

# USER MANUAL

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NORDIC ID PL3000

# PL3000 User Manual

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**Note!** This publication deals with PL3000 within the scope of Windows Embedded CE 6.0 only.

You can have **the latest version** of the manual by visiting Nordic ID's website.

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# SAFETY PRECAUTIONS

## LASER BEAM



The NORDIC ID PL3000 with a laser barcode scanner makes the PL3000 a Class 2 Laser product. The laser scanner uses a low power, visible light diode. As with any very bright light source, such as the sun, the user should avoid staring directly into the light beam. Momentary exposure to a Class 2 laser is not known to be harmful.

The NORDIC ID PL3000 fulfils the regulatory requirements as follows:

- Complies with 21CFR1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.
- EN60825-1:1994+ A1:2002 +A2:2001
- IEC60825-1:1993+A1:1997+A2:2001

**Caution:** Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.

Although the brief exposure to the visible Class 2 laser beam is not known to be harmful to the eye, the risk always exists that the light beam causes injury to the eye, when the laser beam is aimed even indirectly via a reflecting surface (e.g. mirror) at the eyes. So, always take care when you are reading bar codes or when you troubleshoot bar code scanning problems. Never look in the direction of the bar code scanner from which the scan engine emits the laser beam when you activate the scanning process, nor aim the scanner at the human eye or the eye of any animal.

**Caution:** EVERY TIME THE SCAN KEY IS PRESSED THE SCANNER STARTS EMITTING LASER BEAM. By default the functioning of the scan key is not conditional on any application being intended to read bar codes and nor is it conditional on the field or the active area on the display in which barcodes can be read or is intended to be read.

**Caution:** Any key on the Nordic ID PL3000's keypad with the exception of a power button can control the laser scanner. Besides the scan key or as a substitute for the scan key the scan functionality can be mapped onto any other key on the keypad.

## Note of caution about the laser beam in European languages

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### DANSK

**LASERLYF!** SE IKKE IND I STRÅLEN! KLASSE 2 LASER!

### DEUTSCH

**LASERSTRAHLEN!** NICHT DIRECT IN DEN LASERSTRAHL SCHAUEN! LASERPRODUKT DER KLASSE 2!

### ENGLISH

**LASER LIGHT!** DO NOT STARE INTO BEAM! CLASS 2 LASER!

### ESPAÑOL

**LUZ LASER!** NO MIRE FIJAMENTE EL HAZ! PRODUCTO LASER DE LA CLASE 2

### FRANCAIS

**LUMIERE LASER!** NE PAS REGARDER LE RAYON FIXEMENT! PRODUIT LASER DE CLASSE 2!

### ITALIANO

**LUCE LASER!** NON FISSARE IL RAGGIO PRODOTTO!

### NEDERLANDS

**LASERLICHT!** NIET IN STRAAL STAREN! KLASSE-2 LASER!

### NORSK

**LASERLYS!** IKKE STIRRINN I LYSSTRÅLEN! LASER, KLASSE 2!

### PORTUGUÊS

**LUZ DE LASER!** NÃO FIXAR O RAIO LUMINOSO! PRODUTO LASER DA CLASSE 2!

### SUOMI

**VARO LASERSÄDETTÄ!** ÄLÄ SUUNTAA SÄDETTÄ SILMIIN! LASER, LUOKKA 2!

### SVENSKA

**VARNING LASERSTÅLNING!** STIRRA EJ IN I STRÅLEN! KLASS 2 LASER!



### BATTERY

Use only original, Nordic ID approved rechargeable batteries being intended for the NORDIC ID PL3000 to avoid serious health hazards to you or to your fellow-men, or damage to the surrounding property and to your device.

**Cautions:**

Under no circumstances must you disassemble the battery casing or damage it. If the battery casing is damaged, for example, the joint of the casing is opened when the battery has fallen onto the floor, dispose of the battery.

If there is any difference from what is usual or expected on the battery such as a change in normal shape, smell of electrolyte and an electrolyte leakage, do not use the battery any longer, but dispose of it.

Do not put the battery into any liquid.

Care shall be taken to handle, or to store the rechargeable battery so that the battery's electrical conductors do not short-circuit. The short circuit causes damage to the battery.

Do not expose the rechargeable battery to direct sunlight or to other heat sources. The battery temperature cannot go up over 60°C (140°F) without possible consequences for the battery's useful life. The higher temperature may cause damage to the battery, which makes the battery unusable. 100°C (212°F) or higher temperature can cause a battery explosion.

Keep the battery out of the reach of children

### POWER SUPPLY

Before charging the rechargeable battery, check that the mains voltage into which you are plugging the power supply (AC/DC adaptor) does not exceed the AC voltage specified on the power supply. The input voltage exceeding the specified voltage on the AC/DC adaptor may destroy the charger unit, and the charger electronics on your hand-held.

**Cautions:**

Use only the Nordic ID approved power supply being intended for the NORDIC ID PL3000 device.

Do not use the power supply for any other purposes than for charging the rechargeable batteries on the NORDIC ID PL3000.

The power supply, your NORDIC ID PL3000, and its battery charging accessories are designed to charge the Nordic ID approved rechargeable batteries **INDOORS ONLY** at normal room temperature, or at temperature near that.

### MEDICAL DEVICES

**Caution:** Your PL3000 can interfere with medical devices such as hearing aids or pacemakers. Keep your NORDIC ID PL3000 at least 20 cm (8 inches) from a pacemaker; otherwise it can prevent the pacemaker from working correctly because of radio signals which wireless communication generates when you use your hand-held.

## RF EXPOSURE WARNING STATEMENT

This equipment complies with EU and FCC's RF radiation exposure limits set forth for an uncontrolled environment under the following conditions:

1. This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the antenna and user's/nearby person's body at all times.
2. This equipment must not be co-located or operating in conjunction with any other antenna or transmitter.



The picture shows the safe way to handle the device.

## COMPLIANCE STATEMENTS

### CE Compliance Statement



Hereby, Nordic ID Oy, declares that the NORDIC ID PL3000 models and the PL3000 accessories are in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC



EU DIRECTIVE 2002/96/EC ON WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

The NORDIC ID PL3000, its batteries and accessories may not be thrown away with everyday rubbish. Please, dispose of this product, its add-ons and accessories in an ecologically sound manner according to the regulation governing your location.

### FCC Compliance Statement

This hand-held device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the hand-held equipment

The FCC ID information is printed on the back side of your hand-held.

### FCC Compliance Notice

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### Radio modules

The device contains an approved radio modules. This module is identified below.

**Module: SDC-MSD10G**

**FCC ID: TWG-SDMCF10G**

**Module: WT12-A**

**FCC ID: QOQWT12**

**IC ID: 5123A-BGTWT12A**

# 1. INTRODUCTION

PL3000 product family is provided for various industries where item identification is needed. PL3000 connectivity and identification options make it suitable for variety of applications, in essence, when the application demands both mobility and object identification being based on both visible and invisible machine-readable information. Because of its options the PL3000 is also ideal for a niche application; it can incorporate only the parts the application needs. In view of working environment, being tolerant of humidity and splash the PL3000 is suited for diverse conditions, both indoor and outdoor.

## BASIC DEVICE ELEMENTS



The PL3000 is a Windows Embedded CE device providing an Explorer-type shell: the graphical user interface design approaches user from the file system perspective. The screen of the PL3000 is a 3.3", 240-by-320-pixel resolution backlit color screen with a touch screen device. For more information on the shell, see the section 'WINDOWS CE SHELL' (on page 15).



The keypad of the PL3000 is designed in particular for Windows CE system making a device application easy to be controlled with keys. Every key on the keypad has its own software controllable backlit LED.

There are two LED indicators in the keypad area. One indicator is used for showing different power status information; the other one is available for application developers. For more information on the keypad, see the section 'KEYPAD' (on page 18).



A desktop charger (a device cradle) is not an integral part of the device but it is a necessity of charging the PL3000, meaning that you charge the battery installed in its chamber on the device. (Alternative way of charging battery is to charge it on a separate multi-battery charger.) Using USB link e.g. for ActiveSync connectivity also necessitates having the device cradle. For further information on how to put the cradle to use, see the section 'Before Charging Battery, Assemble Device Cradle' (on page 11).



There are two versions of a basic battery package available for the PL3000. The older one is a 7.4V Li-ion rechargeable battery with the ampere-hour capacity of 2200mAh. The newer one differs from the older one in capacitance (2600mAh), and it is designed in particular for use on the PL3000 with a mobile option (see the section 'Optional Device Elements and Features' below). For further information on the battery, see the section 'ABOUT LITHIUM-ION BATTERY' (on page 10).

## OPTIONAL DEVICE ELEMENTS AND FEATURES



There are two options available for optically reading identification code labels. One reader is intended to read linear bar code symbologies and the other one is targeted at the code labels encoded into a two dimensional pattern (2-D symbologies). For more information on the optical readers, see the section 'SYMBOLOLOGY-ENCODED TAG RAEDING (on page 47).



For EPC UHF Class 1 Gen2 RFID tags the PL3000 is obtainable with two models that vary in their antenna design. For more information on the UHF RFID readers, see the section 'RFID TAG READERS' (on page 53).



It is possible to have the PL3000 with HF RFID capability for both the ISO 15693 and the ICODE compatible tags. For more information on the HF RFID option, see the section 'RFID TAG READERS' (on page 53).



Although Bluetooth radio is an integral part of the basic set, the PL3000 can be optionally configured without it. For further information how to put Bluetooth to use, see the section 'BLUETOOTH' (on page 91).



When mobility is an essential part of the business application, Nordic ID holds out the PL3000 with a GPRS option. This mobile option also fits into situations where mobile cellular network is an appropriate infrastructural solution to the application architecture without special need for mobility, or just a cost-effective solution to network maintenance. For more information on the Nordic ID mobile option, see the section 'GPRS' (on page 85).



One of the PL3000's connectivity options is an IEEE 802.11b/g WLAN. This wireless option can be configured to use either an 802.1X stack from the 802.11g radio module manufacture or a native 802.1X stack of Windows Embedded CE for WLAN authentication. For further information on Nordic ID wireless option, see the section 'WIRELESS LAN' (on page 59).

### Add-on Memory

The PL3000 has the possibility of installing additional memory up to two gigabytes. There is a SD / MMC memory card slot on the PL3000 with all available options other than the NordicID mobile. In the case of the NordicID mobile the add-on memory slot is replaced with a SIM slot. With the mobile option the add-on memory will be installed during the manufacture of the PL3000, if need be. For further information on the add-on memory options, see the section 'ADD-ON MEMORY OPTIONS' (on page 28).



A pistol grip with a trigger imparts steadiness to tag scanning. There are two variants of the pistol grip. In addition to the grip with the trigger, it can be equipped with the battery inside. The grip battery either substitutes the basic battery or is an add-on to it. In both cases the pistol grip battery increases battery capacitance on the PL3000, which provides better service life.

## 2. GETTING STARTED

### INSTALLING BATTERY

**Step One**      **Open the battery cover**

1. Loosen the bolt of the battery compartment cover
2. Open the cover on the bolt end by lifting and pulling it

**Step Two**      **Put the battery into its compartment**

Before you begin, check that the electrical conductors of the battery will press against their counterparts in the compartment

1. First place the bottom end of the battery by putting it against the rubber supports in the compartment at the bottom end of the device
2. Press the conductor end of the battery to the compartment so that the battery and the compartment conductors press against each other

**Step Three**      **Close the battery cover**

1. Put two protruding parts at the top of the battery cover into their hollows on the device
2. Settle the bolt end of the cover into its place and fasten the cover to the device by tightening the bolt of the battery compartment cover



### ABOUT LITHIUM-ION BATTERY

Note that the lithium-ion (Li-ion) rechargeable battery included in the box is not fully charged. Before first-time use of the device the battery must be fully charged.

Note that it is strongly recommended to charge the Li-ion battery indoors at 20°C temperature, or at temperature near that ( $\pm 2^\circ\text{C}$ ), because continual charging at high or low temperature may cause degradation of battery performance even within specified allowable temperature range.

## CHAPTER TWO - GETTING STARTED

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Note that every charge/discharge cycle has an effect on the rechargeable battery's ampere-hour capacity, so that the fully charged battery, which is charged many times before, runs down more rapidly in use than the battery just brought into use. After 500 charge/discharge cycles, if the battery has been run with care enough, the battery's ampere-hour capacity is still more than two-thirds of its original one. However, the charge/discharge cycle is a conception being not unambiguous. Accordingly, between short operating periods it is not reasonable to recharge the battery.

Note that ambient temperature has an effect on how long the fully charged Li-ion battery is able to power your device. A rule of thumb is that the colder is using conditions the shorter is operating time of the device powered by the fully charged battery.

Note that if the battery runs down, do not leave the device with the flat battery or the battery which has run down lying idle without recharging the battery, because the battery may be overdischarged due to self discharge. After overdischarging the battery does not preserve its performance properties. In the worst-case scenario, the battery is damaged and cannot store energy any longer.

Note that if you do not use your NORDIC ID PL3000 for a long time, remove the battery from its battery chamber. Never store the battery in the device.

Note that the battery may not be flat nor be fully charged for long-time storage. The ideal charge is about 60% of the battery's full capacity.

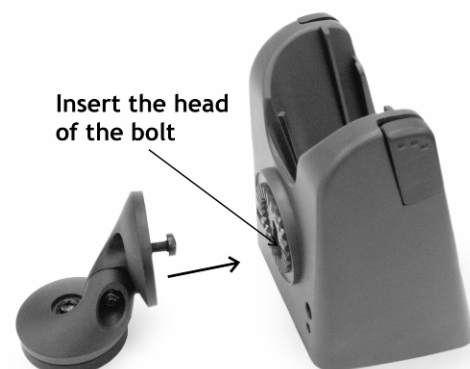
## CHARGING PL3000

### Before Charging Battery, Assemble Device Cradle

#### Step One

Put charger-rest in its position on charger-body

1. Before you begin, check that the set bolt of the charger-rest is loose enough, but not off the charger-rest
2. Put the charger-rest against the charger-body by inserting the head of the bolt into the charger-body through the hole at the point for the attachment of the rest





## CHAPTER TWO - GETTING STARTED

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### Step Two

### Fasten charger-rest to charger-body

1. Settle the charger-rest into its place on the charger-body
2. Once the charger-rest is in position, fasten its set bolt using a crosshead screwdriver by inserting it on the front of the charger-body through the hole in the device slot



## Charging Battery

### Phase One

1. Connect the lead from the power supply to the power socket on the back of the desktop charger
2. Plug the power supply into the mains



### Phase Two

1. Put your Nordic ID PL3000 into the desktop charger
2. Power up the PL3000 by pressing the 'Power button'

Once the operating system is up and running the PL3000 starts charging the battery in its battery chamber



### Phase Three



### PL3000 is being charged

When the PL3000 is docked in the desktop charger and a charging / low-power indicator shines red light, the battery is being charged. When about 90% of the battery's total capacity is charged the indicator turns yellow, you may also refer to it as apricot (yellowish-orange) or as amber (yellowish-brown); be that as it may, charging continues until the indicator goes green (or yellowish-green) indicating that the battery is fully charged. After that the indicator is not a sign of charging but yellowish-green indicates only that the PL3000 is on AC power. For further information on the charging / low-power indicator, see the section 'Charging / Low-battery Indicator' (on page 45).

If there is no discernible enough difference between yellow and green light indication, you can also find charging indication on a taskbar, see below (for more information about the taskbar, see the section 'Taskbar' on page 16)



### Charging annunciator icon on taskbar

Windows CE system also indicates battery charging on the taskbar in its shell. A charging icon is shown on the taskbar until the PL3000 stops charging. After that the battery is fully charged and Windows CE replaces the charging icon with an on-AC-power icon.



### On-AC-power annunciator icon on taskbar

The on-AC-power icon on the taskbar indicates that the PL3000 is connected to AC power, meaning that the battery is not being charged, nor is the PL3000 being powered by the battery.

## CHAPTER TWO - GETTING STARTED

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### Phase Four

#### Undock PL3000 from the desktop charger

When the PL3000 is fully charged it is ready for use. To undock your PL3000 from the device cradle:

1. Press two buttons on the left and the right side of the cradle at the same time
2. Hold the buttons pressed against the cradle while lifting the PL3000 out of the cradle



## CHARGING PISTOL GRIP BATTERY

If your PL3000 incorporates the pistol grip (with or without the battery inside) you can charge the PL3000 in its desktop cradle in the same way as the PL3000 with the basic battery package (see the section 'Charging Battery' on page 12).

### 3. PL3000 BASICS

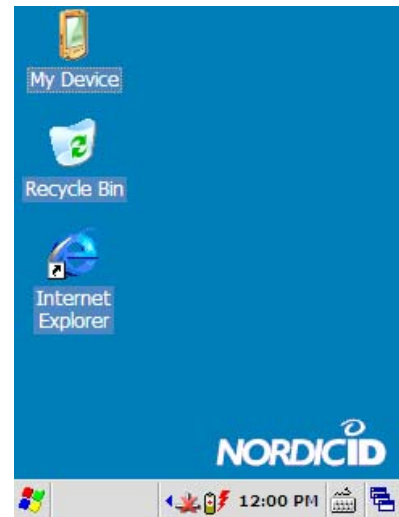
In this chapter, basic elements such as Windows CE shell, touch screen, and keypad are explained. The explanation reveals basic logic of the interactions between a user and the device. Understanding of some facilities on the PL3000 system makes also every day use of the PL3000 more effortless. Those facilities are a database of the system settings, permanent storage options, and power management of the device. In addition, the PL3000 are covered from the manageable perspective telling you most of the features that comprise the system.

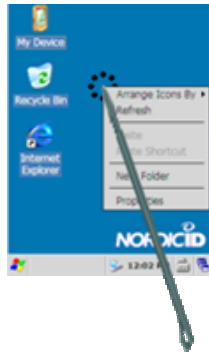
#### WINDOWS CE SHELL

Windows CE shell consists of two segments that present somewhat different perspectives on the system. Along the bottom of the screen there is a bar element. That element is called taskbar, and it has different areas to show different things such as time and active input method being available on the touch screen by keystroke. The taskbar is explained in more detail in its own section on the next page.

The other segment occupying the main part of the screen is the area in which it is possible to have an access to facilities and applications e.g. with a double-tap on their symbolic icons. By default this so called desktop area provides the way in the root of the file system ('My Device'), the way in the hidden directory called 'Recycle Bin', and e.g. the way out the Internet.

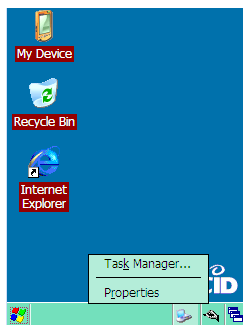
In addition to touch screen navigation, using keys the navigation between two shell segments and inside the segment areas is also achievable, although, on the taskbar, the key navigation is limited to a Start menu. The 'tab' key is a key to move back and forth between the shell segments. Inside the desktop area **the arrow keys** select the application icon being of interest. Pressing the 'ok' key launches the actual application the selected icon represents.





The desktop segment has its own context menu which you can get to appear on the screen by **tapping and holding** with the stylus in the desktop area. For example, through the properties context menu item you can adjust window elements' appearance and select the background of the desktop.

### Taskbar



Taskbar is an adjustable shell segment through its own property sheet. If you hold down the 'alt' key while **tapping the taskbar** with the stylus, the taskbar displays its context menu. Tapping the properties menu item you can get taskbar's property sheet dialog to appear on the screen. Be aware that you can also get that dialog window through a Start menu item 'Settings\Taskbar And Start Menu ...'.

### Start menu



This icon also known as 'Start' button symbolizes a Start menu (an application and system facility menu) on the taskbar. Tapping on the icon with the stylus the Start menu opens on the screen. You can also open the menu using the keypad as follows:

Before you begin, minimize all the application and utility windows, if visible on the screen, using a 'Desktop' menu being achievable on the taskbar, see 'Desktop' below.

#### To open the Start menu:

1. Set input focus to the Start button using the 'tab' key
2. Press the 'ok' key; the Start menu opens

To navigate the Start menu and its submenus with the help of the keypad, use the 'arrow' keys. Pressing the 'ok' key you can launch the facility or application the selected menu item stands for.

### Touch screen input panels



Tapping on a keyboard icon on the taskbar the menu of the touch screen input opens. (Be aware that the icon can also be a handwriting one.) With the menu you can select either a soft keyboard or a transcriber as default input technique on the touch screen. Selecting the input method on the menu triggers it's input panel as well. In addition to the selection of the touch screen input method and to the trigger for its panel, the menu has an item to hide the input panel, that is, to suspend the input method. Be aware that a 'square' key on the keypad toggles the touch screen input panel by default.

### Desktop



Tapping the Desktop icon and after that selecting 'Desktop' menu item you can minimize all the windows you have open on the screen apart from the control panel applets having 'NID' as part of their name.

### Annunciator



In an annunciator area on the taskbar the various subsystems running behind the scenes notify you of their status by showing the icon being appropriate at a particular moment. Tapping the annunciator icon you can get further information about the status and even more. However, not all of the background services provide dialog for user.

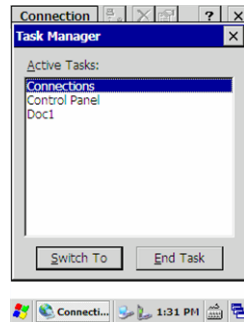
### Clock



In the annunciator area the time is shown by default. If you double tab on that display space the dialog window of a Date/Time control panel applet opens. The subsystem showing the clock on the taskbar is the taskbar itself. You can enable and disable the time-shown property in the property sheet of the taskbar.

**Note!** Nordic ID PL3000 has no Real Time Clock chip, meaning that the system does not maintain the time over the resets other than a warm boot.

### Task Manager



Windows CE Shell facility 'Task Manager' is a way to handle which application has the screen resource of the PL3000 in use. In other words, if you are running at the same time more than one program, only one can interact with you on the screen, and in practice, to receive key events (that is, to have a keypad focus), if you press keys. Through the task manager you choose the program from among the programs running on your PL3000 to put on view its displayable user interface on the screen. Using the task manager you can also close the program of your choice.

To invoke the task manager: hold down the 'alt' key while pressing the 'tab' key; the task manager dialog pops up on the screen.

If you just want to hide the task manager dialog, press the 'esc' key

#### To bring the program of your choice to the screen:

1. Select the program using the arrow keys
2. Press the 'ok' key; the task manager dialog disappears and the program window will be displayed on the screen.

**Note!** The window having the keypad focus can be also changed by holding down the 'alt' key while pressing the 'esc' key to switch between running programs. However, there can be programs such as Internet Explorer that put a stop to this functioning of the alt-esc key combination.

### KEYPAD

The PL3000's keypad can be regarded as four functional areas: the control key area, the keys controlling the modes of alphanumeric keys, the alphanumeric keypad, and on the bottom of the keypad there are some auxiliary keys and a power button.

All the keys, including the power button, have backlights. By default the backlights of the keys are turned off. Only mode selectors of the alphanumeric keys use light indication, when the user operates the device. From the user's viewpoint it is possible to set all the keys on lighting in full operational state. However, from the programmer's point of view every key has a backlight of its own that can be turned on and off separately.

Be aware that all the keys with the exception of the power button are programmable, including the properties they have. (In a sense, the power button is

also programmable if you write your own shutdown utility.) The programmable property means that the effect of a key press depends on the application. In other words, the application program can set how a keypad driver behaves in a keystroke of a particular key. In addition to the programmable property, the keys can be 'customized', meaning that a key can be mapped to another one by configuring the keypad driver outside the application sphere. In consequence of the above-mentioned adaptability the keys can produce the result differing from their default ones explained here. For further information on the key customizing, see the section 'Mapping Key's Functionality onto Another' (on page 101).

### Control Keys



You typically use a 'tab' key and **arrow keys** in the control key area for navigating e.g. between the Windows CE shell segments, and for selecting some item on menus, respectively. The arrow keys also capture control of cursor movements in the text editing context, whereas the 'tab' key advances cursor predefined number of spaces or to the next tab stop.

The control key group also incorporates a **scan key** (a yellow key with a barcode symbol) which is intended, by default, to set off optically visible identification code label reading when pressed.

In addition, the control keys include an 'ok' key and an 'esc' key. These two keys are considered operational ones. The 'ok' key press accepts or activates operation you are selecting. In the text editing context the key advances the cursor to the next line. The 'esc' key press cancels the operation being under way. Typically, as a visible effect, the key press gets a window such as control panel applet or a window menu to disappear from the screen.

The control sphere of a 'del' key is limited to text editing. Using the key you remove the last character you keyed in a text area such as an entry field. To be precise, pressing the key deletes the previous symbol being nearest to the cursor.

