



Release notice

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If you cannot find the information you need in this service manual, or in the *Trimble Service Provider Reference Manual* (P/N 022480-068), submit an inquiry from the Mapping & GIS Partners website. Go to mgispartners.trimble.com and then click **Submit Inquiry**.

Regulatory information

USA

Class B Statement – Notice to Users. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication.

Operation of this equipment is subject to the following two conditions:

- The device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Canada

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe B prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

Europe

This product has been tested and found to comply with the requirements for a Class B device pursuant to European Council Directive 89/336/EEC on EMC, thereby satisfying the requirements for CE Marking and sale within the European Economic Area (EEA). These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential or commercial environment.



Australia and New Zealand

This product conforms with the regulatory requirements of the Australian Communications Authority (ACA) EMC framework, thus satisfying the requirements for C-Tick Marking and sale within Australia and New Zealand.



Notices

Taiwan – Battery recycling requirements

The product contains a removable Lithium Polymer battery. Taiwanese regulations require that waste batteries are recycled.



Notice to our European Union customers

For product recycling instructions and more information, please go to www.trimble.com/ev.shtml.



Recycling in Europe:

To recycle Trimble WEEE (Waste Electrical and Electronic Equipment, products that run on electrical power.), Call +31 497 53 24 30, and ask for the "WEEE Associate". Or, mail a request for recycling instructions to:

Trimble Navigation Limited
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL



Warranty information

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Hardware Limited Warranty

Trimble Navigation Limited warrants that this hardware product (the "Product") will perform substantially in accordance with published specifications and be substantially free of defects in material and workmanship for a period of one (1) year starting from the date of delivery. The warranty set forth in this paragraph shall not apply to software products.

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This Trimble software product, whether provided as a stand-alone computer software product, built into hardware circuitry as firmware, embedded in flash memory, or stored on magnetic or other media, (the "Software") is licensed and not sold, and its use is governed by the terms of the relevant End User License Agreement ("EULA") included with the Software. In the absence of a separate EULA included with the Software providing different limited warranty terms, exclusions and limitations, the following terms and conditions shall apply. Trimble warrants that this Trimble Software product will substantially conform to Trimble's applicable published specifications for the Software for a period of ninety (90) days, starting from the date of delivery.

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These warranties shall be applied only in the event and to the extent that: (i) the Products and Software are properly and correctly installed, configured, interfaced, maintained, stored, and operated in accordance with Trimble's relevant operator's manual and specifications, and; (ii) the Products and Software are not modified or misused. The preceding warranties shall not apply to, and Trimble shall not be responsible for defects or performance problems resulting from (i) the combination or utilization of the Product or Software with hardware or software products, information, data, systems, interfacing or devices not made, supplied or specified by Trimble; (ii) the operation of the Product or Software under any specification other than, or in addition to, Trimble's standard specifications for its products; (iii) the unauthorized modification or use of the Product or Software; (iv) damage caused by accident, lightning or other electrical discharge, fresh or salt water immersion or spray; or

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General Information and Safety

- Introduction
- Assumptions
- Warnings, cautions, and notes
- Updating the information
- Deciding what is serviceable
- Loss of warranty
- Removing and replacing parts
- Safe use
- Electrostatic Discharge (ESD) precautions

Introduction

This service manual is a reference guide for the service personnel at authorized Trimble Service Centers, to enable them to correctly service, maintain, and repair the Survey division's version of the Trimble[®] Recon[®] controller and R3 system components.

If customers are to remain satisfied with Trimble products, proper service and maintenance must be provided. It is therefore important that service personnel read and understand this manual, and that they can readily access it.

Note – *Separate repair manuals are available for the MGIS version of the Trimble Recon controller and the Construction Instruments LM80 Recon controller.*

Assumptions

This service manual assumes that you:

- have a basic understanding of mechanical design, electronic theory, and general service procedures, and have attended the appropriate Trimble service training course for this product
- understand and know how to operate basic electronic test equipment such as volt-ohmmeters, oscilloscopes, generators, and power supplies
- have a basic knowledge of computer use, and are familiar with the operating system and software for the Trimble Recon controller

Warnings, cautions, and notes

Read and follow any alerts (warnings, cautions, and notes) that appear in this service manual. They are provided to minimize the risk of personal injury and/or of damage to the equipment. In particular, observe any safety instructions that are presented in the following formats:



Warning – A warning describes one or more special steps that you must take when completing the procedure. The special steps are necessary to avoid injury.



Caution – A caution describes one or more special steps that you must take when completing the procedure. The special steps are necessary to avoid damage to the assembly that you are working on. They may also help prevent other serious consequences.

Note – A note provides information that enables you to complete the procedure properly. A Note also helps you to understand the procedure.

Note that, even if there are no specific alerts provided for a procedure, there may still be safety risks involved.

Updating the information

The information, photographs, illustrations, and specifications in this service manual were accurate when the manual was released. Any alterations that may be necessary will be issued as supplementary or replacement pages, Service Bulletins, other service information, or as a revised volume of the manual. Always insert updates in the appropriate place to keep the service manual up to date.

Deciding what is serviceable

“Serviceable” assemblies are defined as assemblies that can be repaired at Trimble Service Center level. The tools required to complete the repair, and the time that it takes to complete the work, determine what is considered serviceable.

Loss of warranty

Improper service or repairs performed by a person other than an authorized technician can void the manufacturer’s warranty on a Trimble product. To prevent loss of coverage under such warranties, strict compliance with the instructions in this manual is necessary. The warranty terms are provided in the *Trimble Service Provider Reference Manual* (P/N 022480-068).

Removing and replacing parts

The torque specifications, adhesives, and procedures specified on the assembly drawings are essential to the proper operation of the controller. When you need to replace a part or make an adjustment to the controller, refer to the parts ordering section of this service manual (see Section 8, Replacement Parts).

Safe use

Repairs and maintenance

To safely and correctly repair the Trimble Recon controller, closely follow all steps outlined in this service manual. To perform board level rework, you must be certified as a Level 3 or higher Service Provider. You must also have undergone sufficient training, and have the correct tools and equipment.

Battery safety

The PowerBoot Module™ battery pack is not serviceable. Replacement PowerBoot Modules are available from:

- A Trimble dealer
- Trimble Navigation Limited
- Tripod Data Systems

Remember the following safety measures when working with PowerBoot Module battery packs and batteries:



Warning – To reduce the risk of fire or burns, do not disassemble, mutilate, or puncture the PowerBoot Module battery pack.



Warning – If the battery is damaged or leaking, handle it with extreme care. The electrolyte in the cells is alkaline, and can cause harm if it comes into contact with eyes or skin. If the electrolyte does come into contact with eyes or skin, wash it off immediately with clean water and seek medical advice.



Caution – Do not expose the PowerBoot Module battery pack to long-term storage temperatures above 35 °C (95 °F). High temperatures decrease the battery life.



Caution – Do not charge the PowerBoot Module battery pack if the ambient temperature is above 35 °C (95 °F) or is below 0 °C (32 °F). Extreme temperatures decrease battery life.



Caution – Dispose of PowerBoot Module battery packs and batteries carefully, in accordance with local regulations. Do not dispose of PowerBoot Module battery packs or batteries in a fire. For information on battery disposal or recycling, contact your local waste disposal provider. See Notices, page 2.

AC adaptor

Follow these guidelines for safe use of the AC adaptor:



Warning – Use only AC adaptors intended for the Trimble Recon controller (P/N F-1031-01 or F-1058-01). Using any other external power source can damage the controller and void its warranty.



Caution – Make sure that the input voltage on the adaptor matches the voltage supplied in your location.



Caution – Make sure that the adaptor's prongs are compatible with the outlets used in your location.



Caution – AC adaptors are designed for indoor use only. Do not use the AC adaptor outdoors or in wet areas.



Caution – Unplug the AC adaptor from the mains power outlet when it is not in use.



Caution – Do not short the output connector.

Electrostatic Discharge (ESD) precautions

Note – For detailed information about ESD, refer to the *Trimble Service Provider Reference Manual* (P/N 022480-068).

This controller was constructed in an ESD-protected environment. Most of the semiconductor devices in the controller are susceptible to ESD damage.

ESD charge is generated in many ways. For example, it can be the result of simple contact, the separation of materials, or the normal motion of people working with the device. Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact with, or by mere proximity to, a static charge. The result can be immediate destruction, early failure of the device, or degradation of device performance.

Do not attempt to service the circuitry in a static-sensitive device unless you are thoroughly familiar with industry-accepted techniques for handling such devices. To prevent damage or destruction, always take adequate precautions when you handle or service equipment that contains static-sensitive devices.

Setting up an ESD workstation

An ESD workstation prevents the build-up of static charge on work surfaces and on your body. Always use an ESD workstation when handling static-sensitive devices.

To set up an ESD workstation:

1. Unroll the ESD field service workstation kit and place it, pocket side up, on the workbench. See Figure 1.1.

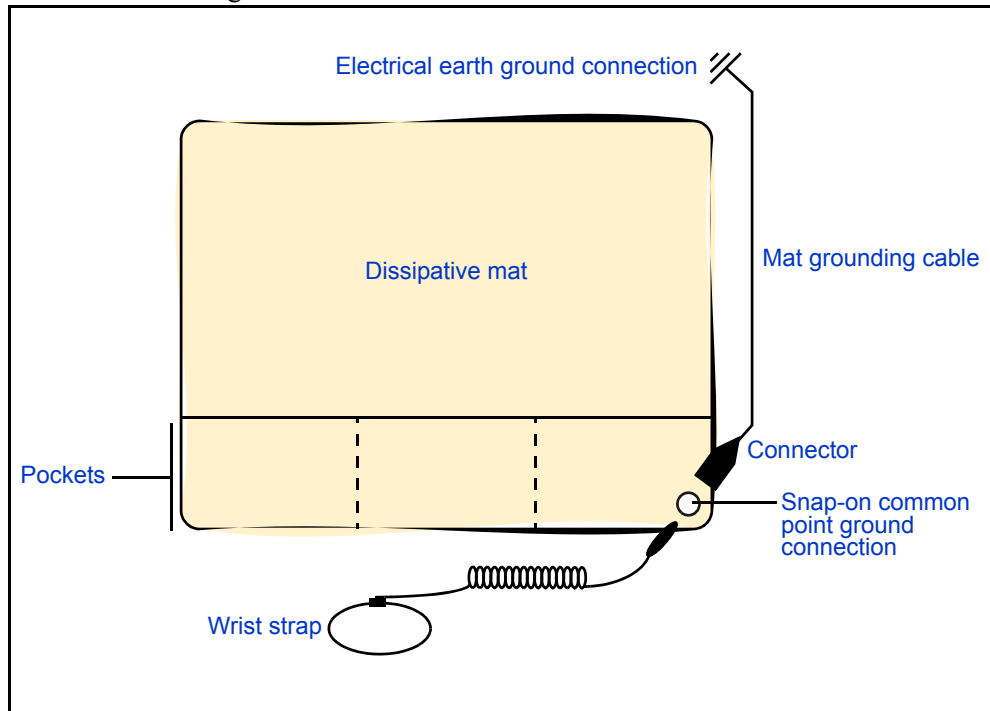


Figure 1.1 ESD workstation setup

2. Remove the mat grounding cable from the mat pocket.
3. Snap the connector on the end of the mat grounding cable onto the common-point ground connection on the mat.
4. Connect the other end of the mat grounding cable to an electrical earth ground, such as a third wire utility ground, a cold water pipe, or a ground rod.
5. Plug the wrist strap cable into the connector on the mat grounding cable.
6. Put on the wrist strap. The wrist strap must fit snugly. To adjust it, unclasp the buckle latch, adjust the size, and re-clasp the latch.

It is now safe to handle components and printed circuit assemblies on the mat.

Note – *Repackage all ESD-sensitive components before you disconnect the wrist strap.*

Specifications

- Trimble R3 L1 GPS system
- Trimble Recon controller with R3 module
- A3 Antenna specifications

Trimble R3 L1 GPS system

The Trimble R3 L1 GPS system is a complete L1 GPS postprocessed solution. The Trimble R3 system includes the following:

- An L1 GPS receiver and antenna. The A3 GPS antenna contains the Trimble Maxwell™ technology used in Trimble's advanced, dual-frequency GPS systems. To establish a survey network, set up two or more R3 systems and then log your data.
- The rugged, lightweight Trimble Recon controller. The Trimble Recon controller has a large color touchscreen, expandable memory, and USB support. The controller has a 400 MHz processor and 128 MB of flash memory. With the introduction of the R3 system the controller is available with the Microsoft® Windows Mobile® 2003 software for Pocket PCs.
- An R3 module, a GPS card receiver that is attached to the Trimble Recon controller to enable GPS data collection.
- Easy-to-use field and office software. The system uses the Trimble Digital Fieldbook™ software with the Trimble Business Center L1 postprocessing module.

The R3 system provides precise subcentimeter control and enables you to establish new localized control and collect topographic data. The system operates without line-of-sight between points, and it can operate day or night in any weather.

Table 2.1 shows the main system components part numbers.

Table 2.1 System level part number matrix (for a complete list refer to [Replacement Parts, page 71](#)).

Part number	Description	Product series	Processor speed	Memory	Operating system	Color
75000-XX	Trimble R3 system					
64000-00	Trimble Recon controller	R3 system	400 MHz	128 MB	Windows Pocket PC	Yellow
63000-00	Trimble R3 module	R3 system				
53406-10	Trimble A3 antenna	R3 system				

Trimble Recon controller with R3 module

Physical specifications

Height	24.13 cm (9.5 inch) Trimble Recon controller with R3 module attached.
Width	9.5 cm (3.75 inch)
Depth	4.5 cm (1.75 inch)
Weight	0.49 kg (1.08 lb) including battery

Electrical specifications

Processor	Intel PXA250 XScale, 400 MHz
Memory	64 MB high-speed SDRAM, ~ 8.5 MB reserved
Storage	Onboard non-volatile NAND flash 128 MB flash disk, up to 19 MB reserved
Expansion	1 × Type I CompactFlash slot 1 × Type II CompactFlash slot
Display	240 × 320 pixel (¼ VGA) color TFT with LED front light
Batteries	3800 mAh Ni-MH rechargeable battery pack
Input/output ports	Standard 9-pin male D-shell RS-232 serial port USB port

Environmental specifications

Operating temperature	–30 °C to 60 °C (–22 °F to 140 °F)
Humidity	MIL-STD-810F, Method 507.4
Sand and dust	IP67, MIL-STD-810F, Method 510.4, Procedures I and II
Water	IP67, sealed against accidental immersion (1 m for 30 minutes) MIL-STD-810F, Method 512.4, Procedure I
Drop	MIL-STD-810F, Method 516.5, Procedure IV 26 drops from 1.22 m (4 feet) onto plywood over concrete 6 additional drops at –20 °C (–4 °F) 6 additional drops at 60 °C (140 °F)
Vibration	MIL-STD-810F, Method 514.5, Procedure I, Figures 17 and 18
Altitude	MIL-STD-810F, Method 500.4, Procedures I, II, and III 4572 m at 23 °C (15,000 ft. at 73 °F)

For detailed information about the environmental specification standards listed above, see [Hardware standards, page 84](#).

A3 Antenna specifications

Physical specifications

Height	6.2 cm (2.44 inch)
Diameter	16.2 cm (6.38 inch)
Weight	0.39 kg (0.86 lb)
RF Connector	TNC bulkhead
Mounting	5/8-11 thread
Polarization	Right hand circular

Electrical specifications

Frequency	1575.42 +/- 10 MHz
Antenna gain	42 dB min (amp plus antenna)
Input voltage	2.95 to 11.5 Volts DC
Current consumption	Up to 60 mA
Temperature:	
Operating	-50 °C to +85 °C (-58 °F to +185 °F)
Storage	-50 °C to +85 °C (-58 °F to +185 °F)

Theory of Operation

- The R3 system components
- The Trimble Recon controller

The Trimble R3 L1 GPS system is useful if you want to perform cadastral surveys, topographic surveys, or provide precise control to support pre-engineering or construction projects. The system is economical, high quality, and easy-to-use for experienced and entry-level GPS users who need a reliable L1 postprocessed solution. Its designed as a post processing solution only. The R3 system is available in packages of two so that one unit can be set up as a Base on a known position and one can be used as a Rover. Since this is not a real-time solution no CMR packets are used. Triangulation between the base and rover(s) is logged during the survey and refined during the post processing. The Base used in the solution can also be from a Continuously Operating Reference Station (CORS).

The Trimble R3 system will augment existing GPS or conventional survey capabilities. It enables new users to quickly harness the power and performance of a survey grade GPS solution. With the Trimble Business Center L1 Postprocessing module, a surveyor can easily download, process and adjust the day's observations.

The R3 system components

An example of the R3 system is shown in [Figure 3.2](#).



Figure 3.2 R3 system shown mounted on a survey pole.

Trimble R3 GPS receiver module (P/N 63000-00)

The Trimble R3 GPS receiver module plugs directly into the front CompactFlash (CF) slot at the top of the controller. The R3 module has an SMA-style RF jack for the A3 GPS antenna to plug into.

At the system level, the R3 antenna receives the A3 GPS antenna signal and converts it into a data format that the software running on the Recon controller can recognize.

Note – *The Trimble R3 receiver cannot be repaired when it fails. It has been deemed a “replace to repair” product by Trimble. Should it prove to have failed outside the warranty period, call Trimble Technical support for assistance.*

Trimble A3 antenna (P/N 53406-10)

The Trimble A3 GPS antenna comes from our Hurricane family of antennas. The A3 antenna incorporates the Trimble Maxwell™ GPS satellite tracking technology and the Everest™ multipath reduction technology. The A3 is a 12-channel full-cycle L1 carrier antenna that can process C/A code and WAAS/EGNOS signals.

The Trimble R3 system is an entry level GPS system and can only process L1 GPS signals. The system will not process L2 signals if you attach an L1/L2 version antenna.



Caution – Only use the A3 antenna P/N 53406-10 in an R3 system. Other A3 part numbers have different voltage and current parameters. Attaching an antenna other than the part numbers specified can cause permanent damage to the R3 receiver module and will void the customers warranty.

Note – *This antenna is permanently sealed when assembled and is a “Replace to Repair” product. Should it prove to have failed outside the warranty period call Trimble Technical support for further assistance.*

Trimble Recon controller (P/N 64000-00)


The Trimble Recon controller uses the Survey Division version of the Trimble Recon controller. The Trimble Survey version of the Trimble Recon controller has a 400 MHz processor, and 128 MB of NAND flash memory and 64 MB of RAM.

The controller uses the Microsoft Windows Mobile for Pocket PCs operating system. The Trimble Digital Fieldbook™ software is also pre-loaded on the controller. The Digital Fieldbook software enables you to carry out Static, FastStatic, Kinematic and continuous Kinematic surveys.


