

# **User Guide**

**Savi Mobile Reader SMR-650 for the  
Intermec 751G/A Mobile Computer  
and PC**

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**Version 1.0**



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Documentation for Savi Mobile Reader SMR-650 for the Intermecc 751G/A Mobile Computer and PC, version 1.0

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# About the Savi Mobile Reader SMR-650 and Mobile Computer

Savi® Mobile Reader SMR-650 is a portable radio frequency identification (RFID) reader that communicates with Savi RFID tags. There are three models of the Savi Mobile Reader SMR-650:

- ◆ SMR-650-212
- ◆ SMR-650-210
- ◆ SMR-650-213

The SMR-650-212 Reader is mounted on the Intermec® 751G/A Mobile Computer and is packaged in kits that provide a specific set of components. Kits can include different hardware or software accessories, as well as different versions of the mobile computer. For example, kit models 741G-Kit-C-101x and 751G-Kit-C-101x include a custom Intermec cable, bracket, and mounting hardware. Model 741G-Kit-C-101x includes a batch Intermec 751G/A Mobile Computer that communicates with the wired LAN, while model 751G-Kit-C-101x includes a Wi-Fi Intermec 751G/A Mobile Computer that communicates with the wireless LAN. Preinstalled software applications include Savi SmartChain® Mobile Manager, SmartChain® for Mobile Devices, or SmartChain Transportation Security System (TSS) for Mobile Devices. Hardware accessories include the portable Zebra® printer, boot for the printer, and serial cable with an RJ-45 and DB-9 connector.

The SMR-650-210 Reader and SMR-650-213 Reader include serial DB-9 interface connectors and work with a notebook or desktop PC or other devices with DB-9 RS-232 serial connectors. The only difference between the SMR-650-210 Reader and the SMR-650-213 Reader is the length of the cable for the DB-9 connector. The SMR-650-210 Reader has a 1-foot (30.48 cm) cable and the SMR-650-213 Reader has a 9-foot (2.74 m) cable.

This guide is primarily designed for use of the SMR-650-212 Reader as packaged in kit models 741G-Kit-C-101x and 751G-Kit-C-101x. It also describes reader functionality, components, and specifications.

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**Note:** In this guide, when the model of the mobile reader or kit is not specifically mentioned, the information applies to all mobile reader models and kits. For information about using the SMR-650-210 and SMR-650-213 Readers with PCs, refer to the *Savi SmartChain Client Tools User Guide*. For information about software applications, verify which software you have preinstalled on your mobile device and refer to the *Savi SmartChain Mobile Manager Pocket User Guide*, *Guide to SmartChain for Mobile Devices*, or the *Guide to SmartChain Transportation Security System for Mobile Devices*.

*Figure 1-1 Mobile device*



## SMR-650 Reader Communication

The SMR-650 Reader has an ultra high frequency (UHF) transceiver and low frequency (LF) transmitter that communicate with all Savi RFID tags via the UHF and LF antennas. Your software determines if you are using UHF or LF commands.

The SMR-650-212 Reader works on a wireless or wired LAN so you can download and upload information to and from your database.

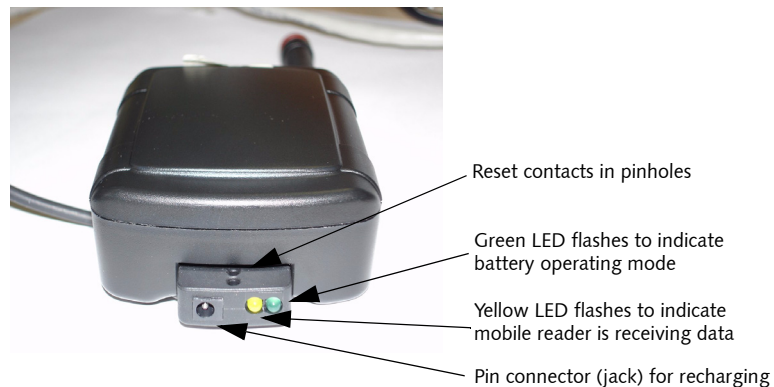
### UHF Mode

The UHF transmitter sends commands and write information to Savi RFID tags. In UHF mode, the mobile reader supports single and continuous collection modes.

