

Quick Reference Guide

**Savi Mobile Reader SMR-650P-210
and SMR-650P-211**

Version 1.0



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Documentation for Savi Mobile Reader SMR-650P-210 and SMR-650P-211,
version 1.0

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Welcome

The Savi® Mobile Reader SMR-650P is a portable radio frequency identification (RFID) interrogator that communicates with all models of Savi RFID tags. The SMR-650P-211 Reader has a customized Symbol cable and works with a Symbol 8100 or 8146 device to provide you with a standalone handheld reader. The SMR-650P-210 Reader has a DB-9 connector for use with a laptop or desktop PC.

In This Guide

This guide describes the specifications, features, and use of the SMR-650P Reader.

- ◆ This chapter, “Welcome,” provides an introduction to this guide and lists resources you can turn to for additional information.
- ◆ Chapter 2, “Savi Mobile Reader SMR-650P and Handheld Device Description,” specifies technical information about the SMR-650P Reader.
- ◆ Chapter 3, “Connecting the SMR-650P Reader and Charging the Battery,” tells you how to connect the SMR-650P-211 Reader to the Symbol 8100 or 8146.
- ◆ Chapter 4, “Printing Labels,” explains how to use the Zebra PT47X printer with the SMR-650P Reader.

Other Information Resources

Guides to Read

Other documentation for the SMR-650P Reader includes:

- ◆ *Handheld Reader Setup Procedure* guide, available on a CD provided by the Savi Training Department.
- ◆ *Savi SmartChain Mobile Manager Pocket Guide* and the *Savi SmartChain Mobile Manager Administrator Guide*, available with the SmartChain Mobile Manager application.
- ◆ For information about the Symbol device, refer to the Symbol *Product Reference Guide* at www.symbol.com.

Contacting Customer Support

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

- ◆ Call 1-888-994-SAVI (North America only) or 1-408-743-8888 between 9 a.m. and 5 p.m. Pacific time.
- ◆ Send email to help@savi.com.
- ◆ Check www.savi.com/support for information.

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

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

Savi Mobile Reader SMR-650P and Handheld Device Description

This chapter provides the Savi Mobile Reader SMR-650P hardware specifications and briefly describes compatible Symbol 8100/8146 handheld components.

SMR-650P-211 Reader Components

The following items are components of the SMR-650P-211 Reader:

- ◆ Custom Symbol cable
- ◆ Rechargeable Lithium-Ion battery (internal and non-removable)
- ◆ AC adapter to recharge the mobile reader internal battery
- ◆ Handheld carrying case, Savi model numbers: HCC-650P-01 or HCC-650P-02.

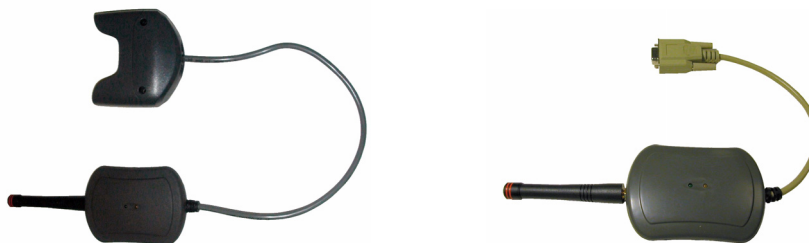
The case is included in the Savi Basic Handheld Mobile Reader Kit. You can purchase an additional carrying case as a separate accessory item.

SMR-650P-210 Reader Components

The following items are components of the SMR-650P-210 Reader:

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

Figure 2-1 SMR-650P Reader



SMR-650P-211 Reader with custom Symbol cable

SMR-650P-210 Reader with DB-9 connector

The only difference between the SMR-650P-210 Reader and the SMR-650P-211 Reader is the serial DB-9 interface connector for use with laptop or desktop PCs. All functionality and other specifications are identical. In this guide, when the model is not specifically mentioned, the information applies to both mobile reader models. For information about using the SMR-650P-210 Reader with PCs, refer to the *Savi SmartChain Client Tools User Guide*.

