

# FC-2500

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 **PRODUCT GUIDE**



**Two Technologies, Inc.<sup>®</sup>**

Hand Held Computers • Your Way • Since 1987

MAN0375 REV. A



## FC-2500 PRODUCT GUIDE

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## WARRANTY INFORMATION

Warranty details for all Two Technologies Inc. products can be found within the Terms and Conditions of Sale which accompanied your original product sales quotation. You can also obtain the warranty details by contacting your sales representative.

## PRODUCT RETURNS

If, after inspection, you note any product damage or discrepancies, please contact us promptly within five days of receipt. If the exterior of the package shows obvious signs of damage, please contact the carrier who delivered the package right away.

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# REGULATORY NOTICES

## FCC PART 15 CLASS A

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/her own expense.

This 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.

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## FCC SECTION 15.21

Changes or modifications to this unit not expressly approved by Two Technologies may void the user's authority to operate the equipment<sup>1</sup>.

## WLAN COMPLIANCE

This device contains a Summit Data Communications SDC-MCF10G 802.11g Mini Module, FCC ID: TWG-SDMCF10G, IC ID: 6616A-SDMCF10G and complies with Part 15 of the FCC rules.

Operation is subject to the following 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.

## CANADIAN DEPARTMENT OF COMMUNICATIONS

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications

Le present appareil numerique n'emet pas de bruits radioelectrique depassant les limites applicables aux appareils numeriques de la class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

## INDUSTRY CANADA

Registration Number: 6616A-SDMCF10G

CENELEC (PENDING)



EMI Standards:

- EN 55022:1998 (CISPR22), Class A | ETSI EN 300 330-2: 2001

EMC Standards:

- 301 489-07 V1.3.1 | EN 301 489-17 V1.21 | EN 55022: 1998 | EN 55024: 1998 | ETSI EN 301489-1: 2002, 301489-3: 2002 | EN/IEC 61000-4-2, 61000-4-3, 61000-4-4

Radio Systems per R&TTE

- EN300 328 V1.7.1

IT Equipment Safety:

- EN60950-1: 2001 | EN50360: 2002 | EN50360: 2002 | EN60825-1

## WARNINGS

Changes or modifications to this unit not expressly approved by the party responsible for regulatory compliance could void the user's authority to operate the equipment.



### ELECTROSTATIC DISCHARGE (ESD)

Electrostatic discharge (static electricity) can have unpredictable adverse effects on any electronic device. Although the design of this product incorporates extensive ESD-related precautions, ESD can still cause problems. It is good practice to discharge static by touching a grounded metal object before inserting cards or connecting devices.

La descarga electrostática (electricidad estática) puede tener efectos nocivos imprevisibles en cualquier dispositivo electrónico. Aunque el diseño de este producto incorpora precauciones ESD-relacionadas extensas, la lata de ESD todavía causa problemas. Es buena práctica descargar parásitos atmosféricos tocando un objeto puesto a tierra del metal antes de insertar tarjetas o de conectar los dispositivos.

La décharge électrostatique (l'électricité statique) peut avoir des effets nuisibles imprévisibles sur n'importe quel dispositif électronique. Bien que la conception de ce produit incorpore des précautions ESD-connexes étendues, le bidon d'ESD posent toujours des problèmes. Il est dans de bons habitudes de décharger la charge statique en touchant un objet au sol en métal avant d'insérer des cartes ou relier des dispositifs.

Elektrostatische Aufladung (statische Elektrizität, ESD) kann unvorhersehbare schädliche Auswirkungen auf jedes elektronische Gerät haben. Obgleich das Design dieses Produktes umfangreiche ESD-Schutzmassnahmen enthält, kann ESD dennoch Probleme verursachen. Vermeiden Sie statische Elektrizität, indem Sie einen geerdeten Metallgegenstand berühren bevor Sie Karten einsetzen oder andere Geräte anschliessen.



### SERVICING INFORMATION

When servicing the unit, the plug (charge power cable) is the disconnect device. Simply unplug the unit before servicing.

Al mantener la unidad, el enchufe (cable de transmisión de la carga) es el dispositivo de la desconexión. Desenchufe simplemente la unidad antes de mantener.

En entretenant l'unité, la prise (cable électrique de charge) est le dispositif de débranchement. Débranchez simplement l'unité avant l'entretien.

Bei Arbeiten am Gerät ist zuerst das Verbindungskabel (Aufladung Energie Kabel) am Gerät abzustecken (falls vorhanden).



### BATTERY REPLACEMENT

**CAUTION!** There is a risk of explosion if you replace the Li-ion battery with an incorrect type. Only use the Li-ion battery supplied with your unit or a replacement Li-ion battery supplied, recommended, or approved by Two Technologies, Inc.

**PRECAUCIÓN!** Hay un riesgo de la explosión si usted substituye la batería de Li-ion por un tipo incorrecto. Utilice solamente la batería de Li-ion provista de su unidad o una batería de Li-ion del reemplazo provista, recomendada, o aprobada por Two Technologies, Inc.

**ATTENTION!** Il y a un risque d'explosion si vous remplacez la batterie de Li-ion avec un type incorrect. Utilisez seulement la batterie de Li-ion fournie avec votre unité ou une batterie de Li-ion de remplacement fournie, recommandée, ou approuvée par Two Technologies, Inc.

**VORSICHT!** Bei Verwendung von Li-ion Akkus, die nicht durch Two Technologies, Inc. geliefert, empfohlen oder genehmigt wurden besteht Explosionsgefahr! Benutzen Sie daher nur solche Li-ion Akkus, die mit dem Gerät geliefert wurden bzw. Ersatzakkus, die durch Two Technologies, Inc. geliefert, empfohlen oder genehmigt wurden.



## BATTERY DISPOSAL

Dispose of batteries in a safe manner. The following are general guidelines for the safe use and disposal of Li-ion batteries:

- Replace a defective Li-ion battery immediately as it could damage the unit.
- Do not throw the Li-ion battery in the trash as it contains heavy metals. Recycle or dispose of the Li-ion battery as required by local ordinances or regulations.
- Do not disassemble, incinerate, short-circuit the Li-ion battery or throw it into a fire. It can explode and cause severe personal injury.

Disponga de las baterías de una manera segura. Los siguientes son pautas generales para el uso seguro y la disposición de las baterías de Li-ion:

- Inmediatamente substituya una bateria de Li-ion defectuosa pues podria dañar el aparato.
- +Inmediatamente substituya una bateria de Li-ion defectuosa pues podria dañar el aparato.
- No desarme, incinere o cortocircuite la bateria de Li-ion, ni la eche al fuego. Puede estallar y causar daños personales graves.

Débarassez-vous des batteries d'une façon sûre. Ce qui suit sont les orientations à l'utilisation sûre et à la disposition des batteries de Li-ion:

- Quand la batterie Li-ion est abime .defectueuse, il faut absolument la changer, sinon l'appareil est endommagé. IMPORTANT.
- La Batterie Li-ion doit etre apres usage etre jete dans une poubelle destinée aux metals lourds: piles,batterie afin d'être recyclées en raison de leur contenu nocif.
- La batterie Li-ion ne doit pas etre demontée ou moitie montée. A ne pas exposer la batterie pres de sources de chaleur. Sinon la batterie peut engendrer des blessures graves.

Beseitigen Sie verbrauchte Akkus und Batterien sicher und umweltfreundlich.

Allgemeine Richtlinien für den sicheren Gebrauch und die Beseitigung der Li-ion Akkus:

- Ein defekter Li-ion Akku muss umgehend ersetzt werden, da sonst Schäden am Gerät entstehen können.
- Li-ion Akkus enthalten Schwermetalle und müssen als Sondermüll entsorgt werden! Bitte bringen Sie diese zu geeigneten Sammelstellen zum Recycling
- Der Li-ion Akku darf nicht zerlegt, kurzgeschlossen oder anderweitig beschädigt werden. Von Feuer und sonstigen Wärmequellen fernhalten! Der Akku könnte dabei explodieren und erhebliche Verletzungen verursachen.



## LASER USAGE

The FC-2500 uses a pair of 635nm red visible lasers that typically emit less than 3mW of radiated power. The lasers are aligned at the factory to be parallel to the center of optics of the FC-2500 camera.

**CAUTION!** Use of controls, adjustments or performance procedures other than those specified may result in hazardous radiation exposure.

The FC-2500 emits light in a tight beam that does not grow in size at a distance from the laser. This means that the same degree of hazard can be present both close to and far from the laser.

The controls for operating the laser are only available through software interaction with eye•WARE™ software.

## SAFETY

**Important!!** Only qualified people are to use the lasers.

**Important!!** People using this device must be properly trained.

When using the lasers in the FC-2500, make sure that you:

- Never aim or shine the laser beam at anyone.
- Only activate the lasers when you are using them to point at a nearby object.
- Never look directly into the lasers. The FC-2500 can focus a laser beam to a very small, intense spot on the retina, which can result in a burn or blind spot.
- Do not modify the FC-2500 housing in any way. This will void the warranty and could cause unpredictable results when using the lasers.

