

Rugged and Connected:

The Motorola ML900 Rugged Notebook



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The Evolving Needs of Today's Mobile Computing

As the mobile workforce continues to grow, so does the demand for complex, secure information in real-time—anytime and anywhere. Saving lives, protecting property, and providing first response all require immediate information exchange and pre-emptive intelligence. However, the worst combination of environmental challenges imaginable—blazing heat, freezing cold, constant shock and vibration as well as water, dust, sand and humidity—hinder these efforts. Devices must rise to the demands of these hazards while providing fast, reliable connectivity in as many ways as possible.

A Cutting-Edge Solution with Strength and Flexibility

Because the needs of today's mobile computing user are broad and the operating conditions difficult, an off-the-shelf computing device will not meet expectations. ABI Research states that in the mission-critical environment:

“A traditional consumer grade device would not function for an acceptable period of time due to the device's lack of durability or inability to withstand the elements. In these situations, justifying the cost of a more expensive ruggedized device should not be difficult”¹

A fully rugged and connected notebook with extreme wireless flexibility executes mission critical tasks faster, safer, and more efficiently while reducing Total Cost of Ownership (TCO).

Flexibility, especially in wireless options, is extremely important in mobile computing since the environment produces dangers and opportunities not found in the office. Wireless LAN, cellular carrier, secure private data, and mesh networks all have tremendous strengths but also have weaknesses. As a result, mobile computing devices must provide a range of these options, and be capable of seamless connectivity between some of them. This concept of seamless mobility allows workers in the field to maintain constant connectivity—along with the peace of mind that their device will operate in almost any hazardous environment.

Motorola – A Pioneer in Mobile Computing

When people think of Motorola, what typically comes to mind is 70+ years of cutting-edge wireless communication technologies, cell phones, and two-way radio systems. However, many people may not realize that Motorola has been designing and deploying mobile data systems and ruggedized mobile computers for over 35 years:

- 1970 – First Rugged Wireless Mobile Data Terminal and First Wireless Data System
- 1991 – Introduction of Private DataTAC Wide Area Wireless Data Network
- 2001 – First Complete Deployment of Internet Protocol-Compliant Voice & Data System

Motorola's ruggedized mobile computing solutions have helped customers in Public Safety, Federal Government, and vertical markets optimize processes, improve service, and reduce downtime. Motorola's design and quality assurance teams have decades of expertise in building rugged mobile computing solutions for the rigorous demands of a mission critical, mobile workforce.

¹ ABI Research, *Ruggedized Mobile Devices, Global Analysis of Air Interfaces, Vertical Markets, and OS Trends for Handsets, Notebooks, PDAs and Tablet PCs*. 2006

ML900 – Wireless Optimized for First Responders

Whether stationary or at highway speeds, Law Enforcement, EMS, and Fire teams must share information to coordinate activities. First responders require accurate, right now data to dispatch and manage the right resources at the right location. To enable these applications, mobile devices must support seamless roaming and multiple wireless communication standards.

Motorola's ML900 rugged notebook provides the seamless mobility technology that Public Safety departments need to:

- Provide First Responders dedicated MOTOMESH 4.9GHz access
- Field deploy command units for improved efficiency and responsiveness
- Boost productivity by reducing trips to headquarters for data retrieval or report filing
- Use broadband connectivity to turn field time into productive time
- Execute mobile, paperless dispatching, work orders, and reports
- Support remote work site and vehicle video surveillance

As a trusted leader in communication technologies, Motorola designed wireless reliability into the ML900 notebook. This approach provides users redundant wireless access across multiple networks, even while traveling in excess of 150 mph and in remote locations. The ML900 supports multiple frequencies and standards, and contains four integrated wireless radios that operate simultaneously:

- WLAN – 802.11a/b/g or MOTOMESH™ 4.9GHz
- WWAN – DataTAC, EVDO or UMTS
- BlueTooth, IR
- GPS Receiver

Motorola optimized the ML900's wireless hardware for the realities of the mission critical worker. The notebook contains a telescoping internal antenna for WWAN access, and a patented antenna concealed in the display latch for GPS, BlueTooth, and WLAN access. When placed in the ML900's vehicle docking station, the notebook connects directly to the vehicle's external antenna, passing through GPS and WWAN signals for expanded wireless coverage.

