Surgical Technique

smith&nephew

TRIGEN® META-NAIL®

Tibial Nail System

Including

TRIGEN® SURESHOT®

Distal Targeting System





TRIGEN◇ META-NAIL◇ Tibial Nail System Surgical Technique

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Nota Bene
The technique description herein is made available to the healthcare professional to illustrate the authors' suggested treatment for the uncomplicated procedure. In the final analysis, the preferred treatment is that which addresses the needs of the patient.

Indications

The TRIGEN® META-NAIL® Tibial Nail is indicated for fractures of the proximal and distal third of the tibia, including the shaft, stable and unstable fractures, nonunions, malunions, and for the prophylactic nailing of impending pathological fractures.



TRIGEN® SURESHOT® indications

Legend

Important warnings appear in orange

Tips, tricks and important information appear in blue

Indications, contraindications, intended use and training

The Smith & Nephew TRIGEN® SURESHOT® Distal Targeting System is intended to be an intraoperative image-guided localization system. It is a computer-assisted orthopaedic surgery tool to aid the surgeon with drill positioning for screws during intramedullary nail implantation. It provides information to the surgeon that is used to place surgical instruments during surgery utilizing intraoperatively obtained electromagnetic tracking data. The Smith & Nephew TRIGEN SURESHOT Targeting System V2.0 is indicated for long bone fractures treated with intramedullary nails in which the use of stereotactic surgery may be appropriate.

An example of a surgical procedure includes but is not limited to locating and drilling the distal holes in an intramedullary nail.

Contraindications

The screw targeting software application for this system is contraindicated for all IM nails other than Smith & Nephew TRIGEN META-NAIL®, TAN®, FAN, Pediatric and Adolescent nails. Do not operate the TRIGEN SURESHOT Targeter within 200mm of an installed pacemaker. The magnetic field produced by the Targeter may interfere with the operation of the pacemaker.

Intended use

The TRIGEN SURESHOT Distal Targeting System is only designed for use with the indicated implants and instruments. Implants and instruments must be used in accordance with the instructions, as described in this manual and/or in the non-navigated surgical procedure.

Training

Only trained operators are allowed to use the TRIGEN SURESHOT Distal Targeting System. The various operating instructions must be fully read and understood as part of the training. If any part of the instructions is unclear, please contact your local representative.

Plausibility check

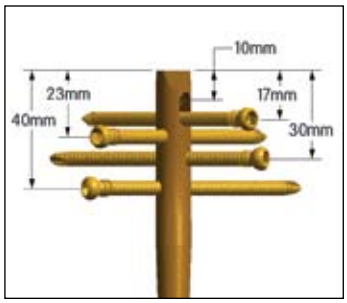
As with all technical equipment, malfunctions may occur due to improper use or, more rarely, technical failure. To reduce the risks involved with such technical malfunction the operation can be completed using manually controlled instruments, providing the malfunction is detected without delay.

It is, therefore, important to check the plausibility of the steps, as indicated by the system, and to carry out verification of the software targeting, particularly when using the system for the first time. Should there be any doubt regarding correct functioning, the targeting should be verified or a switch made to a traditional X-Ray technique.

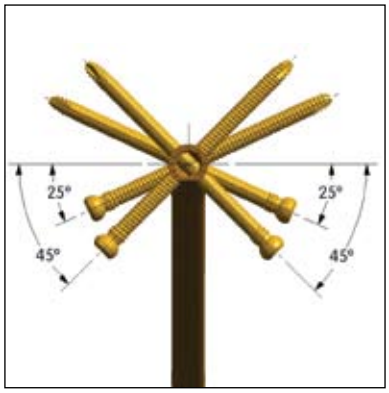
TRIGEN® META-NAIL® Tibial Nail specifications



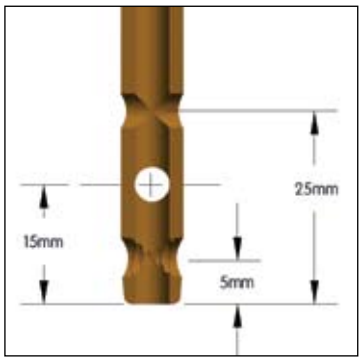
ML view



Driving end of nail (all knee and distal tibial)



Top view of nail



Non-driving end of nail (AP view)

Note These views are not to scale and should be used as a pictorial representation only.

Specifications	TRIGEN META-NAIL Tibia (8.5mm)	TRIGEN META-NAIL Tibia
Material	TI6AL4V	TI6AL4V
Diameter	8.5mm	10, 11.5 & 13mm
Lengths	16-50cm*	16-50cm*
Nail Color	Grey	Gold
Cross Section	Round	Round
Proximal Diameter (driving end)	12mm	12mm (10, 11.5 dia.) 13mm (13 dia.)
Distal Diameter (non-driving end)	8.5mm	10, 11.5 & 13mm
Smallest Thru Diameter	4.8mm	5.0mm
Wall Thickness	1.9mm	2.3mm (10) 3.0mm (11.5) 2.3mm (13)
Guide Bolt Thread	5/16-24 UNF	5/16-24 UNF
Screw Diameter	4.5mm	5.0mm
Screw Color	Grey	Gold
Major Diameter	4.5mm	5.0mm
Minor Diameter (core)	4.0mm	4.3mm
Screw Lengths	25-65mm	25-110mm
Hex Size	4.7mm	4.7mm
Alternative Hexdrivers	RT Femoral & Recon 7.0mm Cannulated Screw PERI-LOC® Locking Screw	RT Femoral & Recon 7.0mm Cannulated Screw PERI-LOC® 4.7mm Hexdriver, PROFIX® 4.7mm Hexdriver
Alternative Modes	No	No
Proximal Locking (Driving End)		
Static Lock Locations/Orientations	17mm/45° Screw Locked w/META-NAIL Cap 23mm/45° Threaded w/bushing 30mm/25° Threaded 40mm/25° Threaded	
Static Locking Hole Dimensions	Threaded 4.3mm minor dia. Threaded 4.7mm major dia.	Threaded 4.5mm minor dia. Threaded 5.3mm major dia.
Compression/Dynamic Slot Location	10mm	10mm
Compression/Dynamic Slot Diameter/Length	4.7mm/7mm	5.3mm/7mm
Degree of Proximal Bend (Herzog)	10°	10°
Proximal Bend Location	27mm	27mm
Distal Locking (Non-Driving End)		
Static Lock Locations/ Orientations	25mm/ML 15mm/AP 5mm/ML (Threaded)	25mm/ML 15mm/AP 5mm/ML (Threaded)
Static Locking Hole Dimensions	4.7mm**	5.3mm**
Degree of Distal Bend	2°	2°
Distal Bend Location	60mm	60mm

* Set does not include all sizes; Outlier sizes may be special order only.
** Most distal hole threaded.

Surgical technique

Patient positioning

Position the patient supine on a radiolucent table with the unaffected limb extended away from the affected limb. Alternatively, a fracture table may be used with a pin inserted through the calcaneus to place the leg in traction.
Flex the affected limb 80-90° and check for length and rotation by comparison to the unaffected limb.



Use a bolster or radiolucent triangle to maintain limb position. Rotate the C-Arm to ensure optimal AP and lateral visualization of the entire tibia. A distraction device may also be applied to obtain and/or maintain traction.

Caution Do not use a metal bump because it will adversely affect the accuracy of the TRIGEN® SURESHOT® system.



Warnings and cautions for TRIGEN◇ SURESHOT◇

Accessibility of documentation
Please ensure that all instructions are kept in an easily accessible place for operating personnel.

The operator checks and decides
All the information provided by the TRIGEN◇ SURESHOT◇ Distal Targeting System is to help the operator make decisions during the operation. The operator must check all the suggestions made by the system and is responsible for all decisions taken.

Responsibility of Smith & Nephew Orthopaedics
In the event of improper use, Smith & Nephew accepts no responsibility or liability whatsoever for the functioning or utility of the TRIGEN SURESHOT Distal Targeting System when used in the operating theatre.

Cleaning and sterilization
All instruments must be sterilized before use. Detailed information on the cleaning and sterilization of components is contained in the separate *Cleaning and Sterilization Instructions* (Smith & Nephew document 7138-1339).

Repair or modifications to the system
The user is not permitted to modify or service the equipment. There are no serviceable parts inside the unit. Refer all service to authorized personnel.

Modifications/additions to the software
The user is not permitted to install or uninstall software. Any new software must be installed by the manufacturer or by authorized personnel.

It is only allowed to connect equipment to the interface and power supply connections of the TRIGEN SURESHOT Distal Targeting System which are IEC60601-1 approved and which are approved by Smith & Nephew Orthopaedics. Do not modify this equipment without authorization of the manufacturer.

Electrical safety warning
To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth (=ground).

Avoid spilling water or other liquids on electronic/electrical equipment.

Use only Smith & Nephew disposables and accessories with the Smith & Nephew TRIGEN SURESHOT Distal Targeting System.

Maintenance
To verify accurate functionality, the device should be checked per the Maintenance Instructions contained in a separate Smith & Nephew document 7118-1540. This accuracy check must be performed at least once every 12 months.

If this accuracy check is not performed as defined in the previous paragraph, all warranty claims expire and the device is operated at the user's own risk.

Recycling
Old electrical and electronic equipment must be disposed separately and may not be included in the regular domestic waste. Alternatively, the unit can be handed over to Smith & Nephew Orthopaedics for correct recycling.

Note Do not unplug the power while the system is running!



Note Danger of damage and tipping over!

Tip Place the unit on a firm, level surface capable of holding at least 10kg (22 lbs).



Note To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.



Devices for system set up



Trauma Interface
Cat. No. 7169-2802

Power Cord
Cat. No. 6680-0193



TRIGEN° SURESHOT° Targeter
Cat. No. 7169-2801

Note The Targeter will be operated within the sterile field and may have contact with the skin of the patient. The drill sleeve inserts will be used in the incision and have direct bone contact.

Note Verify that the Targeter housing is not damaged (holes, tears, cracks). If the housing or the connector is damaged, the Targeter is no longer safe to use.

Note If the Targeter is not recognized after connection to the system, the Targeter is defective and must be exchanged. (See also instrument connection).

Note Broken or damaged instruments must be exchanged immediately and sent back to Smith & Nephew, Inc.

Note This device is provided non-sterile and must be cleaned and sterilized per *Cleaning and Sterilization* (Smith & Nephew document 7138-1339) prior to use.

Note This procedure will cover only the specific steps of freehand targeting of intramedullary locking holes using the TRIGEN® SURESHOT® Distal Targeting System. For the full surgical procedure, please refer to the specific surgical technique for the TRIGEN® IM Nail System being implanted.

Trauma Interface setup

After the sterile areas have been established, place the Trauma Interface (7169-2802) in the desired non-sterile location and turn on the power switch.



Pressing the power button will bring up the start-up screen.



Tip If the Trauma Interface does not power on, make sure the switch is in the "on" position.

Note No other electrical devices should be placed near the Trauma Interface. See the "Guidance and Manufacturer's Declaration – Separation Distances" table contained in Smith & Nephew document 7118-1540.

TRIGEN SURESHOT Targeter connection

When the display prompts for tool connections, connect the TRIGEN SURESHOT Targeter (7169-2801) to the Targeter port on the Trauma Interface.





