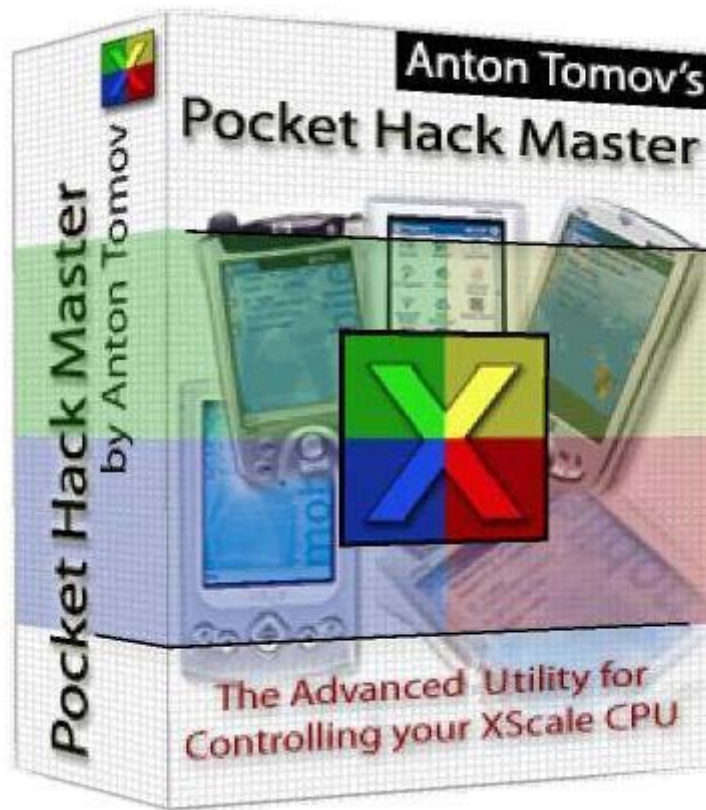# Pocket Hack Master

The Advanced Utility for Controling your XScale CPU

User's Guide

By Anton Tomov
antontomov@hotmail.com

*Dear **Pocket Hack Master** User,*
*Before starting using your **Pocket Hack Master**, please read this guide carefully as it contains important information needed to prevent loss of data and even possible damage of your Pocket PC device.*

Sincerely,
Anton Tomov

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2. **Pocket Hack Master** installation

2.1 Before you start

Make a full backup of your device before starting playing with different **Pocket Hack Master** features. Overclocking pushes your device beyond its normal operating conditions and could lead to loss of your data and programs and even damage your Pocket PC device. Do not overclock your device more than it can handle. For example, a 400 MHz device won't go beyond 500 MHz. A 300 MHz device will probably run at 400 MHz but won't go further.

2.2 Downloading recent versions of **Pocket Hack Master**

The latest versions of **Pocket Hack Master** can be downloaded from Handango:

http://www.handango.com/PlatformProductDetail.jsp?productId=52913

Or from Pocket Gear:

http://www.pocketgear.com/software_detail.asp?id=7258

You could also check the unofficial **Pocket Hack Master** page:

http://www.pockethackmaster.com

for more news, updates, discussion forums and reviews.

2.3 Purchasing **Pocket Hack Master**

The preferable way to purchase **Pocket Hack Master** is by using RegSoft:

http://www.regsoft.net/purchase.php3?productid=57352
(Secure Order Form)

http://www.regsoft.net/purchase_nonsecure.php3?productid=57352
(Non-Secure Order Form, if your browser does not support the Secure Order Form)

Or by using Kagi:

http://order.kagi.com/?3EK&lang=en

Also, **Pocket Hack Master** can be purchased from:

Pocket Gear:
http://www.pocketgear.com/software_detail.asp?id=7258

Handango:
http://www.handango.com/PlatformProductDetail.jsp?productId=52913

PocketLand:
http://pocketland.de/product.php?prod_id=7477

PDAGold:
http://www.pdagold.com/software/ppc/301/detail.asp?SoftwareID=10028
9

PDATopSoft:
http://www.pdatopsoft.com/software/item.php?pid=1365

2.4 Installing **Pocket Hack Master** on your Pocket PC

To install **Pocket Hack Master** on your Pocket PC, start the desktop installation program that is included in the .zip file, containing **Pocket Hack Master**'s distribution (typically named PocketHackMasterXYZ.exe, where XYZ is the version of **Pocket Hack Master**). Make sure your device is in the cradle and Microsoft® ActiveSync is running.

*Do not install **Pocket Hack Master** on a storage card. Instead choose the default location which is \Program Files\Anton Tomov. If you choose to install **Pocket Hack Master** on a storage card you might not be able to use some of the features of **Pocket Hack Master** like the **Register to startup** option.*

After you install **Pocket Hack Master**, it will appear in your Program Files folder and you will be able to start it.

2.5 Registering **Pocket Hack Master**

When you start **Pocket Hack Master** for the first time, go to the **About** tab and notice the Device ID reported there.

Figure 2.3.1 – **Pocket Hack Master** *Device ID and registration status*

The Device ID is the device serial number and is needed to register **Pocket Hack Master** software. Email the Device ID together with some proof of purchase (Handango or Pocket Gear order id for example) to antontomov@hotmail.com. You will then receive your unlock key shortly. When you receive your unlock key, start **Pocket Hack Master**, go to the **About** tab and press the **Register** button.

Figure 2.3.2 – **Pocket Hack Master** *Register button*

Enter the unlock key in the dialog and press OK. **Pocket Hack Master** will close. Restart **Pocket Hack Master**, go the **About** tab again.

Figure 2.3.3 – Registration dialog
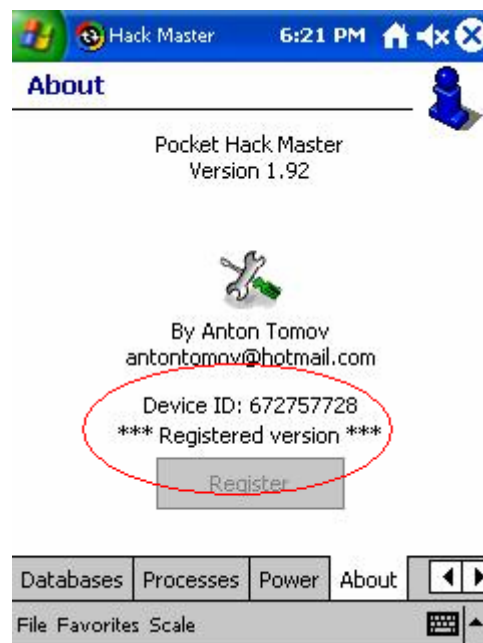
It should say registered now.

*Figure 2.3.4 – **Pocket Hack Master** Device ID and registration status*

If for some reason the program still says "Unregistered" try to reenter the key, be careful not to omit or misplace a digit. If it still doesn't work, check whether you have sent the correct Device ID.

The unlock codes are usually sent a few hours after you send the Device ID and proof of purchase to antontomov@hotmail.com. If, for some reason, you don't receive your unlock code within 2 days after you've sent the Device ID to antontomov@hotmail.com, check whether your email is configured with a "Junk mail" feature. Sometimes, spam protection software blocks certain emails from reaching your mailbox. Please send your Device ID again to antontomov@hotmail.com and also provide a different reply-to email address if possible. You can also post a message in the forums on http://www.pockethackmaster.com/ regarding your registration issue.

2.6 Upgrading Pocket Hack Master

To upgrade to a newer version of **Pocket Hack Master**, simply install it over the old one. You don't need to register it again. Check regularly Handango and Pocket Gear for new updated of **Pocket Hack Master**.

3. **Pocket Hack Master** configuration

3.1 Overview

Pocket Hack Master has a lot of different settings that can be changed by the user to customize the behavior of the program. Most of the options are persistent (not lost after power off or a soft reset). Some of the options are accessible from **Pocket Hack Master** dialog boxes while others are accessible from the tray icon menu, and some of them from both locations.