Figure 2-2 SMR-650P-211 Reader with Symbol handheld device



SMR-650P Reader Specifications

Specification	Description
Physical characteristics	<p>Length: 2.5 inches (6.4 cm)</p> <p>Width: 3.5 inches (8.9 cm)</p> <p>Height: 1 inch (2.5 cm)</p> <p>Weight: 4.8 ounces (136.08 grams)</p>
Environment	<p>Operating temperature: –4°F to +120°F (–20°C to +50°C) when operating from the internal battery; +32°F to +104°F (0°C to +40°C) when operating while being recharged</p> <p>Humidity: 5 to 95% non-condensing at +122°F (+50°C)</p>
RF receiver/transmitter	<p>Ultra High Frequency (UHF) receiver and transmitter (downlink and uplink):</p> <p>Frequency: 433.92 MHz</p> <p>Range: UHF read/write (symmetrical) range of 200 feet (61 meters) line of site to SaviTag ST-654, SaviTag ST-655, and SaviTag ST-410 tags</p> <p>SaviTag range: 100 feet (30.48 meters) typical for SaviTag ST-602, SaviTag ST-604, and SaviTag ST-645 tags</p> <p>Modulation: Frequency shift keying, deviation +/- 35 KHz</p> <p>Data rate: 27.8 Kps, 50% duty cycle</p> <p>Air protocol: Savi EchoPoint Air Protocol 2.1 (two-way UHF commands and seal extension commands)</p> <p>Data coding: Manchester</p> <p>Rx Signal Strength Indicator (RSSI): RSSI logic enables SmartChain Mobile Manager to implement a search function that can poll a tag within range to determine tag proximity</p> <p>RF communication: Amber LED flashes to indicate receipt of valid packet</p>
LF transmitter for tag commissioning	<p>Low Frequency Transmitter (downlink):</p> <p>Frequency: 123 KHz</p> <p>Range: Up to 4 feet (1.22 meters)</p> <p>Modulation: Amplitude shift keying (on-off)</p> <p>Data rate: 1.6 Kps, 50% duty cycle</p> <p>Air protocol: Savi EchoPoint Air Protocol 1.1</p> <p>Data coding: Pulse Code Modulation</p>

Network	Interface: Interface back to network requires handheld to be enabled with wireless or wired docking station Protocol: Universal Data Appliance Protocol (UDAP) used to communicate with Savi SmartChain Site Manager
Memory	On board non-volatile memory of 32 KB for tag data buffering
Tag compatibility	All Savi RFID tags
Interfaces	SMR-650P-211: Captive cable with Symbol proprietary boot interface. Cable is approximately 11.5 inches (29.21 cm) in length SMR-650P-210: Cable with Serial DB-9 interface. Cable is approximately 4.5 inches (11.43 cm) in length
Antenna	External UHF: Omni-directional Di-Pole antenna Integrated (LFT): Ferrite Core
Shock and vibration	Shock: Drop from 4 feet (1.22 meters) height on the plywood floor in accordance with IEC 68 Series (MIL-STD-810E Method 516.4 Category 10) Vibration: Non-operation MIL-STD-810E Method 516.4 Category 10
Protection type	Sealed to IP42 (protection against objects larger than 1mm (.04 inches) in diameter and protection from water falling as much as 15 degrees from vertical)