Two keys are included in the control key group that cannot be obviously considered control keys. These are the keys marked with a 'square' and a 'circle' symbol. The 'square' and 'circle' keys are designed for the special needs of a business application. However, as to the 'square' key, the keypad is customized by default, meaning that the 'square' key is mapped onto a toggle of the touch screen input method (SIP\_TOGGLE) as a factory default. You can find this key customization (as well as change it, if need be) on the 'Mappings' tab in a NID Keypad control panel applet by selecting 'Square' in the Key field.



### Mode Selectors of Alphanumeric Keypad



There are three dedicated keys on the keypad that are intended to select input mode of the keys on an alphanumeric segment of the keypad. If you need to alter the functionality of these selector keys you are compelled to rethink the use of the alphanumeric keys as well and vice versa. For more information about the alphanumeric segment of the keypad, see the section 'Alphanumeric Keypad' on the next page.

A '123' selector and an 'abc' selector keys are mutually exclusive, meaning that pressing the 'abc' key negates the effect of the '123' key, and vice versa.

Pressing the '123' key sets the alphanumeric keys on numeric mode, and the 'abc' key press switches the keypad segment into alphanumeric mode. The backlight of the keys communicates which one of those modes is in use. When the backlight of the key is on, the input mode assigned to the key is enabled. However, the 'F' key's logic breaks the rule, see below.

The 'abc' key also has an extra property. It switches between the upper cases and lower cases. If you press the 'abc' key when its backlight is turned on, you can **toggle between upper-case and lower-case letters**. This property of the 'abc' key can be considered a caps lock. The brightness of the key's backlight suggests which one of the cases is enabled. By default the brighter light denotes the upper cases. (Be aware that there is a shift key on the bottom key row of the keypad, when held down while being pressed a letter key a capital letter is inserted. As you would expect, if the alphanumeric keypad is caps-locked, the effect is reverse.)

Pressing the 'F' key overrides the effects of the 'abc' and '123' keys by setting the alphanumeric keypad into function key mode. The 'F' key works in two different ways. Its basic operation is as follows: When you press the 'F' key, the '123' key's or the 'abc' key's effect is negated for a keystroke of a function key i.e. a key on the alphanumeric key segment. However, there is no indication of negating the current input mode by turning off the '123' key's or the 'abc' key's backlight, but only the backlight of the 'F' key is turned on. After you have pressed the key on the alphanumeric segment the alphanumeric keypad resumes its previous input mode being either 'abc' or '123'. At the same time, the backlight of the 'F' key is turned off.

You can also use the 'F' key for toggling between the function key mode and the other two input modes of the alphanumeric keypad. If you hold down the 'F' key until its backlight becomes brighter the alphanumeric keypad switches to the function key mode. The keys on the alphanumeric keypad segment remain as function keys up to the point you repress the 'F' key and hold it down until its backlight was turned off.

### Alphanumeric Keypad



On the keypad an alphanumeric key segment is intended to insert letters, numbers, punctuation marks, symbols, and spaces to an application. The keys can also play the role of function keys. In fact, the alphanumeric keypad works in three different modes. The input modes of this keypad segment are explained below. You can select the mode with the mode selector keys, see the section 'Mode Selectors of Alphanumeric Keypad' on the preceding page.

#### Numeric Mode

By default the keys on the alphanumeric keypad are in a numeric mode, meaning that each key with the figure enters only number in every key press. If you hold down the key it inserts its number to an application again and again until you release the key (an auto-repeat property).

In this mode the key marked with the dot inserts a full stop and a comma. The key marked with the dash inserts minus and plus signs. Be aware that these two keys do not have the auto repeat property.

#### Alphanumeric Mode

To insert letters, numbers, punctuation marks, symbols, and spaces in addition to numbers, the keys on the alphanumeric keypad have to be in an alphanumeric mode. You may switch the keys into this so called 'text-writing mode' by pressing the 'abc' key (be aware the overriding capability of the 'F' key, see the section 'Mode Selectors of Alphanumeric Keypad' on the preceding page).

In this text-writing mode, repetitive pressing a key enters next character (if letter in the alphabetical order) in the place of cursor until the number printed on the key appears (a character sequencing property). After that the character sequence starts again from the beginning. If small break is taken between keystroke repetitions or it is stopped the cursor advances to the next position and the character which appeared on the screen before stopping the keystroke repetition stays in the entry area.

Be aware that pressing and holding down the key printed a figure on it the character sequencing property is skipped, and the key enters the number only. At the same time cursor advances to the next position.

Typically you may need to insert **white spaces** as well. The key printed zero on it enters a space. The 'tab' key enters a tab and the 'ok' key a new line. These two keys you can find in the control key area (see the section 'Control Keys' on page 19). In addition, there is the 'del' in the control key area to delete characters you have keyed incorrectly.

**Punctuation marks** you can insert using either the number one key or the key marked with the dot. Using the key marked with the dash you can insert some mathematical symbols.

### Function Key Mode

The keys on the alphanumeric key segment are mapped into twelve function keys through the 'F' key by default (for more information about using the 'F' key, see the section 'Mode Selectors of Alphanumeric Keypad' on page 20). You can find these key mappings (as well as change them, if need be) on the 'Mappings' property page in a NID Keypad control panel applet, see the section 'Mapping Key's Functionality onto Another' on page 101. If you select 'a key of the alphanumeric keypad' in a Key field on the 'Mapping' area, and after that select 'Function' in a Modifier field, a VK field tells you a virtual key code the keypad driver sends to application. (Be aware that Windows Embedded CE supports 24 function keys, that is, there are 24 virtual key codes for function keys.)

### Auxiliary Keys



There are two keys on the bottom row of the keypad that are classified here as auxiliary keys. A '↑' key is a shift key. In addition to its conventional use (see the section 'Mode Selectors of Alphanumeric Keypad' on page 20), if you hold down the key while pressing the 'ok' key you can toggle between **locked and unlocked keypad** state.

Windows CE shell uses an 'alt' key as a shortcut one. For example, pressing the key you can access the File menu of an application. In addition, you can switch between programs with an 'alt'-'esc' key combination, and an 'alt'-'tab' combination launches the task manager facility of Windows CE shell.

A NID Keypad control panel applet defines the 'alt' key as modifier together with the shift and the 'F' keys. In theory, you can customize, for example, the 'alt'-'esc' key combination using the NID Keypad, but, in practice, the Windows CE system captures those key presses before the customizing can reach them.

### Power Button



As you need to power up your PL3000, you may press a power button. In the same way, you may power down your PL3000 by holding down the button until the screen goes blank. Through the power button you can also get system resets just pressing the power button without holding down it when the Windows CE system is up and running. The system resets are explained in the section 'Rebooting Your PL3000' on page 25.

Be aware that in some PL3000 configurations the power button also has a hardware reset property.

### STYLUS AND TOUCH SCREEN

The simplest way to navigate through the Windows CE desktop and utility windows is to use a touch screen. For the touch-screen navigation the Nordic ID PL3000 is equipped with a stylus, a pen without ink capability.

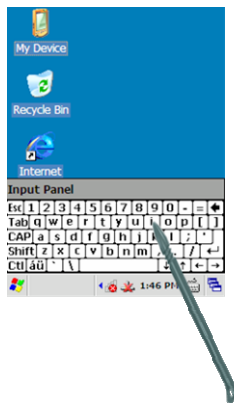
The stylus and the touch screen are the means being in some way analogues to a mouse. A press of the stylus on the screen produces the same result as a left mouse button click on a Windows PC. A right mouse button click is not so obvious, but in the Windows CE desktop window a right click is to tap and hold with the stylus. However, this method does not produce the same effect on the taskbar. To 'right click' the taskbar needs to hold down the 'alt' key while tapping on the taskbar. So, it is up to Windows CE application to choose a sequence as a right mouse click.

### TOUCH SCREEN INPUT METHODS

Windows CE provides two controls that can be used for inserting text, numbers, and symbols through the touch screen. One control simulates a keyboard on the touch screen (a soft-key input panel) and the other one makes it possible to utilize the touch screen as a piece of paper (a transcriber input panel). You can select the method on the menu that can be opened on the taskbar (see the section 'Touch screen input panels' on page 17), and you can toggle the input panel of the method using the 'square' key.

#### Soft-key Input Panel

Characters are entered by tapping on soft keys with stylus and they appear in the entry field in the same way as if they were inserted through the alphanumeric keypad. The logic of the soft-key input panel is similar to a conventional keyboard.



### Transcriber Input Panel



A transcriber is a handwriting recognizer. Using the transcriber input panel enables you to input by handwriting on the touch screen. The learning curve of this input method is much longer than the soft-key input method. It needs some personalizing, meaning that you select letter by letter what kind of letters you are going to input. In practice, you may be learning to write letters and numbers as the transcriber expects you to handwrite them.

The basic idea is to handwrite a word at a time, but it is also possible to write a character by character, for example. After each word or letter (or letters) wait for a second (an adjustable property) the transcriber translates your handwritten input into the internal character format, clears the display, and your application displays the input as the transcriber recognized it. To get started with the transcriber input method, open a Microsoft WordPad:

Before you begin, select the transcriber as the touch screen input method (see the section 'Touch screen input panels' on page 17).

1. Tap on the Start icon on the taskbar, the Start menu opens on the screen
2. Tap the 'Programs' menu item, the submenu opens on the display
3. Tap the 'Microsoft WordPad' menu item, the Microsoft WordPad application opens its window on the display
4. Press the 'square' key to trigger the transcriber
5. On the button bar of the input panel, tap on the forth button on the left-hand side to select whether you are going to insert upper cases, lower-cases, or numbers.
6. Tap on the first input panel button on the left-hand side of the button bar and select writing direction on the 'Quick Settings' tab. The transcriber does not have an omnidirectional property. It recognizes letters, numbers, and words written in one direction only: horizontally, vertically, or diagonally according to your choice.

Now you can start gaining some experience of handwriting input with the Transcriber. The WordPad shows words (also letters and numbers) as they have been recognized. However, the result may not be satisfactory, so tap the second input panel button on the left-hand side of the button bar, and select what kind of letters the transcriber should expect. Be aware that tapping the selected handwritten letter shown on the top of the opened window, the transcriber shows you how that particular letter should be written to be recognized correctly.

# REBOOTING YOUR PL3000

The Nordic ID PL3000 gives variety of reboot options. All the options are accessible through the power button with the exception of some PL3000 configurations. There are configurations of the PL3000 that cannot be hard-reset using the power button.

## Soft-resetting your device

To soft-reboot your device:

1. Press the 'power' button and release the button without delay, a 'Shutdown' dialog window pops up on the screen.

The following soft-resets are available in the list:

Warm boot  
Cold boot  
Reload Windows CE

If you want to cancel the operation, press the 'esc' key, or repress the power button; the shutdown window closes, and the device stays running.

2. Select among the options using the arrow keys.
3. Press the 'ok' key to launch the selected option,

Be aware that through the shutdown dialog you may also place the device in the suspended state. Although the suspend/resume (sleep/awakening) cycle is not an actual reboot option, some drivers unload and reload on resume.

## Hard-resetting your device

PL3000 has two options to hard-reset it.



### HARD-RESET BUTTON IN BATTERY CHAMBER

Every configuration of the PL3000 has a wall-mounted hard-reset button in its battery chamber.

**To hard-reset your device:** Press the button for a little while from above with a small, blunt instrument such as a small screwdriver.



### HARD-RESET OPTION OF POWER BUTTON

At least, on the configurations furnished with the pistol grip the power button has a hard-reset property.

Before you hard-rest your device, be aware that

## CHAPTER THREE - PL3000 BASICS

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hard-resetting with the power button varies a little bit according to the state in which your device is. However, the point is to press the power button continuously at least for ten seconds.

### To hard-rest your device with the power button:

1. Press the power button and hold down it
2. Release the power button after holding down it for ten seconds
3. Re-press the power button, the system reboots

**Note!** Re-slotting the battery into its chamber does not necessarily reset your device but typically generates just sleep/awakening cycle.

## REGISTRY

The Windows Embedded CE running on the Nordic ID PL3000 has a database used to store configuration information for the system itself and for applications. The database also contains state information that the operating system continually references during operation, so in general it is a channel to communicate between different parts of the system in different operational states. The database is called registry as in all versions of Windows. However, the layout of the Windows CE registry does not match up with the Windows versions running on the desktop machines.

On the PL3000 the implementation of the registry is RAM-based, meaning that the Windows CE maintains the registry in its object store being a RAM-based file system. This matter has consequences for the persistence of the registry keys and values, if changed, deleted, or created. Although the RAM device on the PL3000 is battery backed, meaning that the RAM is being refreshed when the device is turned off, the registry data does not persist on cold boots, without mentioning the hardware resets. It's also possible that the device remains lying idle for long enough so that all the batteries on the device run down and the registry settings vanish. However, so called factory settings in the registry does not cease to exist because the system image of the CE windows includes a file containing the registry settings generated during the build process of the Windows CE image.

The Windows CE gives options to implement a save-and-restore method in order to keep volatile registry changes persisting when the registry in the RAM is erased (e.g. on the cold boot), or when the RAM device is not being powered. On the PL3000, one of the save-and-restore methods is implemented so that the contents of the RAM-based registry can be stored in a non-volatile memory, if need be. The Windows CE system checks for the up-to-date registry information in the memory during booting up, and if the updated registry file is available the system initializes the registry database in the object store accordingly.

To store the changed registry information in the non-volatile memory there are two options available on your device. One possibility is that your application calls a

'RegFlushKey' function to force a flush of the registry to the persistent storage and the other one is that you, as a user, save the changes in the registry using a maintenance utility called 'Registry Backup'. Be aware that if your application calls 'RegFlushKey' on a regular basis it slows down performance of the system because storing in the persistent storage is slow relative to the other hardware operations in the system.

**Note!** There is an extra method to bring additional persistent information to the registry database. Your device incorporates so called 'Customizer' technology that enables the Windows CE system to receive additional registry settings through the \*.PAK files in the 'Flash' folder.

## FLASH DIRECTORY

There is a 'Flash' directory off the root of the file system on your PL3000. As its name hints, the Flash directory (actually the Flash partition) is on a non-volatile storage device based on the Flash memory technology. This directory is intended for device customizing purposes, but it can be also used for Windows CE system maintenance to bring update, upgrade, and bug fix patches to the system through \*.PAK files. In other words, the Flash directory is a dedicated part of a 'Customizer' technology on your PL3000 device, and it can contain, if need be, either customization or system maintenance .PAK files, or both.

If you ever receive files being intended for your PL3000, and the extension of the file names is either \*.PAK or \*.pak, put those files into the Flash directory. After you have cold-booted your device the content of the .PAK files is enabled in your system. On the other hand, if you remove a .PAK file from the Flash directory and cold-boot your device, the content of the .PAK file is no longer in use on your PL3000.

Having said that, some cautions must be mentioned – the \*.PAK files are also likely reason for some malfunction on your device. For example, if in the Flash directory there are two .PAK files containing different instances (or even the same instance) of the same file, you will probably encounter malfunction of some feature on your PL3000. So, if you receive some program updates, let us say utility sample updates from Nordic ID, in the form of the .PAK file, remove the .PAK file of the program's earlier version from the Flash directory before copying a new one into the Flash directory.

You can find the Flash directory on your PL3000, for example, by double-tapping on the My Device icon in the Windows CE shell, which launches a file browser program. The file browser shows the root of the file system in its main window, and among the directories and folders you can also see the Flash directory. A double-tap on the Flash directory icon opens the contents of the directory in the file browser window.



### ADD-ON MEMORY OPTIONS

The PL3000 possesses a non-volatile storage option. In most cases it means that there is an SD / MMC memory card slot being accessible through the battery chamber. However, the mobile option of PL3000 changes that memory card slot to a SIM card slot. If your need is the mobile PL3000 with the extra permanent storage device, in that case, the PL3000 can be furnished with an internal non-volatile storage, a so called 'factory-installed add-on memory'. The factory-installed memory is always the size of 2 gigabytes. The size of the SD or MMC memory card installed into its slot can be up to 2 gigabytes, so the memory card can also be a smaller one such as a 512MB or a 1GB SD memory card.

Logically the extra memory is shown as a 'SDMMC' directory off the root of the file system no matter which of two add-on memory options is in use. To be more precise, the 'SDMMC' is a logical drive name. Windows CE does not use drive letters, but represent, such as partitions and separate flash file systems, as directories off the root of the file system. Thus, the SDMMC as a storage volume can be also repartitioned, if need be. In a Control Panel there is an applet called 'Storage Manager' with which you can repartition the SDMMC storage. (For more information about 'Control Panel', see the section 'Control Panel' on page 30)

Having said that, it is recommended that the storage like SD memory card is not repartitioned on the Windows CE device. If you transfer data from your PL3000 to some other system using the SD card as transfer medium, the target system may not find data because it is not stored in the first partition on the SD memory card. For example, Windows XP workstation cannot detect the partitions other than the first one if there is more than one partition on the SD memory card. On the contrary, in the case of the factory-installed add-on memory, repartitioning may be recommended if more than one partition assists the maintenance of an application or clarifies the structure of an application program, for example.

### Installing SD / MMC Memory Card

#### Prologue

Before you can insert your add-on memory card into its slot on the PL3000 you have to open the battery cover and remove the battery from its chamber. In case of the pistol grip you need a special screwdriver called a Torx driver. The pistol grip (functioning also as a battery cover) is fastened to the device body with three Torx-8 (T8) screws.

#### Steps One and Two

1. Open the add-on memory slot cover by lifting up the cover by thumb on its edge on the side of the battery chamber.
2. Insert the memory card into the slot as the adjacent figure shows.



#### Steps Three and Four

3. Press the card that is inserted in its slot so that the lock mechanism of the memory slot clicks, then the card is locked in its slot.

(If you need to remove the card from the slot, in the same way you release the locked memory card by pressing it a little bit inwards so that lock mechanism clicks.)

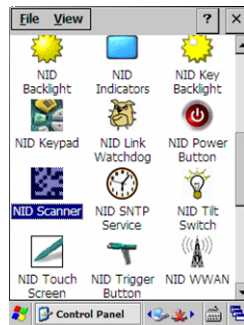
4. Close the cover of the add-on memory slot.



#### Epilogue

Reset your PL3000 by reloading Windows CE after you have installed the battery back to its chamber and fastened the battery cover.

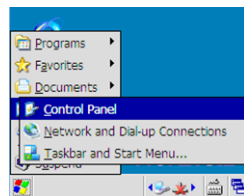
### CONTROL PANEL



Control panel is a collection of applets to access the settings of different system properties; to configure those properties; to change their performance characteristics; to enable and disable them, among others. The control panel is one channel to manage the properties of the PL3000. It may not be the most convenient means to do that, and it is worth considering whether the end user of the device could have access to the device's system resources through the control panel, or whether some of those adjustable and informative features should be made available to the

end user in an actual business application. The control panel is also a good starting point for understanding the features the system allows to enable / disable, to adjust, etc.

### Accessing Control Panel



There are two means of accessing the Control Panel either using the keypad, or tapping the touch-screen with the stylus. The following instructions are based on the use of the keypad. Before you begin, close all application windows on the screen.

#### To open control panel using keypad:

1. Press the '**tab**' key so that the input focus is set to the Start menu icon on the far left of the taskbar, that is, in the bottom left-hand corner of the screen.
2. Press the '**ok**' key to bring up the Start menu
3. Select the '**Settings**' menu item by the '**up-arrow**' key
4. Press the '**right-arrow**' key to bring up the Settings submenu, the '**Control Panel**' submenu item is selected
5. Press the '**ok**' key to open the Control Panel

### Opening Applet

#### To open applet using keypad:

1. Select the applet of your choice using of the **arrow keys**
2. Press the '**ok**' key; the applet opens

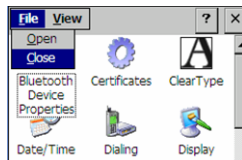
### Closing Applet

To close applet and its window you have two choices:

- If you want to discard the changes you made to the configuration, press the 'esc' key
- If you want to put into effect the changes you made, press the 'ok' key

**Note!** There are also exceptions to the above-mentioned closing practice such as a Network and Dial-up Connections applet.

### Closing Control Panel



To close the Control Panel using the keypad:

1. Press the 'alt' key, the 'File' menu opens in the Control Panel
2. Select the 'Close' menu item by the 'down-array' key
3. Press the 'ok' key; the Control Panel closes

## CONTROL PANEL APPLETS

### Bluetooth Device Properties

A Bluetooth Device applet gives the configuring options and other Bluetooth-related features as follows:

- Turning on / off the Bluetooth radio
- Information on the device's Bluetooth MAC address, among other hardware details
- Making available RFCOMM service on the logical ports: COM2, COM3, COM5, and COM6
- ActiveSync link capability
- Discovering the existence of other Bluetooth devices being within range
- Assigning the Bluetooth device name to the PL3000
- Whether or not to be available to other device's try at discovering Bluetooth devices

### Certificates

Windows Embedded CE provides a certificate store (in fact, three logical stores) to keep and maintain certificates. With the aid of the store and its application programming interface, embedded CE applications can verify, enumerate, retrieve, store, and delete certificates. For example, a Wireless Zero Configuration subsystem when acting as a supplicant uses the store if EAP-TLS is selected as the authentication method for the wireless access. A Certificates applet is the instrument for:

- Viewing certificates in the store as well as their contents
- Deleting certificates from the store
- Adding certificates to the store, that is, manual certificate enrolment.

### ClearType

Windows Embedded CE provides support for three different types of text display technologies. One of them is the 'ClearType'. A ClearType applet refers to the text display technologies as 'font anti-aliasing', and in fact, one of the font anti-aliasing methods is a 'No Anti-Aliasing'. Through the ClearType applet you can choose from those three text display technologies to find the best possible look of a font on the display. In addition, the applet gives you possibility even to fine-tune the 'ClearType' and 'Font Smoothing' rendering methods to get the rendering of your chosen font yet improved.

Be aware that the font rendering technology of your choice is enabled for all fonts in the system, meaning that the different fonts used to display text are rendered with the same text display technology. In practice, the look of one font may improve but the look of another one doesn't.

### Date/Time

In addition to date and time settings, with a Date/Time applet you can change your device's time zone, and enable/disable automatic daylight saving time change.

### Dialing

With the current communication options of the PL3000 a Dialing applet is an oddity. In the future models the applet may be useful, but currently there is no need to set dialing properties for any means of communication on the device.

### Display

With a Display applet you can change the appearance of the window elements on the screen and the background image of the desktop. You can also get this property sheet through the context menu of the desktop shell element.

### Error Reporting

In Windows Embedded CE there is a set of technologies to get information about the state of the machine at the time of a program crash. With an 'Error Reporting' applet you can disable or enable this system property. Furthermore, you can select how much memory the error reporting system allocates for its report files.

### Input Panel

With an Input Panel applet you can change the appearance of the touch screen input methods. It is also possible to choose between the soft-key and the transcriber input panel. In practice, however, you may need this applet if you want to use larger soft keys on the soft-key input panel. The button bar of the transcribe input panel makes the same property sheet available for the transcriber input method.

### Internet Options

Internet Options is a utility to configure Internet Explorer. This property sheet dialog is also available on the view menu in the Internet Explorer.

### Keyboard

A Keyboard applet makes it possible to enable/disable the auto-repeat property of the keys on the keypad, and to adjust the following auto-repeat parameters: repeat delay and repeat rate

### Network and Dial-up Connections

The name of this applet refers to a central connectivity panel that may be expected to be a center of all the means of connectivity in the Windows CE system. In some senses, the Network and Dial-up Connections panel could be considered to be a control center, but in reality it does not play its role unambiguously. Further, you may need this sub-control panel only to assign static IP-address information to a WLAN interface; DHCP is set default to the interface. A double-tap on a 'SDCCF10G1' icon in the panel window opens a dialog to assign IP-address information to the WLAN interface.

With every connectivity option of the PL3000, there is an icon for making a new connection. A double-tap on the 'Make New Connection' icon opens the dialog to add a new connection such as virtual private network or point-to-point connection among others. Besides, there is a 'Gprs' icon in the window of the Network and Dial-up Connections. This icon's presence has no informative value other than that the installed Windows CE image on your PL3000 is capable of handling GPRS modems that the dialog of the 'Gprs' connection lists. If you select the 'Gprs' icon, and then tap on the 'Properties' item on the 'Connection' menu, you gain access to a GPRS modem list called 'Select a modem:'.

In case of uncertainty about the presence of the mobile option (GPRS) on your PL3000, try to open a WWAN Configuration applet by double-tapping a NID WWAN icon in the control panel. If the NID WWAN applet opens, your PL3000

possesses the mobile option, that is, the GPRS modem module. However, if a double-tap on the NID WWAN icon generates a fatal error message on the screen, it is very likely that your PL3000 device does not incorporate GPRS modem.

A real GPRS connection icon is available in the 'connections' window of the 'Network and Dial-up Connections' panel, when you have connected to a mobile operator's network using the NID WWAN applet. In other words, the icon is a sign that your PL3000 has received IP-address information from the mobile operators GPRS network. The icon is named after the GPRS modem that your PL3000 incorporates. A double-tap on the icon reveals the IP-address the PL3000 is using for networking over the mobile network.

