

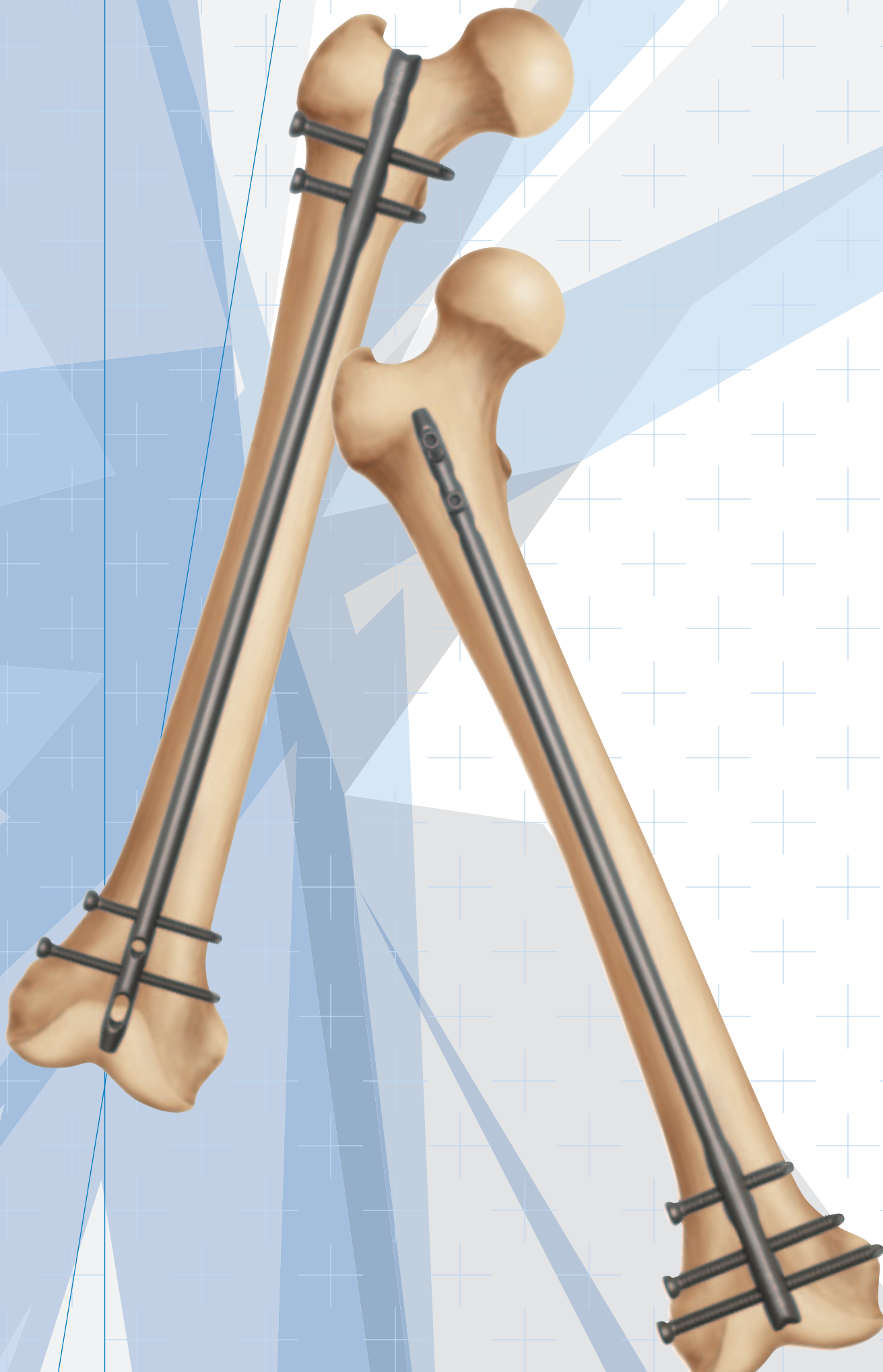


S U R G I C A L T E C H N I Q U E

FEMORAL UNIVERSAL NAILING SYSTEM

OPTIONS MADE EASY





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Note: This brochure presents a surgical technique available for use with the DePuy Orthopaedics, Inc., VersaNail® Platform instruments and implants. Surgeons may need to make modifications as appropriate in their own surgical technique with these devices depending on individual patient requirements.

OPTIONS MADE EASY

The DePuy VersaNail Femoral Universal Nail is part of a long bone nailing system that offers a complete portfolio of implants and instruments based on a single, standardized technology platform.

DESIGN SUMMARY

The Femoral Universal Nail System from the VersaNail Platform offers options to treat a range of femoral fractures using either an antegrade or retrograde approach with one implant. The VersaNail Platform instrumentation system is designed for intuitive assembly and ease-of-use by OR staff and surgeons, enabling a simpler and more efficient procedure. The instrumentation is designed to provide intra-operative options including entry portals, reduction tools and color-coded screw placement, while being standardized to maintain commonality across the platform.

IMPLANT MATERIAL

All implants are manufactured from Ti-6Al-4V grade, type II anodized titanium alloy (TiMAX™) due to this material's superior properties. TiMAX offers a lower modulus of elasticity and increased fatigue strength over stainless steel.

IMPLANT OVERVIEW

The Femoral Universal Nail is designed to treat:

- Femoral shaft fractures
- Proximal or mid-shaft femoral non-unions and malunions
- Pathologic fractures in osteoporotic bone of the diaphyseal area
- Revision procedures

Antegrade Locking Options

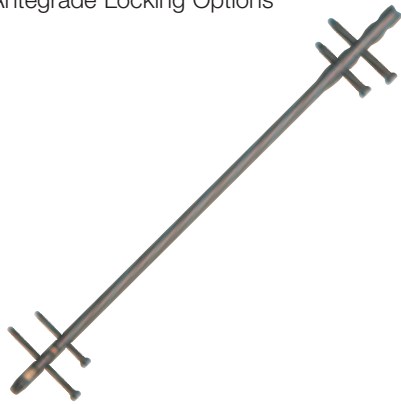


Fig. 1 The Universal Femoral Nail hole configurations provide a number of locking possibilities (Fig. 1). The Femoral Universal Nail is locked with 6.5 mm screws on the drive end and 4.5 mm screws on the non-drive end. The locking instrumentation is color-coded for ease of use.

Color Guide	Screw Size	Drill Bit Size
Black	6.5 mm Cortical	5.3 mm
Gold	6.5 mm Cancellous	6.5 mm/4.8 mm Step Drill
Silver	3.2 mm Guide Pin Sleeve	
Green	4.5 mm Cortical	3.8 mm

Retrograde Locking Option



UNIVERSAL ANTEGRADE SURGICAL TECHNIQUE



Fig. 2 Patient Positioning

Place the patient in the supine position on a fracture or radiolucent imaging table (Fig. 2). Lateral access to the proximal femur is required. The affected leg must be adducted and the trunk secured and bent toward the opposite side. The contralateral leg may be flexed at the hip or scissored below the affected leg.

Entry Site and Surgical Approach

Identify the entry site, which is in the piriformis fossa. The ideal entry point is adjacent to the greater trochanter at the lateral edge of the piriformis fossa.

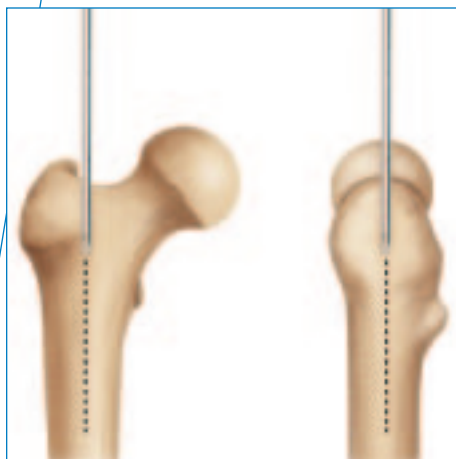


Fig. 3 Initiate the entry site with a 3.2 mm guide pin through a stab incision proximal to the trochanteric region, in line with the femoral axis. Confirm correct entry location and guide pin placement radiographically with AP and lateral views (Fig. 3). The guide pin placement should be in line with the center of the femoral canal in both views.

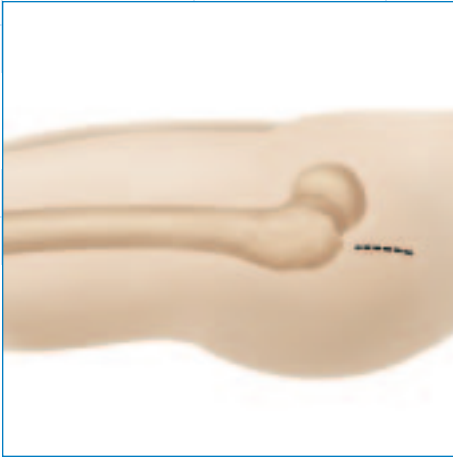


Fig. 4 Once the ideal entry point has been achieved, an appropriate incision can be made. Extend the entry incision 1-2 cm (Fig. 4).