Power	<p>Primary: Rechargeable and non-replaceable Li-Ion battery (3.7V @ 420mAh up to approximately 500 recharging cycles (80% or more of full battery capacity))</p> <p>Battery capacity: Approximately 3 to 4 days of continuous operation based on the following usage:</p> <ul style="list-style-type: none"> ◆ 8 hours per day with a single tag interrogation every 30 seconds (120 times in 1 hour) ◆ Transmitter is active for 300 ms during single interrogation ◆ UHF receiver is active for 10 seconds during each interrogation <p>Charging: 250 mA maximum charge current required. 2 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</p> <p>NOTE: Inactive DTR line or disconnected serial link will automatically put unit in standby mode to conserve battery life</p> <p>Battery status LED: Green status LED indicates various battery operating modes</p>
Regulatory approvals	<p>Radiated emission (intentional): U.S. emission standards as contained in FCC Part 15 and European Community emission standards as contained in EN 300 220-1 (433 MHz) and EN 300 330 (123 KHz)</p> <p>Electromagnetic immunity: ESD compliance Exposed to 8 kV air discharge or 4 kV contact discharge in accordance with EN 301 489-1</p> <p>Radiated immunity (unintentional): European Community immunity standards as contained in EN 301 489-1</p> <p>Safety approval: AC adapter: U.S. UL 1950 and European EN 60950</p>
Handheld mobile reader mounting	<p>Handheld carrying case (Savi model number: HCC-650P-01) attaches the SMR-650P-211 Reader to a Symbol 8100 or 8146. Includes shoulder strap</p>
Options	<p>SMR-650P-210 with DB-9 connector for use with laptop and desktop PCs</p>
Software requirements	<p>SMR-650P-211 requires SmartChain Mobile Manager; SMR-650P-210 requires SmartChain Client Tools</p>

SMR-650P Reader Communication

The SMR-650P Reader has both ultra high frequency (UHF) and low frequency (LF) transmitters that communicate with all Savi RFID tags via the integrated antenna.

Savi SmartChain Mobile Manager is Savi-provided software with the SMR-650P-211 Reader that you must install on your Symbol 8100 or 8146 handheld. It displays information for tags that have been interrogated, collected, or scanned. Tags are interrogated when the SMR-650P Reader is in UHF mode, collected when the SMR-650P Reader is in UHF or LF mode, and scanned when SMR-650P Reader is in LF mode.

Through the Symbol handheld, SmartChain Mobile Manager interfaces the SMR-650P-211 Reader with the wireless and wired LAN so you can download and upload information to and from the database.

UHF Mode Operation

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

LF Mode Operation

LF mode is controlled by the SmartChain Mobile Manager application running on the handheld device. LF mode is compatible only with SaviTags. To use LF mode, you must turn it on in SmartChain Mobile Manager.

You use LF mode to:

- ◆ Disable the UHF mode of SaviTag ST-654 tags to prevent unwanted interrogations
- ◆ Perform short-range tag collections up to 4 feet
- ◆ Locate tags
- ◆ Change SaviTags communication parameters

Optimizing the SMR-650P Reader Tag Collection Range

To optimize the SMR-650P Reader tag collection range, hold the device as shown in Figure 2-3.

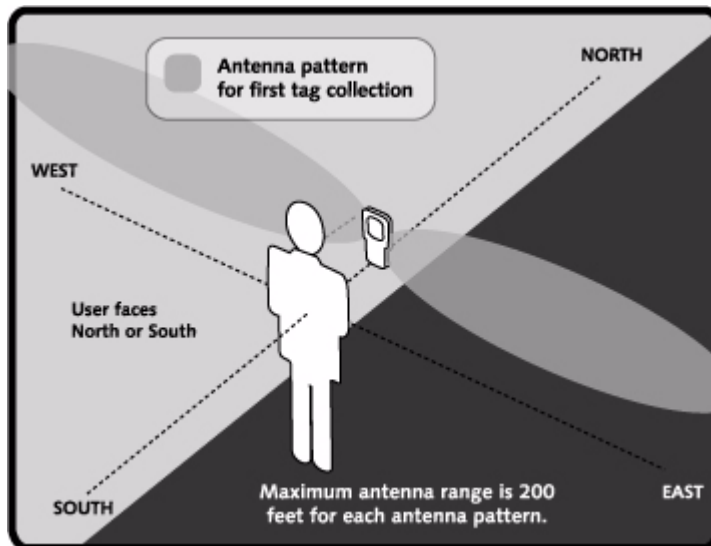
- ◆ Parallel to the your body.
- ◆ Vertically at eye level