When, for example, either Bluetooth or USB connectivity is used as an ActiveSync medium, the Network and Dial-up Connections panel shows the following icons if ActiveSync protocol is in a connected state: 'COM2 on <Computer name>' or 'COM4:', respectively. The 'COM4:' is a fixed logical port name of the USB interface on the PL3000. On the contrary, the 'COM2' is not a fixed one in the system but you assign the logical port to ActiveSync connectivity when you specify ActiveSync connection over the Bluetooth in the Bluetooth Device Properties applet. As a result of that there is also an 'ActiveSync on COM2' icon (COM2 in this particular example) in the 'connections' window.

### NID AutoStart Settings

Using a NID AutoStart Settings applet you can enable/disable a service having control over the system when the device is about to be up and running after it has been powered up. The purpose of the service is to launch your application after the network connection has been established, while keeping user-friendliness during the connecting phase. User-friendliness means that the AutoStart hides unnecessary displayed information on the screen and hinders the user from interfering with the connection establishment phase by pressing the keys or by tapping the screen. The applet has the help of its own to instruct you in its use

### NID Backlight

The backlight of the screen has two properties that can be adjusted through a NID Backlight applet. There is a slider for brightness and a mode selector to choose how the backlight is linked to the working of a power manager. That is, whether or not the backlight can be on in different power states of the system. Be aware that you can select the mode 'Constant off' which actually disables the backlight property of the screen.

### NID Indicators

A NID Indicators gives two measuring bars on the screen. One bar shows charge remaining in the battery. The other one displays signal strength which the PL3000 sees from the wireless LAN access point or from the base station of a cellular network to which it has attached. Moreover, the applet gives four possibilities to place the bar (or bars) on the display.

### NID Key Backlight

If you need either to enable or to disable the keypad's backlight property, a NID Key Backlight applet makes it possible.

### NID Keypad

A NID keypad is an applet to control all the following properties the keypad has:

- Changing a key to another one
- Enabling/disabling the scan key
- Default mode of the alphanumeric keypad, being numeric, lower-case text-writing, or upper-case text-writing
- Changing the functioning of the mode selectors of the alphanumeric keypad

### NID Link Watchdog

With a NID Link Watchdog applet you can bring a connectivity monitoring service into use, either wireless LAN (WLAN) or USB. The service informs user of the loss of connection by sounding a warning signal and showing the message you can see appropriate for the situation on the screen. When there is functional communication channel available again, the message window disappears from the screen with a connected-sound.

The purpose of this service is to increase usability of the device especially in the WLAN environment in which the loss of connectivity may happen on a daily basis because the device goes out of range of the WLAN coverage, or bad quality of signal transmission path persists for long enough. So the user can receive information about the loss of WLAN connectivity, which may be otherwise difficult to notice among other hitches such as slow response time, and accordingly it is possible take right action when the loss of WLAN connectivity arises.

The link watchdog service calls for the computer being reachable through the wired backbone network of the WLAN infrastructure. Monitoring does not require any special software on that computer, just its IP-address and a TCP port number to send 'polls' are set in the applet. However, the polling requires that the TCP port is open in the computer. Additionally the machine must respond to TCP connection initiations from the PL3000. One alternative to the endpoint to monitor connectivity is the computer running a web server.

**Note!** If there is a firewall, a NAT, or both of them in operation between the PL3000 and the computer to which the polls are sent, it might be that the NID link watchdog service is not workable in that case without configuration changes to the NAT and the firewall.



### NID Power Button

Through a NID Power Button applet you can customize the functioning of the power button. The power button has two attributes to be changed:

- 'Virtual key' – whether or not the Power button press generates a virtual key code; the virtual key code can be chosen freely
- 'Hold time' – how long the power button shall be held down until the system powers down itself.

### NID Scanner

A NID Scanner applet gives you control of the scan engine of the optical tag reader and of the scan operation itself on the PL3000 as follows:

- Enabling/disabling barcode decoding on a barcode-to-barcode basis
- Setting the barcode's optional parameters
- Setting the triggering mode of the scan key
- Setting the timeout for the barcode reading
- Adding affixes and placeholders to the read code string
- Replacing the mark in the read code string with another
- Setting how success and failure of the barcode reading is indicated to the user
- Testing the barcode reading to see if the reader reads a particular barcode

Be aware that the NID Scanner applet is not so much a control panel applet as a sample utility to demonstrate the configuration options being available on the scan engine on your PL3000.

### NID SNTP Service

If your business application requires keeping the PL3000(s) in synch with your servers' time, a NID SNTP Service applet makes a Simple Network Time Protocol (SNTP) client available on your Nordic ID PL3000. The SNTP client can retrieve time value from one source. In addition to the address of a time server, you can specify a destination port on which the service is available.

Furthermore, the implementation of the SNTP client demands polling parameters. With a 'Settings' page of the applet you can also adjust the following parameters:

- 'Update interval' - how frequently the client checks time (either in minutes or in hours)
- 'Timeout' - how long to wait for the response from the server before resending the time check request
- 'Retries' - how many times to retry before giving up per the update interval.

This applet also provides a facility for adjusting manually the system time of the device. You can link a time query user dialog utility, called 'AskTime', to the SNTP queries. There are two property pages to customize (to localize) the text fields of the user interface of the AskTime in this applet.

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In addition to using the AskTime, the 'Settings' page instructs you to start the SNTP client.

**Note!** Nordic ID PL3000 has no Real Time Clock chip, meaning that the system does not maintain the time over the resets other than a warm boot.

### NID Tilt Switch

On the PL3000, there is a sensor that reacts to shake and impact. The sensor device is called 'tilt switch'. With a NID Tilt Switch applet you can apply the tilt switch to the following power management properties: powering the system up (a 'Wakeup automatically' feature), and keeping the system awake (a 'Keep alive' feature).

When you move sharply up and down your PL3000 such as with a quick flick of the wrist so that the tilt switch reacts to it, the tilt switch signals the power management of the PL3000. If the 'Wakeup automatically' property is enabled and your PL3000 is suspended the quick flick of your wrist powers your device up. On the other hand, if the 'Keep alive' feature is enabled, the signal from the tilt switch functions as a user input. For example, when your PL3000 is running in one of its two intermediate power-saving modes, the quick flick of your wrist energizes your device by turning on the backlight of the screen, and the screen itself, depending on the power-saving state in which the device was before the tilt switch trigger.

### NID Touch Screen

Using this applet you can disable (also enable) the touch screen device.

### NID Trigger Button

If your PL3000 is furnished with the pistol grip option, using a NID Trigger Button applet you can alter the virtual key code mapping of the trigger button mounted in the pistol grip. By default the button press triggers an optical tag reader or an RFID communication, depending on the optional device elements on your PL3000. With the applet you can also assign the launch of some executable to the trigger button.

### NID WWAN

A NID WWAN applet has a quality that is different from others in the group of the control panel applets. It may well be that you cannot get the applet opened but a 'fatal error' message – 'Unable to open the MHL WWAN driver!' – appears on the screen. The error message pops up if there is no GPRS modem on the PL3000. In other words, the error message does not necessarily say that the system on your device is in a state of disorder but that you may need the PL3000 that incorporates

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the Nordic ID mobile option to open the applet. What makes the situation fatal is that the applet does not open although your PL3000 includes the mobile option.

You need the NID WWAN applet after you have installed a SIM card on your PL3000. Using the applet you can connect your PL3000 to your service provider's (cellular data carrier's) network.

### Owner

An Owner applet applies mainly to user identification information. There are the following tabs available to insert user information.

- 'Identification' – you can specify general information on the owner of the device such as name, company, and address details
- 'Network ID' – this user information is needed to gain access to network resources such as file servers.

### Password

If you need to protect against unauthorized party from gaining access to your background system by using your PL3000 then with a Password applet you may provide the device with a password protection. The password protection is applied when the system powers on, or when the blank display is turned on again. In fact, both of the situations refer to the transition from lower system power state to the full power state. For example, if you 'enable password protection for screen saver' in the Password applet, it means in practice as follows. When the screen has gone blank, in the case of a user or system activity, the screen (or the whole device) is turned on. Before a user gets into the system again he/she has to enter the password.

When you specify password, use the soft-key input panel to make certain of which characters your password actually is composed. If you mix, for instance, numerals, lower case letters, and upper case letters, entering the password by using the keypad is an awkward operation. Be aware that the soft-key input panel is also available to enter the password when you log on.

### PC Connection

With the help of a PC Connection applet you can disable or enable PC connectivity, which is based on Microsoft ActiveSync technology across USB medium by default. In the applet, you can also select ActiveSync medium but by default there is only the USB to choose from.

PL3000 also supports ActiveSync connectivity over Bluetooth. When you specify ActiveSync connection over the Bluetooth in the Bluetooth Device Properties applet, the PC Connection applet gives two mediums to choose from: USB and Bluetooth.

The PC connection over the USB requires the PL3000 USB driver for the ActiveSync connectivity is installed on your Windows-based computer. The driver is available either through the technical support of the Nordic ID or on the Nordic ID website. The Microsoft ActiveSync is available on the Microsoft websites. Be aware that on Windows Vista-based computers this data synchronizing technology is not

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referred to as 'ActiveSync', but it is embedded in the part of a 'Windows Mobile Device Center' (WMDC) software package in the Windows Vista systems.

In addition to the difference that the UBS connectivity requires the driver of its own on the workstation but the Bluetooth connectivity does not, there is also another difference between these connectivity types. You cannot plug USB cable directly into your device but you need a device cradle for the PL3000 into which the USB cable can be connected. Bluetooth is a cableless means of communication and there is no necessary need for the device cradle because of the PC connection.

There is yet another difference. Establishing the PC connection over the USB link is a plug-and-play operation, meaning that the connection establishment begins automatically when you put the PL3000 into its device cradle. In practice, the connection establishment over the Bluetooth link is triggered manually with a double-tap on the ActiveSync desktop icon, although the Bluetooth Device Properties applet makes available an option to start up automatically.

### Power

A Power applet provides the control of system power state transitions from the highest power consumption state to the lowest. (The power states are described in the section 'Power Management' on page 43.) The actual control is based on the adjustment of three timeout periods that are applied either to AC-powered or to battery-powered mode. For each of the periods the system has to remain idle until the change in lower power state can happen, and finally after three idle periods in succession gets the system suspending itself. In addition to controlling the power management of the device, the 'Power' applet provides information on battery status, and on the power status of the sub-systems such as wireless LAN adapter, audio system, and barcode scanner.

### Regional Settings

A Regional Settings applet covers the settings of national language support (NLS) in Windows Embedded CE, and in particular the extent of the NLS implementation on the PL3000. The NLS is about date, time, calendar, number, and currency formats. Furthermore, the applet opens up options to select user interface and input language but for those features the support may be very limited on your PL3000.

### Storage Manager

On your PL3000 there can be two non-volatile storage devices that can be managed using a Storage Manager applet. The applet allows creating and deleting partitions on a storage device as well as formatting the whole volume after dismounting it and deleting all the partitions on it.

Storage Manager refers to a storage volume as the name of the block mode device driver for its hardware. On every PL3000 there is an 'MSFlash' storage that denotes the Flash directory in the file system. If there is an add-on non-volatile memory card such as SD card installed on the device, its name is 'DSK1:' in the

applet. Be aware that before you do any storage operation, you shall select the storage device on which the operation is to be done, that is, on the storage being either 'MSFlash' or 'DSK1.' In addition, first operation before any other is to unseat the storage by tapping on the 'Dismount' button.

### Stylus

A Stylus applet makes two property sheet pages available to adjust your interaction with the touch screen. You can calibrate the touch screen to be unerring for the points of your stylus tapping in addition to your double-tapping interaction with it.

### System

A System applet has two informative property pages, 'General' and 'Copyrights'. Over and above those informative pages the applet has two more pages, 'Memory' and 'Device Name'. On the 'Memory' page there is a slider which regulates the usage of the RAM memory between program execution and storage capacity of the RAM-based file system on the PL3000. The default position of the slider should be fine in normal use, but the occasions can arise e.g. when some maintenance operation can fail unexpectedly. In that case, the adjustment to the usage of the RAM between the file system memory space and the execution memory space may help.

Windows Embedded CE supports dynamic name registration with a WINS (Windows Internet Naming Service) server. For the registration the device has to have a unique name on the network. On the 'Device Name' page you can specify your device name. Be aware that the Bluetooth communication uses the same device name, and that the device name is also possible to specify on the 'General' page in the 'Bluetooth Device Properties' applet.

### USB profile

Windows Embedded CE can use the USB interface on the PL3000 in three operational modes. A USB Profile applet can be seen as a selector by which you choose the operational mode of your device across the USB link. You can put your PL3000 into operation across the USB as follows:

- ActiveSync
- Mass Storage
- RNDIS

#### ActiveSync mode

By default the PL3000 operates across the USB in the ActiveSync mode. This operational mode is for synchronizing data between a local Windows-based desktop computer and a Windows CE-based device across the USB link. Be aware that this mode is also dependent on the enable-disable parameter which you can specify in the PC Connection control panel applet.

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On Windows Vista-based computers this data synchronizing operation is not referred to as 'ActiveSync', but the data synchronizing technology is embedded in the part of a 'Windows Mobile Device Center' (WMDC) software package in the Windows Vista system.

### Mass Storage mode

If you select the Mass Storage option, your PL3000 is seen as USB mass storage device by Windows-based computer when it is connected to the computer's USB socket. What the Windows on your computer sees is the Flash directory off the root of the Windows CE file system on your PL3000. In other words, in this mode you can use your device – your device's Flash directory, to be precise – as a USB memory dongle.

### RNDIS mode

RNDIS (Remote Network Driver Interface Specification) is the protocol that the ActiveSync communication has been based on since the release of the version 4.0. The RNDIS mode on your device in combination with the ActiveSync on your local Windows machine provides IP connectivity across the USB serial bus.

**Note!** Microsoft has informed that a remote synchronization feature is removed from the 4.x versions of ActiveSync (at least from 4.0, 4.1, and 4.2 versions) because the remote synchronization does not allow for a strong authentication.

## Volume & Sounds

Windows Embedded CE uses sound effects to indicate diverse occurrences in the device to a user. The occurrences are classified into five categories: application sounds, system events and warnings, alarms and reminders, keystrokes, and touch-screen taps. With the help of a Volume & Sounds applet you can allow or prevent the sound effects on a source-by-source basis. The applet refers to the system events and warnings as 'events', and to the alarms and reminders as 'notifications'. To the keystrokes it refers as 'key clicks'. As far as the sound effects of keystrokes and touch-screen taps go, they have three level volume control of their own, and when you disable their sound effects, you actually mute their sound.

The Volume & Sounds applet also provides a volume control of a speaker which affects all the sounds the system produces. In addition, there is a 'Sound' page by which you can have greater choice in enabling and disabling the event sources, and the sound effects which you assign to them. The page also helps you in selecting the sound effect for a particular event by giving you possibility to listen the sounds available before you assign one of them to a particular event source. After having made your choice for the enabled event sources and their particular sounds, you can save your choice as a scheme file.

### Wi-Fi

When you start configuring the wireless LAN (WLAN) interface on the PL3000, you will make a decision on which of two available 802.1X supplicants you are going to use for handling the WLAN connectivity. Together with the supplicant you also choose how you configure the supplicant part of the WLAN communication.

On the 'Main' page of a Wi-Fi applet there is an 'Active Profile' field to choose from the following profiles: 'Default' and 'ThirdPartyConfig'. When the 'Default' is selected, a third-party supplicant is in use. The 'ThirdPartyConfig' profile refers to a Windows Embedded CE built-in supplicant. To avoid confusion over the concept of 'third party', in this text the 'third party' is used from the Windows CE perspective. So, the Wi-Fi is a third-party utility to configure, to monitor, and to manage WLAN interface and communication on the PL3000. The actual name of the applet is 'Summit Client Utility'.

If you select the 'Default' profile in the Summit Client Utility (SCU), your supplicant configuration utility is the SCU, and WLAN 802.1X stack is based on OpenSSL Toolkit. On the contrary, if you select the 'ThirdPartyConfig' in the SCU, your supplicant configuration utility is a Windows Embedded CE built-in Wireless Zero Configuration (WZC) service, and WLAN 802.1X stack is a native Windows CE implementation.

You may need the SCU, although the WZC is your supplicant configuration utility. A 'Global' page in the SCU is independent of the Active Profile setting, meaning that the settings on the 'Global' page apply to the WLAN interface no matter which supplicant is in use. In addition, a 'Profile' page of the SCU also relates to the 'ThirdPartyConfig' profile.

# POWER MANAGEMENT

In the PL3000 system, a so called power manager (PM) controls on power-related things. One of the tasks of the PM is to save battery energy by reducing power consumption. The rationale behind reducing the power usage is based on the inactivity of a user or the system. For example, by default the PM turns off the backlight of the screen, if the device remains idle without any user input either key press or stylus tapping on the screen for the specified period of time. On the contrary, if a user or a user application action occurs it is the PM's task to activate the system. For instance, if the screen is turned off, the PM directs the system to turning on the screen with the adjusted, maximum backlight brightness when the user presses some key or taps the screen.

## Power States

The PL3000 has two main power states: it is either switched on or switched off. When the device is switched on, it can be on AC power, or it can be running on battery. However, from the user's point of view there are four distinctive system power states, aka power levels, on the device: On, UserIdle, SystemIdle, and Suspended.

**Note!** In this manual both 'Suspended' and 'Sleep' is used to refer to the 'OFF' state of the device, that is, to refer to the situation when the device is switched off.

By default, if your PL3000 remains idle for a while it reaches the 'Suspended' via the UserIdle and SystemIdle states. For this transition from the 'On' state to the 'Suspend' state the PM uses three inactivity timers. If all the three timers expire the PM suspends the PL3000. To put it another way, using the power button is not the only way to switch off the device. By default the PM has always tendency to power down the device to save energy when it is running on battery.

Be aware that you can power down your PL3000 through the power button in whatever power state your device is, whether it is either in the 'On' or in the intermediate power-saving states. In addition, if the battery cover is removed the device powers off.

### Suspended

When PL3000 is switched off, it is said that it is suspended. For the simple reason that the device cannot be turned off completely but the critical parts of the system's electronics remain powered after powering down the device.

The PM suspends the device if the SystemIdle state is reached, provided that a suspend timer expires. The suspend timer has a settings value of 'Never' (a 'Suspend Timeout' value), if set, the PM does not suspend the device.



You can recognize the suspended state by the blank screen and that the device does not react, with the exception of the power button, to any key press by turning on the screen. Only pressing the power button gets the device leaving this state besides a quick flick of the wrist, if the tilt switch is used as a power trigger on the device. When your device wakes from the suspended state, the Windows CE resumes. In other words, your device does not reboot the Windows CE when powered on.

Be aware that when the device is on AC power you cannot power down it, that is, place it in the suspended state.

### On

When you are interactively using your PL3000, the device is in the 'On' state. If your PL3000 is in some other power state than the 'On', the PM changes the system to the 'On' state when you start operating it, for example, by powering it up, if suspended. You can recognize the 'On' state of the device by the turned-on screen and its backlight with the adjusted, maximum brightness.

The device leaves this state if you power down it, or if a UserIdle inactivity timer expires. If the timer expires, the system changes to the UserIdle power state. Having said that, there is a settings value of Never (a 'User Idle Timeout' value). When you put that setting into effect the timer does not expire but the device remains in the 'On' state until you power down it using the power button.

### UserIdle

The 'UserIdle' is a transitional power-saving state. The point to enter this state is nothing but power saving. In this power state the device gives impression that it is still powered. Typically, you notice the change to the 'UserIdle' state when the backlights of the screen and the keypad are turned off, but the display remains on.

Tapping the screen, or pressing any key you can get the device entering the 'On' state again. Otherwise after the specified timeout the device enters the 'SystemIdle' state. However, as you may expect, there is a 'Never' timeout setting of a SystemIdle timer that disables transition to the lower power-saving state.

### SystemIdle

The SystemIdle is an intermediate power state like the UserIdle. Changing to this state requires that a SystemIdle timer expires. The System Idle timer has a settings value of 'Never' (a 'System Idle Timeout' value), if set, the device does not shift to 'SystemIdle' state but remains in the 'UserIdle' state until you operate the device.

It may well be that it is not easy to make difference between the 'SystemIdle' state and the 'Suspend' state because those power states resemble each other on the outside of the device. When your device looks as if it were turned off, the best way to set it to 'On' state is to press the power button. If the shutdown dialog window appears on the display after your device is fully powered, repress the power button to close the window. Appearing of the shutdown dialog indicates that the power state was the 'SystemIdle'.

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The device remains in the 'SystemIdle' power state for the timeout of the Suspend timer unless some other activity occurs before that, either system or user one. If the Suspend timer expires the PM suspends the device.

**Note!** The above-mentioned particulars of the power states are default operation of the Windows CE Power Manager (PM). Windows CE also provides a power management API (an application programming interface), meaning that an application can demand a given power level (state), or it can request that the PM does not drop power below a given level, for example. Further, a Nordic ID MHL <sup>(1)</sup> gives an application the possibility to control both the keypad and the screen backlights. Therefore, the above-mentioned particulars just give you some idea of power management on your device.

(1) The MHL is Nordic ID's own API formulation for Windows CE devices.

### Backup Battery

PL3000 makes it easy for you to handle the situations when the main battery on your device is running low, and you have a charged spare battery available, for there is a backup battery on the PL3000. In the same way as the main battery, the backup one is rechargeable. Being fully charged the backup battery is able to power the critical electronics of the system for the time to replace the dead or low battery with a charged spare one. Once you have put the spare battery into the chamber and closed the cover, the system resumes by pressing the Power button as if it were normally suspended by the Power button.

The backup battery is charged by means of the main battery. For example, during the charging of the main battery in its chamber the backup battery is being charged as well. Be aware that when the main battery is not being charged, nevertheless it charges the backup battery, if need be.

### Charging / Low-battery Indicator

In the keypad area there is a power indicator that is used for showing charging and battery information on the PL3000. The PL3000 system uses the LED in two different ways. The dividing line is whether the PL3000 is running on battery or whether it is on AC.



### On AC

When the PL3000 is docked in its cradle, - assuming that the device cradle is plugged into mains socket - the power indicator shows both battery charging status and that the PL3000 is on AC. (For more information, see the section 'PL3000 is being charged' on page 13.)

An unlit power indicator is a sign that the PL3000 is not running on AC, when it is in the desktop charger. Similarly, if the indicator is flashing on and off the PL3000 is not running on AC, although it is docked in the desktop charger. Only steady light is an indication

of being on AC together with the up-and-running system.



### On Battery

The power indicator indicates the battery status when the PL3000 is running on battery. An unlit power indicator shows that you need not care about battery performance (service hours). However, when the battery is running low, the LED starts flashing yellow light. You can still use your PL3000, but be aware that the operating time being left is short.



After having flashed yellow for a while the power indicator starts flashing red light and the Windows CE displays a warning message 'Main Batteries Very Low' on the display. Discharging of the battery has reached the point when your device may power down itself any moment now. If you close the warning window, you can still operate your device; although it is risky business to do that. When the system makes a decision that the battery is not able to power the device any longer, the screen goes blank; the red LED stops flickering and red

light stays on. Apart from the red light of the power indicator, the rest of the device is dead.

You can replace the dead or low battery on the fly, if you have a charged spare battery available; see the section 'Backup Battery' on the preceding page. Otherwise, you may charge your PL3000 by docking it into the desktop charger.

# 4. DATA CAPTURE

## SYMBOLOLOGY-ENCODED TAG READING



On the PL3000 there are two reader options available for machine-readable, optical tag information. There is one fundamental difference between the readers, how they transfer information from tags to inside their decoding system. A linear symbology

reader illuminates the tag with laser beam and, by default, expects that the symbol's spaces reflect more light than the bars. This reader is also referred to as 'bar code reader' or to as 'bar code scanner'. The other reader option is based on digital camera technology, and the system is commonly referred to as 'imager'. It takes an electronic picture that should include the symbol which a user is scanning. In fact, it takes shots repetitively until the pattern recognition processing has found a shot including some symbology. (Still, the actual symbol decoding can fail.) The imager uses red LEDs as a flash which it momentarily switches on and off during the scanning operation. There are also green LEDs shining an 'aiming pattern' that is used for aligning the reading device to the symbol.

The handling and applicability differences between the readers results from the above-mentioned technology difference between them. For example, the name 'bar code reader' implies that the laser beam is convenient for reading linear (one dimensional) symbologies but not two dimensional ones. In addition, the bar code reader is an orientation-dependent scanner, because it scans the laser spot in a straight line. The visible line shall sweep through all of the bars and spaces of the symbol so that the reader can succeed in reading the symbol. On the contrary, the imager can omnidirectionally succeed in reading both the one dimensional and two dimensional symbologies, assuming that a shot includes the whole symbol being good enough to be encoded.

