MOTOROLA

MOTOROLA ORIGINAL BATTERIES

PROVEN TOUGH

Motorola Original Batteries

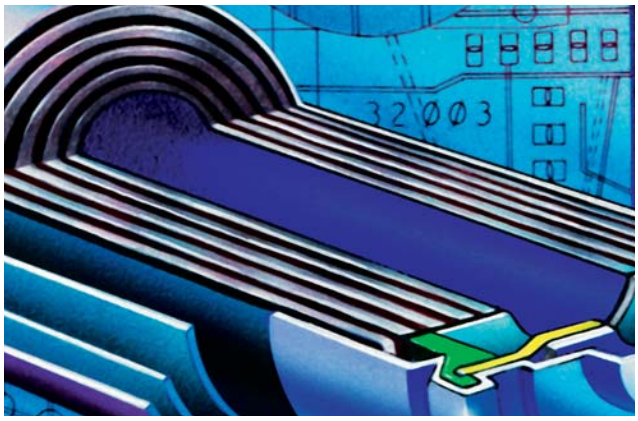
- *TESTED TOUGH*
- *BUILT TO STAND UP TO YOUR WORK SITE*
- *SMART*
- *ENGINEERED BY BATTERY TECHNOLOGY LEADERS*
- *QUALITY ASSURED BY MANUFACTURING EXCELLENCE*

MOTOROLA ® ORIGINAL

Motorola Original Products have to pass stringent design and test standards before we'll sell them to you. Accelerated Life Testing (ALT) packs approximately five years of product use into five weeks of grueling testing. These tests include being dropped, being subjected to electrostatic discharge, cold and hot temperatures, humidity, rain and vibration. We even develop unique tests for customers with exceptional durability requirements.

Only Motorola Original Products are performance-matched to guarantee the same high standards of quality that you enjoy with your Motorola two-way radio. When you see the Motorola Original logo, you know the products are built and tested to meet the toughest standards – yours and ours. Tough Motorola Original Products protect your communication system from the hazards of everyday life – you can count on it.

Radio Products and Services Division



Motorola Manufactured Battery Warranty

Product	*Warranty*
NiCD impres™ Batteries	24 month capacity
NiMH impres™ Batteries and Li-ion impres™ Batteries	18 month capacity
NiCD Premium Batteries	18 month capacity
NiMH and Li-ion Premium Batteries	12 month capacity
NiCD, NiMH Power Batteries	12 month capacity

*All Motorola Manufactured Batteries have a 24 month workmanship warranty with the exception of Power batteries which carry a 12 month workmanship warranty.

*impres™ batteries carry an additional 6 months warranty only when used with an impres™ charger.

Warranty Information

Motorola will replace any of these two-way radio batteries if they fall below 80% of their rated capacity during the period shown.
For complete warranty details, including exceptions, see your Motorola representative or visit http://commerce.motorola.com/consumer/QWhtml/warranty_twoway.html

Radio Products and Services Division

It's not enough to make a tough product. When you buy that product – any product – you want to know there's someone standing behind it. Someone who takes the extra step. That's what true customer service is all about.

It's about helping you keep your product or system up and running. It's about making exceptional customer service the minimum we'll accept. That includes upgrades and repairs as well as quality products. For the life of the product.

This is our commitment to you: We stand behind every Motorola product, service or system, from the day it is deployed until the day it is replaced, working with you to make sure you receive the most value from your investment.

Count on the Motorola Radio Products and Services Division.

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"We stand behind every Motorola product, service or system, from the day it is deployed until the day it is replaced."

Ways to Order

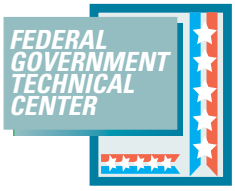
www.motorola.com/businessonline

1-800-422-4210
U.S. Federal Government customers call:
1-800-826-1913
TTY: 1-866-522-5210

1-800-622-6210
U.S. Federal Government customers fax:
1-800-526-8641

Support

1-800-227-6772



1-800-969-6680

1-888-736-8567

Accelerated Life Testing: Evaluation

We're in control to keep you in touch

We engineer each Motorola battery to provide optimum performance with specific Motorola radios and accessories. And we control the manufacturing process to assure superb quality over time: ISO 9000 certification and a high level of automation in the industry lead to consistent high quality, with less human error. So you get clear, reliable communication under tough conditions – something you can't be sure of with a competitor's battery.

MOTOROLA ORIGINAL BATTERIES
PROVEN TOUGH

Motorola batteries built tough

Motorola two-way radio batteries are tough – many years of experience have taught us how to make them that way. From design and manufacturing through real world experience, we build Motorola two-way radio batteries to the highest possible standards of quality and consistency – so you can be sure the Motorola two-way radio batteries you buy will stand up to and survive real-world hazards and rigorous daily use. The tests described in this brochure are the proof.

Built tough from the ground up

A tough battery doesn't happen by accident. Motorola starts with the cells – the critical components that provide the power – to build tough batteries from the inside out. We sort through the cells our suppliers produce to identify those of highest quality
.

The cells we choose for Motorola two-way radio batteries provide:

- High capacity
- Long cycle life
- Low impedance
- Wide temperature range
- Best shock resistance

All these characteristics are essential to keep your radio working within its optimum specifications for transmission and reception sensitivity as long as possible during the battery's life cycle.

Accelerated Life Testing and System Testing

Motorola has a firm commitment to quality and reliability. Before we put the Motorola name on any battery, we put it through Accelerated Life Testing (ALT) – a process of rigorous laboratory testing that simulates years of field use. Each new model is dropped, shaken, zapped and more – undergoing as much torture as your toughest working conditions could provide.

We design, manufacture and test our radios to reach high levels of component and workmanship quality. Most importantly, we design them to minimize costly repairs and downtime for you.

