

## Digital Portable Tiltmeter System User Manual



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## Section 1 : Introduction

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The Soil Instruments Digital Tiltmeter System is designed and built using the very latest technology.

The readings are acquired and displayed using the **Tilt\_Port** Soil Instruments Field PC based software. Bluetooth technology and the remote handheld activator (Key Fob) for taking readings, give a complete cable free reading and data transmitting system, with no field connectors to corrode or break.

The Tiltmeter contains the accelerometer, hard coded calibration factors, power supply and A/D converters, the logging electronics, battery and system power supply.

### DIGITAL BLUETOOTH TILTMETER KEY SYSTEM COMPONENTS



## Section 2 : Equipment Supplied

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- Tiltmeter
- Digital Readout (Field PC) and Accessories (shock resistant and water proof case)
- Remote Handheld Activator (Key Fob)
- Accessories case with accessories

### 2.01 The Tiltmeter

The Tiltmeter contains the tilt sensor and all of the electronics to take readings, apply calibration factors and transmit data to the Field PC. It also contains the batteries and the power supply for the system.

### 2.02 The Digital Readout (Field PC) and Accessories

The Field PC communicates to and from the Tiltmeter by means of Bluetooth technology and so requires no leads or cables. It is supplied with a lead for downloading to a PC or laptop via a USB connection, a charger is also supplied. The Field PC comes with Soil Instruments Tilt\_Port and Microsoft Active Sync software already installed.

### 2.03 Remote Handheld Activator (Key Fob)

The Key Fob comes with a sprung clip for attaching to the Field PC case or elsewhere. It enables the user to initiate readings without having to touch the Field PC screen. If preferred, readings can be taken using the 'read' button on the Field PC, the Key Fob, or a combination of both to suit personal preference.

### 2.04 Specifications

Please refer to the Soil Instruments datasheet (available from Soil Instruments or [www.soilinstruments.com](http://www.soilinstruments.com) ) for the current specification for the particular instrument delivered. If in doubt please contact Soil Instruments.

### 2.05 Before First Use

**IMPORTANT:** If the Field PC has not been used for a prolonged period of time; it may lose battery power. The Field PC is designed to retain programs even if the battery is allowed to fully discharge, however we recommend that the battery is charged on a regular basis and that the Tiltmeter and Field PC are allowed to fully charge before the system is first used.

## Section 3 : About 'Tilt\_Port' Software

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### 3.01 Purpose

**Tilt\_Port** is a program developed by Soil Instruments to take readings from our digital Tiltmeters. It uses Bluetooth wireless technology to communicate with the Tiltmeter, receive the readings, perform checksums and store the results. Tilt\_Port also hold details of Tilt-Plate locations, allows for new Tilt-Plates to be set up and prompts the user through the reading process.

### 3.02 System Requirements

**Tilt\_Port** will run on any Personal Digital Assistant (Field PC), which runs the Microsoft Pocket PC operating system, version 2003 or higher. It does not need any of the programmable buttons on the Field PC to function, but any one of these buttons can be programmed to start up the software – see your Field PC's user manual for details. It has a footprint of approximately 124Kb and uses about 3.5Mb of memory when running. In addition, the database it uses has an initial footprint of approximately 250Kb; this will slowly grow as readings are taken, but should never exceed 1 or 2 MB, provided readings are regularly downloaded and deleted.

### 3.03 Interacting with the System

There are three user modes within the Tilt\_Port software, two for controlling and entering data into the program and one for direct communication with the Tiltmeter to take readings. For using the program we have:

The stylus. This is situated in its holder on the back of the Field PC. Deliver a brief, firm tap with this at the appropriate point on the screen to "press" a "button", change the value of a check box, etc, or to place the cursor in order to enter text. Text is entered using The "virtual keyboard". See section 4.05 below for more detail on this.

The Key Fob .For direct communication with the Tiltmeter there is the "Key Fob". This is a button-activated radio transmitter that tells the to take a reading and send the data to the Field PC Tilt\_Port software. A momentary press on the button operates the Key Fob. It does not need to be pointed at the directly, but will work better when it is. It is not very effective when solid objects such as walls or vehicle doors intervene.

### 3.04 Finding your way around:

When the system is started for the first time, or after a soft reset of the Field PC, the "Today" screen will be displayed. To access the Tilt\_Port software, tap on the "Start" button at the top left to drop down the Programs menu. In here you will see "Tilt\_Port". Tap this to start the program. When a program is running, tap the same place (where the name of the current program or form appears), or on the Windows icon in the very top left-hand corner, to drop down the programs menu.

In the "Today" screen will be the Bluetooth icon. Tap on this and select "Turn Bluetooth On/Off" as needed.

For other functions not specific to Tilt\_Port, see the built-in help or the Field PC user manual.

When Tilt\_Port is running, actions will be selected either from buttons on screen or from the menu bar at the bottom of each screen.

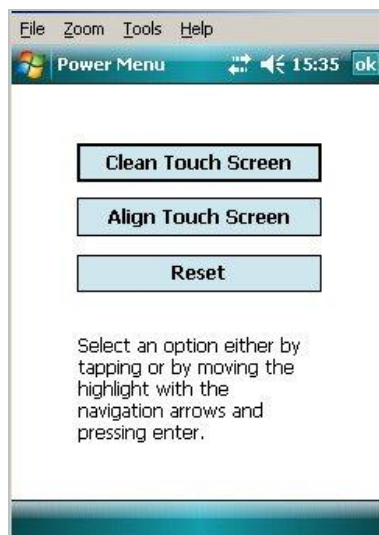
### 3.05 The "Virtual Keyboard"

This is a software equivalent of a keyboard. It is displayed or hidden by tapping the keyboard icon in the bottom of the screen (this is only visible when a program is running that can use the keyboard for input). To use it, simply tap the required key. Tap the Shift button for a single upper-case letter or special character, or tap on CAP for continuous entering of shifted characters. More special characters, especially accented letters, are available by tapping the keyboard icon at the bottom of the screen.

