Telenexus "HHR Demo" User Guide v.2.0.0

This preliminary user guide describes how to use the Telenexus hand-held reader. It also describes how to use the reader HHRDemo test application. The intended uses of this demo app are:

- Demonstration of reader functions.
- Qualification and regression testing of the CE reader software.
- Reader evaluation and test tool for engineering lab use.

Reader operation

POWER

Unit power is applied and removed with the **On/Off** button in the upper right corner of the key panel.

- **On**: Press and hold the **On/Off** button. A high-pitch beep indicates that the button press has been received and that the unit is powering up. The CE desktop will appear ~10 seconds after the beep.
- **Off**: Press and hold the **On/Off** button. A low-pitch beep indicates that the button press has been received and that the unit is powering down. A few additional beeps indicate that the current reader settings are being stored in non-volatile memory prior to power down.

POWER SAVING

The reader provides a Suspend mode which extends battery life while maintaining the application program currently being executed. The reader may be configured to automatically enter the Suspend mode after a period of inactivity. The reader also may be immediately placed in the Suspend Mode by tapping the Start button on the WinCE task bar followed by tapping the Suspend button.

Turning the power off removes all power from the system. This means any programs loaded in RAM and any data generated and saved in RAM since power-up are lost. Programs and data stored in the flash file system are maintained.

BATTERY CHARGE INDICATION

An application may inform you of the state of battery charge in one of two way. The application may provide a 4-level battery charge indication:

- **Good:** OK to use unit.
- **Low:** Recharge as soon as convenient.
- **Critical:** Only a few minutes of charge remaining.
- **Kill:** CE power is turned off to avoid battery damage.

Your application may display **Low** and **Critical** dialogs when the discharge and recharge thresholds are reached.

When the **Kill** state is reached, the reader will shut itself off to avoid battery damage.

BATTERY GAUGE

Your application may provide a gauge icon showing how much battery charge is remaining. **Low** and **Critical** dialogs may also be displayed when the discharge and recharge thresholds are reached.

LCD CONTRAST

LCD bias is set using keypad keys.

- **Increase:** Press and release **2nd**, then press and hold the '.' key until the contrast has increased to the desired level.
- **Decrease:** Press and release **2nd**, then press and hold **0** until the contrast has decreased to the desired level.

No LCD contrast adjustment is needed except when operating the reader in extreme temperatures.

BACKLIGHT

The backlight is illuminated with the keypad **Light** button, and an application may also provide a means to turn it on and off. The amount of time the backlight remains lit is determined by the application program in use.

WINCE KEYBOARD

A WinCE keyboard emulation panel may be viewed by double-tapping the stylus icon in the task bar. The panel may be moved by dragging with a stylus. Keys tapped by a stylus are sent to WinCE in the same manner as done with an actual keyboard. The emulation panel is removed from the screen by double-tapping the stylus icon.

KEYPAD

Keypad codes are sent only to an application that requests them. See the API manual for more detail.

- The keypad is normally in a numeric entry mode.
- Alphanumeric mode is entered by pressing the **Alpha** key. In this mode, multiple presses of the same key will cycle through the set of alphanumeric values assigned to a key. The application program is responsible for presentation of codes to the user: The HHRDemo application provides one example of how this may be done. A short delay, or pressing the cursor-right key indicates selection of the current key value. Pressing the **Alpha** key a second time reverts the mode back to numerics.

- When the keypad is in the alphanumeric mode, Pressing **2nd-Shift** will cause an upper-case character code to be issued. Pressing **2nd-Shift-Shift** will perform a "Caps Lock" operation, causing all subsequent alphabetic characters to be issued in upper case.