Figure 2-3 Hold the mobile reader at eye level and parallel to your body for optimal tag collection



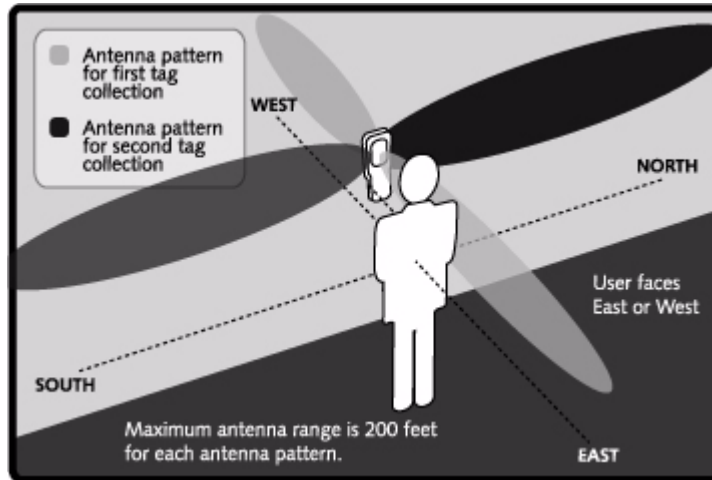
As shown in Figure 2-4, if you face north or south, the radiation pattern of the antenna is strongest to the left and right with a 200-foot maximum tag collection range in either direction. During the first tag collection, most tags within an omni directional pattern of 100 feet will be collected.

Figure 2-4 Tag collection facing north or south



After waiting for a few seconds, turn to the right or left (facing east or west) and perform another collection to determine if additional tags can be collected.

Figure 2-5 Tag collection facing east or west



Factors that can limit the SMR-650P 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
- ◆ Positioning and orientation of the SMR-650P Reader
- ◆ Metal or RF-absorbent surface on the tracked item
- ◆ Tag location relative to the SMR-650P 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 SMR-650P Reader with the Symbol Handheld Device

The SMR-650P-211 Reader is compatible with Symbol 8100 and 8146 handheld devices, which are Windows Pocket PC devices with options for 37- or 47-character alphanumeric keyboards. Symbol 8100 and 8146 handhelds feature a backlight for the keypad.

The following Symbol 8100 and 8146 models are compatible with the SMR-650P-211 Reader:

- ◆ PDT-8100-B2A94000
- ◆ PDT-8100-J4BA3000
- ◆ PDT-8146-B2A930US
- ◆ PDT-8146-B2A940US
- ◆ PDT-8146-J4BA40WW

Note: This guide provides general information for operating a Symbol 8100 or 8146 keypad. For more information regarding Symbol products, refer to the *Symbol Product Reference Guide* at www.symbol.com.

Backlight Control

To turn the backlight on or off:



- ◆ Press and hold

Symbol 8100 and 8146 Keypad

Figure 2-6 shows the keypad of the Symbol 8100 or 8146 that is used with the SMR-650P-211 Reader.

Figure 2-6 Symbol 8100 and 8146 Keypad



47 keys plus two side scan keys (not shown)

Use the Function key to access the characters located above the keys. See "Function Key" on page 19

Keys Unique to the Symbol 8100 and 8146



Power/Suspend Key

When the display is on, press this key to place the handheld in suspend mode. After a minute, the display goes blank.

Resume Key

All yellow keys on the Symbol 8100 or 8146 can operate as a resume key. Press any yellow key to turn the power back on when the handheld is in sleep or suspend mode. Sleep mode is automatically turned on when the handheld is not used for two minutes.



Shift Key

Press the shift key to type the next letter in uppercase. Only the next letter will be uppercase. Each successive uppercase entry requires pressing the shift key.



Function Key

Most keys have a secondary function that you can access by pressing the function key. For example, the + sign is printed above the N key on the keypad, which means that to access the + sign, you press the function key and then the N key.



Backspace Key

Press this key to delete the character to the left of the cursor.