Before starting to use the virtual keyboard, ensure the cursor is positioned at the point where you need the text to appear (by tapping that point on the screen).

### 3.06 Help – I’m Lost!

If the Field PC locks up, or you accidentally start up a program and don’t know how to get out of it, there a couple of ways that you can get back to where you want to be. Tapping the Windows icon at the top left of the screen should always bring up the Windows Start Menu. If that is not possible, you need to carry out a “soft reset” of the Field PC. To do this, hold down the on/off key for about 3 seconds. The unit will start to countdown from 5. Releasing the unit during the countdown will display this menu:



Tapping “Reset” will start a reboot of the Field PC, closing any running programs, without losing any installed programs or settings. If the button is held down for longer, be careful – do not press any other buttons or you may trigger a “Clean boot” which will delete any user-installed programs.

To get out of this screen without re-booting, just tap the “OK” in the top right-hand corner.

### 3.07 Installing Tilt\_Port from the Memory Card

If the Field PC has never had Tilt\_Port installed or has been 'hard reset', Compact Framework will require installation from a PC to the Field PC. The PC must have Microsoft ActiveSync installed. The HP installation CD can be found with the Field PC that ActiveSync can be installed from.

Once ActiveSync is installed, connect the Field PC with the Field PC USB fly lead to the PC. Ensure the Field PC remains on during this process. Using the ActiveSync window browse function, go to the My Pocket PC and SD card. Copy and paste the file onto your PC. Double click on the file to run. Follow the on screen prompts to install the software and the prompts on the Field PC.

If 'Compact Framework' is already installed with your PC you will need to install/upgrade by another method. Please contact Soil instruments for further assistance

If the Tilt\_Port program is lost for any reason (in other words, does not appear in either the “Start” menu or the “Programs” screen), it must be re-installed from the supplied memory (Storage Card) card. Use the File Explorer program to navigate to the card, as follows:

- tap on “Programs” in the Start menu, then on “File Explorer”
- from the top left-hand drop-down menu, choose “My Device”. If this is not visible, click on the first item in the drop-down list and repeat this until “My Device” is visible.

- click on "Storage Card"
- Two programs must be installed. To install, just click on the name once, and wait until installation is complete. The following programs must be installed, **in the order shown**. If any one of them says it already exists, just say yes when asked if it is OK to overwrite it.

1. sqlce30.ppc.wce4.armv4.cab
2. Tilt\_port.cab

- (There should be a message saying, re-installing Tilt\_Port will overwrite any existing database, so the database should be copied elsewhere before re-installing. It can be found in the "Storage Card" folder, and is called "DB\_tiltport2.sdf".)
- When prompted, install the files onto the 'Device' not the 'SD' card.
- The program will now be in the "Program Files" screen, but probably not in the Start menu, as the Field PC will have returned to its factory settings and the limit on the number of programs in the menu will have been reached. To rectify this, Tap on Start – Settings. On the "Personal" tab, select "Menus". By checking and unchecking options, you will be able to customise the Start menu.

**Note:** On some Field PC's a warning may be generated when installing any of the above, saying the program may not display correctly as it was designed for a previous version of Windows Mobile Software. This message can be safely ignored.

**IMPORTANT:** Soil Instruments strongly recommend that you back up the information from the Field PC storage card on a regular basis to prevent loss of data and software due to accidental deletion by users.

**Although the software can be re-installed, the database and information created by users can not be recovered if accidentally deleted.**

## Section 4 : Tilt\_Port Software

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### 4.01 Basic Concept of Operation

Tilt\_Port is the set-up and Tilt-Plate logging software for the Soil Instruments Digital Tiltmeter. It uses Bluetooth wireless technology to take and receive readings from the Tiltmeter, and saves those readings to a database. They can then be downloaded to a text-format file, which can then be transferred to a PC, using Microsoft's ActiveSync software, for later loading into analysis software. To use Tilt\_Port to read an tilt plate, the site and its location must have been defined, using the "Admin" mode. The typical model of use is:

- Define the site
- Define all Tilt-Plates
- Take readings
- Download readings for a site and, optionally, delete them
- Transfer readings to PC and process using software such as Microsoft Excel

Steps (i) and (ii) are done only once for each site. Steps (iii) to (v) will be carried out each time readings are taken, although steps (iv) and (v) can be delayed – in other words, repeated sets of readings can be taken before downloading them.

More detailed information on these procedures will be found in the following sections.

**IMPORTANT:** it is essential that the "local settings" for both Field PC and PC are the same – ie they are both set to "English (UK)", "English (United States)", "French", etc. Also, it is not advisable to switch the Field PC from one locale to another when readings are in the database. Delete any existing readings before changing local settings.

### 4.02 Setting Up Bluetooth on the Field PC

The Field PC and tiltmeter are shipped fully set-up and ready for use. If for some reason Bluetooth does not start when Tilt\_Port is run (the blue 'comms ready' light on the tiltmeter should be illuminated), follow the procedure below to re-connect to the tiltmeter via Bluetooth when Tilt\_Port is started.

**Note:** Exit Tilt\_Port before following these instructions

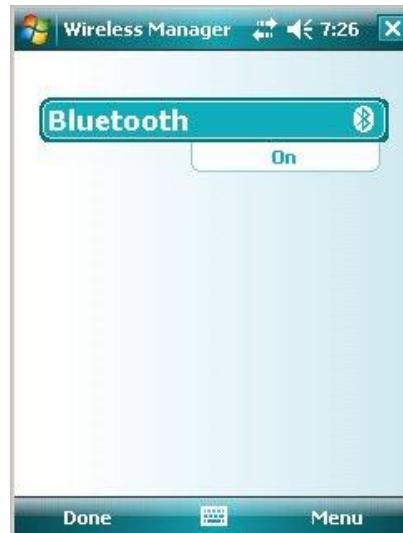
Ensure the tiltmeter and the Field PC are switched on and within 1.5 metres of one another. From the start menu screen tap the small Bluetooth Icon at the bottom right of the screen:



or, from the 'Start' menu, select 'Settings' then the 'Connections' tab at the bottom of the screen, then tap on the Bluetooth icon that will then be seen.

