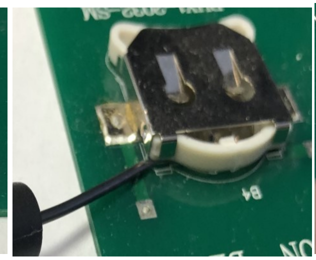
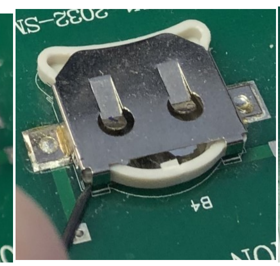
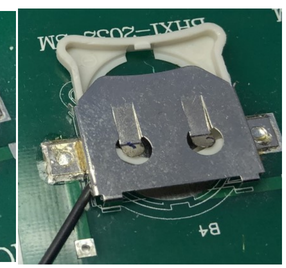
STEP 1– Once the tray is in a lock position, on the metal cage you will see a dimple on each side. That is the lock position.



STEP 2– To remove/unlock the tray, use a small flat head screw drive, position it to the side where the dimple is, in between the dimple and the metal leg you will see the plastic tray, put the head of the screw drive on the plastic tray and push gently on the tray. I will then push the tray backward thus removing it.



CR2032 - BK-912

Battery Install & Removal

STEP 1– Make sure the retainer is soldered in place on your PCB board. Push battery in plus sign up.

STEP 2– Removal is done by pushing the battery from the back using a small flat head screwdriver.

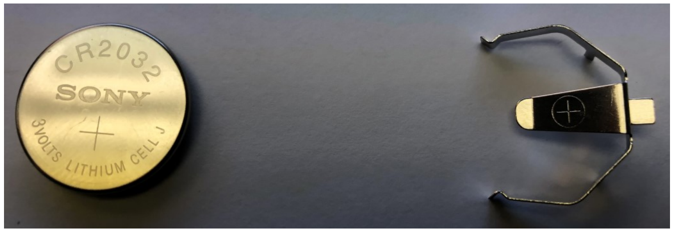
MPD
MEMORY PROTECTION DEVICES

CR2032 - BK-915

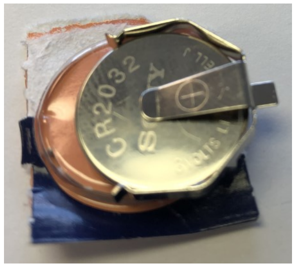
MPD
MEMORY PROTECTION DEVICES

BATTERY INSTALL & REMOVAL

STEP 1– Make sure the retainer is soldered in place on your PCB board.



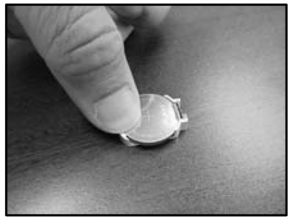
STEP 2– Gently insert the CR2032 battery by sliding in front and pushing in. Removal is done by releasing the battery from the back using a small flat head screwdriver.



Date	SYM	REVISION RECORD	AUTH	DR.	CK.

Battery Insertion Instruction

1. Slide the battery under the positive contact as shown.



2. Press the battery down with the thumb to install.

Battery Extraction Instruction

1. place the tip of the flat head screw driver at corner edge.
2. Twist the screw driver to lift the battery out of the tab.

3. place the tip of the screw driver at center as shown and twist to remove the battery from the holder.

Tolerance (Except as noted)	MPD MEMORY PROTECTION DEVICES, INC. Certified ISO9001:2015		Visit our Website for a complete list of our products. www.batteryholders.com www.memoryprotectiondevices.com We specialize in custom parts! sales@memoryprotectiondevices.com
decimal ±.5 (.020)		Scale	Drawn By B.S. Approved By T.B.
Fractional ± .8 (.030)	Title BATTERY INSERTION AND EXTRACTION INSTRUCTION		
Angular ± 3°	Date 09/09/11	Drawing Number BLP2032SM INSERTION/EXTRACTION INSTRUCTION	

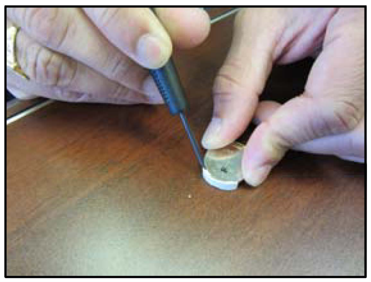
Date	SYM	REVISION RECORD	AUTH	DR.	CK.