Note – *The Trimble Recon controller is the only system level device in the R3 GPS system that can be repaired by the Trimble service provider network. For a description of the repair procedures, see Maintenance and Repair, page 44.*


The Trimble Recon controller

Turning the controller on or off

To turn the Trimble Recon handheld on or off, press  on the keypad. This places the controller into Suspend mode.

Suspend mode

If the controller is on and you press , the controller does not turn off completely, but goes into Suspend mode. Suspend mode is a low-power mode that maintains the contents of RAM but does not allow you to operate the controller. The controller appears to be turned off.

When the controller is in Suspend mode, press  again to turn the controller on. It is instantly ready for operation.

Parts of the controller

Figure 3.3 shows the main parts of the Trimble Recon controller.

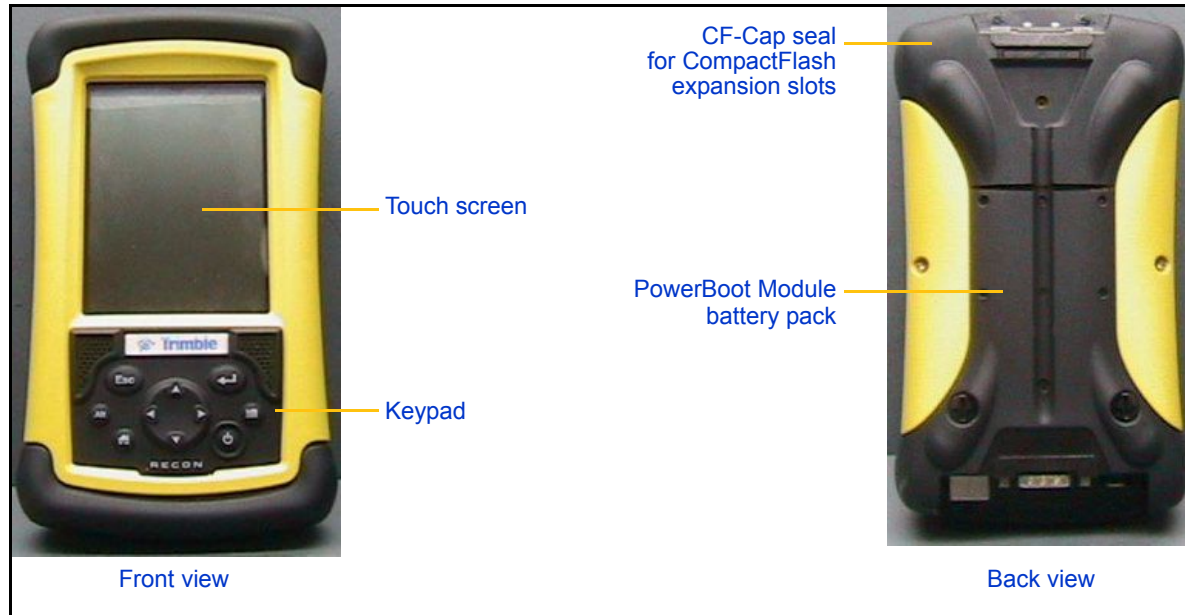


Figure 3.3 Parts of the Trimble Recon controller












The main parts of the controller, and their operation, are described in the following section.

Keypad

The Trimble Recon handheld has seven keys that are used to perform common system functions.


You can also use the keys instead of the touch screen.

The following table shows the common actions that you can perform with the keyboard. When more than one key is used to perform an action, you can press each key in sequence or press the required keys at the same time.

Tap...	And...	To...
	The appropriate item on the screen	Access a right-click (shortcut) menu.
	The appropriate letter key on the on-screen keyboard.	Access a drop-down menu.
		Close a dialog or screen without saving changes, or exit a menu without selecting a command.
	The taskbar	Open the Task Manager.
		Tap the selected button, open the selected file, or perform the default action in a dialog or screen
		Switch between programs.
		Display the <i>Start</i> menu
		Move up, down, left, or right (for example, in a list or menu, or between buttons).
		Minimize all programs and display the desktop.
		Turn the controller on, or put the controller into Suspend mode.

Touch screen

The Trimble Recon controller has a Thin Film Transistor (TFT) touch screen. To make sure that the controller interprets screen taps accurately, you must calibrate the screen.


1. Tap  / *Settings* / *Control Panel*.
2. Double-tap the Stylus icon, and then follow the instructions on the screen.

Frontlight

The frontlight turns on automatically when you do any of the following:

- turn on the Trimble Recon controller
- tap the touch screen
- press a button

To change the frontlight settings:

1. Tap  / *Settings* / *Control Panel*.
2. Double-tap the Display icon to open the *Display Properties* dialog.
3. Select the *Display Light* tab.
4. Do one of the following:
 - Adjust the frontlight brightness settings to suit your requirements.
 - Disable the frontlight to save power.
5. Tap **OK**.

Note – *The brighter the frontlight setting, the more power it uses.*

CF-Cap seal and CompactFlash slots



Caution – If the CF-Cap seal is not attached to the controller, the Trimble Recon controller is no longer sealed, and it is prone to damage from grit or water. The warranty for the Trimble Recon controller does not cover water damage that occurs when the CF-Cap seal is not attached, or is not attached correctly. The controller should at all times have either the CF-Cap seal or the R3 GPS module attached to it, even during shipping.

The Trimble Recon controller has two CompactFlash slots for memory expansion. The CF-Cap™ seal provides a weatherproof seal over the CompactFlash expansion slots.

To insert a CompactFlash card or adaptor:

1. Use the stylus to unscrew the two screws on top of the CF-Cap CompactFlash expansion slot seal.
2. Slide the CF-Cap seal off the controller.
3. Insert the CompactFlash card into one of the CompactFlash slots, with the front (printed side) facing toward the front of the controller.

4. Push gently until the card is firmly seated in the slot.



5. If the CompactFlash card fits completely into the slot, slide the CF-Cap seal back onto the controller and tighten the screws.

Note – Some CompactFlash adaptors are designed to protrude out of the CompactFlash slot when properly installed. If such an adaptor is installed in the controller, you cannot replace the CF-Cap seal.

PowerBoot Module battery pack

The PowerBoot Module battery pack contains the rechargeable Ni-MH battery for the Trimble Recon controller, and the battery circuitry. It also includes the serial (COM) port, USB port, and external AC power port.

Power loss

The Trimble Recon controller is designed to preserve your data even if it completely loses power. Documents, programs, and registry information are stored in flash memory. Flash memory is non-volatile, so data in flash memory is safely stored even if power is lost indefinitely.

When an application or file is open, it is stored in RAM. RAM is volatile memory and it is cleared if power is lost. However, the Trimble Recon controller has been designed to preserve the contents of RAM for up to 30 seconds if power is lost, so running applications and open data files will usually be unaffected by a brief power loss.

Because the controller preserves the contents of RAM during a brief power loss, it is possible to safely replace the PowerBoot Module battery pack while an application is running on the controller. However, to ensure that you do not lose any important data, and to preserve the real-time clock, Trimble recommends that you close all running applications and then turn off the controller before replacing the PowerBoot Module battery pack.

For detailed instructions on removing the PowerBoot Module battery pack and attaching a charged module, see [Replacing the PowerBoot Module battery pack](#), page 16.

Charging the battery

For instructions on charging the battery in the PowerBoot Module battery pack, see [Charging the battery](#), page 27.

Replacing the PowerBoot Module battery pack



Caution – Trimble recommends that you save any important data and close all running applications before replacing the PowerBoot Module battery pack.

Because the controller preserves the contents of RAM during a brief power loss, you can replace the PowerBoot Module battery pack while an application is running on the controller.

To replace the PowerBoot Module battery pack:

1. Make sure that you have a spare, fully charged PowerBoot Module battery pack ready.
2. Unlock the latches on the spare PowerBoot Module battery pack. To do this, use the blade end of the Trimble Recon stylus to rotate the latches counter clockwise until the arrows point towards the communication ports at the bottom of the PowerBoot Module battery pack.



3. On the Trimble Recon controller, disconnect the handstrap from the clip mount at the bottom of the PowerBoot Module battery pack. To do this, hold the handstrap near the bottom clip, and then push the clip toward the bottom of the controller until it is free of the clip mount.

You do not need to disconnect the handstrap from the clip mount at the top of the CF-Cap seal.

4. Save any open files and close any applications that are running.
5. **Turn off the Trimble Recon controller.**
6. Unlock the latches on the attached PowerBoot Module controller. To do this, use the blade end of the Trimble Recon stylus to rotate the latches counter clockwise until the arrows point towards the communication ports at the bottom of the PowerBoot module.



Caution – To avoid data loss, the controller must be turned off, and you must complete the following two steps within 30 seconds.

- Slide the attached PowerBoot Module battery pack off the controller. To do this, push the PowerBoot module firmly with your thumbs in the direction of the arrow.



- Slide the spare PowerBoot Module battery pack onto the controller. Push hard until the PowerBoot Module battery pack is fully seated and its rubber seal fits firmly against the plastic housing.
- Lock the PowerBoot Module battery pack latches. To do this, use the blade end of the Trimble Recon stylus to rotate the latches clockwise until the arrows point towards the CF-Cap seal at the top of the controller.
- Reattach the handstrap to the clip mount on the PowerBoot Module battery pack.
- Turn on the Trimble Recon controller.

Frequently asked questions about battery, power, and charging

How long will a fully charged battery last?

If you use the Trimble Recon controller at moderate temperatures with no card installed, or with only a memory card installed, the battery lasts between 10 and 33 hours.

The battery life depends mainly on frontlight and CPU use:

- If the frontlight is off, and the CPU is idle, the battery lasts for about 33 hours.
- If the frontlight is operating continuously at full intensity, the battery lasts about 15 hours if the CPU is idle, or 10 hours if the CPU is continuously busy.

During normal operation, the CPU is idle most of the time, and the frontlight turns off automatically when the controller is not being used. Under these circumstances, the battery typically lasts between 15 and 33 hours.


What is the most important thing I can do to maximize battery life?

The main factor affecting battery life is the frontlight. Turning the frontlight off can more than double the battery life. For more information, see [Frontlight, page 14](#).

What else can I do to maximize battery life?

Use the controller's power management feature to turn off the controller when it is not in use. When you need to use the controller again, it restarts instantly.

To change power management settings:

1. Select  / *Settings* / *Control Panel* / *Power*.
2. Tap the *Schemes* tab.
3. From the *Power Scheme* list select *Battery Power*, and then set an appropriate timeout for your application. If you choose a short timeout, you can minimize the power that is wasted when the controller is idle.

Use a power management scheme that is suited to your workflow and the applications you are using. For example, if you are using an application that performs input/output operations constantly, there may be a delay when you turn the controller on again. Choose a longer timeout to minimize these delays.

What is the effect of temperature on battery life?

Batteries are optimized to perform best at temperatures that are comfortable for humans. Even if the temperature is above comfort level, the controller's battery has a very stable capacity. However, cold temperatures shorten battery life. At -20 °C (-4 °F), depending upon frontlight and CPU use, the battery life is between 30 % and 70 % shorter than it is at moderate temperatures.

Does using the serial port affect battery life?

Using the serial port does not significantly affect battery life. However, the CPU may be more active when processing the data passing through the serial port. The extra CPU usage may have a small effect on battery life.

Does using the USB port affect battery life?



The USB port does not significantly affect battery life unless it is used constantly to transfer files.

Does using a CompactFlash card affect battery life?

Using a CompactFlash memory card does not significantly affect battery life. However, other CompactFlash cards can use a lot of power. Depending on the type of CompactFlash card that is used, the battery may be drained at more than twice the normal rate. High-drain cards include wireless modems, wireless LAN (802.11a/b) cards, barcode scanners, and Bluetooth cards.

How does the Trimble Recon controller indicate the battery status?

The Trimble Recon controller uses the following taskbar icons to indicate the battery status:

Icon	Description
	The battery is charging.
(no icon)	The battery is well charged and is not connected to external power.
	The battery level is 40 % or less. The battery still has several hours of life left, but you should conserve power, and recharge the battery soon.



Tip – If the Trimble Digital Fieldbook software is installed on the Trimble Recon controller, you can also use the status bar in the software to view the battery level status.

When there are only a few minutes of battery life left, a low battery warning message appears. When this happens, save your work, shut down any applications that are running, and then immediately recharge the battery, or replace the PowerBoot Module battery pack with a charged PowerBoot Module battery pack. If you do not take action within a few minutes, the Trimble Recon controller shuts down automatically to preserve the real-time clock and any data stored in volatile memory (RAM).

For detailed instructions on removing the PowerBoot Module battery pack and attaching a charged battery pack, see [Replacing the PowerBoot Module battery pack](#), page 16.

How long does it take the battery to charge?

The battery recharges within 12 hours if the Trimble Recon controller is turned off, or if the PowerBoot Module battery pack is not attached to the controller.

What if I can't wait until the battery is fully charged?

The battery's charge increases steadily during charging. You can use the PowerBoot Module battery pack before the battery is fully charged. After 2 hours, the battery is charged to about 20 % of its capacity. After 5 hours, the battery is charged to about 50 % of its capacity.

Does turning on the Trimble Recon controller while it is charging affect the time it takes to recharge?

Yes. If you turn the controller on while it is charging, the time required for charging increases. This is true especially if the frontlight is on or the CPU is in heavy use. The graph in Figure 3.4 shows how these factors affect the charging rate.

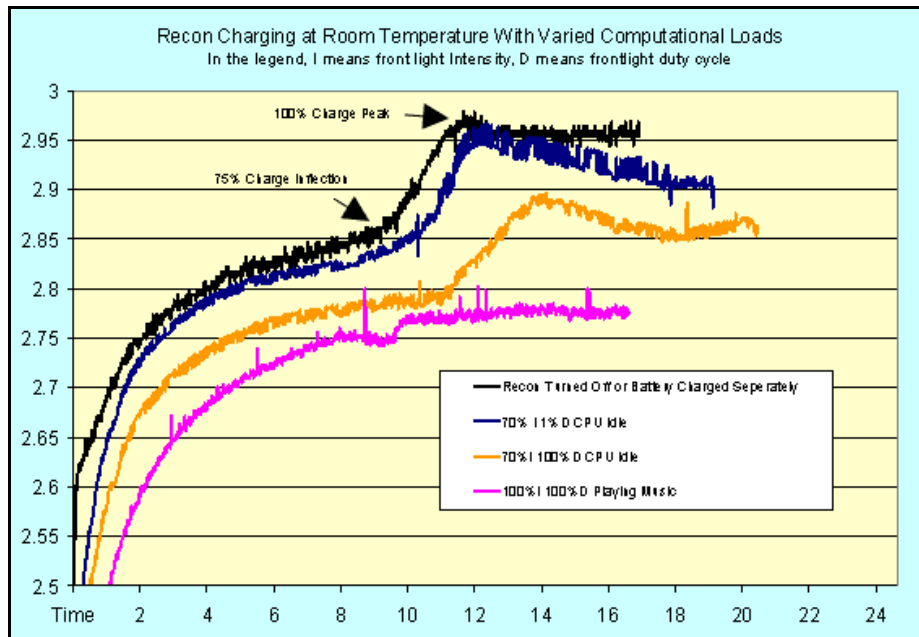


Figure 3.4 Effect of CPU use and frontlight level on charging rate

The battery charges faster if the controller is turned off, or if the PowerBoot Module battery pack is not connected to the controller. With low or no power consumption, it takes about 9 hours for the battery to charge to 75 % capacity, and about 12 hours to charge fully.

If the controller is turned on and is using too much power while charging, the battery may not be able to complete charging. The graph shows that with heavy power consumption, charging peaks at 50 % capacity.

Does it damage the battery if I leave the PowerBoot Module battery pack in the charger?

Batteries degrade more rapidly at higher temperatures. When a battery is fully charged, it becomes warm. Leaving a PowerBoot Module battery pack in the charger is similar to storing it in a warm environment, and shortens the battery's useful life.

Will the battery suffer from “battery memory” problems if it is not fully discharged and then fully recharged each time it is used?

No. Modern battery designs and chemistry have virtually eliminated the problem of “battery memory”. If you do notice a drop in the battery capacity, complete two or three “cycles” (fully discharge and then fully recharge the battery). The battery should return to full capacity.

Does the Trimble Recon controller have a backup battery?

No. User data, applications, and Windows Mobile registry information are safely stored in the non-volatile flash memory. This storage medium retains data indefinitely without battery power, so there is no need for a backup battery.

How long will the battery last before it needs to be replaced?

If you use the controller on 250 working days per year, and recharge its battery after every day’s use, the battery will last two or more years.

A “cycle” is a full charge and discharge of the battery. For the first 50 to 100 cycles, the battery’s capacity increases slightly to its peak value. For the next 300 cycles, its capacity will remain at this peak. By 500 cycles (equal to about two years use), the battery’s capacity will have fallen to approximately 80 %, and the capacity will degrade quickly after this.

Battery life can also decrease if it is stored at high temperatures. Make sure that you do not leave the PowerBoot Module battery pack in a hot environment, particularly while it is charging. Battery life can also decrease if you discharge it in extremely high or low temperatures.

Can the user service the Trimble Recon PowerBoot Module battery pack themselves?

No. The PowerBoot Module battery pack is not user-serviceable. Attempting to service the PowerBoot Module battery pack will void your warranty.



Caution – Do not puncture the battery cells, or dispose of them in a fire. The electrolyte in the cells is alkaline, and can cause harm if it comes into contact with eyes or skin. If the electrolyte does come into contact with eyes or skin, wash it off immediately with clean water and seek medical advice.

What environmental hazards are associated with the batteries for a Trimble Recon controller?

The battery contains no heavy metals or other chemicals that have been linked to environmental damage. However, as with all battery types, you should dispose of them carefully in accordance with local regulations.

How does the storage temperature affect battery life?

If a PowerBoot Module battery pack is stored above room temperature, its battery discharges at a faster rate. Do not store PowerBoot Module battery packs in cars or other enclosed spaces that may become hot. As a guide, do not store or leave PowerBoot Module battery packs in any environment that can become too hot for your own comfort.

How long will the battery remain charged if the PowerBoot Module battery pack is not attached to a Trimble Recon controller?

At room temperature, the battery loses 20 % to 30 % of its capacity every 30 days. At higher temperatures, the battery discharges at a faster rate. At lower temperatures, it discharges at a slower rate.

How long will the battery remain charged if the PowerBoot Module battery pack is attached to a Trimble Recon controller that is turned off?

If the PowerBoot Module battery pack is attached to a Trimble Recon controller, and the controller is turned off and stored at room temperature, the battery loses 40 % to 60 % of its capacity every 30 days. At higher temperatures, the battery discharges at a faster rate. At lower temperatures, it discharges at a slower rate.