- Function mode is entered for the single key following a press of the **2nd** key. Keys **1**..**5** have no function labelled on the keypad, but pressing one of these keys after pressing the **2nd** key will generate function codes that may be used by an application.
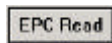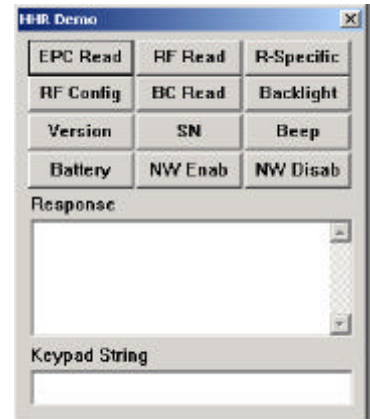
START

The application is started by opening Windows Explorer and navigating to the Windows folder. Double-tap the HHRDemo icon to start the application. Later releases will move the demo app to a more convenient location.

OPERATIONS

The top-level application dialog is shown in the above image. Tapping a button either causes another dialog to be displayed or a function to be performed. Function dialogs may be closed with the title bar OK button.

HHR Demo		✕
EPC Read	RF Read	R-Specific
RF Config	BC Read	Backlight
Version	SN	Beep
Battery	NW Enab	NW Disab

Response

Keypad String

Tapping the EPC Read button creates a pop-up dialog to select the type of EPC-formatted tags to read, and routes the trigger switch to the RFID reader module. Each pull of the trigger switch enable the reader for as long as the trigger is held. See the section titled "EPC Parameter Configuration" for a description of configuring the RFID module for reading EPC tags. As tags are read, they are shown in the Response window. When the trigger is released, reader statistics are display above the response window.
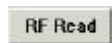
Tapping the RF Read button enables the RF tag reader to read Matrics-formatted tags, and routes the trigger switch to the RF tag reader module. Each pull of the trigger switch enable the reader for as long as the trigger is held. See the section titled "Matrics Mode Configuration " for a description of configuring the RFID module for reading Matrics tags. As tags are read, they are shown in the Response window. When the trigger is released, reader statistics are display above the response window.Tag type and ID are displayed in ascending byte order, with tag type displayed as least-significant byte.

Tapping the R-Specific button enables the RF tag reader to read a specific Matrics tag ID. When the button is tapped, a selection dialog is displayed for entry of a tag type and tag ID. See the section titled, "Read Specific Matrics Tag"for a description of specifying the tag ID. Pulling the trigger causes the reader to search for the specified tag, and a Found or Not Found indication is returned in the response window.

Tapping the BC Read button enables the barcode reader, and routes the trigger switch to the barcode module. Each pull of the trigger

4

switch initiates one barcode read. When a read operation is successful,
a high-pitched tone is generated and the ASCII value of the barcode is displayed in the response window.

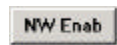|	
Backlight	Tapping the Backlight button turns on the LCD backlight for the default duration set in the HHR.
Version	Tapping the Version button displays the version numbers of all pro-grammable HHR components in the Response window.
SN	Tapping the SN button displays the HHR serial number in the Response window.
Beep	Tapping the Beep button generates a default tone.
Battery	Tapping the Battery button displays the battery status, voltage, and percent remaining charge in the Response window.
NW Enab	Tapping the NW Enable button applies power to the 802.11b network interface. If the network has been configured, a preferred

connection is made. Otherwise, a network setup dialog is displayed. The following sequence may be used to establish a connection:

1. Tap the Wireless Information tab in the CISCO1 dialog.
2. The network card searches for network access points. Available network SSIDs will appear in the CISCO1 window.
3. Tap the desired SSID and tap the Connect button. A configuration dialog appears.
4. For test purposes it is assumed that WEP will not be used, so dismiss the configuration dialog.
5. In a few seconds, the selected SSID will show an Associated status. Tap the OK button.