We don't just test the battery by itself, but also as part of a working system. Every battery is tested with all compatible radios and accessories. In many cases, this means conducting thousands of tests to capture every combination possible. This thorough testing is done to help ensure impedance in your radio system is minimized and that you have dependable power when you need it.

Only when it passes those tests do we begin to produce and sell it.

Here are just a few of the tests each Motorola two-way radio battery must pass:

Rain: Steady rainfall and wind for 30 minutes on every surface. Important for agriculture, light construction, utility and public administration personnel who must work outdoors in any kind of weather.

Salt Fog: Exposure to an atomized salt solution for 48 hours. Hospitality staff, utility workers and public administration personnel working near oceans or around winter salt applications require resistance to salt corrosion.

Dust: Six hours of blowing dust on all surfaces. Critical for agriculture, light construction, utility and public administration workers who are exposed to a variety of dusty environments.

Vibration: Up to nine hours of exposure to vibration that simulates the rattling a radio could undergo while being transported. Light construction and industrial workers, agriculture, utility and public administration staff expect a radio in withstand any vibrations.

Shock: Eighteen shocks with a minimum G force of 40 Gs each.

Testing who's toughest

How do you find out if a battery will stand up to real-world stresses? How do you find out if one brand of battery will continue to perform when others won't? How do you find out which battery will cost you less over time?

Meeting our own standards – even the tough ones in our Accelerated Life Testing program – isn't enough. At Motorola, we want the batteries we sell to be the best you can possibly buy. This means testing our batteries against governmental and industry standards, and against the competition.

So we hired an independent, outside service to collect batteries made by several of our competitors – batteries compatible with the most popular two-way radio model families. They collected 30 samples of each battery type:

Compatible w/ Radio Models	Motorola	Multiplier	Battery Zone	Honeywell	Power Products
HT1000 JT1000 MTX8000 MTX9000	NTN7144	M7144	BZ7144	GTS7144C	BP7144
XTS3000 XTS3500 XTS5000	RNN4006	M8923HX	BZ4006		
HT750 HT1250 HT1550 MTX850 MTX8250 MTX950 MTX9250	HNN9008	M9009	BZ9008	GTS9008M	BP9008
CP150 CP200 PR400	NNTN4496				BP4496
Total Samples	**120 batteries**	**90 batteries**	**90 batteries**	**60 batteries**	**90 batteries**

No comparable product available

While the ALT program includes many tough tests, we chose three that represent events that occur most often in normal battery use:

- Being dropped on a hard surface – Drop Test
- Being subjected to long periods of vibration – Vibration Test
- Being shocked by static electricity – Electrostatic Discharge (ESD) Test

Then experienced technicians compared the performance of Motorola two-way radio batteries against the performance of the competitors' batteries in those tests.

Drop Test

"88% of the Motorola batteries passed."

Vibration Test

"100% of the Motorola batteries passed."

ESD Test

"100% of the Motorola batteries passed."

Tested tough in the lab, for tough jobs in the real world

Count on Proven Tough Motorola batteries in critical situations:

- *Public Safety: When the public relies on you to protect their lives, their families and their homes, there's no margin for error – you must always be prepared, whether you're putting out a fire, transporting accident victims or responding to natural disasters.*
- *Large Businesses: Reliable communication is essential to your bottom line – keeping your personnel in constant contact in business units as diverse as production, distribution and customer service.*
- *Municipalities: Keeping our home towns safe, healthy and pleasant places to live isn't as easy as it may seem – your responsibilities include not just responsive service, but efficient workflow and economical operation as well.*
- *Small Businesses: Keeping your customers happy is your number one job – making sure orders are delivered accurately or crews arrive at job sites on time means your business stays productive and profitable.*

MOTOROLA ® ORIGINAL

Drop Test

Method: The drop test was set up according to specifications issued by the U.S. military for its own equipment (MIL810F Method 516.4). Technicians attached each battery to the appropriate Motorola radio and dropped it four feet to a smooth metal sheet. Each individual battery went through 7 cycles of six drops on each surface for a total of 42 impacts.

A cycle consists of:

- 1 drop on the front
- 1 drop on the back
- 1 drop on the left side
- 1 drop on the right side
- 1 drop on the top
- 1 drop on the bottom

Each individual battery was dropped a total of 42 times.

The technicians inspected each battery for damage after every cycle of drops, for:

- Cracking or splitting open
- Damage to the connection with the radio
- Inability to charge
- Inability to discharge

Results: 88% of the Motorola batteries passed.

Multiplier: None of the Multiplier batteries survived – half of them failed in the first cycle.

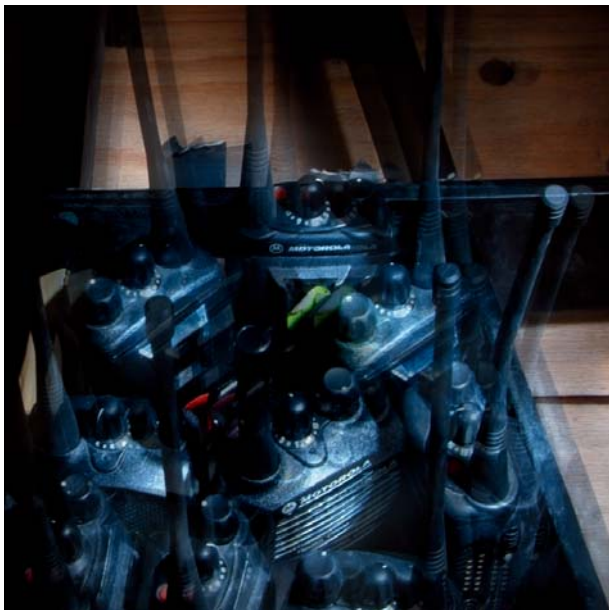
Battery Zone: Only 33% passed.

Honeywell: None of the Honeywell batteries passed.