Note The Targeter body may have contact with the patient and must remain in the sterile field at all times. Only the cable and connector may be removed from the sterile field.

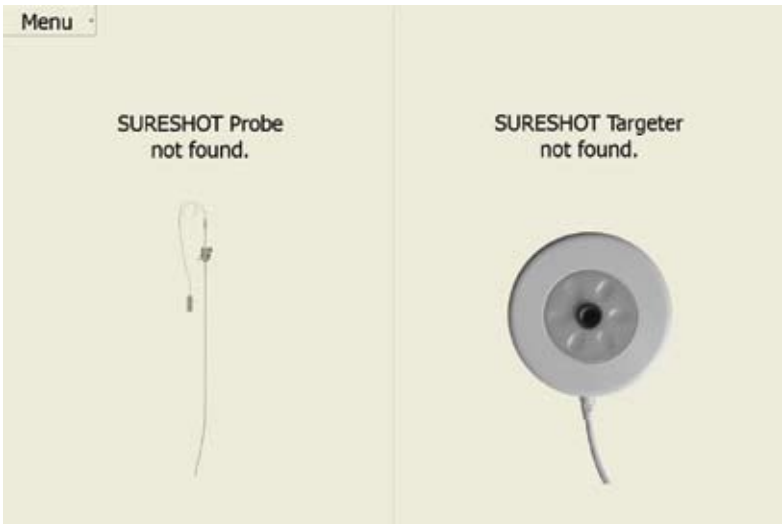
Note This step needs to be performed at least ten minutes prior to targeting in order to ensure proper accuracy.

Tip When oriented as shown, the connector should assemble easily. Do not force the connector into the port.

Note If the Targeter is properly connected to the system and the application remains in this screen for more than 30 seconds, the Targeter may have been damaged during cleaning/sterilization. In this case another Targeter has to be used.

Tip It is possible at any time to disconnect and reconnect tools when the application is running. The display will show a screen reporting the missing instrument.

Targeter and probe have not been connected



Confirmation that the Targeter tool has been connected when the center of the Targeter lights up orange.



Instruments for opening the proximal tibia

3.2mm Tip Threaded Guide Wire
Cat. No. 7163-1690



12.5mm Entry Reamer
Cat. No. 7163-1116



Honeycomb
Cat. No. 7167-4075



Entry Portal Tube
Cat. No. 7167-4060



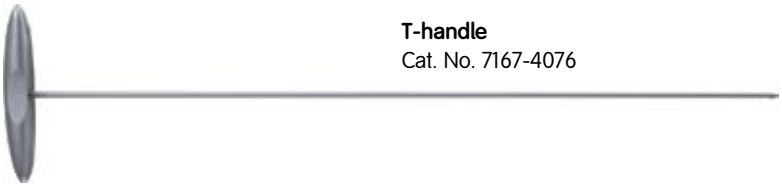
Entry Portal Handle
Cat. No. 7167-4092



Mini Connector
Cat. No. 7163-1186



T-handle
Cat. No. 7167-4076



3.2mm T-handle Trocar
Cat. No. 7167-4074



Cannulated Awl
Cat. No. 7167-4000

Incision and entry point

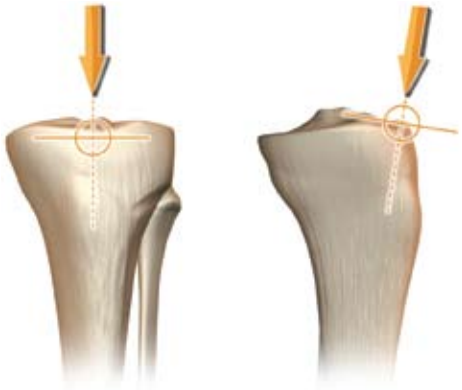
Assemble the Honeycomb (7167-4075), Entry Portal Handle (7167-4092) and Entry Portal Tube (7167-4060). The pieces will lock in place securely at either 0° or 180°.



A 2cm incision is made in line with the intramedullary canal. This may be patellar splitting, medial or lateral parapatellar in its orientation.



The entry point is located just medial to the lateral tibial eminence in the AP view, and in line with the anterior cortex and intramedullary canal in the lateral view.



Entry portal acquisition

Attach a 3.2mm Tip Threaded Guide Wire (7163-1690) to the drill via the Mini Connector (7163-1186) and insert into the proximal tibia to a depth of 4-6cm. The Entry Portal instrumentation serves as a soft-tissue protector.



In the instance of suboptimal Guide Wire insertion, rotate the Honeycomb within the Entry Tube to the desired location and insert another 3.2mm Tip Threaded Guide Wire. Avoid over-insertion of the Guide Wire as this can establish a false trajectory and lead to fracture malalignment.



Entry portal

After definitive Guide Wire placement, remove the Honeycomb from the Entry Tube along with any additionally inserted Guide Wires and attach the 12.5mm Entry Reamer (7163-1116) to power. Advance over the Guide Wire through the Entry Tube to a depth of 4-6cm. Maintain alignment so as to avoid penetration of the posterior cortex.

Check position via radiographic imaging and then remove the 12.5mm Entry Reamer and 3.2mm Tip Threaded Guide Wire.



Alternative technique: Entry portal

Attach the T-handle (7167-4076) to the Cannulated Awl (7167-4000) and insert into the proximal tibia to a depth of 4-6cm. Introduce the 3.2mm T-handle Trocar (7167-4074) into the back of the assembly prior to insertion in order to prevent awl slippage and accumulation of cortical bone within the cannulation.



Cannulated Awl with T-handle

3.2mm T-handle Trocar

Instruments for fracture reduction and reaming



Entry Portal Tube
Cat. No. 7167-4060



Entry Portal Handle
Cat. No. 7167-4092



Gripper
Cat. No. 7167-4080



Ruler
Cat. No. 7167-4079



T-handle
Cat. No. 7167-4076



Reamer Heads
Cat. No. 7111-8231–8246



Obturator
Cat. No. 7167-4078



Flexible Reamer Shaft
Cat. No. 7111-8200



Reducer
Cat. No. 7167-4077



3.0mm x 1000mm Ball Tip Guide Rod
Cat. No. 7163-1626

Fracture reduction

Insert the back end of the 3.0mm Ball Tip Guide Rod (7163-1626) into the front of the Gripper (7167-4080) and gently close the trigger grip. Connect the Reducer and Reducer Connector (7167-4077) so that the words “Slot Orientation” are in line with the opening at the tip. Complete the assembly by connecting it to the T-handle (7167-4076).



Note If blocking screws are desired at this point in the procedure, refer to the blocking screw technique section (pp 45-50).



Advance the Reducer into the intramedullary canal and use the curved tip to direct the 3.0mm Ball Tip Guide Rod past the fracture into the region of the distal epiphyseal scar. The guide rod should be center-center in the AP and lateral views.



Reducer removal

Once the guide rod is at the desired depth, detach the Gripper and remove the Reducer from the tibial canal. Slide the Obturator (7167-4078) into the back of the T-handle during extraction in order to maintain guide rod position within the canal.



Implant measurement

After Reducer removal, reconfirm guide rod placement within the distal tibia and slide the Ruler (7167-4079) over the guide rod to the desired depth. The metal tip of the Ruler denotes the driving end of the META-NAIL° Tibial Nail.



Confirm guide rod position in the window at the opposite end of the Ruler as shown in order to ensure accurate implant measurement. Push down on the top of Ruler until contact is made with the 3.0mm Ball Tip Guide Rod. Implant length is read from the exposed calibrations at the end of the Ruler.

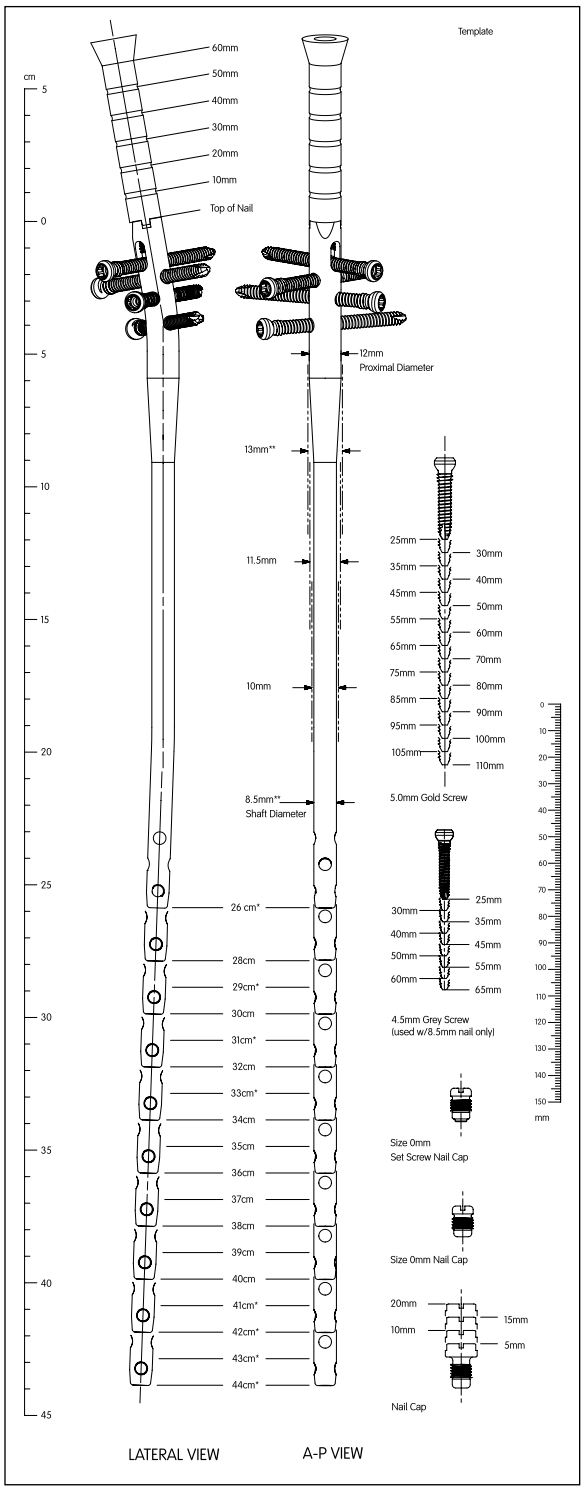


Note Confirm fracture reduction so as not to underestimate correct implant length. Reference the fibula for accurate fracture distraction or compression.

Note Confirm that the Ruler opens easily. Adjust the thumb-wheel connection at the end to allow for free movement.

Unreamed technique

Radiographic templating is used to determine nail size. The appropriate diameter implant will provide translational fill within the isthmus of the intramedullary canal. Generally, selection of a nail approximately 1-1.5mm less than the narrowest canal measurement on the lateral radiograph assists in avoiding implant incarceration during insertion.



TRIGEN® META-NAIL® Tibial Nail Radiographic Template
Cat. No. 7118-0810

Reamed technique

Radiographic templating and intraoperative measurement will determine nail size. Beginning with the 9.0mm Front Cutting Reamer Head (7111-8231) and Flexible Reamer Shaft (7111-8200), ream the intramedullary canal sequentially in half millimeter increments to a size 1-1.5mm larger than the selected nail size.