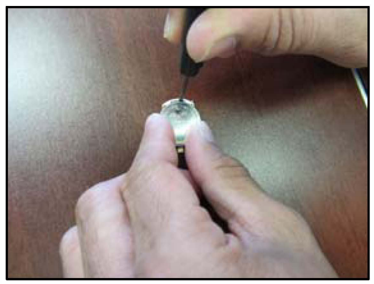
Battery Insertion Instruction

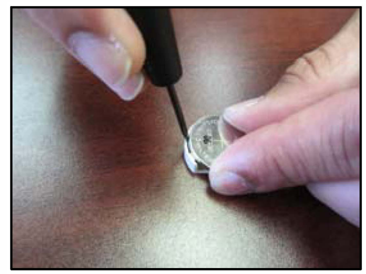
1. Slide the battery under the positive contact as shown.

2. Press the battery down with the thumb to install.

Battery Extraction Instruction





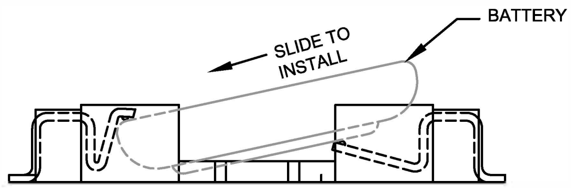


1. place the tip of the flat head screw driver at corner edge.
2. Twist the screw driver to lift the battery out of the tab.

3. place the tip of the screw driver at center as shown and twist to remove the battery from the holder.

Tolerance (Except as noted)	MPD MEMORY PROTECTION DEVICES, INC. Certified ISO9001:2015	Visit our Website for a complete list of our products. www.batteryholders.com www.memoryprotectiondevices.com We specialize in custom parts! sales@memoryprotectiondevices.com	
decimal ±.5 (.020)		Scale	Drawn By B.S. Approved By T.B.
Fractional ± .8 (.030)	Title BATTERY INSERTION AND EXTRACTION INSTRUCTION		
Angular ± 3°	Date 09/09/11	Drawing Number BLP2032SM INSERTION/EXTRACTION INSTRUCTION	

Date	SYM	REVISION RECORD	AUTH	DR.	CK.



Tolerance (Except as noted)	MEMORY PROTECTION DEVICES, INC. Certified ISO9001:2015	Visit our Website for a complete list of our products. www.batteryholders.com www.memoryprotectiondevices.com We specialize in custom parts! sales@memoryprotectiondevices.com	
decimal ±.5 (.020)		Scale	Drawn By B.S. / Approved By T.B.
Fractional ± .8 (.030)	Title INSTALLATION INSTRUCTION		
Angular ± 3°	Date 01/22/05	Drawing Number BU2032 INSTALLATION INSTRUCTION	

Date	SYM	REVISION RECORD	AUTH	DR.	CK.

Battery Insertion Instruction

1. Slide the battery against the positive contact as shown.

2. Press the battery down with the thumb to install.

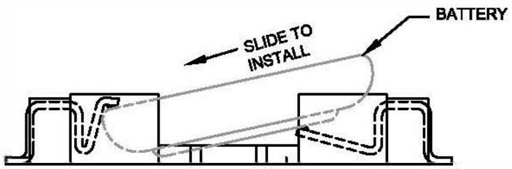
Battery Extraction Instruction

1. place the tip of the flat head screw driver between negative contact and battery.