To demonstrate network connectivity, a network connectivity demonstration app is provided. perform the following operations:

1. Execute the Win32 UDP demonstration application on a workstation having connectivity to the access point serving the HHR.
2. If a UDP port number other than the default port 1717 must be used, enter the new port number on both the HHR and UDP application running on a workstation.
3. Enter the host name of the workstation running the UDP application.
4. Barcode and RFID responses written to the HHR Response window will be sent to the UDP application.
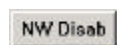
NW Disab	Tapping the NW Disable button removes power from the 802.11b network interface, which extends the HHR battery run time.

EPC Parameter Configuration

EPC Read

Tapping the EPC Read button opens the EPC Parameter dialog to configure the RFID reader for EPC tags. Refer to Auto-ID center documents for detailed descriptions of EPC formats. Radio buttons provide the means to select either a single format or all EPC formats. If the Filtered button is selected, the reader is configured to read a filtered set of tags, dependent on the Count and Filter bits:

Count. The most-significant Count bits of tags within the range of the reader are compared to the most-significant bits of the Filter setting. Only those tags whose specified number of bits match, are passed on to the Response window.

Filter. Left-justified bits are used in tag comparisons. For example, to read tags whose first 10 bits are '1101100011' the filter window is set to "D8C0."

Matrics Mode Configuration

RF Config

Tapping the RF Config button opens the RFID configuration dialog used to perform setup operations. The default value of the parameters allow RFID tag reads.

The default values presented by the dialog are values which allow reading of Matrics RFID tags. Altering values of some parameters alters operation of the HHR. Other values must be unchanged to successfully read Matrics tags.
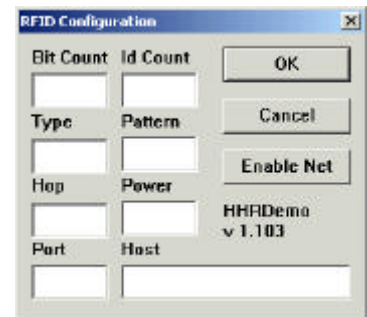
TAG READER PARAMETERS

Bit Count. The default value of 52 reads the 8 bits of tag Type and 44 bits of tag ID.

**ID Count.** ID Count must be set to the default value of 44 to successfully read the current Matrics tag.

Type. Tag type zero allows all Matrics tag types to be read. A non-zero value will read only tags of the specified type.

Pattern. The default check pattern matches the value currently used by the Matrics tags.

Hop. The Hop value sets the number of frequency hops made during a single read operation.

Power. Power level values may range between 0 and 255.

Read Specific Matrics Tag
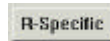
Tapping the R-Specific button opens a dialog to read a specific tag. The ID of the tag to be read may be selected with one of several methods:

- *From a list of tags read by the prior Matrics RF Read operation:* This is the default selection method. The tags found by the prior operation are shown in the dialog main window. Tap one of the IDs and tap the Select button.
- *From a list of tags stored in the flash file system:* To use this option, read a set of Matrics tags and open the Read Specific dialog. Tap the Save List button to save the current set of tags. To load the list on a subsequent execution of the HHRDemo program, open the Read Specific dialog and tap the Get List button. Tap one of the IDs and tap the Select button.
- *Via dialog entry:* Open the virtual keyboard and tap a specific tag type and ID.
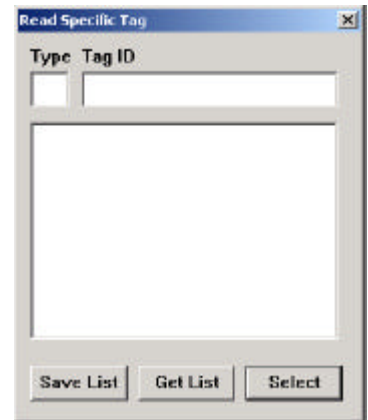
Keypad operation

The Keypad String window may be used to format a character string from HHR keypad entries. During keypad entry, the codes sent from the HHR to the WinCE API are displayed in the Response window. HHRDemo makes no further use of the character string.