Although both the scanners can be configured using specific bar codes, it is strongly recommended that the changes to the scanner settings are made with the help of a 'NID Scanner' control panel applet. However, the ultimate configuring should be done in the application software, for example through Nordic ID MHL API.

### Linear Symbology Reader

The bar code reader supports the following bar code types:

- EAN-8
- EAN-13
- UPC-A
- UPC-E
- UPC-E1
- Bookland EAN
- Code 128

- UCC/EAN-128
- ISBT 128
- Codabar
- Code 1
- Code 39
- Trioptic Code 39
- Code 93
- Interleaved 2 of 5
- Discrete 2 of 5
- MSI
- RSS-14
- RSS-Limited
- RSS-Expanded

### Read range of Laser Scanner

Mainly the thinnest bar and space width that is used to print the bar code determines the read range. However, there are other factors that may have an influence on the read range such as how well the dimensions of a printed bar code are in compliance with the printing tolerances according to the specification of that particular bar code type.

Typically the 'size' of the printed bar code is expressed as the width of its narrow elements (both bars and spaces). The width is measured in mils – thousandths of an inch. (For example, 40 mils in inches are 0.04, in millimeters it is 1.01.) The bar code scanner on the PL3000 is capable of reading all the supported barcode types of **any mils** from **the shortest distance of 5cm**, approximately. **The longest read distance** varies according to the size of a bar code. The distance ranges from **14cm with the 4-mil bar codes to 80cm with the 20-mil and greater bar codes**.

## 2-D Symbology Reader

The imager supports the width-modulated linear symbologies, the height-modulated linear symbologies, the 2-D stacked symbologies, the 2-D matrix symbologies, and the composite symbologies as follows:

### Width-Modulated Linear Symbologies

- Codabar
- Code 11
- Code 128
- Code 39
- Code 93 & 93i
- Coupon Code
- EAN 8
- EAN 13

## CHAPTER FOUR - DATA CAPTURE

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- IATA 2 of 5
- Interleaved 2 of 5
- ISBT 128
- MSI
- Matrix 2 of 5
- Plessey Code
- PosiCode A & B
- RSS-14
- RSS Limited
- RSS Expanded
- Straight 2 of 5
- Telepen
- TL Code 39
- Trioptic Code 39
- UPC version A
- UPC version E0 & E1

### **Height-Modulated Linear Symbologies (Postal Codes)**

- Australian Post
- British Post (BPO)
- Canadian Post
- Chinese Postal Code
- Japanese Post
- KIX (Netherlands) Post
- Korean Post
- Planet Code
- Postnet

### **2-D Stacked Symbologies**

- Aztec Code
- Codablock F
- Code 16K
- Code 49
- MicroPDF417
- PDF417

### **2-D Matrix Symbologies**

- Data Matrix
- MaxiCode
- QR Code

### Composite Symbologies

- Aztec Mesas (Code 39, Code 128, Code 93, Code 93i, Interleaved 2 of 5, UPC-A, EAN-13)
- EAN•UCC Composite
- EAN•UCC Composite with EAN Linear component
- EAN•UCC Composite with UPC Linear component

**Note!** It is possible that the symbology appears in the above-mentioned lists but there is not a mention of it in the MHL manual nor does the 'NID Scanner' applet seem to support that particular symbology. If that is the case, and for example, you would like to test the reading of that seemingly unsupported symbology on the PL3000; please contact the technical support of Nordic ID to know how the symbology can be enabled and configured on your PL3000.

### Read Range of Imager

In reading either one or two dimensional symbols with the imager the range between the shortest and the longest read distance has to do with the size of the symbol in mils as well as with the depth of field effect.

In photography, the depth of field effect refers to plane of focus from near to far within image. With the imager it means the range in which a symbol remains in focus if the reader draws away from the symbol or draws closer to the symbol. As a rule of thumb, the larger is the size of the symbol in mils the wider is the range in which the symbol is in focus, that is, the range in which the imager can succeed in reading the symbol.

In concrete terms, between the 6-mil symbol and the 35-mil symbol the shortest read distance varies from 11 cm to 5 cm, respectively.

Correspondingly, the longest read distance varies from 16 cm with the 6-mil to 33 cm with the 35-mil symbol. The adjacent table lists the approximate read ranges from the 6-mils to the 35-mils. Be aware, that the imager can read one dimensional symbols being 13 mils or greater in size further than the table shows.

Symbol size	Read range between
6-mil	11 cm - 16 cm
8-mil	9 cm - 19 cm
10-mil	8 cm - 23 cm
13-mil	5.5 cm - 25 cm
15-mil	5.5 cm - 26 cm
35-mil	5 cm - 33 cm

### Checking on Symbology Reading

There is a 'NID Scanner' applet in the control panel which provides a 'Scan' page for checking on symbology reading. On the 'Scan' page, it is possible to read a bar code or a 2-D code pattern by directing the aimer light (either laser beam or LED light) emitted by the scanner at the tag after pressing the 'Scan' key.

Before you begin, check that the symbology is enabled and its options are selected properly; see the sections 'Enabling / Disabling Symbology' below and 'Configuring Specifics of Symbology' on the next page.

The tab shows scanning result in its output fields as follows:

Field		Description
Result String		When the scan succeeds the field shows the decoded result, that is, the machine-readable symbol in the human-readable form
Result Info		The field tells whether the scan operation ended in success or in failure
AIMSI (AIM Symbology Identifier)	1 <sup>st</sup> field: AIMSI	When the scan operation succeeds the combination of three characters is shown in this field. The first character is a flag. (It informs that AIM code follows next in the character string received from the scan engine.) The character after the flag tells the type of the symbol, and third one is a modifier character.
	2 <sup>nd</sup> field: Mod char	The modifier character out of the three character AIM symbology identifier tells how the reader interpreted the symbol. (The modifier character, that is, the interpretation is pertinent to the symbology type.)
	3 <sup>rd</sup> field: Type	When the scan succeeds this field tells the type of the decoded symbol in the understandable form

### Enabling / Disabling Symbology

On a 'Codes' page, the 'NID Scanner' control panel applet lists all the symbologies the applet supports (not necessarily all the symbologies the scanner supports). Each list item has a check box telling whether or not the reader decodes the code type when the particular type of code is being scanned. By default, the all the symbologies that the 'Codes' page shows are enabled.



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Before you begin, open the 'NID Scanner' control panel applet (see the section 'Control Panel' on page 30).

### To enable decoding of a particular bar code type:

1. Select the '**Codes**' tab in the NID Scanner applet
2. Check the **check box of the symbology** list item by tapping the check box with the stylus
3. Press the '**ok**' key; the decoding of the bar code is enabled.

### To disable decoding of a particular bar code type:

1. Select the '**Codes**' tab in the NID Scanner applet
2. Uncheck the **check box of the symbology** list item by tapping the check box with the stylus
3. Press the '**ok**' key; the decoding of the bar code is disabled.

Be aware that you can check right after tapping the checkbox of the symbology the result of the change by pressing the scan key. The applet displays the 'Scan' page and the scanner starts reading. If you aim the reader at a symbol tag of that particular symbology, you can see the result on the 'Scan' page.

## Configuring Specifics of Symbology

Before you begin, open the 'NID Scanner' control panel applet (see section 'Control Panel' on page 30).

### To set optional features of the bar code type:

1. Select the '**Codes**' tab in the NID Scanner applet
2. Double-tap the **bar code** list item; the options window of the bar code type opens.
3. Set the **options** of your choice
4. Tap the '**OK**' button to approve your settings
5. Press the '**ok**' key; the selected options are in use.

## Changing Aim/Triggering Mode

Before you begin, open the 'NID Scanner' control panel applet (see section 'Control Panel' on page 30).

### To set Aim/Triggering mode:

1. Select the '**Misc**' tab in the NID Scanner applet
2. Select the '**Trigger Mode**' of your choice.

3. If you want to check on how the selected triggering works, direct your PL3000 at some surface so that you can see the aimer/scan light when you press the 'Scan' key. Pressing the 'Scan' key gets also the applet to display the 'Scan' page, meaning that if you are not satisfied with the trigger mode you may return to the step 1.
4. Press the 'ok' key; the selected trigger mode is in use.

### Changing Scanning Timeout

Before you begin, open the 'NID Scanner' control panel applet (see section 'Control Panel' on page 30).

#### To set the scan timeout:

1. Select the 'Misc' tab in the NID Scanner applet
2. Enter timeout value (in seconds) of your choice in the 'Scan Timeout' text field.
3. If you want to check if the selected value is appropriate time to wait for the scanner until it gives up trying, direct your PL3000 at some surface so that you can see the aimer/scan light when you press the 'Scan' key. Pressing the 'Scan' key gets also the applet to display the 'Scan' page, meaning that if you are not satisfied with the timeout you may return to the step 1.
4. Press the 'ok' key; the selected timeout value is stored in the registry.

## RFID TAG READERS

The PL3000 is available with two RFID reader options. The dividing line between the readers is what type of RFID tags they are able to read. For example, a tag's coupling mechanism determines one of the main fits. This coupling mechanism has also an influence on reading operation in general, such as on the read range between the reader and the tag. Along with range, the coupling mechanism strongly affects which frequency the tag can use. In this respect, the PL3000 with its RFID reader options is suitable for applications using either the inductive coupling tags operating in the 13.56MHz frequency band (ISO 15693 tags andICODE tags) or the backscatter coupling tags operating from 865MHz to 868MHz (EPC UHF Class 1 Gen2 tags, aka EPC UHF Gen2 or ISO18000-6C tags).

Be aware that there are other factors that have an influence on the communication between the tag and the reader. In addition to the coupling, the interaction between the tag and the reader includes the protocol to exchange messages and information stored on tags. There are also different bodies that make the standardization of RFID tags. For example, there are ISO 18000 series of standards and EPC (Electronic Product Code) standards. The ISO 18000 standards are concerned only an air interface but the EPC standards also deal with such as EPC coding structure, object naming service, tags' physical implementation, and application-level interface.

### EPC UHF Class1 Gen2 Tag Interfacing

Using the backscatter coupling with passive tags the power and signal is transferred from the reader to the tag through their antennas in radio frequencies, and the antenna of the reader gathers the RF waves that the tag scatters back. The nature of radio waves is that the propagation path of the RF signals is varied when radio waves encounter obstructions. Therefore, for example because of reflection, you cannot be sure that the physical position of a particular tag is in the direction where you are pointing the reader's antenna, when your application shows information from that particular tag on the screen. Having said that, the antennas are designed for the UHF RFID reader on the PL3000 so that the antenna performance is best at the front of the antenna.

In many instances, you may orient your PL3000 towards the RFID UHF tag(s) so that the reader's antenna (in particular a linear dipole antenna) is not physically aligned with the tag's antenna. Any misalignment between the antennas will result in a polarization mismatch which reduces the efficiency of the communication between the tag and the reader. Typically, you may encounter it in the form of shorter operational distance.

The power level that the reader uses for tag communication has also an influence on operational convenience of the reader. Depending on the application, for example from time to time there can be too much RFID tags within range of your reader as 'background noise'. In that case, if the reader used less power for tag reading, the situation would be more convenient. The UHF RFID reader on your PL3000 can operate in two power level, which your program may change through Nordic ID's MHL, if need be. (The MHL documentation refers to this property as 'RF power control detect' and 'RF power control'.)

For EPC UHF Gen2 tags the PL3000 reader unit has two antenna designs: a linear dipole antenna and a cross dipole antenna.

#### Linear Dipole UHF RFID Unit



The read/write operations of the UHF RFID reader with the linear dipole antenna are subject to a polarization mismatch. However, you can achieve better operational performance if you align the reader antenna with the tag antenna when you are reading or writing tags. For example, you may turn the PL3000 slowly so that the antenna plane turns in the direction to the tag from a horizontal position to a vertical position and back again as if you were using your PL3000 as a screwdriver.

The adjacent figure depicts the PL3000 with the linear dipole antenna that is in optimum alignment with the RFID tag having the kind of physical implementation.

## CHAPTER FOUR - DATA CAPTURE

### Cross Dipole UHF RFID Unit



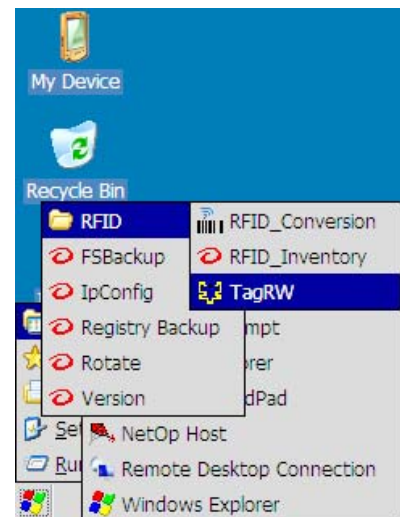
PL3000 with the cross dipole antenna makes the RFID operations more tolerant of polarization misalignment effect. One of the purposes of the cross dipole antenna structure is to deal with the consequences of misalignment of the reader's and tag's antennas during the RFID operations. The antenna design has also an influence on the read/write range of the reader, meaning that with the cross dipole antenna the PL3000 can communicate tags at a greater distance than it can do with the linear dipole antenna.

### Trying out UHF RFID Reader

The PL3000 with the UHF RFID reader is furnished with a utility sample to try out the reader's performance. The utility is called 'TagRW'. When you open the TagRW, it instructs you in its use by showing the available options in its window as well as turning on the backlights of the keys that are in use in the utility.

#### To open the TagRW:

1. Press the 'tab' key so that the input focus is set to the Start menu icon on the far left of the taskbar, in the bottom left-hand corner on the screen.
2. Press the 'ok' key to bring up the Start menu
3. Select 'Programs' menu item by the 'up-arrow' key
4. Press the 'right-arrow' key to bring up the Programs submenu
5. Select 'NordicID' menu item, if not selected, and press the 'right-arrow' key to bring up the submenu
6. Select 'RFID' menu item, if not selected, by the 'arrow' keys
7. Press the 'right-arrow' key to bring up the RFID submenu
8. Select 'TagRW' menu item and press the 'ok' key to open the utility



**Note!** If you have difficulties with UHF RFID reader on the PL3000, please contact Nordic ID's technical support. Before emailing or calling, open the TagRW utility and pick up a bit of information such as RFID module name, its firmware version, and what RF power level the reader is using. (When you open the TagRW, the information is available in its main window; you may scroll up to the beginning of the window.) In addition to the above-mentioned details, we are interested in the type of the RFID tags with which you have reading or writing difficulties as well as the tag manufacturer in order to troubleshoot your RFID reader problem. Please, tell also the application in which the difficulties arise along with how the difficulties arise.

### Integrating UHF RFID Reader into Application

The RFID and the 'symbology' identification technologies differ from each other on a fundamental level: the RFID tag has an active role in transferring information to the reader while the bar code symbol takes part in reading operation passively. This is one reason why the integration of the UHF RFID reader into your application is much more complex than the integration of the 'symbology' reader. In the simplest form, you need not do any coding work to integrate, for example, the bar code scanner into your application but with the UHF RFID reader you do not manage to do that without software work.

For example, just to satisfy a read command of the EPC Class 1 Gen2 protocol the tag requires the following information:

- ◆ A handle to be identified as the particular tag that shall reply to the read request
- ◆ A piece of information on the memory bank so that the tag can read the proper memory area
- ◆ An address in the memory area so that the tag knows where to start from
- ◆ A number of memory words so that the tag can send a proper amount of data to the reader.

It is easy to see that assigning the kind of the read operation mentioned above to some key is worthless without knowing the special requirements of an application.

If your application uses EPC UHF Class 1 Gen2 tags, you may need the description of Nordic ID's MHL for the UHF RFID reader. The MHL is Nordic ID's formulation of an application programming interface (API) for the system components that Nordic ID's Windows CE devices incorporate. In addition to the MHL API manual, you may need an MHL programming support package and code samples to see how to use the MHL API, in particular for the MHL of the UHF RFID reader. You may also need a Windows CE SDK, although using the MHL interface does not require it. Please, contact Nordic ID's technical support if you do not find that information on Nordic ID's website.

**Note!** The MHL manual, SDK, MHL programming support package, and source code samples may be under the partnership policy of Nordic ID.

MHL programming interface supports C/C++ development, JAVA development, and script technologies as follows: C#, VB.Net, JS.Net, VB and Jscript. The MHL manual describes how to make available the MHL in your coding project. Be aware that it may differ between programming languages.

### ISO 15693 HF Tag Interfacing

The original intention of standardizing the ISO 15693 tag was to apply the tags to contactless smart cards – to ‘vicinity cards’. According to that intention, the RFID tag would have to be recognized by its ‘physical position’ as well during the operation, meaning that the relation between the tag and the item to which the tag is attached is unambiguous when the tag is read. As far as the coupling mechanism goes, an inductive coupling was chosen. In practice, that coupling mechanism means that a reader powers tags by using a coil antenna to generate a magnetic field. When energy is transferred from the reader to the tag through the magnetic field, the read range is directly linked to the size of the antenna in use. Typically, the read range of 20-cm antenna design is 20cm, and the read range of 40 cm requires a 40-cm antenna.

#### PL3000 Advanced HF



The PL3000 with a HF RFID reader uses internal antenna for tag reading. It is not possible to recognize externally whether or not the PL3000 incorporates the HF RFID reader. The coil antenna is located at the back of the PL3000, on the opposite side to the screen. (Do not confuse the PL3000 Advanced HF reader with PL3000 Library HF reader that is easy to recognize by its antenna design.)

The best performance of the antenna is behind the device, about 4 to 10 cm away from the back of the PL3000. This read range is appropriate for applications in which a user needs immediate feedback on the relation between the tag and the item that the tag is attached to, in addition to the fact that those items are easily reachable within the read range.

#### Trying out HF RFID Reader

If you are trying out the HF RFID reader, you may need utility samples to do that. It is possible that the unit you have does not include any utility to test the HF RFID reader’s working. If that is the case, please contact Nordic ID’s technical support.

**Note!** The PL3000 Advanced HF reads both the ISO 15693 and NXP ICODE tags

### Integrating HF RFID Reader into Application

Integrating the HF RFID reader into your application is possible through the MHL programming interface. What applies to the integration of the UHF RFID reader applies to integration of HF reader as well.

There are code samples available how to control the reader using the MHL. For more details about the software development support to incorporate the HF RFID reader in your application, see the corresponding section of the UHF reader on page 56.

# 5. CONNECTIVITY

The PL3000's capability of establishing communication over the different kinds of radio links provides the foundation for data collecting and item identification applications. Bluetooth is a default option on the PL3000. The original usage model of the Bluetooth was to replace cables for connecting devices; however its profile-centric approach to cable-replacement communication extends such as to LAN access, and to LAN bridging. On the PL3000 the supported profiles are general ones, that is, the profiles that typically all the Bluetooth devices support: GAP, SDAP, and SSP, but there are also others. OBEX protocol with its API is included in the system. In addition, Windows Embedded CE supports Audio/Video streaming and the connectivity based on PAN profile, however a Bluetooth control panel applet does not incorporate those features.

Nordic ID (NID) Wireless is a Wi-Fi option of carrying messages over wireless link between the front-end and the back-end system. The NID Wireless is an optional radio system on the PL3000. It incorporates both the WPA and the WPA2 authentication and encryption properties. According to the IEEE nomenclature, the radio of the NID Wireless is an 802.11b/g. The authentication and key management stack options of the NID Wireless impart the 802.1X power to wireless LAN access, and it includes both the cipher suites specified by the 802.11i.

Second radio of the PL3000 being optional is for a GSM mobile network access with its GPRS extension. This Nordic ID Mobile option is targeted at the application environment where it is not reasonable to establish an infrastructure for short range wireless connectivity, assuming that there is a cellular data network available. The NID Mobile is also suitable for the cases in which the application uses conventional text-based terminal protocols for user communication, meaning that a terminal emulator program runs on the PL3000. (For more information on a terminal emulation on the PL3000, please contact Nordic ID's technical support.)

## WIRELESS LAN



Two different WLAN subsystems (suppliants) are built into the Windows CE image on your PL3000. Both of them uses the same WLAN radio but the use of them is mutually exclusive, meaning that among the first steps you shall choose which one of the suppliants you are going to put to use. There are a Windows CE built-in suppliant and a third-party suppliant to choose from. To get a rough idea of what that means in practice you may read the description of the 'Wi-Fi' applet (on page 42) in the section 'Control Panel Applets' that tells you the basic story in addition to the section 'Choosing WLAN Suppliant' on page 68. If the term 'suppliant' is unfamiliar to you, you may see the text box below. The following text refers to the built-in suppliant as 'WZC' or as 'Windows Zero Configuration', and to the third-party suppliant as 'SDC Suppliant'.



### **What is WLAN supplicant?**

If you compare a wired network to a wireless network, it is easy to see that in addition to physical signal handling there is also physical security differences between them. In fact, physical security is not inherent in communication based on radio waves. On the other hand, inherent physical security in a wired LAN is derived from the assumption that access to a physical connection conveys authority to connect to the LAN. To tackle this aspect of the WLAN networking some measures has to be taken to reduce security threats such as eavesdropping on transmitted information and unauthorized access to wireless LAN. The IEEE WLAN specifications address the physical security with the authentication framework (IEEE 802.1X) and the link-layer encryption.

The IEEE 802.1X network port authentication architecture on the wireless LAN uses three components to implement a network access control. Supplicant is one of those components. It runs on the end user stations and it seeks access to network resources. In other words, once there is an association between a station and a WLAN access point the supplicant attempts to get the station become authorized in the WLAN context.

**Note!** In this text, the term 'supplicant' may be used in broader sense than the IEEE 802.1X defines the term, meaning that the term 'supplicant' is used loosely and it refers to the whole subsystem on your PL3000 being in charge of communication on wireless LAN.

## PL3000 Wireless LAN in a Nutshell

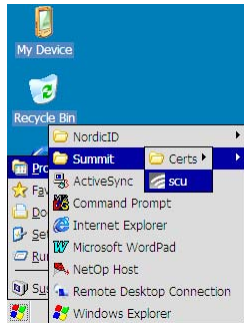
<b>WLAN Radio Characteristics</b>	
Radio	IEEE 802.11b/g
Data rates	802.11b (DSSS): 1, 2, 5.5, and 11Mbps
	802.11g (OFDM): 6, 9, 12, 18, 24, 36, 48, and 54Mbps
Antenna	Internal, Rx and Tx diversity
Tx Power Control	DSSS: From 0 to +19dBm <sup>1)</sup>
	OFDM: From 0 to +15dBm <sup>1)</sup>
Rx sensitivity	-75 to -96dBm <sup>2)</sup>
1) Values are nominal, an accuracy of $\pm 1.5$ dBm 2) Maximum receiver sensitivity depends on data rate being in use at a particular moment	

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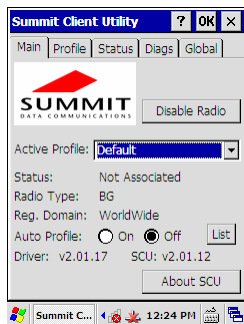
<b>'Windows Zero Configuration' WLAN Security Options</b>	
Authentication with keying (non-EAP authentication options)	WEP with manual shared key
	Pre-shared key (PSK) (according to either WPA or WPA2)
EAP authentication methods	EAP-TLS
	PEAP / MS-CHAPv2
Link-layer encryption	WEP, TKIP, or CCMP <sup>3)</sup>
<b>'SDC Supplicant' WLAN Security Options</b>	
Authentication with keying (non-EAP authentication options)	WEP with manual shared key
	Pre-shared key (PSK) (according to either WPA or WPA2)
	Manual CKIP (Cisco TKIP)
EAP authentication methods	PEAP / MS-CHAPv2
	PEAP / EAP-GTC
	EAP-TLS
	LEAP
EAP authentication methods	EAP-FAST
Link-layer encryption	WEP, TKIP, CKIP (Cisco TKIP), or CCMP <sup>3)</sup>
<p><small>3) Note that the CCMP is an AES-based block cipher protocol specified by the IEEE 802.11i, and in the context of PL3000, AES is used as a synonym for CCMP.</small></p>	

## Before Starting to Configure WLAN



### Opening SCU Configuration Utility

To start with, you need to open a hub of WLAN connectivity on your PL3000. That hub is called SCU Configuration Utility on your PL3000. There are three possibilities to open the SCU utility on your PL3000. The adjacent figure suggests opening the utility through the Start Menu. The second way is to double-tap on the Wi-Fi icon in the control panel window. A double tap on the tray icon of the SCU utility on the taskbar is a third way.