3.2 Tray icon menu options

Pocket Hack Master can be minimized to tray and run in background. This could be done by opening the *File* menu and choosing the *Minimize* option. When **Pocket Hack Master** is minimized, its icon will appear on the command bar when you go to the Today screen of your Pocket PC.

⬛ **Pocket Hack Master** tray icon (the color of the icon might be different according to the load of the XScale processor, see *Scale* option below for more details).

When this icon is clicked, a pop-up menu will appear on the screen, allowing you to change some of the settings or to execute a command.
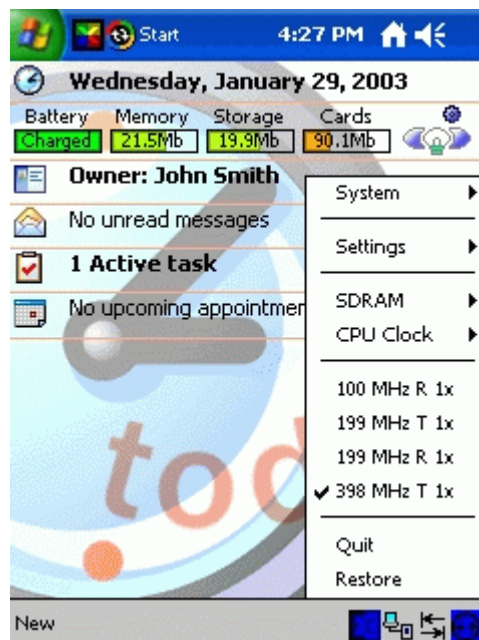

Figure 3.2 – **Pocket Hack Master** *tray icon menu*

3.3 Tray icon settings sub menu

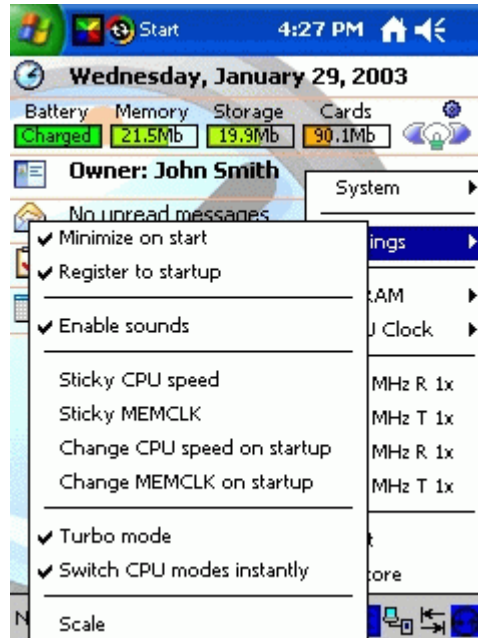By opening the settings sub-menu, the following options could be changed by the user:

Figure 3.3 – **Pocket Hack Master** *tray icon*
Settings sub menu

3.3.1 *Minimize on start* – When this option is checked, **Pocket Hack Master** will automatically minimize to tray icon when started. Handy if you configured **Pocket Hack Master** to automatically start when you soft reset your device and run in background.

3.3.2 *Register to startup* – When selected, this option will place a shortcut in *\Windows\Start Up* directory that will start **Pocket Hack Master** on each soft reset of your device. In order for this option to work properly, **Pocket Hack Master** should be installed in its default location by the desktop installation program (\Program Files\Anton Tomov). Unselecting this option will automatically remove the link from *\Windows\Start Up*. Use this option together with *Minimize on start* option to make **Pocket Hack Master** automatically starts and minimize to tray after you soft reset your Pocket PC.

3.3.3 *Enable sounds* – Checking this option will enable the short beeps that **Pocket Hack Master** produces when changing the processor speed, processor run mode or memory speed. Uncheck this option if you want **Pocket Hack Master** to stay quiet.

3.3.4 *Sticky CPU speed* – Normally, the XScale CPU will restore its default speed after a power off, a soft reset, or a hard reset. If the *Sticky CPU speed* option is set, **Pocket Hack Master** will start to probe the CPU speed every second to check whether it has changed. If **Pocket Hack Master** determines that the speed of the processor was changed (due to a power off / power on of the device for example), it will try to force the previous speed of the processor back. Check this option, if you want **Pocket Hack Master** to preserve the CPU speed after a power off of your device. This option is disabled when the *Scale* option is turned on.

Please make sure you disable any third party software, including OEM speed settings applets, which manipulate the speed of the processor while using the **Sticky CPU speed** *option in order to avoid interference with* **Pocket Hack Master**.

3.3.5 *Sticky MEMCLK* – This option makes sense only if the *Sticky CPU speed* option is on. If *Sticky MEMCLK* option is selected, **Pocket Hack Master** will restore the SDRAM speed settings as well and keep them sticky together with the speed of the processor. This option is disabled when the *Scale* option is turned on.

3.3.6 *Change CPU speed on startup* – If this option is enabled, **Pocket Hack Master** will change the speed of the processor after the application is started. This option could be user together with the *Sticky* options. The *Scale* option however, overrides this setting and disables it.

3.3.7 *Change MEMCLK on startup* – This option is used to tell **Pocket Hack Master** to change the SDRAM speed together with the CPU speed when *Change CPU speed on startup* is active. The *Scale* option, when turned on, disables this setting.

3.3.8 *Turbo mode* – This option is used to change the run mode of the processor. If *Switch CPU modes instantly* option is checked, changing the *Turbo mode* option will instantly change the run mode of the CPU to Turbo or Run mode respectively. If *Switch CPU modes instantly* option is off, the run mode will be changed during the next change of the CPU speed using the XScale dialog (not the favorites).

3.3.9 *Switch CPU modes instantly* – Determines whether the processor run modes are changed instantly after pressing the *Turbo* button (or

selecting the *Turbo* option) or after a frequency change sequence. Used for troubleshooting and compatibility with some devices.

3.4 Tray icon SDRAM settings sub menu

By opening the SDRAM settings sub-menu, the following options could be changed by the user:

Figure 3.4 – SDRAM settings sub menu

3.4.1 *Refresh* – The *Refresh* menu can be used to change the default refresh interval of your SDRAM. When clicked, it will open another sub menu containing the following possible values: 4 Clocks, 8 Clocks, 10 Clocks, and 11 Clocks. The current setting will have a check mark next to it. These settings determine the number of CPU cycles before a refresh is done. The higher the number – the more time between the SDRAM refreshes. The more time between the SDRAM refreshes – the better the performance of the memory will be.

Figure 3.4.1 – SDRAM Refresh setting

It is strongly recommended that you don't change the default settings! If you choose a setting that your SDRAM cannot handle, the memory of your device will get corrupted and you'll have to hard reset your Pocket PC!

3.4.2 ***MEMCLK –*** The MEMCLK menu can be used to change the speed at which your SDRAM runs. The two possible settings are: 1x – the SDRAM runs at the same speed as the system bus and 1/2x – the SDRAM runs at half of the speed of the system bus. The SDRAM that is installed in most Pocket PC devices is 100 MHz SRDAM, so if you are using bus speeds above 100 MHz (settings of L > 27) you should change the speed at 1/2x if you are experiencing problems. Quality SDRAM chips will allow speeds above 100 MHz. The speed of the memory greatly affects the performance of the XScale Pocket PC.