Reset Pinhole

The reset pinhole is located on the back panel of the SMR-650P-211 Reader. Inside the pinhole is a reset button, which you can use to reboot the SMR-650P-211 Reader if the unit is not communicating with Savi RFID tags.

Use the tip of an unfolded paper clip or a similar object without a sharp tip to gently press the reset button. The unit is rebooted when you hear a click.

Note: Before rebooting, examine the connections between the SMR-650P-211 Reader and the Symbol handheld. See “Connecting the SMR-650P Reader and Charging the Battery” on page 21. Verify that the mobile reader has a fully charged battery by checking the battery icon on the SmartChain Mobile Manager page. See “Checking the SMR-650P Reader Battery” on page 27.

Connecting the SMR-650P Reader and Charging the Battery

Connecting the SMR-650P Reader to the Symbol Handheld Device

You connect the custom Symbol cable of the Savi Mobile Reader SMR-650P-211 to a port located at the bottom of the handheld device. Use the SMR-650P-211 Reader carrying case so you can easily hold both the handheld device and mobile reader in one hand.

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

1. Insert the Symbol device into the boot of the custom cable.
2. With the back of the carrying case facing you, unbutton and unzip the case for the handheld device. Unzip the pocket for the SMR-650P-211 Reader.
3. Slide the Symbol device and connected mobile reader into the case.
4. Zip and button the back of the case.
5. Unscrew the external antenna.
6. Insert the SMR-650P-211 Reader into the pocket and zip it into place.
7. Open the velcro flaps on the side panel. Insert the cable of the reader so it is inside the flap. Close the velcro flap.
8. Reattach the external antenna.
9. Put the strap over your neck to prevent the handheld and reader from slipping from your hands (picture not shown).

Figure 3-1 Connecting the SMR-650P-211 Reader

For the instructions that correspond to these photos, see "Connecting the SMR-650P Reader to the Symbol Handheld Device" on page 21.



Batteries

Recharging the SMR-650P Reader Battery

The SMR-650P Reader has a Lithium-Ion internal battery that is not replaceable. To recharge the battery, you use the AC adapter that Savi provides.

1. Ensure that your SMR-650P Reader is not connected to a handheld.

Note: Disconnect the mobile reader from the handheld to suspend RF operations while it is charging. Operating the mobile reader while recharging may compromise the battery charge time.

2. Plug the AC adapter into an active power unit.
3. Connect the other end of the AC adapter to the mobile reader.

Figure 3-2 Charging the internal battery



The battery is fully charged after two hours.

Recharging the Handheld Device in the Carrying Case

1. Ensure that your SMR-650P-211 Reader is not connected to a handheld device.
2. Unbutton and unzip the back of the carrying case.
3. Insert the handheld device into its docking station.
4. Plug the docking station AC adapter into an active power unit.
5. Connect the other end of the AC adapter to the docking station.

Figure 3-3 Charging the handheld device in the carrying case



Battery Status Green LED

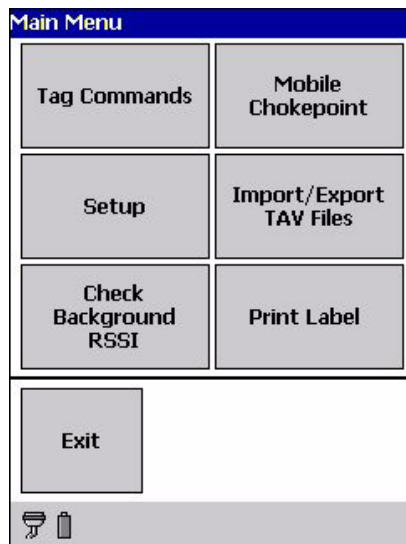
You can determine the percentage of battery power available based on the activity of the green LED on the SMR-650P Reader.

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%

Verifying the SMR-650P Reader Connection

To check the connection, you must have SmartChain Mobile Manager installed on the handheld device. For installation instructions, see the *Savi SmartChain Mobile Manager Administrator Guide*.

