

User Guide

Spectra Precision® Focus® 4 Total Station

Version 1.00
Revision A
January 2009



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Release Notice

This is the January 2009 release (Revision A) of the *Spectra Precision Focus 4 Total Station User Guide*. It applies to version 1.00 of the Focus 4 Total Station.

Manufacturer

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Tokyo 144-0035 Japan

Product Limited Warranty Information

For applicable product Limited Warranty information, please refer to the Limited Warranty Card included with this Spectra Precision product, or consult your Spectra Precision Authorized Distribution Partner.

Notices

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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.



WARNING - This equipment has been certified to comply with the limits for a Class B personal computer and peripherals, pursuant to Subpart B of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this equipment. Operation with non-certified personal computer and/or peripherals is likely to result in interference to radio and TV reception. The connection of a non-shielded equipment interface cable to this equipment will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

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.



Representative in Europe

Trimble GmbH
Am Prime Parc 11
65478 Raunheim, Germany

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.



Taiwan Battery Recycling Requirements

The product contains a removable Ni-MH battery. Taiwanese regulations require that waste batteries are recycled.



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Notice to Our European Union Customers

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

Recycling in Europe: To recycle Spectra Precision 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:

Spectra Precision Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL



Declaration of Conformity

We, Spectra Precision Limited

10355 Westmoor Drive
Suite #100
Westminster, CO 80021
United States of America
+1-720-587-4700

declare under sole responsibility that the product:
Focus 4 Total Station
complies with Part 15 of FCC Rules.

Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received,
including interference that may cause undesired
operation.

Notices for optional Bluetooth unit

USA

FCC Part 15 Subpart/RSS-210, OET bulletin 65 supplement C satisfied.



CAUTION - Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

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 communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Canada

RSS-210 Low Power Device

Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

European Union countries, Iceland, Norway, Liechtenstein, Turkey, and Switzerland

EN300 328v1.7.1, EN50360 satisfied

Hereby, Nikon-Trimble Co., Ltd., declares that this instrument is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Declaration of Conformity available at <http://www.nikon-trimble.com/>

RF exposure compliance

- To comply with FCC/IC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.
- This transmitter must not be co-located with or operate in conjunction with any other antenna or transmitter.

Safety

For your safety read the safety and warnings section and this manual carefully and thoroughly before using the Spectra Precision® Focus® 4 total station.

Although Spectra Precision products are designed for maximum safety, using them incorrectly or disregarding the instructions can cause personal injury or property damage.

You should also read the documentation for any other equipment that you use with a Spectra Precision Focus 4 total station.

Note – Always keep this user guide near the instrument for easy reference.

Warnings and Cautions

The following conventions are used to indicate safety instructions:



WARNING – Warnings alert you to situations that could cause death or serious injury.



CAUTION – Cautions alert you to situations that could cause injury or property damage.

Always read and follow the instructions carefully.

Rechargeable Lithium-ion (Li-ion) batteries



WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage. To prevent injury or damage:

- Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
 - Do not expose the battery to fire, high temperature, or direct sunlight.
 - Do not immerse the battery in water.
 - Do not use or store the battery inside a vehicle during hot weather.
 - Do not drop or puncture the battery.
 - Do not open the battery or short-circuit its contacts.
-



WARNING – Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/or property damage.

To prevent injury or damage:

- If the battery leaks, avoid contact with the battery fluid.
 - If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
 - If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.
-



WARNING – Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/or equipment damage.

To prevent injury or damage:

- Do not charge or use the battery if it appears to be damaged or leaking.
 - Charge the Lithium-ion battery only in a product that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
 - Discontinue charging a battery that gives off extreme heat or a burning odor.
 - Use the battery only in equipment that is specified to use it.
 - Use the battery only for its intended use and according to the instructions in the product documentation.
-

Warnings

Before using the instrument, read the following warnings and follow the instructions that they provide.



WARNING – Never look at the sun through the telescope. If you do, you may damage or lose your eyesight.



WARNING – The Focus 4 total station is not designed to be explosion-proof. Do not use the instrument in coal mines, in areas contaminated with coal dust, or near other flammable substances.



WARNING – Never disassemble, modify, or repair the instrument yourself. If you do, you may receive electric shocks or burns, or the instrument may catch fire. You may also impair the accuracy of the instrument.



WARNING – Use **only** the specified battery charger and AC adapter that are supplied with the instrument. Do **not** use any other charger or adapter as this may cause the battery pack to catch fire or rupture.



WARNING – Do not cover the battery charger and AC adapter while the battery pack is being recharged. The charger must be able to dissipate heat adequately. Coverings such as blankets or clothing can cause the charger to overheat.



WARNING – Avoid recharging the battery pack in humid or dusty places, in direct sunlight, or near heat sources. Do not recharge the battery pack when it is wet. If you do, you may receive electric shocks or burns, or the battery pack may overheat or catch fire.



WARNING – Although the battery pack has an auto-reset circuit breaker, you should take care not to short circuit the contacts. Short circuits can cause the battery pack to catch fire or burn you.



WARNING – Never burn or heat the battery. Doing so may cause the battery to leak or rupture. A leaking or ruptured battery can cause serious injury.



WARNING – Before storing the battery pack or battery charger, cover the contact points with insulation tape. If you do not cover the contact points, the battery pack or charger may short circuit, causing fire, burns, or damage to the instrument.



WARNING – The battery is not waterproof on its own. Do not get the battery wet when it is removed from the instrument. If water seeps into the battery, it may cause a fire or burns.

Cautions

Before using the instrument, read the following cautions and follow the instructions that they provide:



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



CAUTION – The tops of the tripod ferrules are very sharp. When handling or carrying the tripod, take care to avoid injuring yourself on the ferrules.