Once the icon above has been tapped the initial Bluetooth screen will appear:





Tap on the Bluetooth icon on the main screen, a "Bluetooth bar" will appear, tap on this bar to set Bluetooth to "on".

Next, select "Menu", then "Bluetooth Settings", then select "Add New Device", the Field PC will search for available Bluetooth devices and a list will appear (which may only have one device in it, the inclinometer system itself). If more than one device is listed, tap the one which corresponds to your tiltmeter, identified as DI\*\*\*\*<sup>(1)</sup>, then tap "Next".

The screen will then ask you to enter a password, skip this screen by tapping "Next".

A drop down box will appear asking "Do you wish to connect with your device?"

Tap "Yes" and enter the password "0" (zero) then tap "Next". Now tick "Serial Port Box" and tap on "Finish".

Next, tap the comms port tab at bottom of screen, "New Outgoing Port" should be highlighted. Tap on this and the Field PC will now ask you to select the device you want to add (i.e. DI\*\*\*\*). This will be the device highlighted – tap "Next"

The message "Com Port 8" will be highlighted with a check (tick) in a box labelled "Secure Connection". Un-check (un-tick) (i.e. remove) this box and select "Finish". Click on "Ok" located at top of screen, the Field PC is now connected to your device.

(1) DI\*\*\*\* means the serial number of the tiltmeter for example DI1234

The Field PC is now ready to communicate with the tiltmeter, and should remember which device to connect to in the future. If it loses the information, just go through the above procedure again.

For more information concerning Bluetooth connectivity, please see the supplied Field PC manual.

### 4.03 Admin and User Modes

The functions of the program are broadly divided into two "modes" – *Admin* and *User*. The *Admin* functions do not, for the most part, require any Bluetooth connection, and can therefore be carried out without needing to be close to the tiltmeter. The only exception to this is the function to register the key fob with the tiltmeter (see section 5.15). *User* functions are concerned with the actual operation of the tiltmeter, and mostly require a Bluetooth connection.

### 4.04 Starting the Program

**WARNING:** Before starting the program, switch on Bluetooth, unless you want to work in Admin mode and know you are not going to need a connection

**to the Tiltmeter. If you are in User mode, ensure the Tiltmeter is within 1-2 metres of you and is also turned on.**

To turn Bluetooth on the Field PC, tap on the Bluetooth icon at the bottom right of the "Today" screen.

To start Tilt\_Port, tap the stylus on the word "Start" at the top left of the screen (or the Windows icon in the very top left corner). A menu of available programs will drop down. Tap on "Tilt\_Port".

**Note:** it is possible, under certain circumstances, that the program may not appear in the Start menu. If so, it may still be under Start – Programs. If it is here, you can get it into the menu by using Start – Settings – Personal – Menu

If it is not here either, it must be fully re-installed as in section **4.08** above.

## 4.05 Start-up Screen

Here, the user is given the choice of which mode to work in, either by tapping the appropriate radio button and then "GO", or by choosing a mode from the "Mode" menu. As stated above, if "User" mode is chosen ensure the tiltmeter is switched on first and that approx 7-10 seconds after 'Enter Use Mode' has been selected and 'Go' pressed, that the 'comms ready' blue light on the tiltmeter illuminates.

If "Admin" is selected, the user is presented with **FormSet1 – Site set-up**. If "User" is chosen, the default screen that appears is **User screen 1**

## 4.06 FormSet1 – Site Set-up

The screenshot shows a dialog box titled "Tilt\_Port - Site setup" within a window titled "Admin 1". The dialog contains two radio buttons: "New Site" (which is selected) and "Change site". Below these are four text input fields: "6-character site code:", "Site Name:", "Operator:", and "No or Tiltplates:". At the bottom of the dialog are two buttons: "Set up tiltplates" and "OK". A menu bar at the very bottom of the window shows "Mode" and "Action".

This screen fulfils two roles: it is the starting place for defining a new site, or modifying an existing one, and it provides a small number of other admin functions via the menu. The menu options are:

- Action | Exit - exit program
- Action | Register key fob with Tiltmeter - see section 5.15
- Action | Start again – new – this returns to the Start-up screen, after closing any open Bluetooth connection (This command is available on all screens and is , effectively, also the way to change from one mode to another)
- Action | Download Readings – See section 5.13

The user is initially presented with two choices:

- New Site
- Change Site

If (a) is selected, the radio buttons are hidden and a new field appears, "6-character site code". This code can be up to 6 alphanumeric characters – which should be unique, meaningful and easily remembered. The rest of the fields can then be filled in: enter a site name, 3-character Operator Id and the number of tiltplates this site will have (this can be amended later, if necessary).

When (b) is selected, a drop-down box of the available sites will appear. Select the desired one of these and tap "Read". The site's details will be shown.

In either case, to go on to amend the site further or to continue to set it up, tap on "Set-up tiltplates".

This will then display FormSet2:

#### 4.07 FormSet2 – Tilt-Plate Set-up

The screenshot shows a software interface window titled "Admin 2" with the subtitle "Tiltmeter Controller - Admin (Tiltplate setup)". The interface includes a "Tiltplate No." field with a dropdown arrow and an "Amend" button. Below this is a "No of Axes" field with a spinner set to "1". Further down is an "A0 Direction" field with a text box and a "SAVE" button. At the bottom of the form area is a "DELETE" button highlighted with a red border. A status bar at the very bottom of the window shows "Mode" and "Action".

Having defined the number of tilt plates for the current site on the previous screen, this is where the tiltplate details are entered including orientation of the A0 direction.