Application development may be done with Microsoft eMbedded Visual C++ 4.0 and ActiveSync. Both the IDE and ActiveSync are available for free download from the Microsoft CE web site. Application debug is done via USB. Refer to the IDE Help system for procedures needed to make a debug connection and operate the debugger.

ACTIVE SYNC ISSUES

ActiveSync is known to be somewhat problematic on all WinCE systems. The following guidelines will minimize difficulties using ActiveSync for debug:

- Ensure the USB cable is unplugged when booting the host workstation.
- Ensure the USB cable is unplugged when powering up the HHR.
- Plug in the USB cable only when both the workstation and HHR have completed boot.
- Ensure that the USB cable is unplugged before powering down or resetting the HHR.
- Ensure that the USB cable is unplugged before tapping Start | Suspend, or during a period of inactivity if power management is set to automatically set WinCE into the Suspend mode.

ACTIVE SYNC RESTART

If the preceding guidelines are not followed, Active Sync may not automatically connect. If Active Sync does not connect, it may be manually started in most circumstances:

- Display the virtual keyboard by double-tapping the stylus icon in the task bar.
- Tap Start | Run.
- Tap the string **repllog** into the Run dialog and tap the keyboard Enter key.
- Close the virtual keyboard.

Active Sync usually restarts when using the procedure described above. If not, a 3rd party utility "resync" is provided which may be able re-establish the connection. Execute "resync" while the cable is connected. "resync' is provided as-is. No information other than that provided in the release is available.

Also note that "resync" may be able to re-establish a connection such that the HHR will appear as a Mobile Device in Windows Explorer, yet Microsoft Embedded C++ will be unable to connect for program download and debug. This is a workstation issue rather than a CE issue. In this event, the best recourse is to reboot the workstation, although it is possible to re-establish connectivity by disconnecting the USB cable, exiting Microsoft Embedded C++ and killing WinCE manager tasks that continue to run on the workstation.

NON-VOLATILE REGISTRY

The HHR provides a non-volatile registry stored in the FlashFX Disk. WinCE uses a RAM-based copy of the registry during normal operation. The RAM registry is copied to the FlashFX Disk prior to power down. The copy requires 1 to 4 seconds. When the

On/Off button is pressed, a beep tone is sounded during the copy operation as feedback that the button press has been detected and that the copy operation is in progress. If WinCE crashes while debugging an application or if it is reset, registry changes made since the last power-up may not be copied to the non-volatile backup.

FILE HANDLE ISSUE   When debugging an application, the HHR API close function *must* be called prior to exiting the debugger. This is a WinCE issue, and not an issue with the WinCE drivers or with the Telenexus API.

WinCE Kernel Rewrite

The WinCE kernel containing the operating system and HHR applications may be re-written without opening the case using a programming cable and terminal software provided with the cable. the following procedure is used:

1. With the HHR powered off, connect the programming adapter between a host PC and the HHR.

2. Obtain a terminal emulator application capable of raw binary data transfer. The Tera Term application is known to function as needed:

    `http://hp.vector.co.jp/authors/VA002416/teraterm.html`

    The remaining steps of this procedure assume the use of Tera Term.

3. Execute the terminal emulator program and set the comm port to 8 bits, no parity, no flow control, and 115200 bps.

4. Press and hold the **CLR** button on the HHR, and press the **On/Off** button for ~1 second.

5. Note the Tera Term display:

    ```
    Decide :

            1) Ethernet Bootloader

            2) Download to RAM (via Serial)

            3) Download to Flash (via Serial)