Power Products: Only 20% passed – all 10 samples of two of the Power Products battery types failed.

Typical failures included splitting of the battery housing, broken latches, being dislodged from the radio and failure to charge.

Multiplier M8923HX Battery Drop Test Failure
Splitting along right side



Vibration Test

Method: The vibration test, like the drop test, followed specifications developed by the military (MIL810F Method 514.5, Procedure 1, Category 24, figure 514C-18 and figure 514C-17). Again, the batteries were attached to appropriate radios, but this time the radios were fastened to metal plates and then vibrated in two different ways:

Sine vibration, which follows a regular, repeating pattern

- 3 hours along the vertical axis (up and down)
- 3 hours along a horizontal axis (back and forth)
- 3 hours along the perpendicular horizontal axis (side to side)

Random vibration, which follows no predictable pattern

- 1 hour along the vertical axis (up and down)
- 1 hour along a horizontal axis (back and forth)
- 1 hour along the perpendicular horizontal axis (side to side)

Each radio went through a total of 12 hours of vibration.

This time, the batteries were inspected once after each axis of vibration, for a total of six inspections:

- Cracking or splitting open
- Damage to the connection with the radio
- Inability to charge
- Inability to discharge

Results: 100% of the Motorola batteries passed.

Multiplier: Only 57% passed – all 10 samples of one Multiplier battery type failed.

Battery Zone: Only 63% passed.

Honeywell: Only 85% passed.

Power Products: All the Power Products batteries passed.

Broken latches and failure to provide power were the major causes of failure.

Tough Battery.

Electrostatic Discharge Test

Method: This test followed standards set by the International Electrotechnical Commission. There were two parts:

Air discharge (probe is close to battery but not touching)

- Positive 4KV, 8KV, 10KV, 12KV, 15KV
- Negative 4KV, 8KV, 10KV, 12KV, 15KV

Contact discharge (probe touches battery)

- Positive 4KV, 6KV, 8KV
- Negative 4KV, 6KV, 8KV

Every battery went through each combination of contact, power level and polarity 10 times, for a total of 200 air discharges and 60 contact discharges.

After each set of 10 discharges, the technicians inspected the batteries for their ability to charge and to discharge.

Results: 100% of the Motorola samples passed.

Multiplier: Only 57% passed – nine out of 10 samples of one Multiplier battery type failed.

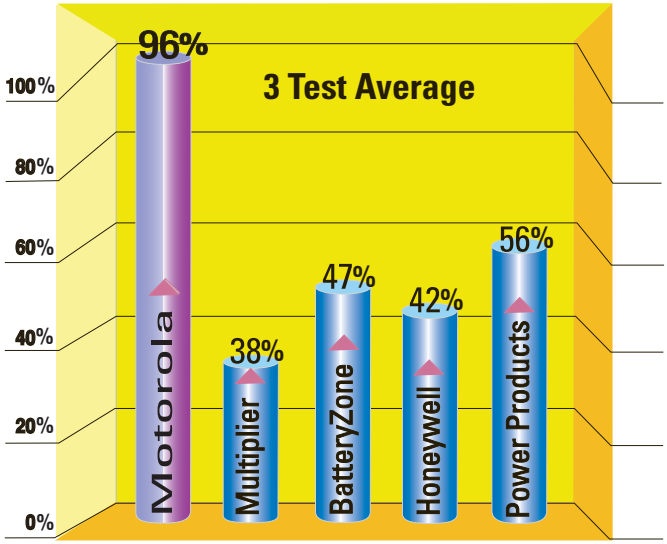
Battery Zone: Only 43% passed – all 10 of one Battery Zone battery type failed.

Honeywell: Only 40% passed – all 10 of one Honeywell battery type and nine out of 10 of another type failed.

Power Products: Only 47% passed – nine out of 10 of one Power Products battery type failed.

Typical failures included inability to charge, thermistor problems and flashing LEDs.

Drop, Vibration and ESD tests prove it – Motorola is consistently tougher than competition.



Multiplier Battery Vibration Test Failure

Passing the value test

Lives and livelihoods depend on the toughness of your two-way radio batteries. Can you afford to buy "cheap" batteries that could fail just when you need them most? Can you afford to replace those batteries every time they fail – when you know there's a better choice?

Beyond these physical tests, Motorola batteries pass two even tougher tests: Keeping you in instant contact in critical situations... and helping to keep your costs under control.

The smart power choice for tough jobs

Motorola batteries for two-way radios are especially designed, built and tested to take the tremendous abuse radios have to handle in the field. Hard knocks and extreme temperatures can cause batteries to lose power. And a sharp drop in power or rise in impedance can easily cause the radio receiver to completely shut down, or "desense."

We start with premium grade battery cells to help ensure you get more charge cycles, more capacity and greater reliability. Then we build in specially designed internal shock absorbers and impact resistant soft-flex copper circuitry, and wrap it all in rugged polycarbonate casings.

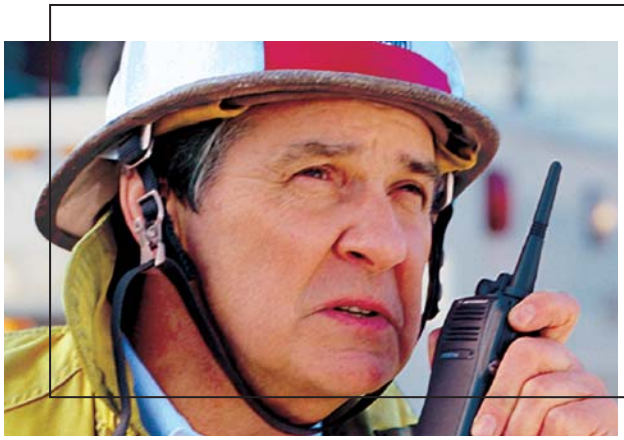
Working smart means staying in touch

No communication device has to stand up to tougher conditions than a two-way radio, often where lives are at stake: fire and accident sites, wilderness rescues, hazardous work sites. Those are the situations where exchanging information quickly, clearly and reliably is critical.