## COMPLIANCE

This product complies with Chapter 21 CFR (Code of Federal Regulations) 1040.10 (h) (2)

The following label is shown on the LCD for several seconds during boot of the FC-2500 eye•WARE software and is intended as a cautionary statement for the operator:





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# OVERVIEW

## ABOUT THIS MANUAL

This manual describes the standard features and operation of the FC-2500. Unless otherwise stated, the operational characteristics described herein correspond to factory default configurations and settings as shipped from Two Technologies.

This manual is provided as a Technical Reference for Two Technologies' GEM Partners. This document is targeted to an audience, consisting of, but not limited to the GEM Partner's Software Developers, Engineers, Technicians, and Sales People. This document is not intended to be distributed to the GEM Partner's end users.

It is the responsibility of the GEM Partner to produce an "End User" manual that describes the GEM Partner's production terms of both software and hardware. Excerpts from this manual may be used in the production of such a manual.

It is not required of this manual to provide operating system tutorials or information about commercial or customized FC-2500 application programs and connected equipment. This information should be available in the manuals that accompany those products.

### *RELATED DOCUMENTS*

- eye•WARE™ User's Guide

Document Number: MAN0371

## ABOUT TWO TECHNOLOGIES

Two Technologies has been producing rugged hand held/panel mount terminals and computers since 1987. By implementing state of the art design and manufacturing techniques, we revolutionized hand held terminals and computers inside and out. Today, Two Technologies offers over a dozen cost-effective solutions serving virtually every market worldwide.

## ABOUT THE FC-2500

The FC-2500 is an intuitive, sealed (IP67), rugged (MIL-STD 810F for shock), true digital color camera, Windows CE system that can also read bar codes. It is the first mobile hand held computing device with dual rechargeable primary batteries!

The FC-2500 comes standard with the Windows CE 5.0 operating system and an Intel PXA270 XScale processor that operates up to 624 MHz. It also comes standard with Bluetooth, WLAN and serial communication (RS-232 and USB that works as either a host or client using an OTG connector)

## FC-2500 FEATURES

### OPERATING SYSTEM

The FC-2500 uses Windows CE 5.0 as its operating system. You can develop applications quickly and easily using the latest development tools and network connectivity from Microsoft, such as Visual Studio 2005, and eMbedded Visual C++ 4.0.

### PROCESSOR

The FC-2500 utilizes the Marvel® PXA270 processor, an integrated system-on-a-chip microprocessor for high performance, dynamic, low-power portable handheld and hand-set devices as well as embedded platforms. It incorporates the XScale® technology which complies with the ARM\* version 5TE instruction set (excluding floating-point instructions) and follows the ARM\* programmer's model. The PXA270 processor also provides Intel® Wireless MMX™ media enhancement technology, which supports integer instructions to accelerate audio and video processing. In addition, it incorporates Wireless Intel Speedstep® Technology, which provides sophisticated power management capabilities enabling excellent MIPS/mW performance.

### MEMORY AND MASS STORAGE

The FC-2500 comes standard with 256MB of SDRAM (approximately 30MB used for the operating system) and 2GB of internal compact flash memory.

### CAMERA

The FC-2500 utilizes a 5 megapixel (4 megapixel processed) digital camera equipped with LED illuminators to assist in low-light situations, a dual aperture optical path, an auto focus system, and IR coated-glass optics for crisp clear images.

The true camera system is also capable of reading 1D, Code39, Code128, UPC, JAN (EAN-13), EAN (all derivatives), Interleaved 2of5, 2D, PDF417 barcode symbologies.

### ILLUMINATORS AND LASERS

The FC-2500 comes with four LED illuminators that you can use to take pictures in low light conditions. In addition, the FC-2500 uses a pair of 635nm red visible lasers for snap focusing, and that you can use to position objects and aligning the FC-2500.

### EYE•WARE™

Two Technologies' eye•WARE is an optional "wedge" program allows you to easily take pictures or capture bar codes and pass data to a text field that has focus in an application. Additionally, eyeWARE provides an API that allows developers to access the camera system's functionality from within their own application program. For more information, please refer to the *eye•WARE User's Guide*.

### DISPLAYS

The FC-2500 features a color, transfective, and active matrix LCD incorporating Advanced TFT technology. It supports QVGA resolution (320 x 240 pixels), and offers excellent outdoor readability. For indoor readability, the display is equipped with a LED Backlight, providing reliability and long life. The backlight is controllable through system setups and also via a programmatic interface. The display also includes a touch panel which functions both as a user input device and a protective/sealing layer above the display.

## KEYPADS

The keypad configuration for the FC-2500 is 55 key (plus joystick). The individual keys are fabricated from a polycarbonate material. It is the only full travel plastic hard key keyboard being used on a hand held computer. It incorporates snapdome technology for a true-feel and the capacity for fast data entry.

## INDICATORS

The FC-2500 has five programmable LED indicators that can provide a number of useful functions including the state of keypad modifier keys. An additional LED indicates the charge and low battery statuses.

## AUDIO

The FC-2500 provides audio feedback using a polypropylene speaker with gasket which is being driven by a 1 watt audio amplifier. This allows the device to reproduce sound at substantial volume levels. The unit also is equipped with a condenser microphone. Some future uses may include voice recording, use a cellular phone, voice communications over air, etc.

## RECHARGEABLE BATTERY PACK

The FC-2500 comes with two rechargeable Lithium Ion (Li-ion) battery packs that can provide up to forty hours of operating time on a full charge. (This is highly dependent upon program and peripheral usage as well as the power management strategies utilized). Partially discharged batteries or extended periods with the charger left connected will not adversely affect battery life or performance. The unique configuration of the battery structure allows for one battery to be hot-swapped to indefinitely extend the operating life of the system without program disruptions. The FC-2500 has a dual/parallel charging system which allows for the two batteries to be charged simultaneously internally in about 3 hours. Another world first!

## COMMUNICATIONS CONNECTIVITY

The FC-2500 comes with one USB OTG mini A/B connector for host and client, a DE-9 full RS-232 serial port with auxiliary power output, and one power/charge jack with outside negative configuration.

## FC-2500 DURABILITY

The case is made of General Electric Xenoy, one of the most durable chemical resistant materials available today. This product is tested to MIL-STD-810F: January 1<sup>st</sup>, 2000 Method 516.5 Procedure IV for shock. Test is performed with a drop tester from 122cm (48 inches) onto all faces, edges, and corners.

## INGRESS PROTECTION

The FC-2500 is completely water and dust proof. The unit is tested to EN60529:1991 IP6x Method 13.5 for dust ingress and to EN60529:1991 IPx7 Method 14.2.7 for water ingress. This results in a product which is ingress rated for IP67 for use in all wet/dirty/filthy/disgusting environments where the work just needs to be done!

# ABOUT DEVELOPING APPLICATIONS ON THE FC-2500

Here are some tools that will aid in the development of Windows CE 5.0 applications for the FC-2500:

- **Visual Studio® 2005**—this development tool allows you to create Windows CE 5.0 applications that run on the .NET Compact Framework 2.0 using C#, Visual Basic and C++. For more information, see the following link: <http://msdn2.microsoft.com/en-us/vs2005/default.aspx> and continue on to the section entitled: “Using Visual Studio® 2005” within this manual.
- **ActiveSync**—this Microsoft utility allow you to transfer files between the FC-2500 and your development system. This and its newer counterpart named Windows Mobile Device Center; are available as free downloads from Microsoft® at: <http://www.microsoft.com/windowsmobile/activesync/default.msp>. ActiveSync 4.0 or above is required for Visual Studio 2005. For more information on how to use ActiveSync, see the section entitled: “Creating an ActiveSync Connection”

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**Note:** ActiveSync 4.5 minimum is recommended.

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- **Kbdtool.exe**—included with the FC-2500 Developer’s CD, this MS-DOS application enables you to remap the FC-2500 keyboard. For more information, see the section entitled: “Keyboard Mapping”.

---

**Note:** After installing any Microsoft product from a disk, you should check their website for newer versions or service packs.

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## THEORY OF OPERATION

The FC-2500 not only takes photographs and scan bar codes, it also allows developers and integrators to pass information, such as the photograph storage path and bar code information into their applications using Two Technologies' eye•WARE™ solution.

eye•WARE utilizes XML configuration files to control camera and barcode scanning functionality. Developers can create these files using the eye•SEE or eye•D Setup utilities or by reading the files into an XML serializer.

### *OUT OF THE BOX FUNCTIONALITY*

When you receive your FC-2500 Developer's kit, your FC-2500 will already have eye•WARE installed. Simply, select "eye•WARE" from the Programs menu to start.

To use eye•WARE:

- Press the **CAMERA** key once to focus the camera; press the key again to take a photograph. Then either press **4** to save the photograph or **1** to delete it.
- Press the **SCAN** key to scan a barcode. If the scan is successful, the FC-2500 will beep. If the scan is unsuccessful, the FC-2500 will buzz.
- Press the **F4** key to refocus the camera.