Can I leave the PowerBoot Module battery pack attached to the Trimble Recon controller for shipment or long-term storage?

No. Remove the PowerBoot Module battery pack before shipping or storing the Trimble Recon controller.

If you leave the PowerBoot Module battery pack attached to the controller for shipment, bumping or jostling during shipment can accidentally turn on the controller. Some freight carriers refuse to carry, or accept liability for damage to, electronic equipment that can be activated in transit.

If the controller is stored, unused, for more than two months with the PowerBoot Module battery pack attached, the battery can be drained so deeply that the cell polarity is reversed. Cell reversal can damage the battery.

What is the storage (shelf) life of the battery in a Trimble Recon PowerBoot Module battery pack

The specified storage temperature range for the controller's battery is -20°C to 35°C (-4°F to 95°F). Provided the PowerBoot Module battery pack is stored at temperatures within this range, the battery should have a shelf life of several years.

Memory

The Trimble Recon controller has 128 MB of non-volatile NAND flash storage memory and 64 MB of RAM.


Unlike many devices that run the Windows Mobile operating system, the Trimble Recon controller has no RAM-based file system. All files are stored either in the flash memory or on an external CompactFlash card. This means that all stored data is maintained if power is lost.

The memory architecture of the Trimble Recon controller can be compared to the memory in an office computer:

Memory in Trimble Recon controller	Comparable memory in computer
NAND flash memory	Hard drive
External CompactFlash cards	External storage devices such as floppy disks and Zip drives
RAM	RAM

Flash memory

All user data and files are stored in the non-volatile flash storage memory.

To check how much free flash memory is available on the Trimble Recon controller, tap  / *Settings* / *Control Panel* / *System*, and then tap the *System Info* tab. This tab shows the total flash memory capacity (128 MB) and the available storage space in flash memory.

Note – *The Windows Mobile operating system uses up to 19 MB of the NAND flash memory for storing files and Windows registry information.*


CompactFlash cards

External CompactFlash memory cards provide additional storage space for applications and data files. When a CompactFlash card is inserted into the Trimble Recon controller, it appears in the controller's file system as a folder called Storage Card.


To check how much free memory is available on the installed CompactFlash card, open Windows Explorer, highlight the Storage Card folder, and then tap *File* / *Properties*. The *Properties* dialog shows the total memory capacity of the installed CompactFlash card and the available storage space on the card.

RAM

The Trimble Recon controller uses RAM mainly for running applications. However, like other Windows Mobile devices, some RAM is allocated as database memory. Some Windows Mobile applications use this memory to store information. For example, the Microsoft ActiveSync[®] technology uses database memory to store information for synchronization with the office computer.

To view the RAM allocation on the Trimble Recon controller, tap  / *Settings / Control Panel / System*, and then tap the *Memory* tab. This tab contains a slider bar which can be adjusted to change the allocation of RAM between database memory and program memory.

Note – *Trimble recommends that you leave the slider bar at the default position. This setting is suitable for most purposes.*

Some RAM is reserved for use by the Windows Mobile operating system. To view how much RAM is reserved for the operating system, tap  / *Settings / Control Panel / System*, and then tap the *System Info* tab. This tab shows the total RAM and the amount of RAM that the operating system is using. Normally the operating system uses about 8 MB.

Frequently asked questions about memory

Can I back up the RAM on the Trimble Recon controller?

No.

What CompactFlash devices does the Trimble Recon controller support?

The Trimble Recon controller supports CompactFlash devices that have drivers for the Windows Mobile operating system. Supported device types include memory cards, modems, network cards, and barcode scanners.

How do I copy data to or from the CompactFlash card?

Use the Microsoft ActiveSync technology on an office computer to copy files between the CompactFlash card and the office computer. Use Windows Explorer on the Trimble Recon controller to copy files between the CompactFlash card and the flash memory.

Can I install software on a CompactFlash card?

No. Most software programs use registry entries, so they must be installed in a permanent storage location.

Where is software installed on the Trimble Recon controller?

Software is installed in the non-volatile flash memory.

How do I back up the flash memory to an office computer?

1. Connect the Trimble Recon controller to the office computer using the ActiveSync technology.
2. In the ActiveSync technology, click **Explore**.
3. Windows Explorer opens, showing the contents of the Trimble Recon controller. Browse to the location of the files that you want to back up.
4. Select the files that you want to back up and copy them to the office computer.

How do I restore the contents of the flash memory from a backup on an office computer?

1. Connect the Trimble Recon controller to the office computer using the ActiveSync technology.
2. Copy the files from the backup on the office computer to the Trimble Recon controller, overwriting the existing files.

Interfaces

- Charging the battery
- Interfacing with the office computer
- Microsoft ActiveSync technology

Charging the battery

The rechargeable Ni-MH battery is housed in the PowerBoot Module battery pack. The battery cannot be removed from the PowerBoot Module battery pack for recharging.

To charge the battery:

1. Turn off the Trimble Recon controller.
2. Connect the AC adaptor to the external power port on the bottom of the PowerBoot Module battery pack.



3. Connect the other end of the AC adaptor to mains power.
4. Leave the controller to charge for up to 12 hours.

Interfacing with the office computer

The Trimble Recon controller has a serial port and a USB (type B) port for communications with other devices and computers. You can also use CompactFlash adaptors to enable other connections. For example, you can use a Bluetooth[®] CompactFlash adaptor to add Bluetooth ports to the controller.

For a serial connection, use a 9-pin null-modem serial cable. This cable is not supplied with the controller. For a USB connection, use an A-B USB cable, such as the USB cable (P/N REC-USBCBL) that is supplied with the controller.

Trimble recommends that you connect to an office computer using USB, which is faster and more reliable than a serial connection. When you use a USB connection, you do not have to select a COM port or configure communication settings such as the baud rate.

Microsoft ActiveSync technology

The Microsoft ActiveSync technology allows Windows CE devices, such as the Trimble Recon controller, to communicate with computers running a Microsoft Windows operating system. Once you have established an ActiveSync connection, you can transfer files, browse the Trimble Recon controller's file system, and install or uninstall software on the controller.

The ActiveSync technology is included with the Trimble Recon controller's operating system. To communicate with an office or laptop computer, you must install the ActiveSync software on the computer. The installation program for ActiveSync is supplied on the *Trimble Recon Resource CD* that is supplied with the controller. You can also download the latest version of ActiveSync from the Microsoft website at www.microsoft.com/windowsmobile.

For information on ActiveSync partnerships, and more information on connecting to an office computer, refer to the *Trimble Recon Getting Started Guide*.

To connect using ActiveSync technology:

1. Install the ActiveSync technology on the office computer. When the installation is complete, the first step of the *Get Connected* wizard appears.
2. Connect the Trimble Recon controller to the office computer. Do one of the following:
 - Use the USB cable that is supplied with the controller to connect the controller's USB port to a USB port on the office computer. The ActiveSync technology automatically establishes a connection between the controller and the office computer.
 - Use a null modem cable to connect the controller's serial port to a serial port on the office computer. In the *Get Connected* dialog, click **Next** to establish a connection between the controller and the office computer. On the Recon controller, a dialog appears, asking whether you want to connect to the desktop. Click **Yes**.

Once a connection has been established, the Set up a Partnership step appears on the office computer.

3. Do one of the following:
 - Select the *Yes* option to create an ActiveSync *partnership* between the two computers. When you set up a partnership, the office computer stores information about the controller and the partnership. This information enables the office computer to recognize the controller when it connects, and to synchronize files with the controller.
 - Select the *No* option to set up a *guest* relationship between the two computers. A guest relationship is a temporary connection that allows you to copy files to and from the controller, and to install files. When the controller is disconnected from the office computer, the guest relationship ends.

If you only want to transfer files, you can use either a partnership or a guest relationship.

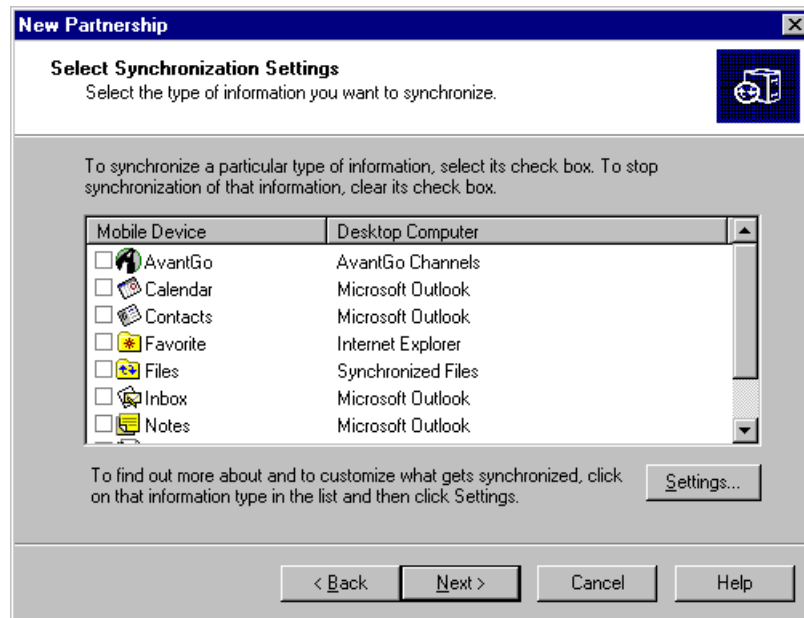
4. If you selected the *Yes* option in the *Set up a Partnership* step:

If you have already set up a partnership between this Recon controller and another computer, the *Select Number of Partnerships* step appears.

- a. To synchronize the controller with only this office computer, select the *Yes* option. Otherwise select the *No* option.
- b. Click **Next**.

The *Select Synchronization Settings* step appears.

- c. Select the types of information that you want to synchronize. If you only want to transfer files, and do not want to synchronize information, Trimble recommends that you clear all of the check boxes.

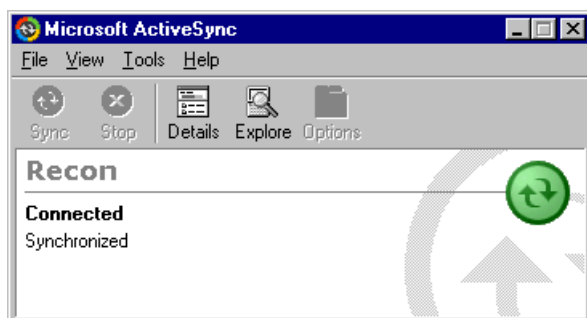


- d. Click **Next**.

The *Setup Complete* step appears.

- e. Click **Finish** to end the Get Connected wizard.

The *Microsoft ActiveSync* window appears, showing the name of the connected controller if you set up a partnership, or Guest if you chose to create a guest relationship.



5. To browse the contents of the Recon controller, click **Explore**. A Windows Explorer window opens, showing the files on the Recon controller. Use this window to move or copy files between the Trimble Recon controller and the office computer.

If you have set up an ActiveSync partnership, you can reconnect at any time simply by connecting the Trimble Recon controller to the office computer. If you are using a serial connection, a dialog appears on the Trimble Recon controller asking you to confirm that you want to connect to the desktop.

If you use a guest relationship to connect the controller to the office computer, you must complete the Get Connected wizard every time you connect to the office computer.

USB connection

When disconnecting the controller from the office computer, do not simply unplug the USB cable from the office computer. If you unplug the USB cable without first disconnecting from the ActiveSync technology, you may have problems reconnecting. To disconnect, Trimble recommends that you do the following:

1. On the Trimble Recon controller, double-tap the connection icon in the system tray. The *Connected to* dialog appears.
2. Tap **Disconnect** to end the ActiveSync connection.
3. Unplug the USB cable from the office computer and the Trimble Recon controller.



Serial connection

If you have difficulty creating a serial connection, make sure that you are using a correctly wired null modem cable. Some null modem cables do not use all of the connections that ActiveSync requires. You can purchase a compatible null modem cable from your local Trimble Dealer.

Alternatively, you can use a voltmeter to test the pinouts on the cable that you are using. A compatible null modem cable has female DB9 connectors at both ends. On both ends of the cable, the pins are numbered as follows:

5	4	3	2	1
9	8	7	6	

Use the voltmeter to confirm that both connectors use the following pinouts:

Pin	Connects to Pin
1	4
2	3
3	2
5	5
6	4
7	8
8	7
9	Not connected

If any other pinouts are used, the cable will not support ActiveSync serial connections.

Troubleshooting

- System level troubleshooting
- Troubleshooting the Trimble Recon controller
- Installing the serial number and/or operating system

For the R3 system there is only some general system level troubleshooting that can be done. The Trimble Recon controller is the only repairable item.

The Digital Fieldbook software must be set up correctly.

System level troubleshooting









To perform system level troubleshooting, you must:





- Connect the R3 module and A3 GPS antenna to the Trimble Recon controller.
- Install the Digital Fieldbook software.

Since a GPS signal is required for troubleshooting, test the system outdoors where good GPS reception is available or indoors using a GPS re-radiator kit.

To troubleshoot the R3 system you need a basic familiarity with the Trimble Digital Fieldbook software. For an overview of the software, see the Release Notes, Users Guide and Help manuals on the *Digital Fieldbook CD*.

You also need to be familiar with the icons used on the status bar in Digital Fieldbook.

Icon	Description
	Controller is connected to and drawing power from an external supply.
	Controller is connected to an external power supply and is recharging the external battery.
	Power level is 100 % or 50 %. If this icon is on the top right it refers to the controller's internal battery. If it is below the internal battery, it refers to the power level of an external device.
	
	A Trimble R3 receiver is in use.
	A 5700 L1 receiver is in use.
	A 4600LS receiver is in use.
	A Trimble R3 or Zephyr antenna is in use. The antenna height is shown to the right of the icon.

Icon	Description
	A static point is being measured.
	Continuous points are being measured.
	WAAS / EGNOS signals are being received.
	If no survey is running, the number of satellites being tracked is shown to the right of the icon. If a survey is running, the number of satellites in the solution is shown to the right of the icon.

There are different versions of the Trimble Digital Fieldbook software and you need to make sure that the customer has installed a version that is compatible with the R3 system. The Release Notes on the CD contain a compatibility chart. If this is not available, you can call Trimble Technical Support for further assistance. An example of a compatibility chart is shown here. This chart refers to the Digital Fieldbook software version 2.0 which was installed on the R3 system at the time it was first released.

Product type	Trimble product	Version
Software	Trimble Business Centre - L1 Postprocessing module	1.0
	Trimble Office Synchronizer	1.24
	Trimble Geomatics Office	1.62
	Data Transfer	1.18
Receiver	4700LS	2.50
	5700 L1	2.20
	Trimble R3	1.0

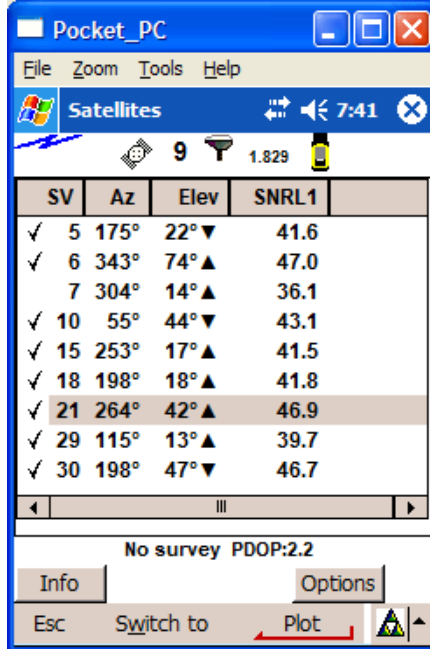


Tip – The R3 module is designed to work specifically with Trimble A3 GPS Antenna (P/N 53406-10). Other antennas are not compatible with the R3 module.

Note – *The only system level component in the R3 system that can be repaired is the Trimble Recon controller. The Trimble R3 GPS module and A3 GPS antenna have to be replaced if they fail.*

To view the *Satellite Status* screen in Digital Fieldbook for troubleshooting:

1. Select *Start / Programs* and then tap the Digital Fieldbook icon.
2. In the *Startup* screen, tap *Instrument* and then select *Satellites*.



SV	Az	Elev	SNRL1
✓ 5	175°	22°▼	41.6
✓ 6	343°	74°▲	47.0
7	304°	14°▲	36.1
✓ 10	55°	44°▼	43.1
✓ 15	253°	17°▲	41.5
✓ 18	198°	18°▲	41.8
✓ 21	264°	42°▲	46.9
✓ 29	115°	13°▲	39.7
✓ 30	198°	47°▼	46.7

No survey PDOP:2.2

Info Options

Esc Switch to Plot

Note – If the *Plot* screen appears, tap the **List** toggle switch (lower right-hand side).

System level troubleshooting chart

Problem area	Symptom	Possible solution
Trimble R3 module	Blank status bar in the Digital Fieldbook software No R3 icon in the status bar	<ol style="list-style-type: none"> Exit the Digital Fieldbook software and remove the R3 module while the controller is powered up. Reattach the R3 module. The controller should report that a new modem has been detected. Tap the dismiss option and then reactivate the Digital Fieldbook software. <p>If the R3 icon is not displayed, or if the status bar is still blank, the R3 module may be defective.</p> <p>Swap the R3 module with a known good one and see if it appears in the Digital Fieldbook software.</p> <p>If the replacement module appears in the Digital Fieldbook software, contact Trimble technical support or order a replacement module.</p>
	Bent or missing pins in the Recon card port.	If a bent pin cannot be straightened, or if a pin is missing, the main PC board will have to be replaced.
A3 antenna	Low satellite SNRs or no SNRs	<p>With the RF cable attached to the R3 module, measure the voltage output at the TNC connector. This should be about 3.25 V DC. If this is not the case, do one of the following:</p> <ul style="list-style-type: none"> – Swap A3 antenna with a known good one and see if SNRs appear or improve. – Swap RF cable and see if SNRs improve.
Antenna height	“?” next to A3 symbol	<p>The antenna elevation needs to be entered into the Digital Fieldbook software.</p> <ol style="list-style-type: none"> Tap and hold the “?” until the <i>GPS antenna</i> screen appears. Enter the antenna height and units of measure.
Incompatible version of Digital Fieldbook software	Light gray A3 Icon in the Digital Fieldbook software.	<p>An incompatible version of the Digital Fieldbook software is loaded and is either not detecting or not allowing the R3 version of the A3 GPS antenna to be used.</p> <p>Load a compatible version of the Digital Fieldbook software.</p>

Note – *When a Trimble R3 module is connected to the Trimble Recon controller, the A3 antenna (P/N 53406-10) is automatically set as the default antenna. No other antenna can be used with the Trimble R3 system.*

Troubleshooting the Trimble Recon controller


Self diagnostics

To test for hardware faults, use the diagnostic tests provided on the Trimble Recon controller. For more information, see [Self-diagnostic tests for the Trimble Recon controller, page 63](#).