The batteries that power that radio have to be just as tough. For every job that requires wireless two-way communications,

Motorola has the power to keep you in touch:

- Batteries – Nickel-Cadmium, Nickel-Metal Hydride, Lithium-Ion, Alkaline
- Chargers – single and multiple unit
- Battery Maintenance Systems
- Battery Optimizing Systems
- Conditioning Chargers and Adapter Plates



High impedance impacts radio performance

Both lab and field testing show high battery impedance (resistance) harms transmission and reception sensitivity. Since impedance exists whenever an electrical path within the cell or battery pack is interrupted (such as at solder joint, weld connection or within a weak or damaged cell), Motorola engineers design extremely tight impedance limits for each battery component.

The transmission and reception circuits, antenna and battery designs must stay within these limits to make sure the radio operates within specifications.

Note: Batteries incorporating FM, MSHA or any other type of similar safety approval will have slightly higher impedance levels (and slightly less operation time per cycle) due to the additional protective circuits.

Batteries can also cause radio desense

Battery impedance normally increases at the end of the discharge cycle. However, in current radio models a "Low Battery" alert appears before it can affect reception or transmission strength.

Impedance can also increase as a result of a sudden impact – such as when the battery is dropped. In this situation, the battery's impedance level exceeds the radio's design limits and literally shuts down the reception circuits. As a result, the radio could transmit using the battery's remaining power, but could not receive.

Sometimes it seems this situation is a radio or system problem, when it may actually be a battery impedance problem. That's why low impedance levels during the discharge cycle as well as throughout the battery's life cycle are essential to giving you the best possible radio performance.

Motorola minimizes impedance by our ALT and 5 year testing. This thorough testing is done to help ensure impedance in your radio system is minimized.

Integrated design and testing

Batteries are an integral part of a radio system design. They can help or harm radio performance over their life cycle. Many problems related to desensing (the ability to pick up a clear signal while a radio is receiving) and transmitting are due to deteriorating battery performance.

To ensure optimum radio performance, Motorola performs system tests on our radios, batteries, antennas and reception/transmission circuits. We do this to identify and correct problems in the design stage, before our customers put them into use in the field.

* Use of non-Motorola-approved batteries or accessories may result in RF energy exposure standards being exceeded.

There's something in the air

Communication is important. Safety is essential. We test Motorola radios and batteries together, the way you would use them in the field, to make sure they'll perform safely and effectively for you.

Outfitting your crew with certified intrinsically safe Motorola two-way radios and batteries helps provide the confidence to communicate in a variety of industrial, agricultural, chemical, petroleum or gas environments.

Radios Used in Hazardous Classified Areas

Hazardous areas are defined as locations where flammable gases or combustible dusts or fibers may be present.

To enable you to communicate safely in such areas, Motorola offers two-way radio products, certified and rated by an approval agency as intrinsically safe for use in classified hazardous areas.

Intrinsically safe products are designed with enhanced protection against potential sparking which could ignite flammable gasses or combustible material.The following agencies approve and certify Motorola two-way radios and batteries: the Factory Mutual Corporation (FM), the Canadian Standards Association (CSA), the Mine Safety and Health Administration (MSHA) and/or CENELEC Approval Agencies.

Radios that are intrinsically safe will have an agency approval label affixed to the back or bottom of the portable radio unit. The label will identify the classification rating Div/Class/Group and the battery part number that can be used for that approved unit.

FM-approved intrinsically safe Motorola batteries will also have an unique I.D. such as a green dot in the plastic housing of the battery, or a green label on the battery.

How Do We Make Batteries Intrinsically Safe?

Actually it's the battery and radio in combination as a system that is intrinsically safe. Most Motorola intrinsically safe products are certified by Factory Mutual (FM) and similar independent testing agencies such as CSA, UL and MSHA.

Most Motorola intrinsically safe products are certified by Factory Mutual (FM), an accredited, nationally recognized testing lab. Other agencies such as CENELEC, MSHA or CSA may have other requirements specific to their standards. We design Motorola two-way communication products to meet these individual standards.

The Motorola communications equipment certified as intrinsically safe by approving Agency (FM, UL, CSA, MSHA) is tested as a complete system. A system consists of the listed Agency-approved portable radio , battery and accessories.

You cannot field upgrade a Motorola radio to an IS approval rating. Radios must be ordered with the Intrinsically Safe option and ship from the Motorola manufacturing facility.

FOR INTRINSICALLY SAFE RADIOS

To maintain a Motorola radio's intrinsic safety certification, use only Motorola approved accessories.

Motorola-approved accessories are a critical part of the specific radio and accessory system certified by a recognized testing organization as intrinsically safe. Non-Motorola approved accessories are not certified as part of the overall Motorola product system. Use of non-Motorola – approved accessories could result in equipment that is unapproved or unsafe in a hazardous environment.

Built tough to last longer

How do we make sure our batteries meet the specifications of our radios, to give you long-lasting, reliable performance? We build them tough, from the inside out.

Premium grade cells have low impedance

Motorola buys only premium grade cells from reliable suppliers. These cells have high capacity, long cycle life, a low impedance level, wide temperature range (-30ºC to + 50ºC) and the best shock resistance specifications.

Premium grade cells not only have the lowest impedance levels but are also tough enough to survive sudden impacts (drops) that could elevate their impedance. Because these premium grade cells are so well made, only minimal impedance increases occur even following a sudden impact.

And these premium cells are more uniform – so you can count on the same high energy, high number of charge cycles and durability with every Motorola battery you buy.

Chemistry counts

Motorola makes many different models of batteries, with the majority of them falling into three major types: Nickel-Cadmium (NiCd), Nickel-Metal Hydride (NiMH), and Lithium Ion (Li-ion).