2. Twist the screw driver to lift the battery out from the holder.

Tolerance (Except as noted)	MPD MEMORY PROTECTION DEVICES MEMORY PROTECTION DEVICES, INC. Certified ISO9001:2015			Visit our Website for a complete list of our products. www.batteryholders.com www.memoryprotectiondevices.com We specialize in custom parts! sales@memoryprotectiondevices.com
decimal ±.5 (.020)		Scale	Drawn By B.S. Approved By T.B.	
Fractional ± .8 (.030)	Title BATTERY INSERTION AND EXTRACTION INSTRUCTION			
Angular ± 3°	Date 08/14/15	Drawing Number BU2032SM INSERTION/EXTRACTION INSTRUCTION		

Date	SYM	REVISION RECORD	AUTH	DR.	CK.



Tolerance (Except as noted)	MEMORY PROTECTION DEVICES, INC. Certified ISO9001:2015 Visit our Website for a complete list of our products. www.batteryholders.com www.memoryprotectiondevices.com We specialize in custom parts! sales@memoryprotectiondevices.com		
decimal ±.5 (.020)		Scale	Drawn By B.S. Approved By T.B.
Fractional ± .8 (.030)	Title INSTALLATION INSTRUCTION		
Angular ± 3°	Date 8/9/2019	Drawing Number BU2450 INSTALLATION INSTRUCTION	

Date	SYM	REVISION RECORD	AUTH	DR.	CK.

Battery Insertion Instruction

1. Slide the battery against the positive contact as shown.

2. Press the battery down with the thumb to install.

Battery Extraction Instruction

1. place the tip of the flat head screw driver between negative contact and battery.

2. Twist the screw driver to lift the battery out from the holder.

MPD MEMORY PROTECTION DEVICES

MEMORY PROTECTION DEVICES, INC.

Certified ISO9001:2015

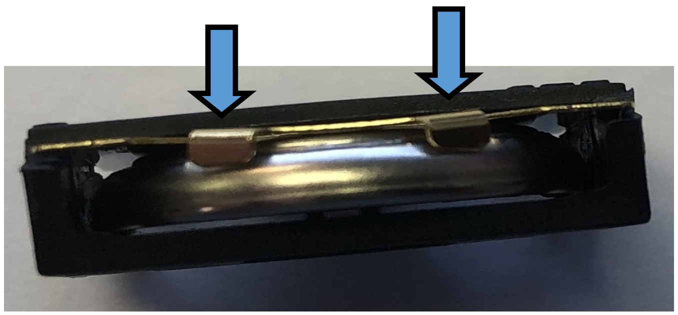
Visit our Website for a complete list of our products.
www.batteryholders.com
www.memoryprotectiondevices.com
We specialize in custom parts!
sales@memoryprotectiondevices.com

decimal ±.5 (.020)		Scale	Drawn By B.S. Approved By T.B.
Fractional ± .8 (.030)	Title BATTERY INSERTION AND EXTRACTION INSTRUCTION		
Angular ± 3°	Date 08/09.2019	Drawing Number BU2450 /EXTRACTION INSTRUCTION	

VERTICAL BV-1632-G

BATTERY REMOVAL

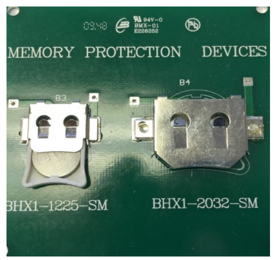
STEP 1– To remove the battery from the vertical BV-1632-G holder, simply gently pull the tab back to release the battery and pull out the battery.



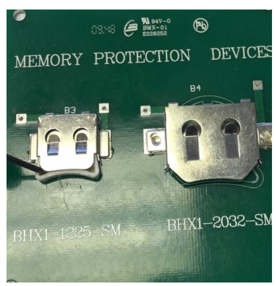
GLIDERS BATTERY INSTALL/REMOVAL

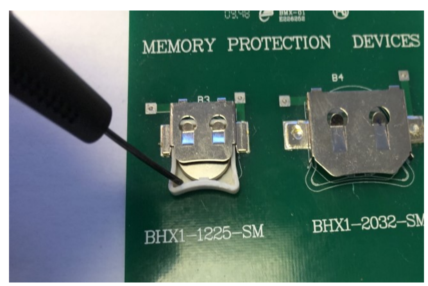
STEP 1– Insert the battery into the plastic tray + positive side up. Then glide the tray into the metal cage.