#### 4.08 To add Tilt-Plates to a Site

- Enter a Tilt-Plate number in the top box (although these are traditionally referred to as "Tilt-Plate numbers" they can in fact be alphanumeric – up to a total of 6 characters).
- Select the number of Axes, i.e. one direction only (A) or and A and B directions.
- Enter a 3-character code for the A0 direction. This code will always appear in any drop-down list of Tilt-Plates, as a reminder to the user of how the Tiltmeter should be oriented on the Tilt-Plate.
- Tap "Save"
- At this point, the "Amend" button will be enabled. If you want to go back and amend a Tilt-Plate, tap "Amend" and the "Tilt-Plate No" text box will change to a drop-down list of existing plates Tap one to select it, make any changes and tap "Save". The changes will be saved and the text box will once more be ready for the next new Tilt-Plate.
- When all the Tilt-Plates specified in the previous screen have been defined, a message to that effect will be displayed. The "Amend" button will now be disabled, as amending (or deleting, via the "Delete" button) are now the only options. To amend a plate now, just select it from the drop-down list and continue as above.

## 4.09 To Amend or Delete Existing Tilt-Plates

Having entered the screen, if any Tilt-Plates have been created for this site, the "Amend" button will be available. To change a Tilt-Plate, select it from the drop-down list and continue as above.

To delete a Tilt-Plate, select it from the drop-down list and tap "Delete". The Tilt-Plate will be deleted. Any readings captured for this Tilt-Plate which have not specifically been deleted will remain on the database until downloaded and deleted.

**NOTE:** Once a Tilt-Plate has been created, it should not thereafter be renamed, or any readings associated with it in the database will be lost.

## 4.10 To Delete Sites

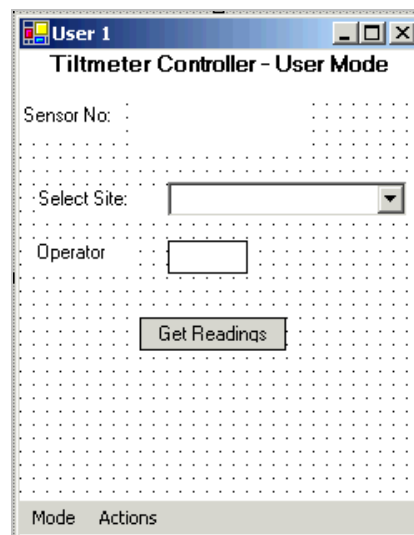
In the first Admin screen (Site Set up), when a site has been selected, it can be deleted by selecting

Action | 'Delete this site' from the menu.

Select the site by first tapping "change site" then the correct site must be chosen from the drop down list and the 'read' button pressed. Only then will the site be available for deleting.

Deleting a site will delete all site details including all Tilt-Plates and readings associated with the site.

## 4.11 User Screen 1 – (FormUse1)

The image shows a screenshot of a software application window titled "User 1" and "Tiltmeter Controller - User Mode". The window contains a form with the following elements: a "Sensor No." label followed by a dotted grid; a "Select Site:" label followed by a drop-down menu; an "Operator" label followed by a text input box; and a "Get Readings" button. At the bottom of the window, there is a status bar with the labels "Mode" and "Actions".

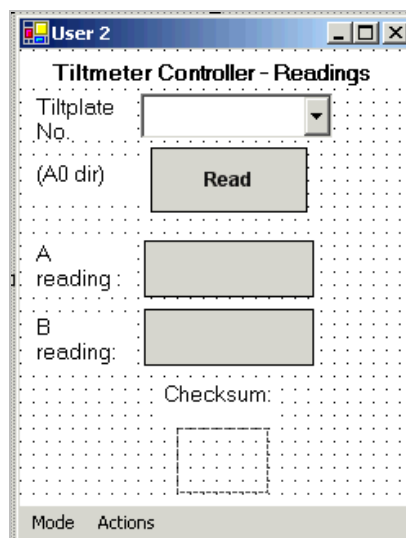
**IMPORTANT:** before selecting this screen, ensure that Bluetooth is switched on (i.e. the blue 'comms ready' light on the tiltmeter is illuminated)

This is where the user chooses the site to be read. From the drop-down box of site names, one is selected. A three-character Operator Id can be entered if desired. If this is left blank, the Operator ID specified in the Site Setup screen will be used (the Operator ID appears in the downloaded data files). Tapping on "Get Readings" will take the user to the second User screen, where the actual readings are taken.

When this screen is first entered, the Field PC will interrogate the tiltmeter and retrieve the probe calibration data from it, to apply to the readings. If there is any problem with this step, the "Get Readings" button will not be available. If the problem is with the data returned from the tiltmeter, an appropriate error message will be displayed. Please refer to the 'troubleshooting' section at the end of this manual for advice should this happen.

#### 4.12 User Screen (FormUse2) - Readings

This is where the actual readings are taken. The site has already been selected in the previous screen, so the first thing to do here is choose the Tilt-Plate to be read.



Select a Tilt-Plate from the drop-down list.

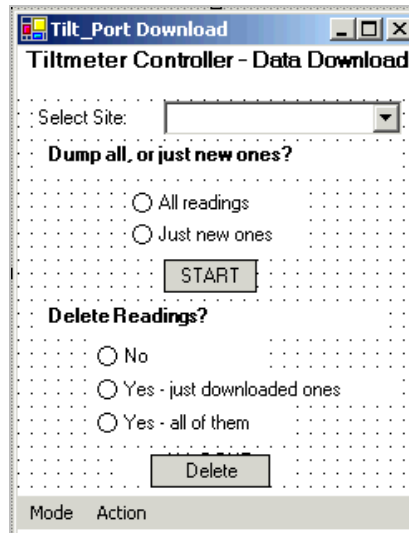
To take a reading, position the Tiltmeter onto the Tilt-Plate in the correct orientation and either press the Key Fob or tap the "Read" button. The Tiltmeter will sound a single beep to indicate it has received the read request. It will take a number of readings and return the maximum and minimum values, which will be averaged and the result displayed, followed by a double beep. The reading in the 0° direction will be displayed and, after a short pause, a message will prompt the user to reposition the Tilt-Plate in the 180° position and to take the second reading.