Ensure guide rod placement during reaming by inserting the Obturator into the back of the Reamer unit during retraction. Continue to confirm Guide Rod placement in the distal tibia throughout reaming. Periodically move the reamer back and forth in the canal to clear debris from the cutting flutes.

Instruments for nail assembly and insertion



Guide Bolt Wrench
Cat. No. 7163-1140



META-NAIL Drill Guide
Cat. No. 7165-4502



META-NAIL Extension Drill Guide
Cat. No. 7165-4503

Note TRIGEN® SURESHOT® cannot be used with this guide.



Extension Guide Bolt
Cat. No. 7165-4505



Cannulated Impactor-Short
Cat. No. 7165-4554



Guide Bolt Long
Cat. No. 7165-4506



T-handle
Cat. No. 7167-4076



Slotted Hammer
Cat. No. 7167-4082



META-NAIL Standard Drill Guide Probe
Cat. No. 7169-2814



META-NAIL° Anterior Drop
Cat. No. 7165-4501



9.0mm Drill Sleeve
Cat. No. 7163-1152



4.0mm Drill Sleeve
Cat. No. 7167-4083

4.0mm Long Pilot Drill*
Cat. No. 7163-1110



Cannulated Impactor-Medium
Cat. No. 7167-5081



META Set Stop
Cat. No. 7169-2806

* 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)

Nail assembly

Attach the META-NAIL® Drill Guide (7165-4502) to the nail with the Guide Bolt Long (7165-4506) and tighten with the Guide Bolt Wrench (7163-1140) and T-handle. The nail is correctly aligned when:



1 The line on the insertion barrel matches the line of the nail.

2 The “A” on the nail matches the “A” on the insertion barrel.

3 The apex of the nail’s proximal Herzog Bend faces posterior and the drill guide is oriented anterior.

The bevel on the front of the nail marks the connection to the drill guide and can be seen in the lateral view as a means for determining proximal insertion depth.



Note It is recommended to use the standard drill guide and Guide Bolt Long for compression or dynamic locking as the longer insertion barrel facilitates countersinking of the nail.

Note The assembly and insertion of the grey 8.5mm diameter META-NAIL Tibial Nail follows the same technique as the 10mm, 11.5mm and 13mm diameter nails.

Attach the Anterior Drop (7165-4501) to the drill guide and verify targeting accuracy by inserting a gold 9.0mm Drill Sleeve (7163-1152) and silver 4.0mm Drill Sleeve (7167-4083) into the Drop and passing a 4.0mm Long Pilot Drill (7163-1110)* through the assembly. An incorrectly attached nail will not target.



Note See page 25 for the field accuracy check with the TRIGEN® SURESHOT® Distal Targeting System.

* 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)

System setup

Connect probe to Trauma Interface unit. Make sure to use the adequate probe with the correct nail (color coded). Connect the probe to either of the probe sensor ports on the Trauma Interface.

Note For assembly, screw on set stop to drill guide, then insert probe.

Note The probe will be used as an intramedullary tool inside the nail placed in the patient's bone.

Note If the probe is not recognized after connection to the system, the probe is defective and must be exchanged. (See also instrument connection).

Note Broken or damaged instruments must be exchanged immediately and sent back to Smith & Nephew, Inc.

Note This device is provided sterile by ethylene oxide gas and is single use.





Red probe
Use only with META-NAIL Standard Drill Guide

Blue probe
Use only with META-NAIL Semi-extended Drill Guide

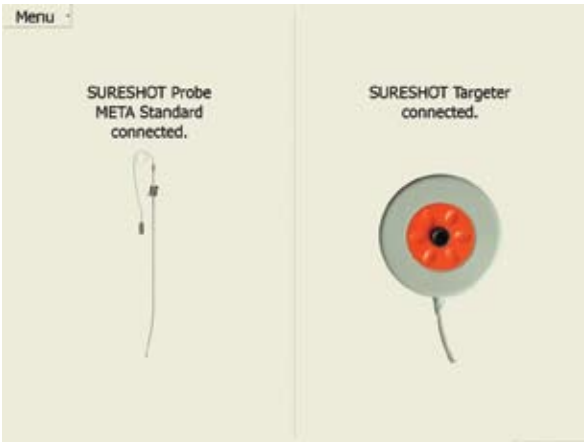
Green probe
Use only with Percutaneous TAN°/FAN Drill Guide (7163-1021)

There will be a confirmation on the screen of the Trauma Interface that implies that the probe has been connected.

Tip When oriented as shown, the connector should assemble easily. Do not force the connector into the port.

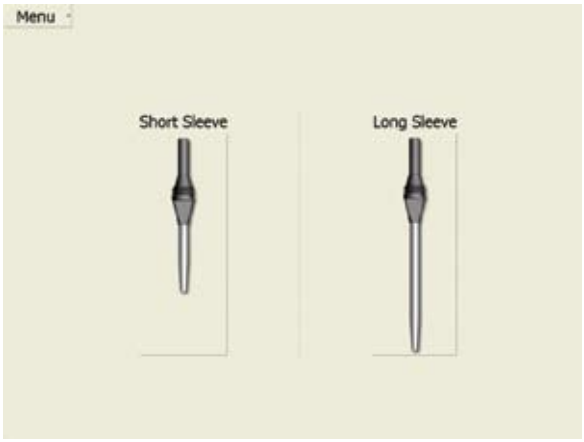
Note If the probe is properly connected to the system and the application reports "Probe not found" for more than 10 seconds, the probe may be damaged or defective. In this case, the probe has to be exchanged.

Tip It is possible at any time to disconnect and reconnect tools when the application is running. The display will show a screen reporting the missing instrument.



After TRIGEN® SURESHOT® Targeter and probe have been connected, attach drill sleeve to Targeter. The displayed screen will occur. Select the length of the drill sleeve (7169-2804 or 7169-2805) that will be used. Generally the short sleeve is sufficient. In some cases using the femoral retrograde technique, the long sleeve needs to be used.

Tip A different sleeve can be selected at any time during the procedure by choosing the drill sleeve option from the drop down menu after the implant has been selected. The selected sleeve will be noted on the Trauma Interface screen.



Drill sleeve attachment

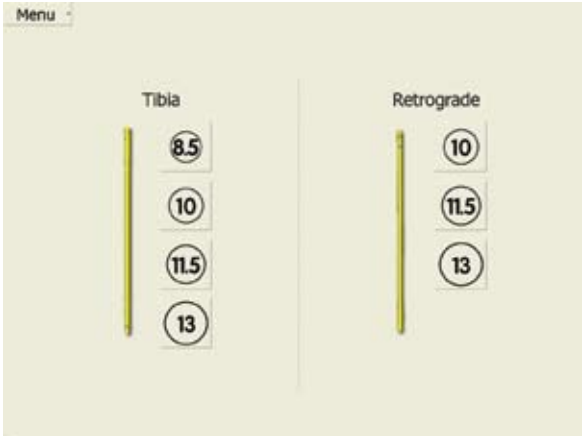
Tightly secure the selected drill sleeve to the Targeter.



Tip The drill sleeve (7169-2804 and 7169-2805) can be loosened from the Targeter using the slot in the TRIGEN Slotted Hammer (7167-4082).

Select the TRIGEN IM nail and size that will be used.

Tip A different TRIGEN IM nail and/or size can be selected at any time during the procedure by choosing the Implant option from the drop down menu. The selected implant and diameter will be noted on the Trauma Interface screen.



Locking hole accuracy check in the operative field

Insert the probe with the assembled set stop through the drill guide and cannulation of the TRIGEN® IM nail.

Tip The guide-bolt wrench (7163-1140) may be used as a lever to release the set stop from the drill guide if overtightened.



Note The TRIGEN® SURESHOT® Distal Targeting System cannot be used with the META-NAIL® Extension Drill Guide (7165-4503).



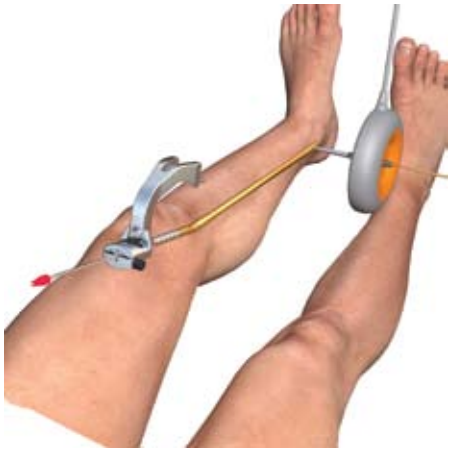
Ensure that the probe is oriented correctly and the set stop position and IM nail length match.

Note Verify the set stop position and nail length match, align the drill sleeve with one of the distal holes of the nail. Verify on the display that the representation of the nail/drill sleeve is true. Remove the probe from inside the nail and begin nail insertion. Take off set stop before inserting the nail and place the impactor.



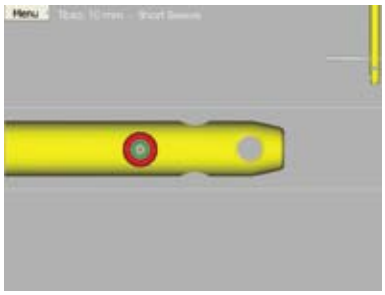
Note Verify the probe is oriented correctly in the set stop (notches should face anteriorly). If the probe is rotated 180°, it will not be accurate.

Note The probe is bent for easier insertion. Do not straighten it as this may cause inaccuracy or even missing the lock.



Note All tool cables should be uncoiled completely and any excess cables should be kept out of the Targeter measurement volume.

Note To guarantee system accuracy, the accuracy check has to be performed directly in the operative field.



Field accuracy check: Optional

A field accuracy check procedure should be performed at least once a year or whenever the accuracy of a TRIGEN® SURESHOT® probe or TRIGEN SURESHOT Targeter needs to be verified. This procedure can also be performed during surgery to verify all components are working correctly prior to their use on a patient.



Field accuracy check steps

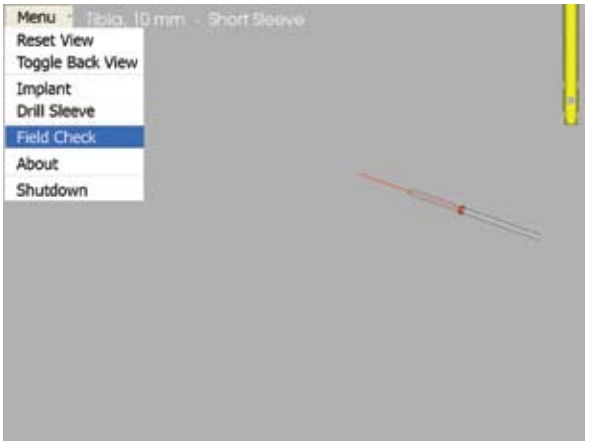
1 Attach TRIGEN SURESHOT Field Accuracy Gauge (7169-2808) to TRIGEN SURESHOT Targeter. The knob on the Field Accuracy Gauge should be hand tightened only.



