IMPRES™ Battery Data Reader Users Guide

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Important Safety Instructions

This document contains important safety and operating instructions. Please read these instructions carefully and save them for future reference.

Before using the IMPRES Battery Data Reader (herein referred to as "Data Reader"), read all the instructions and cautionary markings on (1) the Reader Pocket, (2) the IMPRES battery, and (3) the radio.

WARNING

1. Use of accessories not recommended by Motorola may result in risk of fire, electric shock, or injury.
2. To reduce risk of damage to the USB plug and cord, pull by the plug rather than the cord when disconnecting from the Reader Pocket or from the Personal Computer.
3. To reduce risk of fire, electric shock, or injury, do not operate the Reader Pocket if it has been broken or damaged in any way.
4. Do not disassemble the Reader Pocket – it is not repairable and replacement parts are not available.

Operational Safety Guidelines

- This equipment is intended for indoor, climate-controlled, technical shop use only. This equipment is not suitable for outdoor or vehicular use. Use only in clean, dry locations/conditions.

- Connect equipment only to a powered USB port provided by a Personal Computer (PC) or a self-powered USB 2.0 hub that can supply electrical power to the Reader Pocket.

- Make sure the USB cable is located where it will not be stepped on, tripped over, or subjected to water, damage, or stress.

IMPRES Battery Data Reader Description

The IMPRES Battery Data Reader system reads data from an IMPRES battery, communicates that data to a host Personal Computer (PC), and displays that data on a software application running on the host PC.

The IMPRES Battery Data Reader System is represented in Figure 1.
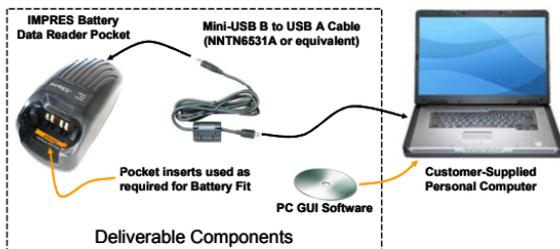
Figure 1. IMPRES Battery Data Reader System ("Data Reader").

The major components include, but are not limited to:

- Reader Pocket, powered by the Universal Serial Bus (USB) connection to the host Personal Computer.

- USB cable.

- Compact Disk (CD) containing the Personal Computer (PC) Graphical User Interface (GUI) software (herein, referred to as PC Software) and containing the User Manual.

- Pocket Inserts compatible with the WPLN4114 Single-Unit Charger (SUC). Pocket Inserts are used, as required, to ensure proper battery fit.

- Personal Computer (PC) with a powered USB port. The PC is not provided by Motorola.

Items Included with the Shipped Kit

- Reader Pocket
- USB Cable
- CD containing PC Software and User Manual

Index to Reader Pocket Controls
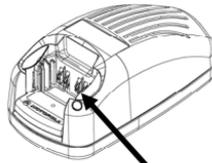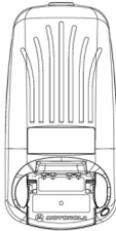
Reader Pocket Indicator
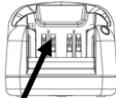
USB Connector

Battery Contacts
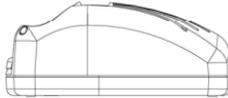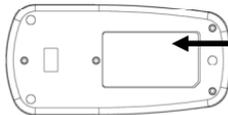
Instruction Label

PC Software
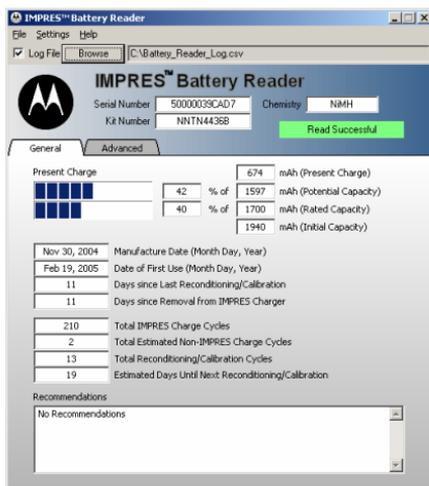
Minimum PC Requirements for Installation

Minimum requirements for the host computer are:

- Personal Computer with Microsoft® Windows® XP with Service Pack 2
- Powered USB 2.0 port or self-powered USB 2.0 hub
- 512MB of RAM (1GB recommended)
- 10MB of available hard-disk space (additional free space required during installation)
- 800x600 monitor resolution with 16-bit color quality (minimum)
- Windows Display Properties DPI setting is "Normal size (96 DPI)"
- CD-ROM drive
- Internet connection recommended

PC Software Installation Instructions

1. Double click the installation file (.msi).

2. Select Next.
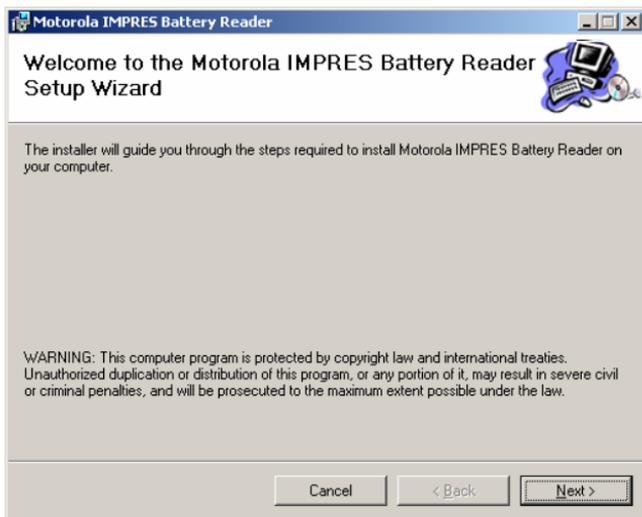
3. Select installation folder.
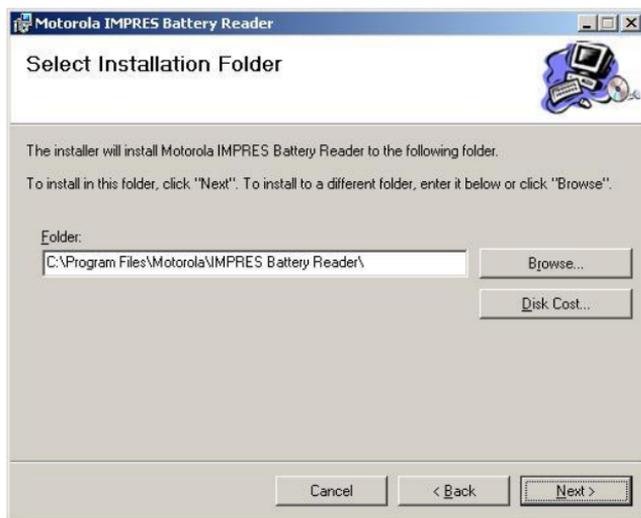
4. Confirm and start the installation.
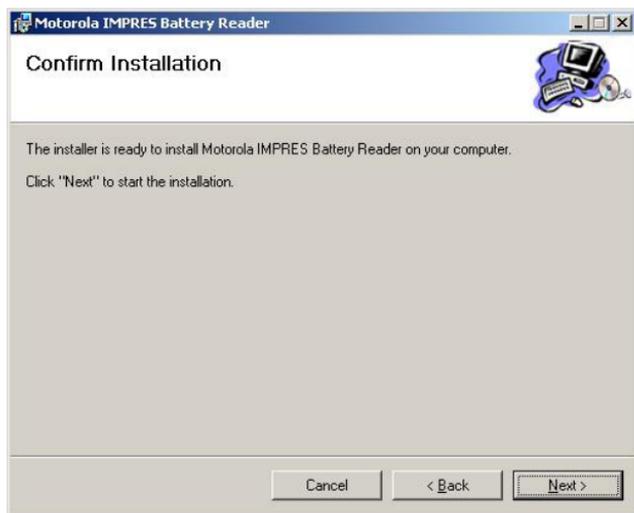
5. Wait for software installation.
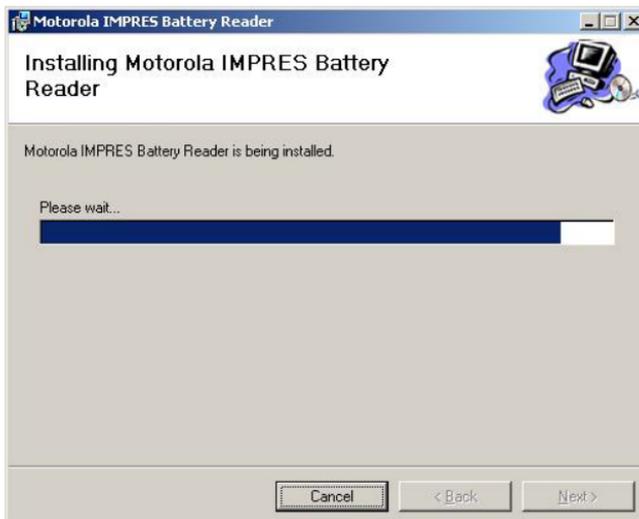
6. If displayed, ignore Windows logo compatibility warning and continue