Fully Rugged? The Need is Real

The environment takes a heavy toll on computing devices. Shock, vibration, extreme temperatures and moisture wreak havoc on sensitive electronic systems—especially mobile ones. Mission critical workers need systems that will withstand the hazards they experience in the field. When lives and public safety are at risk, equipment reliability could make the difference between success and failure.

The best fully rugged devices are tested and certified to thrive in the most challenging environments one can imagine. The ML900 Rugged Notebook is one such device—designed and tested to operate in extreme environments while maintaining reliability and integrity. Built with a rigid magnesium housing, the ML900 features hazard tested components including shock-mounted hard drives and displays, hard drive heaters, and spill proof keyboards.

It is not easy for a mobile device to achieve the status of “fully rugged”. The device must meet strict specifications as outlined by the following organizations:

- MIL-STD 810F
Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests. This is a set of standardized guidelines, tests, and procedures. The primary emphasis of MIL-STD 810F includes:
 - Tailoring the material’s environmental design and test limits to the conditions that the specific material will experience throughout its service life
 - Establishing laboratory test methods that replicate the effects of environments on material rather than trying to reproduce the environments themselves.
- NEMA/IP
International standard IEC 60529 classifies the level of protection a device provides against the intrusion of solid objects or dust. The Ingress Protection (IP) rating (for example IPxy), indicates the conformity level met by the device. The “X” denotes the conformity level met for the ingress of foreign solid objects, while “Y” denotes the conformity level met for the ingress of liquids.

Motorola’s fully rugged ML900 mobile notebook meets or exceeds MIL-STD 810F and IP54 requirements. For example, the ML900 can withstand temperatures of -20°C to +60°C, survive a drop from three feet, and operate for several hours in a dust-laden environment. Instead of using plug-in PC wireless cards, Motorola’s engineers embedded the wireless modems within the core system—sealing the chassis housing from water, dust, and sand.

Figure 1: ML900 Meets Fully Rugged Requirements

Mission Critical	Environmental	ML900
• Fire	• Extreme Temperature	• -20°C to +60°C
• Law Enforcement	• Extreme Humidity	• 5-95% Rel. Humidity
• EMS	• Dust/Sand Exposure	• 5 hour exposure
• Military	• Shock/Vibration	• MIL-STD-810F
• Utilities	• ESD/EMI	• MIL-STD-810F
• Public Services	• Moisture	• MIL-STD-810F
• Transportation	• Drop	• 26 times at 3ft

Adapting to the Mission Critical Environment with REACT

Most rugged devices cannot optimize to the external environment. ML900 confronts this challenge through internal hardware that detects and adjusts to harsh conditions. Designed within the ML900 is the patented Real-Time Environmental Microcontroller Architecture (REACT). This technology performs real-time environment monitoring for greater device reliability. REACT detects high ambient temperatures and changes screen brightness, reduces system speed, and increases cooling fan RPM for improved thermal management.

Rugged Devices Reduce Total Cost of Ownership

Deploying a commercial grade device in a public safety or military environment is not only a risk but can also leave the user with poor productivity and deep frustration. Commercial grade devices have not only a higher failure rate but also a higher overall TCO than their fully rugged counterparts do. Device downtime, hardware failure, and lost operational efficiency all contribute to this cost disparity.

In many cases, the initial cost of a fully rugged device for a public safety or military application will be significantly more than a commercial grade competitor—but that does not tell the whole story. One study shows the replacement cycle for field service workers utilizing rugged notebooks was 4.5 years versus a 3-year replacement cycle for commercial grade, producing per annum costs of rugged notebooks 8.3% less than commercial grade notebooks². Add up the substantial cost savings of using fully rugged devices in municipalities that may have dozens or hundreds of mobile devices deployed, and the case for a fully rugged device becomes clear.

The up-front investment required for a fully rugged device says little about its long-term field productivity and reliability. Increasing numbers of satisfied customers now understand the value and peace of mind gained from purchasing a fully rugged device.