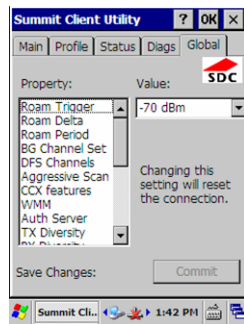


### Checking Presence of WLAN Radio on PL3000

The first thing after opening the SCU utility is to check that your PL3000 incorporates the WLAN radio. The adjacent figure illustrates the situation in which the PL3000 includes the radio with its default options. It takes the SCU utility a little while to receive information about the radio's existence. If the WLAN radio is not included in your PL3000, the status of the following three fields on the 'Main' page remains unchanged as follows:

Status: Down  
Radio Type: --  
Reg. Domain: --

There is a button identified by the text 'Disable Radio' on the Main property page, see the adjacent figure. If the button has text 'Enable Radio' written on it on your Main page in the SCU, then you need to tap on the button to get the radio turned on. It is the second step if you are going to get the WLAN connectivity up and running (of course, assuming that your PL3000 incorporates the WLAN radio module).



### Thinking about Global Settings

The global WLAN connectivity parameters cover the aspects such as roaming in the environment of autonomous access points; Cisco specific WLAN properties known as CCX features; customizing EAP-based authentication; tweaking the radio to suit your WLAN environment.

A tap on the 'Global' tab opens a Global Settings property page. The logic of the page is straightforward: selecting the property on the left-

hand side of the page makes the values of the property available in the 'Value:' field on the right-hand side. When you select some property the value field shows its current value. If you want to change the value of the property, a tap on the value field opens the list of the values available for selection. If there is no set of values available, you may enter the value of your choice in the field depending on the actual property. Be aware that changing the value in the field without tapping the 'Commit' button does not get the change to come into use. A tap on the 'Commit' button also saves your configuration settings permanently.

### Roaming Settings

In the following text, the word 'roaming' refers to the process of moving a station (PL3000) between access points (APs). The settings described below influence on WLAN roaming on your PL3000, that is, you can adjust how your PL3000 decides to move between APs and how it behaves to address the roaming.

Third preparing step is to think about global settings. The global settings split into two groups: the parameters that apply to all the WLAN connectivity possibilities on your PL3000 (with some exceptions to that all covered aspect), and the parameters that apply to the Summit Client Utility itself.

**Note!** If you just configure the WLAN connectivity without special requirements, and you use autonomous access point(s) for your wireless LAN networking, the default global settings should work OK.

**Note!** The global settings include 'DFS Channels' and 'LED' settings that are not applicable to your PL3000.

**Note!** The following roaming settings are not applicable if your WLAN communication is based on Cisco wireless LAN infrastructure with lightweight access points and with a controller unit (Cisco Information Element), not to mention if your WLAN uses only one access point (AP). However, in the case of one AP it is worth considering the values of an 'Aggressive Scan' and 'BG Channel Set'. (As far as Cisco wireless LAN infrastructure goes, there is a global setting 'CCX features' that affects whether or not the roaming settings below are overridden.)

- **Roam Trigger:** When there is an association between a PL3000 and an access point, the PL3000 monitors received signal strength (RSS) from the access point (AP). When RSS drops below the value of the Roam Trigger the PL3000 starts to scan other APs having the same SSID as the current AP has (referred to as roaming scan). Higher values of the Roam Trigger will tend to result in more frequent roaming scans than lower values (be aware that the values are minus numbers, that is, (-) 70dBm is higher than (-)85dBm).
- **Roam Delta:** During the roaming scan the PL3000 monitors received signal strength from all the APs that respond to its probe requests. The value of the Roam Delta is a threshold of starting an actual handoff. If RSS from some AP is at least the value of the Roam Delta stronger than the RSS of the current AP, the PL3000 renews its WLAN association through the AP from which it received at least Roam-Delta stronger signal.
- **Roam Period:** RSS monitoring does not resume immediately after the roaming process has ended with or without re-association (it is possible the PL3000 holds its WLAN connectivity without renewing it through another AP), but PL3000 starts to monitor RSS again after the 'Roam Period' has elapsed. The point of the 'Roam Period' together with the Roam Delta is to prevent the ping-pong effect. You can set the Roam Period in five-second increments in the range of 5 to 60 seconds.
- **BG Channel Set:** PL3000 searches for the APs within range by sending probe requests. To be successful in searching the PL3000 probes the set of the channels being available in the 2.4GHz frequency band. The number of the available channels varies between 11 and 13, depending upon regulatory domain. Because the most of the available channels are framed to overlap with each other, only the non-overlapping channels are typically used. Using the 'BG Channel Set' you can limit the scanning to the non-overlapping channels to decrease scan time, which improves e.g. roaming. Note that the 'Custom' value is not in use, meaning that, it is not possible to create and to use the channel subset of your own.
- **Aggressive Scan:** To sustain WLAN connectivity, there is a special aggressive scan mode on the PL3000 for re-association. When the Aggressive Scan is set to 'On' (a factory default), the aggressive scanning mode (aka aggressive roaming) takes control of roaming as follows. If the PL3000 does not receive the number of beacon frames it expects within the certain period from the AP (referred to as 'current AP') that it has associated with, the aggressive roaming takes place. (Be aware that the AP defines the interval of its beacon frames.) The aggressive roaming does not obey the roam parameters such as the Roam Delta, but it finishes with a successful re-association with the AP (referred to as 'better AP') from which the PL3000 received stronger signal compared to the current one. The aggressive roaming may also end if the beacon frames are captured again at the expected 'rate' from the current AP. If the association with the current AP is lost before finding

a better one, the aggressive scanning stops and the WLAN driver follows its normal procedures for WLAN association. (Of course, you may need to bring your PL3000 within the range of some access point that your PL3000 can associate with.)

**Note!** Some access points have a configuration parameter referred to such as 'Broadcast Wireless Network Name (SSID)', meaning that you can prevent the access point sending its SSID in one way or another. However, the SSID is an important scanning parameter. If your access point does not broadcast its SSID, the 'Aggressive Scan' mode and the roaming may not work as expected. In addition, hiding an SSID can cause problems with 802.11 management in general. Over and above, disabling AP's SSID broadcasting does not provide any real security for your WLAN network.

### Miscellaneous WLAN Global Settings

- **CCX features:** (Cisco Compatible Extensions, CCX for short) The default value 'Optimized' of this setting should work OK with autonomous access points, no matter which manufacturer. To disable totally the features of the CCX there is a settings value of 'Off'. If your WLAN network is based on the concept of Cisco wireless LAN infrastructure, you may set this parameter to 'Full'. Be aware that the 'Full' setting overrides the settings as follows: all the roaming parameters (see above) and a 'Tx Power' setting of an active profile (see a 'Profile' properties page). On the other hand, the 'Optimized' value omits the following features of the CCX: AP-assisted roaming, AP-specified maximum transmit power, and radio management.
- **WMM:** (Wi-Fi Multimedia) This is an on-off switch to enable or to disable a multimedia extension of the WLAN communication. As an aside, WMM (aka 802.11e) provides basic Quality of Service (QoS) features to your IEEE 802.11 network. If you enable the WMM on your PL3000, check that your access point also uses the WMM property and vice versa.
- **Auth Server:** If your WLAN network access control is based on some EAP method, and if the SDC Supplicant is in use, the Auth Server setting is worth considering; especially if your authentication server is Cisco Secure ACS. The Auth Server parameter can have two values: 'Type 1' and 'Type 2'.

**Hint:** In case of troubles with WLAN connection establishment, you may capture WLAN frames using WLAN protocol analyzer (of course, assuming that you have an analyzer at your disposal). If it seems that your PL3000 and your access point communicate with each other, and that the analyzer can capture the wireless frames including the EAP request (Header's Code field: '1'; sent by the access point), in that case, check the 'Type' field in the EAP request message and see if the value matches the value of the Auth Server setting (assuming that the 'Type 1' means the value '1' in the EAP 'Type' field.) If not, changing the value of the Auth Server to correspond to the 'Type' value in the EAP request message may help in getting rid of the problem. In addition, you may need to adjust an 'Auth Timeout'.

- **Auth Timeout:** Like the Auth Server, this global setting has an effect on the SDC Supplicant only. The Auth Timeout instructs the supplicant to wait for an EAP request from an access point for a period of the Auth Timeout in seconds before giving up waiting. The value of the Auth Timeout shall be set in the range of 3 to 60 seconds. If it should happen that the timeout takes place, the SDC Supplicant may prompt you to insert your EAP method-dependent credentials although the EAP request is missing. However, if you specified the credentials during the setting-up WLAN interface on your PL3000, as the timeout takes place, a try at associating with the wireless LAN just ends without notifying you of a missing EAP request.
- **TX Diversity:** Your PL3000 incorporates two WLAN antennas. By default the PL3000 uses both the antennas for transmission. In other words, it utilizes antenna diversity (aka space diversity). If you change a RX Diversity parameter it may be reasonable to change the value of the Tx Diversity as well. Otherwise, it is recommended that the radio uses Tx diversity, because it typically guarantees best performance of the WLAN connectivity.
- **RX Diversity:** Radio signal's quality at the receiver end is very vulnerable to variations in the signal transmission path, especially when the antennas at the receiver and transmitter ends move relative to each other. For that reason, antenna diversity is used to get better probability to construct the most likely transmitted signal at the receiver end. By default your PL3000 uses antenna diversity for receiving transmitted messages, and more often than not, the default value of the Rx diversity gives you the best performance of the WLAN connectivity.
- **Frag Thresh:** The IEEE 802.11 wireless LAN uses a fragmentation threshold in its medium access control (for short MAC). This parameter in the MAC can be configured with the 'Frag Thresh' setting. Any frame longer than the value of the fragmentation threshold, the MAC splits into smaller units for transmission. The default value '2346' is the maximum length of the MAC frame that can be transmitted over the air. The minimum value that you can enter in the 'Frag Thresh' field is 256. Be aware that setting this parameter is a trade-off between a frame overhead and likelihood of getting a frame across to the access point without errors. The shorter is the length of a frame the higher is the likelihood of getting the frame through, but shorter frames generate more overhead for transmission than longer ones.
- **RTS Thresh:** In the WLAN environment there is a common occurrence that stations' talks overlap, that is, more than one station transmits to an access point at the same time. In general, this occurrence is referred to as hidden node problem. Because of possible hidden nodes, WLAN stations use

RTS/CTS handshaking mechanism to clear the medium, meaning that a station use RTS/CTS handshake before sending an actual message frame. The 'RTS Thresh' tells the WLAN driver on your PL3000 that the RTS/CTS handshake shall precede the transmission of the frames being longer than the value set to the 'RTS Thresh'. The standard says that the RTS threshold should be set to 2347 bytes, meaning in practice that the RTS/CTS feature is disabled because the maximum value of the 'Frag Thresh' is 2346 bytes. Thus, to enable the RTS/CTS feature on your PL3000 the value of the 'RTS Thresh' shall be below the value of the 'Frag Thresh'.

- **Certs Path:** The Certs Path tells the SDC Supplicant (not the WZC) where to find a CA (Certificate Authority – the issuer of the server certificate) certificate to check that the network is trustworthy when the authentication server sends its certificate. Before keying in any directory name into this field, be aware that the SDC Supplicant uses the default directory as a certificate store as follows: `\Windows\Programs\Summit\Certs`. Try first to upload and store the required certificate in that directory without specifying the Certs Path. Over and above, be aware that you have to tap on a 'Validate Server' checkbox to be checked when you define your WLAN profile in the SCU, so that the SDC Supplicant verifies the validity of a server certificate. By default the SDC Supplicant does not prove WLAN trustworthiness on an EAP-based port authentication.

### Miscellaneous Global Settings Assigned to SCU Utility

- **Tray Icon:** This is an on-off switch to enable or to disable whether or not the SDU Supplicant icon is in view in the annunciator area on the taskbar.
- **Hide Password:** It is possible to disguise sensitive information such as WPA-PSK or WEP key information in the SCU fields using this global parameter. The Hide Password is an on-off switch. You can see the result of the change if you check the value of an Admin Password.

**Note!** The Hide Password has the significance only when SCU settings are password protected. By default that is not the case. If you want to lock the SCU settings with an admin password, please contact NordicID's technical support and ask how to enable the 'Admin Password' protection in the SCU utility.

- **Admin Password:** In the field of the Admin Password you can key in the administrator password of the SCU utility. Default password is 'SUMMIT'. However, the SCU settings are not password protected by default, so the Admin Password has no meaning before the feature of the administrator password in the SCU is enabled. To enable the admin password, see the text box above.

### Settings of SCU Ping Utility on 'Global' Page

On the 'Diags' page in the SCU utility there is a button to start pinging some IP-address. The settings below apply to that feature of the SCU.



- **Ping Payload:** This parameter defines the packet size of the ping request (ICMP echo request) that the SCU Ping sends. A tap on the Value field displays the values the Ping Payload can have.
- **Ping Timeout ms:** The value of this setting specifies in milliseconds how long the Ping utility waits for the reply to its request before it declares that the other end did not reply to that particular request. The Ping Timeout can have the values in the range of 1 to 30000.
- **Ping Delay ms:** Setting the value to this parameter tells the Ping utility the time between successive ping requests in milliseconds, that is, how often to send a ping request. The Ping Delay can have the values in the range of 0 to 7200000.

### Choosing WLAN Supplicant

Security part of the WLAN configuration starts a supplicant selection. At this point the security requirements of connectivity on your WLAN network come into play. (To recall the supplicants from which to choose, there are the Windows CE built-in supplicant referred to as 'WZC', and the third-party supplicant referred to as 'SDC Supplicant'.)

The selection of the supplicant may follow the line of reasoning as follows:

1. If your WLAN connectivity is based on some EAP method, advance to the step 2. Otherwise, the SDC Supplicant is a good starting point for your WLAN connectivity. If you decide to select the SDC Supplicant, you need not do anything in this phase; the SDC Supplicant is selected by default (assuming that the WLAN on your PL3000 is in its factory defaults. If that is not the case, see the 'Changing Supplicant of WLAN Connectivity' section on the next page).
2. If your authentication (RADIUS) server being in use is Windows IAS Server (in that case, your WLAN EAP-method is most probably either EAP-TLS or PEAP/MS-CHAPv2), playing safe you may choose the WZC supplicant. To select the WZC, see the 'Changing Supplicant of WLAN Connectivity' section on the next page. Otherwise, proceed to the step 3.
3. If your RADIUS server is Cisco Secure ACS, or if your WLAN networking is built on Cisco wireless LAN infrastructure, the SDC Supplicant is obvious choice to play it safe. In that case, you do not need to do anything; the SDC Supplicant is a factory default. Otherwise, proceed to the step 4.
4. In the case of other RADIUS servers (excluding the Windows IAS Serve and the Cisco Secure ACS) if your EAP method is EAP-TLS the WZC is good starting point for the EAP-TLS authentication, otherwise it may be reasonable to use the SDC Supplicant.

**Note!** The above-mentioned recommendation about selecting the 802.1X supplicant is just one approach. For example, in the case of non-EAP authentication it could be also straightforward to use the WZC supplicant depending on how your WLAN access point presents its authentication/encryption configuration options. So, take the above-mentioned line of reasoning as a suggestion for selecting the supplicant.

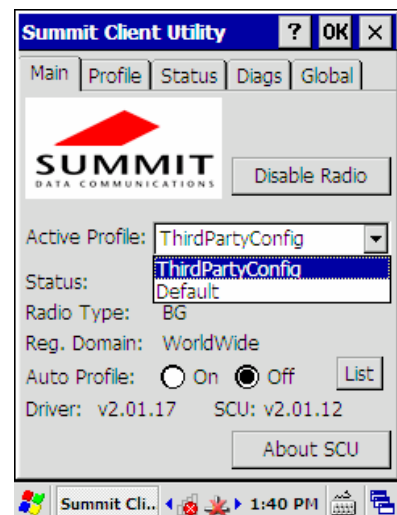
Once you have selected the supplicant you have also selected the WLAN profile for your WLAN supplicant, although in the case of the SDC Supplicant, the 'Default' profile may not be a final one for your WLAN connectivity. No matter which supplicant is in use, there are radio settings relating to each profile. The SCU makes those settings available on the 'Profile' page in the SCU; see the section 'Radio Settings Relating to SCU Profile' on page 70.

### Changing Supplicant of WLAN Connectivity

Before you begin, open the SCU utility (see the section 'Before Starting to Configure WLAN' on page 62) and select the Main page, if not selected. If the Active Profile field has 'ThirdPartyConfig' written on it, the WZC supplicant is in charge of WLAN connectivity. Other profile names in the Active Profile list refer to the SDC Supplicant. Before any SDC profile creation, the list includes only 'ThirdPartyConfig' and 'Default' profiles, meaning that the 'Default' indicates the SDC Supplicant.

**To change WLAN supplicant to the other:**

1. Tap on the 'Active Profile' field
2. Select the profile name of your choice from the list; the SCU prompts you to suspend/resume your PL3000 before your selection is in use. The warm boot does not make any difference; use what suits your particular case.



**Note!** The SCU does not prompt you to suspend/resume your PL3000 if you are changing a profile within the SDC Supplicant. In that case, this operation is done with.

3. Tap on the 'OK' button in the notification box to close it
4. Power down your PL3000 by holding down the Power button until the screen goes blank (or warm boot your PL3000, if it is running off mains).

5. Power your PL3000 up; the WLAN supplicant is changed.

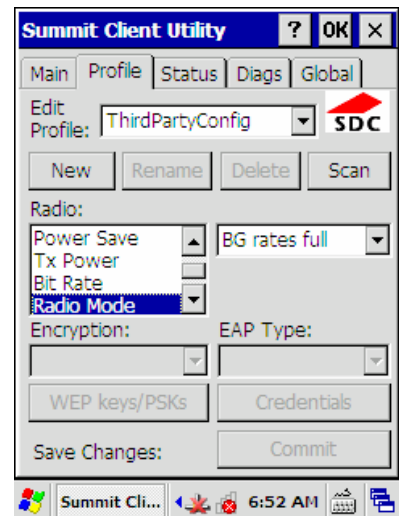
If you selected the 'ThirdPartyConfig' profile, the WZC opens its utility window on screen when your PL3000 is up and running again. A 'Wireless Information' page is usually in view immediately, and it starts showing the SSIDs of the access points being within range. However, before moving on to the section 'Configuring WLAN Interface of Native WZC' on page 72, you may need to check on the radio settings of your selected profile, see the section 'Radio Settings Relating to SCU Profile' below.

**Hint:** When the WZC supplicant (Active Profile: ThirdPartyConfig in the SCU) is in use there are both the WZC supplicant's icon and the SCU icon visible on the taskbar. You can hide the SCU icon using the 'Tray Icon' switch on the Global page in the SCU, if need be.

### Radio Settings Relating to SCU Profile

In the case of the 'ThirdPartyConfig', it would be well to go through the radio settings that the SCU makes available for each profile before continuing the configuration of the rest of the WLAN in the WZC. With the 'Default' profile the line of actions is different. Usually, it is not reasonable to tweak the radio settings of the 'Default' profile but the final one that you specify when you are attaching your PL3000 to your WLAN under the SDC Supplicant.

Before you begin, open the SCU utility (see the section 'Before Starting to Configure WLAN' on page 62) and select the Profile page. The radio settings on the Profile page follow the same logic as the global settings on the Global property page. Selecting the radio property on the left-hand side makes the value(s) of the property available in the (value) field on the right-hand side of the property list. When you select some property the value field shows its current value. If you want to change the value of the property, a tap on the value field opens the list of the values available for selection. Changing the value in the field without tapping the 'Commit' button does not get the change to come into use. A tap on the 'Commit' button also saves your configuration settings permanently.



## CHAPTER FIVE - CONECTIVITY

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**Note** that a right profile in the 'Edit Profile' field is selected before you begin.

- **Client Name:** This parameter is odd one in this context. The SCU uses it internally. If you want to give a name to the client of the ThirdPartyConfig profile or to the client of some other profile, you can enter it in this field, and you will find the name in use on the Status property page.
- **Power Save:** The point of this property is to tell the driver of the WLAN radio how to consume power – or, to put it another way, how to save battery energy. Be aware that the selected power mode is a trade-off between WLAN throughput and power consumption. The power Save can have the following values: 'CAM', 'Maximum', and 'Fast'.

CAM (Constant Awake Mode): In this mode the radio's transceiver is always on, that is, there is no power management in use in the WLAN adapter. Even if you were looking for the best WLAN throughput, the CAM setting can be hardly recommended because the power consumption of the WLAN adapter is significant in this mode.

Maximum: Maximum means that power-saving is maximized. This mode is suitable, if your data or other traffic over the wireless link is not sensitive to variability in delays.

Fast: If you look for something that is optimized between the power consumption and the WLAN throughput, in that case the 'Fast' is a selection. It is a factory default, and it can be recommended in most cases.

- **Tx Power:** If you need to reduce the radio's transmitting power on your PL3000, you may use this parameter. By default, the transmitting power is set to 'Maximum'. Be aware that the 'CCX features' setting on the Global property page affects the 'Tx Power' property. If the 'CCX features' is set to 'Full' on your PL3000, the WLAN driver expects that your access point(s) controls the transmitting power of the WLAN adapter on your PL3000, - or, to be more precise, the transmitting power is controlled from the direction of your AP(s).
- **Bit Rate:** If, for some reason, you need to fix speed on your WLAN connectivity with some particular transmit rate, this parameter makes it possible to do that on your PL3000. Otherwise, the default value being 'Auto' should work OK.
- **Radio Mode:** This parameter with its values refers to the speeds at which your WLAN connectivity would operate. In other words, the Radio Mode defines the connectivity types that your WLAN communication can use.

BG rates full: By default your PL3000 is able to communicate both the 802.11b and the 802.11g rates, which is a good starting point for the WLAN connectivity.

B rates only: If your access point operates only in 802.11b mode, the 'BG rates full' should work as well but you may prefer this value in that case.

**BG subset:** This settings value is a special mode for use **ONLY** with Cisco AP's running in autonomous mode. If your WLAN access points are manufactured by Cisco and the access points are not lightweight ones, you must set the 'Radio Mode' to 'BG subset'.

**G rates only:** It is also possible to use only 802.11g rates for WLAN connectivity, but it is probable that some association difficulties with access points may appear with this mode.

**Ad Hoc:** (This value is available only if you are specifying the SCU profile under the SDC Supplicant.) If you need to establish an ad hoc link between your PL3000 and another WLAN device, set the Radio Mode to 'Ad Hoc'. The ad hoc mode requires as well that you set your ad hoc profile to SSID being the same that the ad hoc counterpart uses. Static WEP key is optional on the ad hoc link. (You may also find the ad hoc feature in the WZC.)

### Configuring WLAN Interface of Native WZC

When the 'ThirdPartyConfig' profile is set active in the SCU and the PL3000 is working again after power cycle, the WZC utility (called 'Network Status Monitor') opens its window on the screen. It may also be that the Network Status Monitor does not show up, if the WZC can associate with the network for which it has configuration (in the WZC terminology, configurations for 802.11 networks are called preferred networks). In the case of no preferred network(s) is configured, or if there is no preferred network(s) within range, the WZC shows up its Network Status Monitor utility when you have powered up your PL3000.



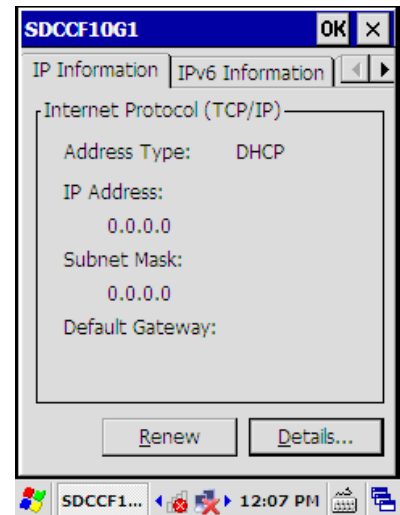
If you need to get the Network Status Monitor shown on the screen without warm boot, the only way is a double tap on WZC icon on the taskbar. The icon on the taskbar has two appearances. Both the appearances inform that the WZC is up and running but the difference is whether or not the TCP/IP stack is ready to communicate. (The stack is ready to communicate when the WLAN interface has been assigned to IP-address after the PL3000 has associated with WLAN network.)

### Introduction to Network Status Monitor

Network Status Monitor gives an adapter view of the wireless LAN communication. Accordingly, the title text in the Network Status Monitor window is rather cryptic and it refers to the name used internally by Windows Embedded CE for the instance of the wireless LAN adapter driver. The Network Status Monitor presents three property pages: IP Information, IPv6 Information, and Wireless Information.

### IP Information Pages

The IP and the IPv6 Information pages give current status of the IP address information assigned to the wireless LAN interface. The pages have the same function as the Network Status Monitor taskbar icons, but the information is available in dotted-decimal notation format. If you assign a static IPv4 address to the WLAN interface the IP address will be shown on the IP Information page as your PL3000 has gained full access to wireless LAN network. On the other hand, if you select the DHCP option, the pages show the IP address information once the device has received that information from the network after the completion of WLAN authentication and association.



In a sense, the IP and IPv6 Information tabs are mutually exclusive because the IP networking is typically based on either the IPv4 or IPv6. So the IPv6 Information page is not very informative in the case that the IP networking uses IPv4 addressing scheme.