7. Close Installation Window when completed
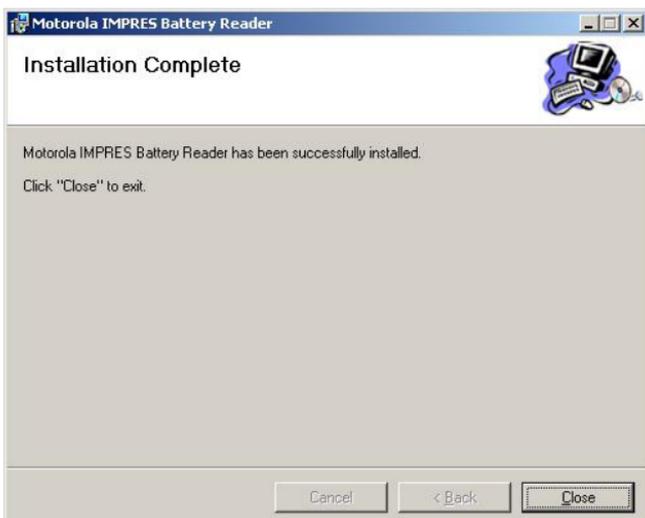
8. Connect Reader Pocket to the PC using USB cable. The Reader Pocket Indicator will flash green if the connection is successful.

9. Wait for Windows to detect the Reader Pocket

10. If Windows asks to search for software, select "No, not this time" and then select "Next >"

11. Use "Install the software automatically (Recommended)" option

12. Ignore Windows Logo compatibility warning and continue

13. Wait for the software drivers to be installed

14. Finish software drivers installation

15. Click the desktop icon to start Data Reader PC application.
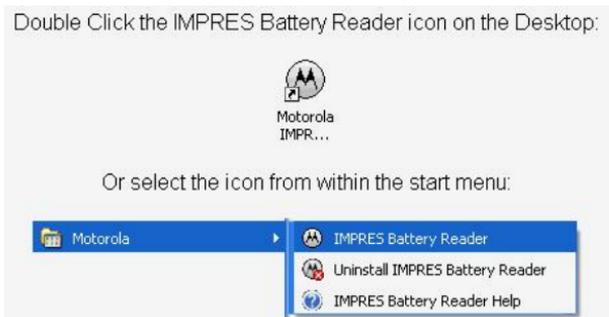
16. If a Reader Pocket software update is available, then Reader Pocket reprogramming will automatically start. Accept the Reader Pocket upgrade.

Pocket Software Update Required

Pocket Software Update Required.
Version in Pocket: V1.01
Version Available: V1.02
Would you like to update the Pocket Software now?

[Yes]   [No]
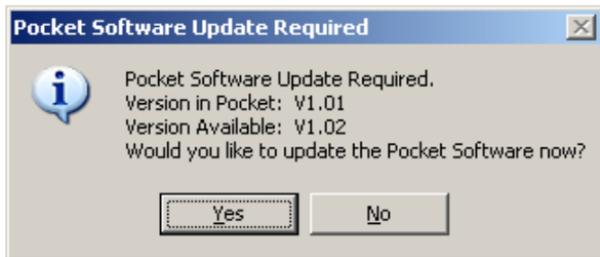
17. Confirm reprogramming is in process.

WARNING

Update in progress.

WARNING: Do NOT disconnect the Pocket.
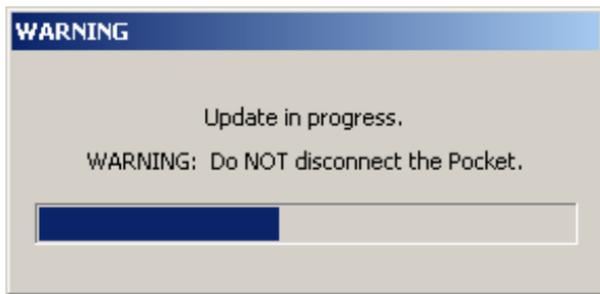
ATTENTION: Do not disconnect the Reader Pocket from the PC while the upgrade is in process.

18. Wait to receive a confirmation message indicating successful reprogramming. In the unlikely event of Reader Pocket reprogramming failure, the PC Software allows for the reprogramming process to be retried.

Update Successful ✕

Reprogramming is successfully completed

OK

Software Upgrades

The user may upgrade software installed on the host PC and embedded in the Reader Pocket. To determine the currently-installed software versions, ensure that the Reader Pocket is connected to the PC and check the "About" option in the Help menu. In order to check online for an update, more information is available in the Check for Updates section on Page 28.
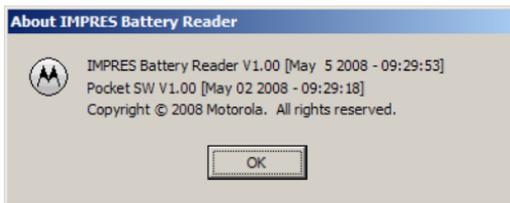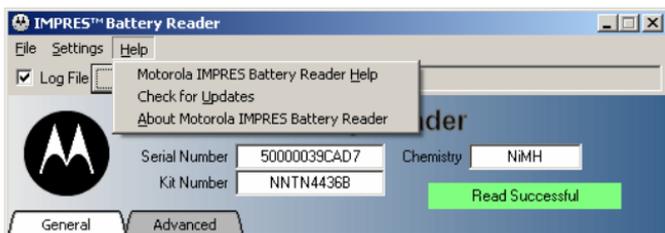
1. Download the software update installation file from Motorola Online.
2. Run the installation file and follow the PC Software Installation Instructions starting on Page 8.

Using the Data Reader

Connect the Reader Pocket to a powered USB port on your PC using the supplied USB cable.

A *SINGLE FLASH GREEN* on the Reader Pocket indicator confirms that the Reader Pocket successfully powered up.

Start the PC Software.

Insert an IMPRES battery into the Reader Pocket.

Once the IMPRES battery is properly seated into the Reader Pocket, the battery data will be read and displayed on the PC.

Ensure that the PC Software Status Message displays "Read Successful". This may take several seconds.

Ensure the Reader Pocket Indicator is Steady Green.

Use two hands to remove the IMPRES battery from the Reader Pocket – one hand to hold and support the Reader Pocket and the other hand to remove the battery.

ATTENTION: Please provide adequate time (a few seconds) between battery insertions. Do not rapidly remove and reinsert batteries into the Reader Pocket.

Reading of battery data is complete only after the data are successfully displayed on the PC.

The Reader Pocket indication varies during battery read and is finalized only after battery data are successfully displayed on the PC.

Application Status Messages are described in Table 1.

Table 1. Application Status Message

Displayed Status	Description
Waiting for Battery …	Waiting for an IMPRES battery to be inserted into the Reader Pocket
Reading Battery …	Busy reading data from the IMPRES battery in the Reader Pocket
Read Successful	IMPRES battery data successfully read and displayed on the PC
Error Reading Battery	An error occurred while attempting to read the IMPRES battery.