1. Turn on the handheld device.
2. Start SmartChain Mobile Manager.



3. To verify that the SMR-650P Reader is connected properly, check the connection icon in the lower left.



SMR-650P Reader is connected

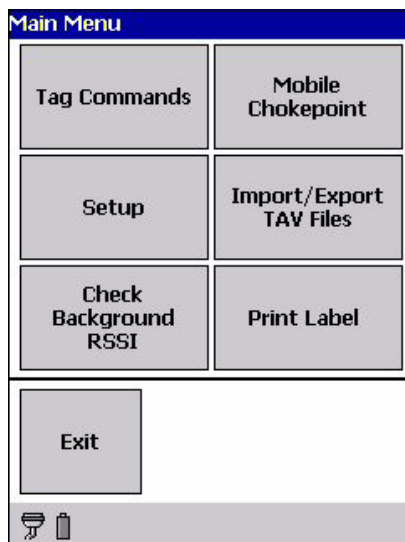


SMR-650P Reader is not attached properly

If the unit is not communicating with Savi RFID tags, use the reset button to reboot the SMR-650P Reader.

Checking the SMR-650P Reader Battery

1. Turn on the handheld device.
2. Start SmartChain Mobile Manager.



3. To verify that the SMR-650P Reader battery is charged, check the battery icon in the lower left.



SMR-650P Reader battery power is okay



No SMR-650P Reader battery power



SMR-650P Reader battery power is low

Printing Labels

Using SmartChain Mobile Manager, you can print using an infrared interface (IrDA) or the serial interface cable (Zebra Pt# 52712). The infrared interface is recommended for printing labels on the Zebra PT47X printer.

Before you attempt to print using the Savi Mobile Reader SMR-650P, verify that the Zebra printer is in proper working order by printing a test label. See the Zebra PT47X users guide for instructions.

Printing with the Infrared Interface (IrDA)

Verify that the Zebra printer is equipped with the IrDA option by checking that the configuration number on the back of the printer is PT471-850-10000 or PT473-850-10000.

Figure 4-1 Check the printer configuration number

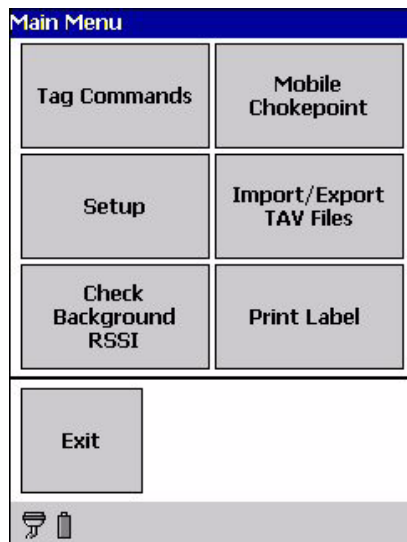


Note: A Symbol handheld 81XX with a Strong Arm based microprocessor or equipped with a black and white display cannot print using the IrDA interface. Check the Symbol *Product Reference Guide* to verify the microprocessor type. If your handheld has this configuration, you must use the serial cable for printing. See “Printing with the Serial Interface Cable” on page 34.

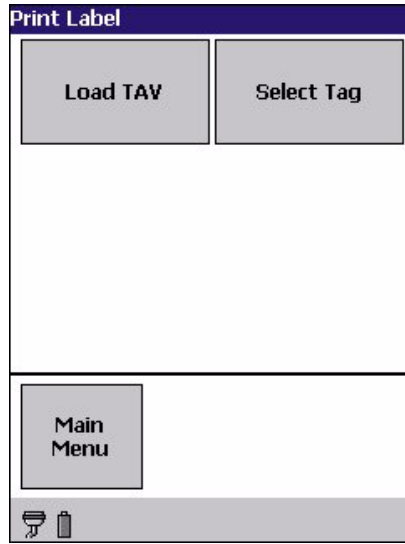
According to Zebra, to properly send data when printing using the IrDA interface, the distance between the communicating units must have clear line-of-sight and not exceed 39 inches. Savi recommends maintaining a 3-inch to 6-inch clear line-of-site distance between IrDA device lenses to maximize printing success.