Should you invalidate the registry, you will need to remap the CAMERA, SCAN and F4 keys to the demo programs. You can accomplish this by navigating to the SystemCF\eyeWARE folder and running eyeKeyMapper.exe. The eyeKeyMapper.exe program may also be used to disassociate the eye•WARE functions from the keys by clearing the check box for each function that you do not wish to have mapped.

### *PROGRAMMING WITH EYE•WARE™*

The eye•WARE system enables both integrators and developers with varying levels of programming expertise to add a camera solution to an application.

The eye•WARE system consists of following layers:

- **Driver Layer**— controls interaction with the physical camera hardware as well as the lamp and laser subsystems. Developers cannot access this layer.
- **Wedge Layer**— consists of the JETTCamera DLL and the eye•WARE engine, which allow a user to perform camera and barcode functions by pressing keys on the FC-2500 keypad. The eye•SEE or eye•D Setup utilities can be used to create XML configuration files that define the details for the camera and barcode operations.
- **Developer Layer**— provides developers programmatic control of the camera for taking photographs or scanning barcodes. The TwoTecheyeWARELibraryCE.dll is a .NET class library that allows developers to interact with the eye•WARE engine, get the camera state, and send camera and barcode events from inside their application without using key presses.

In addition, developers can create custom XML configuration files using the eye•SEE or eye•D Setup utilities and then load these configuration on-the-file from their program. The custom configuration files are read by eye•WARE at the beginning of every camera or barcode event to customize the behavior of that photograph-taking or scanning session.

Preliminary



# COMPONENTS AND INDICATORS

## FRONT COMPONENTS

This section describes the components found on the front of the FC-2500.

Figure 2-1: Front Components

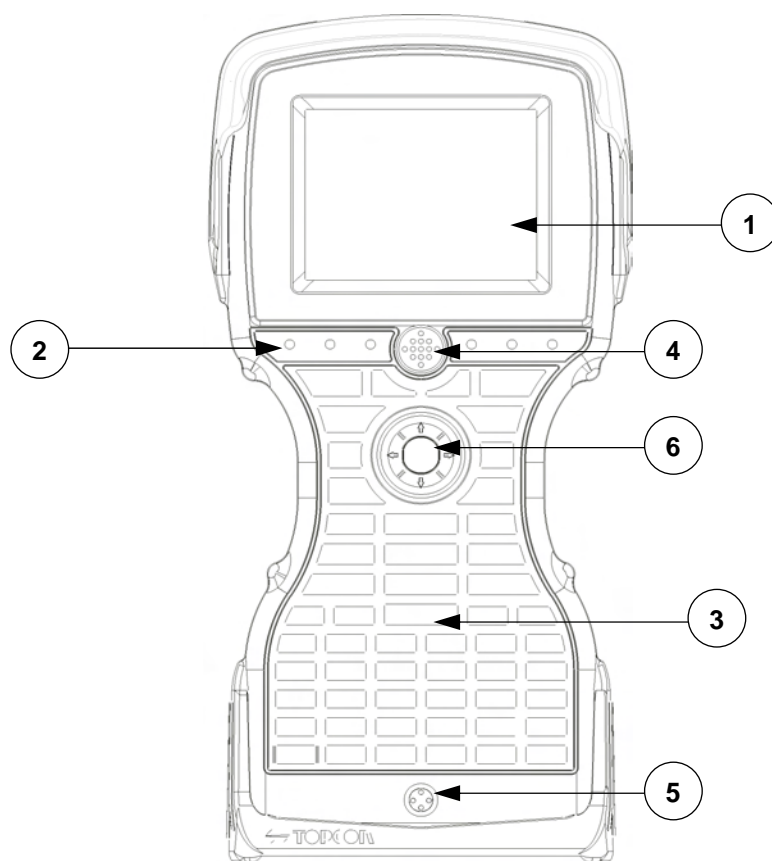


Table 2-1: Front Components and Indicators

Item	Component	Description
1	Display	Color, transfective, outdoor readable, active matrix liquid crystal display with touch screen.
2	Indicators	Contains the LEDs for the Battery Status, Function, Shift & Caps keys, Bluetooth, and WLAN
3	Keypad	55-key keypad with joystick with 8 way joystick
4	Speaker	1 watt polypropylene waterproof 1-way speaker
5	Microphone	Condenser Microphone
6	Joystick	8-way Joystick

## CAMERA, ILLUMINATORS AND LASERS

Figure 2-2: Camera, Illuminators and Lasers

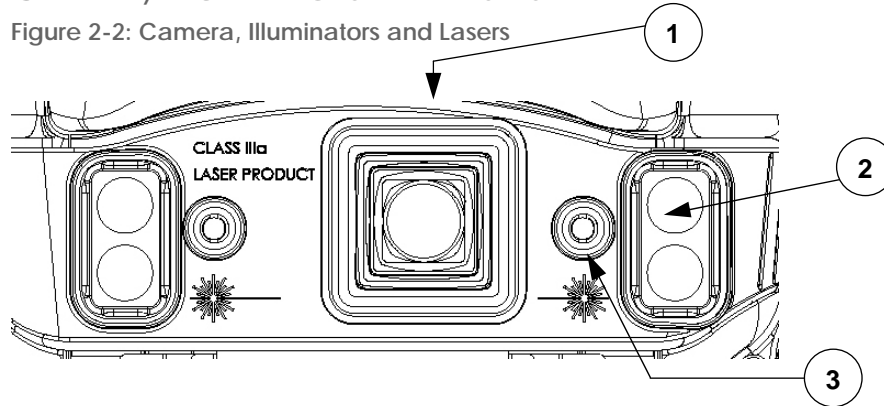


Table 2-2: Camera, Illuminators and Lasers

Item	Component	Description
1	Camera	Color, five megapixel (4 megapixel processed), auto-focus, multi-aperture camera
2	Illuminators	Four illuminators that you can use to take pictures in low light conditions
3	Lasers	Two 635nm red visible lasers used for snap focus and that you can use to position objects and align the FC-2500

## FRONT PANEL

This section describes the components found on the front panel.

Figure 2-3: Indicators

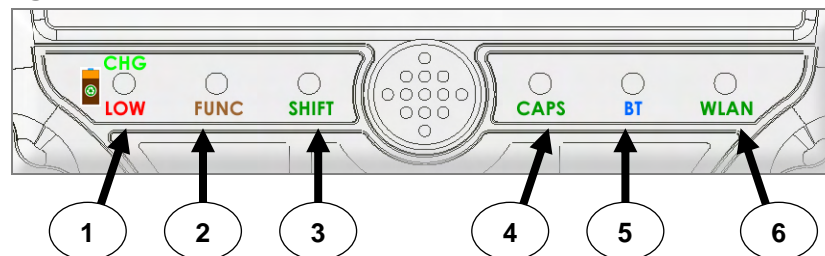


Table 2-3: Front Indicators

Item	Indicator	Description
1	CHG/Low Battery LED	Indicates the capacity and/or charge state of the battery
2	Function	Indicates that the Function key has been pressed
3	Shift	Indicates that the Shift key has been pressed. If the Shift key is pressed twice in rapid succession, the Shift indicator will remain on until it is pressed again.
4	CAPS	Indicates that the CAPS key has been pressed
5	BT	Indicates that Bluetooth is enabled
6	WLAN	Indicates that Wireless LAN connectivity has been enabled

# INTERFACE CONNECTIONS

This section describes the interface connectors found on the bottom of the FC-2500.

Table 2-4 FC-2500 Configuration

<i>FC-2500 Configuration</i>		
RS-232	USB	Charge Jack

Each of the connections listed above have attached rubber caps that are strategically positioned to open upward, protecting the connections from rain and snow. These caps are not required to be closed to maintain an IP67 rating, but they are required to be closed to be compliant with MIL-810F shock testing.

If these plug caps are left open, electrolysis could occur over time, damaging the connectors. This is not covered within the standard warranty and must be repaired by Two Technologies, Inc.

## DE-9 CONNECTOR

The DE-9 connector emulate standard serial pin-out connections, and allow you to connect the FC-2500 to most desktop PCs using a standard null modem cable.

Figure 2-4: DE-9 Male Interface Connector

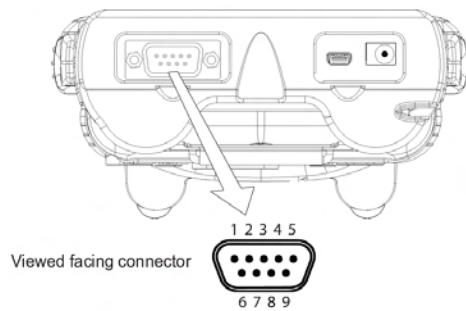


Table 2-5: RS-232 interface Pin-Outs

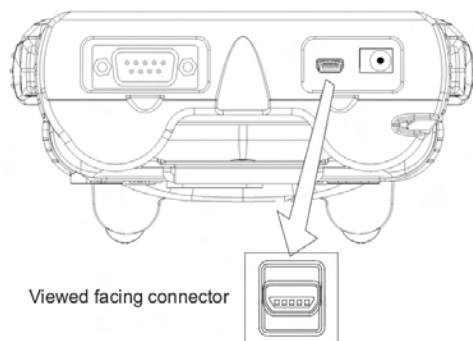
<i>RS-232 Interface Pin-outs with Power Output</i>			
Pin 1 = DCD	I	Pin 7 = RTS	O
Pin 2 = RXD	I	Pin 8 = CTS	I
Pin 3 = TXD	O	Pin 9 = PWR	n/a
Pin 4 = DTR	O	I = Inbound O = Outbound n/a = not applicable	
Pin 5 = GND	n/a		
Pin 6 = DSR	I		

## USING THE POWER OUTPUT LINE TO POWER EXTERNAL DEVICES

The FC-2500 supplies only one Power Output line. The following table shows the typical voltage versus current values when using the power output line to power external devices.