Fig. 5 The entry portal sheath (Cat. No. 2810-13-005) and trocar (Cat. No. 2810-13-004) can be advanced over the guide pin down to the piriformis fossa. Parallel guide holes allow for accurate adjustment of pin positioning. Remove the trocar from the entry portal, keeping the guide pin in place. The entry portal sheath may be left in place to protect soft tissues during canal entry and reaming (Fig. 5).

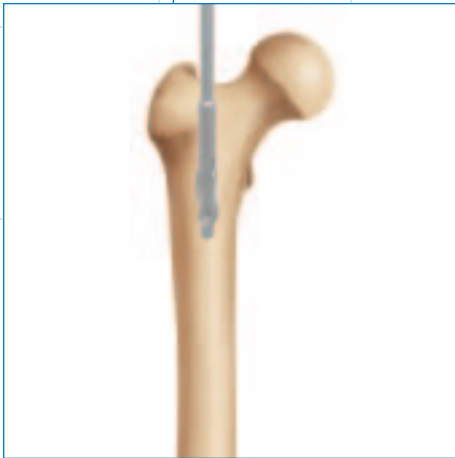


Fig. 6 Canal access can be obtained using either a cannulated entry reamer or cannulated awl (Cat. No. 2810-01-005). Both 12 mm (Cat. No. 2810-13-001) and 13 mm (Cat. No. 2810-13-002) entry reamers are available depending on surgeon preference. The proximal nail diameter is 12 mm for all nail sizes equal to or less than 12 mm, and 13 mm to 15 mm nails have a proximal diameter equal to the nail diameter. Use A/P and lateral fluoroscopic views to confirm accurate placement (Figs. 6 and 7). Use the awl or entry reamer to open the proximal femur in the piriformis fossa.

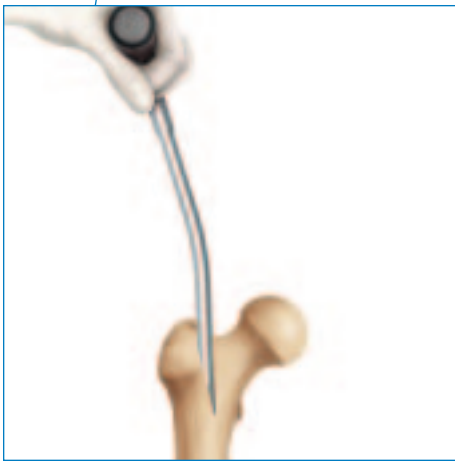


Fig. 7

Note: If utilizing the cannulated entry reamer, the length of the distal portion of the reamer is enlarged and matches the length of the drive end portion of the nail. Fluoroscopically verify the entry reamer has been inserted to the proper depth that will correspond with the depth of the nail.

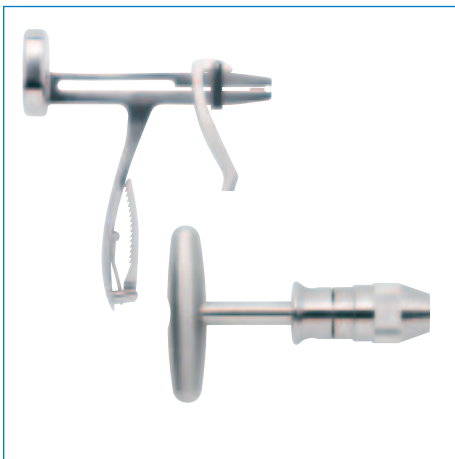


Fig. 8 Once access to the femoral canal has been gained, place the ball nose guide wire into the entry site utilizing the pistol-style guide wire gripper (Cat. No. 2810-01-001) (Fig. 8). If preferred, a T-handle guide wire gripper (Cat. No. 2810-01-002) is also available as an option.

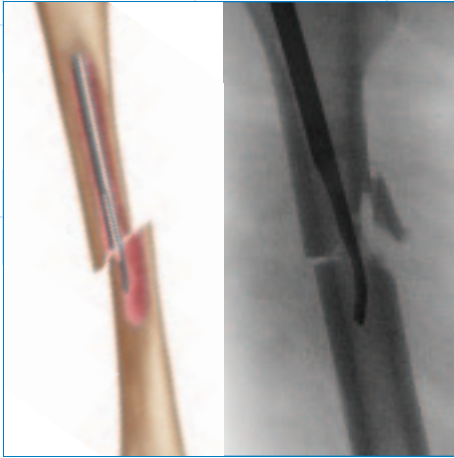


Fig. 9 Fracture Reduction

Once access to the femoral canal has been gained, obtain appropriate anatomic reduction in order to restore length, alignment and rotation of the injured limb. Reduction can be achieved through the surgeon's preferred method such as traction and/or an external fixator. To aid in manipulating the fracture fragments and passing the ball nose guide wire, large (7.5 mm diameter, Cat. No. 2810-01-007) and small (6.5 mm diameter, Cat. No. 2810-01-008) reduction tools are available (Fig. 9).

Insert the reduction tool into the medullary canal, past the fracture site. Once the fracture is aligned, pass the ball nose guide wire, available in both 80 cm (Cat. No. 2810-01-080) and 100 cm (Cat. No. 2810-01-100) lengths, across the fracture site. Remove the reduction tool.



Fig. 10 Canal Preparation

Achieve proper alignment of the fracture prior to reaming and maintain it throughout the reaming process to avoid eccentric reaming. Initiate reaming by placing the VersaNail Flexible Reamers over the DePuy 3.0 mm ball nose guide wire (Fig. 10). Ream the medullary canal in millimeter increments until cortical bone is reached and half-millimeter increments thereafter. Surgeon preference should dictate the actual extent of intramedullary reaming. Monitor the reaming procedure using image intensification to avoid eccentric or excessive cortical reaming.



Fig. 11 Nail Size Selection

An X-ray template including 10 percent magnification is available to determine nail size preoperatively (Cat. No. 2810-13-025) (Fig. 11).

Nail Diameter Selection

Generally, a nail diameter 1 mm to 1.5 mm less than the final reamer diameter is chosen. Femoral Universal Nails are available in 1 mm increments from 9 mm to 15 mm diameters.

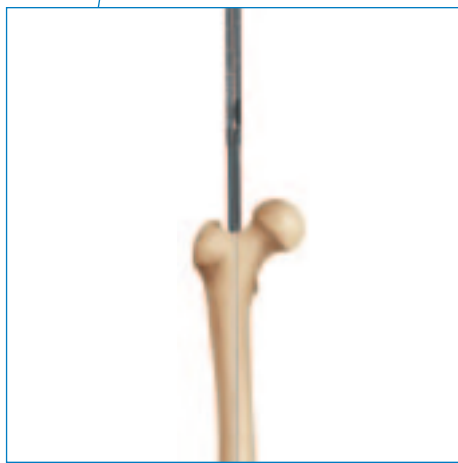


Fig. 12 Nail Length Selection

With the tip of the ball nose guide wire at the level of the desired depth of nail insertion, slide or snap the nail length gauge (Cat. No. 2810-01-031) onto the ball nose guide wire until the nose contacts the bone, ensuring the tip does not fall into the existing entry canal, which could result in an inaccurate measurement (Fig. 12).

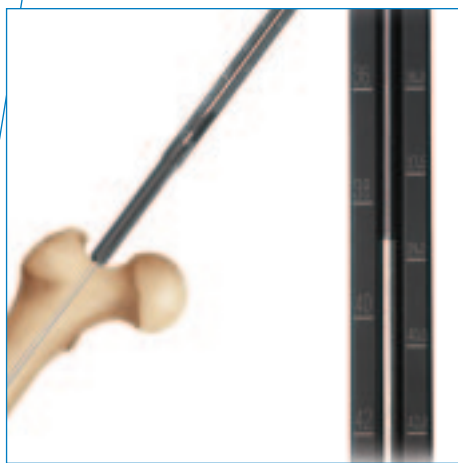


Fig. 13 To obtain the appropriate nail length, read the measurement mark on the nail length gauge that is closest to the beginning of the black transition area on the guide wire (Fig. 13). If a nail of the exact measured length is not available, choose a shorter nail of the next closest available length. A direct measurement can also be taken of the uninjured extremity using either radiographs with magnification markers, or directly on the uninjured limb.



Fig. 14 Nail/Jig Assembly

Place the nail on the femoral insertion handle in the correct orientation. The nail should be oriented on the femoral insertion handle such that the anterior bow of the nail is in line with the anterior bow of the femur and the jig is lateral to the nail. Secure the nail to the femoral insertion handle by inserting the femoral jig bolt (Cat. No. 2810-13-008) through the cannulation of the nose and tightening with the jig bolt driver (Cat. No. 2810-13-006) and T-handle (Cat. No. 2810-01-004) (Fig. 14).