If the Tilt-Plate was set up in the program with both A and B axes, the user will now be prompted to take 0° and 180° readings in the B direction.

When the readings have been taken they are saved to the database on the Field PC. The user now has the option to choose another Tilt-Plate and repeat the process.

#### 4.13 Download Readings Screen

This screen is selected from 'menu' in Admin screen 1



It is not necessary to download readings as they are taken – the database will store thousands of readings. Nevertheless, **it is vital** that some sort of system should be put in place for regular downloading and deleting of readings.

To download readings, a site must first be chosen from the drop-down box. All subsequent choices then apply to this site only. The user must then select either “All readings” or “Just new ones” (readings not previously downloaded). When “START” is tapped. Downloading will begin; after a few seconds, the message “Download completed” will appear.

The user can then, optionally, tap on the drop-down list of sites to select a new site for downloading, delete any new readings, delete all readings (for this site) or do nothing.

Once downloaded the data will be stored on the removable storage card within the Field PC. Please Note: It is not good practice to swap cards between Field PCs as this can cause errors, please see Troubleshooting (Section 14) for details

**Notes:** This screen will download readings for *all* Tilt-Plates in the selected site, subject to the “new/all” choice described above.

Once readings have been downloaded to files, these should be transferred to a PC using ActiveSync. Then they can either be overwritten or (manually) deleted. If they are not deleted or renamed, and the readings are not deleted from the database via the Download screen, the file(s) could be overwritten by a later download unless just the “New” readings are chosen for this later download.

Downloaded data are in a CSV format for direct importation into a spreadsheet package such as Microsoft Excel.

#### 4.14 Transferring Downloaded Files to a PC

There two basic ways to do this; either by using Microsoft’s free tool, ActiveSync, or by means of a Compact Flash Card.

Using ActiveSync: the Field PC must have this installed on it (Field PCs supplied by Soil Instruments will already have it). When a Field PC with this software is connected to a PC which also has ActiveSync installed, a relationship is set up between the two. By clicking on the “Explore” button in ActiveSync on the PC, a FileExplorer window is opened on the PC, showing data from the Field PC, called “Mobile Device”. This actually represents the folder “My Documents”, plus a file representing the Field PC file storage system as a whole, called “My Windows Mobile-Based Device”. Double-click on “My Windows Mobile-Based Device” and then on “Storage Card”, then on “CSV Files”. In here will be one or more .CSV files. Make sure a File Explorer window is open for the PC, then simply drag the files required between the two windows, to the appropriate place on the PC.

Using a Flash card: attach a flash card reader to your PC, then remove the memory card from the Field PC and insert it in the reader. You should then be able to see a folder called "Storage Card" on the PC, using File Explorer, and be able to access the .CSV files in it as required.

#### **4.15 Register Key Fob**

This action is available from the menu in FormSet1.

The Key Fob is "registered" with the tiltmeter, so that the tiltmeter can respond to its signals. This is important if there are multiple tiltmeters in use within the range of a Key Fob. Occasionally it may be necessary to register a Key Fob with a tiltmeter – if a Key Fob is lost and a new one used, for example.

To register a Key Fob, open FormSet1 and select the option from the menu, having first switched on Bluetooth and the tiltmeter. Select the tiltmeter as in 5.02 above. If the Field PC successfully established communication, the screen will now show a large blue message, "PRESS Key Fob". Press the Key Fob briefly until a continuous beep is heard from the tiltmeter (this will take at least 5 seconds). After a short time, the message "PRESS AGAIN" will appear. Press the Key Fob once, no sound will be heard. After a short wait, the "OK" message appears, the Key Fob is now registered with the tiltmeter and ready for use.

## Section 5 : Operating Procedure

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### 5.01 Introduction & Reading Overview

To take a reading, position the Tiltmeter onto the Tilt-Plate in the correct orientation and either press the Key Fob or tap the "Read" button. The Tiltmeter will sound a single beep to indicate it has received the read request. It will take a number of readings and return the maximum and minimum values, which will be averaged and the result displayed, followed by a double beep. The reading in the 0° direction will be displayed and, after a short pause, a message will prompt the user to reposition the Tilt-Plate in the 180° position and to take the second reading.

If the Tilt-Plate was set up in the program with both A and B axes, the user will now be prompted to take 0° and 180° readings in the B direction.

When the readings have been taken they are saved to the database on the Field PC. The user now has the option to choose another Tilt-Plate and repeat the process.

### 5.02 Checking the Equipment Before Use

- Check that there is sufficient battery power in the Field PC. This is located via the 'Start' menu. In the 'Start' menu, go to 'Settings' and enter the 'System' tab located at the bottom of the screen. Tap on the 'Power' icon to access the battery settings. Ideally the main battery should be 50% or over, however the Field PC will function at a lower level. The backup battery should always be at 100% and is really only for emergencies. The best way of ensuring sufficient battery power at all times is to always leave the Field PC on charge when not in use and ensure that the Field PC is turned off during transportation. It is also advisable to turn the Bluetooth function off when readings are complete.
- The Tiltmeter battery will last on average for 12 hours of continuous use or up to two weeks of intermittent use (dependent on workload) and will turn itself off after half an hour if not being used. It takes approximately 12-15 hours to reach full charge. Check that the 'charge battery' warning light is not on and that the power is off during transportation.
- It is advisable to always carry a spare GP23A battery for the Key Fob.

### 5.03 Taking Readings

Turn on the power to the Tiltmeter. Once the power is switched on, a green light will blink intermittently. It is advisable to wait for 5 to 10 minutes for the Tiltmeter to stabilise (adjust to the ambient temperature).