General troubleshooting

Why can't I see all the icons in the system tray?

The system tray on the Trimble Recon controller's taskbar only has room for seven icons. If there are more than seven system tray icons, the eighth and higher icons are not visible. To ensure that you can access all system tray icons, disable icons that you do not use. For example, to disable the clock icon:

1. Select  / *Settings* / *Taskbar and Start Menu*.
2. Select the *General* tab.
3. Clear the *Show Clock* check box.
4. Click **OK**.

Why can't I calibrate the touch screen?

To successfully calibrate the touch screen, you need to tap reasonably accurately on the crosses that are displayed during the calibration sequence. If your screen taps are not close to the crosses, the calibration fails. Use the stylus, not your finger, to tap the crosses on the touch screen.

If you still cannot calibrate the touch screen after accurately tapping the crosses in the calibration wizard, the controller may have a hardware fault.



Resetting the Trimble Recon controller

If the Trimble Recon controller stops responding to the stylus, or the screen goes blank, you may need to reset it. There are two types of reset: a soft reset and a hard reset.

Soft reset

A soft reset stops all running programs, but leaves all files in RAM intact. A soft reset may be required after you have installed new software that includes new drivers. It may also be necessary if the operating system stops responding. Most system problems can be solved by a soft reset.



To perform a soft reset:

1. Hold down the  key and then also press and hold down the  key.
2. Keep holding them down until the screen warns of a soft reset and counts down to zero.
3. Once the boot screen appears, let go of the keys.

Hard reset





A hard reset erases all data in RAM, and then reloads the operating system into RAM from the NAND flash memory. You should only perform a hard reset if a soft reset does not solve a problem. When possible, you should always write down or save all important customer information including their software key information. Some of the controller's RAM is allocated as database memory. When you perform a hard reset, information stored in database memory is lost.

To perform a hard reset:

1. Hold down the  key and then also press and hold down the  key.
2. Wait for the display to give you a hard reset warning and count down to zero, then release the keys when the boot screen appears.

Recovering data

If the controller fails to progress past the “mountain screen” in the start-up sequence, **before** you reflash the unit, do the following to recover any saved data.

1. To enter the diagnostic mode, follow the sequence described on [Manufacturing tests \(MfgTest\)](#), page 64.
2. When the boot loader menu appears, press *more* in the first level menu and then again in the second level menu.
3. In the third level menu, press the recovery key . The message **Recovery flag now set (1)** appears.
4. Press the exit key  twice.
5. Press the NandBoot key .
6. Press the Ret key  to confirm.

The controller should restart with a .NET operating system shell.

7. Double-click **My Computer**.
8. Double-click the folder NVDisk.

All the files and folders that were on the controller should be available in the NVDisk folder. Use the Microsoft ActiveSync technology to transfer them to an office computer.

Installing the serial number and/or operating system



Caution – Write down all software keys before reloading the operating system. On Windows Mobile 2003 you can activate the Pocket Sprite backup to save a backup file to an external memory card. You must change the backup file path to go to the external memory card first before saving the backup file. If you do not do this, you will lose the software key for the Digital Fieldbook software. If this happens, call Trimble Technical support for assistance.

Equipment required

- The Trimble Recon controller to be updated.
- The AC power adaptor that was supplied with the Trimble Recon controller.
- The USB cable that was supplied with the Trimble Recon controller.
- An office or laptop computer with:
 - the Microsoft Windows 98 Second Edition, Me, 2000, or XP operating system installed
 - a free USB port
 - Microsoft ActiveSync technology version 3.7.1 or later installed

Note – You can install the ActiveSync technology from the Trimble Recon Resource CD, or you can download it from the Microsoft website.

Saving the customer software key

Before re-loading or performing an operating system upgrade, you must save the customer software keys. The software keys are available on the controller.

To access the Trimble Digital Fieldbook software key:

1. Turn on the controller.
2. Go to *DigitalFieldbook /Configuration*.
3. Write down the 16-digit authorization key.

Updating the loader firmware

1. Perform a hard reboot on the handheld.
2. Depending on which operating system is running on the handheld, do one of the following:

Operating system	Action
Windows CE .NET	Press the Esc and Return keys simultaneously.
Windows Mobile 2003	Press the Shortcut and Return keys simultaneously.

3. Select *More* to access the *Calibration Functions* screen
4. Select *More* again to access the *Additional Functions* screen and then select *Loader*.
5. Insert the CompactFlash card provided by TDS service department into the CF-0 slot. This is the slot closest to the display.
6. To confirm the update, press **Return**.

Installing the serial number on the new PCA board



Warning – You can do this only once. If you install the wrong serial number, you cannot remove it. You will have to return the PCA board to TDS to clear the serial number from the Flash memory.

To install the serial number so that it can be read during the MFG testing:

1. Activate the command prompt (DOS Window) to perform this procedure. If there is not a command prompt icon in the *Start / Programs* section, do the following:
 - Select *Start / File Explorer*.
 - Select *My Device* from the drop down menu at the upper left.
 - Tap the Windows folder.
 - Scroll down to the **cmd** icon and tap it. You should now be at the command prompt.
2. Use the virtual keypad to enter the following: `awcutil -setserial:FSXXAXXXXX`

Note – You must enter the command exactly as shown. This includes the space after `awcutil`.

3. On the virtual keypad, tap **Enter**.
4. Perform a soft reboot.
5. To verify that the serial number is correct, do one of the following:
 - Windows CE .NET operating system:
Select *Start / Settings / Control Panel / System Tab*.
 - Windows Mobile 2003 software for Pocket PCs:
Select *Start / Settings / System Tab / System Information*.

Installing the operating system

All replacement PCA boards are sent with a pre-installed basic .NET operating system. Once you have installed the serial number, you can install the correct operating system (CE .NET or Windows Mobile 2003 software for Pocket PCs). You must reinstall the same operating system that was in use before you replaced the board.

You need both of the following:

- The update utility with the correct version of firmware. The update utility is available from the web site, or from the ftp site. Make sure that you have the latest version of the firmware.
- A license key. The license key is a 25-character alphanumeric string that you are prompted to enter when you run the updater utility. If you do not already have a license key, contact TDS to obtain one.

Do the following:

1. Connect the handheld to the computer and then run the update utility.
2. When prompted, enter the license key.

When you install the operating system, you must choose an installation method and an updating method.

Installation method

When you run the updater utility, you can perform either an upgrade or a clean installation. Trimble recommends that you choose the ***upgrade*** method.

- An ***upgrade*** updates the operating system only, and preserves your data files and installed applications.
- A ***clean installation*** updates the operating system and erases all your data files and installed applications. If you choose this method, you will lose all data and settings. After the installation, you must reinstall all applications and drivers.

Both methods restore system settings (such as the date and time formats, desktop background image, and other user preferences) to the factory defaults. After the installation, you must reset your user preferences, and recalibrate the touch screen. You may also need to reinstall software or drivers that store settings or data in the registry.

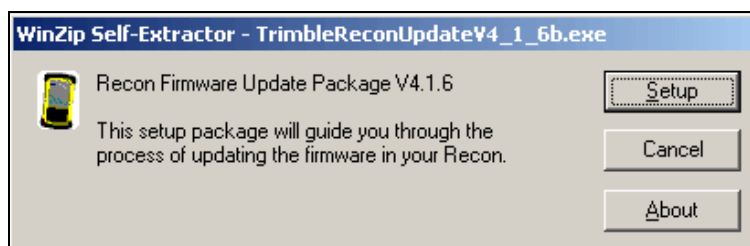
Updating method

You can upgrade the Trimble Recon controller automatically, using ActiveSync technology, or manually. Trimble strongly recommends that you upgrade ***automatically***. If the operating system revision that is currently installed on the handheld is earlier than revision 4.1.5, you ***must*** upgrade automatically.

You only need to upgrade manually if the operating system has become corrupted and will no longer run (the handheld is “unbootable”). To upgrade manually, follow the instructions in the installation wizard. For more information, click **Help** in any step of the installation wizard.

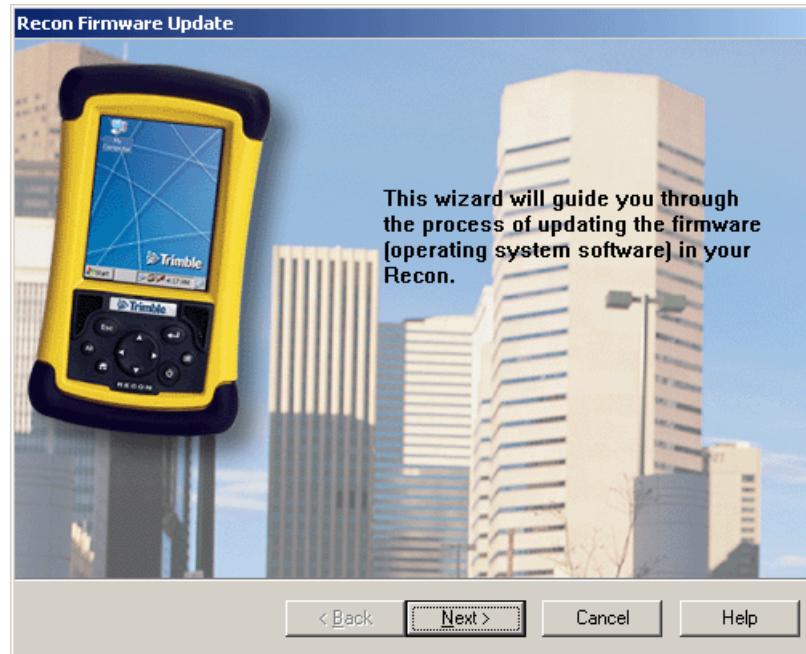
Installing the operating system: Automatic update using ActiveSync technology

1. Use the AC adaptor to connect the Trimble Recon controller to an AC power source (mains power). The AC adaptor must remain connected and supply power throughout the entire installation process.
2. Connect the Trimble Recon controller to the office computer and establish a USB ActiveSync connection.
3. Back up any data files on the Trimble Recon controller that you want to keep. You can use ActiveSync to make a backup on the office computer, or you can copy the files onto a CompactFlash memory card.
4. Download the update utility to a folder on your bench computer. Go to www.partners.trimble.com, log in to Land Survey, and then select *Products A-Z / Trimble Recon Controller / Service / Service Downloads*, and then click the link for the operating system upgrade file.
5. Once you've saved the file to your computer, run the executable file. The following dialog appears:



6. Click **Setup**.

The installer unzips the update files, and then runs the Recon Firmware Update utility:




7. Follow the instructions on the screen to upgrade the operating system.
 - In the *Choose Install Method* step, select the *Upgrade (recommended)* option.
 - In the *Choose Update Method* step, select the *Automatic update over ActiveSync (recommended)* option.
8. When the installation is complete, recalibrate the touch screen and reset your user preferences (such as the date and time format and the desktop background image).
9. Reinstall any software or drivers that store settings in the registry.

Installing the operating system: Manual update

If the operating system is corrupted, lost, or no longer loaded (for example, because you have replaced the PCB), you cannot connect using the ActiveSync technology. In this case, you must reload the operating system manually.

To install the operating system manually:

1. On the office computer, disable ActiveSync USB connections:
 - a. Press  and then select *Programs / ActiveSync*.
 - b. In the ActiveSync window, select *File / Connection Settings*.
 - c. Clear the *Allow USB connection* check box.
 - d. Click **OK**.
2. Use the AC adaptor to connect the Trimble Recon controller to an AC power source (mains power). The AC adaptor must remain connected and supply power throughout the entire installation process.
3. To download the update utility to a folder on the office computer, go to www.partners.trimble.com, log in to Land Survey, and then select *Products A-Z / Recon Land Survey / Trimble Recon Controller / Service / Service Downloads* and then click the link for the operating system upgrade file.
4. Run the downloaded file. In the dialog that appears, click **Setup**.
The installer unzips the update files, and then runs the Update utility.
5. Follow the instructions on the screen to upgrade the operating system.
 - In the *Choose Install Method* step, select the *Clean install* option.
 - In the *Choose Update Method* step, select the *Manual update* option.
6. Reset the Trimble Recon controller by pressing and holding down 0. The default image of the Trimble Recon controller and mountain appears.
7. Do one of the following:
 - Hold down 0 until the handheld beeps twice.
 - Remove and replace the battery.When the double beep sounds, quickly press 2 and 9 simultaneously.
8. Use the USB cable supplied with the Trimble Recon controller to establish a connection between the Trimble Recon controller and the office computer.
9. When the installation is complete, recalibrate the touch screen and reset your user preferences (such as the date and time format and the desktop background image).
10. Reinstall any software or drivers that store settings in the registry.

Maintenance and Repair

- Tools required
- Disposable items
- Disassembling the Trimble Recon controller
- Reassembling the Trimble Recon controller

This section provides:

- information on safely and properly replacing serviceable parts of the Trimble Recon controller
- information on the proper tools to use for maintenance and repair tasks
- step-by-step instructions on how to:
 - disassemble and reassemble a Trimble Recon controller
 - replace the printed circuit board (PCB)
 - replace the display/touch screen assembly
 - replace a keypad

To carry out maintenance or repairs to the Trimble Recon controller, you must be a Level 3 or higher Service Provider.

Note – *The PowerBoot Module battery pack is a self-contained part. It is **not** serviceable. If problems with a PowerBoot Module battery pack cannot be resolved using the troubleshooting information provided in this service manual, the entire PowerBoot Module battery pack must be replaced. See Frequently asked questions about battery, power, and charging, page 18 and Battery safety, page 3.*

Tools required

- The stylus provided with the controller, or a medium straight driver
- Phillips #0 driver
- Torx T6 driver

Note – Maximum torque to set product assembly screws is 3.0 kgf·cm (2.6 lbf·in).

- Tweezers
- Trimble Seal Integrity Test Kit (P/N 48848-00S), and the following tools:
 - Rubber vacuum cup assembly, 2½ Bellows style, 0.35" diameter, 1/8" male connector
 - Brass barb FPI adaptor ¼" x 1/8", fine point thread
- Modified CF-Cap seal (P/N RPR-RECCAPSEAL)

Disposable items

- Kapton tape
- Grease
- Thread seal tape (for the seal integrity test)

Disassembling the Trimble Recon controller



Caution – Unless specified, keep all parts that you remove during the disassembly or repair of the controller. Do not discard any part unless specifically directed to do so. Make sure that you keep small components, such as screws and the display ground spring, in a safe place until you reassemble the controller.

This section describes how to disassemble a Trimble Recon controller. To repair or replace a specific part, only perform the disassembly steps you require to access and remove that particular part. For example, to replace a PCB, you do not need to remove the display assembly or keypad assembly.

You may need to disassemble the controller to:

- repair or replace the front or back housing
- repair or replace the printed circuit board
- repair or replace the touch screen display assembly

To repair, clean, or replace the keypad assembly, you do not need to disassemble the controller. The disassembly and assembly of the keypad is covered in a separate section. See [Keypad assembly, page 59](#).

This section provides detailed instructions on the following steps:

1. [Opening the Trimble Recon controller](#) (see page 46).
2. [Removing the printed circuit board \(PCB\)](#) (see page 48).
3. [Removing the display assembly](#) (see page 51).

For information on reassembly, see [Reassembling the Trimble Recon controller](#), page 53.

Opening the Trimble Recon controller

1. Use the blade end of the Trimble Recon stylus or a medium straight screw driver to remove the two screws from the top of the CF-Cap seal (P/N 58975-00S) if that is what is installed on the controller, or remove the R3 module (P/N 63000-00) and then the accessory cap base (P/N 55251).
2. Slide the CF-Cap seal off the controller.



3. Unlock the latches on the PowerBoot Module battery pack. To do this, use the blade end of the Trimble Recon stylus, or a medium straight screwdriver, to rotate the latches counter clockwise until the arrows point towards the communication ports at the bottom of the PowerBoot Module battery pack.

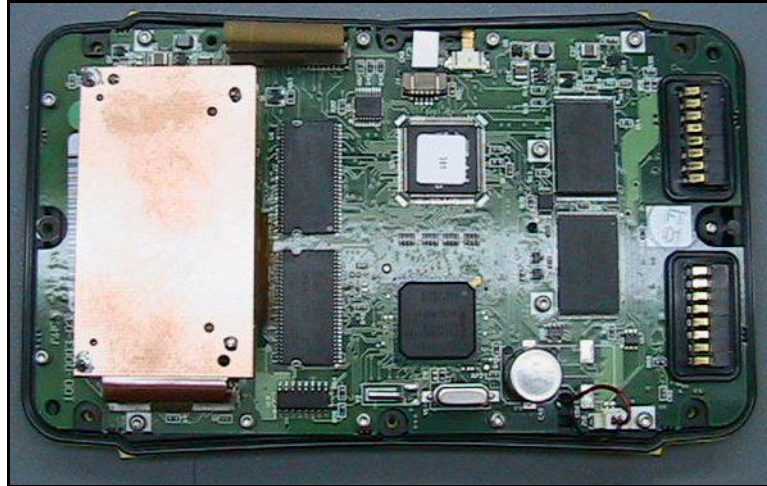
- Slide the PowerBoot Module battery pack, shown below, off the controller by pushing firmly with your thumbs away from the controller.



- Use a Torx T6 driver to remove the eight Torx screws that hold the front and back housings together. There are seven 12 mm case screws (P/N 58982-00S), and one 8 mm case screw (P/N 58993-00S). In the following figure, a circle shows the location of each 12 mm screw. A square shows the location of the 8 mm screw.



6. Lift the back housing to separate it from the front housing. This exposes the printed circuit board (PCB) in the front housing.