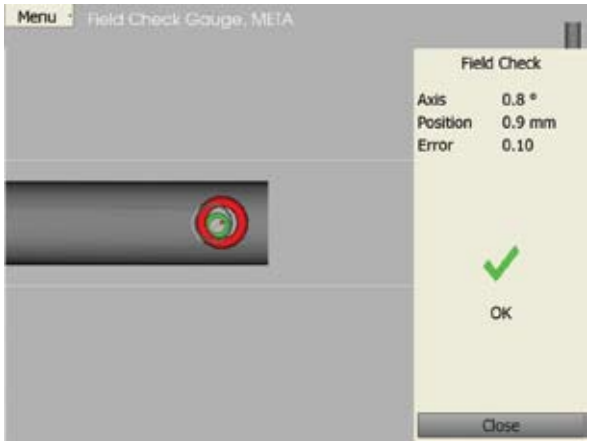
2 Attach the TRIGEN SURESHOT META Set Stop (7169-2806) to the end of the Field Accuracy Gauge, insert a TRIGEN SURESHOT probe into the set stop and set the depth to the “REF” mark on the probe body.



3 From the software “Menu” button, select “Field Check” option.

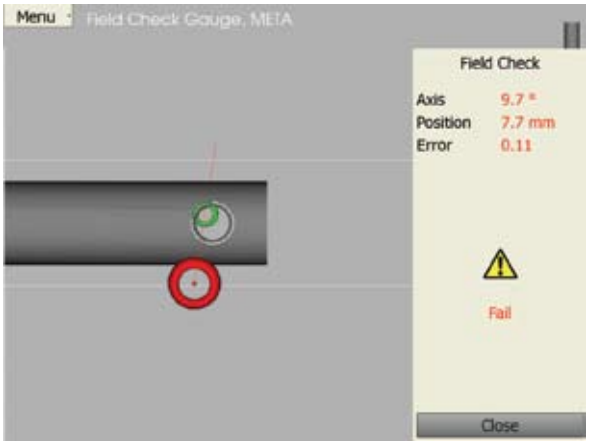


4 A software window will appear informing the user if the TRIGEN® SURESHOT® Targeter and Probe combination is within the predefined accuracy parameters (“Pass” or “Fail” message).



5 If the field accuracy check fails, check the “Troubleshooting” section of this document for possible solutions.

Note This step should be performed at least once a year to ensure that the device is working properly.



Nail insertion

Detach Anterior Drop and set stop and attach impactor

Remove the Anterior Drop and attach the Cannulated Impactor-Medium (7167-5081) to the drill guide. Orient the drill guide assembly in the AP position and advance the nail over the guide rod by light blows from the Slotted Hammer (7167-4082) to the desired depth.

Additional reaming of the intramedullary canal may be indicated if excessive force is required to insert the nail.

Verify fracture reduction as the nail crosses the fracture site paying close attention to rotation, length, alignment, distraction and/or shortening. Check final nail position in both the AP and lateral views for correct alignment.

Tip Provisional fixation of the proximal tibial fragments may be obtained by reattaching the Anterior Drop and by inserting the gold 9.0mm Drill Sleeve (7163-1152) and silver 4.0mm Drill Sleeve (7167-4083) into one of the two Blocking Screw holes in the Drop and passing a 4.0mm Long Pilot Drill (7163-1110)*.



For proximal interlocking with the leg in extension, use the Extension Drill Guide (7165-4503) and Extension Guide Bolt (7165-4505). The long insertion barrel of the standard drill guide may impinge upon the distal femoral condyles and prevent nail interlocking with the tibia in full extension.



Note TRIGEN® SURESHOT® cannot be used with this guide.

Check nail depth

Proximal
In the lateral view, confirm nail position by observing the notch present at the nail/drill guide junction. Each gauge on the insertion barrel represents a 10mm depth interval. If compression or dynamic locking is desired, it is recommended to countersink the nail approximately 10mm in order to avoid implant prominence.



Distal
In the AP and lateral views, confirm that the nail has been inserted to the desired depth. Distal third tibial fractures require at least three locking screws to maintain stability, so optimal insertion depth is essential. Remove the Guide Rod once the nail has been fully seated and attach the Anterior Drop.



Note Following nail insertion, confirm that the nail and drill guide are securely connected as hammering can loosen the Guide Bolt.

Devices to lock distally



Trauma Interface
Cat. No. 7169-2802

Power Cord
Cat. No. 6680-0193



TRIGEN° SURESHOT° Targeter
Cat. No. 7169-2801

AO Drill Bit, Short
Cat. No. 7169-2810

AO Drill Bit, Long
Cat. No. 7169-2811



Drill Sleeve, Long
Cat. No. 7169-2804



Hexdriver
Cat. No. 7169-2809



Drill Sleeve, Short
Cat. No. 7169-2805



META-NAIL° Standard Drill Guide Probe
Cat. No. 7169-2814



META Set Stop
Cat. No. 7169-2806

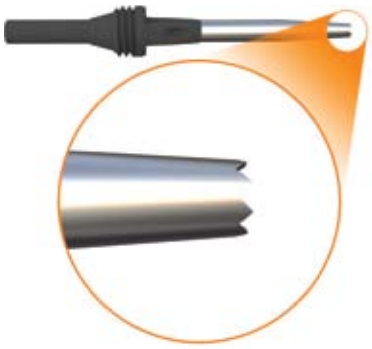
Note When the Targeter is out of the preferred range or there is metal or electrical interference, the green and red Targeter circles on the Trauma Interface screen may become unstable and/or a warning message will be displayed. If the interference is excessive, the IM nail image on the Trauma Interface screen will disappear. If interference cannot be avoided, a standard X-Ray technique must be used.

Note All tool cables should be uncoiled completely and any excess cables should be kept out of the Targeter measurement volume.

Detach Cannulated Impactor-Medium (7167-5081) from drill guide. Reattach META Set Stop (7169-2806) and insert META-NAIL® Standard Drill Guide Probe (7169-2814) in the nail. Adjust probe to nail length.

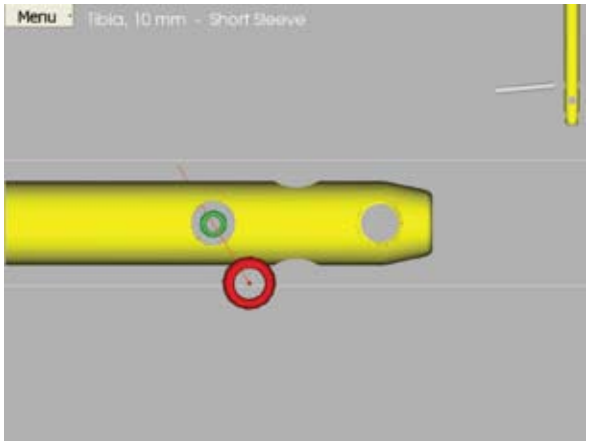
Skin incision

Use serrated tip of Drill Sleeve to identify where to make incision. The tip is at the right position when the green circle is aligned with the desired hole on screen.



Make incision and place tip of the drill sleeve down to bone where the green circle is aligned directly over the hole on screen.

Note No X-Rays necessary.



Targeting the locking hole

With the appropriate length TRIGEN® SURESHOT® 4.0mm Drill Bit (7169-2810 or 7169-2811) inserted into the Targeter, insert the tip of the drill sleeve (represented by the green circle) through the incision and down to bone.



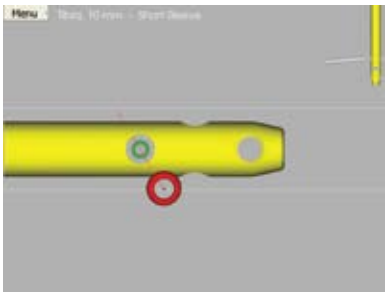


Critical Verify there are no other metal objects (including metal triangles) in the field. Metal interference will cause the system to be inaccurate.

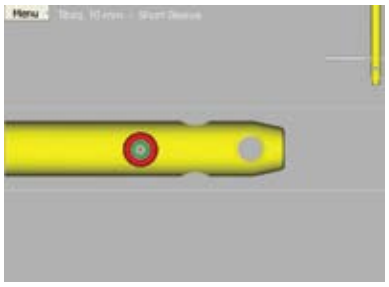
Perfect circles

Align the tip of the drill sleeve over the desired hole in the nail. This will be represented on the screen when the green circle is centered in the hole as shown. Push serrated tip firmly against bone to keep the green circle static on the screen.

Note The orientation of the view is determined based on the orientation of the Targeter relative to the implant. For example, if the desired hole to target is an AP hole, direct the Targeter generally on the Anterior side of the leg. For more options, please see section: "Trauma Interface Screen Operation."



Adjust the trajectory (represented by red line between two circles) of the red circle until both circles are concentric and centered with the desired hole on the screen. Then start drilling.



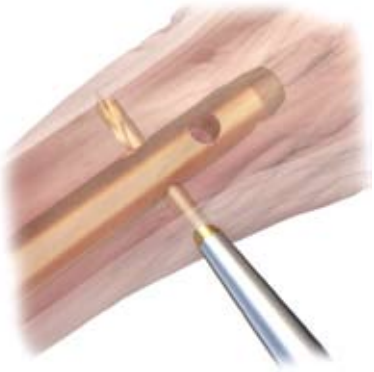
Note The green ring must be fully within the hole of the IM nail displayed on the Trauma Interface screen to ensure accurate drilling.

Drilling distal hole

Drill through near cortex and the nail using the TRIGEN® SURESHOT® 4.0mm Drill Bit (7169-2810 or 7169-2811). Before drilling through far cortex, obtain the screw measurement.

Note Important: if standard 4.0mm drill from TRIGEN set is used, magnetic metal can adversely affect accuracy causing the drill to miss. Verify there is no other magnetic metal object in area other than the items shown.

A note will appear on screen warning of compromised targeting field, if magnetic metal is close. If it is in the field, image disappears.



Screw measurement
With the tip of the drill against the far cortex, measure for length, then drill through the far cortex. Ensure the serrated tip of the drill sleeve is pushed against the bone.

Example
Measure 35mm, add approximately 5mm, the screw length would be 40mm.

Alternative screw measurement with depth gauge (7163-1189).

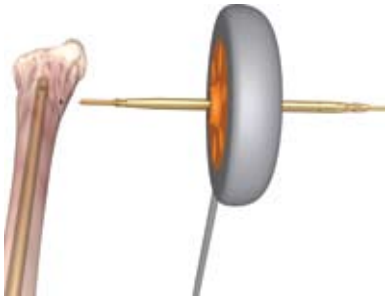
After successfully drilling through the screw hole of the nail with the TRIGEN SURESHOT 4.0mm Drill Bit, remove the drill bit being careful not to move the leg.



Screw insertion

Detach Drill Sleeve from Targeter. Introduce Hexdriver with the screw attached through Targeter.

TRIGEN® SURESHOT® Targeter is backed away from bone by sleeve length, approximately 80mm for the short sleeve.



Note Image disappears if too close.

Note The standard TRIGEN Hexdrivers are made from magnetic stainless steel that will cause interference with the system and cannot be used.

Insert the bone screw into the pre-drilled hole through the nail, and through the far cortex.



Note For 10/11.5/13mm nails, use TRIGEN Internal Captured Screws 5.0mm (gold), for 8.5mm nails, use TRIGEN Internal Captured Screws 4.5mm (grey).