Reader Pocket indications are described in Table 2.

Table 2. Reader Pocket Indications

Reader Indicator	Description
Single Flash Green	Reader Pocket successfully powered up.
Off	Reader Pocket does not detected an IMPRES battery or Reader Pocket is not powered.
Steady Yellow	IMPRES Battery detected and data is being read.
Steady Green	Data was successfully read from the IMPRES battery.
Flashing Red	Battery is detected but cannot be read. Battery may not be making proper contact, or check connection between Reader Pocket and PC.

Data Field Background Colors are described in Table 3.

Table 3. Data Field Background Colors.

Condition	Background Color
No Battery in Reader Pocket	White
Data Successfully Read from Battery	White
Unrepairable Corrupted Data	Light-Red
Data Successfully Repaired	Blue
Data Not Supported by Battery[1] or Battery Not Initialized[2]	Gray

[1]Some IMPRES battery kits do not contain all data fields.
[2]Data is initialized in an IMPRES battery when the battery completes an IMPRES Reconditioning/Calibration cycle in an IMPRES charger.

Recommendations Presented

Table 4 General Recommendations

Recommendation	Condition
Recondition/Calibrate Battery	Reconditioning/Calibration Required
Cool battery before charging	Battery is too hot for charging
Warm battery before charging	Battery is too cold for charging
Please remove and reinsert the battery or charge the battery in an IMPRES charger	Error Reading Battery Data: A) Contacts may not be making good connection. (Reference Contact Cleaning on Page 55.) B) See the Over-Discharged Batteries section on Page 48.
No Recommendations	

File Menu

The **File** menu provides three selections:

- **Save As…**
- **Export Raw Data…**
- **Close**
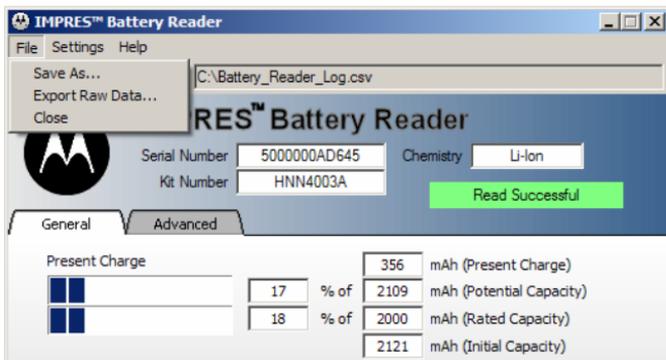
The Data Reader enables the user to save IMPRES battery data for further analysis. Data can be saved in one of the following two ways by using "Save As…" and "Export Raw Data…":

Save As…

This selection allows the user to save all displayed information (including the present Date and Time taken from the PC) into a comma-separated values (.csv) text file. The "Save As" (.csv) file contains the data for only one battery.

Export Raw Data…

This selection allows the user to save all battery data (including the present Date and Time taken from the PC) into a text format file. The "Export Raw Data" text file contains the data for only one battery.

Note: Data saving options are enabled only when an IMPRES battery is present in the Reader Pocket.

Close

When selected, the program terminates.

Settings Menu

The **Settings** menu provides three selections:

- **Language…**

- **Date Format….**

- **Fleet Management Settings…**
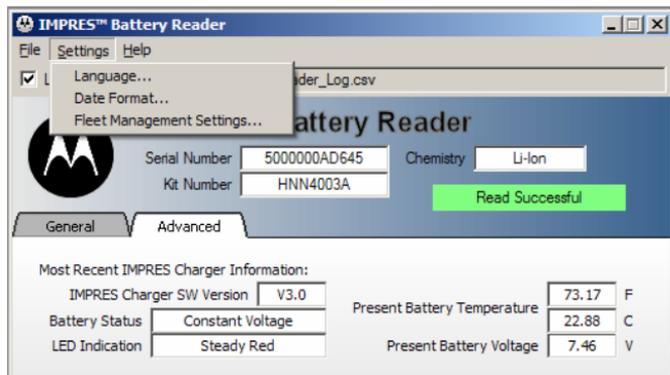
Using the SETTINGS menu the Data Reader software allows the user to customize the software behavior and appearance.

Language…

> This selection allows the user to select from a list of available languages and country preferences.

Date Format…

This selection allows the user to select the desired date format. The available options control how date fields are displayed in the PC Software or recorded in a data file (when user chooses to save displayed values or export raw battery data).
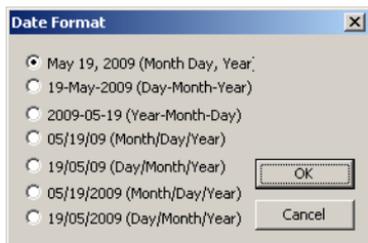
Fleet Management Settings

This selection allows the user to specify information necessary for uploading battery data to a Fleet Management server (when available). The user may need to contact their local network administrator for assistance when configuring these settings.

Help Menu

The **Help** menu provides three selections:

- **Motorola IMPRES Battery Reader Help**

- **Check for Updates**

- **About Motorola IMPRES Battery Reader**
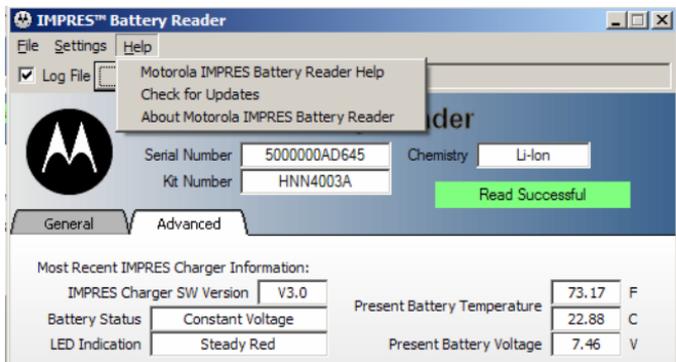
Motorola IMPRES Battery Reader Help

This selection allows the user to select from a list of additional help topics as shown in the figure below.
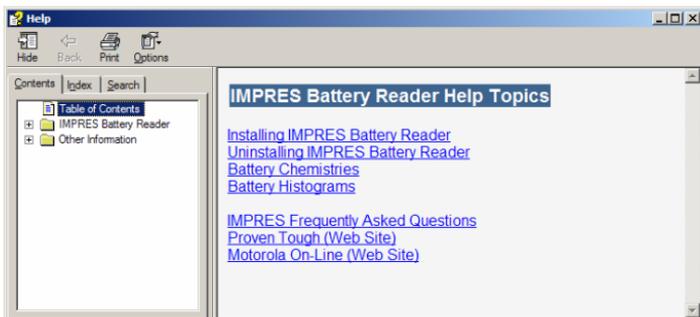
Check for Updates (Requires PC to be connected to the internet)

This selection opens the login page for Motorola Online. The user must enter their user ID and password to access the latest update information for this application.
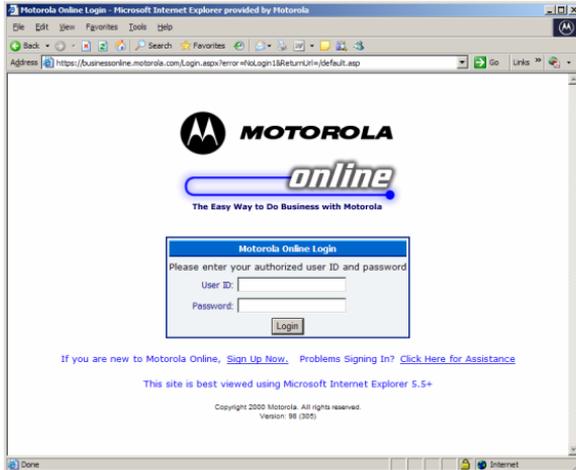
About Motorola IMPRES Battery Reader

This selection provides the software version of the Data Reader PC application and the software version within the Data Reader. For an example of how this information is displayed, see the Software Upgrades section starting on page 18.