## USB

The OTG compliant USB mini A/B connector is Version 2.0 full speed compatible and allows you to connect to other USB devices as either as a “host” (connecting a USB flash drive) or as a client (connecting via ActiveSync to a PC).



**Note:** The unit cannot be charged via the USB connector

Table 2-6: USB devices that work with the FC-2500

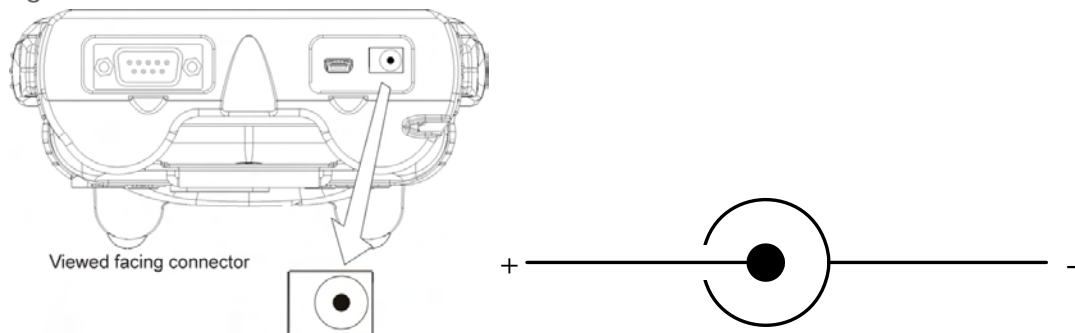
Role	Device	More Information
Client	USB Flash Drives	Most USB flash drives work with the FC-2500, however you should check that the flash drive is OTG compliant. In addition, make sure your USB cable is OTG compliant as well. For more tips on OTG, see the <a href="#">FAQs</a> section at the end of this manual.
Client	Printek Printers	This includes the FieldPro Mobile, MTP300 Series, and MTP400 Series Mobile Thermal Printers.
HOST	PCs	Most PCs will work with the FC-2500. They must have a USB port, Windows® and have ActiveSync installed.

**Note:** This is a partial list; contact Two Technologies, Inc. Technical Services for an up to date list of compatible devices.

## POWER JACK

The power jack found on the bottom of the FC-2500 enables you to connect a Topcon 12V AC/DC converter power supply (model# AD-11) or a lithium battery charger (P/N# BC-30B). Use of other power supplies unless approved by Two Technologies may cause damage to the unit and void the warranty.

Figure 2-5: Power Jack



**Warning:** Some power supplies (even those supplied by Two Technologies, Inc.) have outside positive and must not be used with the FC-2500.

## CABLES AND ADAPTERS

Two Technologies can provide the following optional cables and adapters based on communication and power requirements. For cable signal and pin assignments, see [Appendix B: Signal and Pin Assignments](#).

Table 2-7 Available Power Supplies, Cables and Adapters

<i>Two Technologies Part #</i>	<i>Part Description</i>
14375	Black, 15-Foot Null Modem Cable (DE9 Female to DE9 Female)
14987	Type A to Mini B USB Cable
14988	Mini A to Type B USB Cable
14989	Mini A to Mini B USB Cable







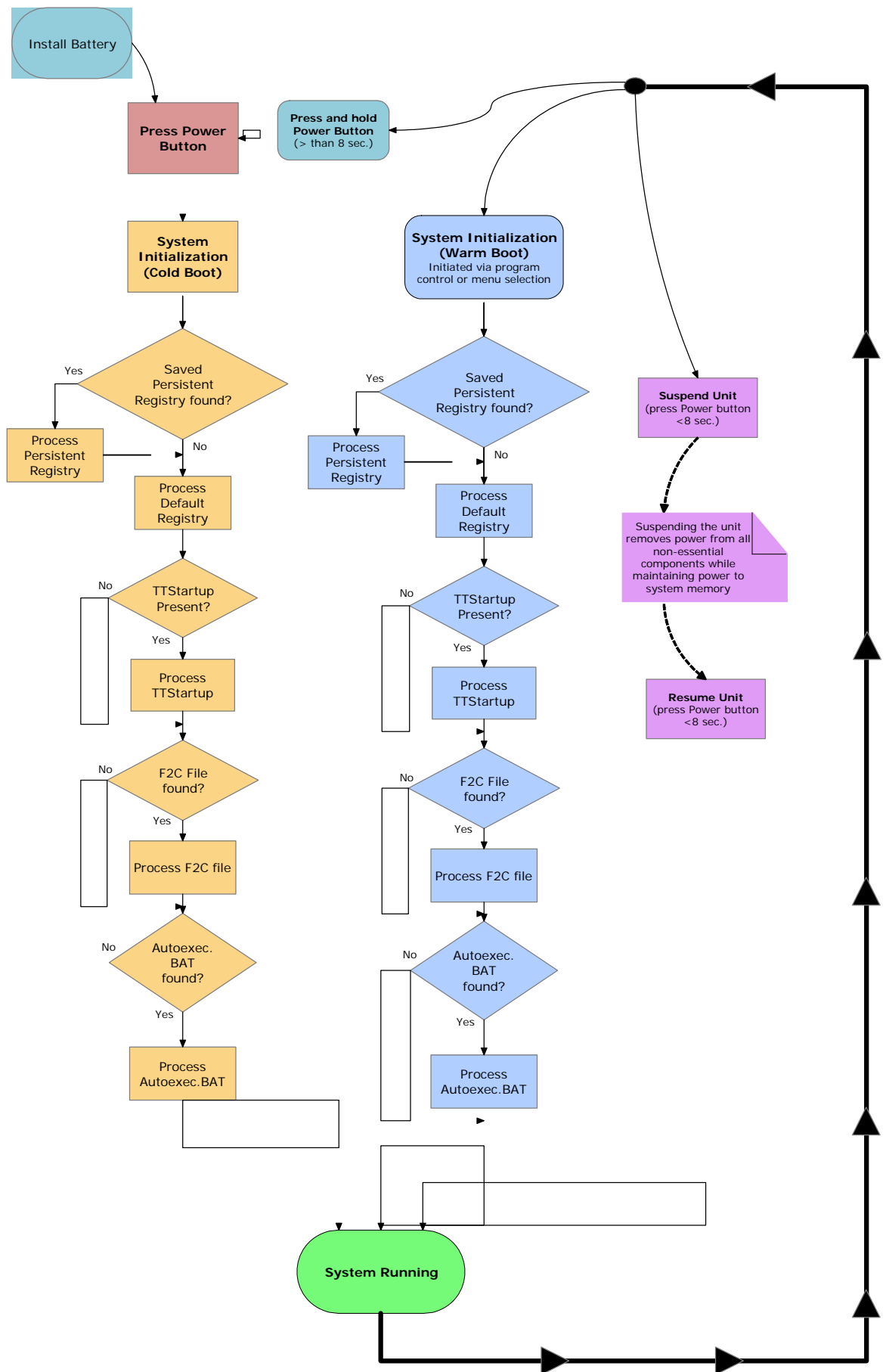
## THE BOOT STAGES OF THE FC-2500

There are several stages included in the boot up (and operation) of a Windows CE device. These are shown as a flow chart on the following page. These include:

1. Engaging/Restoring power to the unit
  - a) By pressing the power button (cold boot)
  - b) By warm booting the unit
  - c) By resuming from a suspend
2. System initialization
3. Load-up of the registry
4. F2C and TTStartup check & processing
5. Autoexec.bat check & processing
6. System running

You will notice that there are a couple different paths in the figure on the next page:

- Amber Path: This is the path the device takes when the device is cold booted.
- Blue Path: This is the path the device takes when the device is warm booted.
- Purple Path: The path the device takes when the device goes into a Suspend State.