CAUTION – Before carrying the tripod or the instrument in the carry case, check the shoulder strap and its clasp. If the strap is damaged or the clasp is not securely fastened, the carry case may fall, causing personal injury or instrument damage. The shoulder strap is available as an optional extra.



CAUTION – Before setting up the tripod, make sure that no-one's hands or feet are underneath it. When the legs of the tripod are being driven into the ground, they could pierce hands or feet.



CAUTION – After mounting the instrument on the tripod, securely fasten the thumb screws on the tripod legs. If the thumb screws are not securely fastened, the tripod may collapse, causing personal injury or instrument damage.



CAUTION – After mounting the instrument on the tripod, securely fasten the clamp screw on the tripod. If the clamp screw is not securely fastened, the instrument may fall off the tripod, causing personal injury or instrument damage.



CAUTION – Securely fasten the tribrach clamp knob. If the knob is not securely fastened, the tribrach may come loose or fall off when you lift the instrument, causing personal injury or instrument damage.



CAUTION – Do not stack objects on the plastic carry case, or use it as a stool. The plastic carry case is unstable and its surface is slippery. Stacking or sitting on the plastic carry case may cause personal injury or instrument damage.



CAUTION – The system in the instrument may stop functioning in order to avoid any errors in measurements when the instrument detects strong electromagnetic wave(s). If this happens, turn off the instrument and remove the source of the electromagnetic wave(s). Then turn on the instrument to resume the work.

Laser safety

The Focus 4 is a Class 2 laser instrument, in accordance with IEC60825-1, Am2 (2001): *Safety of Laser Products*.

To counteract hazards, it is essential for all users to pay careful attention to the safety precautions and control measures specified in the standard IEC60825-1, (2001-08), particularly EN60825-1:1994, A11:1996, and A2:2001, as this refers to the hazard distance that is defined in this User Guide.

Note – The **hazard distance** is the distance from the laser at which beam irradiance or radiant exposure equals the maximum permissible value to which personnel may be exposed without being exposed to health risks.



WARNING – Only qualified and trained persons should be assigned to install, adjust, and operate the laser equipment.



WARNING – Precautions should be taken to ensure that persons do not look directly, with or without an optical instrument, into the beam.



WARNING – Wherever practicable, the laser beam path should be located well above or below eye level.

Specifications for laser emission

Laser pointer

Wave length	630-680 nm
Output power	CW: $P_o \leq 1.0$ mW

Distance meter

Wave length	850-890 nm
Output power	Pulse: $P_o \leq 6.4$ mW
Pulse width	< 5 ns

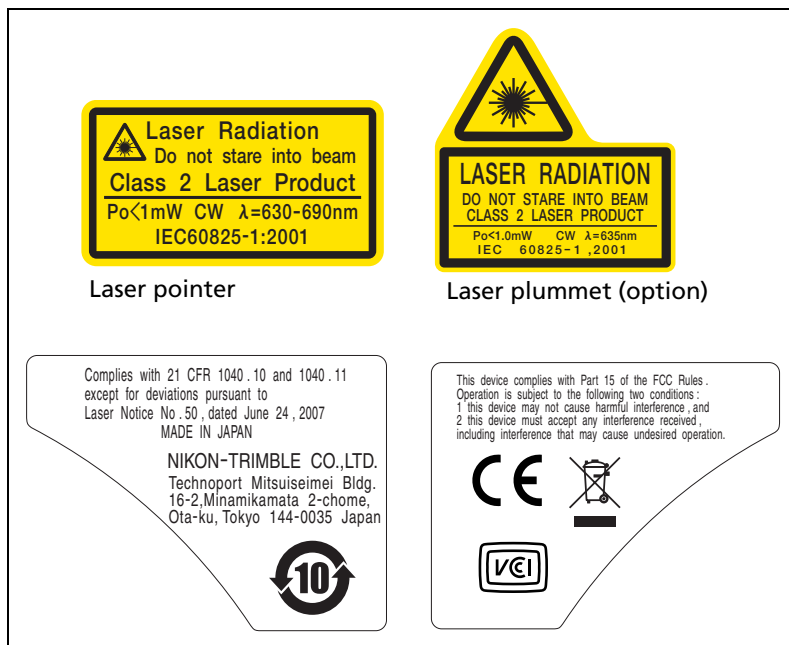
Laser plummet (option)

Wave length	635 nm
Output power	CW: $P_o < 1.0$ mW

Conforming standards

EU	EN60825-1/Am.2 : 2001 (IEC60825-1/Am.2 : 2001) Laser pointer: Class 2 Distance meter: Class 1 Laser plummet: Class 2 (Option)
USA	FDA21CFR Part 1040 Sec.1040.10 and 1040.11 Except for deviations pursuant to Laser Notice No.50, dated June 24, 2007.

Labels



Contents

Safety	5
Warnings and Cautions	5
Rechargeable Lithium-ion (Li-ion) batteries	5
Warnings	6
Cautions	7
Laser safety	8
Specifications for laser emission	9
Conforming standards	9
Labels	9
1 Introduction	17
System diagram	18
Care and maintenance.	19
Environmental conditions	19
Storage	19
Cleaning	20
Adjusting and tightening	20
Related information	21
2 Setting up the Instrument	23
Unpacking and repacking the instrument	24
Charging the battery pack	24
Applying power	26
Charging the battery.	26
Conditioning / calibrating a battery	27
Detaching the battery pack.	28
Attaching the battery pack	28
Setting up the tripod	29
Centering the instrument.	29
Centering with the optical plummet.	29
Centering with the laser plummet	30
Centering with a plumb bob	31
Leveling the instrument.	31
Focusing the telescope.	32
Setting the measurement mode and preparing the target	33
Measurement with a prism.	33
Measurement in reflectorless (N-Prism) mode	34
Viewing and changing the measurement settings.	35
Target field	35
Prism constant	35