Nickel Cadmium (NiCd) batteries are the most cost-effective option for many applications – they provide longer cycle life than other types. They are ideal for anyone who needs a high-performance battery and who communicates under extreme conditions of cold and heat (-30º C to +50º C). NiCd batteries can experience "memory effect" – not returning to full capacity after being recharged too soon – but Motorola impres™ batteries used with impres™ chargers can help that from happening.

Nickel-Metal Hydride (NiMH) batteries can work 40% to 50% longer between charges than NiCd batteries of similar size, but do not operate as efficiently in extreme temperatures. NiMH contain fewer toxic chemicals, so disposal is more environmentally friendly.

Lithium Ion (Li-ion) batteries have a higher energy-to-weight ratio than NiMH batteries, offering a lighter, smaller power supply for more compact devices. They also offer a major advantage of not experiencing "memory effect."

Shock absorbers and fillers hold all the components in place

Motorola uses a variety of pliable shock absorbing materials to protect the cell pack and flex circuitry. By damping vibration inside the battery housing, these materials reduce component damage during sudden impact.

This is often an area where competitors could cut costs by not including such shock absorbers. The result can make their batteries more susceptible to breaking during a drop or shock.

Automated battery manufacturing ties it all together

Even the best battery design can result in a poor radio performance if the assembly process isn't automated and repeatable. At Motorola we use state-of-the-art computer-controlled assembly equipment. We constantly monitor the manufacturing process and test production samples to detect trends that might cause defects.

Often competitive batteries are assembled by hand leading to a less consistent weld.

In addition to in-line process control during manufacturing, we routinely test radios and their batteries as a system (within varying levels of expended life cycles) to make sure they'll operate within specifications every time you need them.

Routine and repetitive system testing is the only way to be sure all radios and batteries meet their original specifications throughout their life cycles, as defined by Motorola radio engineers.

Only Motorola system tests all radios, batteries and accessories to help ensure optimum performance.

Soft film copper flex circuitry reduces impedance

Motorola uses soft film copper flex circuitry to connect the battery cells to the radio contacts. This circuitry has the flexibility to "give" in the case of a drop – unlike the thin wires found in other battery brands. And we determine the electrical paths within the copper film during the design stage, to make sure the current flows as efficiently as possible. Both these factors help reduce impedance to improve performance.

To further reduce impedance, Motorola solders, rather than welds, components to the flex circuits. This helps reduce aging, which also causes impedance build-ups.

Soft film copper flex circuitry assures you that every Motorola battery has the same low level of impedance, and you can be sure it will meet the radio's impedance specifications, for tough, dependable performance every time.

Many competitors use wired cells instead of flex copper circuitry. This is a manual process that is also more susceptible to dislodging if dropped or shaken.

Tough plastic housings protect performance

Many battery manufacturers make their battery housings from either ABS or polycarbonate plastic.

Motorola uses only polycarbonate plastic – it provides maximum protection against battery failures from falls or sudden impacts:

- Polycarbonate housings have significant tensile strength than ABS. (The ability to resist lateral forces generated in a drop.)
- Polycarbonate housings have significant flexural strength than ABS. (The ability to withstand bending or flexing forces generated in a drop.)

Both characteristics – tensile and flexural strength – are essential in the rugged environments where you use your radios.

The impres™ system: Intelligent Motorola Portable Radio Energy system Batteries & Chargers

Let's talk tough about saving time and money

With the impres™ system, there's no need to guess when a battery needs to be reconditioned. There's no worry about wasting unused power or shortening battery life by reconditioning too often. Get the most life out of every battery so:

- *You and your crew spend less time swapping batteries*
- *You can reduce your need to keep spares on hand*
- *Each battery can work longer*

All of which can help you save time and money. And because impres™ batteries are tested tough, just as all Motorola batteries are, you know you can count on consistent, reliable performance wherever you use them.

What your batteries know can help you save time and money

This patented Motorola technology for two-way radio power combines a "smart" battery, a "smart" charger, and a system that lets the battery and charger communicate over a single wire.

The battery itself has the intelligence to store information such as elapsed usage time, charge and discharge current, voltage and temperature. The charger then uses the battery information to control battery maintenance automatically.

So the impres™ system automatically manages battery reconditioning to extend battery pack life, extend talk time and improve performance. This innovative, intelligent technology helps to make sure your two-way radios are working when you need them most: in high-risk public safety applications, remote field operations and any time reliable operation is critical.

The impres™ system works with nickel-cadmium, nickel-metal hydride and lithium-ion batteries.The impres™ system provides the following functions:

- Record of date of manufacture
- Unique battery serial number
- Periodic battery fuel tank recalibration
- Record of battery charge cycles: "smart", approximated and reconditioned
- Record of initial and present "fuel tank" size
- Battery end-of-service-life indicator

The brains of the outfit

The impres™ system is an advanced tri-chemistry energy solution including a smart battery pack, an adaptive single- or multi-unit charger and a compatible two-way radio.

The impres™ battery and charger provide automatic, adaptive reconditioning and charging through Motorola's patented hardware and software battery management algorithms. And all you do is put the battery in the charger pocket.

The impres™ adaptive charger is actually four units in one: a rapid charger, a conditioning charger, a reconditioner, and, with a multi-unit charger with display, an analyzing unit. The battery pack features unique smart circuitry that sends data to the charger.

Impres™ chargers can both charge and discharge compatible rechargeable batteries. They can charge lithium-ion rechargeable batteries and can discharge and recondition both nickel-cadmium and nickel metal-hydride rechargeable batteries.

The charger uses information from the battery to automatically and adaptively determine the proper interval for nickel-based battery reconditioning. It can also charge conventional compatible batteries, providing an optimal charge without overheating. When you use impres™ batteries with an impres™ charger, you can even charge or recondition them while they're still on the radio they power.