General View

A) When the **Log File** box is checked, the viewable data from both the **General** and **Advanced** tabs is logged in the file identified in B).

B) The field shows the default location and filename. Both can be changed by selecting **Browse** and following standard Windows operations. Data is logged upon battery insertion and initial read. Additionally, if the file name is changed after initial log of data, the data will be logged to the new file as well.

Note: Additional information regarding **Log Files** is provided in the **Log File** section on Page 39.

C) This field identifies the battery **Chemistry**. Additional general information on proper maintenance and charging can be found in the General Battery Care and Tips section on Page 56.

Note: Battery chemistry is also listed on the battery label.

D) All IMPRES batteries have a unique **Serial Number** stored in the battery's memory. Some IMPRES batteries will have this **Serial Number** printed on the label.

E) The battery **Kit Number** is stored in the battery memory and is printed on the battery label.

Note: Older batteries may not contain the **Kit Number** in the battery memory. (Reference "Data Not Supported by Battery" in Table 3.)

F) **Rated Capacity** is the minimum-specified battery capacity when the battery is new. (Reference General Battery Care and Tips on Page 56.)

G) The **Potential Capacity** is the capacity of the IMPRES battery when it is fully charged.

The **Potential Capacity** value can be above or below the **Rated Capacity** depending on the age of the battery and the battery's history.

The **Potential Capacity** is updated during Reconditioning/Calibration cycles. **Potential Capacity** is the capacity measured and stored at the completion of the rapid charge mode of a Reconditioning/Calibration cycle (charge indicator transitions from Steady Red to Flashing Green) plus an estimate of the additional

charge added between the start of Flashing Green to the start of Steady Green (battery is fully charged). If the battery remains in the charger until it is fully charged, the Potential **Capacity** will be updated based on the actual charge added between start of Flashing Green to start of Steady Green.

H) **Present Charge** is the current state-of-charge of the battery. This is reported from 0% (fully depleted) to 100% (fully charged) of **Potential Capacity**.

Note: This field may not be supported if the IMPRES battery is used in an IMPRES charger with older software. (Reference Updates for IMPRES Accessory Software on Page 50.)

I) Two **Present Charge** state bar graphs are provided. The top bar represents the percentage of **Potential Capacity** while the bottom bar represents the percentage of **Rated Capacity**.

Note: These fields may not be supported if the IMPRES battery is used in an IMPRES charger with older software. (Reference Updates for IMPRES Accessory Software on Page 50.)

J) The **Initial Capacity** is the capacity of the IMPRES battery when it completes rapid charge during its first Reconditioning/Calibration cycle in an IMPRES charger.

The **Initial Capacity** is calculated when the charge indicator transitions from Steady Red to Flashing Green. **Initial Capacity** includes an estimate of the additional charge added between the start of Flashing Green to the start of Steady Green (battery is fully charged).

K) **Manufacture Date** is the date that the battery was manufactured.

L) **Date of First Use** is the date that the battery was first used in an IMPRES charger or Radio with IMPRES capability.

Note: Additional information regarding this and other fields that contain date stamps is provided in the Battery Clock section on Page 49.

M) **Days Since Last Reconditioning/Calibration** is the elapsed number of days since the last Reconditioning/Calibration cycle. If required, then a recommendation will be presented in the **Recommendations** field to "Recondition/Calibrate Battery."

Note: Additional information regarding this and other fields that contain date stamps is provided in the Battery Clock section on Page 49.

N) **Days Since Removal from IMPRES Charger** is the elapsed number of days since the battery was removed from an IMPRES charger.

Note: This field may not be supported if the IMPRES battery is used in an IMPRES charger with older software. (Reference Updates for IMPRES Accessory Software on Page 50.)

Note: Additional information regarding this and other fields that contain date stamps is provided in the Battery Clock section on Page 49.

O) **Total IMPRES Charge Cycles** is the number of charge cycles the battery has experienced in IMPRES chargers. This number will increment when an IMPRES battery has been allowed to rapid charge for a few minutes in an IMPRES charger.

NOTE: Certain users routinely remove their IMPRES battery from an IMPRES charger and then shortly return the battery to either the same IMPRES charger or a different IMPRES charger. The IMPRES system is designed to recognize this condition and will continue the charge cycle from the previous insertion. The **Total IMPRES Charge Cycles** will only be updated by the initial insertion.

P) **Total Estimated Non-IMPRES Charge Cycles** is a cumulative estimate of the number of charge cycles performed in non-IMPRES chargers.

IMPRES batteries can track the amount of energy sourced into a battery over its life. When used with an IMPRES charger, the IMPRES charger maintains a record of the energy sourced into the battery. Additional energy sourced into the battery outside of an IMPRES charger is also accumulated and used to calculate the number of non-smart charge cycles.

An IMPRES battery that has been in long-term storage, can become over-discharged. This means that the battery cells have reduced significantly in voltage. When the IMPRES battery is over-discharged, the fuel gauge circuitry cannot maintain proper operation. When this occurs, random data can be written to the memory location used to track the amount of energy sourced into the battery over its life. Later, when a battery with this condition is placed in an IMPRES charger, the charger will charge the battery normally and potentially calculate a large number of the Non-IMPRES Charge Cycles. A battery that has not been used for several months should always be charged before insertion into the Reader Pocket. If this procedure is followed, the Data Reader will then automatically correct this situation in the battery.

Q) **Total Reconditioning/Calibration Cycles** is the number of Reconditioning/Calibration cycles that successfully complete a full rapid charge cycle (charge indicator transitions from Steady Red to Flashing Green).

R) **Estimated Days Until Next Reconditioning/Calibration** is based on the usage pattern of the battery including the number of days since the last Reconditioning/Calibration cycle. The accuracy of the estimate will improve with additional IMPRES charge cycles.

Note: Additional information regarding this and other fields that contain date stamps is provided in the Battery Clock section on Page 49.

S) **Recommendations** field – See the Recommendations Presented section on Page 22 for more details.

Advanced View
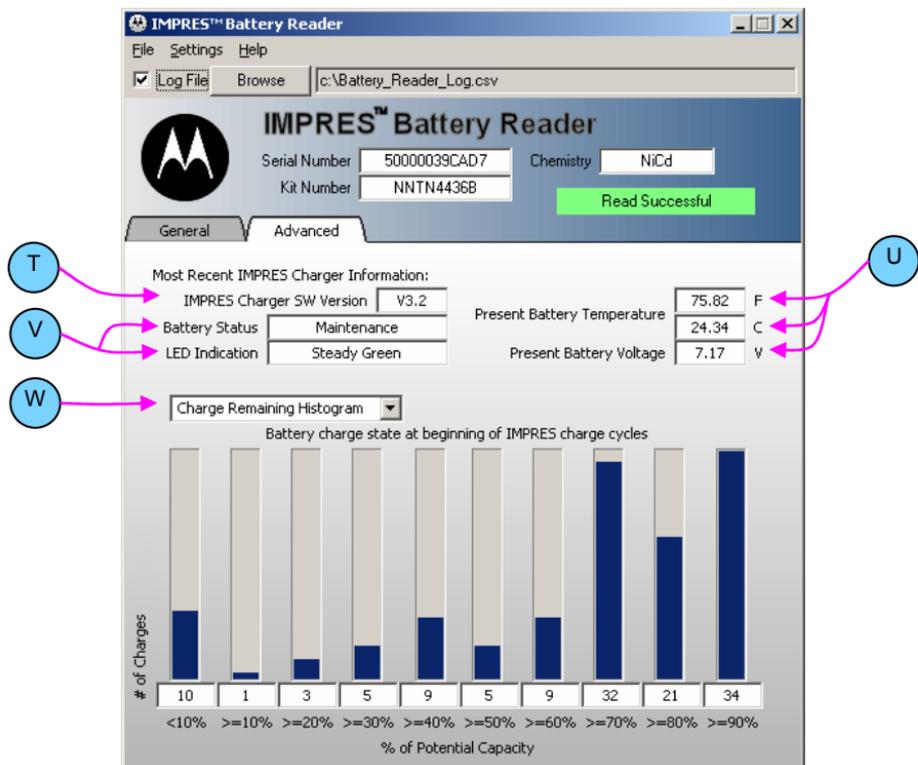
T) **IMPRES Charger SW Version** information is written into the battery by the last IMPRES charger used. If the battery has not yet been placed in an IMPRES charger, then a hyphen (-) will be displayed. The battery must remain in the IMPRES charger pocket for several minutes to ensure that the **IMPRES Charger SW Version** is written to the battery.