Fig. 15 **Nail Insertion**

Once proper reduction has been achieved, insert the nail over the 3 mm ball nose guide wire into the medullary canal (Fig. 15). It is important not to strike the femoral insertion handle directly.



Fig. 16 Attach the hammer pad (Cat. No. 2810-13-011) to the insertion handle (Fig. 16). Ensure that the hammer pad is tightened thoroughly prior to impaction. Avoid excessive force when inserting the nail. If the nail jams in the medullary canal, extract it and choose the next-smaller diameter nail or enlarge the canal appropriately.



Fig. 17 **Note:** The femoral insertion handle is marked with three grooves (Fig. 17). The groove closest to the nail is an indicator for the nail/insertion handle junction. A K-wire can be inserted lateral to medial through the target arm if additional identification of the nail/insertion handle junction is needed. The middle groove is marked 5 mm from the top of the nail and the groove farthest from the nail is marked 15 mm from the top of the nail. Ensure the nail is seated to proper depth for planned dynamization.

Confirm fracture reduction and ensure appropriate nail insertion depth proximally and distally with biplanar fluoroscopy. Remove the ball nose guide wire.

Dynamization

A dynamic slot has been incorporated in the drive end and non-drive end of the nail. The drive end slot has a 10 mm range of dynamization. The non-drive end slot has a 5 mm range of dynamization. If dynamization is planned, countersink the nail to the appropriate depth to avoid backing out of the nail into the proximal soft tissues. Lock the M/L slot in the dynamic mode. Delayed dynamization may be performed at a later date with the removal of the static screws.



Fig. 18 Universal Target Arm Assembly

Attach the radiolucent universal target arm (Cat. No. 2810-13-009) onto the insertion handle, using the target arm attachment bolt (Cat. No. 2810-13-026) and hand tighten (Fig. 18). Ensure the target arm is properly secured to the insertion handle for excellent targeting.

Locking

Prior to locking both proximally and distally, check femoral length and rotational alignment. The nail can be locked either distally or proximally first, depending on surgeon preference.



Fig. 19 Proximal Locking

The universal target arm is marked to identify which locking option is being targeted (Fig. 19).



Fig. 20 Place 6.5 mm cortical locking screws using the black instrumentation (Fig. 20).



Fig. 21 Place the 6.5 mm screw sheath (Cat. No. 2810-13-020) and trocar (Cat. No. 2810-13-021) through the appropriate holes in the jig's targeting arm to locate the incision site (Fig. 21). Make a stab incision and advance the sheath and trocar to the bone. Soft tissue dissection should be completed sharp and precise to clear a path for the sheath. Undue soft tissue tension against the sheath can cause misdirect drilling.



Fig. 22 **Note:** A 3.2 mm x 17.5 in guide pin (Cat. No. 9030-03-004) and 3.2 mm pin guide sleeve (Cat. No. 2810-13-018) can be used to verify screw position prior to drilling (Fig. 22).



Fig. 23 Remove the trocar and replace it with the 5.3 mm drill sleeve (Cat. No. 2810-13-022) (Fig. 23).

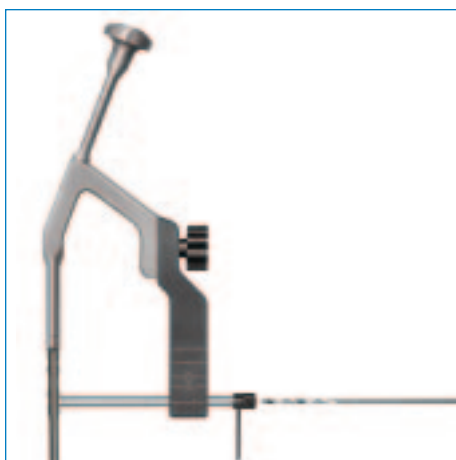


Fig. 24 Utilizing the 5.3 mm drill bit (Cat. No. 2810-13-153) drill through the drill sleeve and sheath until the far cortex is penetrated (Fig. 24).

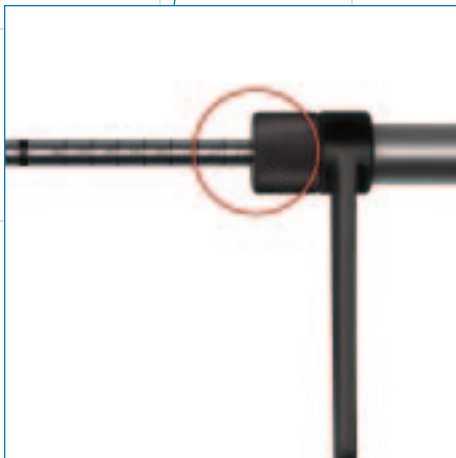


Fig. 25 Read the calibration on the drill bit that lines up with the drill sleeve to determine the screw length (Fig. 25).



Fig. 26 If further screw length is required, or if the locking hole has been initiated with a guide pin, a 6.5 mm screw depth gauge (Cat. No. 2810-13-035) is available to read screw length off of the 3.2 mm x 17.5 in guide pin (Fig. 26).



Fig. 27 Verify fluoroscopically to assure the proper screw length selection. Remove the drill sleeve. Using the 6.5 mm screwdriver shaft (Cat. No. 2810-13-024), insert the 6.5 mm cortical screw through the sheath. The etch mark on the screwdriver corresponds with the screw sheath to indicate when the screw is fully seated (Fig. 27).

Repeat above steps for additional screw placement.

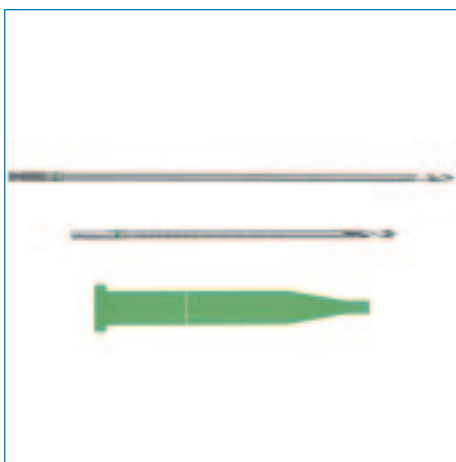


Fig. 28 Distal Locking

Place 4.5 mm cortical locking screws using the green instrumentation (Fig. 28).



Fig. 29 Use fluoroscopy to conduct freehand locking utilizing a familiar freehand technique. A black radiolucent wand (Cat. No. 2810-12-016) is available to aid in freehand locking (Fig. 29).

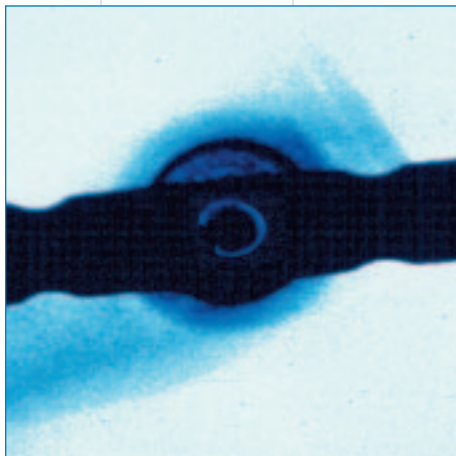


Fig. 30 Accurate C-arm position is confirmed when the distal nail hole appears to be a perfect circle. Once correct placement has been verified fluoroscopically, make a stab wound in direct alignment with the distal hole (Fig. 30).

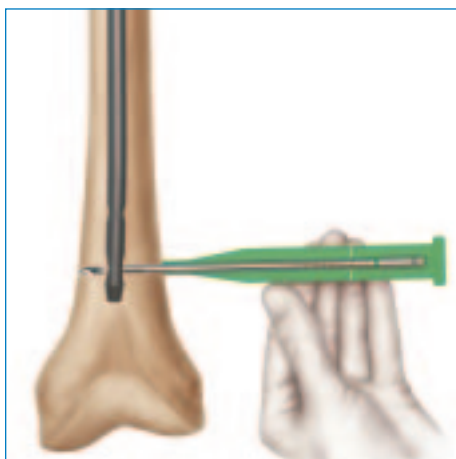


Fig. 31 Using the 3.8 mm drill bit (Cat. No. 6 in: 2810-12-138 or 8 in: 2810-13-138), drill until the second cortex is penetrated. Verify the drill bit position fluoroscopically prior to taking any measurements. Place the green 4.5 mm screw length gauge (Cat. No. 2810-01-032) onto the calibrated drill bit and advance down to the bone. Read the calibration on the drill bit that corresponds to the measurement line indicated on the screw length gauge (Fig. 31). A screw depth gauge (Cat. No. 2810-01-017) is also provided for further screw length verification. *For an accurate reading, take care to ensure the 4.5 mm screw length gauge or screw depth gauge sheath is fully seated on the bone.*

Remove the drill bit and advance the 4.5 mm screw. Repeat above steps for additional screw placement. The SolidLok™ screwdriver (Cat. Nos. 2810-01-020 and 2810-01-021) can be utilized to capture the screw while passing it through soft tissue during screw placement.