Note: Not allowing for temperature stabilisation could result in unstable readings.

Switch on the Field PC and turn the Bluetooth function on by selecting the icon in the bottom right hand corner of the screen and choosing the 'Turn Bluetooth ON' option. Once Bluetooth is activated, the icon will turn blue on the Field PC.

Open Tilt\_Port and Enter User Mode (Take readings). A blue light should be activated on the Tiltmeter informing you that the comms is ready. You can now browse to the pre-defined site required. Once the site is selected, click the Get Readings button.

*(For more detail, refer to the chapter Tilt\_Port Software) .*

You will now see the Tilt-Plate on the Field PC screen, position the Tiltmeter on the Tilt-Plate in the correct orientation and once you are ready, momentarily press the button on the Key Fob, (alternatively, the 'Read' button can be used and if preferred this can be pressed using your finger rather than the Stylus.) First, a single beep confirms that the Key Fob has been acknowledged, however the reading has not yet been stored, a second double beep confirms the reading has been taken.

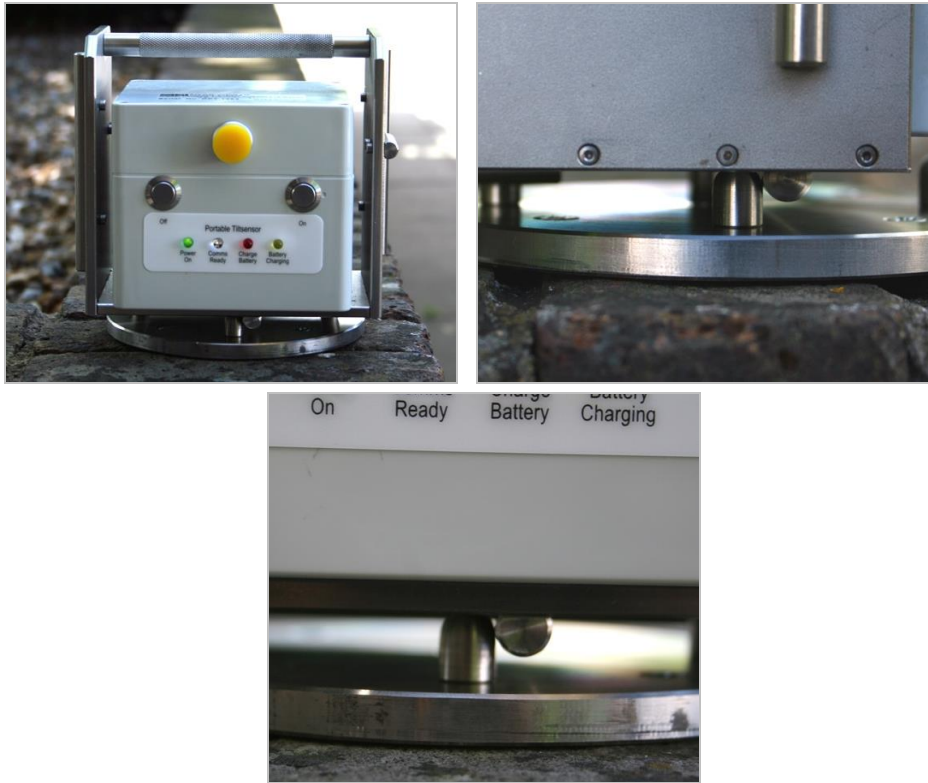
Once the A (0) position reading is complete, a dialogue box will prompt you to rotate the Tiltmeter to take the A (180°) position reading.

If the B Axis was selected in the Tilt-Plate set-up the user will be prompted to take the B axis readings.

Once this process has been completed a dialogue box will inform you that the Tilt-Plate readings are completed. Click OK. The reading is now complete. To exit Tilt\_Port, go to the Actions tab at the bottom tool bar and choose the exit option.



The readings displayed on the screen whilst taking readings are in units of arc degrees. For downloading the readings, refer to section 5.14 in chapter 5 – Tilt\_Port Software.



For Horizontal Tilt-Plates, place the Tiltmeter on the Tilt-Plate and ensure that the locating bars touch the protruding rounded studs on the Tilt-Plate *in both directions* (see photos above).

For Vertical Tilt-Plates, hold the Tiltmeter against the Tilt-Plate as shown below. As for horizontal Tilt-Plates ensure the locating bars contact the studs on the Tilt-Plate. Hold the Tiltmeter gently, but firmly and try not to move when the key-fob, or read button on the Field PC is pressed until the double beep sounds.





**Note:** In the pictures above a stainless steel Tilt-Plate is used for photographic clarity, all of the comments apply when using the cast bronze Tilt-Plate as pictured below is used.



## Section 6 : Maintenance

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### 6.01 Care and Maintenance of the Tiltmeter System

- Treat all items with respect and handle with CARE.
- Ensure that the Unit and Field PC are protected from shock during transit. Although the system is robust, dropping the may cause damage to the sensors.
- Ensure that the dust cap is always fitted in the charger socket when the charger is removed.
- Always wipe off dirt and moisture from the Tiltmeter after use.
- Do not expose the Tiltmeter to temperatures outside the range of -25 to +75°C.