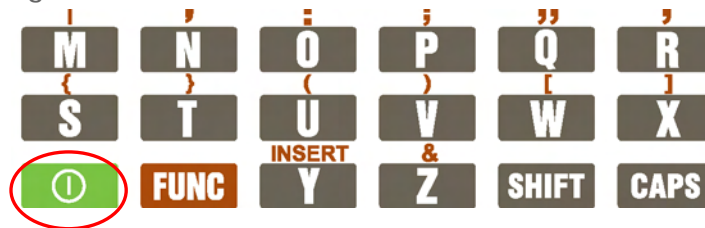


## THE ON/SUSPEND/RESET-OFF SWITCH

The On/Suspend/Reset-Off switch is located at the bottom left of the keypad. Its function depends on the state of the FC-2500 at the time the switch is pressed. It also depends on the length of time that the switch is depressed. Operations that the On/Off switch can initiate are:

- Power On
- Reset-Off
- Suspend

Figure 3-1: On/Off Switch

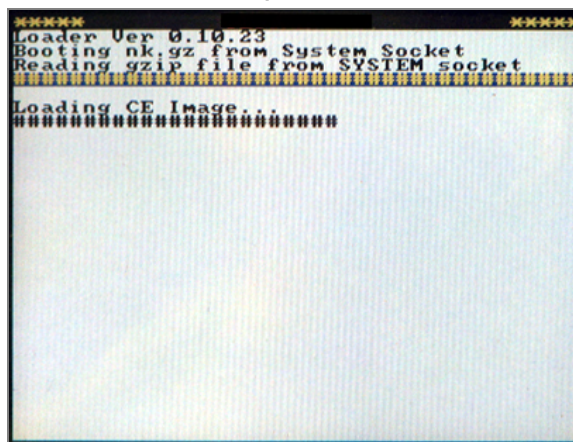


### POWER ON

To power on the FC-2500:

7. Press and hold the ON/OFF switch for one second. The unit should turn on and begin displaying the boot-up process. For example...

Figure 3-2: The FC-2500 boot-up screen



...where x.x.x (in this case 0.10.23) is the version number of the loader, and nk.gz is the operating system.

8. After approximately 15 seconds, the Windows CE 5.0 desktop should appear. If the unit does not power up or you cannot select any items from the desktop, refer to the "Troubleshooting" chapter for help.

Figure 3-3: The Windows CE Desktop



### RESET/OFF

To turn off the FC-2500, press and hold the On/Off switch for at least eight seconds. This action will also terminate running applications and cease serial port operations). The next press of the button will activate the unit's cold boot process.

---

**Caution!** Do not remove the batteries to perform a reset of the unit! Any abrupt loss of power may cause flash memory issues including: corrupt sectors, loss of data, corrupt registry, and a requirement to return the unit to Two Technologies, Inc. for non-warranty repair.

---

### SUSPEND STATE

Suspend State allows you to suspend, but not terminate active applications. In this mode, the display will turn off and the FC-2500 will cease serial port operations, suspend the PXA270, turn off the backlight and display, and suspend power to the WLAN, Bluetooth, and RS-3 (if equipped). Because of this, Suspend State conserves battery power. To place the unit in Suspend State, press and release the On/Off switch rapidly; the screen will then turn off. To take the FC-2500 out of Suspend State, press and release the On/Off switch again. The display will turn on and the FC-2500 will resume running any suspended application. In some cases, the application is responsible for managing transitions to and from Suspend state. This can include Bluetooth®, WLAN, serial connections, RS-1, and other peripherals, which will be affected during a Suspend. It is important to note that this is a software issue, not a hardware issue. When planning and developing an application that will run on the FC-2500, consider using the Windows messaging stream for notifications concerning suspend and resume. This will help your application better manage the suspend/resume states, especially when concerned with serial, Bluetooth, and WLAN connections.

---

**Note:** If you attempt to resume immediately after suspending the FC-2500 or vice versa, the unit will delay three seconds before resuming or suspending.

**Note:** The unit should not be left in Suspend State for extended (more than 24 hour) periods of time (or if the battery is near exhausted) if data/program state is important. Instead, the unit should either be put on charge or turned off.

---

### SUSPEND VS. OFF

There are some differences between the Suspend State and the Off State. When the unit is turned off, all information in volatile memory is lost and virtually no battery power is used. When you Suspend the unit, very little battery power is used, however, the unit goes into ready mode. Applications and files are still available, and the operating system is still running in the background.

---

**Note:** For information about working with Suspend/Resume programmatically, see the section entitled: [“Suspend/Resume Functions”](#).

---

## USING THE RECHARGEABLE BATTERY

The FC-2500 uses 2 rechargeable (Li-ion) battery packs that can provide up to 40 hours of operating time on a full charge (depending on power management settings and peripheral use).

### CHARGE/LOW BATTERY INDICATOR

When using the Li-ion battery packs, the CHARGE/LOW BAT LED will indicate the current battery status as shown in the table below.

Table 3-1: Charge\Low Battery Indicator Functions

<i>Event</i>	<i>Description</i>
<b>CHARGE</b>	<p>With the power supply connected, the CHARGE/LOW BAT LED will indicate one of following conditions:</p> <ul style="list-style-type: none"><li>▪ <b>Standard charge cycle</b> – During the bulk of the charge cycle, the indicator will blink green, once per second, in a uniform fashion. The LED will be green for <math>\frac{1}{2}</math> of each second. This indication should start no more than 5 seconds after plugging the FC-2500 into the Topcon charger.</li><li>▪ <b>End of charge cycle</b> – When the current drops 10% (120 mA), the LED will once again blink green once per second, but at this stage it will be green for <math>\frac{3}{4}</math> of each second.</li><li>▪ <b>Charge complete</b> – the LED will turn solid green when charging has completed. This will take a maximum of 3 hours</li></ul>
<b>LOW BAT</b>	<p>With the power supply disconnected, the CHARGE/LOW BAT LED will indicate one of following conditions:</p> <ul style="list-style-type: none"><li>▪ <b>Batteries are low</b> – the LED will blink red once per second when there is approximately 30 minutes of power remaining</li><li>▪ <b>Batteries are very low</b> – the LED will turn solid red when there is approximately 10 minutes of power is remaining</li></ul>
<b>ERROR CONDITION</b>	<p>There are several error conditions that can occur. The following error conditions will result in the LED alternating between red and green.</p> <ul style="list-style-type: none"><li>▪ If the battery charges for more than approximately 3.5 hours</li><li>▪ If the battery is shorted</li><li>▪ If an extraordinary amount of current is detected</li></ul>
<b>BATTERY DOOR OPEN</b>	<p>If the battery door is open the indicator will blink red twice per second. This will happen no matter what, regardless of the battery capacity or if a charger is plugged in. DO NOT store the FC-2500 in a blinking red condition!</p>

## CHARGING THE UNIT

The lithium-ion technology used in the FC-2500 has exceptional charge life without the “charge memory” characteristic of conventional nickel cadmium batteries. Partially discharged batteries or extended periods with the charger left connected will not adversely affect battery life or performance.

**Note:** Because the internal battery charger senses several conditions, including temperature, you should charge the unit away from any known or potential heat sources. Units exposed to temperatures in excess of 40 degrees Celsius (104 degrees Fahrenheit) during the charge cycle may experience incomplete charging and reduced operating time per charge.

To charge the Li-ion battery packs:

1. Plug the charging end of the Topcon 12V AC/DC converter/power supply (model# AD-11) into the charge jack of the FC-2500.
2. Plug the battery charger/power supply into a power outlet. After a maximum of 5 seconds, the Charge LED indicator should begin to blink green at a rate of twice per second, indicating that the batteries are charging (see Table 3-1 for more on battery LED indicators).

Figure 3-4: Topcon 12V Power Supply (model# AD-11)



The Charge indicator LED will blink green once per second until charge is complete when it will turn solid green.

3. Once the batteries are fully charged (approximately three hours), you can disconnect the AC power supply and run the FC-2500 exclusively on battery power.

**Note:** There are two fuel gauges within the FC-2500 that monitor the state of charge/discharge of the unit. Changing batteries will make these measurements less accurate. The longer you keep the batteries in the unit, the more accurate the measurement becomes.

**Note:** Batteries will not charge when the unit is below 0°C or above 40°C.

**Note:** Operation of the unit below -20°C may cause damage to the Li-ion cell structure which is not covered under warranty.

There is software within the operating system that controls the consolidation of both batteries into one capacity. For more information, refer to the following link: < <http://msdn2.microsoft.com/en-us/library/ms940385.aspx> >. This reference, SYSTEM\_POWER\_STATUS\_EX2 is populated to give applications and the operating system information on the state of the batteries.

## REPLACING BATTERIES/BATTERY PACK

**CAUTION!** There is a risk of rupture, ignition, or explosion if you replace the Li-ion battery with an incorrect type. Only use the Li-ion batteries supplied with your unit or replacement Li-ion batteries supplied, recommended, or approved by Two Technologies, Inc.