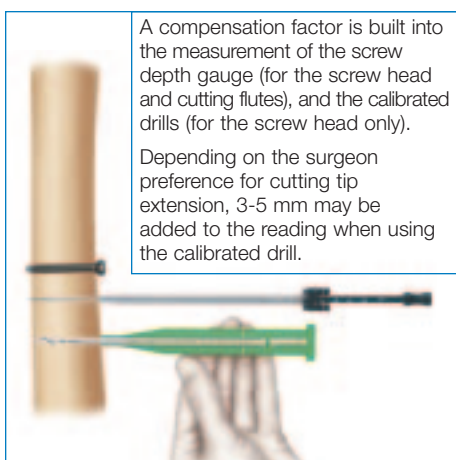


Fig. 32 Determining Screw Length

The screw size indicates the total measurement from the tip to the screw head. The calibrated drills and the screw depth gauges have a compensation factor built into the measurement such that the reading should indicate the exact size screw to achieve bi-cortical purchase. To ensure a proper reading, the screw depth gauge and drill sleeves must be touching bone. Fluoroscopy is recommended to verify the correct screw length (Fig. 32).

UNIVERSAL RETROGRADE SURGICAL TECHNIQUE

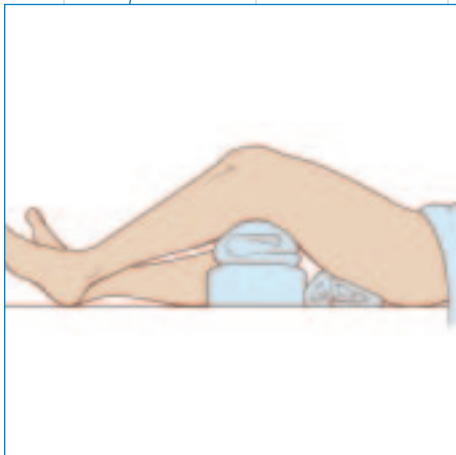


Fig. 33 Patient Positioning

Place the patient in the supine position on a fracture or radiolucent imaging table (Fig. 33). Place the knee in approximately 45 degrees of flexion. Use manual traction, a femoral distractor or an external fixator to reduce severely displaced fractures and maintain length. Special attention is needed to maintain proper length when using a retrograde approach to treat a comminuted fracture.

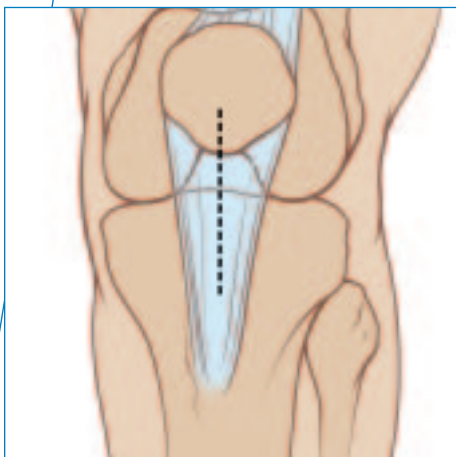


Fig. 34 Entry Site and Surgical Approach

Identify the entry site, which is above the intercondylar notch (Fig. 34).

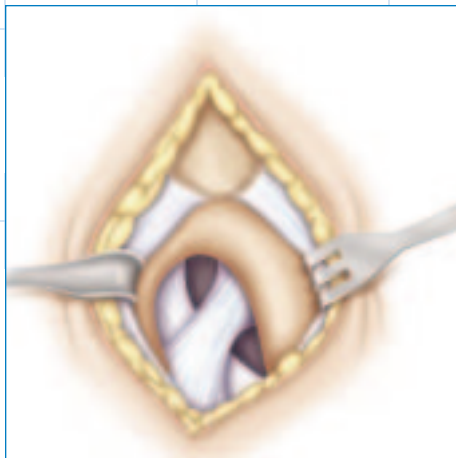


Fig. 35 Approach the distal femur through a midline longitudinal incision between the patella and the tibial tubercle (Fig. 35). Obtain access to the intercondylar notch by splitting the tendon longitudinally or displacing the tendon laterally.

Alternative approach: Approach the distal femur through a longitudinal incision from the superior pole of the patella to the tibial tubercle, placed along the medial border of the patellar tendon. Expose the intercondylar notch by using retractors to reflect the patellar tendon laterally or perform the procedure percutaneously.

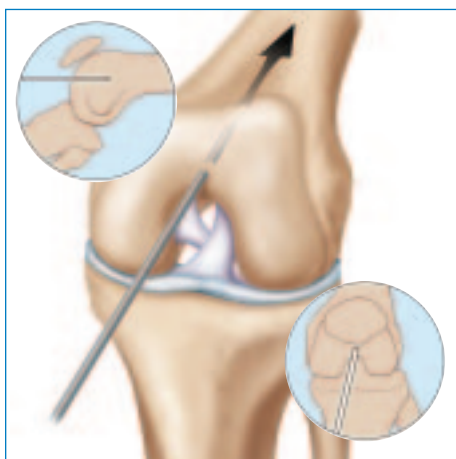


Fig. 36 Place the guide pin in the center of the intercondylar notch approximately 1 cm anterior to the posterior cruciate ligament and confirm accurate guide pin placement in two planes fluoroscopically prior to reaming. The guide pin placement should be in line with the center of the femoral canal in both views (Fig. 36).



Fig. 37 Canal access can be obtained using either a cannulated entry reamer or cannulated awl (Cat. No. 2810-01-005) (Figs. 37 and 38). Both 12 mm (Cat. No. 2810-13-001) and 13 mm (Cat. No. 2810-13-002) entry reamers are available depending on surgeon preference. The distal (drive end) nail diameter is 12 mm for all nail sizes equal to or less than 12 mm, and 13 mm to 15 mm nails have a distal diameter equal to the nail diameter. Use A/P and lateral fluoroscopic views to confirm accurate placement. Use the awl or entry reamer to open the distal femur in the intercondylar notch. As an option, an entry portal sleeve (Cat. No. 2810-12-001) is available for soft tissue protection, as great care must be taken to protect the undersurface of the patella.

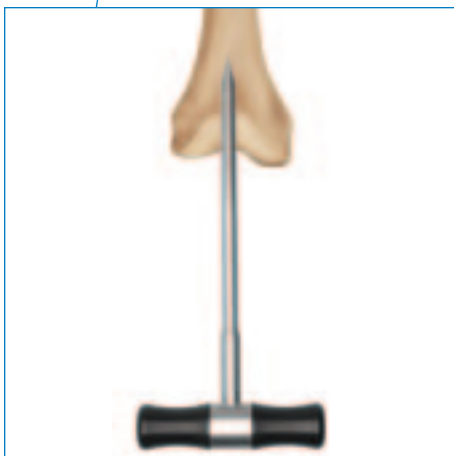


Fig. 38

Note: If utilizing the cannulated entry reamer, the length of the distal portion of the reamer is enlarged and matches the length of the drive end portion of the nail. Fluoroscopically verify the entry reamer has been inserted to the proper depth that will correspond with the depth of the nail.

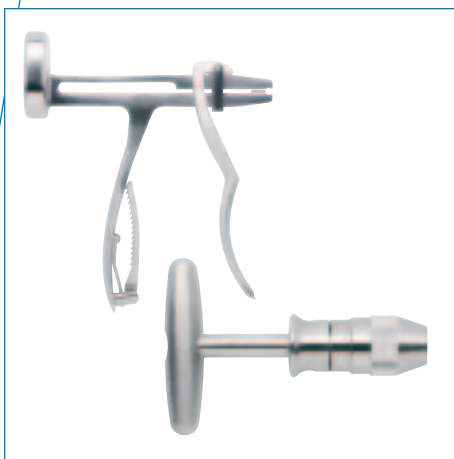


Fig. 39 Once access to the femoral canal has been gained, place the ball nose guide wire into the entry site utilizing the pistol-style guide wire gripper (Cat. No. 2810-01-001) (Fig. 39). If preferred, a T-handle guide wire gripper (Cat. No. 2810-01-002) is also available as an option.