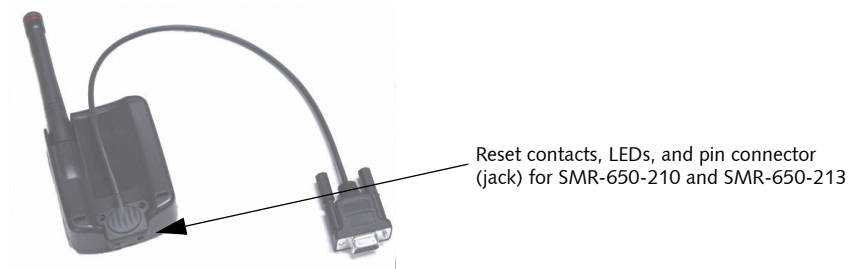
When the mobile reader is in single UHF mode, you can only perform one tag collection within a fixed radius. When the mobile reader is in continuous UHF mode, you can perform multiple tag collections while moving through a facility.

The yellow status LED shows when the SMR-650 Reader is receiving a UHF signal. When the yellow LED flashes, it indicates that the mobile reader received a valid data packet. The yellow LED continues to flash until all data is received. The yellow LED is not functional during UHF transmit or LF transmit.

*Figure 1-2 LEDs and pin connector (jack) for recharging for SMR-650-212 Reader*



*Figure 1-3 Reset contacts, LEDs, and pin connector (jack) for recharging for SMR-650-210 and SMR-650-213*



## LF Mode

LF mode is controlled by the software running on the mobile computer. LF mode is compatible only with SaviTags. To use LF mode, you must turn it on in your software.

With your software, you can use LF mode to perform short-range communications up to 3 feet (.91 m)

## Optimizing the SMR-650-212 Reader Tag Collection Range

To optimize the SMR-650-212 Reader tag collection range, hold the mobile device as shown in Figure 1-4. Make sure the device is:

- ◆ Parallel to your body
- ◆ Vertical, close to eye level

Most tags within an omni-directional pattern of 200 feet (61 m) are collected.



*Figure 1-4 Hold the mobile device close to eye level and parallel to your body for optimal tag collection*



Factors that can limit the SMR-650 Reader collection range include:

- ◆ Obstructions such as multiple walls, chained areas, solid-core doors, and enclosures
- ◆ RF interference from other equipment such as computers, cellular phones, walkie-talkies, elevators, electrical motors, or other RF-emitting devices
- ◆ Reflection from the ground and from nearby objects
- ◆ Position and orientation of the SMR-650 Reader
- ◆ Metal or RF-absorbent surface on the tracked item
- ◆ Tag location relative to the SMR-650 Reader, such as behind a metal obstruction or stacked under multiple layers

Radio interference also affects the probability of collecting any given tag, and you can expect some variance in repeatability in the field.

## Operating the Mobile Device

The mobile device consists of the SMR-650-212 Reader mounted on an Intermec 751G/A Mobile Computer, which runs the Windows CE .NET 4.2 operating system and includes a 42-character alphanumeric keyboard. The Intermec 751G/A Mobile Computer features a backlight for the keypad.

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**Note:** This guide provides general information for operating the Intermec 751G/A Mobile Computer keypad. For more information regarding Intermec products, refer to the *Intermec 751G Computer with Alphanumeric Keypad User's Manual* on the CD that is packaged with your mobile device.

### Turning on the Keypad Backlight

If you work in dim or unlit areas, you can turn on the keypad backlight.

1. Turn on your mobile computer.
2. Select **Start > Settings > Control Panel**.
3. Select the **Backlight** icon.
4. Select the **Keyboard** tab.
5. Use the arrows on your keypad to select your backlight settings.
6. Select **OK**.

## Intermec 751G/A Mobile Computer Keypad

Figure 1-5 shows the keypad of the Intermec 751G/A Mobile Computer.

Figure 1-5 Intermec 751G/A Mobile Computer Keypad



Use the Gold/White Plane key to access display controls, special characters, and Windows CE options

Use the Blue Alpha Plane key to enter letters

## Keys Unique to the Intermec 751G/A Mobile Computer



### Blue Alpha Plane Key

The Blue Alpha Plane key allows you to enter letters. When you press this key, the keypad stays in Alpha mode until you press the Blue Alpha Plane key again. Hold the Caps Lock key to enter the next letter in uppercase.



### Gold/White Plane Key

The Gold/White Plane key allows you to access display controls, special characters, and Windows CE options. Most keys have a secondary function that you can access by pressing the Gold/White Plane key. For example, the @ symbol shares the **K** key on the keypad, which means that to enter the @ symbol, you press the Gold/White Plane key and then the **K** key.