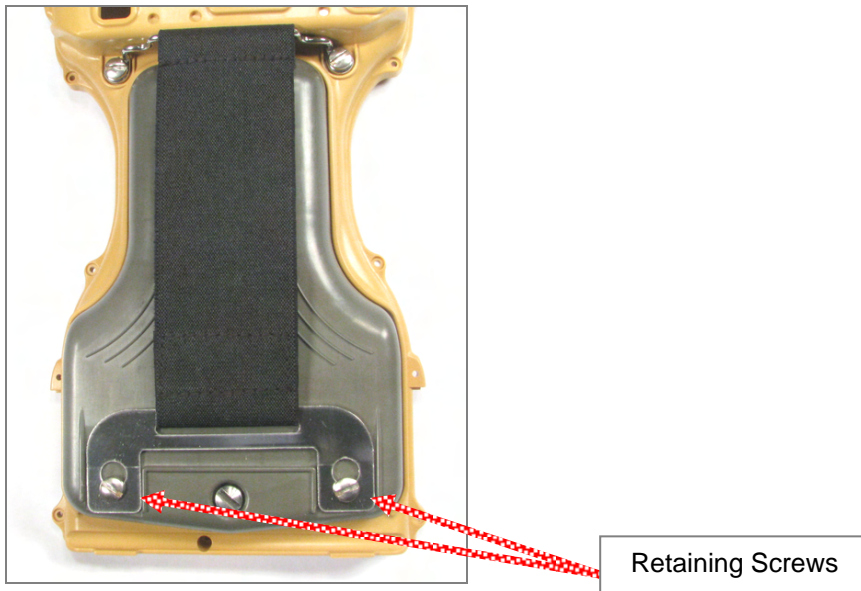
**Note:** When the battery door is open, the unit is not sealed. When replacing batteries, do so in a clean, dry area, away from sunlight. Due to the high capacity of the battery, this should not be necessary in the field if the unit was charged prior to the days work.

Remove the batteries from the FC-2500 when not using the device for extended periods. Store the batteries in a cool, dry, dark location at normal room temperature.

To replace the rechargeable battery packs:

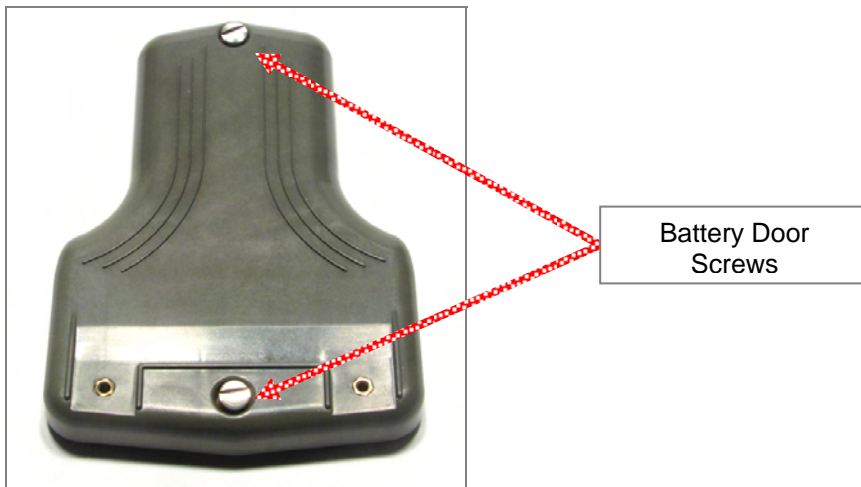
1. Turn the power off, or suspend the unit.
2. With the unit face down, loosen the two screws that secure the lower hand strap bracket (indicated below) one full turn. Do not remove the screws.

Figure 3-5: Removing the battery door



3. Pull down on the lower hand strap bracket and lift it away from the battery door. This will allow access to the two screws which secure the battery door as shown below.

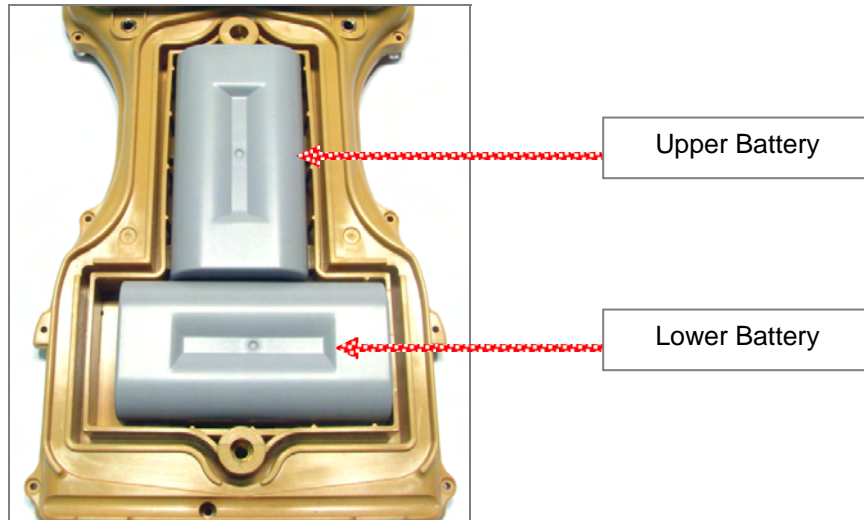
Figure 3-6: Removing the battery door



4. Unscrew both of these screws and remove the battery door. You will see both lithium-ion batteries.

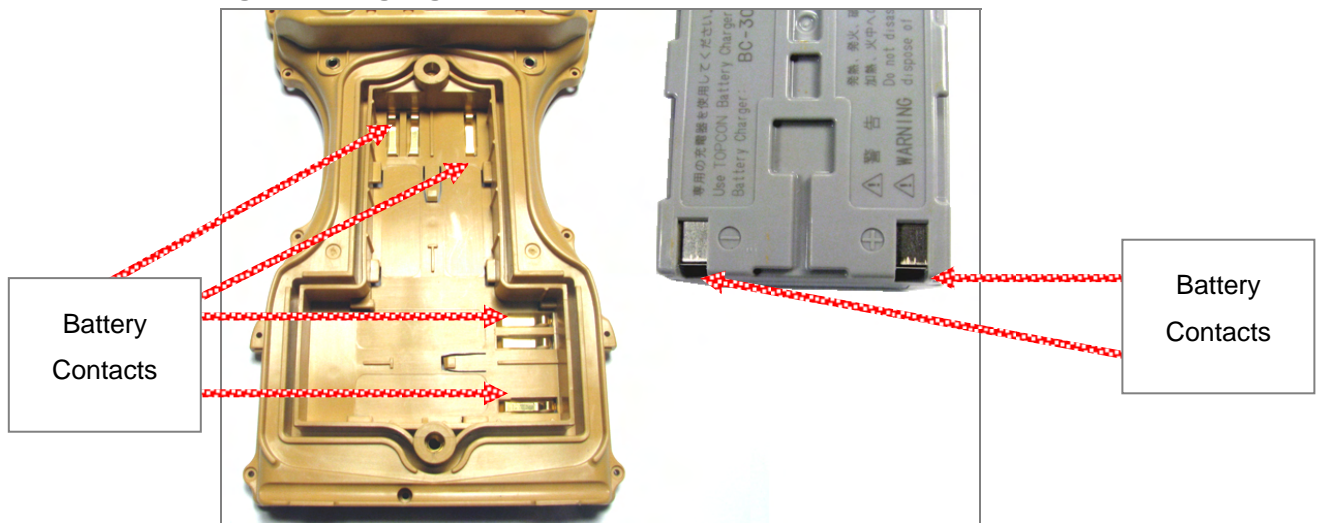


Figure 3-7 The lithium-ion batteries



5. Remove the lower battery first, it should slide and lift out easily. Then remove the upper battery, slide it down until it unlocks and lift it out.
6. When inserting new batteries, make sure that the battery contacts line up with the case contacts as shown below.

Figure 3-8: Aligning the contacts



**Note:** the third contact shown in the battery compartment is not an error, but for future use. By design, there is no 3<sup>rd</sup> contact on the BT-66Q battery packs.

7. Insert the upper battery first; make sure that it locks into place. Then insert the lower battery, this will simply slide into place, but make sure it is flat against the inside of the battery compartment.
8. Replace the battery door with the two screws.
9. Replace the strap by attaching the strap plate with the retaining screws.

**Note:** Batteries will not charge when the unit is below 0°C (32°) or above 40°C (104° F).

**Warning:** -20° C is the absolute lowest temperature that the device can be operated at; and that the battery can be stored at.

**Note:** Higher temperatures cause faster discharge of the battery



# POWER MANAGEMENT

Battery-powered units can utilize a rechargeable lithium-ion battery pack that has an average operating time of up to forty hours on a full charge with power management.

As with all battery-powered devices, the operating time is completely dependent on the environment, device usage and the number and type of power-drawing peripherals attached. The battery discharge rate in a full "Power Off" state is only slightly higher to the self-discharge rate of the battery itself.

---

**Note:** *Allowing the batteries to remain in a low or very low condition will cause the unit to enter Suspend mode. In either case, you should save your work and recharge the unit as soon as possible*

---

To aid in maximizing battery life, and lengthen the time between charges, you can perform the following actions:

- Use external power whenever possible when using peripherals. Extended communication via the serial or other ports, may require large amounts of power to operate, and can quickly drain the batteries.
- Limit the use of backlight – minimize backlight use when you are operating on battery power. You can adjust the backlight timeout level through the Display Settings in the Control Panel or on some units by using the keypad.
- Shorten Auto-suspend time – the FC-2500 is automatically set to suspend operation to conserve battery power when you have not used the keyboard or the stylus after three minutes. You can increase the Auto-suspend time by changing the Power settings in the Control Panel.