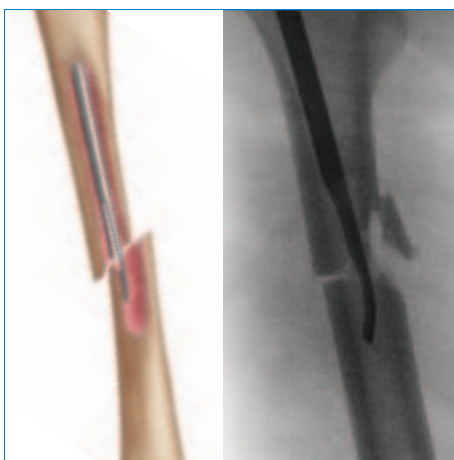


Fig. 40 Fracture Reduction

Obtain appropriate anatomic reduction in order to restore length, alignment and rotation of the injured limb. Reduction can be achieved through the surgeon's preferred method such as traction and/or an external fixator. To aid in manipulating the fracture fragments and passing the ball nose guide wire, large (7.5 mm diameter, Cat. No. 2810-01-007) and small (6.5 mm diameter, Cat. No. 2810-01-008) reduction tools are available (Fig. 40). Insert the reduction tool into the medullary canal, past the fracture site. Once the fracture is aligned, pass the ball nose guide wire, available in both 80 cm (Cat. No. 2810-01-080) and 100 cm (Cat. No. 2810-01-100) lengths, across the fracture site. Remove the reduction tool.



Fig. 41 Canal Preparation

Achieve proper alignment of the fracture prior to reaming and maintain it throughout the reaming process to avoid eccentric reaming. Initiate reaming by placing the VersaNail Flexible Reamers over the DePuy 3.0 mm ball nose guide wire (Fig. 41). Ream the medullary canal in millimeter increments until cortical bone is reached and half-millimeter increments thereafter. Surgeon preference should dictate the actual extent of intramedullary reaming. Monitor the reaming procedure using image intensification to avoid eccentric or excessive cortical reaming.



Fig. 42 Nail Size Selection

An X-ray template including 10 percent magnification is available to determine nail size preoperatively (Cat. No. 2810-13-025) (Fig. 42).

Nail Diameter Selection

Generally, a nail diameter 1 mm less than the final reamer diameter is chosen. Universal Femoral Nails are available in 1 mm increments from 9 mm to 15 mm diameters.



Fig. 43 Nail Length Selection

With the tip of the ball nose guide wire at the level of the desired depth of nail insertion, slide or snap the nail length gauge (Cat. No. 2810-01-031) onto the ball nose guide wire until the nose contacts the bone, ensuring the tip does not fall into the existing entry canal, which could result in an inaccurate measurement (Fig. 43).

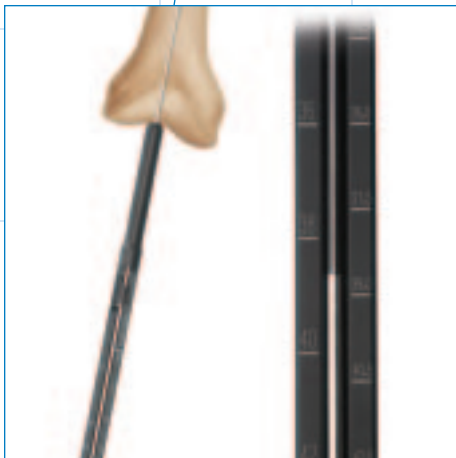


Fig. 44 To obtain the appropriate nail length read the measurement mark on the nail length gauge that is closest to the beginning of the black transition area on the guide wire (Fig. 44). The selected nail length must be at least 5 mm less than the measured length to allow for the required recessing of the drive end of the nail, ensuring that the nail will not protrude into the patellofemoral joint. If the dynamization mode is to be used at the drive end of the nail, nail length should be further appropriately shortened. If a nail of the exact measured length is not available, choose a shorter nail of the next closest available length. A direct measurement can also be taken of the uninjured extremity using either radiographs with magnification markers, or directly on the uninjured limb.



Fig. 45 Nail/Jig Assembly

Place the nail on the femoral insertion handle in the correct orientation. The nail should be oriented on the femoral insertion handle such that the anterior bow of the nail is in line with the anterior bow of the femur and the jig is lateral to the nail. Secure the nail to the femoral insertion handle by inserting the femoral jig bolt (Cat. No. 2810-13-008) through the cannulation of the nose and tightening with the jig bolt driver (Cat. No. 2810-13-006) and T-handle (Cat. No. 2810-01-004) (Fig. 45).

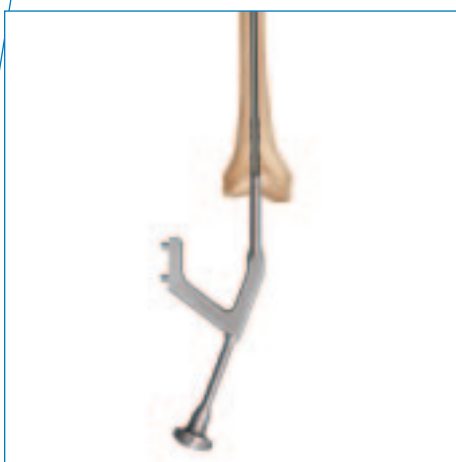


Fig. 46 Nail Insertion

Once proper reduction has been achieved, insert the nail over the 3 mm ball nose guide wire into the medullary canal (Fig. 46). It is important not to strike the femoral insertion handle directly.



Fig. 47 Attach the hammer pad (Cat. No. 2810-13-011) to the insertion handle (Fig. 47). Ensure that the hammer pad is tightened thoroughly prior to impaction. Avoid excessive force when inserting the nail. If the nail jams in the medullary canal, extract it and choose the next-smaller diameter nail or enlarge the canal appropriately.

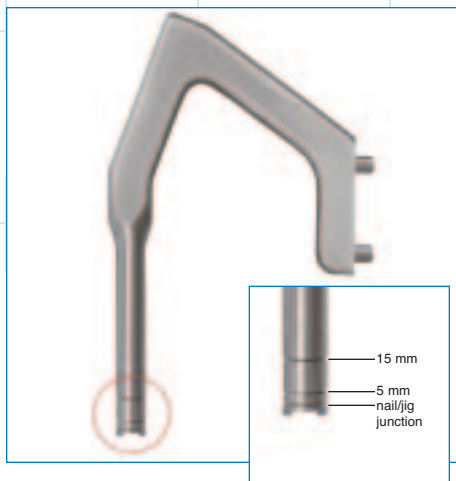


Fig. 48 **Note:** The femoral insertion handle is marked with three grooves (Fig. 48). The groove closest to the nail is an indicator for the nail/insertion handle junction. A K-wire can be inserted lateral to medial through the target arm if additional identification of the nail/insertion handle junction is needed. The middle groove is marked 5 mm from the top of the nail and the groove farthest from the nail is marked 15 mm from the top of the nail. Ensure the nail is seated to proper depth for planned dynamization.

Confirm fracture reduction and ensure appropriate nail insertion depth proximally and distally with biplanar fluoroscopy. Remove the ball nose guide wire.

Dynamization

A dynamic slot has been incorporated in the drive end and non-drive end of the nail. The drive end slot has a 10 mm range of dynamization. The non-drive end slot has a 5 mm range of dynamization. If dynamization is planned, countersink the nail to the appropriate depth to avoid backing out of the nail. Lock the M/L slot in the dynamic mode. Delayed dynamization may be performed at a later date with the removal of the static screws.

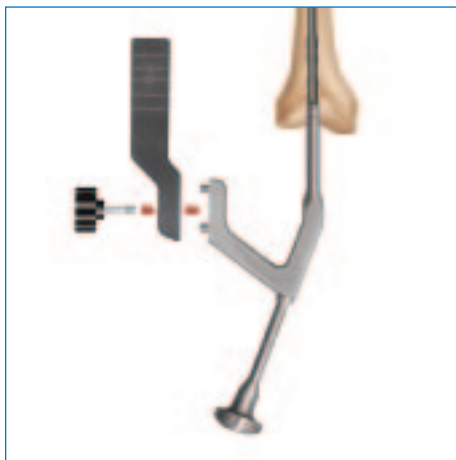


Fig. 49 **Universal Target Arm Assembly**

Attach the radiolucent universal target arm (Cat. No. 2810-13-009) onto the insertion handle, using the target arm attachment bolt (Cat. No. 2810-13-026) and hand tighten. Ensure the target arm is properly secured to the insertion handle for excellent targeting (Fig. 49).

Locking

Prior to locking both proximally and distally, check femoral length and rotational alignment. The nail can be locked either distally or proximally first, depending on surgeon preference.



Fig. 50 Distal Locking

The universal target arm is marked to identify which drive end locking option is being targeted (Fig. 50).



Fig. 51 Place 6.5 mm cortical locking screws using the black instrumentation (Fig. 51).

Note: Depending on surgeon preference, a 6.5 mm lag screw is also available for distal locking. If a lag locking technique is preferred, place the 6.5 mm cancellous lag screw using the gold instrumentation.