3	Getting Started	37
	Parts of the instrument	38
	Instrument keyboard and display	40
	Instrument keyboard	40
	Status bar	41
	LCD backlight, laser pointer, beep sound, and contrast adjustment	43
	[DSP] button	44
	[MODE] button	46
	[HOT] key	46
	Bubble indicator	47
	Laser plummet (option)	47
	Turning on the instrument	48
	Turning off the instrument	48
	Sleep mode	48
	Regional configuration	49
	List available jobs or data	50
	Entering data	50
	Entering a point name or number	50
	Entering a code	53
	<i>Advanced feature: Searching for a code using the first character</i>	54
	Entering values in feet and inches	54
	Creating or opening a job	55
	Creating a new job	55
	Creating a control job	56
	Measuring distances	56
	Sighting a prism reflector	56
	Taking a distance measurement	57
	Viewing and changing the measurement settings	57
4	Applications	59
	HA reset and angle operations	60
	Setting the horizontal angle to 0	60
	Entering the horizontal angle	60
	Station setup	60
	Baseline	61
	Known	62
	Resection	64
	<i>Advanced feature: Viewing and deleting a measurement in resection</i>	67
	Base XYZ	67
	Remote BM	68
	BS Check	69
	Stakeout menu	69
	S-O to Point	70
	L-O from Line	71

L-O from Arc.	72
XYZ	73
<i>Advanced feature: Specifying a layout list by inputting points by range</i>	<i>75</i>
Programs menu	75
Remote distance measurement (RDM) - overview	76
RDM (Radial)	77
RDM (Cont)	77
REM	78
Cogo	78
<i>Advanced feature: Entering a range of points</i>	<i>83</i>
<i>Advanced feature: Entering angle and distance offsets</i>	<i>89</i>
Recording measurement data	90
Switching between display screens	90
5 Menu Screen	91
Job	92
Opening an existing job.	92
Creating a new job	92
Deleting a job	94
Setting the control job.	95
Displaying job information.	95
Settings (basic job settings).	96
Angle	96
Distance	96
Coordinate	99
Communications	99
Unit	99
Power saving.	100
Recording.	100
Other settings	101
Data	102
Viewing records.	102
Deleting records	104
Editing raw records	106
Searching records.	109
Entering coordinates	111
Communication	112
Downloading coordinate data.	112
Uploading coordinate data.	113
<i>Advanced feature: Editing the data order for upload</i>	<i>114</i>
1sec-Key.	115
[MSR] button settings	115
[DSP] button settings	115
Calibration	116

Time	116
6 Checking and Adjusting	117
Adjusting the electronic level	118
Checking and adjusting the circular level	118
Checking and adjusting the optical/laser plummet.	118
Zero point errors of vertical scale and horizontal angle corrections	119
Checking the calibration	119
Adjusting the calibration	120
The instrument constant	121
Checking the laser pointer	122
7 Transferring Coordinate Data	123
Transferring coordinate data to the total station	124
Settings	124
Record format	124
Data example	125
Transferring coordinate data from the total station	125
Settings	125
Data examples.	125
A Specifications.	127
Main body.	128
Telescope	128
Measurement range	128
Distance measurement precision.	129
Measurement intervals	129
Angle measurement	129
Tilt sensor	130
Tangent screws	130
Tribrach.	130
Level	130
Optical plummet	130
Optical laser plummet (option)	130
Display and keypad	130
Connections in the base of instrument	131
Battery pack	131
Environmental performance.	131
Dimensions	131
Weight.	131
Environmental protection	132
Standard components	132
External device connector	132

B Error Messages 135

- Cogo136
- Communications136
- Data137
- Job manager137
- Stakeout.138
- Programs139
- Recording data.139
- Searching140
- Settings141
- Station setup141
- System error142

Introduction

In this chapter:

- [System diagram](#)
- [Care and maintenance](#)
- [Related information](#)

This user guide describes the unique capabilities and features available in the Spectra Precision® Focus® 4 total station.

The software for the Focus 4 total station makes it easy for you to learn to operate one model of instrument and, with little additional training, to apply that knowledge to other models.