Before fully inserting the screw, remove power drill and Targeter. Final screw seating must be done by hand by attaching the T-handle (7167-4076) to the Medium Hexdriver (7163-1066).

The depth of the screw can be verified by placing a gold 9.0mm Drill Sleeve (7163-1152) down to bone over the hexdriver. There is a profile of the screw head and a groove on the hexdriver that may be used as an indicator for the position of the screw head relative to the near cortex. Positioning of the screw can be verified with the C-Arm.

Repeat with other distal screws.

Note Remove probe before proceeding to proximal locking. Remove the probe from the set stop. Detach set stop from the drill guide. Do not pull the cable to remove probe.

Instruments for standard, dynamic and compression locking



Screw Length Sleeve
Cat. No. 7167-4085



Nail Cap Set Screw
Cat. No. 7165-6000



META-NAIL° Anterior Drop
Cat. No. 7165-4501



Medium Hexdriver
Cat. No. 7163-1066



Mini Connector
Cat. No. 7163-1186



4.0mm Drill Sleeve
Cat. No. 7167-4083



9.0mm Drill Sleeve
Cat. No. 7163-1152



Screwdriver Release
Cat. No. 7167-4084

4.0mm Long Pilot Drill*
Cat. No. 7163-1110



Universal META-NAIL Compression Driver
Cat. No. 7165-4528



T-handle
Cat. No. 7167-4076

4.0mm Short Drill**
Cat. No. 7163-1117



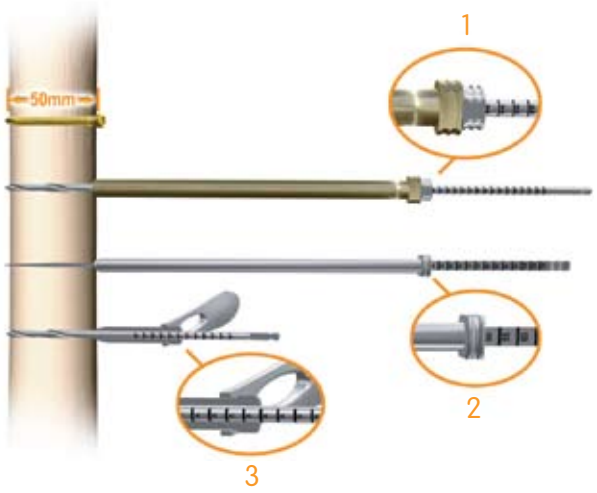
Screw Depth Gauge
Cat. No. 7163-1189

* 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)
** 4.0mm Short Drill (7163-1117) is interchangeable with 4.0mm AO Short Drill (7163-1123)

Locking screw measurement

There are three methods:

1. Gold 9.0mm Drill Sleeve, silver 4.0mm Drill Sleeve and 4.0mm Long Pilot Drill*.
2. Screw Depth Gauge (7163-1189).
3. Screw Length Sleeve (7167-4085) and 4.0mm Short Drill (7163-1117)**.



Locking screw insertion

Proximal locking options include three statically locked threaded holes and one slot that allows for both fracture compression and/or dynamization. These are targeted through the orange and blue color-coded holes on the Anterior Drop.

Distal locking options include three statically locked holes, two ML and one AP. The most distal ML hole is threaded for additional stability.

Gold 5.0mm locking screws are compatible with 10mm, 11.5mm and 13mm diameter nails and grey 4.5mm locking screws with 8.5mm diameter nails.

Note Do not use the 4.0mm Short Step Drill (7164-1123) when drilling for a grey 4.5mm locking screw. Its diameter transitions from 4.0mm to 4.7mm and will drill too large a hole in the near cortex. This may compromise locking screw purchase.



* 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)
** 4.0mm Short Drill (7163-1117) is interchangeable with 4.0mm AO Short Drill (7163-1123)

Note Make sure to remove probe before proximal locking.

Proximal locking: Static

Make a small incision at the site of screw entry and insert the gold 9.0mm Drill Sleeve and silver 4.0mm Drill Sleeve through the static slot on the Anterior Drop down to bone. Drill both cortices with the 4.0mm Long Pilot Drill*.



Measure for screw length using either the calibrations on the 4.0mm Long Pilot Drill* or by removing the 4.0mm Drill Sleeve and using the Screw Depth Gauge. Attach the appropriate length screw to the end of the Medium Hexdriver (7163-1066) and insert through the gold 9.0mm Drill Sleeve on power until the laser etched ring on the Hexdriver reaches the back of the Drill Sleeve. Attach the T-handle to the Hexdriver and tighten the screw by hand.

Proximal locking: Dynamic

With the nail countersunk approximately 10mm, make a small incision at the site of screw entry and insert the gold 9.0mm Drill Sleeve and silver 4.0mm Drill Sleeve through the dynamic slot on the Anterior Drop down to bone. Drill both cortices with the 4.0mm Long Pilot Drill*. Screw measurement and insertion follows the previously described technique.



Note If nail is left in dynamic mode, a nail cap cannot be used, as it will push against the locking screw.



* 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)

Proximal locking: Compression
There are two (2) methods:

Compression Driver method

1 Countersink the nail a minimum of 10mm and lock the nail distally.

2 Reduce the fracture as much as possible to maximize the advantage of the compression driver.

3 Insert a screw through the proximal side of dynamic slot as previously described.

4 Remove the gold 9.0mm Drill Sleeve and Medium Hexdriver.

5 Attach the Universal Compression Driver (7165-4528) to the T-handle and thread it through the guide bolt into the top of the nail until it contacts the most proximal 5.0mm locking screw.

6 Advance the Compression Driver clockwise to drive the locking screw distally which will compress the fracture up to 7mm.

7 Once the fracture gap is adequately compressed, lock the nail with up to three additional proximal static screws while the Anterior Drop is still attached to the drill guide.





Nail Cap Set Screw method
Lock the nail distally, fully insert the dynamic locking screw as previously described and remove the Drill Guide/Anterior Drop assembly. Insert the Nail Cap Set Screw (7165-6000) into the top of the nail and advance with the Medium Hexdriver/T-handle assembly until the fracture is compressed and the Nail Cap Set Screw has fully engaged the locking screw.



Note If the Compression Driver is progressed after the fracture is fully compressed, then the locking screw will begin to bend. In extreme cases where excess force is applied, the screw may break upon removal.



Trauma Interface screen operation

Overview mode

When the Targeter is greater than 5cm from the interlocking holes, the Trauma Interface screen will display the IM nail in the overview mode. This provides the user with a larger field of view in order to help find the general location of the interlocking holes.

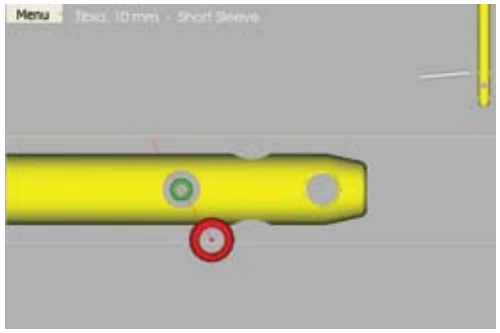
The view in the upper right corner is the profile view. It is collinear to the drill sleeve axis and the position is aligned with the tip of the drill sleeve.



Drilling mode

When the Targeter is moved within 5cm of the interlocking holes, the Trauma Interface screen will display the IM nail in the drilling mode. This provides the user with a smaller field of view that automatically zooms in to the interlocking holes.

The white lines displayed on either side of the IM nail can be used for targeting blocking screws. These lines are located 2.5mm from the side of the IM nail for all IM nails 10mm and larger in diameter. These lines are located 2mm from the sides of 8.5mm IM nails.

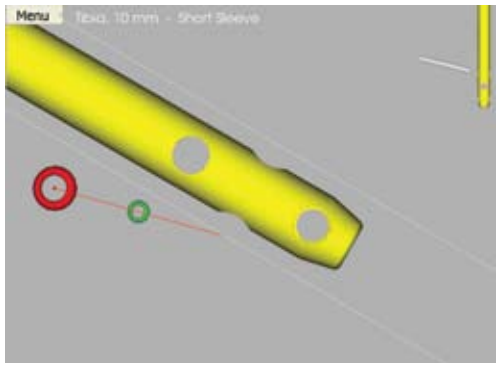


Drilling mode manual rotation

Each IM nail has several predefined views that are automatically selected depending on the position of the Targeter to the IM nail. Depending on the operating environment, these predefined views might not be appropriate and can be manually adjusted.

To rotate the view

Touch the screen near the outside and "drag" the view in a clockwise or counterclockwise direction.



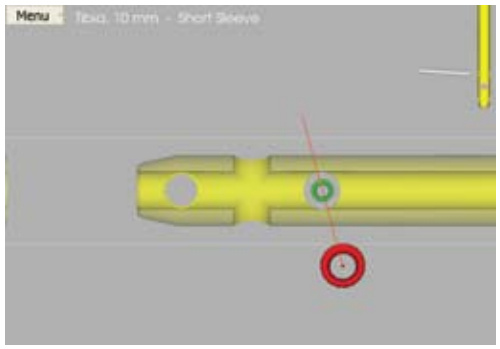
To flip the view

Touch the "Menu" button and select "Toggle Back View."

All changes made for a view are temporarily stored for that view until program exit.

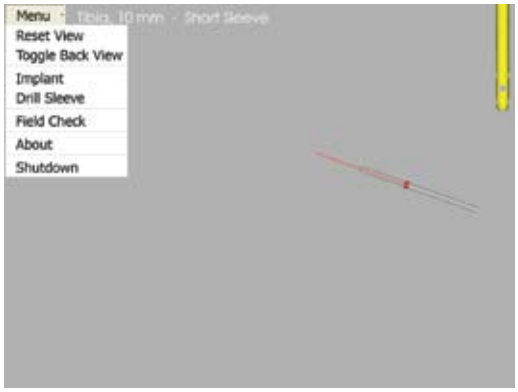
To reset the view

The default view settings can be restored by touching the "Menu" button and selecting "Reset View" or double tapping the center of the screen.

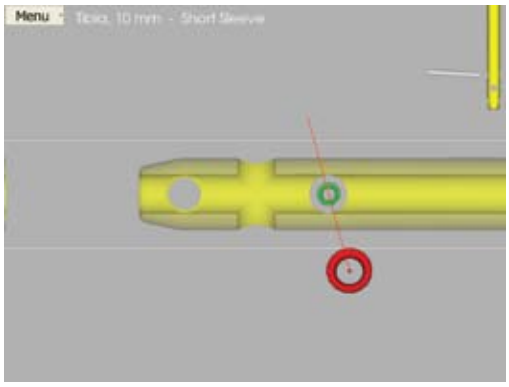


Menu – Options

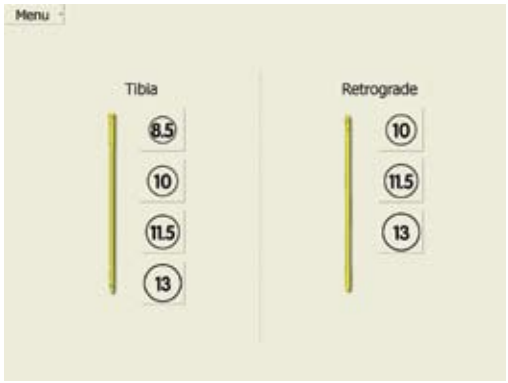
Menu
Tapping on the Menu button will open up several Menu options.