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**Note:** *For more information on Battery Care, see the section entitled: "[Battery Care & Maintenance](#)".*

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**Note:** *For more information on Power Management for Windows CE 5.0 (and how to manipulate Power Management programmatically) see the following MSDN link: <http://msdn.microsoft.com/en-us/library/aa447554.aspx>*

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# BATTERY CARE AND MAINTENANCE

## OVERVIEW:

The lithium-ion battery is a crucial element in your FC-2500 hardware system and the one “consumable” item which is affected by the application, the environment, and daily use by the end-user. This article describes the do’s and don’ts with respect to taking care of your FC-2500 batteries from the time they are received until they need to be replaced.

## BATTERY DO'S:

**Charge often.** Frequent full discharges add strain to the battery pack. Several partial discharges (regular use) with frequent recharges are better for lithium-ion than one total discharge.

**Use the right charger.** Every kind of battery has its own technology, its own rate of charge and so on. The Topcon AD-11 12V power supply and the BC-30B battery charger are designed specifically for the lithium-ion BT-66Q battery packs.

Keep the lithium-ion battery cool. **Avoid heat.** Short battery life is more likely to be caused by heat rather than charge/discharge patterns. Avoid direct sunlight or a hot car, for example.

If the batteries will not be used for a month or longer, remove it from the FC-2500 and store it in a cool, clean place.

Expect to replace batteries periodically. The life span of batteries is highly dependant upon many factors including charge/discharge cycles, storage times, and operating and storage temperatures.

## BATTERY DON'TS:

**Do not short-circuit; Ever.** Short-circuiting a Li-ion battery can cause it to ignite or explode, and as such, any attempt to open or modify a Li-ion battery's casing or circuitry is dangerous.

Do not expose the Li-ion battery pack to high temperature environments. This can cause the battery to rupture, ignite, or explode.

Do not drop, hit or modify the battery in any way.

Do not expose the battery directly to moisture or rain. Opening the battery door on the FC-2500 negates the IP rating while it is open. Change batteries in a protected location.

Keep battery away from fire or other sources of extreme heat. Do not discard batteries in the trash. Do not incinerate. Dispose of batteries in accordance with local municipality guidelines.

**Don't use old batteries.** Avoid purchasing spare lithium-ion batteries for later use.

## MY NEW BATTERY ISN'T CHARGING. IS IT DEFECTIVE?

Two Technologies has experienced an extremely small number of infant mortality defects of batteries over the 20 years we have been making handheld devices.

It is recommended that the unit be charged overnight to attain a complete state of charge.

It is normal for a battery to become warm to the touch during charging and discharging. FC-2500s have safeguard systems in place to protect against harmful temperatures during charging.

## HOW CAN I MAXIMIZE THE PERFORMANCE OF MY BATTERY?

There are several steps you can take to help get maximum performance from your battery:

**Power Management** - Make certain your application takes advantage of all the power options available. Backlight, 802.11, Clock Speed, Bluetooth, & Program Management all contribute toward battery consumption and are controllable through the application to limit their power consumption.

**Keep the Batteries Clean** - It's a good idea to clean dirty battery contacts with a cotton swab and alcohol. This helps maintain a good connection between the battery and the FC-2500.

**Battery Storage** - If you don't plan on using the battery for a month or more, store it in a clean, dry, cool place away from heat and metal objects after charging it.

## THE RECHARGEABLE LITHIUM BACKUP BATTERY (RTC)

There is a rechargeable lithium backup battery that powers the Real Time Clock (RTC) which maintains the correct time and date when the FC-2500 has no other source of power, (batteries or line) connected to it. This ensures that you will not lose the time and date in Windows CE while the FC-2500 is completely powered off. If there is no other power source, the backup battery will be used as the primary source of power for the Real Time Clock (RTC). This will result in the lithium backup battery completely discharging in about 1 month. However, this battery will recharge in minutes when a main battery is installed in the unit and will last from 3 to 5 years of normal field usage prior to needing replacement.

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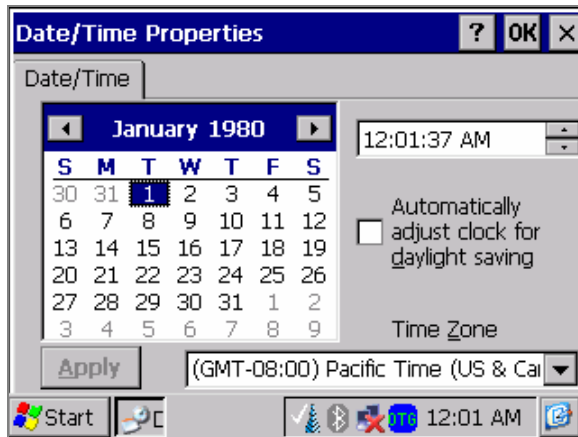
**Note:** The lithium backup battery is rechargeable. If there is a working power source, the battery will re-charge.

---

### What happens when my lithium backup battery fails?

First, you will see that the time and date have changed to 12:00 AM, January 1<sup>st</sup>, 1980 as shown in Figure 3.5

Figure 3-9: Date and Time reset to January 1<sup>st</sup>, 1980, 12:00 AM



Second, applications that are time sensitive may have problems or possibly fail altogether.

Finally, if you modify time to the correct time, and subsequently turn off the FC-2500, then time will revert back again to 12:00 AM, January 1<sup>st</sup>, 1980. This will continue until you have the FC-2500 repaired.

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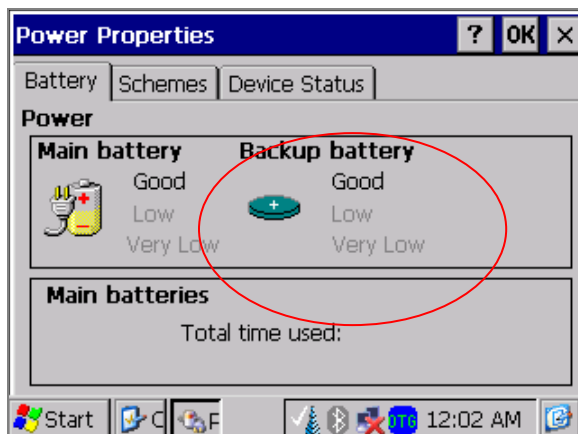
**Note:** The lithium backup battery in the FC-2500 is not user serviceable. If the lithium backup battery fails, the FC-2500 will still function, but in order to have the time and date display correctly, you will need to contact Two Technologies to have the lithium backup battery replaced.

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### How do I know if my lithium backup battery is losing power?

You can check the strength of the lithium battery in Windows CE. The path is Start>Settings>Control Panel, then double tap on the Power applet. This will bring up a screen as shown in Figure 3-6. Notice that in this screen Windows CE calls the lithium battery a "Backup Battery".

Figure 3-10: Strength of Lithium Battery



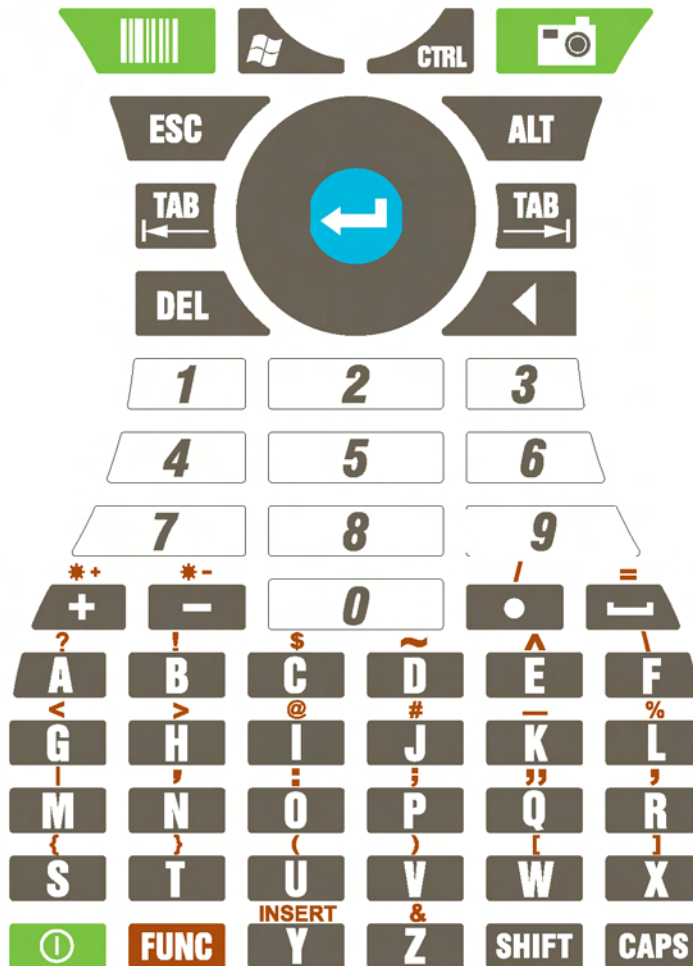
# DATA ENTRY

## KEYPADS

### 55-KEY KEYPAD

This joystick style keypad with bezel nomenclature features easy screen navigation and alphanumeric keypad entry.