## **Reset Contacts in Pinholes on the SMR-650**

For the SMR-650-212 Reader, the reset contacts are located in the pinholes on the unit. For the SMR-650-210 and SMR-650-213 Readers, the reset contacts are located in the pinholes on the cable. See Figure 1-2 and Figure 1-3 for reset pinhole location.

If the SMR-650 Reader is not communicating with Savi RFID tags, insert the tips of an unfolded paper clip (made into a U-shape) into the pinholes simultaneously to reboot the unit.

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**Note:** Before rebooting, examine the connections for the mobile device or SMR-650-210 or SMR-650-213 reader with the desktop or notebook computer. Verify that the mobile reader has a fully charged battery by checking the battery. See “Determining Available Battery Power” on page 20.

## **For More Information**

### **Guides to Read**

Other documentation for the SMR-650 Reader in kit models 741G-Kit-C-101x and 751G-Kit-C-101x includes:

- ◆ *Savi SmartChain Mobile Manager Pocket User Guide* and the *Savi SmartChain Mobile Manager Administrator Guide*, available with the SmartChain Mobile Manager application.
- ◆ For information about the Intermec device, refer to the *Intermec 751G Computer with Alphanumeric Keypad User’s Manual* on the provided CD.

## **Contacting Savi Support**

If you cannot find the information you need, contact Savi Support.

- ◆ Check [www.savi.com/services/su.contact.shtml](http://www.savi.com/services/su.contact.shtml) for contact information.
- ◆ Send email to [help@savi.com](mailto:help@savi.com).
- ◆ Call 1-888-994-SAVI (North America only) or 1-408-743-8888 between 9 a.m. and 5 p.m. Pacific time.

When you contact Savi Support by telephone or email, have the following information available:

- ◆ Contact information (company name, your name, email, and phone number)
- ◆ Problem description
- ◆ Product type
- ◆ Software version
- ◆ Serial number or license information



# Assembling and Using the Intermec Holster

## Inserting the Mobile Device into the Holster

As you follow these steps, refer to the corresponding photos on the next page.

1. Buckle the waist strap around your waist.
2. Buckle the leg strap around the middle of your thigh.
3. Adjust the waist and leg straps for a secure fit.
4. Turn the mobile device upside-down. Ensure that the unit is vertical.
5. Insert and slide the mobile device into the holster.

*Figure 2-1 Inserting the mobile device into the holster*

For the instructions that correspond to these photos, see "Inserting the Mobile Device into the Holster" on page 15.





# Recharging Batteries

## Recharging the SMR-650-212 Reader Battery

The SMR-650-212 Reader has a Lithium-Ion internal battery that is not replaceable. To recharge the SMR-650-212 Reader battery, use the power cable and power supply with the 1/8-inch (3.2 mm) jack that Savi provides.

You can also use the power cable, power supply, and Intermec dock to recharge the mobile device. Recharging both units simultaneously using the Intermec dock is the preferred method.

1. Ensure that your SMR-650-212 Reader is securely connected to the Intermec 751G/A Mobile Computer.

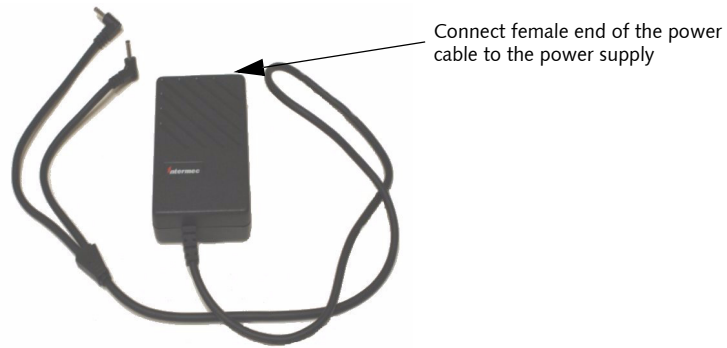
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**Note:** The LF transmitter of the mobile reader is not functional when it is recharging.

2. Plug the 3-prong connector of the power cable into an active power unit.



3. Connect the female end of the power cable to the Intermec power supply.



4. Connect the other end of the power supply to the AC adapter on the dock.



5. Insert the mobile device into the dock.



The battery of the reader and mobile computer are fully charged after three to four hours.

## Recharging the SMR-650-210 and SMR-650-213 Reader Battery

The Lithium-Ion internal battery for the SMR-650-210 and SMR-650-213 Readers is not replaceable. To recharge the battery, use the power cable and power supply with the 1/8-inch (3.2 mm) jack that Savi provides.