Note: Additional information is provided in the IMPRES Charger SW Version section on Page 50.

U) **Present Battery Temperature** in both Fahrenheit (**F**) and Celsius (**C**) and **Present Battery Voltage** are read directly from the battery and displayed.

V) **Battery Status** and **LED Indication** information is a record of the last charge mode (see Table 5, on Page 51, for a listing of possible charge modes) and LED indication (see Table 8, on Page 53, for a listing of possible LED indications) written into the battery by the last IMPRES charger used.

A hyphen (-) will be displayed in the **Battery Status** field if the battery has not yet been placed in an IMPRES charger. The text "Off" will be displayed in the **LED Indication** field if the battery has not yet been placed in an IMPRES charger. The battery must remain in the IMPRES charger pocket for several minutes to ensure that this data is written to the battery. A battery that is in an over-discharge state will require additional recovery time.

Note: Additional information is provided in the Battery Status and LED Indication section on Page 50.

W) **Histograms** – A pull-down button is available to select display of either the **Charge Remaining Histogram** or the **Charge Added Histogram**.

Charge Remaining Histogram: Each percentage value is incremented based on the **Present Charge Percentage** in the Battery 2.5 minutes after battery was placed into the IMPRES charger for charging.

Charge Added Histogram: Each percentage value is incremented based on the charge added to the battery while the battery is charging in an IMPRES charger.

Histogram Mismatches: The histograms typically complement each other. Mismatches between the two

histograms are a result of battery removal before full charge is complete.

IMPRES Frequently Asked Questions (FAQ)

| 1. | Are competitor batteries IMPRES-compatible? | NO |

Competitor batteries do not have EPROM's that contain optimal charge parameters. As a result, competitor batteries CANNOT be Reconditioned or Calibrated. IMPRES chargers use default charging parameters when charging competitor batteries. Only IMPRES batteries CAN be optimally charged using IMPRES chargers.

| 2. | Do IMPRES batteries have a fixed number of charge cycles? | NO |

IMPRES batteries do NOT have a fixed number of charge cycles. Capacity of all batteries (IMPRES and non-IMPRES) decreases slowly over time. IMPRES Reconditioning/Calibration slows the decrease in potential capacity and, hence, increases the number of charge cycles.

| 3. | Does IMPRES provide any value for Li-ion batteries? | YES |

IMPRES IS valuable in Charging/Recalibrating Li-ion batteries. IMPRES chargers calibrate batteries for best fuel gauge performance. IMPRES protects cycle life by terminating charge current at an optimal limit which is stored in the EEPROM of each battery.

| 4. | Can IMPRES batteries be stored in an active IMPRES charger for a long period of time? | YES |

IMPRES batteries CAN be stored in IMPRES chargers long term. IMPRES chargers are ideally suited to maintain full charge & protect cycle life without over-charging batteries. This is done by automatically Reconditioning/Calibrating batteries and by continuously monitoring battery status and reacting accordingly.

IMPRES Frequently Asked Questions (FAQ)

| 5. | Can IMPRES batteries be charged in non-IMPRES Motorola chargers? | YES |

IMPRES Batteries CAN be charged in Non-IMPRES Motorola chargers. IMPRES chargers will recover any lost Nickel capacity & recalibrate IMPRES battery fuel gauges to maintain fuel-gauge accuracy.

| 6. | Why does the charger display a different fuel gauge percentage than the radio? |

IMPRES chargers display the fuel gauge in relation to the minimum rated capacity of the battery. IMPRES radios display the fuel gauge in relation to the total potential capacity of the battery.

| 7. | Can I still use my battery if the LED on the charger flashes Red and Green? | YES |

The IMPRES charger is indicating that the battery's total potential capacity has degraded below a recommended replacement level. You may continue to use the battery. However, be cautious about the battery's potential capacity and consider replacement, especially if the battery is not meeting your shift's needs.

| 8. | If you use non-IMPRES chargers too much will you disable all IMPRES features of the battery? | NO |

IMPRES batteries always have their features enabled. Some IMPRES Radios will stop using the IMPRES data in a battery if the battery was charged more than 10 times in a non-IMPRES charger before it is placed into an IMPRES charger. IMPRES Radios will also use a voltage-based fuel gauge or may disable the fuel gauge if they have determined that the IMPRES battery needs to be Reconditioned/Calibrated.

Log File

Records of IMPRES battery data are stored in a Log File. All data displayed in both the General and Advanced tabs is written to the Log File, when the Data Reader **Log File** option is selected. Data in the log file is text and the data is stored as comma-separated values (.csv) file format. Log Files are readable using Microsoft Excel®.

ATTENTION: Periodically check the log file size. It may be necessary to create a new log file in order to prevent log file size from exceeding Microsoft Windows or Excel limits.

Battery Data Correction

The Data Reader can protect the usefulness of an IMPRES battery by detecting and automatically correcting battery data corruption. IMPRES batteries have memory devices enabling IMPRES chargers to perform optimal charging and to automatically Recondition/Calibrate IMPRES batteries. Conditions outside of the IMPRES battery or charger may occasionally corrupt portions of the IMPRES battery memory. The Data Reader detects corruptions in the IMPRES battery memory and, if feasible, makes corrections that enable continued and full use of the IMPRES battery.

Correctable Battery Errors

The Data Reader can detect and correct the following types of IMPRES battery data corruption:

- Vector Table Corruption
- Battery Clock Error
- Discharge Current Accumulator (DCA) Error
- Charge Current Accumulator (CCA) Error

In the unlikely event that the IMPRES Battery Data Reader is prevented from correcting a correctable IMPRES battery corruption, the Reader will advise the User.

Vector Table Correction

Vector Table Corruption disables most IMPRES functions within the IMPRES battery, preventing use of those IMPRES functions by an IMPRES charger or IMPRES radio. The Data Reader rebuilds the Vector Table. As a result, the IMPRES battery is restored to normal IMPRES operation.

After the Data Reader detects and corrects Vector Table Corruption, all displayed data will be normal and accurate. The log file will contain a record of the battery information after the

corruption was repaired. This record will indicate "CORRECTED" under the Vector Table Corruption heading. For more information see the Log File section on Page 39.

If the Data Reader is prevented from correcting the Vector Table Corruption, affected data fields will be highlighted as "Unrepairable Corrupted Data" (reference Table 3) and (since no correction occurred) the log file will contain a record of battery information wherein affected data are zero. This record of uncorrected data will indicate "YES" under the Vector Table Corruption heading. The Data Reader will also recommend "Battery Data Error Detected" and reference the Unable to Repair Battery section of this user guide on Page 46.

Battery Clock Correction

The Data Reader can detect and correct battery clock errors. Battery clock errors may occur in any of the following scenarios:

- the radio contacts on the battery are shorted together
- the radio over-discharges the battery
- the battery is left uncharged during long-term storage, resulting in over-discharge

The frequency of a battery clock error occurring is dependent on how often the scenarios, above, occur. When required, the battery clock will be reset by the Data Reader, which restores full functionality to the IMPRES battery.

When an IMPRES Battery Clock Error exists, information based on time or dates may be in error. Potentially affected fields include:

- Present Charge
- Present Charge Percentage of Potential Charge
- Present Charge Percentage of Rated Capacity
- Present Battery Temperature (°F and °C)
- Date of First Use

- Days since Last Reconditioning/Calibration
- Days since Removal from IMPRES Charger
- Estimated Days Until Next Reconditioning/Calibration

(For more information regarding the Battery Clock, see the Battery Clock section on Page 49.)