Figure 3-11: Standard 55-Key Keypad



**Note:** For the Key Map of the 55 key keypad, see the section entitled: "[Keyboard mapping](#)".

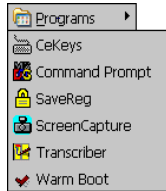
### KEY REPEAT

By default, the FC-2500 does not automatically repeat a key stroke when you hold down a key. However, you can enable the key repeat function by configuring the Keyboard setting in the Control Panel.

## CE KEYBOARD

In addition to entering data through the keypad, you can also enter data by using the CE Keyboard. This utility displays a keyboard on the screen to allow data entry via the Command Line or into applications where “text accessibility” control has focus (i.e., text or combo box).

To use the CE Keyboard, select **Programs > Tools> CeKeys** from the **Start** menu.



To minimize the keyboard, click the keyboard icon that appears in the system tray

Figure 3-12: CE Keyboard

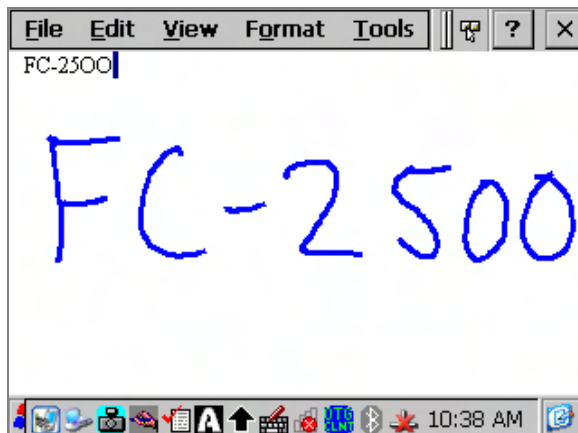


## TRANSCRIBER

Microsoft® Transcriber is a natural handwriting recognition software program that interprets pen movement across the screen as handwriting (cursive, print or mixed) input. For more information, please refer to Microsoft Transcriber Help on the FC-2500.

To run Microsoft Transcriber, select **Programs > Tools> Transcriber** from the **Start** menu.

Figure 3-13: Transcriber



## USING THE INTEGRATED CAMERA

Although the FC-2500 has an integrated camera, its usage is application dependant. Two Technologies' eye•WARE demo applications for taking pictures and scanning barcodes are installed on the units supplied with developer kits. These applications are provided on the FC-2500 developer's CD.

Two Technologies' eye•WARE™ is a “wedge” program that can be used to easily take pictures or capture bar codes and pass data to a text field that has focus in an application. For more information, please refer to the *eye•WARE™ User's Guide MAN0371*.

# THE WINDOWS CE 5.0 DESKTOP

This section provides a brief overview of the functions that appear on the Windows CE 5.0 desktop. For information on how to change desktop settings, refer to Windows CE help (Start > Help).








Figure 3-14: Windows CE 5.0 Desktop



## WINDOWS CE 5.0 DESKTOP FUNCTIONS

You can access the following applications, functions and utilities from the Windows CE 5.0 desktop:

Table 3-5: Windows CE 5.0 Desktop Functions

Icon	Function	Description
	Recycle Bin	Use the Recycle Bin to restore deleted files or empty the bin to create more disk space.
	My Device	Use My Computer to navigate and view the folders and files stored on the JETT.
	Inbox	Use the Inbox to send and receive e-mail by connecting to a POP3 or IMAP4 server.
	My Documents	The default storage location for documents, graphics, and other files.
	Microsoft WordPad	Use WordPad to create or edit text files that contain formatting or graphics.
	Internet Explorer	Use Internet Explorer to view Web pages. You will need a modem or Ethernet card to connect to an Internet service provider (ISP) or network.
	PC Link	Use PC Link to make an ActiveSync, Bluetooth or other type of connection to another device

## THE TASKBAR

The taskbar at the bottom of the Windows CE 5.0 desktop displays the Start button, buttons of currently running applications, the Status Area and the Show Desktop icon.

Tap the Start button to display the Start menu (see below for details). For each open application, a button appears on the taskbar. Simply tap the button to activate the application.

The status area appears on the right and by default displays small icons for the input panel, current time, and power status and network connections. Tap an icon to activate the related program.

Tapping the Show Desktop icon minimizes active applications and redisplay the desktop. Tapping the Keyboard icon displays the Input Panel menu for data entry.




Figure 3-15: Windows CE 5.0 Desktop Taskbar



## POWER STATUS ICONS

The FC-2500 will display power status icons (Table 3-6) in the taskbar status area (Figure15) to indicate power use, charging status and low battery conditions.

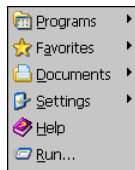
Table 3-6: Power Status Icons

Icon	Description
	Batteries are charging
	Batteries are low – approximately 30 minutes or less of use remaining (the CHARGE/LOW BAT LED will blink red once per second)
	Batteries are very low – approximately 10 minutes or less of use remaining (the CHARGE/LOW BAT LED will turn solid red)

## THE START MENU

When you tap Start, the Start menu appears.

Figure 3-16: Start Menu



By tapping one of the menu's icons (and not the name), you can:

- Open programs that do not appear on the desktop
- View a list of web sites added to your Favorites List
- View recently accessed documents and images
- Access the Control Panel, establish connections, or configure the Taskbar and Start Menu
- View Help
- Start an application using the Run command

## MISCELLANEOUS TOOLS

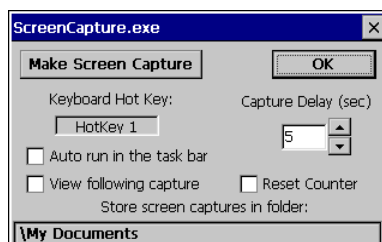
You can access the following utility programs from the Tools menu.

### SCREEN CAPTURE

The Screen Capture program takes a picture of the screen and saves it as a bitmap file (.BMP) to a designated location. You can set up the program to run from the system tray, or by pressing a hot key.

To setup the Screen Capture program:

1. From the Start menu, select **Programs > Tools > Screen Capture**. The ScreenCapture.exe dialog box appears:

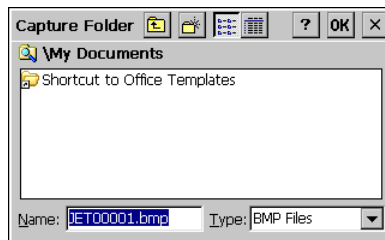


By default, the Screen Capture program is set to take a picture by pressing HotKey1 after a five-second delay.

2. To change the wait time before the Screen Capture program takes a picture, tapping the up or down scroll bars under **Capture Delay (sec)**. The default value is five seconds.
3. To change the **Keyboard Hot Key** assignment, you must access the Hot Key applet in the Control Panel. The default value is five HotKey1
4. To have the Screen Capture program take a picture when you tap its icon in the System Tray, check **Auto run in the task bar**.

*Note: To deselect this option after making it active, tap and hold the icon until the Screen Capture program appears.*

5. To view the picture immediately following the screen capture, check **View following capture**.
6. To change the default folder (My Document) where picture are stored, tap the button under **Store screen capture in folder**.



7. Select a new location and tap **OK**.
8. By default the Screen Capture program, automatically assigns a number to each screen capture. The numbering scheme starts at JET00000 and increment by one after each capture. To set this number back to JET00000, check **Reset the counter**.

*Note: The default location for screen captures is \My Documents, which is volatile. Screen captures stored in folders other than the SystemCF folder will be lost if you remove power from the unit.*

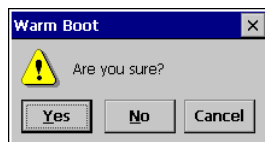
## WARM BOOT

A warm boot is when you restart the device without turning off the power. The operating system is retained in RAM and is reinitialized. Any open documents that were saved will still remain intact (even if they were saved into a volatile area). Any open documents that were not saved will be lost.

There are several reasons why you might want to proceed with a warm boot. Some changes to applications require a warm boot, for example, when you create and initiate a new profile for the Summit WLAN Client Utility. Or, you may have to start the warm boot process when a new application has been installed. And occasionally, a program may encounter an error from which it cannot recover. In these cases the warm boot will reinitialize the unit allowing the user to re-open the application and resume work.

To perform a warm boot:

1. Select **Programs > Tools> Warm Boot**. The "Are you sure?" popup window appears.



2. Tap **Yes** to warm boot the unit.

Remember that any open applications (and their documents) will be closed when initiating a warm boot.

To perform a warm boot from the command line (Run or CMD), simply type **warmboot**. In addition, you can warm boot the unit without the "Are you sure?" popup window by typing **warmboot YES**.

*Note: For more information on how to configure warm booting programmatically, see the section entitled: "Warm Booting from an Application"*