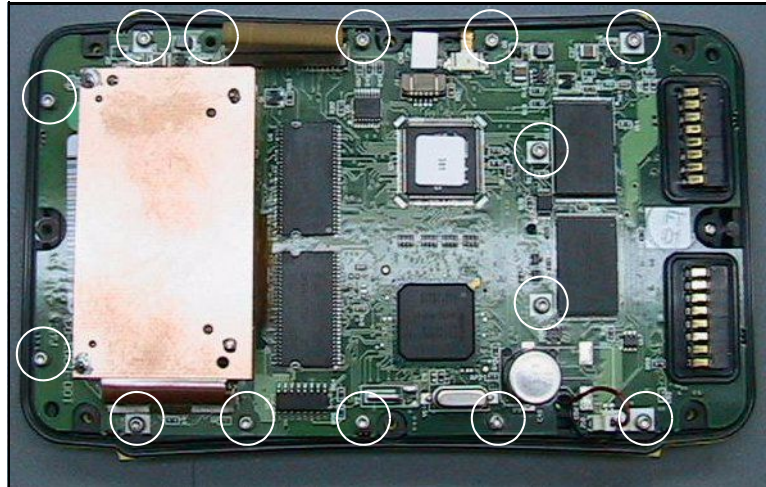


Removing the printed circuit board (PCB)

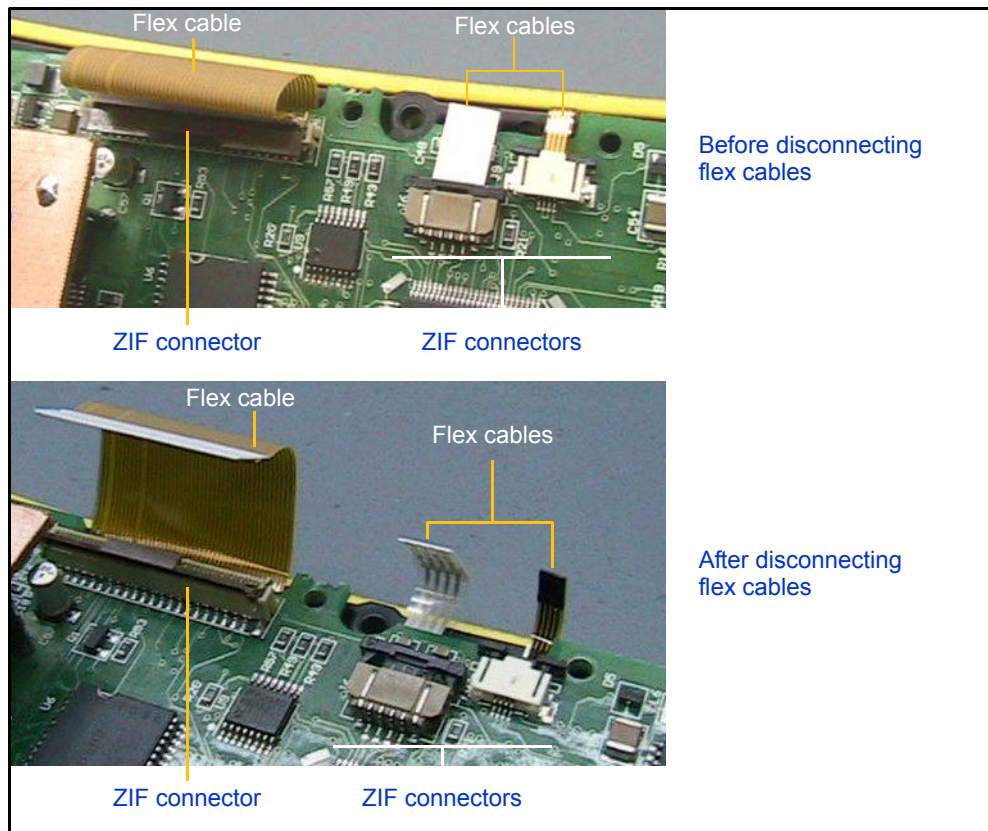
1. Use tweezers to remove the main seal (P/N 58995-00S) from the PCB.



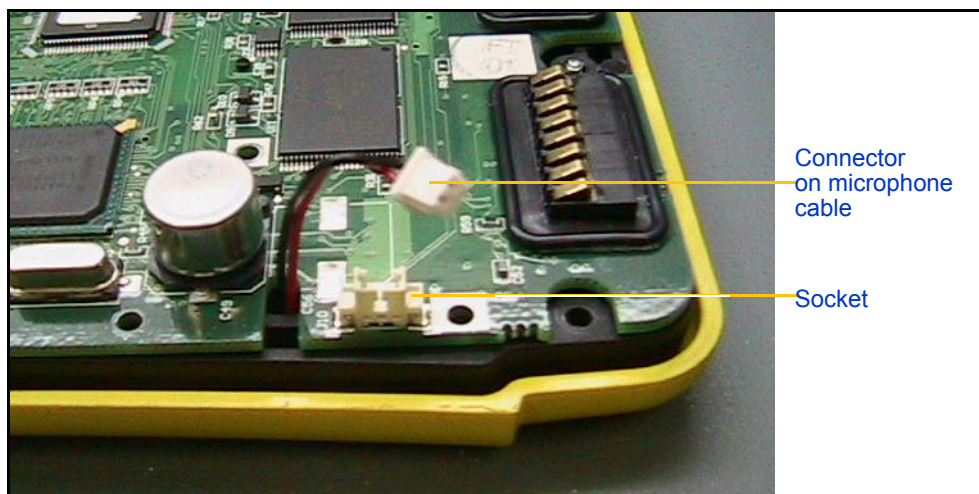
- Use the Torx T6 driver to remove the 14 PCB screws (P/N 58994-00S) that secure the PCB to the front housing. There are 12 screws around the perimeter of the PCB, and 2 screws inboard. In the following figure, a circle shows the location of each screw.



- Gently pull the three flex cables out of the zero insertion force (ZIF) connectors on the PCB.

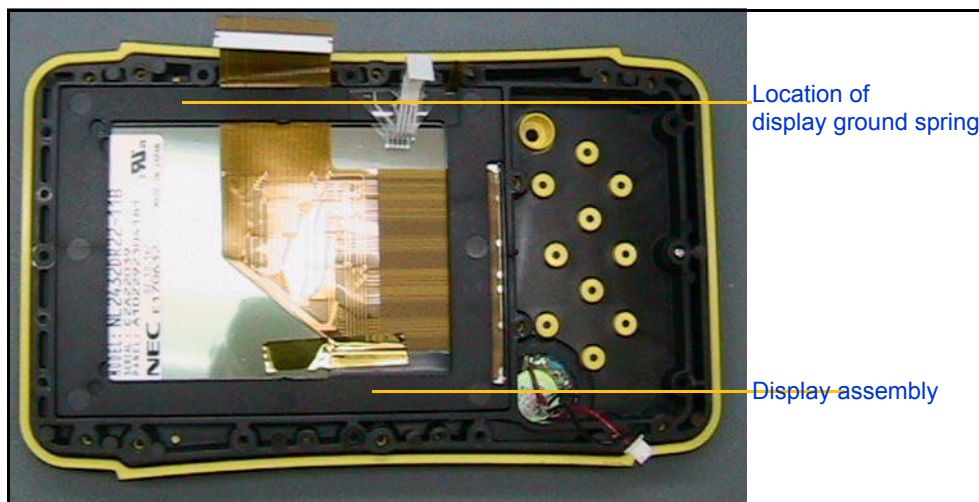


4. Disconnect the microphone cable by gently pulling its connector out of the socket on the PCB.



5. Lift the PCB out of the front housing.
6. Locate the display ground spring (P/N 58977-00S) and keep it in a safe place. The display ground spring is a very small spring between the PCB and the display. It provides a conductive path for ESD discharge.

Note – The controller is only CE-compliant if the display ground spring is properly installed.



Removing the display assembly

1. Make sure that the display ground spring (P/N 58977-00S) has been removed. For more information, see [Step 6 on page 50](#).
2. Lift the display assembly out of the front housing.

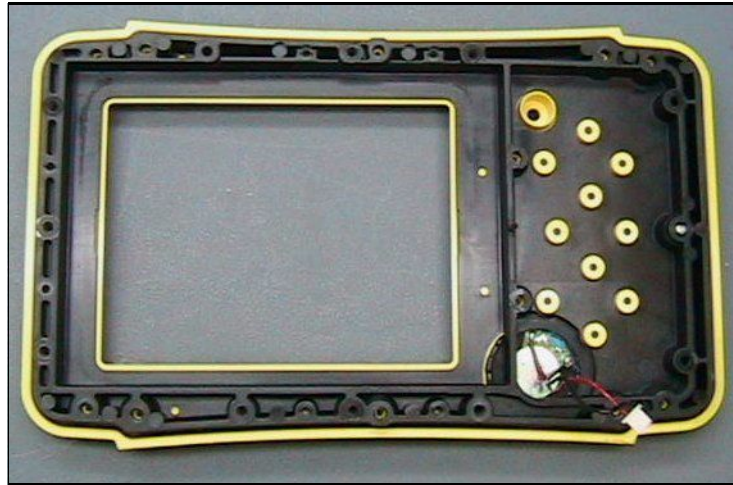


Figure 6.5 Front housing with all serviceable parts removed

3. If the rigid black display spacer is taped to the display, remove the tape. The tape keeps the parts in place during assembly.
4. Remove the rigid black display spacer from the back of the display.



5. Turn over the display assembly.
6. Use tweezers to remove the soft rubber gasket from the touch screen.



Reassembling the Trimble Recon controller



Caution – Use only the exact torque specified for each step and follow proper ESD procedures at all times.

This section details how to reassemble a Trimble Recon controller. If the unit under test has been completely disassembled, you *must* perform the steps in the specified order.

This section provides detailed instructions on the following steps:

1. Replacing the display assembly (see page 53).
2. Replacing the PCB (see page 55).
3. Re-sealing the controller (see page 58).

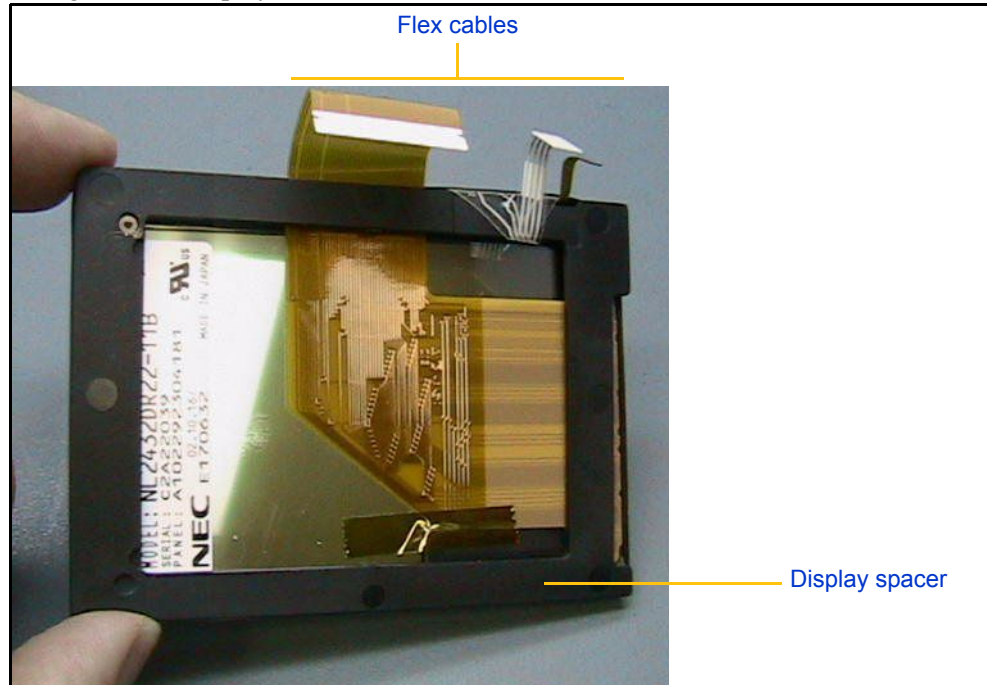
For information on disassembly, see [Disassembling the Trimble Recon controller, page 45](#).

Replacing the display assembly

The display assembly includes the color touch screen and the display housing for the screen. Although both the display housing and touch screen are serviceable, they can only be purchased as one assembly (P/N 58998-00S). To repair the touchscreen, you must order a complete replacement display assembly.

1. Place the touch screen face down on the work surface.
2. Place the soft rubber gasket (P/N 58978-00S) around the screen.

3. Turn the display assembly over and put the rigid display spacer (P/N 58996-00S) in place, as shown in the following figure. Make sure that the three display cables are routed between the display spacer and the display, and that the display spacer lies flat against the display.



4. Place a small piece of Kapton tape across the display spacer, the display flex cable, and the display.
5. Make sure that the display ground spring (P/N 58977-00S) is in place on the display spacer. Use a small dab of lithium grease to hold the spring in place.

Note – *This completes the reassembly of the display. It will be held in place after the PCB is mounted.*

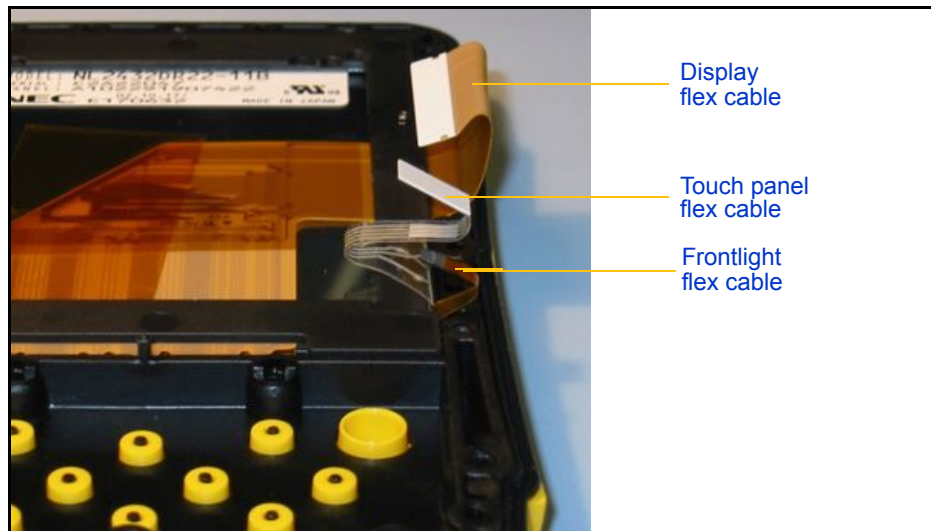
Replacing the PCB

This procedure assumes that you have already reassembled and replaced the display assembly in the front housing.

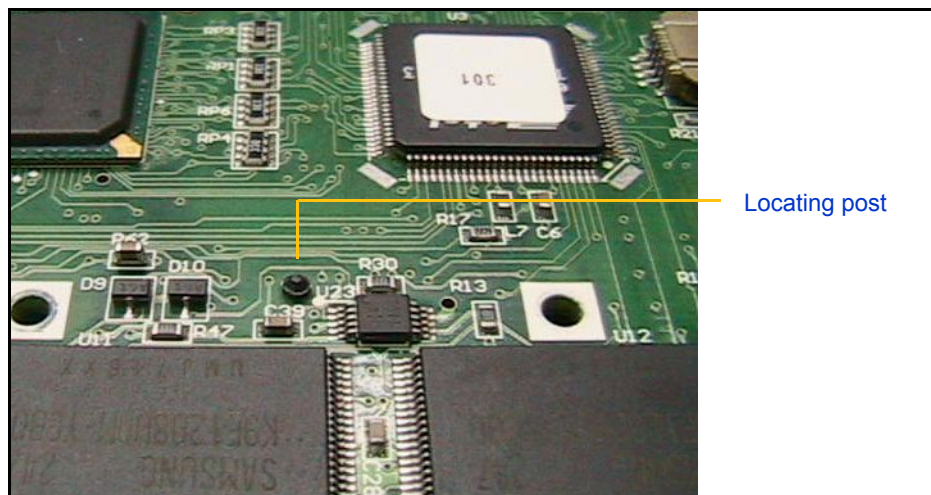
1. Make sure that the display ground spring (P/N 58977-00S) is in place on the display spacer, as described in [Step 4 on page 54](#).

Note – The controller is not CE-compliant unless this spring is properly installed.

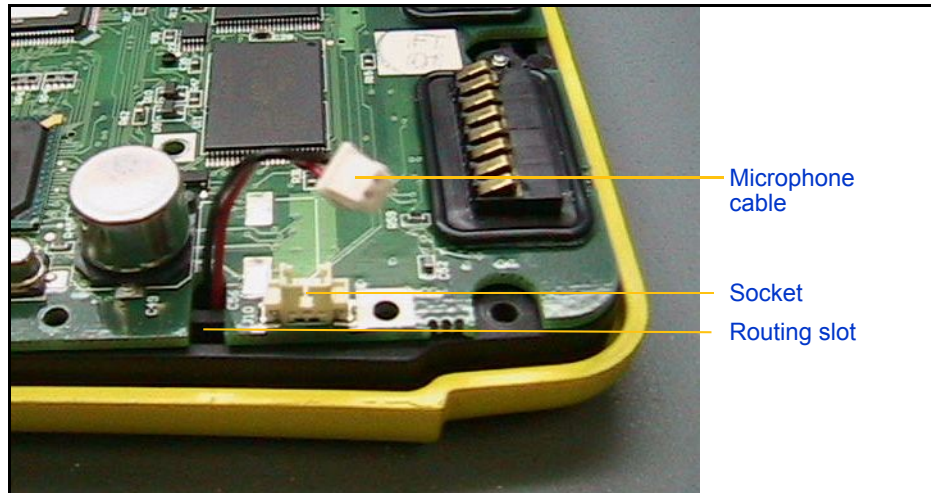
2. Mount the PCB (P/N 58970-00S) over the display assembly. Make sure that:
 - a. The touch panel flex cable is routed over the milled area on the display spacer. See the following figure for the correct routing. The display and frontlight flex cables must be routed between the display spacer and the display



- b. The locating post in the center of the PCB is aligned with the locating post on the display assembly



- c. The microphone cable is routed through the slot provided.



3. Connect the microphone cable to the socket on the PCB.
4. Connect the three flex cables to the ZIF connectors.
5. Using a T6 torque driver set at **2.6 inch-pounds (0.294 Nm)**, fasten the 14 PCB screws.



Caution – Do not over-tighten the screws. Maximum torque specification is 3.0 kgf-cm (2.6 lbf-in).

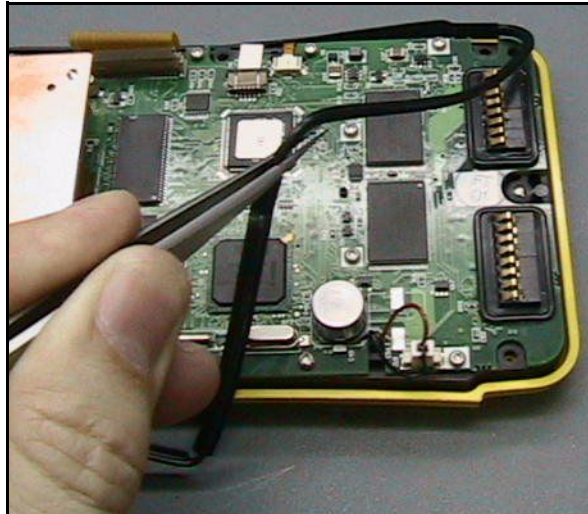
6. Make sure that the battery seals (P/N 58979-00S) around the battery contacts are firmly seated. If they are not, use the tweezers to move the seals into place.

Note – The battery seals may be wider on one side. If they are, place them around the battery contacts so that the narrow side is closest to the edge of the housing



Figure 6.6 Seating the battery seals (gaskets)

7. If this is a new replacement board, you must reinstall the model number and operating system reinstalled. See [Reinstall any software or drivers that store settings in the registry.](#), page 43.
8. Use tweezers to replace the main seal (perimeter gasket) (P/N 58995-00S) around the PCB.