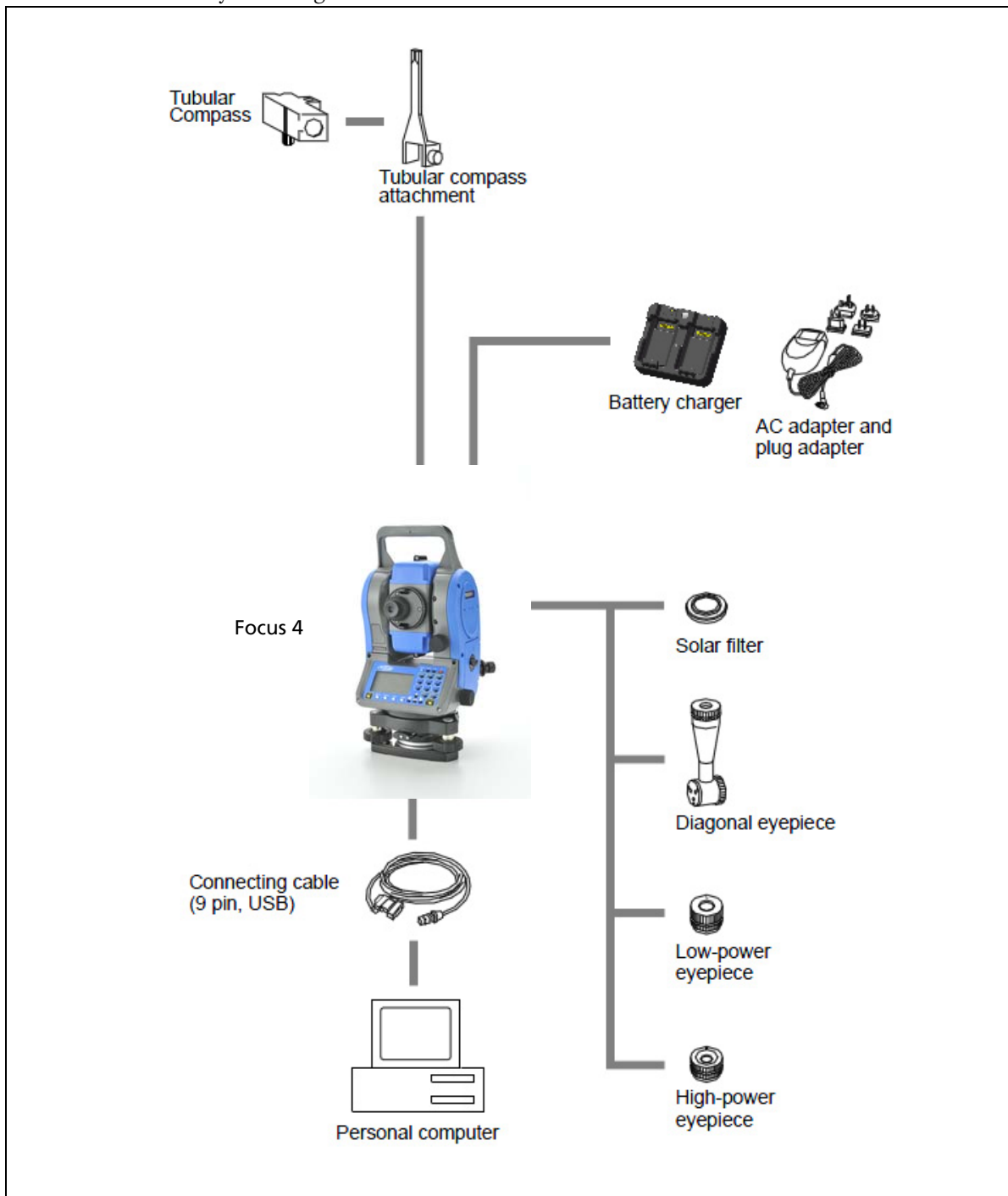
Before using the instrument, read this user guide carefully. In particular, pay attention to the warnings and cautions that appear in the Safety section, see [Safety, page 5](#).

Your comments and suggestions about the Focus 4 total station are welcome. Please contact us at the address given in the front of this manual.

In addition, your feedback about the supporting documentation helps us to improve it with each revision. Email your comments to sales@spectraprecision.com.

System diagram

The system diagram shows the hardware that is used with the Focus 4 total station.



Note – You must use the Spectra Precision Focus 4 total station with tribrach W30 or W30b.

Care and maintenance

Before using the instrument, read and follow the following maintenance instructions.

The Focus 4 total station is a precision instrument that you should store, use, and clean in an appropriate way.



CAUTION – The battery pack contains a Lithium-ion battery. When disposing of the battery pack, follow the laws or rules of your municipal waste system. For more information on the safety warnings associated with the Lithium-ion battery, see [Rechargeable Lithium-ion \(Li-ion\) batteries, page 5](#).



CAUTION – Store the battery pack with the battery pack discharged.

Environmental conditions

- Do not leave the instrument in direct sunlight or in a closed vehicle for prolonged periods. Overheating the instrument may reduce its efficiency.
- If the total station has been used in wet conditions, immediately wipe off any moisture and dry the instrument completely before returning it to the carry case. The Focus 4 total station contains sensitive electronic assemblies which have been well protected against dust and moisture. However, if dust or moisture gets into it, severe damage could result.
- Sudden changes in temperature may cloud the lenses and drastically reduce the measurable distance, or cause an electrical system failure. If there has been a sudden change in temperature, leave the instrument in a closed carry case in a warm location until the temperature of the instrument returns to room temperature.

Storage

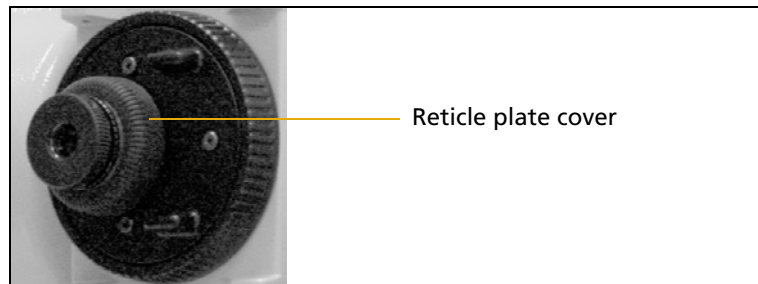
- Do not store the total station in hot or humid locations. In particular, you must store the battery pack in a dry location at a temperature of less than 30 °C (86 °F). High temperature or excessive humidity can cause mold to grow on the lenses. It can also cause the electronic assemblies to deteriorate, and so lead to instrument failure.
- Store the battery pack with the battery discharged.
- When storing the instrument in areas subject to extremely low temperatures, leave the carry case open.
- If the tribrach will not be used for an extended period, lock down the tribrach clamp knob and tighten its safety screw.
- The carry case is designed to be watertight, but you should not leave it exposed to rain for an extended period. If exposure to rain is unavoidable, make sure that the carry case is placed with the Spectra Precision nameplate facing upward.

Cleaning

- Do not use organic solvents such as ether or print thinner to clean the non-metallic parts of the instrument, such as the keyboard, or the painted or printed surfaces. Doing so could result in discoloration of the surface or in peeling of printed characters. Clean these parts only with a soft cloth or tissue that is lightly moistened with water or a mild detergent.
- To clean the optical lenses, lightly wipe them with a soft cloth or a lens tissue that is moistened with alcohol.