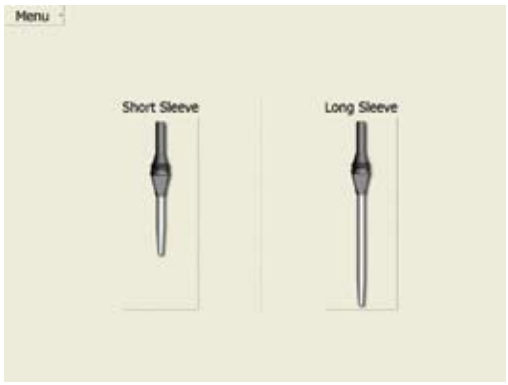
Toggle back view
This view may be used in cases where the Trauma Interface cannot be placed in front of the surgeon. It is intended to be used similar to the mirror option commonly available on C-Arm machines.



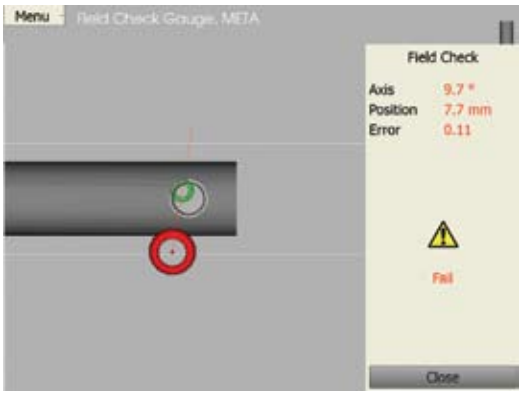
Implant
When choosing an implant, several options are given. Tap on screen to select.



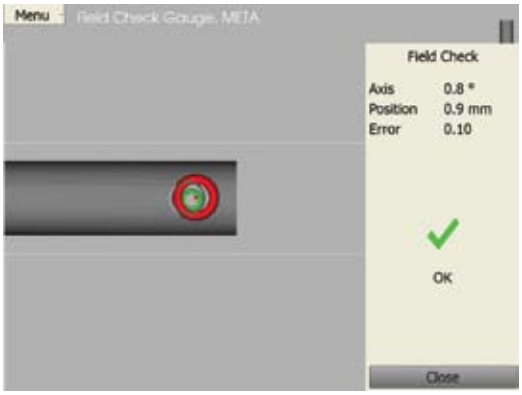
Drill sleeve
Tap on screen to select appropriate drill sleeve.



Field check Fail screen, meaning that something is not targeting correctly. See “Troubleshooting” section for further information.



Pass screen
When targeting correctly, a “pass screen” will occur.



About
The “About screen” provides more information about the software used.



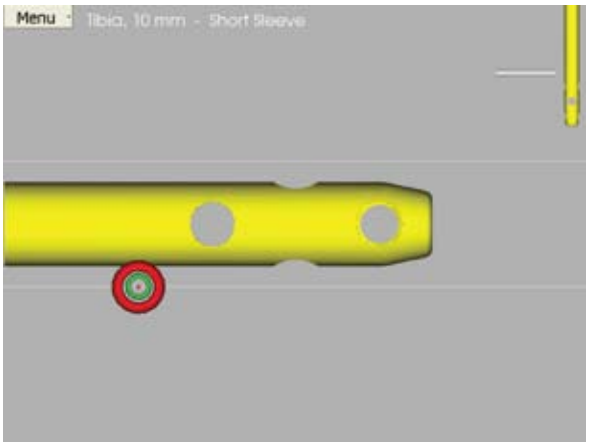
Shutdown
Tap on screen to shut down the system before flipping the power switch.



Error message
An error message will occur, if a probe-sensor is invalid or broken.



Distal blocking screws with TRIGEN® SURESHOT®
The white lines displayed on either side of the IM nail can be used for targeting blocking screws. These lines are located 2.5mm from the side of the IM nail for all IM nails 10mm and larger in diameter. These lines are located 2mm from the sides of 8.5mm IM nails.



Troubleshooting

Problem	Possible cause	Suggested action
Trauma Interface unit is without power	Mains power plug is not inserted (properly) or there is no mains power	Insert mains power plug into reliable power supply
	No power on the wall outlet	Try other power outlet
	One or both mains power fuses are blown	Replace mains fuses
Buttons or items are difficult to select on the touchscreen	Touchscreen is de-calibrated	Access calibration software by selecting “Maintenance” from the “About” option under the “Menu” options (password required)
VGA video out not functioning	VGA port not activated on Trauma Interface	Connect VGA cable to both Trauma Interface and video monitor before powering on Trauma Interface
	Damaged VGA cable	Replace VGA cable
	Video monitor not on correct input	Select proper input on video monitor
TRIGEN® SURESHOT® Targeter not recognized	Error reading data from Targeter	Unplug Targeter wait 10 seconds, plug back in
	Damaged Targeter	Replace Targeter with new unit
Probe not recognized	Error reading data from probe	Unplug probe, wait 10 seconds, plug back in
	Damaged probe	Replace probe with new unit
Probe will not insert to the proper depth in the nail	Obstruction within the nail cannulation	Re-insert the ball tip guide rod into the nail cannulation to clear any obstruction
Nail not visible on the screen	Metal interference within the TRIGEN SURESHOT electromagnetic field	Remove any metal objects from the targeting field
	TRIGEN SURESHOT Targeter and probe not within range of each other	Move the TRIGEN SURESHOT Targeter closer to the sensor end of the probe
Drill bit too short	Short drill bit being used and long drill sleeve option selected within software	Press “Menu”, “Drill Sleeve” and **select the short drill sleeve option** and use the short drill bit
Drill bit too long	Long drill bit being used and short drill sleeve option selected within software	Press “Menu”, “Drill Sleeve” and **select the long drill sleeve option** and use the long drill bit

Problem	Possible cause	Suggested action
Red and Green targeting circles representing the drill sleeve appear incorrect	Incorrect drill sleeve length selected	Verify the correct drill sleeve length is selected from the software menu
	Metal interference within the TRIGEN® SURESHOT® electromagnetic field	Remove any metal objects from the targeting field
	Probe not inserted correctly within set stop	Verify probe is oriented and seated correctly in the notches of the set stop
	Damaged probe	Verify probe accuracy with Field Accuracy Gauge
Targeting missed the intended hole	Metal interference within the TRIGEN SURESHOT electromagnetic field	Remove any metal objects from the targeting field
	Probe not inserted correctly within set stop	Verify probe is oriented and seated correctly in the notches of the set stop
	Damaged probe	Verify probe accuracy with Field Accuracy Gauge
Drill sleeve cannot be removed from TRIGEN SURESHOT Targeter	Over-tightening of drill sleeve	Use the Slotted Hammer from the instrument tray as a wrench to unscrew the drill sleeve counter-clockwise from the Targeter
The 4.7mm/4.0mm step drill will not fit through the drill sleeve	Not compatible with the TRIGEN SURESHOT Distal Targeting System	Only use the long (7169-2811) and short (7169-2810) drills designated for use with the TRIGEN SURESHOT Distal Targeting System
Field Accuracy Check fails	Metal interference within the TRIGEN SURESHOT electromagnetic field	Remove any metal objects from the targeting field
	Field Accuracy Gauge improperly installed on Targeter	Verify Field Accuracy gauge is fully seated within Targeter port and knob is hand tightened to Targeter
	META Set Stop improperly installed on Field Accuracy Gauge	Verify META Set Stop is correctly oriented and tightened securely to Field Accuracy Gauge
	Probe is incorrectly inserted within META Set Stop	Verify probe is oriented properly and inserted to the “REF” notches on probe body
	Probe is damaged	Replace probe with a new probe
	Targeter is damaged	Replace Targeter with a new Targeter and return old one for service

Instruments for blocking screw insertion



Tibia Blocking Screw Attachment
Cat. No. 7165-4509



11.0mm T-handle Awl
Cat. No. 7165-4522



T-handle
Cat. No. 7167-4076



8.5mm/10.0mm Screw Cartridge
Cat. No. 7165-4511



11.5mm/13.0mm Screw Cartridge
Cat. No. 7165-4513



Offset Blocking Screw Cartridge
Cat. No. 7165-4514



Blocking Screw Alignment Pin
Cat. No. 7165-4523

4.0mm Long Pilot Drill*
Cat. No. 7163-1110



4.0mm Drill Sleeve
Cat. No. 7163-1156



9.0mm Drill Sleeve
Cat. No. 7163-1152



Medium Hexdriver
Cat. No. 7163-1066



Mini Connector
Cat. No. 7163-1186



Blocking Screw Device
Cat. No. 7165-4515

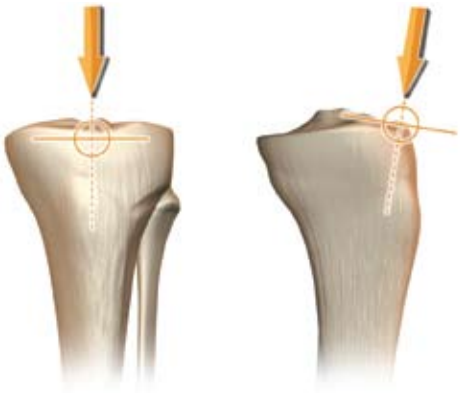
* 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)

Blocking screw technique

Incision and entry point

A 2cm incision is made in line with the intramedullary canal. This may be patellar splitting, medial or lateral parapatellar in its orientation.

The entry point is located just medial to the lateral tibial eminence in the AP view and in line with the anterior cortex and intramedullary canal in the lateral.



Entry portal acquisition

Insert the 11.0mm T-handle Awl (7165-4522) manually to a depth just proximal to the fracture.

Note When creating the initial entry point, pay close attention to the trajectory of the awl and the relationship to the anatomic axis of the tibia. Correct awl trajectory in the proximal fragment must be established prior to alignment with the anatomic axis of the distal fragment. This will ensure accurate fracture reduction when the nail is inserted.



AP blocking screw insertion

In order to prevent varus or valgus malalignment of the proximal fragment, blocking screws may be placed in the AP plane. Attach the Blocking Screw Device (7165-4515) to the 11.0mm T-handle Awl and move it into the desired position in the AP plane.

Note The Blocking Screw Alignment Pins (7165-4523) can be screwed into the three (3) threaded holes on the metal handle of the Blocking Screw Device to serve as external points of reference during fracture alignment.



Tighten the device to the awl and insert the appropriate Blocking Screw Cartridge (7165-4511, 7165-4513, 7165-4514). Adjust the Cartridge proximally or distally within the Blocking Screw Device to determine blocking screw position.



Insert the gold 9.0mm Drill Sleeve and silver 4.0mm Drill Sleeve into the desired cartridge hole and down to bone. Drill both cortices with the 4.0mm Long Pilot Drill*. Screw length is determined by reading the exposed drill bit calibrations or by removing the 4.0mm Drill Sleeve and measuring with the Screw Depth Gauge. Insert the screw with the Medium Hexdriver/T-handle assembly until the screw engages the far cortex.

Note Use caution during drilling and insertion of blocking screws in the AP plane. Plunging the drill bit past the posterior cortex or insertion of a screw that is too long may damage the neurovascular structures located posterior to the proximal tibia.