Motorola Battery Chargers: Brains and brawn

Power and toughness alone are not enough. The intelligence to use power effectively is essential. That's why we thought carefully about the kinds of chargers you need, based on the kinds of batteries you use, and the way you use them. Charging Motorola batteries in the right Motorola charger is a smart decision that lets you use your power more effectively, for a much longer time.

Take charge of the situation

A rechargeable battery without a charger is worse than a day without sunshine – it's a radio without a voice. But each battery chemistry requires its own type of charger to maintain its peak performance over the longest possible operating life. That's why Motorola designs chargers with the specific charging cycles to complement each of the three major chemistries, NiCd, NiMH and Li-ion:

- Standard Rate Chargers – Low initial cost, suitable for NiCd batteries. Removal of battery as soon as charge is completed is recommended.
- Rapid Rate Tri-Chemistry Chargers – Quicker turn-around charging suitable for NiCd, NiMH, and Li-ion batteries. Batteries may be left in chargers for up to two hours after charge is completed.
- Negative Pulse Chargers – Popular for NiCd and NiMH batteries, allow removal of charged batteries at your convenience.
- Reconditioners – Drain batteries down to a predefined voltage threshold of one volt per cell, to help eliminate memory effect and maximize the number of charging cycles. Help you get more use out of each battery, and reduce replacement costs.
- impres™ – Offers the capability of rapid rate, negative pulse, automatic adaptive reconditiong and battery management features, all in one charger. Batteries may be removed from the charger at the user's convenience.

Tough to forget

When a NiCd or NiMH battery is consistently recharged before it uses all its power, it can over time develop "memory effect" – which limits the ability of the battery to accept a full charge. That means it works for a shorter time, and needs to be recharged more often.

What causes this effect? Excess heat during charging causes an accumulation of tiny gas bubbles and the formation of irregularly shaped crystals, which stick to the cell plates inside the battery. These bubbles and crystals keep the battery from being fully charged, no matter how long it stays in the charger.

By appropriately managing the charge process for each type of battery, Motorola chargers employ features that minimize the conditions that allow memory effect to occur. Motorola impres chargers manage the entire process for you, making sure you get the most value from your battery purchase.

Motorola Battery by Radio Model Matrix

					FM (Factory Mutual) Ratings*				
Part Number	**Chem Type**	**Volts**	**Avg. Mah**	**Warranty type**	**Rtg.**	**Class**	**Div**	**Group**	**Other Info**
CP100									
NNTN4190	NiMH	4.8	1500	12C/24W					
CP150 / CP200 / PR400									
NNTN4496	NiCD	7.5	1100	18C/24W					
NNTN4497	Li-ion	7.2	1800	12C/24W					
NNTN4851	NiHM	7.5	1400	12C/24W					
NNTN4970	Li-ion	7.2	1600	12C/24W					Slim
NNTN4852	NiHM	7.5	1300	12C/24W	IS	I,II,III	1	C,D,E, F, G	PR400 Only
CT250 and CT450									
PMNN4019_R	NiMH	7.5	1200	12C/24W	IS	I,II,III	1	C,D,E,F,G	
PMNN4018_R	NiMH	7.5	1250	12C/24W					
PMNN4021_R	NiCd	7.5	1100	18C/24W					
EXPO									
NLN7162	NiCd	7.5	550	18C/24W					
EX500 / EX600									
JMNN4023_R	Li-ion	7.5	1000	12C/24W					Slim
JMNN4025_R	NiMH	7.5	700	12C/24W					
JMNN4024_R	Li-ion	7.5	1300	12C/24W					
GP300 / GTX / LTS 2000									
HNN8133	NiCd	7.5	1200	18C/24W	IS	I	1	C & D	GP300 Only
HNN8308	NiCd	7.5	600	18C/24W					Slim
HNN9628	NiCd	7.5	1200	18C/24W					
HNN9701	NiCd	7.5	1100	18C/24W	IS	I,II,III	1	C,D,E,F,G	
HNN9808	NiCd	7.5	600	18C/24W	IS	I,II,III	1	C,D,E,F,G	Slim
WPNN4044_R	NiCd	7.5	1000	12C/12W					Powerline
GP350									
HNN9360	NiCd	7.5	1200	18C/24W					
HNN9361	NiCd	7.5	1000	18C/24W	IS	I,II,III	1	C,D,E,F,G	
HT50									
NTN5453	NiCd	10	1100	18C/24W					

WARRANTY LEGEND:	
18C/24W	Warranteed for 18 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12C/ 24W	Warranteed for 12 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
24C/24W	Warranteed for 24 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12C/12W	Warranteed for 12 months electrical performance to maintain 80% capacity & 12 months for workmanship defects
6C/24W	Warranteed for 6 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12W only	Warranteed for 12 months for workmanship defects

Workmanship Defects:
Any battery which leaks
Any battery which ceases to operate because the cells shift in battery pack
Any battery case which cracks and does not show visible signs of abuse
Any battery which has contact corrosion / pitting
Any battery clip breakage which does not show visible signs of abuse (clips which hold battery on radio)
Any battery which does not fit into the radio or charger properly

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The FM approval label refers to the classification rating and battery part number.