Adjusting and tightening

- When adjusting the leveling screws, stay as close as possible to the center of each screw's range. The center is indicated by a line on the screw.
- The reticle plate cover has been correctly mounted. Do not release it or subject it to excessive force, for example in an attempt to make it watertight.



- Before attaching the battery pack, make sure that the contact surfaces on the battery and Focus 4 total station are clean.
- Securely press the cap that covers the data output/external power input connector terminal. The instrument is only watertight if the cap is attached securely or when the data output/external power input connector is used.
- The Focus 4 total station is not watertight when the data output/external power input connector is used.
- Static electricity from the human body, discharged through the data output/external power input connector, can damage the instrument. Before handling the instrument, touch any other conductive material once in order to remove static electricity.
- Be careful not to pinch your finger between the telescope and trunnion of the instrument.

Related information

- Contact your local Spectra Precision dealer for more information about the support agreement contracts for software and firmware, and an extended warranty program for hardware.
- Consider a Spectra Precision training course to help you use your total station to its fullest potential. For more information, go to the Spectra Precision website at www.spectraprecision.com.

Alternatively, send an email to support@spectraprecision.com.

Setting up the Instrument

In this chapter:

- Unpacking and repacking the instrument
- Charging the battery pack
- Detaching the battery pack
- Attaching the battery pack
- Setting up the tripod
- Centering the instrument
- Leveling the instrument
- Focusing the telescope
- Setting the measurement mode and preparing the target
- Viewing and changing the measurement settings

This chapter explains how to prepare the Focus 4 total station before you use it in the field.

Unpacking and repacking the instrument

Note – Handle the Focus 4 total station carefully to protect it from shocks and excessive vibration.

To unpack the instrument, grip the carry handle and carefully remove the instrument from the carry case.

To replace the instrument in the carry case, place it as shown in the figure.



Charging the battery pack

Before charging the battery pack, read the following warnings, cautions, and notes.



WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage.

To prevent injury or damage:

- Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
 - Do not expose the battery to fire, high temperature, or direct sunlight.
 - Do not immerse the battery in water.
 - Do not use or store the battery inside a vehicle during hot weather.
 - Do not drop or puncture the battery.
 - Do not open the battery or short-circuit its contacts.
-



WARNING – Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/or property damage.

To prevent injury or damage:

- If the battery leaks, avoid contact with the battery fluid.
 - If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
 - If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.
-



WARNING – Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/or equipment damage.

To prevent injury or damage:

- Do not charge or use the battery if it appears to be damaged or leaking.
 - Charge the Lithium-ion battery only in a product that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
 - Discontinue charging a battery that gives off extreme heat or a burning odor.
 - Use the battery only in equipment that is specified to use it.
 - Use the battery only for its intended use and according to the instructions in the product documentation.
-



WARNING – To charge the battery pack, use **only** the battery charger and AC adapter that are supplied with the instrument. Do **not** use any other charger or you may cause the battery pack to catch fire or rupture. The enclosed battery pack cannot be used with other chargers.



WARNING – Do not cover the battery charger and AC adapter while the battery pack is being recharged. The charger must be able to dissipate heat adequately. Coverings such as blankets or clothing can cause the charger to overheat.



WARNING – Avoid recharging the battery pack in humid or dusty places, in direct sunlight, or near heat sources. Do not recharge the battery pack when it is wet. If you do, you may receive electric shocks or burns, or the battery pack may overheat or catch fire.



WARNING – Although the battery pack has an auto-reset circuit breaker, you should take care not to short circuit the contacts. Short circuits can cause the battery pack to catch fire or burn you.



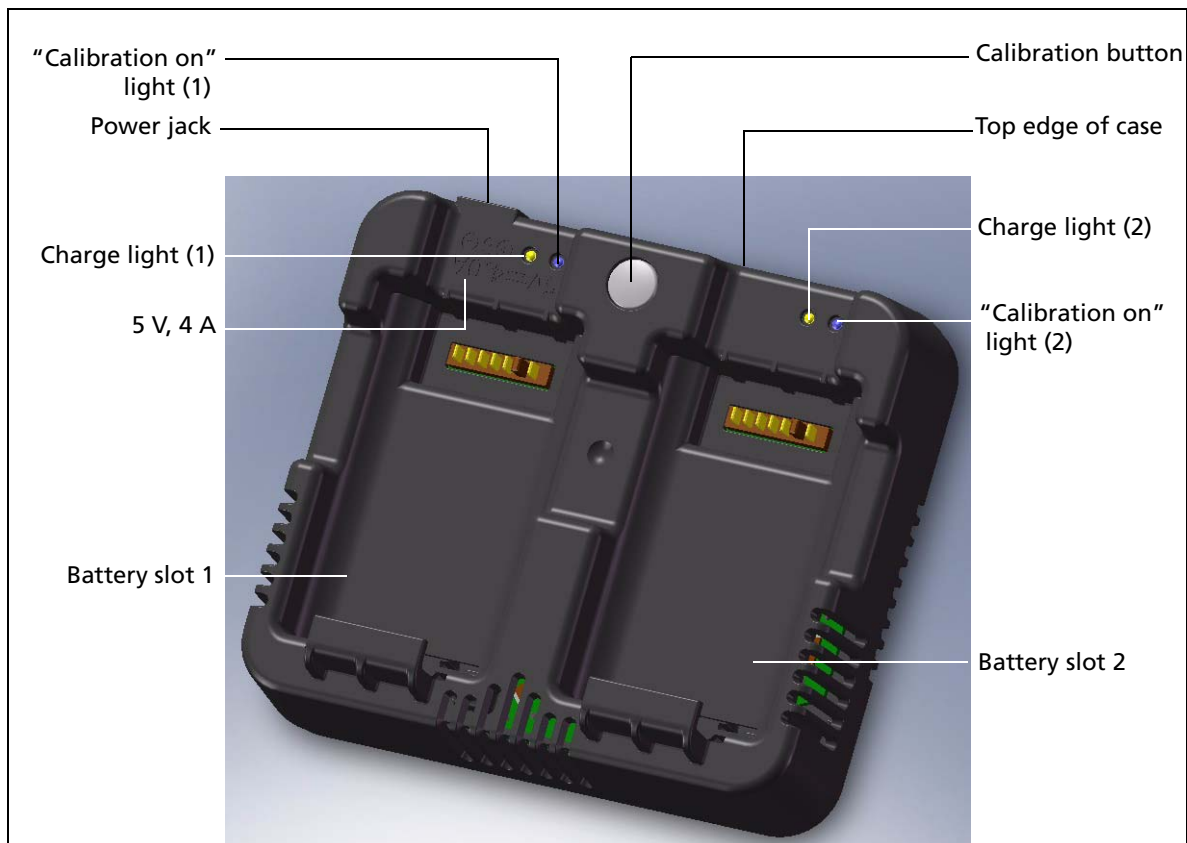
WARNING – Never burn or heat the battery. Doing so may cause the battery to leak or rupture. A leaking or ruptured battery can cause serious injury.