* 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)

Following implantation of the proximal blocking screw and fracture reduction, pass the 11.0mm T-handle Awl into the distal fragment.

Reposition either the Blocking Screw Cartridge or the awl as necessary and follow the previously described technique for blocking screw insertion.



ML blocking screw insertion

In order to prevent anterior or posterior malalignment of the proximal fragment, blocking screws may also be placed in the ML plane. Attach the Blocking Screw Device to the 11.0mm T-handle Awl and rotate it into the desired position in the ML plane.



Tighten the device to the awl and insert the appropriate Blocking Screw Cartridge. Adjust the cartridge proximally or distally within the Blocking Screw Device to determine blocking screw position. Blocking screw insertion follows the previously described technique.



Blocking screw Insertion with reducer

Blocking screw insertion can also be performed by attaching the Blocking Screw Device to the Reducer instead of the 11.0mm T-handle Awl. Blocking screw insertion follows the previously described technique.



Final view: AP and ML blocking screw insertion

Once blocking screw insertion is complete, remove the Blocking Screw Device from the 11.0mm T-handle Awl or Reducer and obtain both AP and lateral radiographic images to confirm accurate placement.

The awl or Reducer provides a good indication of the nail's insertion trajectory based upon the location of the blocking screws. Following confirmation of proper screw placement, proceed with nail insertion following the META-NAIL® Tibial Nail insertion technique.



Stability blocking screw insertion

Following nail insertion and confirmation of fracture reduction, blocking screws can be placed on either side of the nail in the metaphyseal region for additional stability. Screws may be inserted in both the AP and ML planes.

With the nail inserted, attach the Tibial Blocking Screw Attachment (7165-4509) to the Anterior Drop (Triangle to Triangle for AP screws and Square to Square for ML screws). Follow the previously described technique for Cartridge positioning and blocking screw insertion.

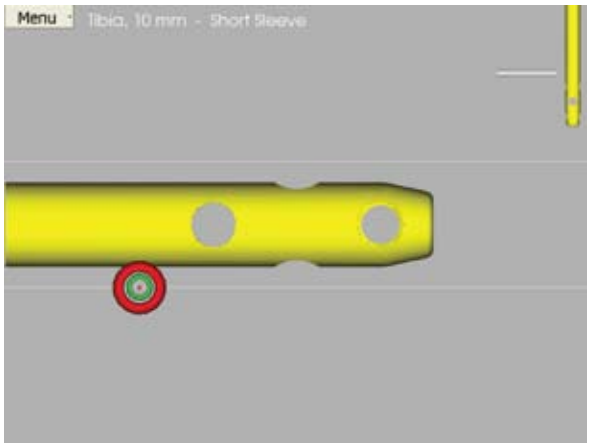
Note The AP blocking screws targeted through the two (2) holes built into the Anterior Drop cannot be used if the most inferior oblique proximal locking screw has been inserted.





Distal blocking screws with TRIGEN® SURESHOT®

The white lines displayed on either side of the IM nail can be used for targeting blocking screws. These lines are located 2.5mm from the side of the IM nail for all IM nails 10mm and larger in diameter. These lines are located 2mm from the sides of 8.5mm IM nails.



Final view: Stability blocking screws

Once stability blocking screw insertion is complete, remove the Blocking Screw Attachment and Anterior Drop from the drill guide and obtain both AP and lateral radiographic images to confirm accurate placement.





TRIGEN® nail cap insertion: *optional*

Remove the drill guide/Anterior Drop assembly. Attach the selected Nail Cap to the Medium Hexdriver/T-handle assembly and insert into the top of the nail until tight.

A Nail Cap cannot be used if a Nail Cap Set Screw is implanted or if a locking screw is inserted in the dynamic locking position. The tip of the Nail Cap will contact the locking screw and prevent complete engagement of the Nail Cap with the nail.

Note If cross-threading occurs, rotate the Nail Cap counterclockwise until its threads line up with those of the nail. Proceed with insertion until tight.



Instruments for implant removal

3.2mm Tip Threaded Guide Wire
Cat. No. 7163-1690



Mini Connector
Cat. No. 7163-1186



12.5mm Entry Reamer
Cat. No. 7163-1116



Disposable Nail Extractor***
Cat. No. 7163-1320



Cannulated Impactor-Medium
Cat. No. 7167-5081



Cannulated Impactor-Long**
Cat. No. 7163-1185



T-handle
Cat. No. 7167-4076



3.0mm x 1000mm Ball Tip Guide Rod*
Cat. No. 7163-1626



Medium Hexdriver
Cat. No. 7163-1066



Slotted Hammer
Cat. No. 7167-4082

* Additional guide rods listed on page 53
** The Cannulated Impactor-Long is located in the original TRIGEN® Instrument Set (7163-1326)
*** The Disposable Nail Extractor (7163-1320) is interchangeable with the Large Nail Extractor (7163-1278) located in the original TRIGEN Instrument Set (7163-1326) and the HFN® Instrument Set (7170-0001)

Nail extraction: *optional*

Standard technique

Remove the Nail Cap or Nail Cap Set Screw if implanted and all of the distal locking screws with the Medium Hexdriver/T-handle assembly. Remove all of the proximal locking screws except for one in the same manner.

Thread the Cannulated Impactor-Medium (7167-5081) or Cannulated Impactor-Long (7163-1185)* into the back of the Disposable Nail Extractor (7163-1320)** and then thread the assembly into the top of the nail. Remove the remaining proximal locking screw and then extract the nail with a back-slapping motion using the Slotted Hammer.



Percutaneous technique

This technique assumes the absence of a Nail Cap or Nail Cap Set Screw. Remove all distal locking screws and all but one of the proximal locking screws as previously described. Under fluoroscopy, insert a 3.2mm Tip Threaded Guide Wire (7163-1690) into the top of the nail on power or by hand. Make a 2cm incision around the pin and advance the 12.5mm Entry Reamer over the pin and into the top of the nail to remove any bony ingrowth.



Thread the Cannulated Impactor-Medium or Cannulated Impactor-Long* (7163-1185) into the back of the Disposable Nail Extractor** (7163-1320) and then thread the assembly into the top of the nail. Remove the remaining proximal locking screw and then extract the nail with a back-slapping motion.



Note The tip of the Entry Reamer is straight for approximately 1cm before flaring out. It is this portion of the Entry Reamer that enters the top of the nail.

*The Cannulated Impactor-Long is located in the original TRIGEN® Instrument Set (7163-1326)
**The Disposable Nail Extractor (7163-1320) is interchangeable with the Large Nail Extractor located in the original TRIGEN Instrument Set (7163-1326) and the HFN® Instrument Set (7170-0001)

An alternative method for extraction

Guide rod jamming technique

Advance the end of a 3.0mm Ball Tip Guide Rod through the end of the nail. Insert a 2.0mm Smooth Guide Rod (7111-8280) in the same manner. With both guide rods in place, attach the Gripper to the end of the 3.0mm Ball Tip Guide Rod and pull it back so that it wedges the ball tip against the 2.0mm Smooth Guide Rod. Backslap against the Gripper with the Slotted Hammer to extract the nail.

Guide rods

Cat. No.	Description
7111-8280	2.0mm x 900mm Smooth (RUSSELL-TAYLOR® System)*
7111-8202	3.0mm x 900mm Ball Tip (RUSSELL-TAYLOR System)*
7163-1626	3.0mm x 1000mm Ball Tip (TRIGEN® System)

Additional removal items

Cat. No.	Description
115074	Large Extractor Hook*
115073	Small Extractor Hook*
914658	Large Easy Out**
914659	Small Easy Out**

*Available sterile packed. For nail removal only, do not use for nail insertion
**Located in RUSSELL-TAYLOR Extraction Kit (Set #7508) available through Loaners

Catalog information – TRIGEN◇ META-NAIL◇ Implants

TRIGEN Internal Captured Screws 4.5mm and 5.0mm

Set No. 7163-1321

Cat. No.	Length
7164-2125	4.5mm x 25mm
7164-2130	4.5mm x 30mm
7164-2135	4.5mm x 35mm
7164-2140	4.5mm x 40mm
7164-2145	4.5mm x 45mm
7164-2150	4.5mm x 50mm

Cat. No.	Length
7164-2225	5.0mm x 25mm
7164-2230	5.0mm x 30mm
7164-2235	5.0mm x 35mm
7164-2240	5.0mm x 40mm
7164-2245	5.0mm x 45mm
7164-2250	5.0mm x 50mm
7164-2255	5.0mm x 55mm
7164-2260	5.0mm x 60mm
7164-2265	5.0mm x 65mm
7164-2270	5.0mm x 70mm
7164-2275	5.0mm x 75mm



4.5mm



5.0mm

TRIGEN META-NAIL 8.5mm Tibial

Set No. 7165-3002

Cat. No.	Length	Availability
7165-5018*	18cm	Outlier
7165-5020*	20cm	Outlier
7165-5022*	22cm	Outlier
7165-5024	24cm	Implant set
7165-5026	26cm	Implant set
7165-5028	28cm	Implant set
7165-5029	29cm	Outlier
7165-5030	30cm	Implant set
7165-5031	31cm	Outlier
7165-5032	32cm	Implant set
7165-5033	33cm	Implant set
7165-5034	34cm	Implant set

Cat. No.	Length	Availability
7165-5035	35cm	Implant set
7165-5036	36cm	Implant set
7165-5037	37cm	Implant set
7165-5038	38cm	Implant set
7165-5039	39cm	Outlier
7165-5040	40cm	Outlier
7165-5041	41cm	Outlier
7165-5042	42cm	Outlier
7165-5043*	43cm	Outlier
7165-5044*	44cm	Outlier
7165-5046	46cm	Outlier
7165-5048	48cm	Outlier
7165-5050	50cm	Outlier



* Available through special order

TRIGEN® META-NAIL® 10mm Tibial

Set No. 7165-3000

Cat. No.	Length	Availability
7165-5118*	18cm	Outlier
7165-5120*	20cm	Outlier
7165-5122*	22cm	Outlier
7165-5124*	24cm	Outlier
7165-5126	26cm	Outlier
7165-5128	28cm	Implant set
7165-5129	29cm	Outlier
7165-5130	30cm	Implant set
7165-5131	31cm	Outlier
7165-5132	32cm	Implant set
7165-5133	33cm	Outlier
7165-5134	34cm	Implant set

Cat. No.	Length	Availability
7165-5135	35cm	Implant set
7165-5136	36cm	Implant set
7165-5137	37cm	Implant set
7165-5138	38cm	Implant set
7165-5139	39cm	Implant set
7165-5140	40cm	Implant set
7165-5141	41cm	Outlier
7165-5142	42cm	Outlier
7165-5143	43cm	Outlier
7165-5144	44cm	Outlier
7165-5146*	46cm	Outlier
7165-5148*	48cm	Outlier
7165-5150*	50cm	Outlier



TRIGEN META-NAIL 11.5mm Tibial

Set No. 7165-3001

Cat. No.	Length	Availability
7165-5218*	18cm	Outlier
7165-5220*	20cm	Outlier
7165-5222*	22cm	Outlier
7165-5224*	24cm	Outlier
7165-5226	26cm	Outlier
7165-5228	28cm	Outlier
7165-5229	29cm	Outlier
7165-5230	30cm	Implant set
7165-5231	31cm	Outlier
7165-5232	32cm	Implant set
7165-5233	33cm	Outlier
7165-5234	34cm	Implant set