Figure 3.4.2 – MEMCLK setting

3.5 Tray icon CPU Clock settings sub menu

By opening the CPU Clock settings sub menu, you will get to another set of sub menus containing predefined CPU speeds that you can quickly choose:
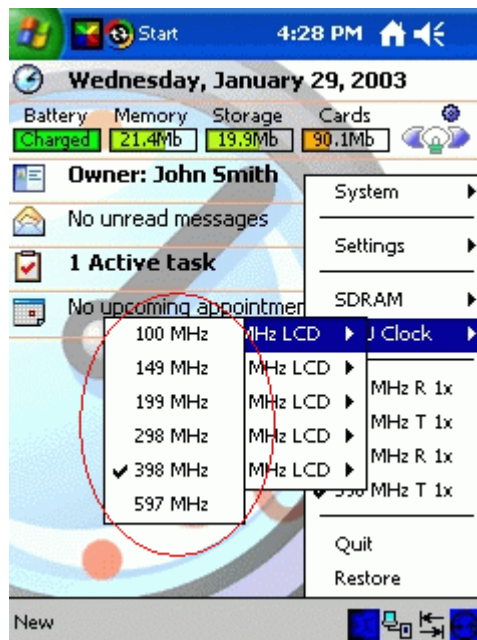

Figure 3.5 – CPU clock settings

The speeds are grouped by bus clock (L value). The upper sub menu for example corresponds to L=27 setting and does not overclock the system bus. You will see a check mark next to the speed that your CPU is currently running at.

3.6 Tray icon favorites

The tray menu contains four user predefined speeds called favorites. You can map your own settings to each of the favorites by using the *Favorites* menu in the **Pocket Hack Master** dialogs:
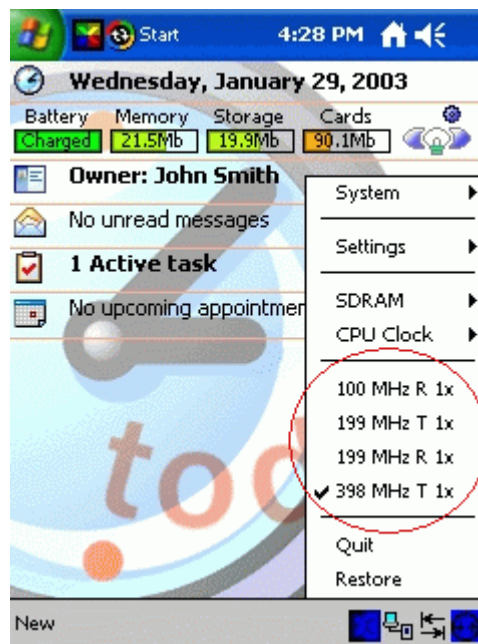

Figure 3.6 – Favorites

The menu items show the speed setting, the Turbo setting (T = Turbo mode, R = Run mode) and the MEMCLK setting (1x or 1/2x). A check mark next to a favorite setting indicates that the current CPU speed, run mode and MEMCLK correspond to that favorite.

3.7 Tray icon Quit command

Use the Quit command to close **Pocket Hack Master** and exit the program:
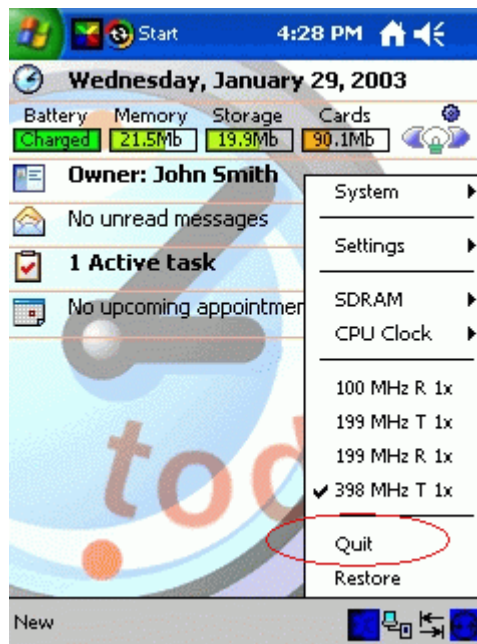
Figure 3.7 – Quit command

Please not that even if you exit **Pocket Hack Master**, the current settings of the processor speed, run mode and MEMCLK will remain until you power off / power on your device or make a soft or a hard reset.

3.8 Tray icon Restore command

Use the Restore command to restore **Pocket Hack Master** to full screen and have access to **Pocket Hack Master** dialogs:
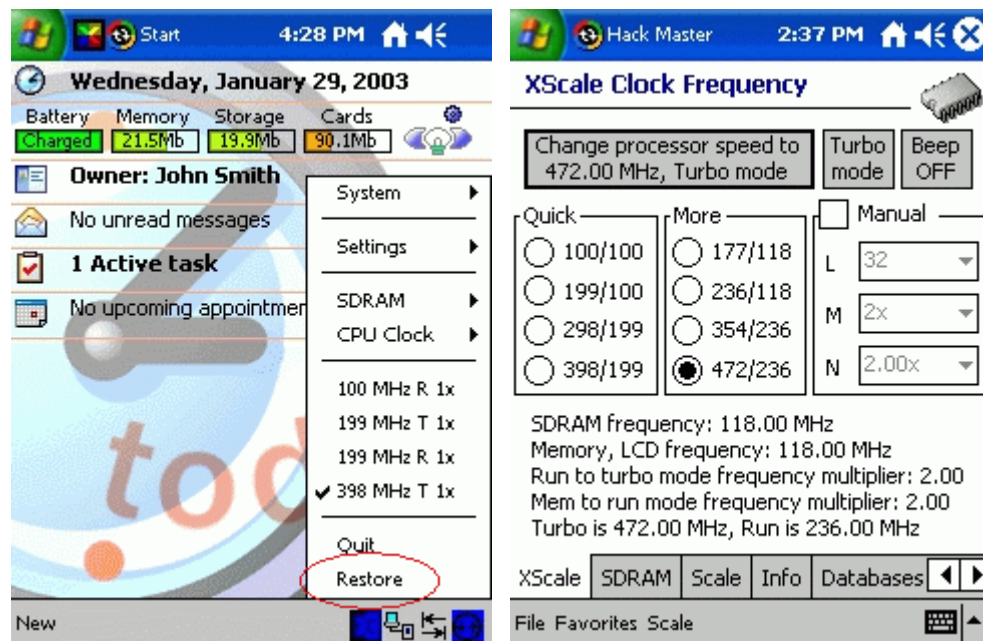

Figure 3.8 – Restore command and restored application

If you wish to minimize the application again, choose *File* menu and choose *Minimize*.

4. Pocket Hack Master dialogs

4.1 Overview

Pocket Hack Master consists of several dialogs that can be used to change settings, view information or perform commands. The dialogs can only be seen while **Pocket Hack Master** is not minimized to system tray. To restore from system tray, click on the tray icon of **Pocket Hack Master** and choose *Restore*.

4.2 XScale dialog

The *XScale* dialog is used to tweak the speed settings (frequency, multipliers, run modes etc) of the XScale processor.
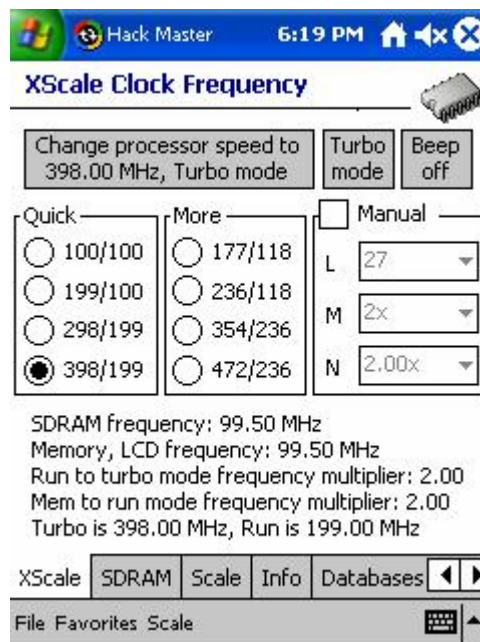

Figure 4.2 – XScale dialog

The main parts of the XScale dialog are the *Change processor speed* button, the *Turbo* button, the *Beep* button, the *Quick* speed selection radio buttons, the *More* speed selection radio buttons, the *Manual* multipliers section and the *Status* section. In details:

4.2.1 *Change processor speed* button

This button is used to change the speed of the processor. The label on it shows the selected speed that will be applied if the button is pressed and will eventually change when you change the speed settings using *Quick*, *More* or *Manual* settings or when **Pocket Hack Master** changes the speed

automatically in *Sticky* or *Scale* mode. When you start **Pocket Hack Master**, the button will display the current settings of the CPU:
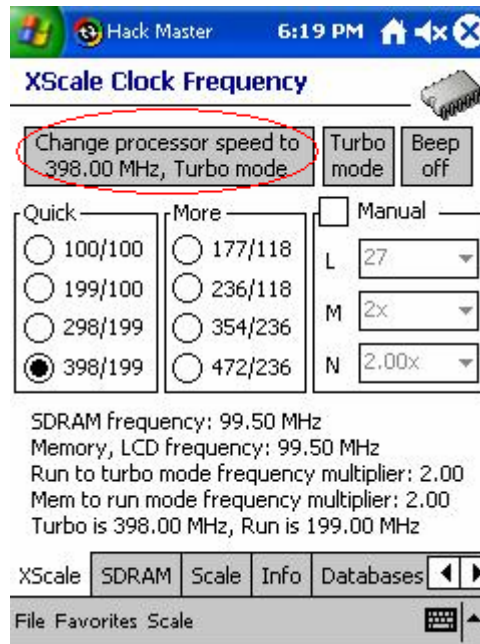

Figure 4.2.1 – Change processor speed button

Use this button to change the processor speed and run mode. When you press it, the screen will flicker and if the ***Sounds on*** tray menu option is checked (or the ***Beep*** button says "Beep on") you will hear a short beep indicating the **Pocket Hack Master** changed the speed and the run mode of the processor. See below to learn how to select different speeds before applying them.

If you choose a speed that is not supported by your device, your Pocket PC will lock up. In such case, perform a soft reset and don't use that speed setting again to avoid further lock ups. If a soft reset does not help, you'll have to make a hard reset. Always backup your data before experimenting with speeds that you haven't tested before.

4.2.2 ***Turbo*** button

This button is used to change the run mode of the processor. If ***Switch CPU modes instantly*** option is checked, pressing the ***Turbo*** button will instantly change the run mode of the CPU to Turbo or Run mode respectively and if the ***Sounds on*** tray menu option is checked (or the ***Beep*** button says "Beep on") you will hear a short beep indicating the **Pocket Hack Master** changed the run mode of the processor.. If ***Switch CPU modes instantly*** option is off, the run mode will be changed during

the next change of the CPU speed using the XScale dialog (not the favorites):
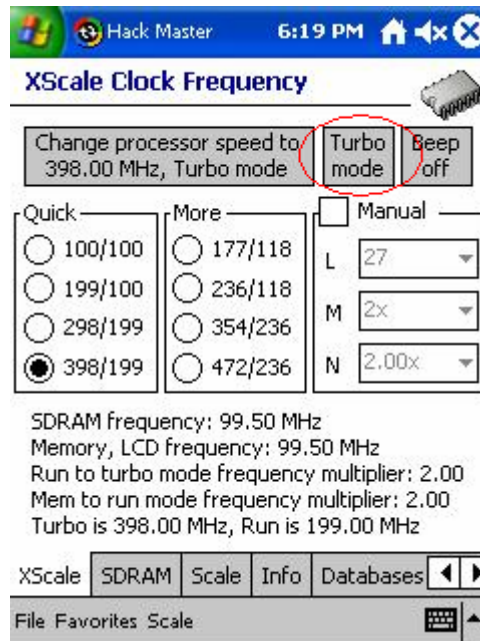

Figure 4.2.2 – Turbo button

The label on the button shows the currently selected run mode of the processor.

4.2.3 **Beep** button

The **Beep** button is used to enable or disable the short beeps that **Pocket Hack Master** produces when changing the processor speed, run mode or memory settings:
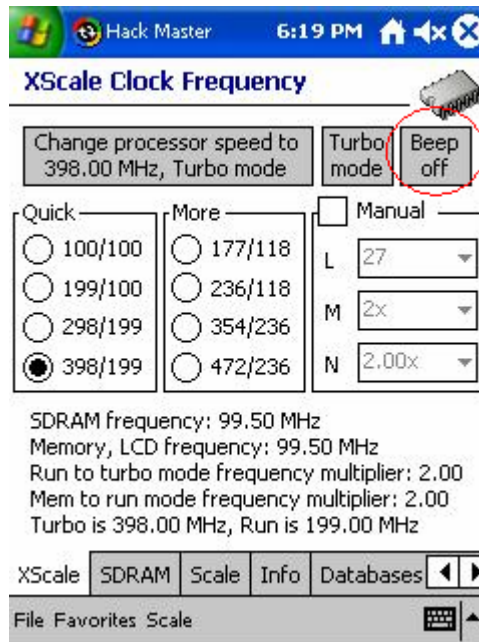
Figure 4.2.3 – Beep button

The tray menu **Sounds on** icon duplicates the functionality of this button. The label on the button shows whether sounds are currently enabled or disabled.

4.2.4 *Quick* speed selection radio buttons

The **Quick** speed selection radio buttons is a group of four radio buttons that can be used to switch to the following predefined processor speeds:

- 100 MHz Turbo mode / 100 MHz Run mode
- 199 MHz Turbo mode / 100 MHz Run mode
- 298 MHz Turbo mode / 199 MHz Run mode
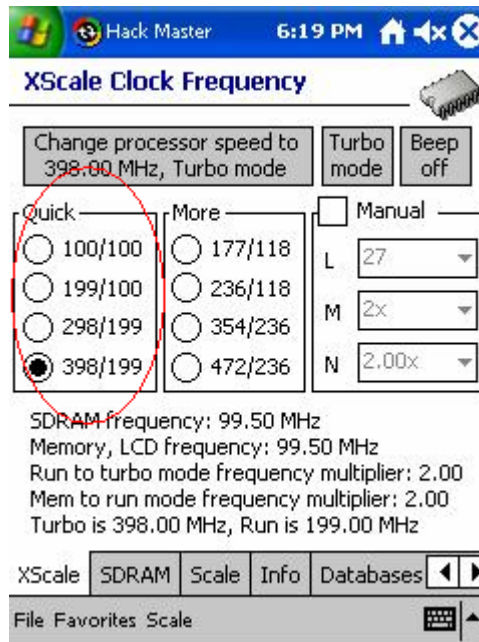- 398 MHz Turbo mode / 199 MHz Run mode

Figure 4.2.4 – Quick selection

These are the standard speed settings that are used in most Pocket PCs (L = 27, see below) and should work on almost every device. For example, if you have a 400 MHz Pocket PC, you can safely choose any of the quick settings. If you have a 200 MHz device, you can safely choose 100 MHz and 200 MHz settings and might want to try the 300 MHz setting which will try to overclock your device.

Please note that selecting a new speed from the Quick settings will not change the CPU speed until you press the Change processor speed button.

Don't try to overclock your device too much. A 400 MHz device could be overclocked to 472 MHz or 500 MHz in some cases. A 200 MHz device will hardly go above 300 MHz. Also note that every device has its own overclocking limit. You have to experiment in order to find the best stable speed that works on your device.