WARNING – Before storing the battery pack or battery charger, cover the contact points with insulation tape. If you do not cover the contact points, the battery pack or charger may short circuit, causing fire, burns, or damage to the instrument.



WARNING – The battery is not waterproof on its own. Do not get the battery wet when it is removed from the instrument. If water seeps into the battery, it may cause a fire or burns.



Applying power

Plug in the charger to the supplied AC adapter to turn the unit on. The power input must be 5 V with at least 4 A of current capability. Each battery may take up to 2 A while charging.

Charging the battery

Slide a battery into either battery slot to begin charging. The adjacent charge indicator will illuminate yellow when charging is in progress. The charge indicator will change to green when charging is complete.

Take note of the following:

- Charger slots are completely independent so a battery may be inserted regardless of what is occurring in the other battery slot.
- Charging may take 2-4 hours if the battery was normally discharged.
- Charging may take up to 5 hours with a completely drained battery which has been stored for several months without use.
- If the charge indicator(s) are blinking, there is a problem with the battery or with the charger.

- Lithium-ion batteries should not be charged above 40 °C to 45 °C (104 °F to 113 °F). A blinking charge light may mean that the batteries are too hot for charging. Charging will resume after the batteries cool down.

Conditioning / calibrating a battery

You must calibrate the battery (“condition”) once every 6 months or more often if required. Calibration ensures that the reported remaining battery charge is accurate.

To start calibrating a battery, hold down the calibration button on the unit and then insert a battery. Only the battery that was inserted while the button is pressed begins calibration.

During battery calibration, the battery will be charged, discharged completely, and then recharged again. Calibration should complete in approximately 17 hours. Do not cover the charger vents during a calibration cycle.

- The blue calibration indicator light(s) blink slowly (on 1.5 sec, off 2 sec) while calibration is in progress. The charge light(s) may be on or off during the calibration cycle if the case temperature does not get too high.
- When a calibration cycle is completed, the calibration light stops blinking but remains on until the corresponding battery is removed.
- Case temperature:
 - The temperature of the bottom case may continue to climb to approximately 43 °C before temperature regulation is enabled to keep the case from becoming warmer. As the battery voltage drops, the case cools down and the automatic temperature limiting is no longer necessary. This minimizes the time required to discharge a battery.
 - If the case temperature continues to become too hot internally, even after temperature regulation is enabled, there is a secondary failsafe that aborts the calibration completely. If an abort occurs, the calibration light(s) blink rapidly and battery charging is re-enabled.

Detaching the battery pack



CAUTION – Avoid touching the contacts on the battery pack.

1. If the instrument is turned on, press **[PWR]** to turn it off.
2. Turn the battery box release knob counterclockwise, open the battery box cover and then pull the battery pack out of the battery box.

Attaching the battery pack

1. Clear any dust or other foreign particles from the battery contacts.
2. Turn the battery box release knob counterclockwise and then open the battery box cover.



3. Put the battery pack into the battery box. Connect the battery pack at the bottom with the connecting direction faced inside.
4. Close the battery box cover and then turn the knob clockwise until you hear a click sound.



CAUTION – If the battery pack is not attached securely, this could adversely affect the watertightness of the instrument.

Setting up the tripod



CAUTION – The tips of the tripod ferrules are very sharp. When handling or carrying the tripod, take care to avoid injuring yourself on the ferrules.

Note – Do not carry the instrument while it is attached to a tripod.


1. Open the tripod legs far enough for the instrument to be stable.
2. Locate the tripod directly over the station point. To check the position of the tripod, look through the center hole in the tripod head.
3. Firmly press the tripod ferrules into the ground.
4. Level the top surface of the tripod head.
5. Securely fasten the thumb screws on the tripod legs.
6. Place the instrument on the tripod head.
7. Insert the tripod mounting screw into the center hole of the base plate of the instrument.
8. Tighten the tripod mounting screw.

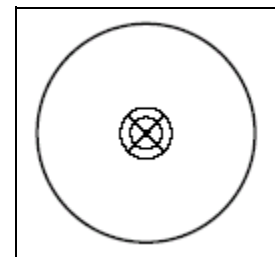
Centering the instrument

When you center the instrument, you align its central axis precisely over the station point. To center the instrument, you can use the optical plummet, the laser plummet, or a plumb bob. The plumb bob is sold separately.

Centering with the optical plummet

Note – For high accuracy, check and adjust the optical plummet before you center the instrument.