Re-sealing the controller

This procedure assumes that you have already reassembled and replaced the display assembly in the front housing, and replaced the PCB.

1. Lower the back housing onto the front housing.
2. Use a T6 Torx driver to replace the first 7 12mm back case screws (P/N 58982-00S). Make sure to use an 8 mm screw (P/N 58993-00S) in the hole at the center bottom of the back housing. **Torque all eight screws to 2.6 inch-pounds (0.3 Nm).**



3. Replace the PowerBoot Module battery pack and then lock the latches.
4. Install the CF-Cap seal or the R3 module and then fasten the two mounting screws.

Seal Integrity Test

After assembly the Trimble Recon controller must be tested to determine if it has been sealed properly. To perform this test, use the Trimble Seal Integrity Test Kit (P/N 48848-00S).

1. Place some thread seal tape on the threads of the 2½ rubber bellows vacuum cup and then tighten it firmly using a wrench.
2. Attach the new adaptor to the end of the seal integrity testers air hose.
3. Remove the R3 adaptor (if attached) and then attach the modified CF-Cap seal (P/N RPR-RECCAPSEAL) to the top of the controller. Tighten it securely.
4. Perform the leak test by pulling in 5 inch Hg of vacuum. See [Testing vacuum, page 76](#).

The controller passes if it can hold at 5 inch Hg of vacuum for 10 seconds and only drop 1 inch or less.

5. Remove the CF-Cap seal and then re-attach the R3 adaptor to the top of the unit if it is needed.

Keypad assembly

To repair, clean, or replace the keypad assembly, you do not need to disassemble the controller. The keypad assembly can be removed and replaced without removing or opening any other part of the controller.

The keypad assembly consists of a black rubber keypad (P/N F-2010-01), six single key stems (P/N F-1030-01), and a key stem for the directional arrow (P/N F-1029-01). There are no electronics in the keypad assembly.

Note – *The following figures show the keypad and front housing separate from the rest of the controller. This is for the purpose of demonstration only. The procedure can be performed without disassembling the controller.*

To remove the keypad assembly:

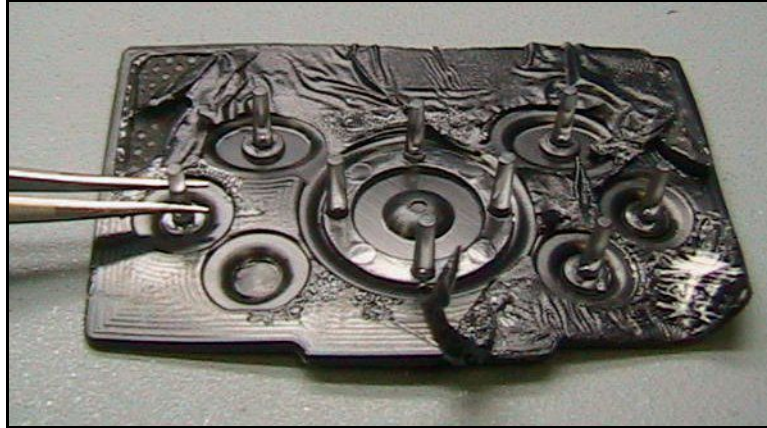
1. Use tweezers to peel the rubber keypad off the front housing.



Note – *The keypad has a strong adhesive backing. If you plan to re-use the keypad, try to avoid touching the adhesive as you remove the keypad.*

2. Place the keypad face down on your work surface.

3. Use tweezers to pull the seven key stems off the back of the keypad.



Note – The keypad shown above is from one of the first Recon controllers built. In later controllers, the keypads use less adhesive.

To replace the keypad assembly:

1. Use tweezers to place the keypad stems in the slots in the front housing.



2. If you have ordered a replacement keypad, use the tweezers to carefully remove the backing. Make sure that the adhesive sticks to the keypad, not to the backing.



3. Carefully place the keypad in the front housing. Make sure that it is straight and that the keys are aligned over the key stems.



Caution – Place the keypad correctly the first time. The adhesive on the back of the keypad is very strong, and will not re-adhere after multiple placements.



4. Press firmly over the whole keypad to ensure that it seals completely onto the front housing.
5. Test the controller as described in [Self-diagnostic tests for the Trimble Recon controller](#), page 63.

Performance Verification

- Performance verification checklist
- Test equipment
- Self-diagnostic tests for the Trimble Recon controller
- System level testing

The performance verification of the R3 system consists of the following:

- Ensure that the Trimble Recon controller is fully functional, see [Self-diagnostic tests for the Trimble Recon controller, page 63](#)
- Performing a system level test, see [System level testing, page 66](#)

Performance verification checklist

This checklist can be used as a repair test checklist as well as a post repair checklist.

Test	Description	Pass
Recon tests		
CompactFlash test	Test the Compact Flash ports.	
Match serial number to rear housing	Check that the serial number programmed on the main board matches the serial number (S/N) label on the rear housing.	
Touch screen test	Test the touch screen sensitivity	
Backlight test	Toggle the backlight on and off.	
Keypad test	Test the keys on the keypad.	
Display calibration test	Adjust the bias to reduce screen flicker.	
R3 system level tests		
R3 antenna voltage output	Check that the output voltage of the R3 module is approximately 3.25 V DC.	
R3 GPS signal test	Check the SV SNR levels of the R3 module.	
A3 antenna with the R3 module	Check the SV SNR levels of the A3.	
Seal Integrity	Test vacuum and pressure. See The Trimble Seal Integrity Test, page 73 . This test should be performed: <ul style="list-style-type: none"> – before disassembly – after reassembly 	

Test equipment

To test the Trimble R3 System you will need the following items:

- 2 CompactFlash cards, 256 MB capacity or higher
- 1 gold R3 system (P/N 75000-00 or equivalent)
- GPS signal at the workbench

Test software

Load the following test files onto each CompactFlash card:



- nand.nbo
- test.pcm
- test0.pcm
- test1.pcm

Self-diagnostic tests for the Trimble Recon controller







Caution – There are many tests available in the Diagnostic menu. You should only run the tests listed below. Other tests in the menu are factory tests, and can damage the equipment if they are done improperly.

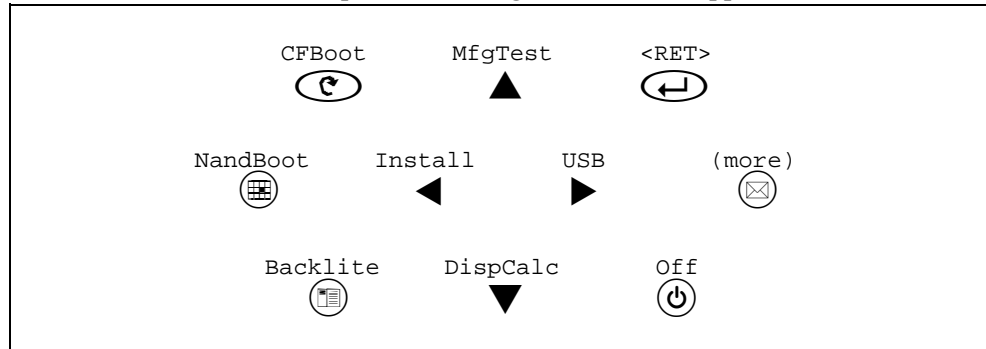
Diagnostic mode enables you to access self-diagnostic tests for the Trimble Recon controller.

1. Reset the Trimble Recon controller. To do this, press and hold down . The default image of the Trimble Recon controller and mountain appears.
2. Do one of the following:
 - Hold down  until the controller counts down to zero and shuts down.
 - Quickly remove and replace the PowerBoot Module battery pack before the unit reboots.



Note – *If you shut down the unit as normal and then quickly remove the PowerBoot Module battery pack, you will not need to perform a hard reset.*

3. Do one of the following:
 - On a controller running the Windows Mobile 2003 software for Pocket PCs operating system, when the double beep sounds, quickly press  and  simultaneously.
 - On a controller running the Windows CE operating system, when the double beep sounds, quickly press  and  simultaneously.


You will hear a series of beeps and the *Diagnostics* screen appears:



Diagnostic screen key sequence

The position of each command on this menu corresponds to the key on the keypad that you press to execute it. For example, to execute the `CFBoot` command, press , to execute the `MfgTest` command, press .

Manufacturing tests (MfgTest)



To start the manufacturing test sequence, press  (`MfgTest`).

There are four tests and they are run consecutively. It is presumed that the unit under test remains in manufacturing mode till all tests are completed.

The tests are:


- [CompactFlash test, page 64](#)
- [Matching the serial number to the rear housing, page 65](#)
- [Touch screen test, page 65](#)
- [Backlight test, page 65](#)

CompactFlash test


1. Place the test CompactFlash card in the CompactFlash slot closest to the front of the Trimble Recon controller.
2. Press  (`CFTest`).
3. A message on the screen indicates whether the test file has been read properly. If the text **StartCF failed, aborting...** appears on the screen, then the front CompactFlash slot fails.
4. Remove the test CompactFlash card from the front slot and place it in the rear slot.
5. Press  to execute the `CFTest` command.

6. A message on the screen indicates whether the test file has been read properly. If the text **StartCF failed, aborting...** appears on the screen, then the rear CompactFlash slot fails.


Matching the serial number to the rear housing


1. Press  to execute the PWARev command. A diagnostic report appears on the screen, showing information about the processor, memory, and other system components.
2. Write down and then compare the serial number on the rear housing with the serial number listed under *Unit Serial Number*. These two numbers should be the same. If they are not, check whether the housing was accidentally swapped in your shop during repair. If the housing was not swapped, contact Trimble Technical Support for further assistance.

Touch screen test

1. Press  to start the touch screen test.
2. Follow the instructions on the screen and tap the screen with the stylus. If the touch screen passes the test, the text `Touch functions correctly` appears on the screen.

Backlight test

1. Press  (Backlite).
2. If the backlight can be toggled on and off the unit under test has passed.

When you complete the Backlight test, you can exit from the Manufacturing test section. To do this, press .



Additional tests

After you exit the Manufacturing test section, there are a number of additional tests that you can run.






The tests are:

- [Keypad test, page 66](#)
- [Display calibration test, page 66](#)







To exit diagnostic mode:

1. Press .
2. Press  again to reboot the Windows Mobile operating system.

Keypad test

1. Press  (more).
1. Press  to execute the `keyTest` command. A list of keys, labelled S1 through S10, appears. Each key represents a key on the keypad. The labels appear in reverse video (black characters on a white background).
2. Press each key on the keypad. As you press each key, the controller beeps and the corresponding label on the list changes to normal display (white characters on a black background). If all keys respond properly the unit under test has passed.
3. Press  and  to exit the test.
4. Press  to exit the `more` menu.

Display calibration test

1. Press  (`DispCal`).
2. A range of color test patterns appears on the screen.
3. Check to see whether the black and white fields at the top of the screen are flickering. If they do flicker, adjust the minus, plus, odd and even keys () to reduce the flickering to a minimum.
4. When finished, press .

Seal Integrity Test

Carry out a seal integrity test when you have finished all manufacturing and other tests. See [Seal Integrity Test, page 58](#).

System level testing

If the Recon controller has passed all of the self-diagnostic tests, you can perform a final system level performance verification test. The system is systematically tested in stages.

Test setup requirements

- A DC-blocked GPS source to provide RF input to the R3 module.
- A GPS re-radiator kit at the workbench.
- An outdoor location where GPS reception is exceptionally good.

For further reference on setting up and using a GPS re-radiator and DC blocked outputs, see [Setting up a GPS re-radiator kit, page 82](#).

Testing the R3 module

R3 module voltage output test

Note – *You may need to measure the output voltage of two or three known good R3 modules to establish what a acceptable output voltage is.*

1. Attach the R3 module to the Recon controller and then turn the controller on.
2. Attach the TNC-to-N RF cable and then measure the voltage output between the center conductor and ground on the N connector. The voltage output should be approximately 3.25 Volts DC.

If the voltage output is drastically different, the R3 module has failed this test. Do not connect the A3 antenna to the module.



If the voltage output is within range, proceed to the next test.

R3 module GPS signal test

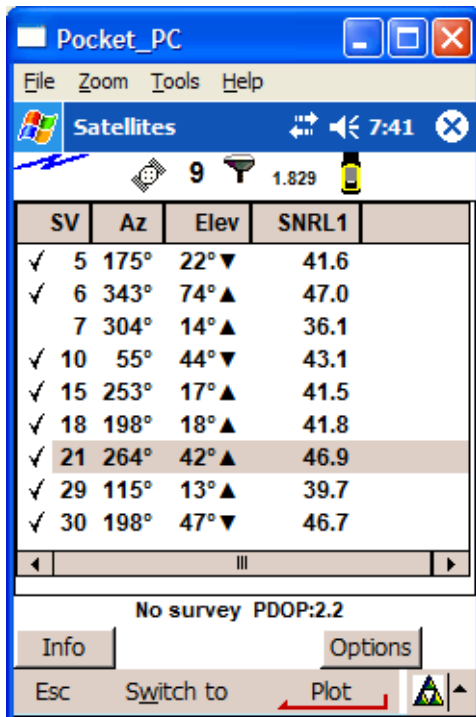
1. To prove that the R3 module has acceptable GPS satellite (SV) signal to noise ratios (SNRs), you must provide a DC-blocked GPS signal input into the SMA jack of the R3 module, equivalent to Test 2 as shown in [Setting up a GPS re-radiator kit, page 82](#).
2. When you have established a DC-blocked RF source for GPS you must establish what the appropriate satellite (SV) SNRs are for your bench setup. Use a couple of known good R3 modules and determine the average SV SNR levels.

Note – *Since GPS signals are obtained from a live source, the SNR levels will fluctuate depending on the time of day.*

Once you can provide this GPS signal, proceed as follows:

3. Plug the DC-blocked GPS RF source into the SMA jack on the R3 module.
4. Select  / *Digital Fieldbook*.
5. Tap  in the status bar. If the *Satellite* screen appears in Plot mode, tap `List` in the lower right of the screen. A list of the satellites that are being tracked appears, together with their corresponding RF signals.

6. Confirm that the SNRs that are shown are close to the standards of your bench (gold) R3 module. See Figure 7.7.



SV	Az	Elev	SNRL1
✓ 5	175°	22° ▼	41.6
✓ 6	343°	74° ▲	47.0
7	304°	14° ▲	36.1
✓ 10	55°	44° ▼	43.1
✓ 15	253°	17° ▲	41.5
✓ 18	198°	18° ▲	41.8
✓ 21	264°	42° ▲	46.9
✓ 29	115°	13° ▲	39.7
✓ 30	198°	47° ▼	46.7

No survey PDOP:2.2

Info Options

Esc Switch to Plot

Figure 7.7 Digital Fieldbooks Satellite list screen showing SNR's for L1.

Note – You may need to let the unit under test run for a while to gather the GPS data from the satellites.

7. Tap **ESC** and then tap *Instruments* and select *Position*. Confirm that the GPS position matches the position for your location.
8. Do one of the following:
 - If the SNRs and GPS position look normal, proceed to the next test, [Testing the A3 GPS antenna with the R3 module, page 69](#).
 - If the SNRs are low or missing or the position is wrong, then the R3 module under test has failed. If the R3 module fails this test, do the following using the customer's A3 antenna:
 - measure the A3 antenna at the TNC connector for a short
 - if the TNC connector is not shorted, test the A3 antenna on a known working R3 module and see if its SNRs are normal.

Testing the A3 GPS antenna with the R3 module

If the R3 module has proven GPS signal levels you can connect the A3 GPS antenna to see if the SV SNRs maintain acceptable signal levels.



To do this, do one of the following:

- Complete Test 1, see [Setting up a GPS re-radiator kit, page 82](#)
- Take the R3 system outside, if you have strong and unhindered GPS reception near your workshop.

To carry out a complete system test including the A3 GPS antenna:

1. Attach the R3 module to the Trimble Recon controller and tighten the lock screws. If the R3 module is already attached to the controller, make sure that the DC blocked antenna cable is unplugged.
2. Use the customer's RF cable to connect the A3 GPS antenna to the Trimble Recon controller.

Note – *If the customer's cable is not available, use the RF cable supplied with the kit (P/N 57962-00).*

3. Do one of the following:
 - Place the A3 GPS antenna under re-radiator Test 1 see [Setting up a GPS re-radiator kit, page 82](#)
 - Take the R3 system outside for live GPS signal reception.
4. Select  / *Digital Fieldbook*.
5. Tap  in the status bar. If the *Satellite* screen appears in Plot mode, tap **List** in the lower right of the screen. A list of the satellites that are being tracked appears, together with their corresponding RF signals.
6. Confirm that the SNRs that are shown are close to the standards of your bench (gold) R3 module.

Note – *You may need to let the unit under test run for a while to gather the GPS data from the satellites.*

7. Tap **ESC** and then tap *Instruments* and select *Position*. Confirm that the GPS position matches the position for your location.
8. If the SNRs and GPS position look normal, both the A3 GPS antenna and the entire R3 system have passed final testing.
 - If the SNRs are low or missing or the position is wrong, connect a known good A3 GPS antenna (gold unit) and see if the SNRs and/or position return to normal. If they do, the A3 GPS antenna under test has failed.
 - If the SNRs do not improve when you connect a known good A3 GPS antenna, swap the customer's RF cable. If the SNRs improve then the RF cable has failed. Replace the RF cable.

Note – *The SNR levels in this test will most likely not be the same as the SNR levels in the previous R3 GPS Signal Test. Each workshop must have a known good “gold” R3 system to establish the normal SNR and position for their location. When you test outside you must also be familiar with each satellite and their SNR levels at any given time of day. SNR levels also fluctuate throughout the year.*

The system has now passed all tests. If you need to run a baseline survey to test further accuracy you may do so. This is not covered in this revision of the manual.

Replacement Parts

- Trimble R3 system parts
- Trimble Recon controller replacement parts
- Trimble Recon controller accessories

Trimble R3 system parts

Note – The part numbers for the main system components are derived from top level kit P/N 75000-00.

Part number	Description	System	Processor speed	Memory	Operating system	Housing
64000-00	Trimble Recon controller (Survey)	Trimble R3	400 MHz	128 MB	Windows Pocket PC	Yellow
53406-10	Trimble A3 GPS antenna	Trimble R3				
63000-00	Trimble R3 module	Trimble R3				
53917-00	Pouch TNL, yellow	Trimble R3				
55251	Accessory cap base					
54572-00	Field case, R3 system	Trimble R3				
52618-00	Tape measure, yellow	Trimble R3				
57962-00	Antenna cable, 1.5 m					
53706-00	Tripod bracket					
57226-00	Quick Reference Card	Trimble R3				

The only system component that can be repaired is the Trimble Recon controller. The Trimble A3 GPS antenna and the Trimble R3 module must be replaced if they have failed.