4.2.5   *More* speed selection radio buttons

The *More* speed selection radio buttons is a group of four radio buttons that can be used to switch to the following predefined processor speeds:

- 177 MHz Turbo mode / 118 MHz Run mode
- 236 MHz Turbo mode / 118 MHz Run mode
- 354 MHz Turbo mode / 236 MHz Run mode
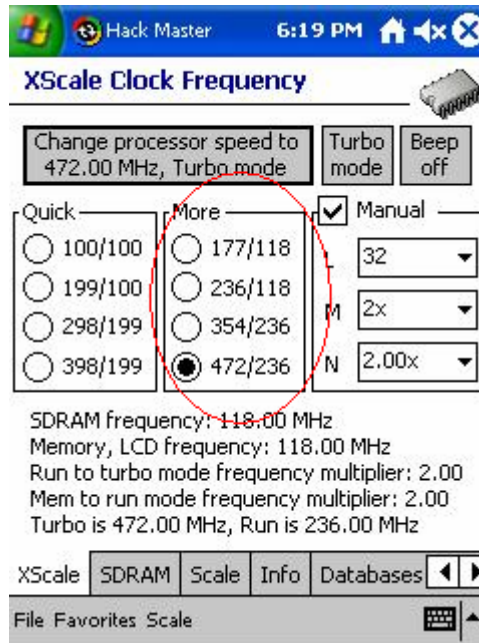- 472 MHz Turbo mode / 236 MHz Run mode

Figure 4.2.5 – More selection

These speeds are not standard because they overclock the system bus (L = 32) but they work on most devices (excluding the Dell Axim).

Please note that selecting a new speed from the Quick settings will not change the CPU speed until you press the Change processor speed button.

Don't try to overclock your device too much. A 400 MHz device could be overclocked to 472 MHz or 500 MHz in some cases. A 200 MHz device will hardly go above 300 MHz. Also note that every device has its own overclocking limit. You have to experiment in order to find the best stable speed that works on your device.

4.2.6 *Manual* multipliers section

This section gives you total control over the frequency change sequence of the processor. It contains the three multipliers that are used to form the processor run speed, the processor turbo speed and the device bus speed. These settings are for advanced users only and that's why they have to be enabled first (by clicking the **Manual** check box) and answering Yes to the warning message if you want to use them:
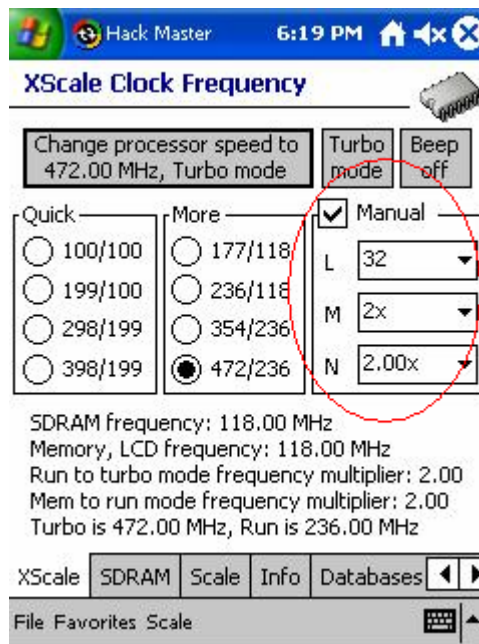
Figure 4.2.6 – Manual multipliers

4.2.6.1 L: Crystal Frequency to Memory Frequency Multiplier

L multiplier determines the memory frequency. The memory frequency is the external synchronous memory frequency and is also used to form the SDRAM frequency. The SDRAM frequency can be the same as memory frequency or ½ of it. The SDRAM frequency can be configured by the **MEMCLK** setting (see below). The valid values for L are:

L	Memory frequency, MHz
27	99.5
32	118.0
36	132.7
40	147.5
45	165.9

To summarize, the L parameter determines the memory frequency which is used to drive the SDRAM and the LCD controller. The SDRAM speed can be the same as the memory frequency or ½ of it.

Any value of L above 27 (99.5 MHz) overclocks the LCD controller, the memory and other peripherals. This can dramatically improve the performance of the device but there is always a risk of locking your device and even loosing all your data when overclocking the memory frequency. Most devices can safely use the L=32 (118.0 MHz) memory

frequency and very few support higher values of L. Dell Axim devices DO NOT support values of L other than 27.

4.2.6.2   M: Memory Frequency to Run Mode Frequency Multiplier

This multiplier determines the required Core Frequency for normal (Run Mode) operation. This mode is used during normal processing, when the application must make occasional fetches to external memory. The possible values are one, two, or four times the Memory Frequency.

M	Run mode frequency
1	Same as the memory frequency (L)
2	Twice the memory frequency (L)
4	Four times the memory frequency (L)

It is preferable that you use values of M equal to 1 or 2, 4 is not supported by most of the Pocket PC devices.

Example: Let's say you configured L = 27 which gives you memory frequency equal to 99.5 MHz. If you program M with value of 2 this will result Run Mode Frequency equal to 99.5 MHz x 2 = 199.0 MHz.

4.2.6.3   N: Run Mode Frequency to Turbo Mode Frequency Multiplier

This multiplier determines the Core Frequency for Turbo Mode operation. This mode is generally used when the application runs entirely from the caches, because any fetches to external memory slow the Core's performance. This value is a multiple (1.0, 1.5, 2.0, 2.5, 3.0 or 5.0) of the Run Mode Frequency.

Please note that values of N equal to 2.5 and 5.0 are not officially supported by Intel but they can be used on all Pocket PC devices.

N	Turbo mode frequency, MHz
1.0	Same as the Run Mode Frequency
1.5	1.5 times the Run Mode Frequency
2.0	2 times the Run Mode Frequency
2.5	2.5 times the Run Mode Frequency
3.0	3 times the Run Mode Frequency
5.0	5 times the Run Mode Frequency

Example: Let's say you configured L = 27 which gives you memory frequency equal to 99.5 MHz. If you program M with value of 2 this will result Run Mode Frequency equal to 99.5 MHz x 2 = 199.0 MHz. Programming N with value equal to 2.5 then will result Turbo Mode Frequency equal to 199.0 MHz x 2.5 = 497.5 MHz.

4.2.6.4   Notes on manual multipliers

Please note that although you will achieve the same speeds when exchanging the places of N and M multipliers, the performance might be different. For example, using L=27, M=1, N=2 will give you 199.0 MHz Turbo frequency. You will achieve the same speed if you swap the places of M and N (L=27, M=2, N=1). However there are two major differences between the two modes:

- The first mode gives you a Run Frequency different than the Turbo Frequency (L=27, M=1, N=2 results 99.5 MHz Run Frequency and L=27, M=2, N=1 results 199.0 MHz Run Frequency − the same as the Turbo Frequency because N=1).
- The second mode will give you more performance because of the higher (M=2) External Synchronous Memory Frequency but both the Run and Turbo frequency will be the same.

The ***Quick*** group of radio buttons is formed using the L=27 setting. The ***More*** group of radio buttons is formed using the L=32 setting. Therefore, the ***Quick*** selection contains the most compatible settings and the ***More*** group contains the next most compatible settings (this mode does NOT work with Dell Axim devices).

400 MHz Dell Axim devices can be overclocked using manual settings L=27, M=1, N=5 or L=27, M=2.5, N=2 resulting 500 MHz Turbo mode frequency.

*300 MHz Dell Axim devices can be overclocked by using the 398 MHz **Quick** setting.*

Table 3-1. Core PLL Output Frequencies for 3.6864 MHz Crystal

L	M	Turbo Mode Frequency (MHz) for Values "N" and Core Clock Configuration Register (CCCR[15:0]) programming for Values of "N":				PXbus Frequency	MEM, LCD Frequency (MHz)	SDRAM max Freq
		1.00 (Run)	1.50	2.00	3.00			
27	1	99.5 @.85v	—	199.1 @1.0 V	298.6 @1.1v	50	99.5	99.5
32	1	118.0 @1.0v	—	235.9 @1.1 V	353.9 @1.3v	59	118.0	59.0
36	1	132.7 @1.0v	—	265.4 @1.1v	398.1 @1.3v	66	132.7	66
40	1	147.5 @1.0v	—	294.9 @1.1v	—	74	147.5	74
45	1	165.9 1.0v	—	331.8 1.3v	—	83	165.9	83
27	2	199.1 @1.0v	298.6 @1.1v	398.1 @1.3v	—	99.5	99.5	99.5
32	2	235.9 @1.1v	—	—	—	118	118.0	59.0
36	2	265.4 @1.1v	—	—	—	132.7	132.7	66
40	2	294.9 @1.1v	—	—	—	147.5	147.5	74
45	2	331.9 @1.3v	—	—	—	165.9	165.9	83

Figure 4.2.6.4 – Multiplier combinations from Intel's Intel® PXA250 and PXA210 Application Processors Developer's Manual

4.2.7 *Status* section

The status section displays the values for the current settings of the CPU speed, either chosen manually by the multipliers or by the radio buttons.