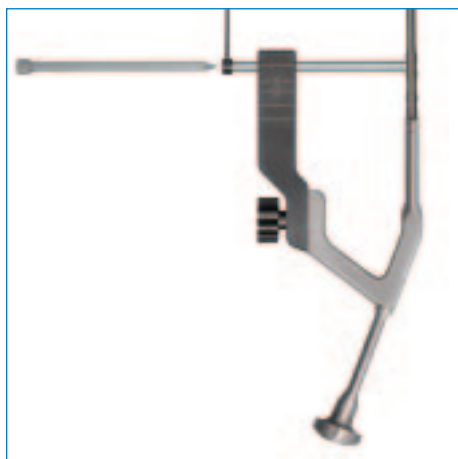


Fig. 52 Place the 6.5 mm screw sheath (Cat. No. 2810-13-020) and trocar (Cat. No. 2810-13-021) through the appropriate holes in the jig's targeting arm to locate the incision site (Fig. 52). Make a stab incision and advance the sheath and trocar to the bone. Soft tissue dissection should be completed sharp and precise to clear a path for the sheath. Undue soft tissue tension against the sheath can cause misdirect drilling.

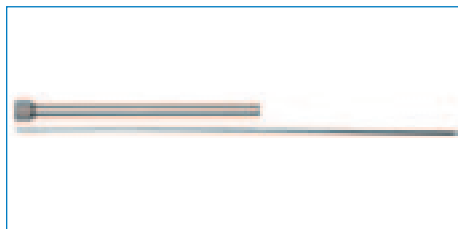


Fig. 53 **Note:** A 3.2 mm x 17.5 in guide pin (Cat. No. 9030-03-004) and 3.2 mm pin guide sleeve (Cat. No. 2810-13-018) can be used to verify screw position prior to drilling (Fig. 53).

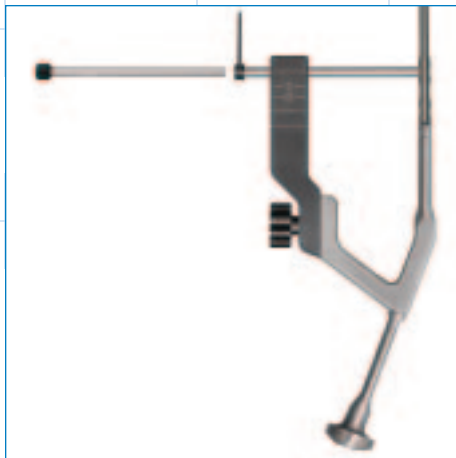


Fig. 54 Remove the trocar and replace it with the 5.3 mm drill sleeve (Cat. No. 2810-13-022) (Fig. 54).

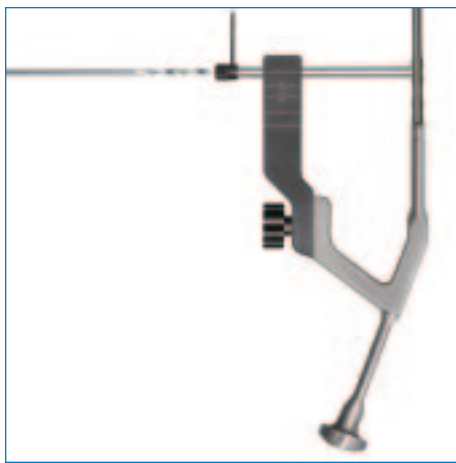


Fig. 55 Utilizing the 5.3 mm drill bit (Cat. No. 2810-13-153) drill through the drill sleeve and sheath until the far cortex is penetrated (Fig. 55).

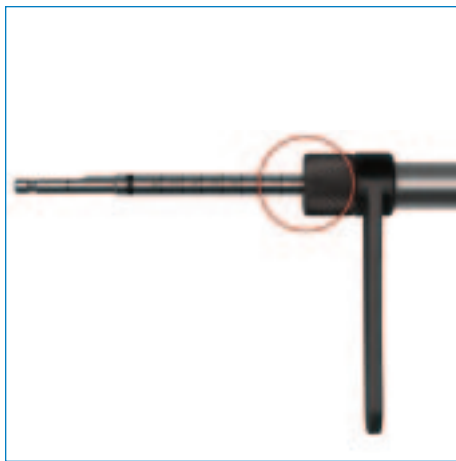


Fig. 56 Read the calibration on the drill bit that lines up with the drill sleeve to determine the screw length (Fig. 56).



Fig. 57 If further screw length is required, or if the locking hole has been initiated with a guide pin, a 6.5 mm screw depth gauge (Cat. No. 2810-13-035) is available to read screw length off of the 3.2 mm x 17.5 in guide pin (Fig. 57).

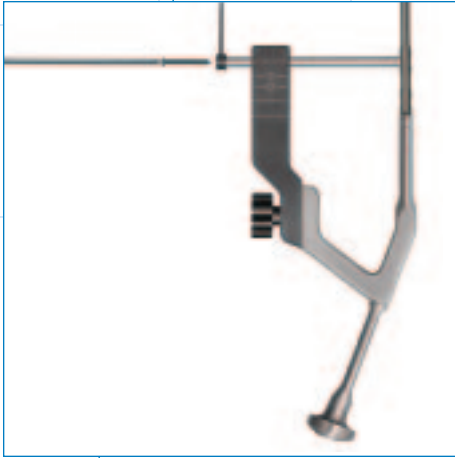


Fig. 58 Verify fluoroscopically to assure the proper screw length selection. Remove the drill sleeve. Using the 6.5 mm screwdriver shaft (Cat. No. 2810-13-024), insert the 6.5 mm cortical screw through the sheath (Fig. 58). The etch mark on the screwdriver corresponds with the screw sheath to indicate when the screw is fully seated.

Repeat above steps for additional screw placement.



Fig. 59 Proximal Locking

Place 4.5 mm cortical locking screws using the green instrumentation (Fig. 59).



Fig. 60 Use fluoroscopy to conduct freehand locking utilizing a familiar freehand technique. A black radiolucent wand (Cat. No. 2810-12-016) is available to aid in freehand locking (Fig. 60).

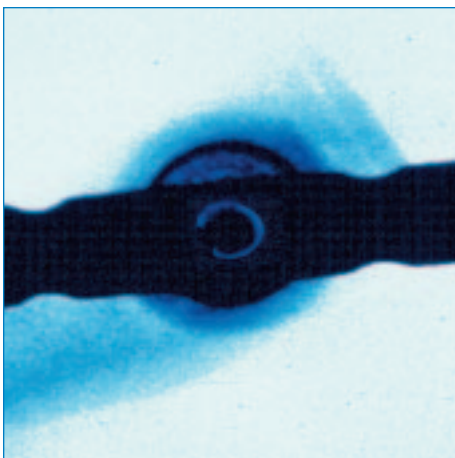


Fig. 61 Accurate C-arm position is confirmed when the distal nail hole appears to be a perfect circle (Fig. 61). Once correct placement has been verified fluoroscopically, make a stab wound in direct alignment with the distal hole.



Fig. 62 Using the 3.8 mm drill bit (Cat. No. 6 in: 2810-12-138 or Cat. No. 8 in: 2810-13-138), drill until the second cortex is penetrated. Verify the drill bit position fluoroscopically prior to taking any measurements (Fig. 62). Place the green 4.5 mm screw length gauge (Cat. No. 2810-01-032) onto the calibrated drill bit and advance down to the bone. Read the calibration on the drill bit that corresponds to the measurement line indicated on the screw length gauge.

A screw depth gauge (Cat. No. 2810-01-017) is also provided for further screw length verification. *For an accurate reading, take care to ensure the 4.5 mm screw length gauge or screw depth gauge sheath is fully seated on the bone.*

Remove the drill bit and advance the 4.5 mm screw. Repeat above steps for additional screw placement. The SolidLok screwdriver (Cat. Nos. 2810-01-020 and 2810-01-021) can be utilized to capture the screw while passing it through soft tissue during screw placement.

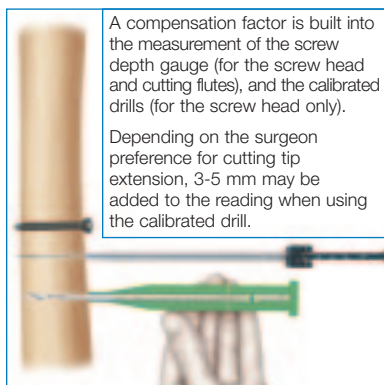


Fig. 63 **Determining Screw Length**

The screw size indicates the total measurement from the tip to the screw head. The calibrated drills and the screw depth gauges have a compensation factor built into the measurement such that the reading should indicate the exact size screw to achieve bi-cortical purchase. To ensure a proper reading, the screw depth gauge and drill sleeves must be touching bone. Fluoroscopy is recommended to verify the correct screw length (Fig. 63).



Fig. 64 **End Cap Placement**

Impinging and non-impinging cannulated end caps are provided in the system to both prevent bony ingrowth and add length when needed (Fig. 64).