Trimble Recon controller replacement parts

Part number	Description	Quantity
58969-00S	Keypad assembly	1
58970-00S	PCB assembly 400 MHz with CompactFlash upper slot	1
58976-00S	Front case assembly (yellow)	1
58977-00S	Spring, display ground	1
58978-00S	Seal, display	1
58979-00S	Seal, battery	2

Part number	Description	Quantity
58981-00S	Key stem, directional arrow	1
58982-00S	Case screws, 12 mm	7
58982-00S	Key stem, single	6
58993-00S	Case screws, 8 mm	1
58994-00S	PCB screws	14
58995-00S	Seal, main (perimeter gasket)	1
58996-00S	Display spacer	1
58997-00S	Rear case (yellow)	1
58998-00S	Color display	1
58975-00S	CF-Cap seal assembly	1
TBD	Trimble Bubble label (for keypad)	1

Trimble Recon controller accessories

Part number	Description	Quantity
F-1054-01-AWC	<i>Trimble Recon Getting Started Guide</i>	1
58968-00S	AC charger, 110 V	1
F-1058-01	AC charger, 220 V	1
F-1044-02	Stylus	2
F-1057-10	Screen protectors	10
REC-APOWERBOOT	Lower rubber boot/battery/RS-232 (PowerBoot Module battery pack)	1
F-2009-01	Hand strap	1
REC-BRACKET	Tripod bracket	1
REC-STDCase	Nylon carry case, Trimble	1
REC-USBCBL	USB data cable with ferrite core	1

The Trimble Seal Integrity Test

- Tools
- Assembling the Trimble Seal Integrity Kit, page 74
- Installing the software, page 75
- Testing vacuum, page 76
- Testing pressure, page 80

Once the Trimble Recon controller is assembled, you must ensure that it is airtight. To do this, Trimble recommends that you use a Trimble Seal Integrity Test Kit (P/N 48848-00S). This kit is a complete vacuum and pressure leak test system that connects to a test computer.

Tools

In addition to the kit, you need the following tools:

- Open-end adjustable wrench
- Channel locks
- Pliers

Assembling the Trimble Seal Integrity Kit

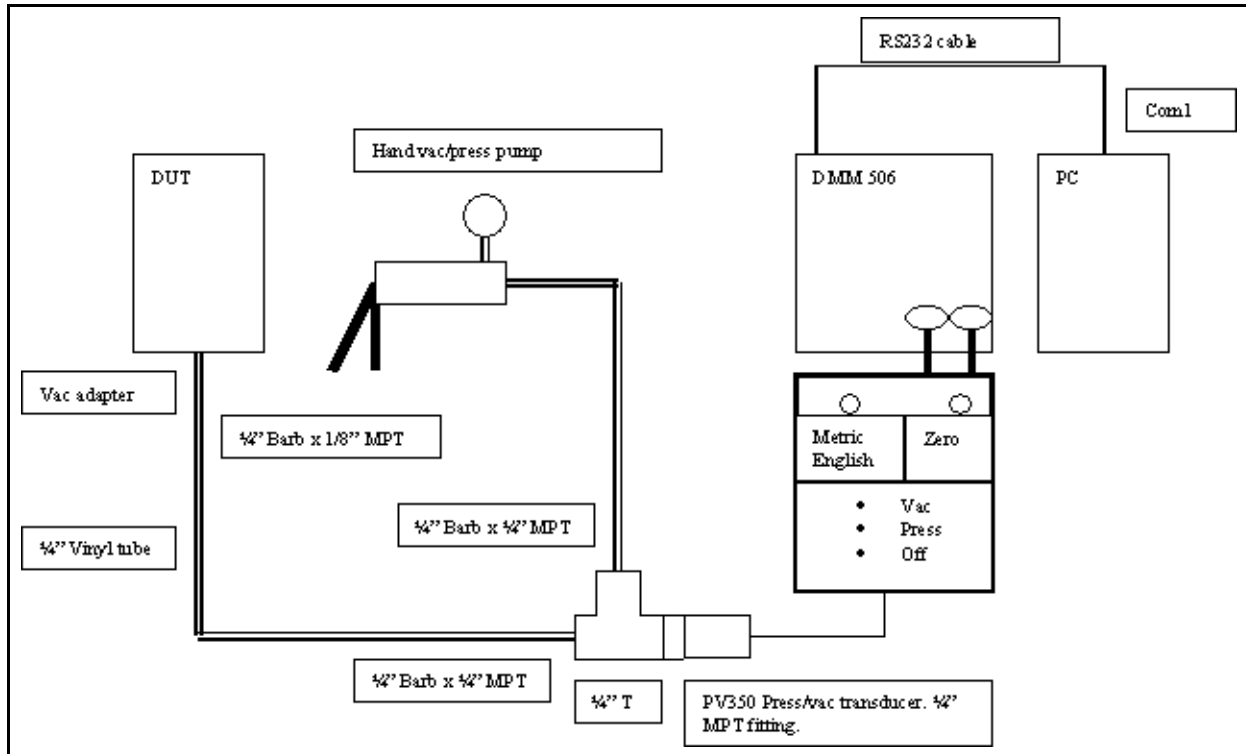


Figure A.1 Assembled Trimble Seal Integrity Kit

To assemble the kit:

1. Wrap three layers of Teflon tape around each of the following items:
 - the 3 MPT hose nipples
 - the male pipe threads of the PV350 transducer



Tip – If you have a 1/4" to 1/8" Barb nipple from a previous Seal Integrity Kit, you can use that.

2. Screw the two 1/4" nipples onto one end of the TEE and to the middle outlet, and then tighten the nipples firmly.
3. Screw the PV350 threaded end into the TEE and then tighten firmly.
4. Screw the 1/8" to 1/4" Barb into the 26919-TL vacuum adaptor.
5. Install the small O-ring over the threaded end of the adaptor.
6. Install one of the vinyl tubes between the adaptor and the TEE.
7. Install the other vinyl tube between the Vac/Press pump and the TEE.

Hardware requirements

To run the Trimble Seal Integrity test, the computer must have a physical RS232 port (DB9).

Installing the software

On a computer that is running a Microsoft Windows 95, 98, 2000, or XP operating system:

1. Use the Kill ActiveSync program to turn off Microsoft ActiveSync[®] technology.
2. Copy the file pd506.zip into a newly created folder called DMM506 that is located under C:\.
3. Extract the files to the same folder.
4. Run the SETUP.EXE file. The program is installed in the DMM506 folder, unless you chose a different folder name in Step 2.

Setting up communication

To set up communication between the computer and the DMM.

1. Run the DMM506.EXE program.
2. Plug the PV350 into the common (–) and volt (+) terminals. You may need to install the 9 V battery in the PV350: see the instruction sheet.
3. Select the mV scale on the DMM. You may need to install the 9 V battery in the DMM: see the instruction sheet.
4. Connect one end of the RS232 cable to the DMM and the other end to an RS232 port on the computer.
5. Turn on the DMM.
6. Turn the PV350 by sliding the switch to the cmHg in Hg position (vacuum).
7. Click **Menu** on the DMM repeatedly. When the RS232 in the display blinks, click **Return** on the DMM.
8. On the computer:
 - Select the *Setup* menu (at the top) and then select the interface item. Choose the appropriate COM port.
 - Select *Sample Rate* and set the rate to 1 per second.

Once the computer and the DMM are communicating:

- the DMM shows TX and RX symbols
- the program on the computer shows values and a connection

Troubleshooting communication

If the computer and the DMM are not communicating, double-click the *Trans* menu item on the computer and select ON.

If this does not work, make sure that:

- ActiveSync technology has been removed from the computer
- the RS232 cable is connected and working
- the RS232 label is on the left side of the DMM screen

Testing vacuum

Figure A.2 shows the screens and buttons used during vacuum testing.

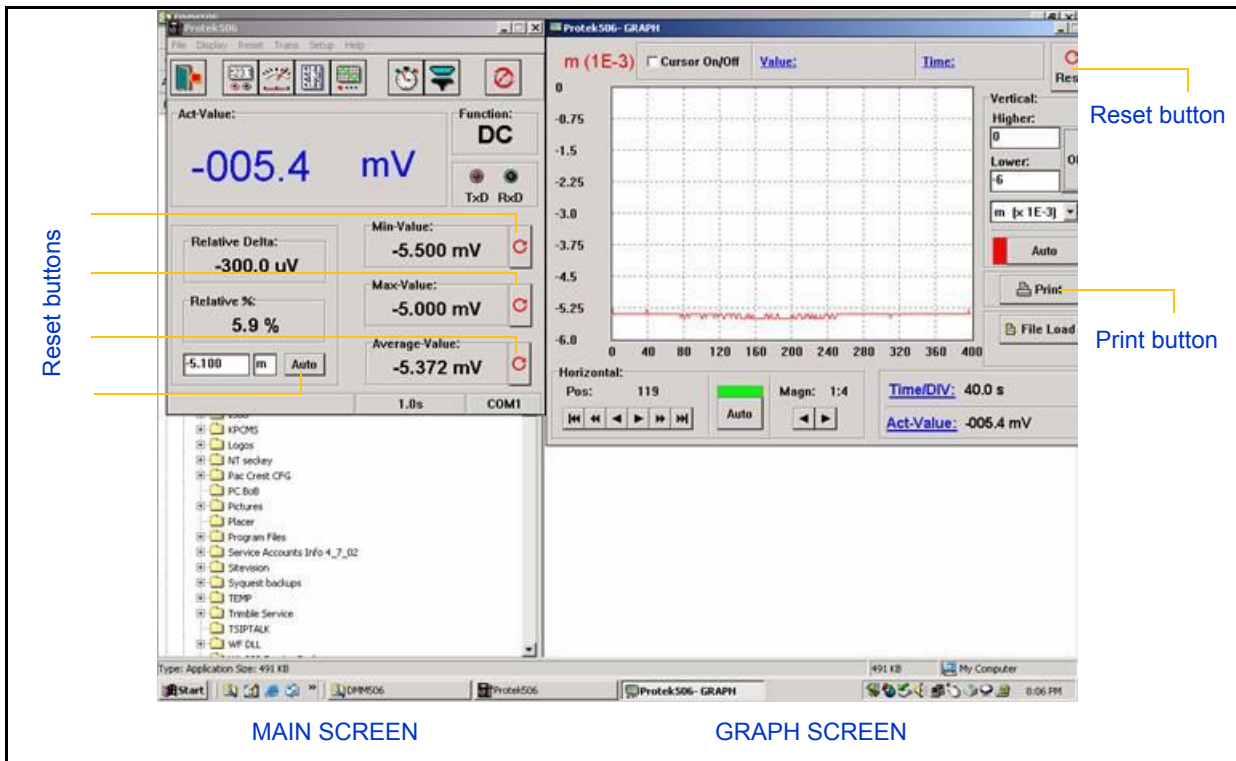


Figure A.2 Vacuum acquisition



Caution – The Trimble Seal Integrity test is **highly** sensitive to cell phone and radio transmissions. If you do not eliminate such transmissions, the graph will show erratic values.

To test vacuum:

1. Connect the vacuum adaptor to the unit:
 - a. Remove the brass cap from the vacuum adaptor and install the 10-32 brass nut onto the vacuum adaptor.
 - b. Install the adaptor into the seal port of the unit.
 - c. If the unit has a vent hole, install a piece of Kapton tape over the vent hole to seal it.

Note – The O-ring **must** be installed before you test vacuum.

2. Make sure that the hand pump is in Vacuum mode. Pull the trigger while watching the display. Do not exceed -5 mV.
3. Make sure that the PV350 is set to the Vacuum setting (cmHg or inHg).
Turn on the PV350 at least three minutes before you run the seal integrity test. This allows time for the circuits to stabilize.
4. Start the DMM506 program.
5. Activate communication between the computer and the DMM. See [Setting up communication, page 75](#).



Caution – Make sure that the DMM is set to “Don't turn off” mode. Otherwise it will shut off and lose communication with the computer.

6. On the PV350, adjust the Zero potentiometer until the mV reading on the DMM is as close to zero as possible.
7. On the computer, click **Graph-Display**.
There should be two screens showing details of the DMM:
 - *Protek506* is displayed at the top of the main screen. Move the main screen to the left.
 - Move the graph screen to the right, and position the two screen side by side.
8. On the graph screen:
 - a. In the *Vertical higher limit* field, enter **0**.
 - b. In the *Vertical lower limit* field, enter **-6**.
 - c. Click **OK**.
 - d. Set the *Vertical scaling factor* to "m (x 1E-3).
 - e. Set the *Magn* (magnification factor) to 1:4. *Time/Div* will be 40.0 seconds.
9. Pull the hand pump trigger slightly. Check the displays. If the reading goes past -6 mV, relieve some of the vacuum until the reading is at or below -5 mV.
10. Click the **Reset** buttons (see [Figure A.2 on page 76](#)) as follows:

- On the graph screen, click **Reset**.
 - On the main screen, click **Auto** and the three **Reset** buttons to the right of it. This resets all values.
11. Wait *at least six minutes* and then observe the vacuum loss over 400 seconds.
 - There should be no large positive and negative fluctuations.
 - There should be no appreciable vacuum loss over 400 seconds. Maximum decay rate is 1 mV (1 inch Mercury) over 400 seconds. Some products, such as the TSCe controller, have a decay rate of 1 inch Mercury over 5 seconds, which means that after 25 seconds they will be at atmosphere. Other products differ.
 - Please keep a record of all average decay rates that you find.
 12. If large fluctuations occur, but the average is fairly constant, change the sample rate to 1 sample for every 2 seconds. (enter **2 seconds**.) This setting will smooth the transitions.
 - If results show a fairly flat line, with fluctuations of about 100 uV, wait 400 seconds. If the displayed mV drops below 500 uV for the relative delta, the unit has passed the Seal Integrity test and is functional.
 - If the displayed mV decreases by 500 uV or more after 400 seconds, the unit needs to be retested. Check all fittings and the Teflon tape and then start again.
 13. To print out the data that you have acquired, click **Print** on the graph screen.
 14. To save the file, use the format *mmyyssss*, where m=month, y=year, and s=the last 4 digits of the serial number. (You cannot save the configuration setup.)



Tip – You can use this data acquisition system to monitor many things (for example, temperature, voltage, or current) over time. It is especially useful for recording AC power.

Examples of vacuum test results

The following results were achieved when a Trimble 4700 GPS receiver was vacuum tested using the method just described:

- [Figure A.3](#) shows what the screen initially displayed.

Note – At this point, the gauge actually showed that the unit was passing the vacuum test.

- Figure A.4 shows the same screen after some time had passed. It was clear that the unit *leaks*. Look at the deviation in the *Relative Delta* and *Relative %* values. In this case, the receiver leaked because the dustcaps had not been inserted.

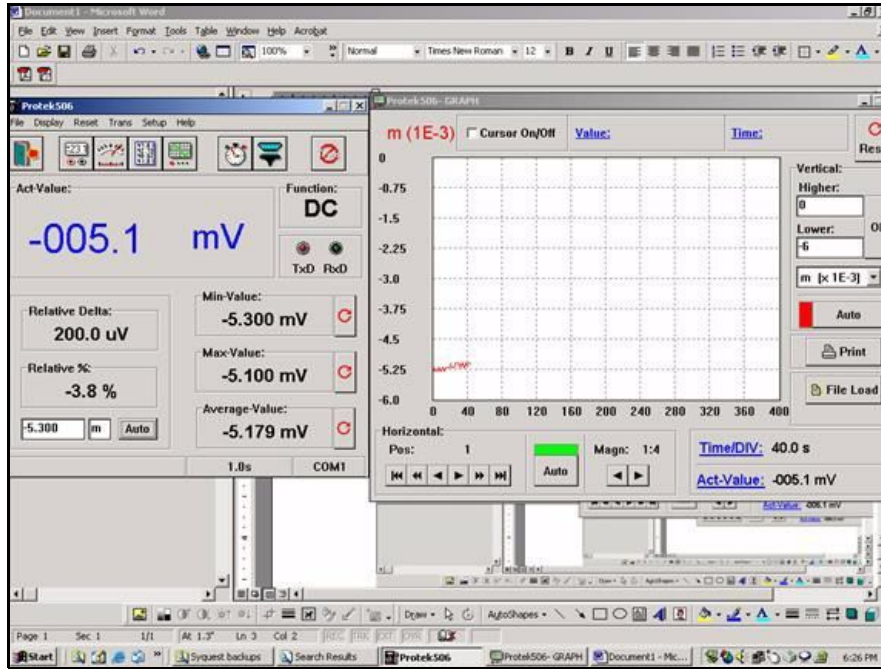


Figure A.3 Example: Vacuum testing a 4700 GPS receiver (first reading)

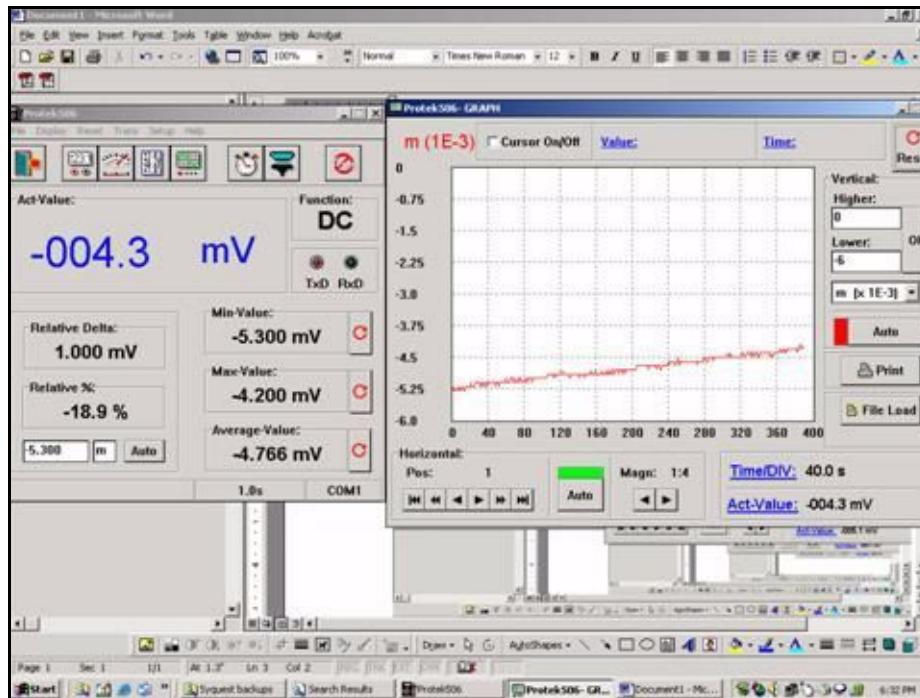


Figure A.4 Example: Vacuum testing a 4700 GPS receiver (second reading with leak apparent)

Testing pressure



Caution – Only test pressure if you are specifically instructed to do so. Otherwise, test vacuum only. Some units, such as the Trimble 4800 GPS receiver, will blow up if you pressure test them!