4.3 SDRAM dialog

The **SDRAM** dialog contains settings that can be used to tweak the performance of the SDRAM. ***These settings require Intel XScale processor.***
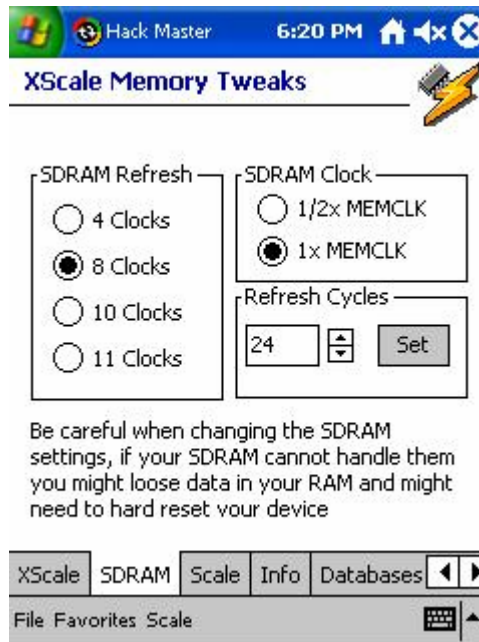
Figure 4.3 – SDRAM Settings

4.3.1 SDRAM Clock

This setting determines the frequency at which the SDRAM memory runs. The possible values are 1/2x or 1x. 1x means that the SDRAM memory runs at the same speed as the Memory Frequency (L multiplier). 1/2x means that the SDRAM memory runs at half the speed of the Memory Frequency (L multiplier). For example, if L=27 (99.5 MHz Memory Frequency) and MEMCLK is 1x than the SDRAM memory will run at 99.5 MHz. If L=32 (118.0 MHz Memory Frequency) and MEMCLK is 1/2x then the SDRAM memory will run at 59.0 MHz.

Clicking on the radio buttons will change the speed *instantly*.

Since the memory speed is the main limitation for the performance of the XScale devices, the higher the SDRAM speed, the higher the overall performance of the device will be. Most Pocket PCs have 100 MHz SDRAM installed which can be overclocked by about 10%. Some Pocket PCs (Dell Axim) do not tolerate overclocking of the SDRAM memory while others (Asus) will allow more than 20% overclocking.

Default values for MEMCLK are 1x for L=27 and 1/2x for any other value of L.

Always change the MEMCLK speed before changing the CPU speed (L multiplier) to avoid lockups.

4.3.2 SDRAM Refresh

This setting can be used to change the default refresh of the SDRAM. The possible values are 4, 8, 10 and 11 CPU cycles. Lower values mean more frequent memory refresh and less memory performance.

Clicking on the radio buttons will change the speed *instantly*.

Warning! Changing the SDRAM refresh settings could lead to loss of all the data and programs in your Pocket PC. Since changing the values of the SDRAM refresh frequency does not affect performance much, it is strongly recommended that you leave these settings in their default values.

4.3.3 SDRAM Refresh Cycles

This setting can be used to change the default refresh of the SDRAM. The possible values are between 0 and 4095 clocks. Lower values mean more frequent memory refresh and less memory performance.

The ***Set*** button must be pressed for the new settings to be applied.

Warning! Changing the SDRAM refresh settings could lead to loss of all the data and programs in your Pocket PC. Since changing the values of the SDRAM refresh frequency does not affect performance much, it is strongly recommended that you leave these settings in their default values.

4.4 Scale dialog

The *Scale* dialog is used to set various settings for the *Scale* option that **Pocket Hack Master** supports.

4.4.1 Overview of **Pocket Hack Master** "Scale" Option

Intel designed the XScale processor with the ability to "Scale" (hence their name). This feature allows dynamic changes of the frequency of the processor according to the required performance. Scaling is a feature that gives the user the best performance/battery life ratio. When more power is needed, the processor scales to a higher speed. When the processor is idle, scaling lowers the frequency and maximizes battery life.

The scaling however should be supported by the Operating System. Microsoft Windows CE 3.0 (and Pocket PC 2002) does not natively support scaling. **Pocket Hack Master** "unlocks" the scaling feature of the XScale CPU by implementing own scaling code.

Generally, scaling in **Pocket Hack Master** works in the following way:

1. The user configures four different speeds that he wants to use for different CPU loads. **Pocket Hack Master** defines four states according to the load of the processor:

   a. *Idle* (Blue icon,)
   b. *Low* (Green icon,)
   c. *Medium* (Yellow icon,)
   d. *Heavy* (Red icon,)

The four scale speeds are configured much like the favorite speeds are configured – the user has to apply the desired speed and then map it to a Scale setting using the "Scale" menu.

These states are completely used definable. The only thing that should be noted here is that *Idle* means less load than *Low*; *Low* means less load than *Medium* and *Medium* means less load than *Heavy*.

2. The user adjusts the triggering levels for the different CPU levels in the Scale tab.

3. The user enables the "Scale" feature of **Pocket Hack Master**

4.4.2 Scale dialog components

4.4.2.1   CPU load indicator

The CPU load indicator displays the load of the processor. It is displayed in % (lowest load is 0% and highest load is 100%). The indicator also shows the current CPU state (*Idle*, *Low*, *Medium*, and *Heavy*).

*Please note that the CPU load indicator DOES NOT ALWAYS display the actual load of the processor. It shows the average and smoothened load and can vary depending on the **Settle** and **Latency** settings (see below).*
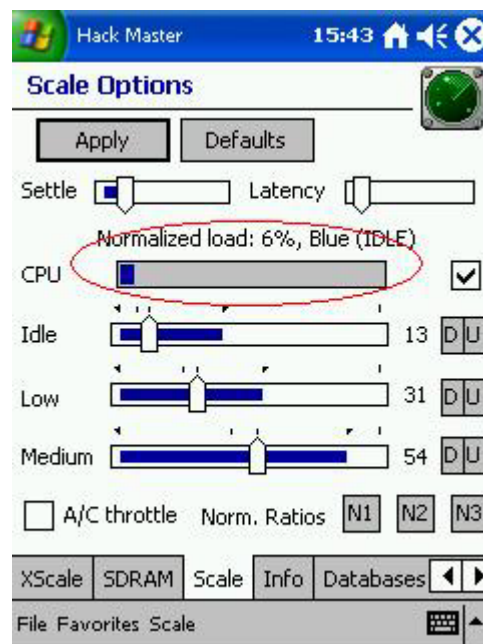

Figure 4.4.2.1 – CPU Load Indicator

4.4.2.2   Latency control

The *Latency* slider determines the number of points (probes) that should be done to calculate the average CPU load. The CPU load is checked every second by **Pocket Hack Master** and is calculated using the formula:

$$CPULoad = (CPULoad1 + CPULoad2 + … + CPUloadN) / N$$

N is determined by the *Latency* slider. If the *Latency* slider is set to its minimum (left position) then the CPU load indicator will show the actual momentum load of the processor. If the *Latency* slider to its maximum the average time to calculate the CPU load will be 120 seconds.
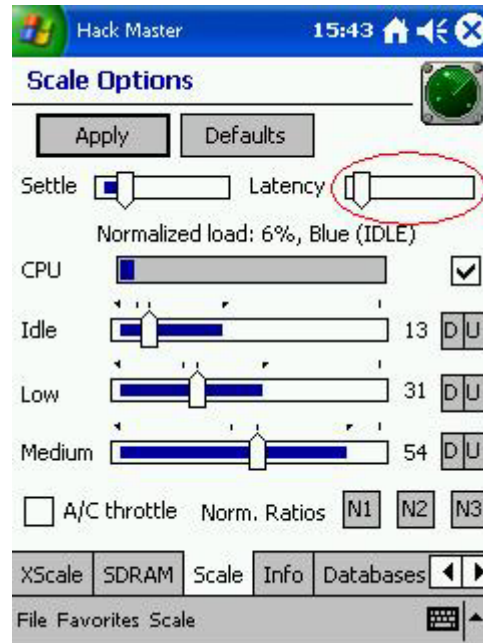
Figure 4.4.2.2 – Latency Control

The ***Latency*** slider is used to control the smoothening (how fast the reaction to an instant CPU load change) will be. More latency eliminates peaks but also slows down **Pocket Hack Master**'s reaction to changes in the load of the processor.