1. Set up the instrument on the tripod. See above.
2. Look through the optical plummet and align the reticle with the station point. To do this, turn the leveling screws until the center mark  of the reticle is directly over the image of the station point.
3. While supporting the tripod head with one hand, loosen the tripod leg clamps and adjust the lengths of the legs until the air bubble is in the center of the circular level.
4. Tighten the tripod leg clamps.
5. Use the electronic level to level the instrument. See also [Leveling the instrument](#), page 31.



6. Look through the optical plummet to make sure that the image of the station point is still in the center of the reticle mark.
7. If the station point is off-center, do one of the following:
 - If the station point is slightly off-center, loosen the tripod mounting screw and then center the instrument on the tripod. Use only direct movement to center the instrument. Do not rotate it.

When the instrument is centered, tighten the mounting screw.
 - If there is major displacement of the station point, repeat this procedure starting with Step 2.

Centering with the laser plummet



CAUTION – Do **not** look at the laser directly.

Note – For high accuracy, check and adjust the laser plummet before you center the instrument.

1. Set up the instrument on the tripod. See [page 29](#).
2. Turn on the laser plummet.
3. Align the laser pointer to the station point. To do this, turn the leveling screws until the laser pointer is over the station point.
4. While supporting the tripod head with one hand, loosen the tripod leg clamps and adjust the lengths or the legs until the air bubble is the center of the circular level.
5. Tighten the tripod leg clamps.
6. Use the electronic level to level the instrument. See [Leveling the instrument, page 31](#).
7. Check that the laser pointer is over the station point.
8. If the station point is off-center, do one of the following:
 - If the station point is slightly off-center, loosen the tripod mounting screw and then center the instrument on the tripod. Use only direct movement to center the instrument. Do not rotate it.

When the instrument is centered, tighten the mounting screw.
 - If there is major displacement of the station point, repeat this procedure starting with Step 2.

Centering with a plumb bob

1. Set up the instrument on the tripod. See [page 29](#).
2. Hang the plumb line on the hook of the tripod mounting screw.
3. Adjust the length of the plumb line so that the tip of the plumb bob is at the height of the station point.
4. Loosen the tripod mounting screw slightly.
5. Using both hands to support the outer side of the tribrach, carefully slide the instrument about on the tripod head until the tip of the plumb bob is positioned over the exact center of the station point.

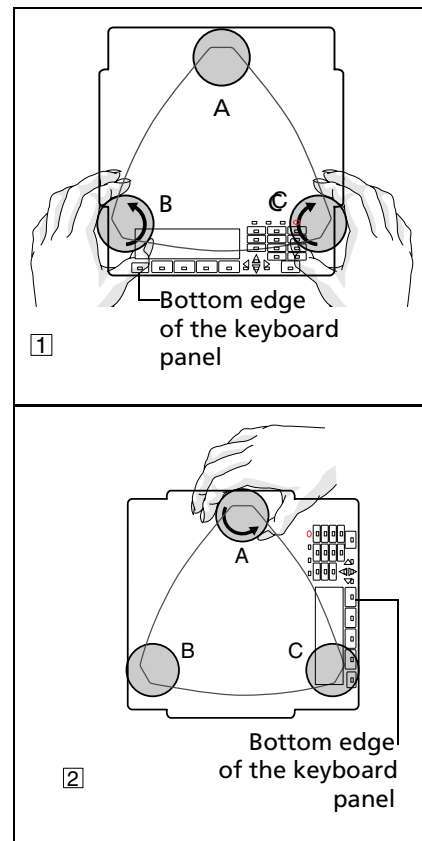
Note – To confirm that the instrument is precisely aligned, check its position from two directions at right-angles to each other.

Leveling the instrument

When you level the instrument, use the electronic level to you make the vertical axis of the instrument exactly vertical. During leveling, always set the instrument in the Face 1 direction. See [Figure 3.1, page 38](#).

To level the instrument:

1. Move the bubble into the circle on the circular level and then turn on the power.
2. Rotate the alidade until the bottom edge of the keyboard panel is parallel to the two of the leveling screws (B and C).
3. Use leveling screws B and C to move the bubble into the center of the electronic level.
4. Rotate the alidade approximately 90°.
5. Use leveling screw A to move the bubble into the center of the electronic level.
6. Repeat Step 1 through Step 5 to center the bubble in both positions.
7. Rotate the alidade 180°.
8. If the bubble in the electronic level remains centered, the instrument is level. If the bubble moves off center, adjust the electronic level. For detailed instructions, see [Adjusting the electronic level, page 118](#).

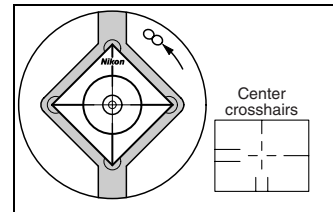


Focusing the telescope



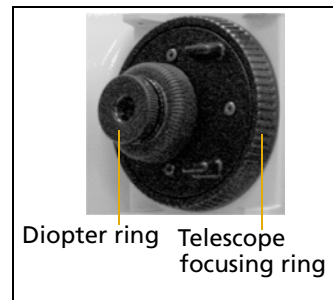
WARNING – Never look at the sun through the telescope. If you do, you may damage or lose your eyesight.

When you sight the instrument, you aim the telescope at the target, bring the target image into focus, and align the image with the center cross-hairs of the reticle.



To sight the instrument:

1. Adjust the diopter:
 - a. Aim the telescope at a blank area, such as the sky or a piece of paper.
 - b. Looking through the eyepiece, rotate the diopter ring until the reticle cross-hairs are in sharp focus.
2. Eliminate parallax:
 - a. Aim the telescope at the target image.
 - b. Rotate the focusing ring until the target image is in sharp focus on the reticle cross-hairs.
 - c. Move your eye vertically and laterally to check whether the target image moves relative to the reticle cross-hairs.
 - If the target image does not move, there is no parallax.
 - If the target image does move, rotate the telescope focusing ring and repeat [Step 2c](#).
3. Rotate the tangent screw. The final turn of the tangent screw should be in a clockwise direction, to align the target accurately on the center cross-hairs.