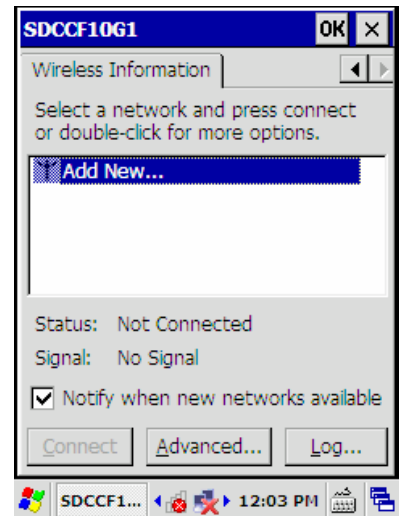
**Note!** The assigned IP-address to the WLAN interface may not always be valid in the networking context. In particular, if DHCP address assigning fails the WZC may assign an IPv4 address with the 169.254/16 prefix to the WLAN interface on your PL3000. The IPv4 address with the above-mentioned prefix is valid for link-local communication only. (The link-local IP-address is used for the communication across ad-hoc links, for further information see IETF RFC3927)

### Wireless Information Page

The most informative part of the Network Status Monitor becomes visible on the Wireless Information page. The page permits you to set a preferred network configuration, and to configure the behavior of WZC itself. The Wireless Information page also shows the wireless LAN devices being within range in its list window – a **network view**. The WZC updates the list in the network view on a regular basis, which is based on the beacon frames the WLAN adapter has received within the refreshing period of the network view.

The network view gives two different approaches to the wireless LAN configuration as follows:

1. By tapping on the 'Add New ...' list item in the network view
2. By tapping on the network name (SSID) shown in the list



**Hint:** As you specify wireless networking parameters such as authentication and encryption to join your PL3000 to the desired service set (SSID) you make a 'preferred network' of that SSID.

**Status** field on the page tells connection state of the wireless LAN adapter.

**Signal** field on the page expresses the signal strength/quality the WLAN adapter sees from the other end of the established wireless link.

The checked '**Notify when new network available**' enables (unchecked disables) the Network Status Monitor to appear on the screen, for example, after the warm-boot, provided that you have not specified the preferred network.

If the 'Notify when new network available' checkbox is checked, the appearance of the Network Status Monitor window does not necessarily happen when the device awakes from the suspended state. In that case, the stress is placed on the word 'new', that is, only if the WZC has received a new SSID broadcast message by sweeping from channel to channel, it shows up its Network Status Monitor as long as there is no preferred network(s) assigned to the WLAN interface. The WZC retains the found SSID information over the sleep/awakening (suspend/resume) cycle. On the other hand, if your PL3000 is up and running and it has a working wireless LAN association, the appearance of a new SSID does not get the Network Status Monitor with its Wireless Information page to show up on the screen.

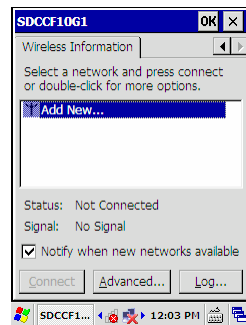
Despite the fact that assigning a preferred network(s) to the WLAN interface has an influence on the pop-up feature of the Network Status Monitor, the assigned, preferred network does not hinder the Network Status Monitor from

showing up on the screen. If the check box is checked, and for some reason the WZC is unable to connect to the preferred SSID(s), the Network Status Monitor with its Wireless Information page appears on the display after the WZC has made either an unsuccessful search for the preferred network(s) or an unsuccessful attempt to associate with the preferred network(s).

A tap on the '**Connect**' button forces the WZC to try to associate with the selected SSID in the network list.

A tap on the '**Advanced ...**' button opens the configuration window of the WZC showing e.g. a preferred list of the networks for deleting network configurations from the WZC, and for rearranging the preferences for the configured networks.

A tap on the '**Log ...**' button reveals the WLAN events the WZC has recorded since the last rebooting of the device.



If you are not attaching your PL3000 to any available network or if the available network access point(s) does not broadcast its SSID, in that case, using the 'Add New ...' option you are able to add a network to the preferred network list of the WZC supplicant. Using the 'Add New...' option you need to set the configuration from scratch meaning that you have to know beforehand a network name (SSID), the type of network authentication and encryption used by the WLAN network.

### Setting up WLAN Interface - Add New ...

By default the 'Add New ...' suggests you the highest level of security being possible in the wireless LAN standards. If it should happen that you have to specify EAP-TLS 802.1X authentication type, you may

first require using a 'Certificates' applet being available in the Control Panel for manual certificate enrolment.

Before you begin, open the Network Status Monitor with its Wireless Information page on the screen by tapping first on its icon on the taskbar, and after that tapping on the Wireless Information tab. If the Wireless Information tab is not in view, use the arrow buttons on the right-hand side of the tab row for getting the Wireless Information tab visible.

#### To add new preferred network:

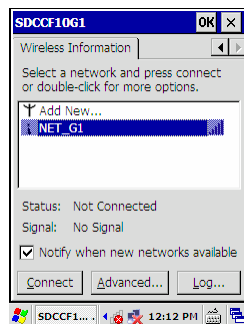
1. Double-tap on the '**Add New ...**' list item in the network view window; a 'Wireless Properties' dialog box opens
2. Enter the **network name** in the Network Name (SSID) -text field
3. Select the '**Authentication**' used by the network, this selection is necessary for the rest of the settings. The authentication selection controls the options and fields being available for further configuration.
4. Select the '**Encryption**' used on the wireless LAN



5. Chose the appropriate options from the rest of the enabled setting fields. For example, enter the network key if the 'Network key' field is enabled.

**Note!** In the case of the configuration for the network SSID, the '**This is an ad-hoc network**' check box is leaved unchecked.

6. Tap on the '**OK**' button, the WZC attempts to connect to the network which you just made a preferred network. If the connecting attempt results in the message: 'Failed to connect', it is very likely that there is no network access point available. If that is not the case, check the settings you made e.g. the 'Network key', if applicable; see also the 'Log', it may hold some clue to the cause of the failed connecting attempt.



### Setting up WLAN Interface - SSID Available

This configuration case applies if your WLAN access point(s) broadcasts SSID, assuming that your PL3000 is within range of some access point on your WLAN network.

Before you begin, open the Network Status Monitor with its Wireless Information page on the screen, by tapping first on its icon on the taskbar, and after that tapping on the Wireless Information tab. If the Wireless Information tab is not in view, use the arrow buttons on the right-hand side of the tab row for getting the Wireless Information tab visible.

**To attach your PL3000 to a WLAN network, the SSID of which is listed in the network view:**

1. Wait for a little while so that the WZC gets the WLAN channels scanned for a beacon frame of the desired SSID, and shows the **SSID** in the network view on the Wireless Information page
2. Double-tap on the **SSID** (network name) row in the network view; a 'Wireless Properties' dialog window opens

**Hint:** The WZC has already filled the '**Network name (SSID)**' field, and has selected the '**Encryption**' and the '**Authentication**' being in use on the wireless LAN

## CHAPTER FIVE - CONECTIVITY

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3. Choose the appropriate options from the rest of the enabled setting fields (see the text box above). For example, enter the network key if the 'Network key' field is enabled.

**Note!** In the case of configuration for the network SSID, the "This is an ad-hoc network" check box is leaved unchecked.

**Note!** If your WLAN uses EAP-TLS authentication you have to select appropriate certificates. In case you cannot find the required certificates, you have to import (enroll) the certificates into the Windows Embedded CE, for example, manually with the help of the 'Certificates' control panel applet before you are able to get your PL3000 connected to the desired wireless LAN.

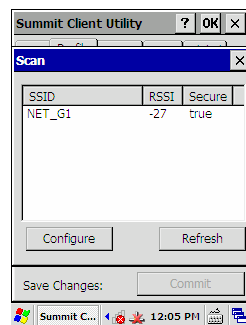
4. Once you have chosen the other wireless networking options, tap on the 'OK' button. The WZC attempts to connect to the network which you just made a preferred network. The connecting attempt should succeed, and you should see in the 'Status' field the following information: 'Connected to <SSID>'. Otherwise, check the settings you made e.g. the 'Network key', if applicable; see also the 'Log', it may hold some clue to the cause of the failed connection attempt.

**Note!** If you test whether or not the established wireless link works, for example, by using an Internet Explorer or a ping utility in the command prompt window, the connectivity test may fail because your PL3000 has not the IP address being valid for networking. To check which IP address and network mask are assigned to the WLAN interface, open the IP Information pages, either IP Information or IPv6 Information page, depending on the addressing scheme in use. (For further information, see section 'Introduction to Network Status Monitor' on page 73)

### Configuring WLAN Interface of SDC Supplicant

In the SCU utility, configuring the WLAN interface for the SDC Supplicant forms a new profile. To end in the new profile may happen in two ways. Either you give a name to profile, which creates a new profile, or the SCU guides you through the WLAN configuration steps, which creates a new profile with a name of the SSID that your access point broadcasts. The following two illustrations of the WLAN configuration show both the above-mentioned approaches.

**Note!** Creating and configuring a new profile does not make the profile active. The SCU utility does not put a new profile to use after its creation and configuration, but you have to select the new profile in the field of the 'Active Profile' on the Main property page in the SCU. When the profile is selected the active one, the SDC Supplicant operates according to the profile rules.



#### Configuring WLAN Interface under SCU Guidance

Configuring the WLAN interface under the SCU guidance requires that your AP broadcasts its SSID.

Before you begin, open the SCU utility (see the section 'Before Starting to Configure WLAN' on page 62) and select the Main page, if not selected. Check that the value 'Default' has selected in the Active Profile field. If that is not the case, change the active profile to 'Default' (see the section 'Changing Supplicant of WLAN Connectivity' on page 69). After that tap on the 'Profile' tab to open the Profile page.

#### To configure WLAN interface under the SCU guidance:

1. Tap on the 'Scan' button on the Profile page; the SCU opens its Scan window. The Scan window shows the SSIDs being within range.

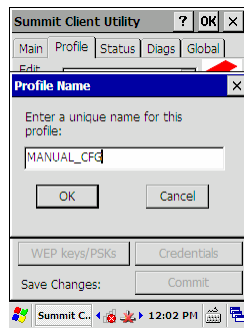
**Note!** If you do not see the SSID that you may expect, tap on the 'Refresh' button.

2. Tap on the **SSID** of your choice in the scan window to select with which SSID your PL3000 shall associate.
3. Tap on the '**Configure**' button in the Scan window; the SCU informs you what kind of configuration is in question and what steps shall be taken during the configuration.
4. Tap on the '**Yes**' button if you want to continue with the guided operation.

**Note!** The following steps forward may vary according to the authentication and the encryption options being in use on your access point. In this particular case the SCU informs that the access point expects WPA2 PSK encryption, and there is no EAP in use.

5. Enter the **security relevant information** (in this particular case, pre-shared key in its field) according to the text in the window that opened on the screen.
6. Tap on the '**OK**' button; you have completed the guided configuration.
7. Tap on the '**Commit**' button on the Profile page to save the profile you just created. The '**Commit**' button saves your configuration settings permanently

Now you have the new profile with the configuration for your WLAN connectivity, meaning that your PL3000 is ready to get connected to your access point. However, the guided configuration did not necessarily take the 'Radio' properties on your WLAN network into account with the exception of the SSID. So before you move on to the section 'Associating PL3000 with Access Point under SDC Supplicant' on page 82, see first the section 'Radio Settings Relating to SCU Profile' on page 70. On the Profile page, you can also change the SCU profile's those parameters that the guided process already set, if need be.



### Configuring WLAN Interface by Creating SCU Profile

If the guided configuration task is not suitable to configure the WLAN interface of your PL3000, there is an alternative way of configuring WLAN by inserting the required configuration information manually. Before entering an actual configuring task you have to create a SCU profile, a skeleton for configuration data. After that you can assign a network name (SSID), and the type of network authentication and encryption with the required security information to the created SCU profile. Once you have got the SCU profile ready for your WLAN connectivity, you can set the Active Profile field (on the Main page in the SCU) to the name of your new WLAN profile: the SDC Supplicant starts to associate with your WLAN network.

Before you begin the profile creation, open the SCU utility; see the section 'Before Starting to Configure WLAN' on page 62. After that, tap on the 'Profile' tab to open the Profile page.

#### To create SCU profile for your WLAN connectivity:

1. Tap on the '**New**' button on the Profile page to give a name to your WLAN connectivity in the SCU.
2. Enter the **name of your choice** in the field in the window opened on the screen.
3. Tap on the '**OK**' button in the window; the profile is created.

Before you continue with the WLAN interface configuration on the Profile page, make yourself familiar with 'Radio' properties of the profile; see the section 'Radio Settings Relating to SCU Profile' on page 70. Be aware that there is only one mandatory parameter for the WLAN configuration among the 'Radio' settings; you have to define SSID, the others may work OK by default.

#### To assign configuration information to the just created profile:

1. Tap on the **SSID** in the 'Radio' property list to select the SSID property.
2. Enter the **SSID of your WLAN network** in the field on the right-hand side of the 'Radio' property list.
3. Tap on **other 'Radio' settings** in the list and change their values, if **need be** (see the section 'Radio Settings Relating to SCU Profile' on page 70).
4. In the 'EAP Type:' field, 'None' is OK unless **your WLAN connectivity uses EAP authentication**. If that is the case,
  - a. Tap on the '**EAP Type:**' field to get the list of EAP authentication methods in view the SDC Supplicant supports.
  - b. Select the **relevant EAP type** by tapping on it in the list

- c. Tap on the '**Credentials**' button and enter the required security information in the window that opens

**Note!** If you want that the SDC Supplicant verifies the validity of a server certificate, meaning that the supplicant validates that it connects to the network that is what it claims to be, you have to check the 'Validate server' checkbox. If you do that, there are two possibilities where to put a CA certificate. The CA certificate can be stored either in the certificate store of the Windows CE or somewhere in the directory hierarchy. (For more information, see the description of 'Certificates' applet in the section 'Control Panel Applets' on page 32 and the description of the 'Certs Path' on page 67 in the section 'Thinking about Global Settings'.) If the CA certificate is stored in Windows CE store, you have to check the 'Use MS store' checkbox as well.

**Note!** In the case of EAP-TLS, a user certificate (your device certificate) must be always stored in the Windows CE certificate store.

5. Tap on the '**Encryption:**' field to get the encryption options in view.
6. Tap on the **encryption type of your WLAN connectivity** in the encryption list to select the encryption method.
7. **If the SCU enables its 'WEP keys/PSKs' button, tap on it to enter the required key material.**
  - a. In the opened window, enter the key material according to the instructions given in the window
  - b. Tap on the 'OK' button.
8. In conclusion, tap on the '**Commit**' button to save your profile. Be aware that a tap on the 'Commit' button saves your configuration settings permanently.

With the finished profile for WLAN connectivity the next step would be to move on to the section 'Associating PL3000 with Access Point under SDC Supplicant' on the next page.

### Associating PL3000 with Access Point under SDC Supplicant

Before you can begin to associate your PL3000 with your access point under the SDC Supplicant, in the SCU utility, there has to be a SCU profile with the proper configuration in addition to the proper global settings for your WLAN connectivity; see the sections 'Thinking about Global Settings' on page 62 and 'Configuring WLAN Interface of SDC Supplicant' on page 78.

#### To associate PL3000 with access point under the SDC Supplicant:

1. Open the **Main** property page in the SCU
2. Select the **SCU profile** for your WLAN connectivity to be an active one
3. SDC Supplicant **starts to associate** with your WLAN network, that is, with the access point for which it has configuration.

**Note!** If your PL3000 does not associate with your access point, you may need to warm-boot your PL3000. After the PL3000 is up and running again it should associate immediately your access point. If that is not the case, check configuration of the SCU profile, especially the security information.

When you have assigned the SCU profile of your WLAN connectivity to the SDC Supplicant (the Active Profile), the SCU remembers it over the different reboot types until you assign a new profile to the SDC Supplicant. When the PL3000 is rebooted or powered up, the SDC Supplicant starts automatically associating with the access point that it has the profile for (of course, with the exception of the 'ThirdPartyProfile' in which case the SCU hands over the responsibility for WLAN association to the WZC supplicant).

**Note!** When your PL3000 has associated with your access point (see the 'Status' field on the Main page in the SCU), it does not guarantee you connectivity over the access point unless your WLAN network issues an IP address to your PL3000. By default on your PL3000, the WLAN interface expects to receive the IP address from DHCP server. If there is no DHCP service available on your wireless LAN, see the section 'Assigning Static IP Address to WLAN Interface' on page 84.

If you do not know whether or not the IP address is assigned to the WLAN interface, tap on the 'Status' tab in the SCU. If there is no IP address below the text 'Device Name', your PL3000 has no IP address by means of which it could have a networking. However, if there does be an IP address below the text 'Device Name', see the next 'Note' box.

**Note!** The assigned IP-address to the WLAN interface may not always be valid in the networking context. In particular, if DHCP address assigning fails, the WLAN subsystem on your PL3000 may assign an IPv4 address with the 169.254/16 prefix to the WLAN interface. With the above-mentioned prefix the IP address is valid for link-local connectivity only. (The link-local IP-address is used for the communication across ad-hoc links, for further information see IETF RFC3927)

### Getting More Than One SCU Profile Active

Under the SDC Supplicant, it is possible to broaden the one active profile practice so that the SDC Supplicant sees more active profiles than only one. In the SCU terminology this property is called '**Auto Profile**'. There are 'On' and 'Off' spots of the 'Auto Profile' on the Main property page in the SCU.

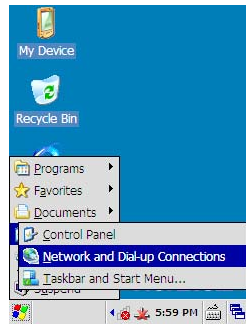
1. A tap on the '**On**' spot gets the SCU to tell you what to do if you are enabling the Auto Profile.
2. After closing the pop-up message window, the SCU directs you to select profiles for an active profile list, just press the '**ok**' button on the keypad.
3. When you have selected profiles for the active list (assuming that you have more than one profile being created and configured), tap on the '**On**' spot again on the Main page.

Now, according to its profile list, the SDC Supplicant begins scanning the access points for which it has the configurations to associate with.

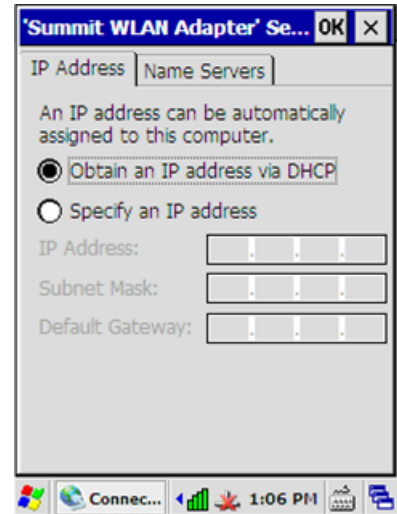


### Assigning Static IP Address to WLAN Interface

When your network provides DHCP service there is no necessity to configure networking part of the WLAN communication. By default the device expects to obtain IP-address information from the local area network to which the access point is attached. If the DHCP service does not exist on your WLAN infrastructure, or if you prefer to assign a static IP address, using the 'Network and Dial-up Connections' panel you may assign a static IP address to the WLAN interface.



To assign static IP-address to WLAN Interface:



1. Open the 'Network and Dial-up Connections' control panel applet (see the adjacent figure).
2. Double-tab the **SDCCF10G1** icon in the panel window, the IP address property sheet of the WLAN interface opens on the display.
3. On the 'IP Address' page, select the 'Specify an IP address'.
4. Enter your **IP network information** in their particular fields on the 'IP Address' page. If need be, fill the fields on the 'Name Servers' page.
5. Tap on the 'OK' button; the static IP address is assigned to the WLAN communication.

### GPRS



GPRS connectivity is available on your PL3000, if your PL3000 incorporates the GPRS modem, and you have a GSM SIM card that has been assigned to GPRS property. In addition, the GPRS connectivity needs that your service provider has activated your SIM card on its cellular network. To check whether or not your PL3000 includes the GPRS modem, see the description of the 'NID WWAN' applet on page 37 in the section 'Control Panel Applets'.

To put the GPRS to use on your PL3000, you need first to install SIM card on your PL3000. Having installed the card you have to configure the GPRS parameters of your network operator for the GPRS connectivity using the 'NID WWAN' applet. Once those operations are done with, the GPRS connectivity is always available on your PL3000 when the PL3000 is up and running, assuming that you have saved the settings permanently, and that PL3000 is able to receive power level good enough from a base station on the cellular network of your network operator.

**Note!** There is also one thing you have to check out, when you put the mobile option to use on your PL3000. If your device uses the basic battery package, check that the battery package is 2600mAh in capacitance, because the 2600mAh battery is designed in particular for use on the PL3000 with the mobile option. If the battery is not 2600mAh (or greater) in capacitance, you can temporarily use the older version of the battery package until you have obtained a proper one.

**Hint:** When you are choosing your GPRS mobile network operator, check the following thing of the network operator's GPRS implementation. One quality aspect of GPRS connectivity is how the radio resources within a cell are chosen to be allocated for GPRS data traffic and for mobile phone calls. If the strategy for traffic engineering GPRS is not based on, for example, a fix channel pool for GPRS traffic, the GPRS connectivity is subject to breakdown within peak periods of speech calls. Typically, the strategy for distributing channel capacity among GPRS traffic and voice within a cell divides the mobile network operators into two camps: favorable and unfavorable for GPRS networking although both the camps provide GPRS network services.

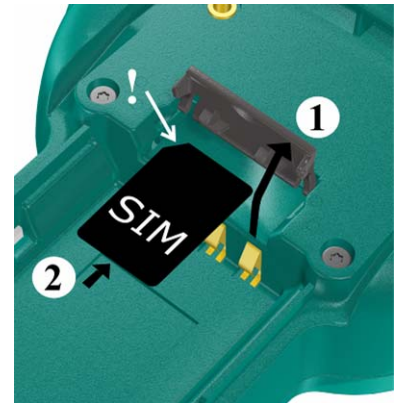
### Installing SIM Card

#### Prologue

Before you can insert your SIM card into its slot on the PL3000 you have to open the battery cover and remove the battery from its chamber. In the case of the pistol grip you need a special screwdriver called a Torx driver. The pistol grip (functioning also as a battery cover) is fastened to the device body with three Torx-8 (T8) screws.

#### Steps One and Two

1. Open the cover of the SIM slot by lifting up the cover by thumb on its edge on the side of the battery chamber.
2. Insert the SIM card into the slot as the adjacent figure shows.

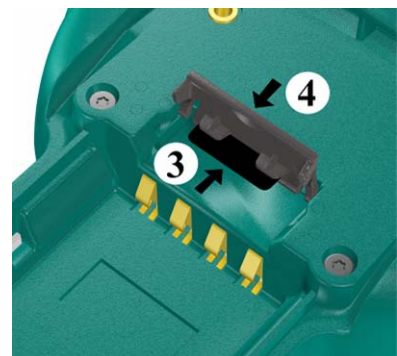


#### Steps Three and Four

3. Press the SIM card that you inserted in its slot so that the lock mechanism of the slot clicks, then your SIM card is locked in its slot.

(If you need to remove the SIM card from the slot, in the same way you release the locked SIM card by pressing it a little bit inwards so that lock mechanism clicks.)

4. Close the cover of the SIM slot.



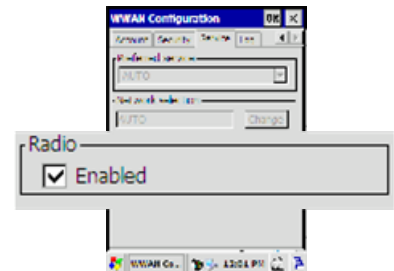
#### Epilogue

Reset your PL3000 by reloading Windows CE (see the section 'Soft-resetting your device' on page 25) after you have installed the battery back to its chamber and fastened the battery cover.

### Attaching PL3000 to GPRS Network

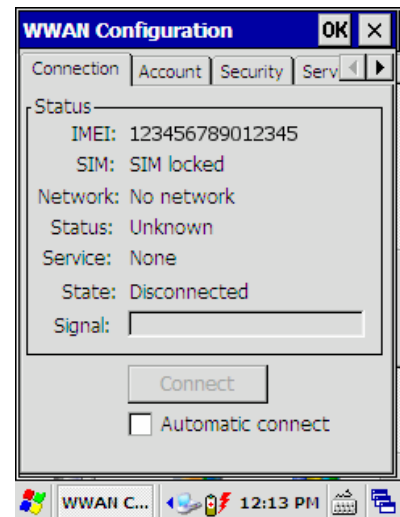
When you have installed the SIM in its slot on your PL3000, the PL3000 is ready to be configured for attaching it to your network operator's GPRS network. If you have not installed the SIM yet, see the section 'Installing SIM Card' in the preceding page.