The recommended setting for the ***Latency*** slider is 10 to 30 seconds ($1/12^{th}$ to $1/4^{th}$ of the scale).

The Apply button needs to be pressed to apply the new latency settings.

4.4.2.3   Settle control

The ***Settle*** slider determines how fast the CPU load will calm down. When the CPU load changes from a higher value to a lower value, **Pocket Hack Master** does not allow an instant change from the higher to the lower value. Instead, **Pocket Hack Master** will start to smoothly decrease the calculated CPU load until it reaches the lower value. The ***Settle*** slider is used to determine how fast **Pocket Hack Master** should decrease the calculated CPU load. If the ***Settle*** slider is set to its minimum, then **Pocket Hack Master** will not use the Settle function. More ***Settle*** slider means faster settle time.
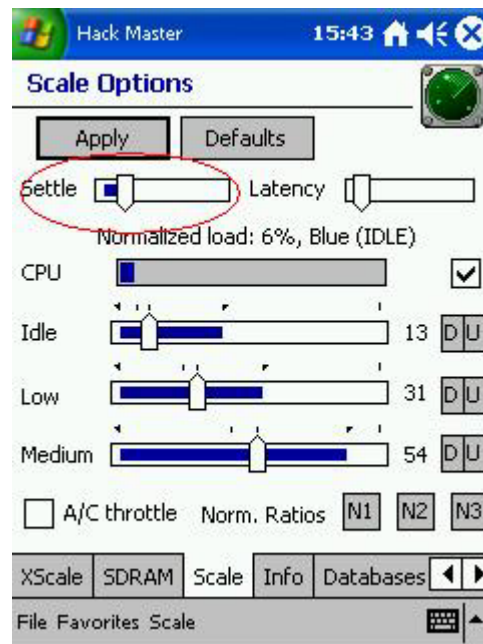
Figure 4.4.2.3 – Settle Control

The ***Settle*** slider together with the ***Latency*** slider is used to eliminate CPU load peaks and to avoid oscillation between two neighbor CPU states.

The recommended setting for the ***Settle*** slider is 1/5th of the slider scale.

4.4.2.4   Scale triggers

The Scale triggers are used to set the triggering values for the CPU load that will change the CPU speed when the desired load is reached.
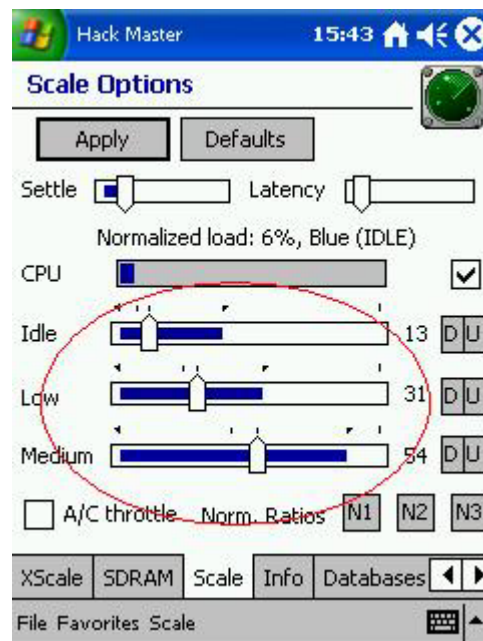

Figure 4.4.2.4.1 – Scale Triggers

The blue bars on the sliders represent the normalized 100% load compared to the highest Scale speed (see **Normalization Ratios** below). You can only choose a triggering load within the range of the blue bar.

The two small tick marks on each slider represent the UP and DOWN decision points.

The number next to each slider represents the current UP decision point value.

To set the triggering decision points for the *Idle* CPU state, use the slider to choose the load for which you wish to switch to the next higher speed and press "D" button to set the DOWN decision point (this point will be used when switching from a higher CPU state to the *Idle* state) or press "U" button to set the UP decision point (this point will be used when switching from *Idle* CPU state to a higher speed). If the DOWN decision point is set above the UP decision point, **Pocket Hack Master** will automatically adjust the DOWN decision point to be equal to the UP decision point.
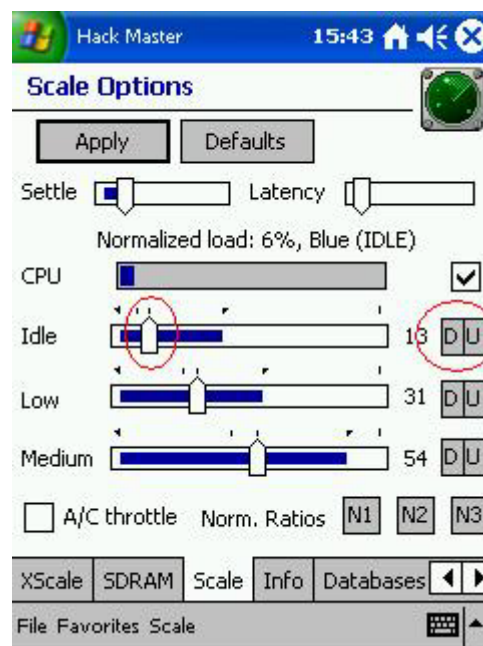

Figure 4.4.2.4.2 – Choosing Idle Triggers

After you choose the decision points, press the **Apply** button to apply the changes.
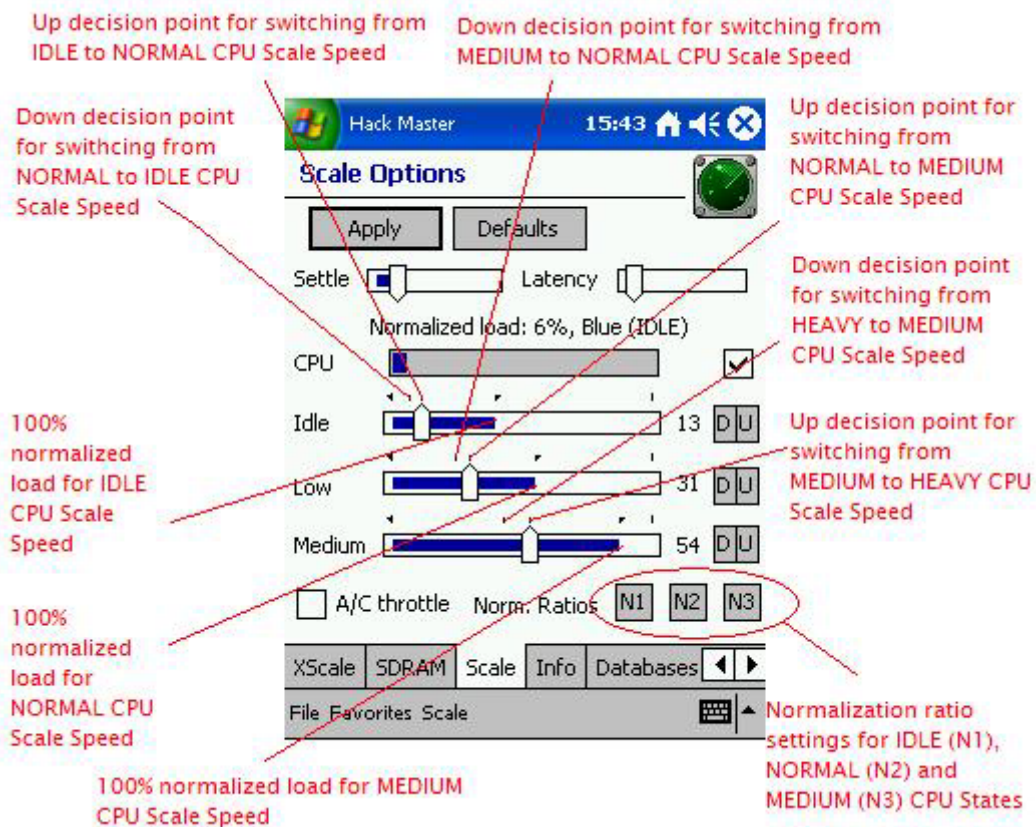
Figure 4.4.2.4.3 – Scale Triggers, Sliders, Decision Points and Normalization Settings

You can also adjust the rest of the triggers similarly.