To print via the IrDA:

1. Start SmartChain Mobile Manager.

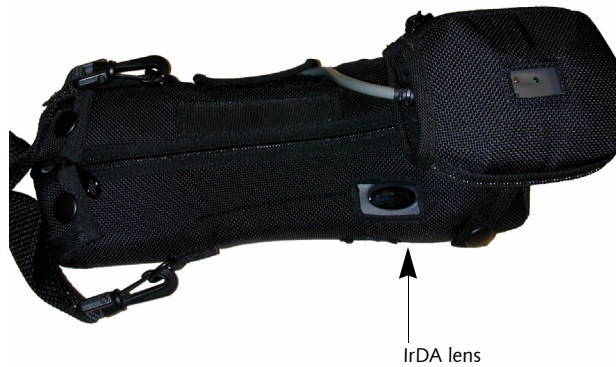


2. From the Main Menu, select **Print Label**.



3. Fill in the fields on the Print Label page.
4. Locate the Symbol handheld IrDA lens.

Figure 4-2 Symbol handheld IrDA lens



5. Locate the printer IrDA lens.

Figure 4-3 Zebra printer IrDA lens



IrDA lens

6. Align the Symbol handheld IrDA lens with the printer IrDA lens.

Figure 4-4 Align printer lens with lens on handheld device



7. Select **Print** on the SmartChain Mobile Manager Print Label page.
See the *Savi SmartChain Mobile Manager Administrator Guide* or the *Savi SmartChain Mobile Manager Pocket Guide* for additional printing information.

IrDA Printing Troubleshooting Tips

If you have problems printing using the IrDA port:

- ◆ Hold the PDT81XX IrDA lens steady 3-inches to 6-inches over the PT47X IrDA lens and then select **Print**.
- ◆ Verify that the **smm.properties** file has the correct information:
 - a. Open the **My Pocket PC** directory and go to the **\Application\Savi\SMM\6.0** directory.
 - b. Find the **smm.properties** file and copy it to the local PC's desktop.
 - c. Open the file with a text editor and modify it as follows:

```
PRINT.PrinterPort.Name=COM1:
PRINT.PrinterPort.UseIR=True
```
 - d. Save and close the **smm.properties** file and place the newly modified file in the original **\Application\Savi\SMM\6.0** My Pocket PC directory.
 - e. Select **Yes** to replace the original file.

Printing with the Serial Interface Cable

To print using the serial interface cable, you must use Microsoft Active Sync to edit the SmartChain Mobile Manager properties file on the Symbol 81XX. The following steps assume that Active Sync is installed on the desktop or laptop PC.

To modify the properties file:

1. Exit the SmartChain Mobile Manager application.
2. Disconnect the SMR-650P Reader and insert the Symbol handheld into the charging cradle.
3. On the local PC desktop, select the **My Computer** icon and open Mobile Device.
4. Open the **My Pocket PC** directory and go to the **\Application\Savi\SMM\6.0** directory.

5. Find the **smm.properties** file and copy it to the local PC's desktop.
6. Open the file with a text editor and modify it as follows:

```
PRINT.PrinterPort.Name=COM1:  
PRINT.PrinterPort.UseIR=False
```
7. Save and close the **smm.properties** file and place the newly modified file in the original **\Application\Savi\SMM\6.0 My Pocket PC** directory.
8. When asked to replace the original file, select **Yes**.

Active Sync synchronizes with the handheld device. Now you can print using the serial interface cable.
9. Restart SmartChain Mobile Manager.

See the Zebra PT47X users guide for information about connecting the Symbol handheld device to the printer. See the *Savi SmartChain Mobile Manager Administrator Guide* or the *Savi SmartChain Mobile Manager Pocket Guide* for label printing information.