Fig. 65 End caps have a double hex of 5 mm and 3.5 mm and are cannulated to accept a 3.2 mm guide pin. Place the end cap into the end of the nail with the 4.5/5.5 mm screwdriver (Cat. No. 2810-01-015) or the SolidLok screwdriver (Cat. Nos. 2810-01-020 and 2810-01-021) (Fig. 65). If the end cap will be placed using a 3.2 mm guide pin, place the end cap with the 5 mm hex driver (Cat. No. 2810-01-037). Irrigate the joint to ensure that no debris remains. Close the wound.



Fig. 66 Nail Removal

If the surgeon deems it appropriate to remove the nail, a cannulated extractor bolt (Cat. No. 2810-01-023), used with 3/4 in hex driver (Cat. No. 2810-01-027) and T-handle Hudson (Cat. No. 2810-01-004), is provided to aid in nail extraction (Fig. 66).



Fig. 67 Locate the top of the nail through an appropriate incision. Remove the end cap. End caps have a double hex of 5 mm and 3.5 mm and are cannulated to accept a 3.2 mm guide pin.

If using the guide pin method, insert the 3.2 mm guide pin and remove the end cap using the cannulated 5 mm hex driver (Cat. No. 2810-01-037), which is connected to the T-handle Hudson (Cat. No. 2810-01-004) (Fig. 67).



Fig. 68 The SolidLok locking screwdriver (Cat. Nos. 2810-01-020 and 2810-01-021) is also available to aid in removing the end cap, if not utilizing a guide pin. Insert the SolidLok screwdriver into the hex tip (Cat. No. 2810-01-019) and tighten the handle to lock the end cap's hex tip into the inner end cap's 3.5 mm hex (Fig. 68). The end cap can also be removed with a standard 3.5 mm hex screwdriver.



Fig. 69 Make the appropriate incisions and remove all locking screws. Remove all overgrown bone around the nail's proximal aspect to avoid iatrogenic fracture during nail extraction. Once locking screws are removed, drive a 3.2 mm guide pin into the cannulation in the nail's proximal section. Insert the extractor bolt over the 3.2 mm guide pin and thread it into the nail (Fig. 69).



Fig. 70 Then thread the impactor rod into the extractor bolt and use either the slotted mallet or sliding hammer to remove the nail (Fig. 70).



Fig. 71 If nail removal is unobtainable utilizing the standard extractor bolt, a conical nail extractor bolt (Cat. No. 2810-01-022) is available for removal cases where the nail threads are difficult to engage (Fig. 71). This instrument is designed to work with various nail thread/cannulation designs.

Note: Nail thread/cannulation condition may limit the purchase amount that can be gained using the conical extractor bolt.

IMPORTANT

This Essential Product Information does not include all of the information necessary for selection and use of a device. Please see full labeling for all necessary information.

INDICATIONS

The use of metallic surgical appliances (orthopaedic screws, intramedullary nails, plates, compression hip screws) provides the orthopaedic surgeon a means of bone fixation and helps generally in the management of fractures and reconstructive surgeries. These implants are intended as a guide to normal healing, and are **NOT** intended to replace normal body structure or bear the weight of the body in the presence of incomplete bone healing. Delayed unions or nonunions in the presence of load bearing or weight bearing might eventually cause the implant to break due to metal fatigue. All metal surgical implants are subjected to repeated stress in use, which can result in metal fatigue.

CONTRAINDICATIONS

Orthopaedic screws, intramedullary nails, plates, and compression hip screws are contraindicated in: active infection, conditions which tend to retard healing such as blood supply limitations, previous infections, insufficient quantity or quality of bone to permit stabilization of the fracture complex, conditions that restrict the patient's ability or willingness to follow postoperative instructions during the healing process, and foreign body sensitivity.

ADDITIONAL CONTRAINDICATIONS FOR INTRAMEDULLARY NAILS ONLY

Cases where the nail would cross open epiphyseal plates in skeletally immature patients and obliterated medullary canal or other conditions which tend to retard healing such as blood supply limitations, or previous infections.

ADDITIONAL CONTRAINDICATION FOR RETROGRADE FEMORAL NAILING

A history of septic arthritis of the knee and knee extension contracture with inability to attain at least 45° of flexion.

WARNINGS AND PRECAUTIONS

Bone screws and pins are intended for partial weight bearing and non-weight bearing applications. These components cannot be expected to withstand the unsupported stresses of full weight bearing.

ADVERSE EVENTS

The following are the most frequent adverse events after fixation with orthopaedic screws, intramedullary nails, plates and compression hip screws: loosening, bending, cracking or fracture of the components or loss of fixation in bone attributable to nonunion, osteoporosis, markedly unstable comminuted fractures; loss of anatomic position with nonunion or malunion with rotation or angulation; infection and adverse reactions to the device material.

UNIVERSAL PLATFORM

**Femoral Universal Nail 9 mm
28-50 cm**

Cat. No.	Description
1813-09-280	9 mm x 28 cm
1813-09-300	9 mm x 30 cm
1813-09-320	9 mm x 32 cm
1813-09-340	9 mm x 34 cm
1813-09-360	9 mm x 36 cm
1813-09-380	9 mm x 38 cm
1813-09-400	9 mm x 40 cm
1813-09-420	9 mm x 42 cm
1813-09-440	9 mm x 44 cm
1813-09-460	9 mm x 46 cm
1813-09-480	9 mm x 48 cm
1813-09-500	9 mm x 50 cm

**Femoral Universal Nail 10 mm
28-50 cm**

Cat. No.	Description
1813-10-280	10 mm x 28 cm
1813-10-300	10 mm x 30 cm
1813-10-320	10 mm x 32 cm
1813-10-340	10 mm x 34 cm
1813-10-360	10 mm x 36 cm
1813-10-380	10 mm x 38 cm
1813-10-400	10 mm x 40 cm
1813-10-420	10 mm x 42 cm
1813-10-440	10 mm x 44 cm
1813-10-460	10 mm x 46 cm
1813-10-480	10 mm x 48 cm
1813-10-500	10 mm x 50 cm

**Femoral Universal Nail 11 mm
28-50 cm**

Cat. No.	Description
1813-11-280	11 mm x 28 cm
1813-11-300	11 mm x 30 cm
1813-11-320	11 mm x 32 cm
1813-11-340	11 mm x 34 cm
1813-11-360	11 mm x 36 cm
1813-11-380	11 mm x 38 cm
1813-11-400	11 mm x 40 cm
1813-11-420	11 mm x 42 cm
1813-11-440	11 mm x 44 cm
1813-11-460	11 mm x 46 cm
1813-11-480	11 mm x 48 cm
1813-11-500	11 mm x 50 cm

**Femoral Universal Nail 12 mm
28-50 cm**

Cat. No.	Description
1813-12-280	12 mm x 28 cm
1813-12-300	12 mm x 30 cm
1813-12-320	12 mm x 32 cm
1813-12-340	12 mm x 34 cm
1813-12-360	12 mm x 36 cm
1813-12-380	12 mm x 38 cm
1813-12-400	12 mm x 40 cm
1813-12-420	12 mm x 42 cm
1813-12-440	12 mm x 44 cm
1813-12-460	12 mm x 46 cm
1813-12-480	12 mm x 48 cm
1813-12-500	12 mm x 50 cm

**Femoral Universal Nail 13 mm
28-50 cm**

Cat. No.	Description
1813-13-280	13 mm x 28 cm
1813-13-300	13 mm x 30 cm
1813-13-320	13 mm x 32 cm
1813-13-340	13 mm x 34 cm
1813-13-360	13 mm x 36 cm
1813-13-380	13 mm x 38 cm
1813-13-400	13 mm x 40 cm
1813-13-420	13 mm x 42 cm
1813-13-440	13 mm x 44 cm
1813-13-460	13 mm x 46 cm
1813-13-480	13 mm x 48 cm
1813-13-500	13 mm x 50 cm

**Femoral Universal Nail 14 mm
28-50 cm (Special Order Only)**

Cat. No.	Description
1813-14-280	14 mm x 28 cm
1813-14-300	14 mm x 30 cm
1813-14-320	14 mm x 32 cm
1813-14-340	14 mm x 34 cm
1813-14-360	14 mm x 36 cm
1813-14-380	14 mm x 38 cm
1813-14-400	14 mm x 40 cm
1813-14-420	14 mm x 42 cm
1813-14-440	14 mm x 44 cm
1813-14-460	14 mm x 46 cm
1813-14-480	14 mm x 48 cm
1813-14-500	14 mm x 50 cm