4.4.2.5   Normalization

The CPU load needs to be normalized before it is compared with the decision points. This is needed because the same program may cause different CPU load with different speed settings. For example, if an application loads the processor at 25% at 400 MHz speed, it will load the processor at approximately 50% at 200 MHz speed. This is the reason **Pocket Hack Master** uses normalization ratios for the *Idle*, *Low* and *Medium* CPU states. The normalization ratio is defined as "the amount of load that will be caused if the highest CPU speed is used". So, if an application loads the processor at 25% at 100 MHz speed, and the same application loads the CPU at 10% at 400 MHz speed, the normalization ratio would be:

$$25\% / 10\% * 100\% = 250\%$$

The normalization settings can be set by using the three buttons marked *N1*, *N2* and *N3*:
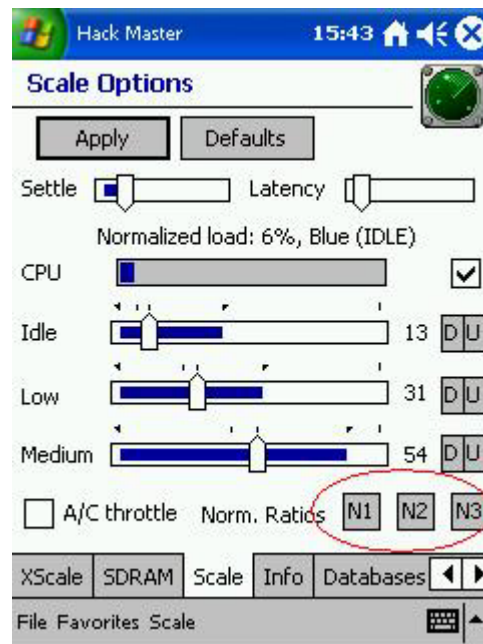
Figure 4.4.2.5 – Normalization Settings

N1 is the normalization ratio for the ***Idle*** CPU state, **N2** is for the ***Low*** CPU state and **N3** is for the ***Medium*** CPU state. The normalization ratio for the ***Heavy*** CPU state is always fixed to 100% since it is the basis for the other ratios.

To change the desired ratio, press the corresponding button. A dialog window will appear. You can see the current value of the ratio there and you can change it using the spin controls or by typing a new value in. You have to press the **Apply** button to apply the changes. The blue bar will reflect the normalization setting by showing the normalized 0% - 100% range on the corresponding slider.

You can easily calculate the normalization ratios by doing the following:

1. Turn off the ***Scale*** option
2. Map the desired ***Scale*** speeds to the four ***Scale*** favorites. I suggest you also map the ***Scale*** speeds to the normal favorites to avoid confusion
3. Set the ***Latency*** slider to approximately 1/3rd of the scale. This will cut off the peaks
4. Set the ***Settle*** time to approximately 1/10th of the scale
5. Select the highest ***Scale*** speed
6. Start an application that loads the processor. Use an mp3 player, a video player, a favorite game or whatever
7. Open **Pocket Hack Master**'s ***Scale*** dialog and wait for about 30 seconds for the CPU load indicator to settle. Write down the CPU load that the

application is causing at the highest speed. This is the 100% of your normalization scale

8. Change the speed to the next lower scale speed
9. Start the same application again and measure the load at this speed
10. Divide the number by the load that you measured when running at the highest speed and multiply by 100%. For example if your load at the highest speed was 24% and the load at the next (*Heavy*) lower speed was 32%, then the normalization ratio would be

$$N3 = 32\% / 24\% * 100\% = 133\%$$

11. Do the same for the next lower speed. Calculate the normalization ratio for it by dividing the measured load by the measured load of the highest speed. For example if your load at the highest speed was 24% and the load at the next (*Low*) lower speed was 43%, then the normalization ratio would be

$$N2 = 43\% / 24\% * 100\% = 179\%$$

12. Calculate the last normalization ratio similarly.
13. Configure the normalization ratios
14. Restore your original *Latency* and *Settle* configuration
15. Adjust the triggering points
16. Turn on the *Scale* option

4.4.2.6   CPU load view checkbox

You can switch between displaying the normalized CPU load and the actual CPU load by using the check box next to the CPU load indicator. If you turn the option off (on by default), the indicator will start showing the actual CPU load. Please note that the *Settle* and *Latency* calculations will still be performed before the average smoothened load is shown on the indicator.
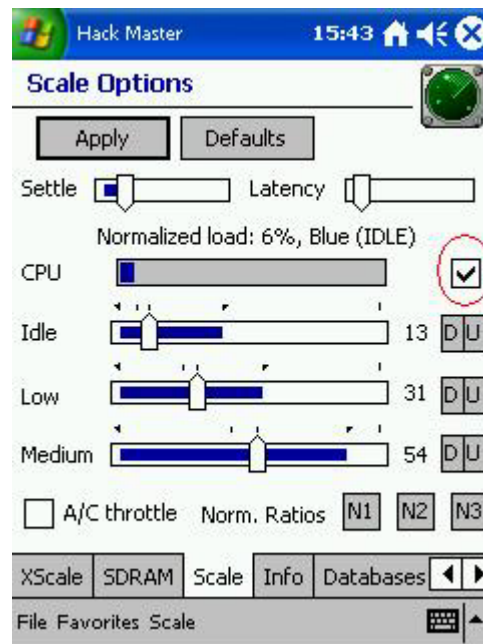
Figure 4.4.2.6 – CPU load view setting

4.4.2.7 A/C throttle

If this option is turned on, **Pocket Hack Master** will force the highest *Scale* speed when you plug your device in the A/C line.
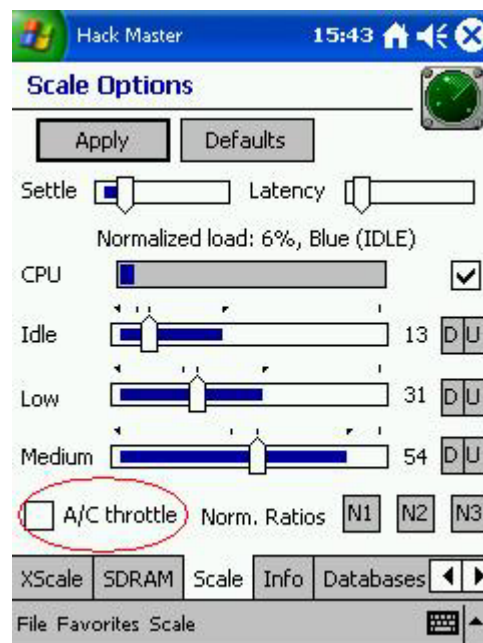

Figure 4.4.2.7 – A/C Throttle

The rest of this manual should be available soon in the distribution of Pocket Hack Master.