When the Data Reader detects a Battery Clock Error for the first time after startup, a "Clock Error Detected" window will be displayed and the user will need to select the "Verify Date/Time" button to enable further processing. Once the "Verify Date/Time button is selected the "Clock Error Detected" window will close and the standard Windows "Date and Time Properties" window will be displayed. If the date and time are already correct, then select "Ok" to close the "Date and Time Properties" window. Otherwise, edit the date and time, select "Apply" to update the PC date and time, and select "Ok" to close the "Date and Time Properties" window. Once the the "Date and Time Properties" window is closed, the Data Reader application will reasses the accuracy of the battery clock and correct/adjust any battery clock error.
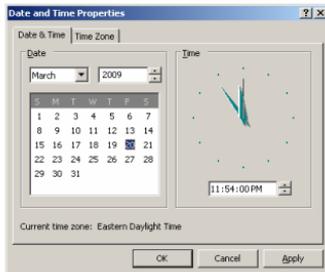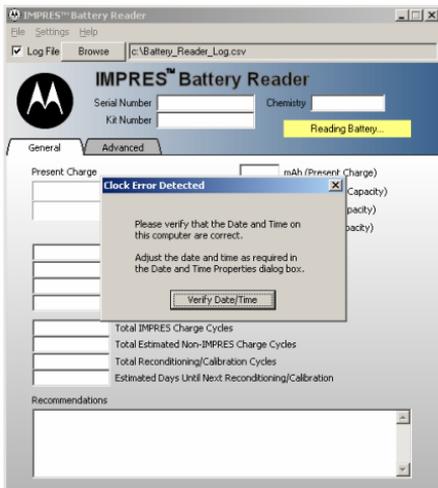
After the Battery Clock Error is corrected, affected fields will be highlighted as "Corrupted Data Successfully Repaired" (reference Table 3) and the following recommendations will be displayed in the **Recommendations** field:

"Battery Clock Error was Detected and Corrected"
"Affected Values restored to Factory Default Values and are grayed out"
"To Ensure Fuel Gauge accuracy, Recondition/Calibrate Battery in IMPRES Charger"
"See "Fuel Gauge Errors" in User Guide"

(For more information see Fuel Gauge Errors section on Page 48.)

Date of First Use will be set to the present date. **Days Since Last Reconditioning/Calibration** and **Days Since Removal from IMPRES Charger** will be reset to their factory default values.

Also, the battery End-of-Service Indication will be reset to its factory default value. The battery End-of-Service Indication is not visible using the Data Reader. If the battery was previously indicating End-of-Service (when fully charged in an IMPRES charger), then the End-of-Service indication will not be presented until an IMPRES charger has once again determined the battery to be End-of-Service. IMPRES chargers will automatically reinstate the End-of-Service indication as required upon subsequent Reconditioning/Calibration cycles. For more information see End-of-Service section on Page 54.

After the Data Reader detects and corrects Battery Clock Error, the log file will contain a record of the battery information after the correction was made. This record of repaired data will indicate "CORRECTED" under the Battery Clock Error heading. For more information see the Log File section on Page 39.

If the Data Reader is prevented from correcting the Battery Clock Error, affected data fields will be highlighted as "Unrepairable

Corrupted Data" (reference Table 3). The Data Reader will also recommend "Battery Data Error Detected" and reference the Unable to Repair Battery section of this user guide on Page 46. Since no correction occurred, the log file will contain a record of uncorrected battery information. This record of uncorrected information will indicate "YES" under the Battery Clock Error heading.

Discharge Current Accumulator (DCA) Correction

The Data Reader can detect and correct Discharge Current Accumulator (DCA) errors. DCA errors may occur when the battery clock is corrupted because the battery is left uncharged during long-term storage (resulting in over-discharge). This type of error may overstate the amount of energy delivered by the battery over its life.

The frequency of a DCA error occurring is dependent on how often the battery is left uncharged during long-term storage. When required, the DCA error will be corrected by the Data Reader, which restores full functionality to the IMPRES battery.

The Data Reader corrects a DCA Error by returning the value (the amount of energy delivered by the battery over its life) to a previously known good value. No display field is affected.

Once a DCA Error is corrected, the log file will contain a record of the repaired data and will indicate "CORRECTED" under the DCA Error heading. For more information see the Log File section on Page 39.

If the Data Reader is prevented from correcting the DCA Error, the Data Reader will recommend "Battery Data Error Detected" and reference the Unable to Repair Battery section of this user guide on Page 46. Since no correction occurred, the log file will contain a record of uncorrected battery information. This record

of uncorrected information will indicate "YES" under the DCA Error heading.

Charge Current Accumulator (CCA) Correction

The Data Reader can detect and correct Discharge Current Accumulator (CCA) errors. CCA errors may occur when the battery clock is corrupted because the battery is left uncharged during long-term storage (resulting in over-discharge). This type of error may overstate the amount of energy delivered by the battery over its life.

The frequency of a CCA error occurring is dependent on how often the battery is left uncharged during long-term storage. When required, the CCA error will be corrected by the Data Reader, which restores full functionality to the IMPRES battery.

The Data Reader corrects a CCA Error by returning the value (the amount of energy delivered by the battery over its life) to a previously known good value. No display field is affected.

Once a CCA Error is corrected, the log file will contain a record of the repaired data and will indicate "CORRECTED" under the CCA Error heading. For more information see the Log File section on Page 39.

If the Data Reader is prevented from correcting the CCA Error, the Data Reader will recommend "Battery Data Error Detected" and reference the Unable to Repair Battery section of this user guide on Page 46. Since no correction occurred, the log file will contain a record of uncorrected battery information. This record of uncorrected information will indicate "YES" under the CCA Error heading.

Unable to Repair Battery

The Data Reader cannot correct a few uncorrectable types of IMPRES battery data corruption. However, the Data Reader can easily identify these uncorrectable IMPRES battery data corruptions. Uncorrectable IMPRES battery data corruptions are listed below:

- Battery Status Block Error
- Checksum Error

Battery Status Block Error

A **Battery Status Block Error** cannot be corrected. A **Battery Status Block Error** corrupts some of the data fields within the battery memory. The **Battery Status** and **LED Indication** data are unaffected and remain valid.

The log file will contain a record of the battery information, including the potentially corrupted data fields. The record of corrupted data will indicate "YES" under the **Battery Status Block Error** heading. For more information see the Log File section on Page 39.

The data fields affected by **Battery Status Block Error** will be highlighted as "Unrepairable Corrupted Data" (reference Table 3). The Data Reader will also recommend "Battery Data Error Detected" and reference the Unable to Repair Battery section of this user guide on Page 46.

Checksum Error

A **Checksum Error** cannot be corrected. A **Checksum Error** is the result of corruption of some data fields within the battery memory.

The log file will contain a record of the battery information, including potentially corrupted data fields. The record of corrupted data will indicate "YES" under the **Checksum Error** heading. For more information see the Log File section on Page 39.

The data fields affected by **Checksum Error** will be highlighted as "Unrepairable Corrupted Data" (reference Table 3). The Data Reader will also recommend "Battery Data Error Detected" and reference the Unable to Repair Battery section of this user guide on Page 46.

General Notes

1. Fuel Gauge Errors

IMPRES batteries contain fuel gauge information. This fuel gauge information is used by radios with IMPRES capabilities and with IMPRES chargers in order to provide capacity information. Whenever a full Reconditioning/Calibration cycle is performed, the fuel gauge is calibrated. These cycles are automatically started by IMPRES chargers based on battery usage data stored within the battery (including the lack of recent usage).

The accuracy of the fuel gauge is based, in part, on Stand Loss. Stand Loss is the charge lost by the battery when the battery is not charged in an IMPRES charger. (Note: Stand loss is much more significant when dealing with Nickel chemistry batteries due to their higher self discharge characteristics.) The IMPRES charger compensates for Stand Loss based on battery chemistry and amount of time since the IMPRES battery was last charged. Battery Clock Errors affect fuel gauge accuracy, thereby affecting the ability of the IMPRES charger to compensate for Stand Loss.