Before you begin, open the NID WWAN control panel applet (see the section 'Control Panel' on page 30). By default GPRS modem is enabled on your PL3000. To make certain of the modem's state you may tap on the 'Service' tab in the NID WWAN applet. If the radio is not turned on, check the 'Enabled' checkbox in the 'Radio' area on the 'Service' page.



The configuration is an interactive operation in a sense that after you have entered and applied the PIN code of your SIM card, the PL3000 starts synchronizing with a cell of your cellular carrier's network. Thus, the following configuration task is divided into two sections: 'Synchronizing PL3000 with Base Station', and 'Accessing External Packet Network'.

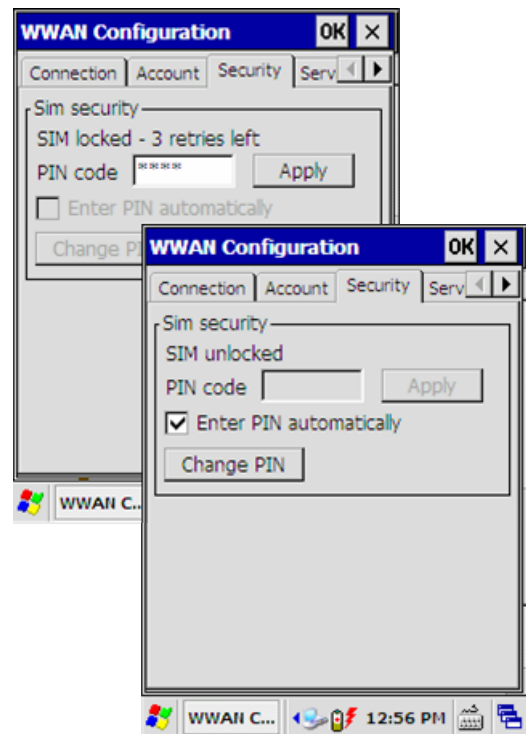
The adjacent figure illustrates the condition early on, after the NID WWAN applet is opened. The Connection page of the applet shows such as the IMEI code of your mobile equipment; there is no network available; the 'SIM:' field displays the inaccessible state of the SIM card. If the 'SIM:' field is empty, you may need to turn on the radio on the 'Service' page.



### Synchronizing PL3000 with Base Station

To get your PL3000 synchronized with base station:

1. Tap on the 'Security' tab to open the Security page.
2. Enter the PIN code of your SIM card in the 'PIN code' field.
3. Tap on the 'Apply' button; wait until the Security page informs you that the SIM is unlocked.
4. Check the 'Enter PIN automatically' checkbox.

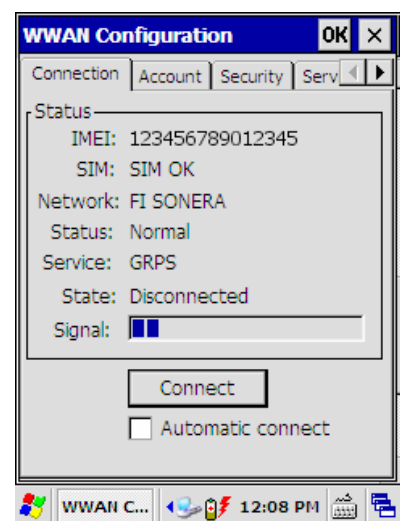


The PIN code is now inserted into the GPRS modem, and your PL3000 is synchronizing with a cell of your service provider's cellular network. The checked 'Enter PIN automatically' checkbox makes it possible next time as you power up your PL3000 that you need not return to this 'Security' page for PIN code insertion but PL3000 inserts the saved PIN code for you. However, these two settings are not yet stored permanently. If you want to do it now, close the NID WWAN applet and see the section 'Making Your Configuration Settings Permanent' on page 97. After that you can return to the NID WWAN applet and check if your PL3000 has synchronized with your service provider's cellular network.

5. If the Connection page is not in view on the screen, tap on the 'Connection' tab to see whether or not your PL3000 is synchronized with your operator's network.

When your PL3000 has found your service provider's network, on the Connection page:

- ✓ The '**Network:**' field displays the name of the network that your PL3000 has synchronized with.
- ✓ The '**Status:**' field tells you the state of the GPRS modem's access to the cell.
- ✓ The '**Service:**' field displays the fastest service available either in your current coverage area or supported by the GPRS modem on your PL3000.

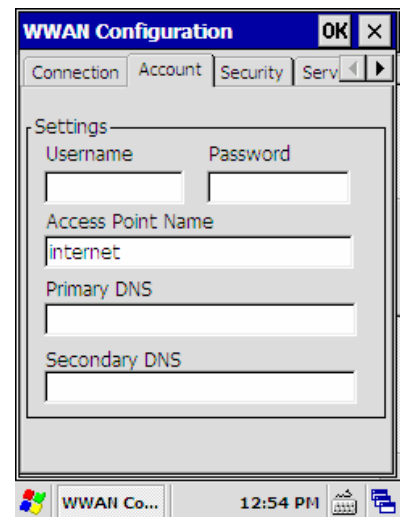


- ✓ The **'State:'** field shows whether or not your PL3000 has connected to the packet network, meaning in practice that whether or not your service provider's network has issued your PL3000 with an IP address information. In this particular case, the 'Disconnected' state is a sign of the uncompleted configuration task.
- ✓ The **'Signal:'** field indicates the received signal strength from the base station.

When your PL3000 is synchronized with a cell of your service provider's network, it assures that your configuration is on track for GPRS connectivity. After completing the following phase, you should have the connectivity over the GPRS network of your cellular data carrier. In fact, you should get access to resources whatever your service provider opens through its access point, the name (APN) of which you should have received from your service provider.

### Accessing External Packet Network

Getting your PL3000 GPRS-attached the PL3000 requires at least an access point name (APN). In addition to APN, some service providers may need some further information on establishing the GPRS connection such as a user name and a password. Even so, for example in the case of Internet access, the user name and the password are not personal ones. The adjacent figure illustrates the case of Internet access in which only APN 'internet' is required. (Be aware that information on 'Primary DNS' and on 'Secondary DNS' are rarely needed.)



### To access external packet network:

1. Tap on the 'Account' tab to enter information required to access the resources that you demand over the GPRS network of your cellular data carrier, see the figure of the Account property page above. If you don't have the GPRS access information available, you may consult your service provider to obtain the required information.

2. Tap on the Connection tab to open the page on which you can attach your PL300 to packet network.

3. On the 'Connection' page, tap on the 'Connect' button, your PL3000 starts attaching to the GPRS network of your service provider (see the adjacent figure).

When your PL3000 is connecting to the GPRS network, the Connection page shows it in its 'State' field. If you need, for some reason, to stop the connection establishment, you can tap on the 'Cancel' button on the Connection page.

Your PL3000 is GPRS-attached to the external packet network, when the 'State:' field on the Connection page displays 'Connected'. If you want to detach your PL3000 from the GPRS network, tap on the 'Disconnect' button. However, when you power down the PL3000, the GPRS modem detaches itself from the network and indicates it to you with a notification sound.

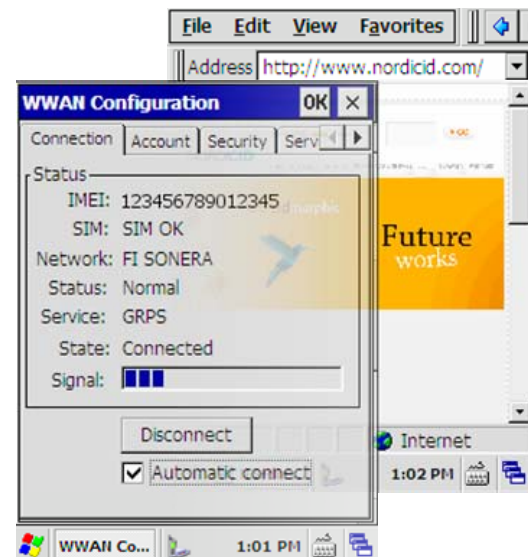
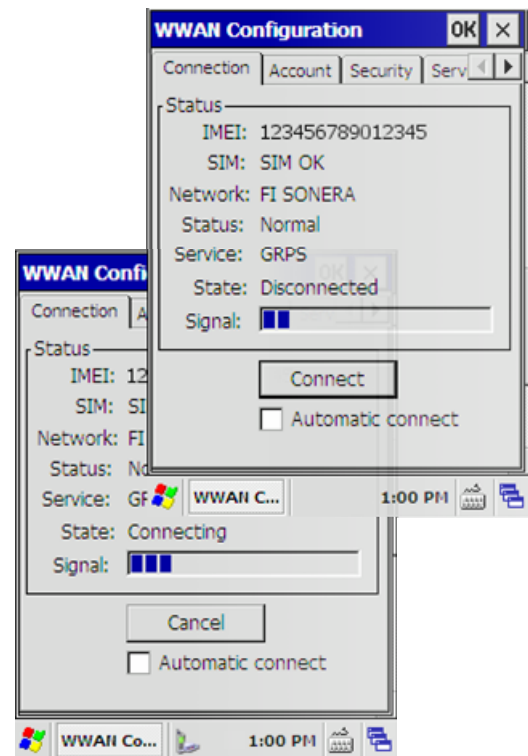
### There remain two optional completion tasks before trying the connectivity:

1. If you want to get your PL3000 automatically to connect to your service provider's network after powering it up, check the 'Automatic connect' checkbox on the Connection page, before tapping on the 'OK' button in the top right-hand corner of the 'WWAN Configuration' window to close the applet.

2. It is also recommended that you make your configuration permanent; see the section 'Making Your Configuration Settings Permanent' on page 97 after closing the control panel.

### Testing GPRS connectivity

You were not probably configuring your PL3000 for Internet surfing. However, if there is available some Web server beyond the access point to which you just



connected your PL3000, you can use 'Internet Explorer' for testing the just established GPRS connection. A double-tap on the 'Internet Explorer' icon on the desktop of the Windows CE shell opens the browser on the display.

## BLUETOOTH



By default the Bluetooth radio is turned off on your PL3000. When you turn on the radio, other Bluetooth devices can discover your PL3000. However, your device does not publish any service by default, so it cannot be connected to through the Bluetooth. In fact, quite probable use for Bluetooth connectivity on your PL3000 is to connect it to another device that provides some service for the program running on your PL3000.

If Bluetooth is used as a part of communication aid in the Windows CE application, the easiest way to build the required functionality is to build it on Bluetooth's RFCOMM communication, of course depending on the required functionality. On the PL3000, ActiveSync is that kind of application that works out of the box above Bluetooth's RFCOMM protocol layer, assuming that you have assigned RFCOMM to some virtual serial port (COM port) for ActiveSync in the 'Bluetooth Device Properties' applet.

**Hint:** Windows CE has two application programming mechanisms to use Bluetooth connectivity above RFCOMM protocol: Winsock API and virtual serial ports API. The preferred method is to use Winsock API to access Bluetooth stack for the simple reason that the socket interface is well known abstraction of the programming interface above transport protocol layer. Furthermore, the Winsock version 2.2 on the PL3000 offers some easiness for Bluetooth stack configuration through the 'setsockopt' and 'getsockopt' calls.

## Turning on/off Bluetooth Radio

The first step to bring Bluetooth into service on the PL3000 is to turn on its radio. In the similar way you can shut down the Bluetooth.

Before you begin, open the '**Bluetooth Device Properties**' control panel applet (see the section 'Control Panel' on page 30).

**To turn on the Bluetooth radio:**

1. Tap on the '**Hardware**' tab to open the page where you can switch on the radio
2. Tap on the '**Turn ON Bluetooth**' button to switch on the radio; you may wait a moment before the radio and the Bluetooth stack are up and running. When the radio is on, the button text is changed to 'Turn OFF



Bluetooth', and the page shows the version and revision information on the HCI and on the LMP of the Bluetooth.

**Note!** The manufacture and the address information may be confusing because the manufacture is unknown and the address is zeros. Yet next time you open the 'Bluetooth Device Properties' applet the Bluetooth address information is available, although the manufacture remains unknown.

3. The Bluetooth is now up and running. You can close the applet either tapping on the 'OK' button or the 'Close' button on the title bar. This setting was made permanent in the registry by tapping the ON/OFF button on the 'Hardware' property page. However, before you continue, please, read the note below, because this operation has a side effect which may come as a surprise.

**Note!** The 'Bluetooth Device Properties' applet is not a typical one, because tapping on the 'Turn ON Bluetooth' button on the 'Hardware' property page makes all the changes in the registry permanent. The stress is placed on the words: 'all the changes', meaning that if you have made alterations to the settings of some other property on your PL3000, for example using another control panel applet, now after turning on (also off) the Bluetooth on the 'Hardware' property page you also made those other settings permanent. For more information on permanent settings, see the section 'Registry' on page 26.

### Setting Bluetooth in Non-Discoverable/Discoverable Mode

Non-discoverable mode means that the other Bluetooth devices cannot discover the existence of the PL3000 being within their range. Similarly you can make the PL3000 discoverable if it is in non-discoverable mode.

Before you begin, open the '**Bluetooth Device Properties**' control panel applet (see the section 'Control Panel' on page 30).

#### To set the Bluetooth in non-discoverable mode:

1. Select '**General**' tab, if not selected
2. Tap on the '**Advanced**' button to open the 'Advanced Configuration' dialog box.
3. Tab on the '**Discovery**' check box ('Let other Bluetooth devices discover this device') so that the tick (the check mark) disappears from it.

4. Now the PL3000 is in non-discoverable mode and you can close the 'Advanced Configuration' dialog box and the applet.

**Note!** The setting is not made permanent. For more information on permanent settings, see the section 'Registry' on page 26.

### Establishing ActiveSync Link over Bluetooth

In this section, the aim is to establish ActiveSync connection between the PL3000 and the Windows desktop computer that is capable of Bluetooth communication. The following directions for doing that do not include the settings at the PC end. However, some hints on getting started with the PC are listed here. Windows XP with the Service Pack 2 is the minimum requirement on the desktop computer. ActiveSync version 4.5 was being tried out with success. The ActiveSync requires that the connection shall be allowed to a virtual serial port (COMx); to find out to which one, open the 'Bluetooth Devices' control panel applet on your Windows computer and click on the 'COM ports' tab. It is possible that there is no the logical COM port assigned to incoming service requests. If that is the case, you have to add one, click the 'Add' button on the same page.

On the 'Options' property page, make sure that your PC can be discovered and it allows Bluetooth connections. In establishing a connection, your Windows PC is a slave and your PL3000 is a master in Bluetooth terms, meaning that the PL3000 initiates connection establishment and it must know the Bluetooth address of the PC before pairing can occur.

Before you get down to configuring ActiveSync connectivity on your PL3000, open the '**Bluetooth Device Properties**' control panel applet, aka 'NID BTManager' (see the section 'Control Panel' on page 30) and check first that the radio is turned on.

#### To pair your PL3000 with your PC:

1. Tap the '**Scan**' tab to open the 'Scan' page

**Note!** The NID BTManager may show invalid pairing information in the device area on the 'Scan' page, especially if you start using your PL3000 again after suspension of either your PC or of your PL3000. Unpair your PL3000 before moving on to the step 2 by double-tapping the device name and by selecting the 'Unpair' menu item in the pop-up menu.

2. On the 'Scan' page, tap on the '**Scan for devices in range**' button at the bottom of the page; wait a moment, your PL3000 is searching for your PC (be aware that your PC shall be discoverable)

**Note!** At the PC end the Windows is a bit tricky with its discoverability; on the 'Options' page in the 'Bluetooth Devices' control panel applet on your PC you may be compelled to turn discover off and on again. Do not omit to apply the change to the Bluetooth stack after the discoverability change.

3. Double-tap on the line of the discovered PC in the devices area, the pop-up menu appears on the screen

**Note!** This step may not work unambiguously; first tap may show available services on the device as well. However, that services information is not a current one, but because of the prior browsing the Bluetooth services on your PL3000.

4. Tap on the 'Pair' menu item to get your PL3000 paired with your computer; your PL3000 asks the passkey
5. Enter Bluetooth passkey of your choice in the 'Pin Code:' field (at least a sequence of four digits such as '1234' is required, however the PC end will suggest no less than 8 digits for the passkey)
6. Tap on the 'OK' button at the bottom of the page

**Hint:** At this point, your PC should inform you that 'A Bluetooth device is requesting to connect to your computer'

7. Click on the message on the screen of your PC, an 'Add Bluetooth Device Wizard' utility window opens on the screen
8. Follow the instructions that the wizard utility gives, and finish the pairing on your Windows PC.

Now, on the 'Scan' page the NID BTManager should inform you that the PL3000 is paired with the Windows computer.

The previous steps got your devices paired; the following steps are required to browse services on your PC. Furthermore, the following steps instruct you to link your PL3000 to the ActiveSync service on your PC, but not yet to establish the actual ActiveSync connection between the PL3000 and the PC.

Before you continue, you need to start up the **ActiveSync** on your Windows computer so that there is a service to associate with. Be aware that in the ActiveSync the connection shall be allowed to the virtual serial port (COMx)

## CHAPTER FIVE - CONECTIVITY

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assigned to incoming Bluetooth service request. The following configuration steps resume on the PL3000.

To link the PL3000 to ActiveSync service:

1. On the scan page, double-tap the line of the **discovered device name** (, that is, your Windows computer having now the paired status) in the devices area; the pop-up menu appears on the screen.
2. Tap on the '**Scan Services**' menu item to get the available services on your Windows computer; it may take a moment to enquire about Bluetooth services. The services being available are shown in the area of its own below the devices area.

The service being of interest is shown as a virtual serial port such as the COM16 having the inactive status.

3. Double-tap the line of the **discovered COMx service** in the 'Services on [...]' area, the dialog box opens on the screen to link to the service
4. In the dialog box window, tap on the '**Create ActiveSync link**' checkbox so that the tick (the check mark) appears in the check box.
5. Select the **local virtual serial port** (COM2 by default) of your choice, if need be, in the '**Map to COM port:**' field to assign a logical port to the service.
6. Tap on the '**Activate**' button at the bottom of the page to enable the point-to-point serial service over Bluetooth.
7. Tap on the '**Close**' button at the bottom of the page to close the window.
8. Now the PL3000 is connected to the PC over the virtual serial link; you can close the applet and the control panel.

There is no ActiveSync connection available yet, but there is an **ActiveSync connectivity** icon in the desktop area of the Windows CE shell. **A double-tap on the icon** establishes ActiveSync connection between your PL3000 and your Windows desktop computer.

## 6. CONFIGURING AND ADMINISTERING SYSTEM

### MANAGING REGISTRY DATABASE

On your PL3000, there is a simple facility for making the changes in the registry permanent, and on the other hand, for removing the permanent changes from the registry. The facility for managing the registry database is called 'Registry Backup'. As an aside, you make changes in the registry when you change some attribute of a device property using a control panel applet, and when you accept the change, for example, by pressing the 'ok' key.

**Note!** Clearing the persistent changes from the registry resets the device to its factory defaults. However, there is an extra method to bring additional persistent information to the registry database through the \*.PAK files in the Flash folder. Using the Registry Backup utility to reset your device to the factory defaults does not affect the \*.PAK files stored in the Flash directory (for further information, see the section 'FLASH DIRECTORY' on page 27).

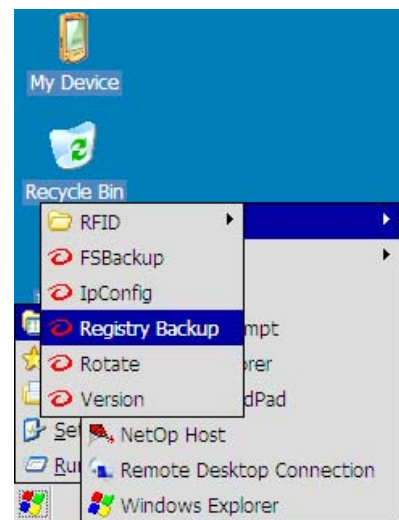
#### Accessing Registry Backup

There are two means of accessing the Registry Backup, either using the keypad or using the touch-screen and the stylus. The following instructions are based on the use of the keypad. Before you begin,

close all the applications.

#### To open the Registry Backup:

1. Press the 'tab' key to set the input focus set to the Start menu icon.
2. Press the 'ok' key to bring up the Start menu
3. Select 'Programs' menu item by the 'up-arrow' key
4. Press the 'right-arrow' to bring up the Programs submenu, 'NordicID' submenu is selected
5. Press the 'right-arrow' to bring up the NordicID submenu
6. Select 'Registry Backup' menu item by the 'down-arrow'
7. Press the 'ok' key to open the Registry Backup



### Closing Registry Backup

If you want to exit from the Registry Backup utility:  
Press the 'esc' key.

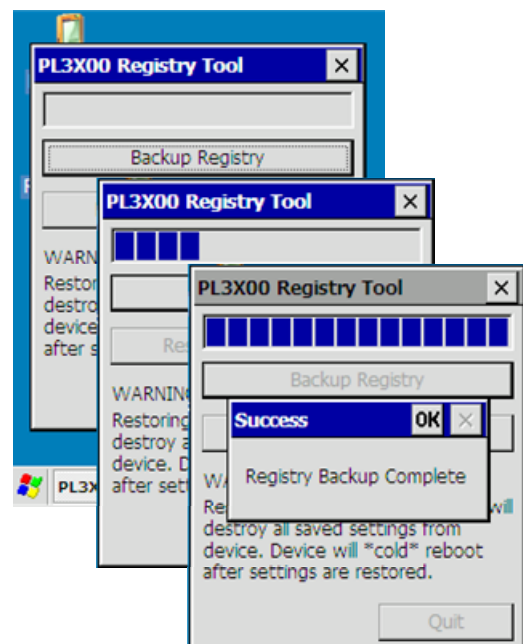
## Making Your Configuration Settings Permanent

If you want to make persistence of your configuration changes, you may use the Registry Backup to store them permanently. Before you begin, open the Registry Backup -utility, see 'Accessing Registry Backup'.

**Note!** If you make changes to the system properties using control panel applets, the volatility of the changes is not unambiguous after closing the applet. As a general rule the settings modified by an applet are not persistent. However, there are applets such as the Wi-Fi and the Bluetooth Device Properties that incorporate setting features that makes the changes permanent when the value is changed in the registry (for background information, see the section 'REGISTRY' on page 26).

### To make the changes in Registry permanent:

1. Set keypad focus on the 'Backup Registry' button, if not set, by using the 'up-arrow' key
2. Press the 'ok' key
3. Wait until the Registry Backup utility informs you that it is finished with the operation.
4. Press the 'ok' key to close the message window
5. Set keypad focus on the 'Quit' button by the 'down-arrow' key
6. Press the 'ok' key to close the utility



Now your configuration settings are stored in the non-volatile memory.

### Restoring PL3000 to Factory Defaults

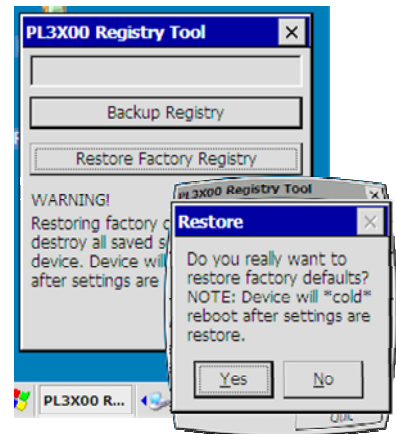
If your PL3000 does not operate as you may expect, or if you just want to start from scratch, in that case, the Registry Backup utility gives an option to clear all the changes you or your application have made permanent in the registry database. See also the section 'FLASH DIRECTORY' on page 27.

**Note!** Despite the fact that you have not saved your configuration changes in the persistent memory, the changes can be persistent because some part of the system called the 'RegFlushKey' function.

Before you begin, open the Registry Backup utility; see 'Accessing Registry Backup'.

To restore PL3000 to its factory defaults:

1. Set keypad focus on the 'Restore Factory Registry' button by the 'down-arrow' button
2. Read 'WARNING!' the Registry Backup utility shows in the window
3. Press the 'ok' key; the Registry Backup gives you the last chance to go back on the operation by pressing the 'esc' key
4. Press the 'ok' key; the Registry Backup removes the persistent add-ons from the registry and cold-boots your device



After your PL3000 is up and running, all the changes to the default contents of the registry database are gone except the registry settings in the \*.PAK file(s) in the Flash folder.

**Note!** The \*.PAK files in the 'Flash' directory may also contain Registry settings that the system views as permanent settings. Even though you restored the contents of the registry to the factory defaults using the Registry Backup, the registry settings included in the \*.PAK file(s) remain in the registry database after the cold boot.