Motorola Battery by Radio Model Matrix

					FM (Factory Mutual) Ratings*				
Part Number	**Chem Type**	**Volts**	**Avg. Mah**	**Warranty type**	**Rtg.**	**Class**	**Div**	**Group**	**Other Info**
HT90 / 440									
NLN7434	NiCd	12.5	630	18C/24W					
NLN7435	NiCd	12.5	630	18C/24W					
NLN7640	NiCd	12.5	630	18C/24W	IS	I,II	1	D,F,G	
NLN7694	NiCd	12.5	630	18C/24W					
HT600									
NTN4564	NiCd	10	550	18C/24W	IS	I,II, III	1	C,D,E,F,G	
NTN4584_R	NiCd	10	630	18C/24W					
NTN5414_R	NiCd	10	1100	18C/24W					
NTN5415	NiCd	10	1000	18C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN7016	NiMH	10	950	12C/24W					
HT750 / HT1250 / HT1550 / MTX850 / MTX8250 / MTX950 / MTX9250									
HNN9008_R	NiMH	7.5	1500	12C/24W					
HNN9009_R	NiMH	7.5	1900	12C/24W					
HNN9010_R	NiMH	7.5	1800	12C/24W	IS	I,II,III	1	C,D,E,F,G	
HNN9011_R	NiCd	7.5	1200	18C/24W	IS	I,II,III	1	C,D,E,F,G	
HNN9012_R	NiCd	7.5	1300	18C/24W					
HNN9013_R	Li-ion	7.5	1200	12C/24W					
HNN4001	NiMH	7.5	1900	18C/24W					impres
HNN4002	NiMH	7.5	1800	18C/24W	IS	I,II,III	1	C,D,E,F,G	impres
HNN4003	Li-ion	7.2	2000	18C/24W					impres
WPNN4045_R	NiMH	7.5	1200	12C/12W					Powerline
HT1000 / MT2000 / MTS2000 / JT1000 / MTX8000 & 9000									
HNN9028_R	NiCd	7.5	1500	24C/24W					impres
HNN9029_R	NiCd	7.5	1400	24C/24W	IS	I,II,III	1	C,D,E,F,G	impres
NTN7143_R	NiCd	7.5	1200	18C/24W					
NTN7144_R	NiCd	7.5	1500	18C/24W					
NTN7149_R	NiCd	7.5	1300	18C/24W					CSA
NTN7150_R	NiCd	7.5	1200	18C/24W					MSHA
NTN7341_R	NiCd	7.5	1400	18C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN7372_R	NiCd	7.5	1200	18C/24W	IS	I,II,III	1	C,D,E,F,G	
WPNN4013	NiMH	7.5	2000	12C/24W					
MT1000 / MTX 800900									
NTN4823_R	NiCd	10	550	18C/24W	IS	I,II, III	1	C,D,E,F,G	
NTN5447_R	NiCd	10	1100	18C/24W					
NTN5448_R	NiCd	10	1000	18C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN7015	NiMH	10	950	12C/24W					
MT500 / HT220									
NLN4462	NiCd	15	550	18C/24W					SLIM
NLN4463	NiCd	15	550	18C/24W					OMNI

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Motorola Battery by Radio Model Matrix

					FM (Factory Mutual) Ratings*				
Part Number	**Chem Type**	**Volts**	**Avg. Mah**	**Warranty type**	**Rtg.**	**Class**	**Div**	**Group**	**Other Info**
MX									
NLN5860	NiCd	7.5	1400	18C/24W	IS	I,II,III	1	D,F,G	
P10 / P50 / HT10									
HNN9027	NiCd	11.25	630	18C/24W					
HNN9044_R	NiCd	7.5	550	18C/24W					
HNN9233	NiCd	7.5	550	18C/24W	IS	I	1	C,D	
HNN9234	NiCd	11.25	550	18C/24W	IS	I	1	D	
HNN9018_R	NiCd	7.5	1200	18C/24W					
P100									
NTN5451	NiCd	10	1100	18C/24W					
P110									
HNN8148	NiCd	7.5	1100	18C/24W					
P1225									
HNN9049	NiCd	7.5	1200	18C/24W					
HNN9050	NiCd	7.5	1200	18C/24W	IS	I,II,III	1	C,D,E,F,G	
HNN9051	NiMH	7.5	1400	12C/24W					
PR860									
HNN9008_R	NiMH	7.5	1500	12C/24W					
HNN9009_R	NiMH	7.5	1900	12C/24W					
HNN9010_R	NiMH	7.5	1800	12C/24W	IS	I,II,III	1	C,D,E,F,G	
HNN9011_R	NiCd	7.5	1200	18C/24W	IS	I,II,III	1	C,D,E,F,G	
HNN9012_R	NiCd	7.5	1300	18C/24W					
HNN9013_R	Li-ion	7.5	1200	12C/24W					
HNN4001	NiMH	7.5	1900	18C/24W					impres
HNN4002	NiMH	7.5	1800	18C/24W	IS	I,II,III	1	C,D,E,F,G	impres
HNN4003	Li-ion	7.2	2000	18C/24W					impres
WPNN4045_R	NiMH	7.5	1200	12C/12W					Powerline

WARRANTY LEGEND:	
18C/24W	Warranteed for 18 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12C/ 24W	Warranteed for 12 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
24C/24W	Warranteed for 24 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12C/12W	Warranteed for 12 months electrical performance to maintain 80% capacity & 12 months for workmanship defects
6C/24W	Warranteed for 6 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12W only	Warranteed for 12 months for workmanship defects

Workmanship Defects:
Any battery which leaks
Any battery which ceases to operate because the cells shift in battery pack
Any battery case which cracks and does not show visible signs of abuse
Any battery which has contact corrosion / pitting
Any battery clip breakage which does not show visible signs of abuse (clips which hold battery on radio)
Any battery which does not fit into the radio or charger properly

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The FM approval label refers to the classification rating and battery part number.