2. Over-Discharged Batteries

If you see the "Please remove and reinsert the battery or charge the battery in an IMPRES charger" recommendation on the Data Reader display, then you must charge the battery before reading the battery in the Data Reader.

3. Battery Clock

IMPRES batteries contain a real-time clock. This clock is also referred to as the Elapsed Time Meter (ETM). The clock is set when the battery is manufactured. The Data Reader ensures the accuracy of this clock. This clock is used as a reference to determine the **Present Charge**, **Date of First Use, Days Since Last Reconditioning/Calibration**, **Days Since Removal from IMPRES Charger**, and **Estimated Days Until Next Reconditioning/Calibration**.

If you suspect that you have a battery where the battery clock may have reset, Motorola recommends the following steps to return the battery clock to an accurate value. Performing these steps will also ensure future IMPRES information will be accurate (e.g., **Days Since Removal from IMPRES Charger**).

- Place the suspect battery in a charger and allow it to "rapid charge" for approximately 30 minutes.

  Note: The purpose of this step is to recover an over-discharged battery. Customers with IMPRES multi-unit chargers (running V3.4 software) and the display option will observe battery information being displayed on the display after the battery is recovered.

- After the battery recovers, remove the battery from the charger and then place the battery into the Reader Pocket.

  Note: The Battery Reader application will ask the user to verify that the PC date and time are correct. This is important to establish an accurate time of reference.

- Follow the recommendations provided by the IMPRES Battery Reader. In most instances the battery will require a Reconditioning/Calibration cycle to restore full fuel gauge accuracy.

4. IMPRES Charger SW Version

An IMPRES charger writes its software (SW) version to battery memory. The battery must remain in the IMPRES charger pocket for several minutes to ensure that this data is written to the battery. A over-discharged battery will require additional time to ensure that software version is written to the battery memory.

Conditions that prevent the **IMPRES Charger SW Version** from being updated are:

- The IMPRES charger is not powered.
- The IMPRES charger does not detect the battery; observable by a lack of an LED indication with the charger pocket.
- The IMPRES battery did not remain in the IMPRES charger pocket long enough for the update to occur.
- While recovering an IMPRES battery from over-discharge, the IMPRES charger cannot communicate with the IMPRES battery until the internal over-discharge protection circuitry resets. Several minutes may be required to recover the battery from over-discharge.

5. Updates for IMPRES Accessory Software

The most recent version of IMPRES charger software is available on Motorola On-Line, located at Resource Center > Software > Two-Way > Accessories >.

6. Battery Status and LED Indication

IMPRES chargers write **Battery Status** and **LED Indication** to the IMPRES battery. The IMPRES battery must remain in the IMPRES charger pocket for several minutes to ensure that this data is written to the battery. Table 5 and Table 7 list the possible **Battery Status** values for Nickel batteries. Table 6 and Table 7 list the possible **Battery Status** values for Lithium batteries. Table 8 lists the possible **LED Indication** values.

Table 5. Nickel Battery Status - Charge Modes

Charge Mode	Description
Discharging	Battery was discharging when it was removed from an IMPRES charger
Standby	Charger was standing by waiting for battery condition (see Table 7) to clear when it was removed from an IMPRES charger
Rapid	Battery was rapid charging when it was removed from an IMPRES charger
Trickle	Battery was Top-off (trickle) charging when it was removed from an IMPRES charger
Maintenance	Battery was fully charged when it was removed from an IMPRES charger
-	Battery was never in an IMPRES charger
Invalid State	Data in the battery is corrupted. Data will be repaired on the next insertion into an IMPRES charger. For more information see Battery Status Block Error on Page 46.

Table 6. Lithium Battery Status - Charge Modes

Charge Mode	Description
Discharging	Battery was discharging when it was removed from an IMPRES charger
Standby	Charger was standing by waiting for battery condition (see Table 7) to clear when it was removed from an IMPRES charger
Constant Current	Battery was rapid charging when it was removed from an IMPRES charger
Constant Voltage	Battery was Top-off charging when it was removed from an IMPRES charger
Completed	Battery was fully charged when it was removed from an IMPRES charger
-	Battery was never in an IMPRES charger
Invalid State	Data in the battery is corrupted. Data will be repaired on the next insertion into an IMPRES charger. For more information see Battery Status Block Error on Page 46.

Table 7. Battery Status – Battery Conditions

Battery Condition	Description
- Hot	The battery was too hot to charge or discharge when it was removed from an IMPRES charger
- Cold	The battery was too cold to charge or discharge when it was removed from an IMPRES charger
-Low Voltage	The battery voltage was too low for rapid charge (slow charge was in progress) when it was removed from an IMPRES charger
- Hot & Low Voltage	The battery voltage was too low for rapid charge and battery was too hot to charge when it was removed from an IMPRES charger
- Cold & Low Voltage	The battery voltage was too low for rapid charge and battery was too cold to charge when it was removed from an IMPRES charger
	No battery condition preventing charge or discharge
- Invalid State	Data in the battery is corrupted. Data will be repaired on the next insertion into an IMPRES charger. For more information see Battery Status Block Error on Page 46.

Table 8. LED Indications

LED Indication	Charge Status
Steady Red	Battery was in rapid charge mode when it was removed from an IMPRES charger
Flashing Green	Battery completed rapid charging, was charged to greater than 90% of available capacity, and was in Top-Off charge (Trickle) when it was removed from an IMPRES charger[1, 2]
Steady Green	Battery was fully charged and was ~95% or more of available capacity when it was removed from an IMPRES charger[2,3]
Flashing Yellow	Battery was recognized by the charger but is waiting to charge when it was removed from an IMPRES charger
Flashing Red	Battery was unchargeable or not making proper contact when it was removed from an IMPRES charger
Steady Yellow	Battery was discharging when it was removed from an IMPRES charger
Alternating Red/Green	Battery was fully charged and was ~95% or more of available capacity when it was removed from an IMPRES charger[2,3] Battery continues to be usable, however the End-of-Service threshold stored in the battery was exceeded.
Alternating Yellow/Green	Battery was fully charged and was ~95% or more of available capacity when it was removed from an IMPRES charger[2,3] The IMPRES charger recommended a Reconditioning/Calibration cycle.
OFF	Battery was never in an IMPRES charger
Invalid LED Status	Data in the battery is corrupted. Data will be repaired on the next insertion into an IMPRES charger. For more information see Battery Status Block Error on Page 46.

[1]The reported **Present Charge** may be less than 90% due to battery stand loss.
[2]Stand Loss is the charge lost by the battery when the battery is not charged in an IMPRES charger. (Note: Stand loss is much more significant when dealing with Nickel chemistry batteries due to their higher self discharge characteristics.) The Data Reader compensates for Stand Loss based on battery chemistry and amount of time since the IMPRES battery was last charged.
[3]The reported **Present Charge** may be less than 95% due to battery stand loss.

An over-discharged battery requires additional recovery time. An IMPRES charger updates these data as the IMPRES battery changes charge mode and the IMPRES charger LED indication changes. Conditions that prevent this information from being updated in an IMPRES battery include:

- The IMPRES charger is not powered.
- The IMPRES charger does not detect the battery; observable by a lack of an LED indication with the charger pocket.
- The IMPRES battery did not remain in the IMPRES charger pocket long enough for the update to occur.
- While recovering an IMPRES battery from over-discharge, the IMPRES charger cannot communicate with the IMPRES battery until the internal over-discharge protection circuitry resets. Several minutes may be required to recover the battery from over-discharge.

7. End-of-Service
Indicates that the battery may be approaching the end of its rated service life. While this battery is fully charged, its charging capacity has been reduced by usage and my not adequately support heavier applications. This is not a fault indication, merely a notification to the user that the battery may soon no longer be able to yield expected service and may need to be

replaced. When this indication occurs, contact your Motorola Dealer for replacement batteries.