STEP 2– Push the tray until you hear a click. Once you hear the click your tray will be fully locked in place.



STEP 3– To remove the tray and replace the battery, using a very small flat blade screw driver, insert the flat end into one of the tray corners and gently pull back at the same time wiggling the tray side to side.

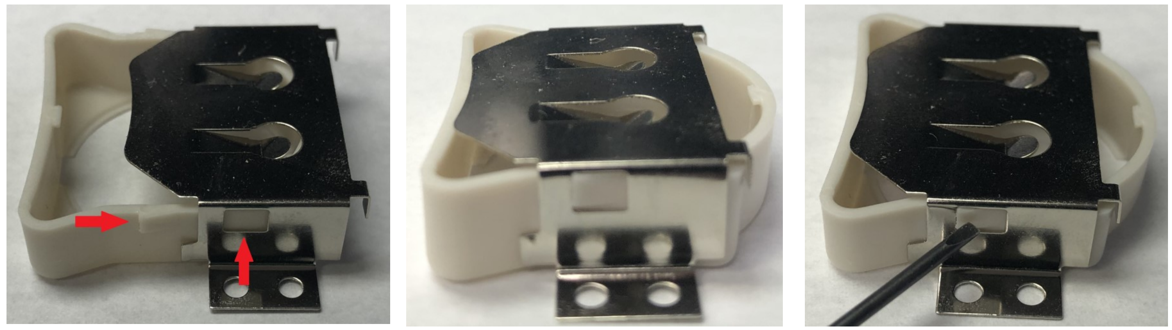




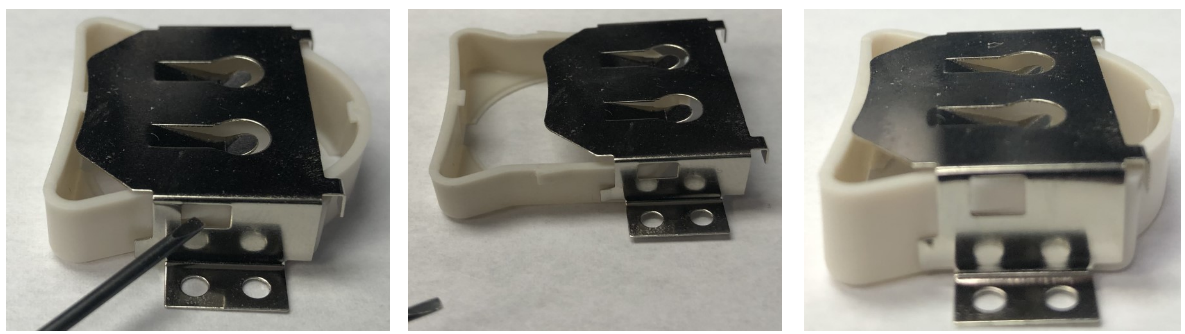
BRX1-2477-SM - BRX1-0001

BATTERY INSTALL & REMOVAL

STEP 1– Once the tray is in a lock position, on the metal cage, simply use a flat head screw driver and depress the lock tab. You will here or feel a pop and the tray moving slightly backward. Repeat oin the other side and then pull out the tray gently.



STEP 2– Replace the battery and push the tray back in until you hear or feel a click and the tray is in lock position. Gently tried and pull the tray back to ensure it is fully locked.



ZA2070

WIRE CONNECTION

To connect the ZA2070 12 volt cigarette socket, unscrew the unit to expose the metal cage as shown in the image. Select your wire gauge and add a crimped end to the center pin for your positive connection and do the same to the external wire, negative contact using a flat crimped female part to fit the side tab of the unit.