**Hint:** There are two different ways to remove the registry settings in a \*.PAK file from your PL3000 registry. You can remove the \*.PAK file from the 'Flash' folder (see the section FLASH DIRECTORY on page 27), or you can remove the registry settings from the \*.PAK file using a special tool, 'Customizer'. Check with the help of the Customizer, if the \*.PAK file includes the registry settings you want to change or to remove. If need be, generate a new \*.PAK file with the changes to registry settings. (Modifying the content of the \*.PAK file succeeds only if you have generated the original \*.PAK file.) For further information, consult NordicID's technical support.

## CONFIGURING KEYPAD

### Adjusting Keys' Auto-repeat Delay

The auto-repeat delay has an influence on how quickly the repeat property takes place after the first symbol the key press generated is shown on the screen if the key is held down.

Before you begin, open the '**Keyboard**' control panel applet (see the section 'Control Panel' on page 30), and check that the alphanumeric keypad is in the numerical mode (see the section 'Alphanumeric keypad' on page 21)

#### To shorten auto-repeat delay:

Move the '**Repeat delay:**' trackbar slider in the direction of the right side, or tap the right-arrow button at the right side of the trackbar.

#### To extend auto-repeat delay:

Move the '**Repeat delay:**' trackbar slider in the direction of the left side, or tap the left - arrow button at the left side of the trackbar.

#### To have a quick check if the adjustment is OK:

1. Tap the **test** entry field at the bottom of the applet window
2. Press **some numeric key** and hold down it for a little while to check the delay
3. If the result is satisfactory, tap the '**OK**' button on the title bar. Otherwise, repeat the operation.





### Adjusting Keys' Auto-repeat Rate

The auto-repeat rate has an influence on how quickly the symbol is repeated on the screen while the key is held down.

Before you begin, open the **'Keyboard'** control panel applet (see section 'Control Panel' on page 30), and check that the alphanumeric keypad is in the numerical mode (see section 'Alphanumeric keypad' on page 21)

#### To increase auto-repeat rate:

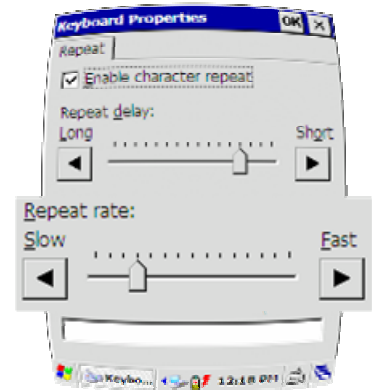
Move the **'Repeat rate:'** trackbar slider in the direction of the right side, or tap the right-arrow button at the right side of the trackbar.

#### To decrease the auto-repeat rate:

Move the **'Repeat rate:'** -trackbar slider in the direction of the left side, or tap the left-arrow button at the left side of the trackbar.

#### To have a quick check if the adjustment is OK:

1. Tap the **test entry field** at the bottom of the applet window
2. Press **some numeric key** and hold down it for a little while to check the repeat rate
3. If the result is satisfactory, tap the **'OK'** button on the title bar. Otherwise, repeat the operation.



### Enabling/Disabling Keys' Auto-repeat Property

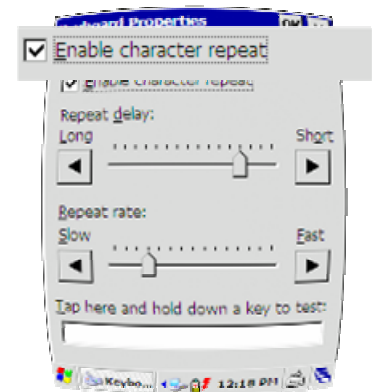
Before you begin, open the **'Keyboard'** control panel applet (see section 'Control Panel' on page 30)

#### To enable auto-repeat property:

1. Check the **'Enable character repeat'** check box on the 'Repeat' page by tapping the box
2. Tap the **'OK'** button on the title bar; the auto-repeat property is enabled

#### To disable the auto-repeat property:

3. Uncheck the **'Enable character repeat'** check box on the 'Repeat' page by tapping the box
4. Tap the **'OK'** button on the title bar; the auto-repeat property is disabled

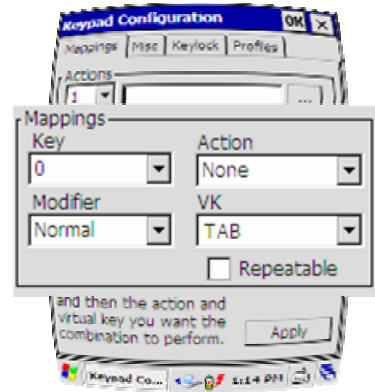


### Mapping Key's Functionality onto Another

Before you begin, open the 'NID Keypad' control panel applet (see the section 'Control Panel' on page 30). To illustrate a simple mapping case, in the first example, the key '0' is configured to act as 'tab' key.

**To map key's functionality onto another one:**

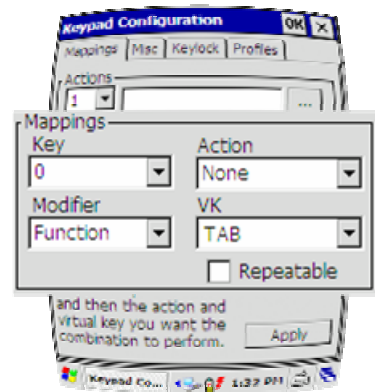
1. Select the 'Mappings' tab in the NID Keypad applet, if the page is not in view
2. Select 'Key' you want to map onto another one, in the 'Mappings' area. In this example, the key '0' is selected.
3. Select 'VK' (Virtual Key) code you want the selected key to generate. In this example, the 'TAB' virtual key code is selected.
4. Tap on the 'Apply' button at the bottom of the 'Mapping' page
5. Tap on the 'OK' button on the title bar; the key '0' acts now as a 'tab' key



The next mapping case illustrates when TAB functionality is assigned to the 'F11' key:

**To map key's functionality onto another one with modifier property:**

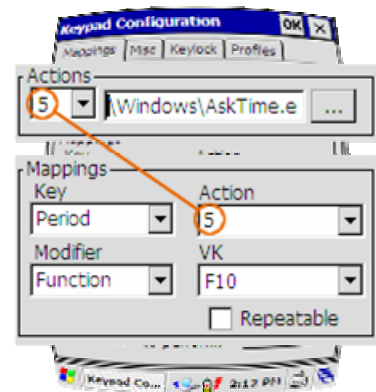
1. Select the 'Mappings' tab in the NID Keypad applet
2. Select 'Key' you want to map onto another one, in the 'Mappings' area. In this example, the key '0' is selected.
3. Select 'Modifier', in the 'Mappings' area. In this example, 'Function' is selected
4. Select 'VK' (Virtual Key) code you want the selected key to generate. In this example, the 'TAB' virtual key code is selected.
5. Tap the 'Apply' button at the bottom of the 'Mapping' page
6. Tap the 'OK' button on the title bar; the key '0' as an F11 key acts now as a 'tab' key.



In addition, the 'Mappings' tab makes it possible to assign some action to a key, meaning that the keystroke starts an executable, an action, that you have assigned to the key. The following steps illustrate the mapping case in which the 'F10' keystroke starts an AskTime utility in the Windows folder. Actually, now the 'F10' key will be assigned to the action identification number that is assigned to the AskTime utility.

### To assign launching-a-program property to key:

1. Select the '**Mappings**' tab in the NID Keypad applet, if the page is not in view.
2. Select '**action id**' in the 'Actions' area. In this example, the number 5 is selected.
3. Tap the '...' button to browse the executable the desired key will launch. In this example the AskTime in the Windows folder is selected. Now the action id is linked with the executable.
4. Select '**Key**' you want to map onto the action id, in the 'Mappings' area. In this example, the key 'Period' is selected.
5. Select '**Modifier**', in the 'Mappings' area. In this example, 'Function' is selected
6. Select '**VK**' (Virtual Key code) you want the selected key to generate. In this example, the default 'F10' virtual key code is selected.
7. Select '**Action**' in the 'Mappings' area, that is, the action identification number you linked with the executable above. In this example, the number 5 is used.
8. Tap the '**Apply**' button at the bottom of the 'Mapping' page
9. Tap the '**OK**' button on the title bar; the task is finished. In this illustrative example, the key 'Period' as an F10 key now starts the executable AskTime when pressed.



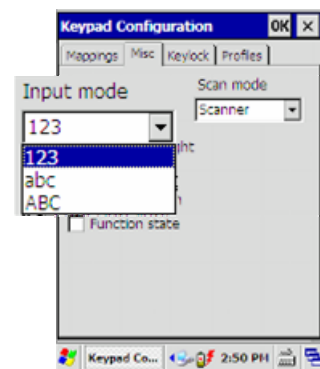
### Setting Default Mode of Alphanumeric Keypad

The factory default of the alphanumeric keypad mode is numeric, that is, every keystroke of the alphanumeric keys enters only numbers on the display by default. In this context the default keypad mode means that after rebooting the device (warm, cold, hardware, or reloading the system) the alphanumeric keypad is in its default mode. This default mode can be changed with the help of the 'NID Keypad' control panel applet.

Before you begin, open the 'NID Keypad' control panel applet (see section 'Control Panel' on page 30).

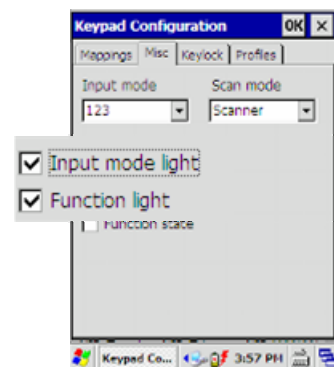
#### To change the default mode of the alphanumeric keys:

1. Select the 'Misc' tab in the NID Keypad applet
2. Select 'Input mode' of your choice.
3. Tap the 'OK' button on the title bar; the task is finished.



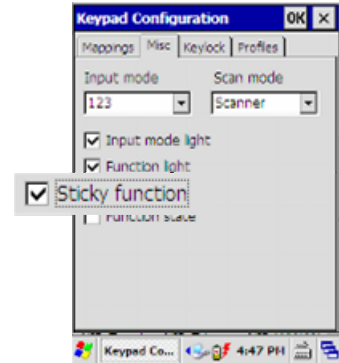
### Enabling/Disabling Backlight Indication of Alphanumeric Keypad Selectors

By default the mode selectors of the alphanumeric keypad (for more information, see the section 'Mode Selectors of Alphanumeric Keypad' on page 20) communicate in their backlights to a user in which mode the alphanumeric keypad is. If you want to disable that backlight indication you can do it with the help of the 'NID Keypad' control panel applet. On the 'Misc' page there are two checkboxes, 'Input mode light' and 'Function light'. When you uncheck either of them you can see the result of that on the keypad immediately. As you may expect, the Function light means the 'F' key and the Input mode light means both the '123' and the 'abc' key.



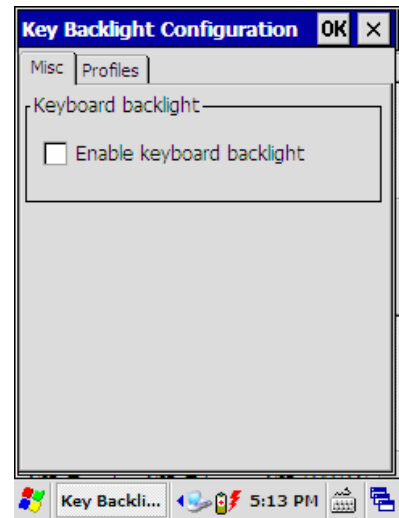
### Confining Alphanumeric Keypad to Function Keys

If your need is to use the alphanumeric keypad only as function keys, the '**NID Keypad**' control panel applet provides you with a 'Sticky function' option on its '**Misc**' page. When the 'Sticky function' checkbox is checked the alphanumeric keypad is forced into the function key mode.



### Enabling / Disabling Backlight of All Keys

If you use your PL3000 in dim light, you may turn on the backlight of the keypad using the '**NID Key Backlight**' control panel applet. Checking the 'Enable keyboard backlight' checkbox on the 'Misc' page turns on the backlight of every key on the keypad.

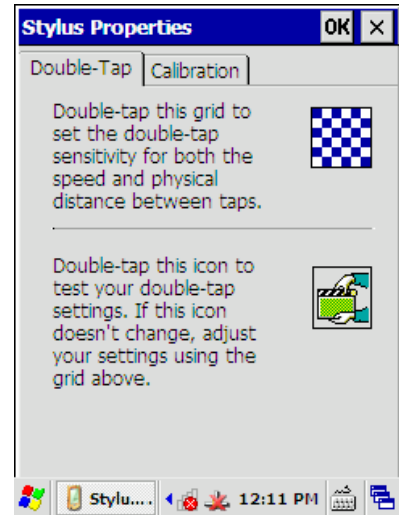


### MANAGING TOUCH SCREEN

#### Adjusting Double-tapping Sensitivity of Touch Screen

Before you begin, open the 'Stylus' control panel applet (see section 'Control Panel' on page 30).

Be aware that double-tapping is measured against the maximum time between two screen-taps in succession. That is, quicker successive tapping than the longest period you adjust between consecutive taps in the area of check pattern, the system view as a double-tap but the longer does not. In addition, the time between successive tapping to be a double-tap is limited to certain maximum value by the system.



To adjust double-tapping sensitivity:

1. Select the 'Double-Tap' page in the Stylus applet
2. Follow the **instructions** on the page to adjust and to check the double-tapping sensitivity
3. Once you are satisfied with your adjustment, tap the 'OK' button on the title bar

#### Disabling/Enabling Touch Screen

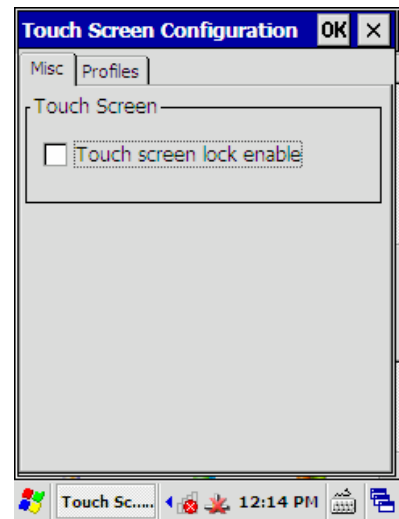
Be aware that after disabling the touch screen you cannot enable it any longer by tapping a checkbox with the stylus. If you want to enable the touch screen again you have the following choices:

- ◆ Using the keypad to uncheck the 'Touch screen lock enable' checkbox
- ◆ Cold-booting your device, assuming that you have not made the change permanent
- ◆ Resetting your PL3000 to the factory defaults, if you have made the disabled state permanent.

Before you begin, open the 'NID Touch Screen' control panel applet (see the section 'Control Panel' on page 30).

To enable the touch screen using the keypad:

1. If the 'Misc' tab is not shown on the display, set first the **input focus** to the label of the currently visible tab by pressing the 'tab' key, and then select the 'Misc' tab by using the 'arrow' keys.
2. On the 'Misc' tab, press the 'tab' key until you have set the **input focus** to the 'Touch screen lock enable' check box
3. If the alphanumeric keypad is not in the text inserting mode, switch it to text mode by pressing the 'abc' key
4. Press the '0' key once or twice to uncheck the 'Touch screen lock enable' checkbox.
5. Press the 'ok' key, the touch screen is enabled



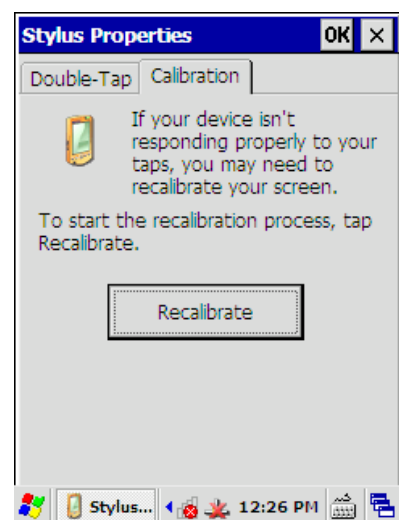
To disable the touch screen:

1. Select 'Misc' tab
2. Check the 'Touch screen lock enable' check box by tapping it with the stylus
3. Press the 'ok' key; the touch screen is disabled.

## Recalibrating Touch screen

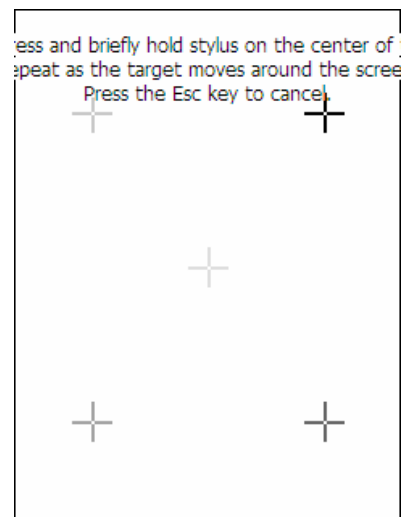
It should be rare to recalibrate the touch screen, but in some cases it could be reasonable to recalibrate it, for example, if the touch screen has no good response to tapping it. However, it is normal that the response time to tapping some display object on the screen varies because it correlates directly with the load of the processor unit.

Before you begin, open the 'Stylus' control panel applet (see section 'Control Panel' on page 30).



### To calibrate the touch screen:

1. Select 'Calibration' tab
2. Tap the 'Recalibrate' button
3. Tap with the stylus on the **centre of the reference points** showed on the screen, until the calibration utility stops showing new reference points.
4. After tapping the fifth reference point, press the 'ok' key to accept your touch screen calibration; the calibration is completed.
5. Tap the 'OK' button on the title bar; the task is finished.



**Note!** You need not make your calibration permanent because the Stylus applet flushes new calibration values in the Registry to persistent storage.

**Note!** If the touch screen needs to be calibrated on a regular basis due to fact that tapping objects on the screen does not seem to result in success in the desired function until the recalibration, it is strongly recommended that you send your device to Nordic ID repair centre to be checked for the hardware of the touch screen.

## MANAGING SCREEN BACKLIGHT

### Adjusting Screen Brightness

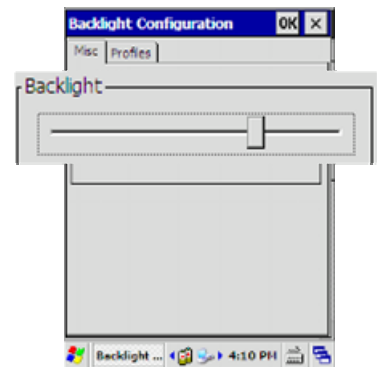
There is a trackbar slider called 'Backlight' available on the 'Misc' tab in the 'NID Backlight' control panel applet. Moving the slider affects directly the screen brightness in the full power state of the device ('On' power state – for further information, see the section 'Power States' on page 43), so that the backlit screen gives you immediate feedback on the brightness.

Before you begin, open the 'NID Backlight' control panel applet (see the section 'Control Panel' on page 30).



To adjust the brightness of the screen:

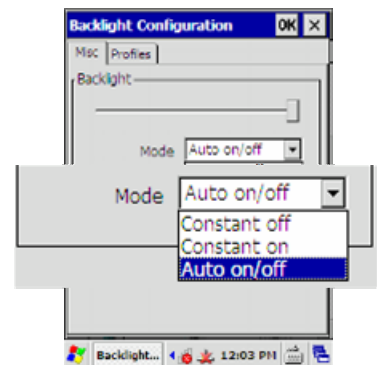
1. Tap on the 'Misc' tab, if the 'Misc' page is not in view on the screen
2. Drag the 'Backlight' slider using the stylus to find appropriate brightness level
3. Press the 'ok' key; the brightness adjustment is finished.



### Selecting Operation Mode of Screen Backlight

Before you begin, open the 'NID Backlight' control panel applet (see the section 'Control Panel' on page 30).

On your PL3000 the screen backlight can operate in three modes. A 'Constant off' mode switches off the screen backlight. The other two modes may be more applicable to your application in most cases. These two modes are linked to the system power states, meaning that when the system enters the power state to which the backlight mode is linked, the system turns off the backlight. A 'Constant on' mode links the backlight blanking to the 'SystemIdle' state. In practice, the 'Constant on' mode means that the system turns off the screen backlight and the screen at the same time. An 'Auto on-off' mode links the backlight blanking to the 'UserIdle' power state. (For further information on the power states, see the section 'Power Management' on page 43)



### Setting Timeout for Automatic Screen Backlight Blanking

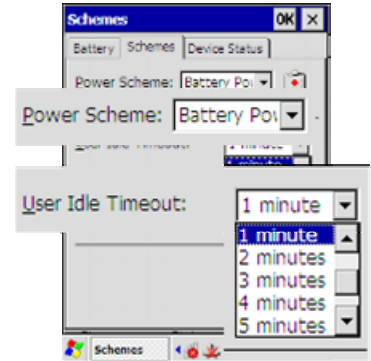
The backlight of the color backlit screen is a drain on the power. For that reason, the power manager can be configured to reduce power consumption on PL3000 by switching off the screen backlight before switching off the screen itself. In the 'Auto on/off' operation mode (default mode; for further information, see the section 'Selecting Operation Mode of Screen Backlight' above), the screen backlight is turned off when your PL3000 remains idle without any user input either a key press or stylus tapping on the screen for the specified 'User Idle Timeout' period. Using the 'User Idle Timeout' you can adjust two aspects of user-

friendliness of your PL3000 yet being a little bit in contradiction to each other, that is, battery lifetime and keeping readability of the screen.

Before you begin, open the 'Power' control panel applet (see the section 'Control Panel' on page 30).

### To set timeout value for screen backlight blanking in backlight's 'Auto on-off' mode:

1. Select 'Schemes' page by tapping the 'Schemes' tab.
2. Select 'Power Scheme' to which your timeout change applies, either 'Battery Power' or 'AC Power'. That is, a source of electricity on which the device is running determines when the setting is in use
3. Select the 'User Idle Timeout' value being appropriate for your needs (for more information on 'Never' settings value, see section 'Power States' / 'On' on page 44)
4. Press the 'ok' key; new timeout value is set.



**Note!** Three timeout values for transition from one power state to another, which can be specified on the 'Schemes' page, are associated with each other (for more information, see section 'Power States' on page 43). In addition to the fact that the 'Never' settings value disables the feature of saving battery energy using the backlight blanking, it also disables all the transitions to lower power states.

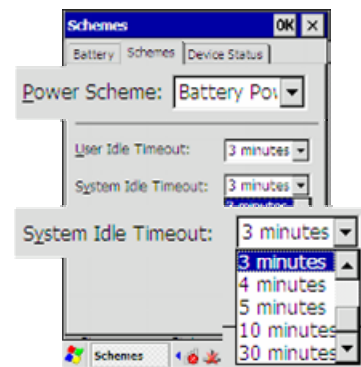
# SETTING TIMEOUT FOR AUTOMATIC SCREEN BLANKING

Your PL3000 turns off the screen after the specified periods of the 'User Idle Timeout' and the 'System Idle Timeout' has elapsed, if there is neither user nor user application activity during those timeout periods. The '**System Idle Timeout**' alone specifies the period between the screen backlight blanking (note the mode, see the section 'Selecting Operation Mode of Screen Backlight' on page 108) and the screen turning-off. Although your device may look as if it were suspended after turning off the screen, the rest of the unit stays on.

Before you begin, open the '**Power**' control panel applet (see the section 'Control Panel' on page 30).

**To set timeout for automatic screen turning off:**

1. Select '**Schemes**' page by tapping the '**Schemes**' tab.
2. Select '**Power Scheme**' to which your timeout change applies, either '**Battery Power**' or '**AC Power**'. That is, a source of electricity on which the device is running determines when the setting is in use.
3. Select the '**System Idle Timeout**' value being appropriate for your needs
4. Press the '**ok**' key; new timeout value is set.



**Note!** Three timeout values for transition from one power state to another, which can be specified on the 'Schemes' page, are associated with each other. The 'Never' settings value disables the automatic screen turning-off. In addition, it disables further transition to lower power state. (For more information, see the section 'Power States' on page 43)

### SETTING TIMEOUT FOR AUTOMATIC SYSTEM SUSPENSION

The Power Manager suspends your PL3000 after the third inactivity period has elapsed. In fact, after the three inactivity timers have expired in succession. The third inactivity period is called 'Suspend Timeout'. The other two are 'User Idle Timeout' and 'System Idle Timeout'. The 'Suspend Timeout' settings value determines how long the device can remain idle before the system will automatically power down itself. The idleness in this context means that neither a user operates the device nor a business application prevents the device from powering down. Be aware that application traffic over the wireless link does not stop automatic suspension from occurring, but ActiveSync does.

**Hint:** You can disable automatic suspension by setting the 'Suspend Timeout' to 'Never'.

Before you begin, open the 'Power' control panel applet (see the section 'Control Panel' on page 30).

To set the timeout value for the automatic suspension:

1. Select 'Schemes' page by tapping the 'Schemes' tab
2. Select 'Battery Power' from the 'Power Scheme' list.
3. Select the 'System Idle Timeout' value being appropriate for your needs
4. Press the 'ok' key; new timeout value is set.