8.   Contact Cleaning
The 'DeoxIT®GOLD' cleaner/lubricant pen (supplier CAIG Labs, part number GX100P-UV) has been found to be very effective at cleaning and extending contact life. DeoxIT®GOLD is available at numerous electronics suppliers (Radio Shack, McMaster Carr, Fry's, etc.) and directly from the manufacturer, CAIG Labs, at http://www.caig.com. The pen-based package is recommended as it provides better access to recessed contacts. The pen's tip may need to be modified (trimmed on the sides) to improve penetration into the recesses.

Per the manufacturer's instructions, shake the pen and depress the tip until the fluid saturates the tip. Apply to each contact surface. IMPORTANT - Extra care should be taken to ensure adequate lubrication of the larger contact surfaces.

After cleaning, inspect all contact surfaces for signs of advanced wear. Advanced contact wear is defined as wear through the contact plating to the base metal (copper). Copper exposure is characterized by a distinctive orange-brown metal appearance surrounded by the silvery nickel underplate and gold top plating. In some cases, a magnified (8x to 10x) inspection may be required to verify wear into the base material. Wear that does not penetrate the gold or nickel surface is common and does not require replacement.

After cleaning the contact areas of any foreign material, let the lubricant/cleaner air dry for two minutes. IMPORTANT - Do not wipe dry. Insert the battery into the Reader Pocket and observe the Steady Green indication. Regular maintenance (at least annually) of this area is recommended to ensure contamination free interface and to prolong the life of the contacts.

General Battery Care and Tips

1. Battery Chemistry

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 (-30 ºC). 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 prevent that from occurring.

Nickel-Metal Hydride (NiMH) batteries can work 40% to 50% longer between charges than NiCd batteries of similar size.

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".

2. Nickel Battery Memory Effect

Memory Effect occurs in Nickel batteries when batteries are repeatedly partially discharged before the next charge. In subsequent full discharges, the battery voltage drops faster than normal, resulting in decreased discharge capacity. The IMPRES system automatically performs a Reconditioning/Calibration cycle, as needed, to maximize **Potential Capacity**.

3. Helpful battery guidelines

New Motorola IMPRES Batteries, when inserted into a Motorola IMPRES charger, will be Reconditioned/Calibrated. The charger will indicate a Reconditioning/Calibration cycle by displaying a steady Yellow indicator on the charge status indicator. Allow this Reconditioning/Calibration process to complete. Do not remove the battery from the charger until charging is complete and the charger displays a steady green indication.

Charge your Lithium battery 1 to 2 additional hours after the charger light turns steady green, to maximize **Present Charge**.

To maximize **Potential Capacity**, charge your new Nickel battery (or batteries stored for more than two months) overnight before use. Nickel Cadmium or Nickel Metal Hydride batteries require 14-16 hours for charging. In general, nickel chemistry batteries can take up to 25 charge/discharge cycles to maximize **Potential Capacity**.

If used batteries are to be removed from service for extended periods (greater than 30 days), they should be discharged to about 50% of their capacity before storage in a cool, dry location. In order to minimize permanent capacity loss and cycle life reduction, new batteries must be stored in well ventilated, cool, and dry locations.

Troubleshooting

When troubleshooting, always observe and note the color of the Reader Pocket Indicator.

Table 9. Troubleshooting

Problem	What it means…	What to do…
No Indication	No power to the Reader Pocket.	Make sure that the USB cable is securely plugged into the Reader Pocket and a powered USB port on the host PC.
	Battery not making contact with the Reader Pocket.	Check that the battery is inserted properly into the Reader Pocket.
	Hardware Fault	Contact your Motorola representative.
Flashing Red Indication	Battery not making proper contact with the Reader Pocket	Remove the battery and reinsert it into the Reader Pocket.
	Reader Pocket is not properly connected to the host PC	Disconnect and reconnect the USB cable. Restart the application.
	Over-discharged IMPRES battery	Charge the battery in a Motorola IMPRES charger, then reinsert the battery into the Reader Pocket.
	Non-IMPRES battery	Verify that the battery is a Motorola IMPRES battery. Other batteries cannot be read.
Flash Green Indication at any time other than Power-Up	The USB connection to the host PC may have been temporarily interrupted, causing the Reader Pocket to power up.	Verify that an IMPRES battery can be successfully read. No user intervention is required.

IMPRES Feature / Benefit Description

The IMPRES energy solution is a unique patented system approach that is an advanced Tri-Chemistry energy system developed by Motorola which encompasses (a) IMPRES batteries, (b) IMPRES Chargers and, (c) a means by which IMPRES- compatible devices communicate with each other. IMPRES batteries include a high-accuracy fuel gauge, enabling users to monitor their energy consumption.

IMPRES Chargers, when used in conjunction with Motorola IMPRES batteries, will:

1. Automatically recalibrate the IMPRES battery fuel gauge (NiCd, NiMH, Li-ion).

    Motorola's industry-exclusive IMPRES technology allows communication between the charger and the battery. A memory chip in the battery stores all usage information, which is accessed and evaluated by any IMPRES charger.

    This information enables automated battery Reconditioning/Calibration and enables display of critical charging information. Critical charging information includes:

    -   Battery capacity (in mAh and percent of **Rated Capacity**)
    -   Voltage while charging and at completion of charge
    -   Time remaining to complete rapid charging (NiCd and NiMH only)
    -   Current battery charge status
    -   The battery's unique serial number, part number and chemistry

2. Maximize battery life by significantly reducing heat during the trickle and post-charge cycles, while maintaining maximum charge, for Nickel batteries.

Overheating during long-term charging can damage a battery and result in lost capacity. Most conventional chargers have a maintenance charge mode at the completion of a charge cycle that applies constant power to a battery in an effort to keep it charged over time. This maintenance charge can cause batteries to overheat.

IMPRES chargers automatically turn off at the end of a charge cycle, yet continue to electronically monitor IMPRES batteries every five minutes to determine when more energy should be applied. This ensures the battery has a high state of charge without sustaining any heat damage.

IMPRES batteries can be left in IMPRES chargers for extended periods without heat damage. The charger monitors the batteries so that they're charged and ready to go whenever you need them.

3. Eliminate the need to purchase reconditioning equipment and train personnel to "manage battery maintenance tasks."

With IMPRES adaptive reconditioning, Motorola has made it easy and automatic for you to maintain your battery inventory.

IMPRES chargers evaluate the actual usage pattern of every battery to establish the optimal reconditioning interval.

Adaptive reconditioning makes it easy for battery maintenance technicians to know the correct reconditioning intervals. Unwarranted reconditioning cycles wastes battery cycles. Not reconditioning often enough robs the user from being able to use the full **Potential Capacity** of the battery.

4. Maximize operation time between charge cycles by automatically minimizing memory effect in Nickel batteries.

Motorola's IMPRES chargers evaluate the actual usage pattern of each IMPRES battery. This allows the charger to

adapt to that individual battery's usage pattern and establish the optimal Reconditioning/Calibration interval for that battery. IMPRES uses an adaptive algorithm, which relies on several factors to evaluate the need for Reconditioning/Calibration. The system then automatically Reconditions/Calibrates the battery as required. The intelligence within the IMPRES system automates the process, removing guesswork from determining the optimal Reconditioning/Calibration interval.

With this unique patented system approach, there is no need to conduct or schedule manual Reconditioning/Calibration cycles. IMPRES Chargers monitor the usage pattern of the IMPRES battery, store that information in the IMPRES battery, and perform a Reconditioning/Calibration cycle only when needed.

Warranty Information

The Data Reader is warranted for 12 months.

Battery Data Reader is tested and certified to meet the following certifications:

US:

  47 CFR 15 Class B

CE Mark - European Community

  EN 55022 Class B, EN55024, Class B

Canada

  ICES-003 Class B, CAN/CSA-C22.2 No. 60950-1.

Australia / New Zealand

  AS/NZS CISPR 22 Class B.

The warranty becomes void if:

- The Data Reader or any of its components is used for purposes other than that for which it was designed,

- The Data Reader is used with equipment not approved for use with the Data Reader.

- The Data Reader hardware or software is modified or altered in any way.

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