Motorola Battery by Radio Model Matrix

					FM (Factory Mutual) Ratings*				
Part Number	**Chem Type**	**Volts**	**Avg. Mah**	**Warranty type**	**Rtg.**	**Class**	**Div**	**Group**	**Other Info**
PR1500									
NTN9815	NiCd	7.5	1525	18C/24W					
NTN9816	NiCd	7.5	1525	18C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN9858	NiMH	7.5	1800	12C/24W					
NTN9857	NiMH	7.5	1800	12C/24W	IS	I,II,II	1	C,D,E,F,G	
P200									
NTN5521	NiCd	10	1100	18C/24W					
NTN5531	NiCd	10	630	18C/24W					
NTN5545	NiCd	10	1000	18C/24W	IS	I,II,III	1	C,D,E,F,G	
SABER / ASTRO									
HNN9033_R	NiCd	7.5	1800	24C/24W					impres
HNN9034_R	NiCd	7.5	1800	24C/24W	IS	I,II,III	1	D,F,G	impres
NTN4538_R	NiCd	7.5	1100	18C/24W	IS	I,II,III	1	D,F,G	Submersible
NTN4593_R	NiCd	7.5	1100	18C/24W					
NTN4595_R	NiCd	7.5	1800	18C/24W					
NTN4596_R	NiCd	7.5	1800	18C/24W	IS	I,II,III	1	D,F,G	Submersible, Ruggedized
NTN4657_R	NiCd	7.5	1100	18C/24W					CSA, Ruggedized
NTN4992_R	NiCd	7.5	1800	18C/24W	IS	I,II,III	1	C,D,E,F,G	Submersible
NTN7014_R	NiMH	7.5	950	12C/24W					Ruggedized
NTN7058_R	NiCd	7.5	1800	18C/24W	IS	I,II,III	1	D,F,G	Submersible, Ruggedized
NTN8251_R	NiMH	7.5	1650	12C/24W	IS	I,II,III	1	D,F,G	Ruggedized
NTN8818	Li-ion	7.5	1700	12C/24W					Ruggedized
SP10 / SP21									
HNN9044_R	NiCd	7.5	550	18C/24W					
SP50									
HNN9018_R	NiCd	7.5	1200	18C/24W					Standard
HNN9044_R	NiCd	7.5	550	18C/24W					Compact
STX / MX800									
NTN4326	NiCd	7.5	1300	18C/24W					
NTN4327	NiCd	7.5	1800	18C/24W					
NTN4500	NiCd	7.5	1800	18C/24W	IS	I,II,III	1	D,G	
NTN4534	NiCd	7.5	1300	18C/24W					
TELARIO									
HNN9021_R	NiMH	3.6	550	12C/24W					
VISAR									
NTN7394_R	NiMH	7.5	1300	12C/24W					
NTN7395_R	NiCd	7.5	1200	18C/24W					
NTN7396_R	NiMH	7.5	600	6C/24W					
NTN7397_R	NiMH	7.5	1300	12C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN7398_R	NiCd	7.5	1200	18C/24W	IS	I,II,III	1	D,F,G	

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Motorola Battery by Radio Model Matrix

					FM (Factory Mutual) Ratings*				
Part Number	**Chem Type**	**Volts**	**Avg. Mah**	**Warranty type**	**Rtg.**	**Class**	**Div**	**Group**	**Other Info**
VL50									
56557	Li-ion	3.6	1100	12C/24W					
1564200W18	ALK	NA	NA	12W					
VL130									
PMNN4063_R	NiMH	7.2	1500	12C/24W					
XTS3000 / XTS3500 / XTS5000									
HNN9031_R	NiCd	7.5	1525	24C/24W					impres
HNN9032_R	NiCd	7.5	1525	24C/24W	IS	I,II,III	1	C,D,E,F,G	impres
NNTN4435	NiMH	7.5	2000	18C/24W					impres
NNTN4436	NiMH	7.5	2000	18C/24W	IS	I,II,III	1	C,D,E,F,G	impres
NNTN4437	NiMH	7.5	2000	18C/24W	IS	I,II,III	1	C,D,E,F,G	impres, Ruggedized
NTN9862	Li-ion	7.2	2000	18C/24W					impres
NTN8294_R	NiCd	7.5	1525	18C/24W					
NTN8295_R	NiCd	7.5	1525	18C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN8297_R	NiCd	7.5	1525	18C/24W	IS	I,II,III	1	C,D,E,F,G	Ruggedized
NTN8299_R	NiMH	7.5	1700	12C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN8610_R	Li-ion	7.5	1650	12C/24W					Slim
NTN8923_R	NiMH	7.5	1800	12C/24W					
RNN4006	NiMH	7.5	3500	12C/24W					
RNN4007	NiMH	7.5	3500	12C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN9177	ALK	N/A	N/A	12W					
NTN9183	ALK	N/A	N/A	12W					
XTS1500 / XTS2500									
NTN9815	NiCd	7.5	1525	18C/24W					
NTN9816	NiCd	7.5	1525	18C/24W	IS	I,II,III	1	C,D,E,F,G	
NTN9858	NiMH	7.5	1800	12C/24W					
NTN9857	NiMH	7.5	1800	12C/24W	IS	I,II,II	1	C,D,E,F,G	

†Intrinsic safety is met only when used with the Approved Radio models, Approved accessories, and options.
Check your radio for the intrinsically safe label. The label will identify the rating and batteries to be used with your Approved portable unit.

WARRANTY LEGEND:	
18C/24W	Warranteed for 18 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12C/ 24W	Warranteed for 12 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
24C/24W	Warranteed for 24 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12C/12W	Warranteed for 12 months electrical performance to maintain 80% capacity & 12 months for workmanship defects
6C/24W	Warranteed for 6 months electrical performance to maintain 80% capacity & 24 months for workmanship defects
12W only	Warranteed for 12 months for workmanship defects

Workmanship Defects:
Any battery which leaks
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Any battery case which cracks and does not show visible signs of abuse
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†The VTS3000, XTS3500, XTS5000 radio products have "IS" rating of C, D, E, F, G without encryption.
If XTS radio product is installed with encryption then the "IS" rating is D, F, G.

COME INTO THE LAB AND SEE HOW WE DID THE TESTS!

Watch as technicians reenact drop, vibration and electrostatic discharge tests on Motorola and competitors' two-way radio batteries.
See the results yourself, on this free CD!

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