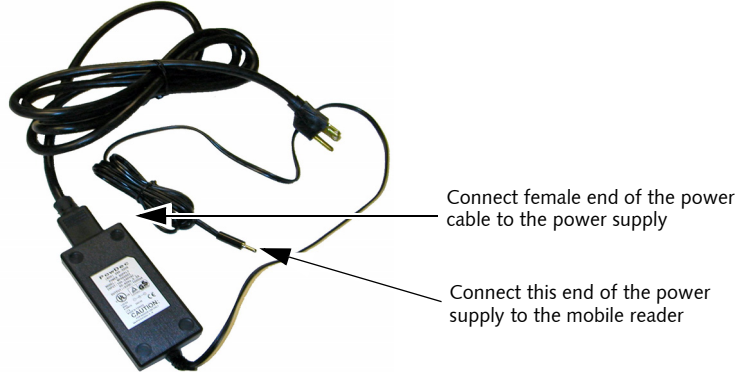
1. Ensure that your SMR-650-210 or SMR-650-213 Reader is NOT connected to your desktop or notebook computer.

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**Note:** The LF transmitter of the mobile reader is not functional when it is recharging.

2. Plug the 3-prong connector of the power cable into an active power unit.

3. Connect the female end of the power cable to the mobile reader power supply.



4. Connect the other end of the power supply to the mobile reader.

## Determining Available Battery Power

You can determine the percentage of battery power available based on the activity of the green LED on the SMR-650 Reader.

Wall adapter	Application running (COM port open)	Green LED activity pattern	Percentage of battery power available
Plugged in	Not applicable	flash, flash, off for two seconds, flash, flash, off for two seconds	Less than 90%
Plugged in	Not applicable	flash, off for two seconds, flash, off for two seconds	Greater than 90%
Unplugged	Yes	flash, off for five seconds, flash, off for five seconds	Greater than 20%
Unplugged	Yes	flash, flash, off for five seconds, flash, flash, off for five seconds	Less than 20%
Unplugged	Application running, no activity	Light is completely off; battery is discharged	0%

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# Printing Labels

You can print labels using the serial interface cable (Zebra Pt# 52712). Before you attempt to print using the Savi Mobile Reader SMR-650, verify that the Zebra printer is in proper working order by printing a test label. See the Zebra user's guide for instructions.

This chapter applies to kits that include the portable Zebra printer, boot for the printer, and serial cable with an RJ-45 and DB-9 connector for hardware accessories.

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**Note:** For information about how to print labels, verify which software you have preinstalled on your mobile device and refer to the *Savi SmartChain Mobile Manager Pocket User Guide*, *Guide to SmartChain for Mobile Devices*, or the *Guide to SmartChain Transportation Security System for Mobile Devices*.

## **Connecting the Printer to the Mobile Device**

You connect the printer to the mobile device using the Intermec boot. You can also use the Intermec dock to connect to the mobile device.

### **Using the Intermec Boot to Connect to the Mobile Device**

1. Retrieve the network cable with a DB-9 and RJ-45 connector.



2. Connect the Intermec boot to the bottom of the mobile device.



3. Connect the DB-9 connector to the bottom of the boot.



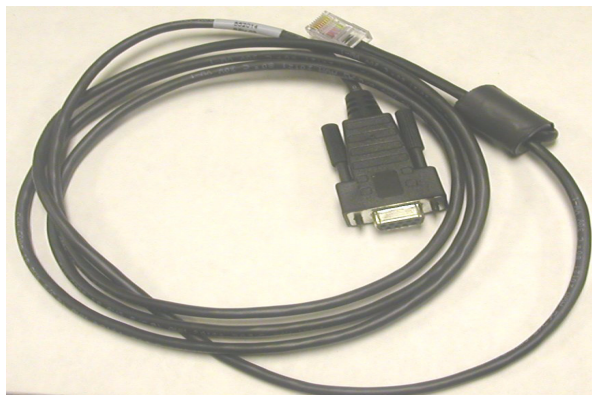
4. Insert the RJ-45 connector to the printer port.