            4) [unsupported] Boot from CompactFlash

            5) Enter the Monitor

            6) Jump to Kernel

    :>
    ```

6. Type 3

7. Select File | Send File...

8. Ensure the Binary ckeckbox is checked.

9. Open the kernel image file.

10. File transfer progress is indicated in the terminal window. A typical image will load in 10-25 minutes.

11. Upon completion of file transfer, the flash ROM is erased and reprogrammed. The main terminal window indicates:

    •   Erase

    •   Program

    •   Verify

Reprogramming is not completed until the verification message is displayed.
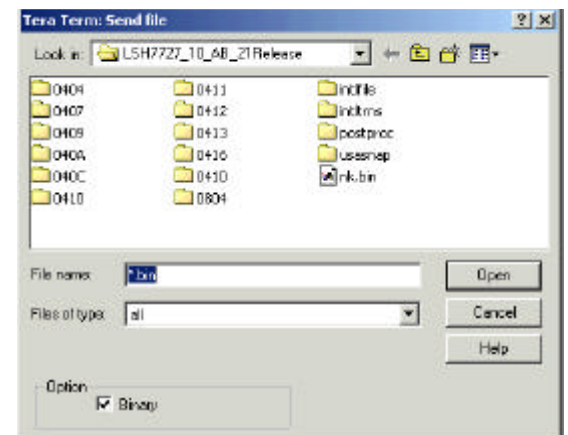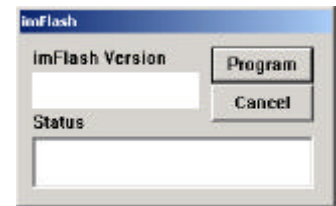
Interface Microcontroller Program Rewrite

The HHR interface microcontroller program can be rewritten from WinCE. This facility is used to install an updated version of code without opening the case or disassembling the reader. The following procedure is used:

1. Obtain the appropriate microcontroller code update from the Telenexus FTP site.

2. Copy the update program to the HHR FlashFX Disk using ActiveSync or a wireless network connection. It is not advisable to copy the program to My Computer or another RAM-based folder. If power is lost or a rewrite operation fails, it may not be possible to re-copy the update program to the HHR. Copying the program to FlashFX Disk ensures that the program will be available if the rewrite operation must be restarted.

3. Double-tap the imFlash icon.

4. Note the current version and update version of the microcontroller code. If the expected versions are shown, double-tap the Program button.

2. Status updates are shown in the Status window. Upon successful completion, the HHR will reset.

3. If the reprogramming operation fails, it may be retried. The HHR will boot if the microcontroller is not properly programmed, but its functionality is limited. If the HHR boots in this mode, a periodic beep tone will be generated to indicate the reader is in this mode. Navigate back to the imFlash icon in FlashFX Disk and double-tap the icon to retry the operation.

RF Tag reader DSP Program Rewrite

The HHR RF tag reader DSP program can be rewritten from WinCE. This facility is used to install an updated version of code without opening the case or disassembling the reader. The following procedure is used:

1. Obtain the appropriate microcontroller code update from the Telenexus FTP site.

2. Copy the update program to the HHR FlashFX Disk using ActiveSync or a wireless network connection.

3. Double-tap the rfFlash icon.

4. Note the current version and update version of the DSP code. If the expected versions are shown, double-tap the Program button.
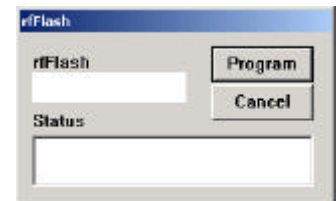
3. Status updates are shown in the Status window. If the reprogramming operation fails, it may be retried.

Note:

- Changes or modifications to this device not expressly approved by the manufacturer could void the user's authority to operate the equipment.

- This product has been evaluated for RF exposure at a distance of 20 cm. Operation at a separation distance less than 20 cm from the radiating element to nearby persons will expose nearby persons to RF levels that exceed the FCC rules for RF exposure.

> **Telenexus Handheld Reader**
>
> Model: HHR-001   FCC ID.: JNB-HHR001
> This device complies with Part 15 of the FCC rules subject to the following two conditions:
> 1) This device may not cause harmful interference.
> 2) This device must accept all interference received, including interference that may cause undesired operation.