**Femoral Universal Nail 15 mm
28-50 cm (Special Order Only)**

Cat. No.	Description
1813-15-280	15 mm x 28 cm
1813-15-300	15 mm x 30 cm
1813-15-320	15 mm x 32 cm
1813-15-340	15 mm x 34 cm
1813-15-360	15 mm x 36 cm
1813-15-380	15 mm x 38 cm
1813-15-400	15 mm x 40 cm
1813-15-420	15 mm x 42 cm
1813-15-440	15 mm x 44 cm
1813-15-460	15 mm x 46 cm
1813-15-480	15 mm x 48 cm
1813-15-500	15 mm x 50 cm

End Caps

Cat. No.	Description
1813-00-005	End Cap Universal 5 mm
1813-00-010	End Cap Universal 10 mm
1813-00-015	End Cap Universal 15 mm
1813-00-002	End Cap Universal Impinging
1813-00-001	End Cap Universal Flush

**6.5 mm Self Tapping Cortical
Screws Full Thread (Drive End)**

Cat. No.	Description
1020-40	40 mm Length
1020-45	45 mm Length
1020-50	50 mm Length
1020-55	55 mm Length
1020-60	60 mm Length
1020-65	65 mm Length
1020-70	70 mm Length
1020-75	75 mm Length
1020-80	80 mm Length
1020-85	85 mm Length
1020-90	90 mm Length
1020-95	95 mm Length
1020-100	100 mm Length

**6.5 mm Solid Cancellous Lag Screws
(Drive End)**

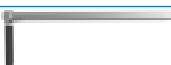
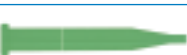
Cat. No.	Description
1030-60	60 mm Length
1030-65	65 mm Length
1030-70	70 mm Length
1030-75	75 mm Length
1030-80	80 mm Length
1030-85	85 mm Length
1030-90	90 mm Length
1030-95	95 mm Length
1030-100	100 mm Length
1030-105	105 mm Length
1030-110	110 mm Length
1030-115	115 mm Length
1030-120	120 mm Length

**4.5 mm Self Tapping Cortical Screws
Full Thread (Non-Drive End)**

Cat. No.	Description
14022-24	24 mm Length
14022-28	28 mm Length
14022-32	32 mm Length
14022-36	36 mm Length
14022-40	40 mm Length
14022-44	44 mm Length
14022-48	48 mm Length
14022-52	52 mm Length
14022-56	56 mm Length
14022-60	60 mm Length
14022-65	65 mm Length
14022-70	70 mm Length
14022-75	75 mm Length
14022-80	80 mm Length

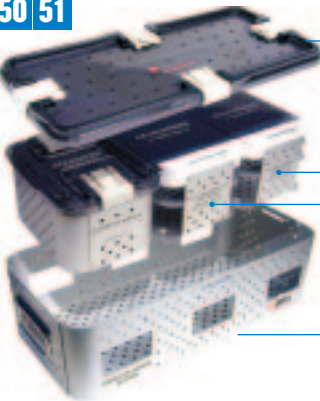
Indicates outlier size not included
in standard set configuration.

Indicates special orders only.
Not an inventory item.

GENERAL	2810-01-001	Pistol Guidewire Gripper	1	1		2	
	2810-01-002	T-Handle Guidewire Gripper (optional)	2				
	2810-01-003	Slotted Mallet	3	3		4	
	2810-01-004	T-Handle Hudson	4				
CANAL PREP	2810-01-005	Curved Cannulated Awl	5	5		10	
	2810-01-025	Awl Stylus	6				
	2810-01-026	Guidewire Pusher	7	6		11	
	2810-13-001	12 mm Entry Reamer, Femur	8				
	2810-13-002	13 mm Entry Reamer, Femur	9	7			
	2810-13-004	Entry Portal Trocar	10				
	2810-13-005	Long Entry Portal	11	8		12	
	2810-01-007	Long Reduction Tool	12				
	2810-01-008	Short Reduction Tool	13	9		13	
NAIL INSERTION	1186	3/4 in Combination Wrench	14	15		19	
	2810-13-006	Jig Bolt Driver, 8 mm	15				
	2810-13-007	Femoral Insertion Handle	16	16		20	
	2810-13-008	Femoral Jig Bolt	17				
	2810-13-009	Universal Target Arm	18	17		21	
	2810-13-011	Hammer Pad Femur	19				
	2810-13-026	Target Arm Attachment Bolt	20	18		22	
	1095	Impactor Rod/Extraction	21				
	1096	Sliding Hammer	22				
	14						
PROXIMAL LOCKING	2810-13-018	3.2 mm Guide Pin Sleeve - Silver	23	23		27	
	2810-13-020	6.5 mm Screw Sheath	24				
	2810-13-021	6.5 mm Screw Trocar	25	24		28	
	2810-13-022	5.3 mm Drill Sleeve - Black	26				
	2810-13-023	6.5/4.8 mm Step Drill Sleeve - Gold	27	25		29	
	2810-13-024	6.5 mm Screwdriver Shaft	28				
	2810-13-035	6.5 mm Screw Depth Gauge	29	26		30	
	2141-49-000	AO Quick Couple Screwdriver	30				
DISTAL LOCKING	2810-12-016	Freehand Distal Targ. Dev. Universal - Black	31	31		34	
	2810-01-015	4.5/5.5 mm Screwdriver Shaft	32				
	2810-01-032	4.5 mm Screw Length Gauge	33	32		35	
	2810-01-017	Screw Depth Gauge	34				
	2810-01-020	SolidLok Screwdriver Handle	35	33		36	
	2810-01-021	SolidLok Driver Inner Shaft	36				

NAIL REMOVAL	2810-01-023	Extractor Bolt, Tibia/Femur	37	37	
	2810-01-022	Conical Extractor Tool	38	38	
	2810-01-027	3/4 in Hex Driver	39	39	

DISPOSABLES	14012-14	3.2 mm x 14 in Short Threaded Guide Pin	40	40		44	
	9030-03-004	3.2 mm x 17 1/2 in Threaded Guide Pin	40				
	2810-01-019	SolidLok Hex Tip, 3.5 mm	41	41		45	
	2810-01-100	Ball Nose Guide Wire 100 cm	42				
	2810-12-138	3.8 mm Drill Bit 6 in, Non-sterile	43	42		46	
	2810-13-138	3.8 mm Drill Bit 8 in, Non-sterile	44				
	2810-13-153	5.3 mm Drill Bit, Non-sterile	45	43			
	2810-13-165	6.5/4.8 mm Step Drill Bit, Non-sterile	46				

CASES & TRAYS	2810-13-030	Femoral Tray Entry & Jigs	47	49 50 51	 Screw Modules Outer Case		
	2810-13-031	Femoral Tray Locking & Extraction	48				
	8299-10-500	Modular Screw System Outer Case	49				
	8299-10-045	4.5 mm Cort Screw Module	50				
	8299-10-065	6.5 mm Screw Module	51				

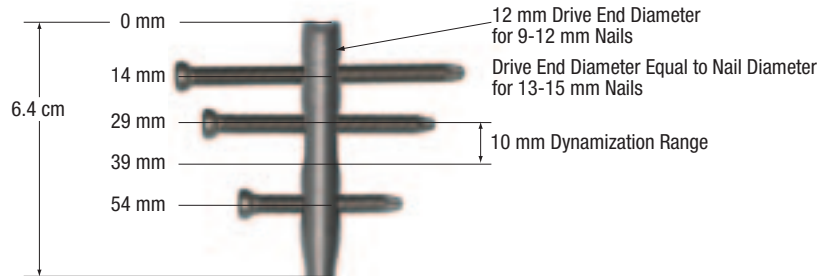
NAIL MEASUREMENT	1245	Radiographic Ruler	52	52	
	2810-01-031	Nail Length Gauge, 14 mm	53	53	
	2810-13-025	VersaNail Femoral Universal Template	54	54	

ENDCAP PLACEMENT	2810-01-037	5.0 mm Hex Driver, Long	55	55	

FEMORAL UNIVERSAL NAILING SYSTEM

12 mm drive end accommodates 6.5 mm screws

Large core diameter of 6.5 mm screws decreases risk for screw breakage



Universal design allows one nail for either antegrade or retrograde application to treat right- or left-sided fractures

Enlarged nail cannulation accepts the ball nose guide wire, eliminating the need for an exchange tube

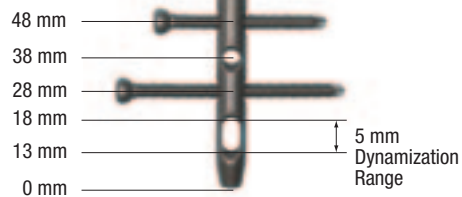
2.2 meter radius of curvature accommodates the anterior bow of the femur

Dynamization options available proximally and distally allowing compression at the fracture site

Distal locking options to treat a greater range of fracture patterns

Large core diameter of 4.5 mm non-drive end screws decreases the risk of screw breakage

Bullet-style tip increases ease of insertion



For more information about DePuy products, visit our web site at www.injgateway.com.



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