5. Use the software on your mobile device to print labels.

## **Using the Intermec Dock to Connect to the Mobile Device**

1. Retrieve the network cable with a DB-9 and RJ-45 connector.



2. Connect the DB-9 connector to the Intermec dock.





3. Insert the RJ-45 connector to the printer port.



4. Insert the mobile device into the dock.



5. Use the software on your mobile device to print labels.



# SMR-650 Reader Specifications

Specification	Description
<b>Physical characteristics</b>	<b>Length:</b> 6.25 inches (15.88 cm) including antenna and cable <b>Width:</b> 2.5 inches (6.35 cm) <b>Height:</b> 1 inch (2.5 cm) <b>Weight:</b> 6.4 ounces (181 g) with clip
<b>Environment</b>	<b>Storage temperature:</b> -4°F to +140°F (-20°C to +60°C) ambient <b>Operating temperature:</b> -4°F to +140°F (-20°C to +60°C) ambient; 32°F to +104°F (0°C to +40°C) when charging <b>Humidity:</b> 5 to 95% non-condensing. IP64 compliant. <b>Altitude:</b> Maximum is 40,000 feet (12,192 m); rate of change is 2,000 feet (610 m) per minute

<b>RF receiver/transmitter</b>	<p><b>Ultra High Frequency (UHF) receiver and transmitter (downlink and uplink):</b></p> <p><b>Frequency:</b> 433.92 MHz</p> <p><b>Range:</b> UHF read/write (symmetrical) range of up to 200 feet (61 m) line of site to SaviTag ST-6XX series and SaviTag ST-41X series</p> <p><b>Modulation:</b> Frequency shift keying, deviation +/- 50 KHz</p> <p><b>Data rate:</b> 27.8 Kps, 50% duty cycle</p> <p><b>Air protocol:</b> Batch Collection System (BCS) and Extended Batch Collection System (EBCS) commands; Savi EchoPoint™ Air Protocol 2.1 (two-way UHF commands and seal extension commands)</p> <p><b>Data coding:</b> Manchester</p> <p><b>Rx Signal Strength Indicator (RSSI):</b> RSSI logic enables software to implement a search function that can poll a tag within range to determine tag proximity</p> <p><b>RF communication:</b> Yellow LED flashes to indicate receipt of valid packet</p> <p><b>Maximum transmit power:</b> 0.6mW</p> <p><b>Security:</b> Password-protected communication with SaviTag ST-6XX series</p> <p><b>Error detection:</b> 16-bit CRC</p> <p><b>Wakeup signal:</b> 31.25 KHz</p>
<b>LF transmitter for tag commissioning</b>	<p><b>Low Frequency Transmitter (downlink):</b></p> <p><b>Frequency:</b> 123 KHz</p> <p><b>Range:</b> Up to 3 feet (.91 m) with SaviTag ST-6XX series</p> <p><b>Modulation:</b> Amplitude shift keying (on-off)</p> <p><b>Data rate:</b> 1.6 Kps, 50% duty cycle</p> <p><b>Air protocol:</b> Savi EchoPoint Air Protocol 1.1</p> <p><b>Data coding:</b> Pulse Code Modulation</p> <p><b>Error detection:</b> 8-bit CRC</p>
<b>Network</b>	<p><b>Interface:</b> Interface back to network requires mobile computer to be enabled with wireless or wired docking station</p> <p><b>Protocol:</b> Universal Data Appliance Protocol (UDAP) used to communicate with Savi SmartChain Site Manager</p>
<b>Memory</b>	<p>On board non-volatile memory of 256 KB for tag data (up to 500 records)</p>

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<b>Tag compatibility</b>	SaviTag ST-6XX series and SaviTag ST-41X series
<b>Interfaces</b>	<p><b>SMR-650-212:</b> Cable with Intermec proprietary interface and overmolded connectors. Cable is approximately 5 inches (12.7 cm) in length</p> <p><b>SMR-650-210 and SMR-650-213:</b> Cable with serial DB-9 interface. Cable for SMR-650-210 is approximately 1 foot (30.48 cm) in length. Cable for SMR-650-213 is approximately 9 feet (2.74 m) in length.</p>
<b>RS-232 Interface</b>	<p><b>Data rate:</b> 19.2 Kps</p> <p><b>Flow control:</b> CTS, half duplex communication, DTR for switching between standby and active modes</p> <p><b>Data format:</b> 8 data bits, non-parity, 1 stop bit</p> <p><b>Signals:</b> TXD, RXD, DTR, and CTS</p>
<b>Antenna</b>	<p><b>External UHF:</b> 50 Ohms matched external helical antenna (attached using SMA connector)</p> <p><b>Integrated (LF):</b> Ferrite Core</p>
<b>Shock and vibration</b>	<p><b>Shock:</b> Drop from 4-foot (1.22 m) height on the concrete floor in accordance with IEC 68 Series (MIL-STD-810E Method 514.4 Category 10), mechanical shock, transit drop methods 516.4 per National Safe Transit Association (NSTA) project 1A.</p> <p><b>Vibration:</b> Random vibration, 3 axis, 60 minutes each axis MIL-STD-810E Method 514.4 Category 10 Procedure 1 Minimum</p>
<b>Protection type</b>	Sealed to IP64 (protection against objects larger than 1mm (.04 inches) in diameter and protection from water falling as much as 15 degrees from vertical)

