Elbow Plating System

Product Rationale
& Surgical Technique

never stop moving®
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Low profile, anatomically contoured elbow plates.

Low profile plate design helps minimize discomfort and soft tissue irritation.

Engineered from TiMAX™ for strength, biocompatibility, a smooth implant surface and enhanced imaging capabilities over stainless steel.

Contoured plates mimic the anatomy of the distal humerus, olecranon, radial head and coronoid.

Available in small and large sizes to best match anatomy.

Bullet tip minimizes soft tissue disruption during insertion.


Adapters available for fixed angle K-wire placement for provisional fixation.

The A.L.P.S. Elbow Plating System features an extensive set of anatomically contoured implants to address a wide array of fractures around the elbow. The anatomic design of each plate matches the natural anatomy of the specified location. However, in-situ contouring is available for fine adjustment and patient specific customization.

F.A.S.T. Guide Technology
Pre-loaded and disposable F.A.S.T. Guides facilitate accurate drilling and reduce intraoperative assembly, saving time in the OR.

F.A.S.T. Tabs™ Technology
F.A.S.T. Tabs Technology enables in-situ contouring for true plate-to-bone conformity.

Provisional Fixation
K-wire placement through provisional fixation holes for immediate and secure plate positioning.

The A.L.P.S. Elbow Plating System comes pre-loaded with Fixed Angle Screw Targeting Guides - F.A.S.T. Guides - that direct the trajectory of the drill through the screw hole in the plate. Additionally, F.A.S.T. Tabs™ technology allows for in-situ contouring for patient specific customization, while provisional fixation holes allow the plate to be securely positioned with K-wires.
Locking, Non-Locking, and Multi-Directional Locking Screw options.

Choose locking, non-locking, or multi-directional locking screws according to need and without compromising plate profile.

Tapered, threaded screws lock into position when tightened to establish a fixed angle construct for improved fixation or when bone quality is poor and optimal screw purchase is required.

Multi-directional locking screws (MDS) allow for up to a 25 degree cone of angulation and lock into the plate by creating their own thread without the risk of cold welding.

Low profile non-locking screws provide the same profile as locking screws.

Slotted holes allow for axial compression.

Particularly helpful in challenging fracture cases, the interlocking screw construct of the Elbow Plates provide you with both versatility and strength. The addition of the MDS screw technology allows you to target and capture fragments for optimum fixation. With the added feature of the low profile non-locking screw, whichever screw option you choose plate profile is maintained for minimum soft tissue disruption.
Surgeon Design Team

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Introduction

The A.L.P.S. Elbow Plating System is a comprehensive system designed to address fractures around the elbow. The system includes eighteen anatomically contoured plates including Medial, Lateral, Posterior Lateral, Olecranon, Proximal Radial Head, and Coronoid designs. All plates have TiMAX™ surface treatment for increased strength compared to standard Ti Alloys and stainless steel. F.A.S.T. Guide inserts incorporating flexible plating technology have been designed into all implants for fast drilling as well as in-situ contouring to allow for a true anatomic fit.

Note: The pre-assembled F.A.S.T. Guide inserts are NOT to be removed prior to sterilization. They should be removed and discarded only after use.
Medial Plate

Low profile, anatomically contoured plate design for less soft tissue irritation

2.0 mm K-wire Adapter converts any F.A.S.T. Guide into a fixed angle K-wire hole

Slotted holes for active compression

Proximal bullet tip facilitates submuscular plate insertion

Provisional 1.6 mm K-wire fixation slot

3.5 mm multi-directional locking screws allow for 25 degrees of angulation

Design features allow for multiplanar plate contouring without compromising strength

Medial Plate Specifications

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Width</th>
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<tr>
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<td>127 mm</td>
<td>10.9 mm</td>
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<tr>
<td>166 mm</td>
<td>10.9 mm</td>
<td>2.5 mm</td>
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Lateral Plate

Proximal bullet tip facilitates submuscular plate insertion

2.0 mm K-wire Adapter converts any F.A.S.T. Guide into a fixed angle K-wire hole

Low profile, anatomically contoured plate design for less soft tissue irritation

Slotted holes for active compression

Fixed angle K-wire slot for provisional plate fixation with a 1.6 mm K-wire

Design features allow for contouring in the coronal plane

Fixed angle K-wire slot for provisional plate fixation with a 1.6 mm K-wire

Design features allow for multiplanar plate contouring without compromising strength

Reference tabs on the lateral edge of the plate maintain optimal stability on the posterior ridge of the distal humerus.