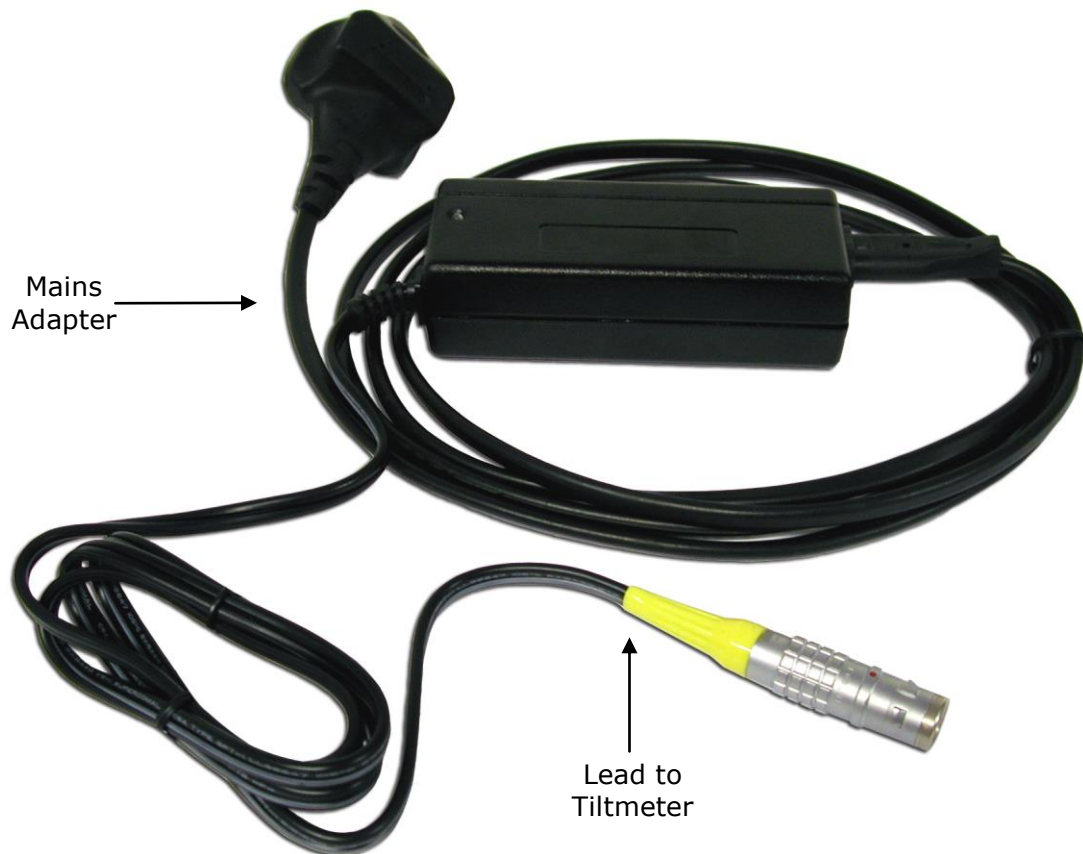
### 6.02 Charging the System

#### 1: Charging the Field PC

Please refer to the Field PC user manual for guidance

#### 2: Charging the Tiltmeter System

The system is supplied with a mains a charger, which is pictured below



To charge from the mains, plug the Lemo plug (sleeved plug pictured above and below) into the socket in the centre of the reel hub, ensure the system is turned off and then connect

the mains adapter to the mains power outlet. The charge indicator on the charger will light red to indicate charging is taking place and then become green once the charge is complete.



The mains adapter is supplied with power leads for most countries and automatically adjusts for any AC input voltage from 100-240VAC

It is advisable to leave the Tiltmeter system on charge overnight ready for the next day if readings are to be taken, (a light on the unit will inform you when battery power is low). Charging will take approximately 12-15 hours. After this time the unit will automatically switch to trickle charge mode. This is indicated by the charger led changing colour from red to green. The system can be left on trickle charge for several days with no ill effects.

Charging must take place in a dry environment such as in a workshop or office

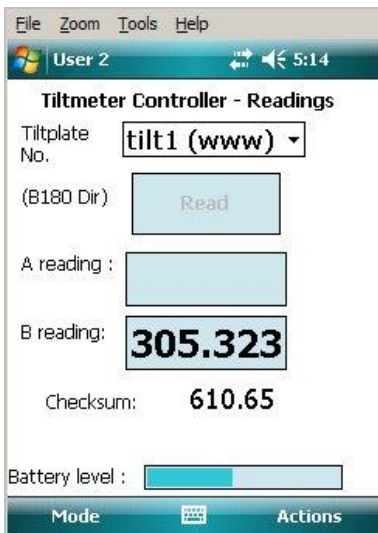
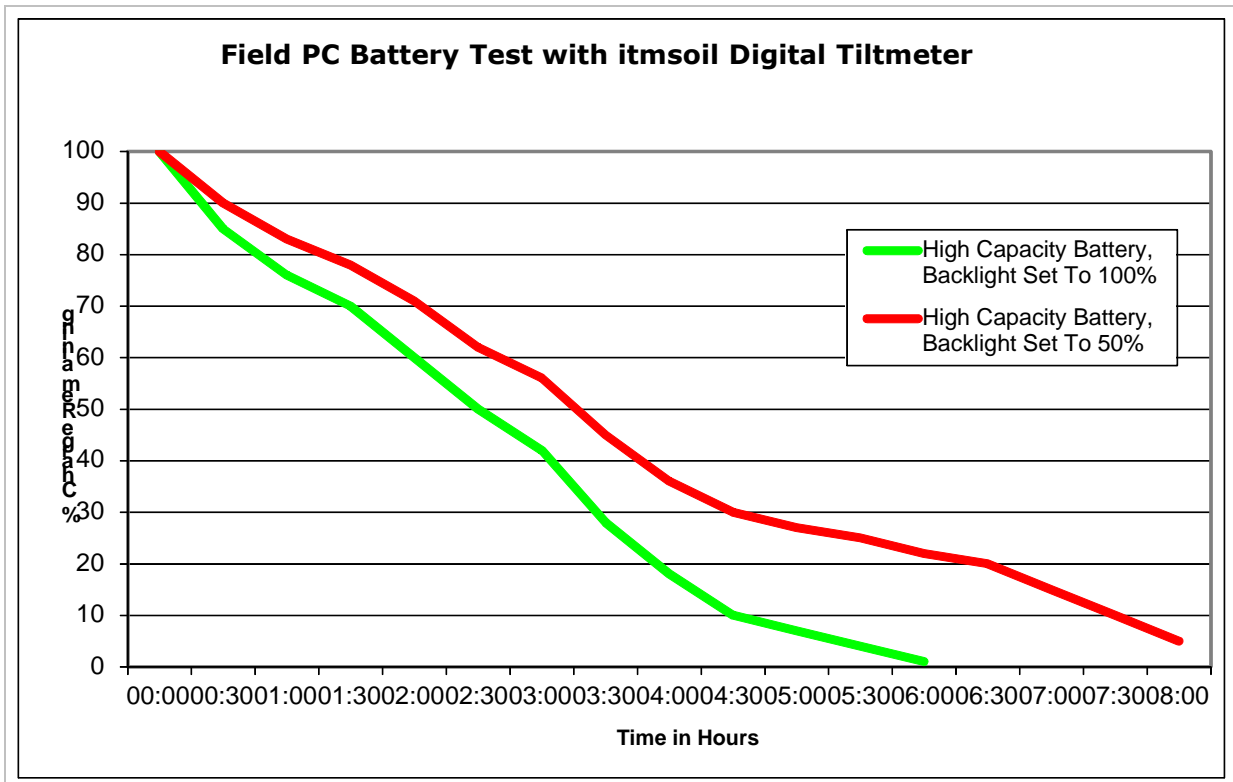
#### **Replacing the Battery – Key Fob**