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**Power**

**Primary:** Rechargeable and non-replaceable Li-Ion battery (3.7V @ 420mAh up to approximately 500 recharging cycles (80% or more of full battery capacity))

**Battery capacity:** Approximately 3 to 4 days of continuous operation based on the following usage:

- ◆ 8 hours per day with a single tag detection every 30 seconds (120 times in 1 hour)
- ◆ Transmitter is active for 300 milliseconds during single detection
- ◆ UHF receiver is active for 10 seconds during each detection

**Charging:** 120 mA maximum charge current required. 3 to 4 hours to charge Li-Ion battery with AC adapter. AC adapter has an input range of 100 to 240 VAC and an output of 5V +/- 10% regulated at maximum 1 Amp

**NOTE:** Inactive DTR line or disconnected serial link automatically puts unit in standby mode to conserve battery life

**Battery status LED:** Green status LED indicates various battery operating modes

**Reset contacts:** Reset contacts in pinholes resets the mobile reader and flashes green battery status LED and yellow RF communication LED to indicate reset process

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**Regulatory approvals**

**Radiated emission (intentional):** U.S. emission standards as contained in FCC Part 15, Canada RSS-210, and European Community emission standards as contained in EN 300 220 (433 MHz) and EN 300 330 (123 KHz)

**Electromagnetic emission:** ESD compliance  
Exposed to 8 kV air discharge or 4 kV contact discharge in accordance with EN 301 489-1

**Radiated immunity (unintentional):** U.S. emission standards as contained in FCC Part 15 and European Community immunity standards as contained in EN 301 489-1

**Safety approval:**  
AC adapter: U.S. UL 60950; CSA C22 950; European EN 60950;  
Savi Mobile Reader SMR-650: US. UL 1604 approved for use in hazardous locations Division 2 Class I Groups A, B, C, and D, Class II Groups F, G, Class III; European EN 60950  
Ordnance safety: HERO tested

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<b>Mobile computer mounting</b>	Mounting hardware and bracket attaches the SMR-650-212 Reader to the Intermec 751G/A Mobile Computer. Includes holster
<b>Options</b>	SMR-650-212 for use with Intermec 751G/A Mobile Computer; SMR-650-210 and SMR-650-213 with DB-9 connectors for use with notebook and desktop PCs
<b>Software requirements</b>	SMR-650-212 requires SmartChain Mobile Manager, SmartChain for Mobile Devices, or SmartChain Transportation Security System for Mobile Devices; SMR-650-210 and SMR-650-213 require SmartChain Client Tools

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# Hardware Components

The SMR-650-212 is packaged in kits that include the following items:

- ◆ Intermec model 751G/A handheld terminal with alpha keypad, 802.11G radio (model 751G-Kit-C-101x only), and 2D imager\*
  - ◆ 256 MB memory card (SD format)
  - ◆ Operational and spare battery (two batteries total)
  - ◆ Operational and spare stylus
  - ◆ Charger/communications dock (USB, serial)
  - ◆ Universal Power Supply
  - ◆ USB interface cable
  - ◆ *Intermec 751G Computer with Alphanumeric Keypad User's Manual*
  - ◆ Power cord
  - ◆ Intermec holster and shoulder strap
- \* Model 741G-Kit-C-101x includes a batch Intermec 751G/A Mobile Computer and model 751G-Kit-C-101x includes a Wi-Fi Intermec 751G/A Mobile Computer

## SMR-650-212 Reader Components

- ◆ Custom Intermec cable
- ◆ Rechargeable Lithium-Ion battery (internal and non-removable)
- ◆ AC adapter to recharge the mobile reader internal battery

*Figure B-1 SMR-650-212 Reader*



SMR-650-212 Reader with custom Intermec cable

## SMR-650-210 and SMR-650-213 Reader Components

- ◆ Rechargeable Lithium-Ion battery (internal and non-removable)
- ◆ AC adapter to recharge the mobile reader internal battery

*Figure B-2 SMR-650-210 and SMR-650-213 Reader*



SMR-650-210 and SMR-650-213 Reader with DB-9 connector