Cat. No.	Length	Availability
7165-5235	35cm	Implant set
7165-5236	36cm	Implant set
7165-5237	37cm	Implant set
7165-5238	38cm	Implant set
7165-5239	39cm	Implant set
7165-5240	40cm	Implant set
7165-5241	41cm	Outlier
7165-5242	42cm	Outlier
7165-5243	43cm	Outlier
7165-5244	44cm	Outlier
7165-5246*	46cm	Outlier
7165-5248*	48cm	Outlier
7165-5250*	50cm	Outlier



* Available through special order

Catalog information – TRIGEN◇ META-NAIL◇ Implants

TRIGEN META-NAIL 13mm Tibial

Cat. No.	Length	Availability
7165-5318*	18cm	Outlier
7165-5320*	20cm	Outlier
7165-5322*	22cm	Outlier
7165-5324*	24cm	Outlier
7165-5326*	26cm	Outlier
7165-5328*	28cm	Outlier
7165-5329*	29cm	Outlier
7165-5330	30cm	Outlier
7165-5331	31cm	Outlier
7165-5332	32cm	Outlier
7165-5333	33cm	Outlier
7165-5334	34cm	Outlier

Cat. No.	Length	Availability
7165-5335	35cm	Outlier
7165-5336	36cm	Outlier
7165-5337	37cm	Outlier
7165-5338	38cm	Outlier
7165-5339	39cm	Outlier
7165-5340	40cm	Outlier
7165-5341	41cm	Outlier
7165-5342	42cm	Outlier
7165-5343	43cm	Outlier
7165-5344	44cm	Outlier
7165-5346*	46cm	Outlier
7165-5348*	48cm	Outlier
7165-5350*	50cm	Outlier



Nail Cap Set Screw

Cat. No. 7165-6000



TRIGEN Nail Caps

Cat. No.	Length
7163-4000	0mm
7163-4005	5mm
7163-4010	10mm

Cat. No.	Length
7163-4015	15mm
7163-4020	20mm



* Available through special order

Catalog information – TRIGEN◇ META-NAIL◇ Implants

TRIGEN META-NAIL Blocking Screw Instruments

Set No. 7165-4001

Blocking Screw Device
Cat. No. 7165-4515



Tibial Blocking Screw Attachment
Cat. No. 7165-4509



11.0mm T-handle Awl
Cat. No. 7165-4522



8.5mm/10mm Blocking Screw Cartridge
Cat. No. 7165-4511



11.5mm/13mm Blocking Screw Cartridge
Cat. No. 7165-4513



Offset Blocking Screw Cartridge
Cat. No. 7165-4514



Blocking Screw Alignment Pin
Cat. No. 7165-4523



Retrograde Femoral Blocking Screw Attachment*
Cat. No. 7165-4508



Blocking Screw Instrument Case
Cat. No. 7165-4552

Blocking Screw Instrument Lid
Cat. No. 7165-4553



* Not used in META-NAIL tibial technique

Catalog information – TRIGEN◇ META-NAIL◇ Instruments

TRIGEN META-NAIL Blocking Screw Instruments

Set No. 7165-4002

META-NAIL Anterior Drop
Cat. No. 7165-4501



META-NAIL Drill Guide
Cat. No. 7165-4502



META-NAIL Extension Drill Guide
Cat. No. 7165-4503



Extension Guide Bolt (23mm)
Cat. No. 7165-4505



Guide Bolt Long (51mm)
Cat. No. 7165-4506



META-NAIL Instrument Case
Cat. No. 7165-4551

META-NAIL Instrument Lid
Cat. No. 7165-4550



Long Screw Length Sleeve
Cat. No. 7165-4520



Cannulated Impactor-Short
Cat. No. 7165-4554



Instruments used if you have TRIGEN® Base Set

Set No. 7167-4012

Medium Hexdriver
Cat. No. 7163-1066



Short Hexdriver
Cat. No. 7163-1068



12.5mm Entry Reamer
Cat. No. 7163-1116



Guide Bolt Wrench
Cat. No. 7163-1140



9.0mm Drill Sleeve
Cat. No. 7163-1152



Multipurpose Driver
Cat. No. 7163-1161



Mini Connector
Cat. No. 7163-1186



Screw Depth Gauge
Cat. No. 7163-1189



Cannulated Awl
Cat. No. 7167-4000



Entry Portal Tube
Cat. No. 7167-4060



3.2mm T-handle Trocar
Cat. No. 7167-4074



Honeycomb
Cat. No. 7167-4075



Flexible Reamer Shaft
Cat. No. 7111-8200

Reamer Heads
Cat. No. 7111-8231-8246



Catalog information – TRIGEN◇ META-NAIL◇ Instruments

T-handle
Cat. No. 7167-4076



Reducer
Cat. No. 7167-4077



Obturator
Cat. No. 7167-4078



Ruler
Cat. No. 7167-4079



Gripper
Cat. No. 7167-4080



Cannulated Impactor-Medium
Cat. No. 7167-5081



Slotted Hammer
Cat. No. 7167-4082



4.0mm Drill Sleeve
Cat. No. 7167-4083



Screwdriver Release
Cat. No. 7167-4084



Screw Length Sleeve
Cat. No. 7167-4085



Entry Portal Handle
Cat. No. 7167-4092



Instruments used if you have existing TRIGEN® set

Set No. 7163-1326

Medium Hexdriver
Cat. No. 7163-1066



Short Hexdriver
Cat. No. 7163-1068



Gripper
Cat. No. 7163-1100



Entry Tool
Cat. No. 7163-1114



12.5mm Entry Reamer
Cat. No. 7163-1116



Obturator
Cat. No. 7163-1122



Reducer
Cat. No. 7163-1124

Ruler
Cat. No. 7163-1128



Guide Bolt Wrench
Cat. No. 7163-1140



Hammer
Cat. No. 7163-1150



9.0mm Drill Sleeve
Cat. No. 7163-1152



4.0mm Drill Sleeve
Cat. No. 7163-1156

Multipurpose Driver
Cat. No. 7163-1161



T-handle
Cat. No. 7163-1172



Catalog Information – TRIGEN® META-NAIL® Instruments

Mini Connector
Cat. No. 7163-1186



Screw Depth Gauge
Cat. No. 7163-1189



Screw Driver Release Handle
Cat. No. 7163-1208



Cannulated Impactor-Long
Cat. No. 7163-1185



Flexible Reamer Shaft
Cat. No. 7163-1192

Reamer Heads
Cat. No. 7111-8231-8242



META-NAIL Disposables

Set No. 7165-4003

4.0mm Long Pilot Drill*
Cat. No. 7163-1110

4.0mm Short Drill**
Cat. No. 7163-1117

3.0mm x 1000mm Ball Tip Guide Rod
Cat. No. 7163-1626

3.2mm Tip Threaded Guide Wire
Cat. No. 7163-1690

Universal Compression Driver
Cat. No. 7165-4528



Disposable Nail Extractor***
Cat. No. 7163-1320



* 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)
** 4.0mm Short Drill (7163-1117) is interchangeable with 4.0mm AO Short Drill (7163-1123)
*** The Disposable Nail Extractor (7163-1320) is interchangeable with the Large Nail Extractor (7163-1278) located in the original TRIGEN Instrument Set (7163-1326) and the HFN® Instrument Set (7170-0001)

Catalog information – TRIGEN® SURESHOT® Instruments

TRIGEN SURESHOT Targeting Interface

Cat. No. 7165-7000

Cat. No.	Device	Case Qty
7169-2802	Trauma Interface	1



TRIGEN SURESHOT Targeting Instrument Set

Set No. 7165-7001

Cat. No.	Description	Tray Qty
7169-2801	Targeter	1
7169-2804	Drill Sleeve, Long	2
7169-2805	Drill Sleeve, Short	2
7169-2806	META Set Stop	1
7169-2807	TAN® Set Stop	1
7169-2808	Field Accuracy Gauge	1
7169-2809	Hexdriver	1
7169-2816	TAN Anteversion Locking Guide	1
7169-2830	Targeting Instrument Tray	1
7169-2831	Targeting Instrument Tray Lid	1



TRIGEN SURESHOT Targeting Disposables Set

Set No. 7165-7002

Cat. No.	Description	Qty
7169-2810	AO Drill Bit, Short	2
7169-2811	AO Drill Bit, Long	1

Additional Disposables

Cat. No.	Description
7169-2803	META-NAIL® Semi-Extended Drill Guide Probe (used with TRIGEN META-NAIL Semi-Extended Instrument Set, 7165-4004)
7169-2814	META-NAIL Standard Drill Guide Probe (used with TRIGEN META-NAIL Nail Instrument Set, 7165-4002)
7169-2815	Percutaneous TAN/FAN Drill Guide Probe (used with TRIGEN Percutaneous TAN/FAN Instrument Set, 7163-2351)



TRIGEN SURESHOT Country Kit – North America

Cat. No. 7165-7003

Cat. No.	Description	Qty
6680-0193	Power Cord, 125 Volt 10 Amp – North America (Hospital Grade)	1
7118-1540	User Manual, English	1

Additional country kits

TRIGEN SURESHOT Country Kit – Australia

Cat. No. 7165-7004

Cat. No.	Description	Qty
6680-0303	Power Cord, 250 Volt 10 Amp – Australia/NZ	1
7118-1540	User Manual, English	1

TRIGEN SURESHOT Country Kit – Continental Europe

Cat. No. 7165-7005

Cat. No.	Description	Qty
6680-0291	Power Cord, 250 Volt 10 Amp – Continental Europe	1
7118-1540	User Manual, English	1

TRIGEN SURESHOT Country Kit – Germany

Cat. No. 7165-7006

Cat. No.	Description	Qty
6680-0291	Power Cord, 250 Volt 10 Amp – Continental Europe	1
7118-1538	User Manual, German	1

TRIGEN SURESHOT Country Kit – Spain

Cat. No. 7165-7007

Cat. No.	Description	Qty
6680-0291	Power Cord, 250 Volt 10 Amp – Continental Europe	1
7118-1539	User Manual, Spanish	1

TRIGEN SURESHOT Country Kit – France

Cat. No. 7165-7008

Cat. No.	Description	Qty
6680-0291	Power Cord, 250 Volt 10 Amp – Continental Europe	1
7118-1537	User Manual, French	1

TRIGEN SURESHOT Country Kit – Italy

Cat. No. 7165-7009

Cat. No.	Description	Qty
6680-0291	Power Cord, 250 Volt 10 Amp – Continental Europe	1
7118-1536	User Manual, Italian	1

TRIGEN SURESHOT Country Kit – United Kingdom

Cat. No. 7165-7011

Cat. No.	Description	Qty
6680-0213	Power Cord, 250 Volt 10 Amp – UK	1
7118-1540	User Manual, English	1

TRIGEN SURESHOT Country Kit – South Africa/India

Cat. No. 7165-7012

Cat. No.	Description	Qty
6680-0302	Power Cord, 250 Volt 10 Amp – So. Africa/India	1
7118-1540	User Manual, English	1

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