It is advisable to always carry a spare GP23A battery for the Key Fob. To replace the battery, remove the two screws located on the back, (you will need a terminal screwdriver with a Phillips head). Remove old battery and replace with new, ensuring that the battery terminals are in the correct position, (+ and - are marked on the plastic).

### **6.03 Field PC Battery Life**

The Field PC battery life depends on whether the High Capacity battery (standard on systems supplied by Soil Instruments) or the Standard battery is being used, on the backlight settings, the ambient temperature, state of charge and the way in which the system is used. As a guide to battery life a Field PC and Digital Inclinometer were tested in our factory with the inclinometer transmitting readings to the Field PC every 10 seconds (i.e. as fast as the faster operator could use the instrument in the field). This test resulted in the battery life shown in the chart on the next page.

It must be remembered that all batteries decay as the age and therefore it may be necessary to replace the Field PC battery after 12-18 months of use dependant on the site and user requirements. It should also be remembered that the chart on page 24 is a guide, actual performance will vary.



The User Screen shows a Battery Level bar. Once a reading has been taken (in other words, data have been sent back from the reel), the user screen will show this bar indicating the reel battery level. The bar's start and end voltages are 13v (right hand end) and 11v (left hand end). It does not change colour at all – the indication of the state of the battery is the position of the bar.

When the reel voltage reaches about 11.8v, a warning is given that the battery is getting low and when it reaches 11.2, a further warning is given that the battery is about to run out.

## 6.04 Calibration

The Tiltmeter system will need to be returned to Soil Instruments for calibration after one year. Once the system reaches the end of its calibration service life, a warning display will appear on the Field PC. The warning will remain until the unit is returned and calibrated, although the system will still be usable. You should return the system to Soil Instruments for calibration – please see [www.soilinstruments.com](http://www.soilinstruments.com)

## 6.05 Troubleshooting

The table on the page to follow show some common errors and answers questions raised by customers and from Soil Instruments ongoing testing and development of the Digital Tiltmeter. We welcome feedback from users, please contact us if you find a problem not detailed here.

<b>SYMPTOM</b>	<b>SOLUTION</b>
The serial number of the Tiltmeter does not appear in the Bluetooth "Select device" screen	Tap on the "refresh" icon at the bottom of the screen (when it's green, not red). If that fails - is the Tiltmeter switched on? Is the Tiltmeter fully charged?
Field PC Cannot Communicate With the Tiltmeter	Try the keyfob - does the Tiltmeter give one beep, followed a few seconds later by two? If not, then either the Tiltmeter is faulty or the keyfob battery is flat. If there is no first beep, it could be the Bluetooth on the Field PC not working.
Tilt_Port displays "Warning - your calibration is out of date" on entering User mode.	The system is out of calibration; it can still be used, but must be returned to Soil Instruments as soon as possible.
The Key Fob does not initiate a reading	First, does the Field PC? If so, then replace the Key Fob battery and perform the 'register the Key Fob' procedure.
Tilt_Port is not in the Start menu	When re-installing, Tilt_Port there may not be enough slots in the menu (very limited by Microsoft). Use Start - Settings (Personal tab) - Menus. Check and uncheck programs to get the ones you want in the start menu. If this doesn't work, may still be a possible to find it in the File Explorer - Program Files\Tilt_Port folder. If all else fails, re-install as in section 5.08 of the manual.
On starting up, get an error message saying "25046"	The database is not where it should be on the memory card. Have cards been swapped between HP and Dell Field PC's? There may be a folder called SD Card (when they are actually on a Dell, which expects "Storage Card") or vice versa for an HP one. Use ActiveSync to copy the file <b>Tilt_Port.sdf</b> to the right place ("SD Card" for HP, "Storage Card" for Dell, "Carte de Stockage" for a French Dell) If you cannot find the database, contact Soil Instruments for a new full installer program
On starting up, get an error either 25009 or 25010	Normally same problem as "25046" error as above, try the same solution - or the Field PC is using a database and program version that do not match. Please contact Soil Instruments.
(On HP Field PC's) - Field PC hangs on the BT select device screen - no devices appear	Bluetooth was not switched on before starting Tilt_Port. Soft reset, turn it on and try again.
"Read" button locks in use	Try to use the Key Fob - this may unlock the screen. Failing that, soft reset (from version 1.8 onwards, should not lose any data)
Field PC displays "All readings complete" after first reading taken	You have entered the start and end depths wrong way round
Read button on Field PC screen greyed out preventing next reading.	Use the Key Fob to take reading, this should reactivate the button for the next reading.





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