Setting the measurement mode and preparing the target

The Focus 4 total station has two measurement modes: Prism mode (P r i s m) and Reflectorless mode (N o P r i s m). To change the mode at any time from any observation screen, hold down (MSR1) or (MSR2).

Set the measurement mode depending on the target that you want to measure, as shown here.

Target	Target settings
Prism, reflector sheet	Prism mode
Other, reflective materials	Reflectorless mode

In some cases, you can measure to another target that is not appropriate to the set measurement mode.

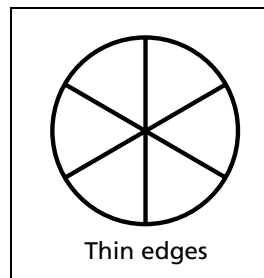
Note – The Focus 4 total station is Laser Class 1 in the measurement function, and Laser Class 2 in the Laser Pointer function. Do not sight the prism when the Laser Pointer is on.

Measurement with a prism

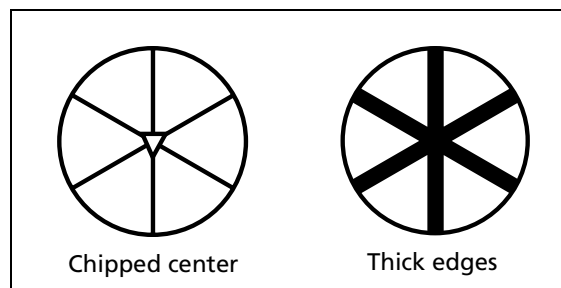
As the Focus 4 total station is extremely sensitive, multiple reflections on the prism surface can sometimes cause a significant loss in accuracy.

To maintain the accuracy of your measurements:

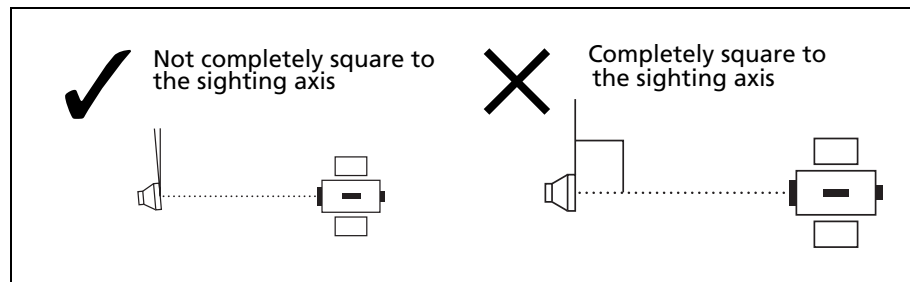
- Use a prism with thin edges.



Do not use a prism with scratches, a dirty surface, a chipped center, or thick edges.



- When measuring a short distance, incline the prism slightly so that the EDM can ignore unnecessary reflections on the prism surface, as shown below.



- Hold the prism securely in place and do not move while taking measurements.

In Prism mode, to avoid false measurements on objects other than the prism or reflector-sheet, targets that are less reflective than the prism or reflector sheet are not measured. Even if you start a measurement, measured values are not displayed. To measure less reflective objects, use the N-Prism (Reflectorless) mode.

Measurement in reflectorless (N-Prism) mode

The Focus 4 total station enables reflectorless measurements up to 300 m (984 feet).

The intensity of the reflection from the target determines the distance the Focus 4 total station can measure in this mode. The color and condition of the target surface also affect the measurable distance, even if the targeted objects are the same. Some less-reflective targets may not be measured.

The following table describes some examples of targets and approximate measuring distances:

Target	You can measure approximately...
Traffic signs, reflectors	500 meters (1640 feet)
Paper (white), veneer (new)	300 meters (990 feet)
wall (brightly painted), brick	100 to 200 meters (330 to 660 feet)

Measurable distances may be shorter or measurement intervals may be longer if either of the following conditions apply:

- the angle of the laser against the target is small
- the surface of the target is wet

In direct sunlight, the measurable distance may be shorter. In this case, try to throw a shadow on the target.

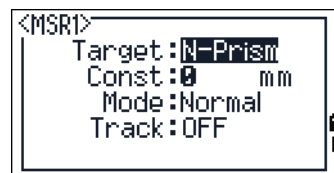
Targets with completely flat surfaces, such as mirrors, cannot be measured unless the beam and the target are perpendicular to each other.

Make sure there are no obstacles between the instrument and the target when taking measurements. When you need to take measurements across a road or a place where vehicles or other objects are frequently moving, take several measurements to a target for the best result.

Viewing and changing the measurement settings

Hold down **[MSR1]** or **[MSR2]** for one second.

- To move the cursor between the fields, press **[^]** or **[v]**.
- To change the value in the selected field, press **[<]** or **[>]**.



The available values are:

Field	Values
Target	Prism mode N-Prism mode
Constant (prism constant)	-999 mm through 999 mm
Mode	Precise Normal
Track	Track (continuous MSR) ON Track (continuous MSR) OFF

Target field

If the measurement is started with the *Target* field set to Prism mode, there is a dash in front of the prism constant, for example -18 mm.

If the measurement is started with the Target field set to N-Prism (Reflectorless) mode, there is square bracket in front of the prism constant, for example]18 mm.

The displayed symbol will continuously move from left to right over the prism constant in the display.

Prism constant

The factory default of the prism constant value of the Focus 4 total station is -30 mm.

Change the prism constant to match the constant value of the prism you are using.



Once you have set up the instrument, you can turn on the Focus 4 total station, change the instrument settings, and start a job. See also [page 37](#).