1. Complete Steps 1 through 7 as described in [Testing vacuum, page 76](#).
2. On the graph screen:
 - a. In the *Vertical higher limit* field, enter **6**.
 - b. In the *Vertical lower limit* field, enter **0**.
 - c. Click **OK**.
3. Change the PV350 to the appropriate pressure scale (kPa or PSI).
4. Change the hand pump to the pressure mode.
5. Pull the trigger on the hand pump slightly. Check the displays. Make sure that the range has not been exceeded.
6. On the graph screen, click **Reset**.
7. On the main screen, click **Auto** and the three buttons to the right of it.

Again, there should be no large positive and negative fluctuations. The unit is leaking if you see a deviation greater than 500 uV.

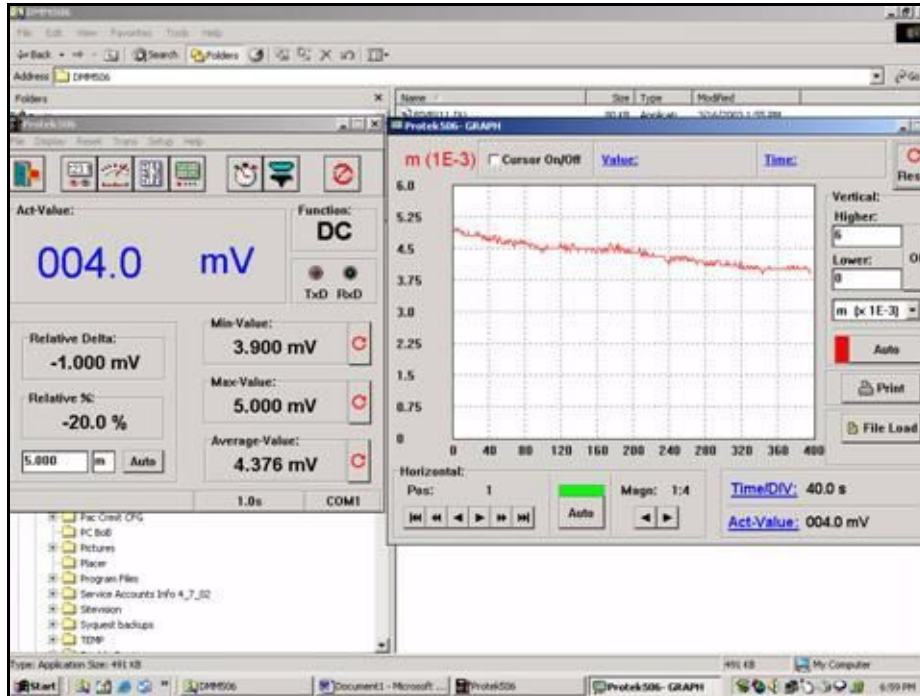


Figure A.5 Example: Pressure testing a 4700 GPS receiver

If a unit passes the vacuum test but fails the pressure test, check where and how the seals are mounted. Some Trimble products only require a vacuum test but not the pressure test. Always refer to the Maintenance and Repair section of the products manual to see which tests should be performed.

GPS Re-Radiator Kit

- [Setting up a GPS re-radiator kit](#)

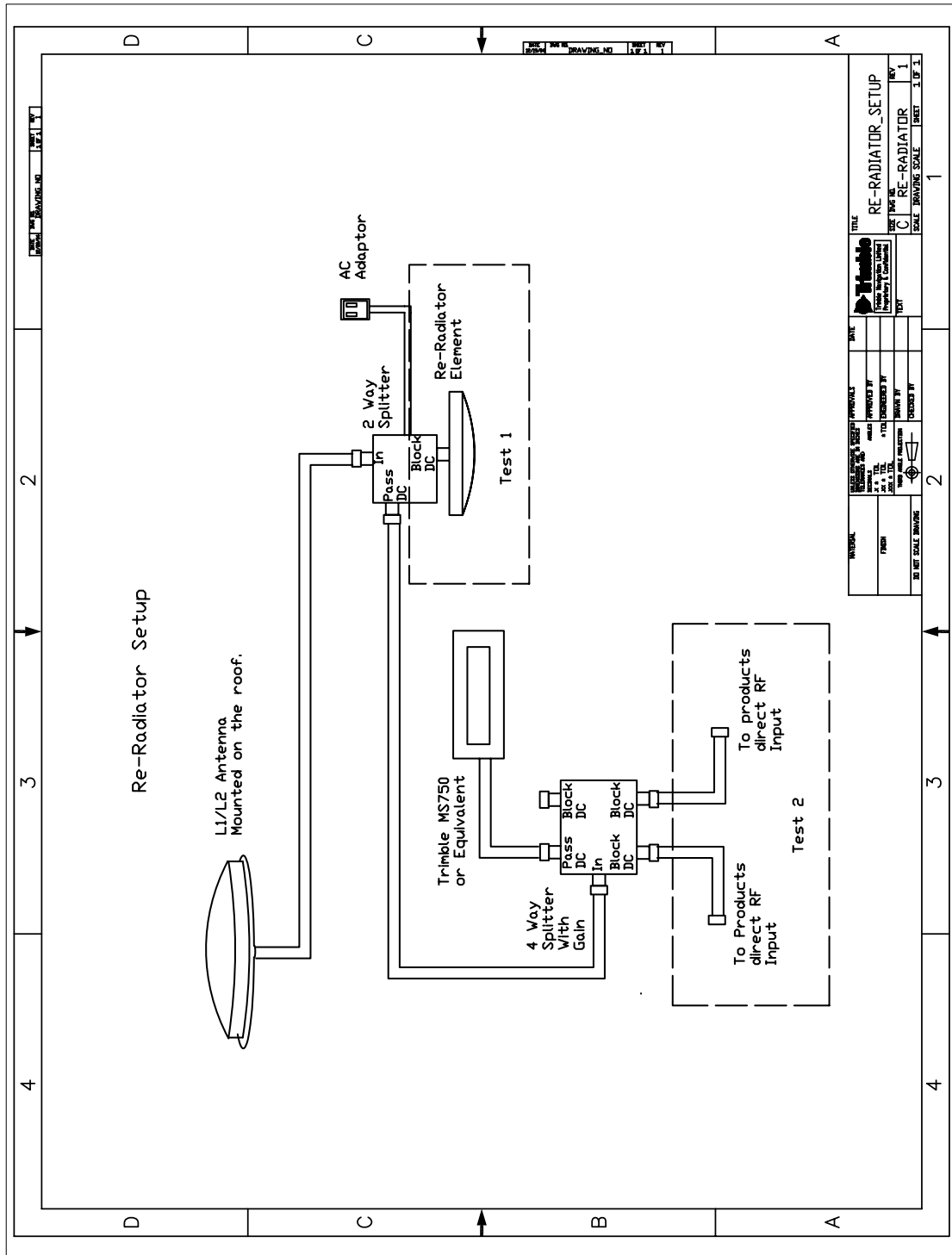
Setting up a GPS re-radiator kit

To test the R3 module and A3 GPS antenna you need a source for providing GPS signals at the work bench. A GPS re-radiator kit is ideal for troubleshooting the R3 system because it has both of the following:

- A DC-blocked splitter for direct GPS input
- A re-radiator kit for system level testing

To duplicate the re-radiator and four-way splitters shown in the re-radiator setup drawing you will need the GPS Source model GPSRKL1 repeater kit and the S14 four-way splitter (<http://www.gpssource.com/index.php>). Other splitter and repeater brands may be used if they achieve the same end results. For the GPS Source products note the following:

- The S14 is ordered with one port that allows DC out and the other three ports with DC blocked. This means that one port can be used to provide voltage to the GPS antenna on the roof and the other three outputs can be used to provide DC blocked RF input for testing purposes to equipment on the workbench.
- Trimble recommends ordering the splitters with 0 dB gain or with enough gain to compensate for the RF cable so that there is little or no gain by the time the RF signal reaches the equipment being tested at the bench. If you try to boost gain too high, this can cause a number of problems including causing the SV SNR readings to become unrealistic. Some GPS equipment does not respond well to signal levels that are too high.
- You must choose a GPS device to keep on the workbench to drive the GPS antenna. The GPS antenna that you choose should be compatible with the GPS device that is driving it. Typically you should choose a device that works with an L1/L2 antenna. GPS products that do not process L2 will simply not track that signal at the work bench and just process the L1 signal.
- It is up to each service provider to determine if their business is allowed to operate a GPS re-radiator system in their geographical location in accordance with government regulations.



Standards

- Hardware standards
- Military standards

Hardware standards

This section explains the standards that were used to evaluate the ruggedness of the Trimble Recon controller.

IEC 529 – Degrees of Protection Provided by Enclosures

The IEC 529a standard, published by the International Electrotechnical Committee (IEC), describes a system for classifying the degrees of protection provided by the enclosures of electrical equipment, such as ruggedized controller computers.



Figure C.6 Elements of the IP Code

The Trimble Recon controller is tested to IP67 (dust-tight and temporary immersion).

Military standards

MIL-STD-810F Method 500.4 – Low Pressure

Low-pressure (altitude) chamber tests are performed to determine if material can withstand, and operate in, a low-pressure environment, and withstand rapid pressure changes. Exposure to reduced pressure can cause:

1. Rupture or explosion of sealed containers.
2. Change in physical and chemical properties of low-density materials.
3. Erratic operation or malfunction of equipment resulting from arcing or corona.
4. Overheating of equipment due to reduced heat transfer.
5. Failure of hermetic seals.

The Trimble Recon controller is tested to 15,000 feet at 23 °C (73 °F). Rapid decompression is performed at 610 meters (2,000 feet) per minute.

MIL-STD-810F Method 501.4 – High Temperature

High temperatures may temporarily or permanently impair the performance of the test item by changing the physical properties or dimensions of the material composing it. Exposure to high temperatures can cause:

1. Parts binding from differential expansion of dissimilar materials.
2. Materials changing in dimension, either totally or selectively.
3. Gaskets displaying permanent set.
4. Closure and sealing strips deteriorating.
5. Fixed-resistance resistors changing in values.
6. Electronic circuit stability varying with differences in temperature gradients and differential expansion of dissimilar materials.
7. Transformers and electromechanical components overheating.
8. Shortened operating lifetime.
9. High pressures created within sealed cases.
10. Discoloration, cracking or crazing of organic materials.

The Trimble Recon controller is tested to the Hot Dry (A1) and Hot Humid (B3) conditions of seven 24-hour cycles at 65 °C (149 °F).

MIL-STD-810F Method 502.4 – Low Temperature

Low temperatures have adverse effects on almost all basic materiel. They may either temporarily or permanently impair the operation of the test item by changing the physical properties of the material composing it. Exposure to low temperatures can cause:

1. Hardening and embrittlement of materials.
2. Binding of parts from differential contraction of dissimilar materials and the different rates of expansion of different parts in response to temperature transients.
3. Changes in electronic components (for example, resistors or capacitors).
4. Stiffening of shock mounts.
5. Cracking and crazing, embrittlement, change in impact strength, and reduced strength.
6. Static fatigue of restrained glass.
7. Condensation and freezing of water.

The Trimble Recon controller is tested to the Basic Cold (C1) standard of one 24-hour cycle at $-30\text{ }^{\circ}\text{C}$ ($-22\text{ }^{\circ}\text{F}$).

MIL-STD-810F Method 503.4 – Temperature Shock

Temperature shock tests are conducted to determine if materiel can withstand sudden changes in the temperature of the surrounding atmosphere without experiencing physical damage or deterioration in performance. As a result of exposure to sudden temperature changes, operation of the test item may be affected either temporarily or permanently. Exposure to sudden changes in temperature can cause:

1. Shattering of glass.
2. Binding or slackening of moving parts.
3. Separation of constituents.
4. Stiffening of shock mounts.
5. Changes in electronic components.
6. Electronic or mechanical failures due to rapid water or frost formation.
7. Differential contraction or expansion of dissimilar materials.
8. Deformation or fracture of components.
9. Cracking of surface coatings.
10. Leaking of sealed compartments.

The Trimble Recon controller is temperature shock-tested using two thermal chambers set at $-20\text{ }^{\circ}\text{C}$ ($-4\text{ }^{\circ}\text{F}$) and $60\text{ }^{\circ}\text{C}$ ($140\text{ }^{\circ}\text{F}$), with a 4-hour minimum soak and a 5-minute maximum transfer time between chambers. Four cycles are conducted through both chambers.

MIL-STD-810F Method 506.4 – Rain

The rain test is conducted to determine the effectiveness of protective covers or cases in preventing the penetration of rain, and the capability of the test item to satisfy its performance requirements during and after exposure to rain. Exposure to moisture and rain can cause:

1. Degradation of strength.
2. Corrosion of metals.
3. Deterioration of surface coatings.
4. Malfunction of electrical components.

The Trimble Recon controller is tested for 40 minutes with a droplet-size of 2 to 4.5 mm, at a pressure of 40 lb./in.². Prior to the test, the samples go through a hot-soak of 25 °C (78 °F) for 4 hours.

MIL-STD-810F Method 507.4 – Humidity

Moisture can cause physical and chemical deterioration of material to include surface effects such as corrosion, and biologic growth; changes in material properties due to moisture penetration, and electrical or mechanical performance effects due to condensation. Exposure to a warm, humid environment can cause:

1. Swelling of materials due to moisture absorption.
2. Loss of physical strength.
3. Changes in mechanical properties.
4. Degradation of electrical and thermal properties in insulating materials.
5. Electrical shorts due to condensation.
6. Binding of moving parts due to corrosion or fouling of lubricants.
7. Oxidation and/or galvanic corrosion of metals.
8. Loss of plasticity.
9. Accelerated chemical reactions.

The Trimble Recon controller is exposed to temperature and humidity levels more severe than those that occur in documented service scenarios. 10 cycles are performed. Each cycle consists of 12 hours at 60 °C (140 °F) and relative humidity of 95%, and 12 hours at 30 °C (86 °F) with relative humidity of 85%.

MIL-STD-810F Method 510.4 – Sand and Dust

This test method is divided into two procedures. The small-particle procedure (dust, fine sand) is performed to ascertain the ability of equipment to resist the effects of dust particles which may penetrate into cracks, crevices, and joints. The blowing sand test is performed to determine whether materiel can be stored and operated under blowing and conditions without experiencing degradation of its performance, effectiveness, reliability, and maintainability due to the abrasion (erosion) or clogging effect of large, sharp-edged particles. Exposure to blowing sand and dust can cause:

1. Abrasion of surfaces.
2. Penetration of seals.
3. Erosion of surfaces.
4. Degradation of electrical circuits.
5. Clogging of openings and filters.
6. Physical interference with mating parts.
7. Fouling of moving parts.

The Trimble Recon controller is tested for 6 hours at 23 °C (73 °F) and 6 hours at 70 °C (158 °F) for Procedure I, blowing dust. It is then tested for Procedure II, blowing sand (2.2 g/m³) for 90 minutes per face, 6 faces total.

MIL-STD-810F Method 512.4 – Immersion

A temperature differential between the test item and the water can affect the outcome (leakage) of an immersion test. Increasing the test item temperature above the water temperature for the immersion test usually includes heating of the test item to establish a pressure differential (while cooling) to determine if the seals or gaskets leak under relatively low-pressure differential, and to induce expansion/contraction of materials. Although desired, establishing a specific temperature differential for fording tests is often impractical due to the size of the materiel. Also, consider materiel adjacent to heat-producing equipment such as engines, and use temperatures indicative of actual exposure.

The Trimble Recon controller is heated to 27 °C (81 °F) above the temperature of the water chamber, then immersed in 1 meter (3.28 feet) for a period of 1 hour.

MIL-STD-810F Method 514.5 – Vibration

Vibration testing is performed to determine the resistance of equipment to vibrational stresses expected in its shipment and application environments. Exposure to vibration can cause:

1. Wire chafing.
2. Loosening of fasteners.
3. Intermittent electrical contacts.
4. Touching and shorting of electrical parts.
5. Seal deformation.
6. Component fatigue.
7. Display/touch screen misalignment.
8. Cracking and rupturing.
9. Excessive electrical noise.

Two vibration tests are performed on the Trimble Recon controller: a general test and a helicopter test. The minimum integrity (general) test is a Power Spectral Density = $0.04 \text{ G}^2/\text{Hz}$, 20 to 1000 Hz, descending 6 dB/oct to 2000 Hz. Three axes are tested, one hour per axis. The helicopter test is a logarithmic sweep from 5 to 500 Hz, beginning at 0.5 cm (0.20 inches) displacement, 30 minutes per axis.

MIL-STD-810F Method 516.5 – Shock

Shock tests are performed to assure that material can withstand the relatively infrequent, non-repetitive shocks or transient vibrations encountered in handling, transportation, and service environments. Shock tests are also used to measure an item's fragility, so that packaging can be designed to protect it, if necessary. Mechanical shocks will excite an equipment item to respond at both forced and natural frequencies. This response, among other things, can cause:

1. Failures due to increased or decreased friction, or interference between parts.
2. Changes in dielectric strength, loss of insulation resistance, variations in magnetic and electrostatic field strength.
3. Permanent deformation due to overstress.
4. More rapid fatiguing of materials.

The Trimble Recon controller is tested in accordance with Procedure IV, Transit Drop, for items weighing less than 45.4 kg (100 lb.), and under 91 cm (36 inches) in its largest dimension. Test items are dropped on each face, edge and corner, for a total of 26 drops, from a height of 1.22 m (4 ft.).

Keypad comparison

The figures shows the keypad buttons on the Trimble Recon controller when it is:

- running the Windows CE operation system

























- running the Windows Mobile 2003 operating system for Pocket PCs



Note – *The numbers shown in the illustrations (S1 through S10) do not appear on the keypad, but are an indication that the buttons are in the same position regardless of the menu that is active or the operating system and are used in the same way.*

The following table shows how the keys are used.

Press on the Trimble Recon controller running		And...	To...
Windows CE	Windows Mobile		
		The appropriate item on the screen	Access a right-click (shortcut) menu.
		The appropriate letter key on the on-screen keyboard.	Access a drop-down menu.
			Close a dialog or screen without saving changes, or exit a menu without selecting a command.
		The taskbar	Open the Task Manager.
			Tap the selected button, open the selected file, or perform the default action in a dialog or screen
 	 		Switch between programs.
			Display the <i>Start</i> menu
			Move up, down, left, or right (for example, in a list or menu, or between buttons).
			Minimize all programs and display the desktop.
			Turn the controller on, or put the controller into Suspend mode.