Figure 2 demonstrates that rugged devices last longer and cost less than consumer grade devices do.

Figure 2: Total Cost of Ownership

Category	Rugged Device	Consumer Grade Device
Purchase price of Device	\$3,250	\$1,700
Cost of accessories, add-ons, ports	\$425	\$275
Spare components	\$350	\$225
License fees, customization	\$75	\$75
IT support	\$800	\$1,425
Repair/replace parts	\$350	\$525
Lost productivity	\$750	\$1,450
Customer service issues	\$500	\$1,150
Subtotal	\$6,500	\$6,825
Lifespan (Years)	6	3
Approximate cost to own product 6 years	\$6,500.00	\$13,650.00
Cost to own per year	\$1,083.33	\$2,275.00

(Source: ABI Research)

With the ML900, Public Safety departments now have a fully rugged notebook that boosts operational efficiency and reduces operating expenses.

Advanced Information Delivery Enables Efficiency

As the number of applications for mobile devices continues to expand, so does the challenge of presenting this information in an intuitive, usable format. Making matters worse, Public Safety workers find themselves encumbered by more complex and difficult tasks. Improving efficiency means finding a better way to deliver mission critical information to the right people at the right time.

In the field, EMS workers must view large amounts of information from multiple applications. To ease this load, the ML900 comes equipped with a high-resolution 13.3-inch display so First Responders can view multiple applications simultaneously.

Law Enforcement officials know that security and quick access to information becomes vital for mission success. Contained within the ML900 is an integrated 500dpi fingerprint reader. This biometric recognition system allows officers to protect their data without the headache of remembering passwords, and provides convenient “authentic user only” access to their ML900.

² Venture Development Corp, *Enterprise Mobility Solutions: Mobile Devices, Mobile Software and Professional Services, Third Edition*. July 2006

Real-Time Video Recording and Information Sharing

In Public Safety, the lives and well-being of employees and the citizens they protect are at stake. Law Enforcement, EMS, and Fire departments require real-time information sharing to make faster decisions while deploying fewer resources. Live video is a crucial piece of information collected daily in the field.

Designed with the Public Safety mission in mind, the ML900 contains both a composite video port and a DVI-I digital port, allowing users to connect and record from their digital video camera. When used with Motorola's Mobile Video Enforcer (MVE) in-vehicle camera, the ML900 notebook becomes an integrated platform for live crime scene archiving, video clip classification, and activity cataloging.

Field collaboration is a growing trend in Public Safety. Single point of activity video recording is not enough. Imagine a scenario where with just one-click, an officer shares streaming video with other officers who are able to assess the situation in real-time.

The above scenario becomes today's reality on a ML900 running Multi-Net Mobility™. This application is a VPN solution that delivers broadband performance over secure 4.9GHz wireless connections like MOTOMESH. Users can send and receive video information with command centers and other responders—even while moving at high speed.

MOTOMESH and Multi-Net Mobility – Enabling Seamless Mobility

Motorola's MOTOMESH is a high performance, scalable, mobile mesh network that supports broadband solutions. With MOTOMESH, departments can deploy applications to a vehicle or mobile device so that Public Safety officials can use the same applications in the field as they use in the office.

Multi-Net Mobility™ is a Mobile Virtual Private Network (VPN) solution that maintains secure connectivity while users roam between wireless networks. As a result, open applications remain active while roaming and during coverage gaps. When coverage becomes available again, Multi-Net Mobility automatically re-connects the session.

MOTOMESH and Multi-Net Mobility running in tandem yields tremendous benefits—public safety agencies can now operate low-cost, seamless data communication networks with efficiency and reliability. With this power, Public Safety agencies can proactively assess the mission, respond effectively based on real-time visual information, and help increase officer safety.

The ML900 is Mission Critical Ready Today

Motorola's ML900 delivers the wireless strength and flexibility that today's mission critical workforce requires. Through the power of innovation like REACT, MOTOMESH, and Multi-Net Mobility, the fully rugged and reliable ML900 meets the challenges of extreme environments while reducing TCO and improving operational efficiency. With ML900 and seamless mobility, mission flexibility and improved response times become today's reality.



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RO-14-2001