3.5 mm multi-directional locking screws allow for 25 degrees of angulation

Lateral Plate Specifications

<table>
<thead>
<tr>
<th></th>
<th>64 mm</th>
<th>85 mm</th>
<th>103 mm</th>
<th>142 mm</th>
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<tr>
<td>Length</td>
<td>64 mm</td>
<td>85 mm</td>
<td>103 mm</td>
<td>142 mm</td>
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<tr>
<td>Width</td>
<td>9.7 mm</td>
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<td>10.7 mm</td>
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<tr>
<td>Thickness</td>
<td>2.4 mm</td>
<td>2.4 mm</td>
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</table>
Posterior Lateral Plate

- Low profile F.A.S.T. Guide for reduced soft tissue irritation during plate insertion
- Slotted holes for active compression
- Plate undersurface contour allows for bending in the coronal plane
- Plate cut-outs engineered to allow for plate contouring in the coronal plane
- Multiplanar arms designed to allow for eccentric screw positioning
- Isolated lateral screw for trochlear fixation
- Extremely distal condylar screw position

2.0 mm K-wire Adapter converts any F.A.S.T. Guide into a fixed angle K-wire hole

Posterior Lateral Plate Specifications

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
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<tr>
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<td>94 mm</td>
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<tr>
<td></td>
<td>148 mm</td>
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Olecranon Plate

Low profile F.A.S.T. Guide for reduced soft tissue irritation during plate insertion

Slotted holes for active compression

Low profile screw heads for either locking or non-locking options

Anatomically positioned coronoid screw

Bridging screw for maximum subchondral support

Two tab option for larger olecranon

Isolated olecranon screw

Olecranon Plate Specifications

<table>
<thead>
<tr>
<th></th>
<th>Overall Length</th>
<th>Shaft Width</th>
<th>Thickness</th>
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<tbody>
<tr>
<td></td>
<td>79 mm</td>
<td>10.7 mm</td>
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<tr>
<td></td>
<td>104 mm</td>
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<td></td>
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<td></td>
<td>194 mm</td>
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<td>2.5 mm</td>
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</table>

2.0 mm K-wire Adapter converts any F.A.S.T. Guide into a fixed angle K-wire hole

Small olecranon plate offers one tab option

Small olecranon plate

Multiplanar arm for optimal placement
Coronoid and Proximal Radial Plates

**Coronoid Plate Specifications**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Length</td>
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<tr>
<td>Width</td>
<td>28 mm</td>
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<tr>
<td>Thickness</td>
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**Proximal Radial Plate Specifications**

<table>
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<tbody>
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<td>36.5 mm</td>
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<tr>
<td>Width</td>
<td>17.5 mm</td>
<td>18 mm</td>
</tr>
<tr>
<td>Thickness</td>
<td>1.5 mm</td>
<td>1.5 mm</td>
</tr>
</tbody>
</table>

- Threaded holes for 2.5 mm locking and non-locking screws
- Paddle for buttressing the sublime tubercle
- Paddle for buttressing the coronoid process
- Suture point for fixation of capsule
- Multiplanar trajectories
- Dual radial curvatures for maximum fit
Screw Specification

2.5 mm Locking Screw (Cat. No. FPXX):
- Self tapping tips to assist with screw insertion
- 1.3 mm Square drive to maximize torque delivery
- Triple lead thread on screw head to reduce possible cross threading
- Tapered threads to reduce potential of screw backout
- Available in lengths of 14 – 40 mm
- Screw (Cat. No. FPXX) uses a Drill Bit F.A.S.T. 2.0 mm (Cat. No. FDB20)

2.5 mm Non-Locking Screw (Cat. No. SPXX000):
- Self tapping tips to assist with screw insertion
- 1.3 mm Square drive to maximize torque delivery
- Available in lengths of 14 – 40 mm
- Screw (Cat. No. SPXX000) uses a Drill Bit F.A.S.T. 2.0 mm (Cat. No. FDB20)

3.5 mm Locking Cortical Screw Cat. No. 8161-35-XXX):
- Larger core diameter and shallower thread pitch for improved bending and shear strength compared to a standard 3.5 mm Cortical Screw
- Self tapping tip minimizes the need for pre-tapping and eases screw insertion
- Tapered screw head helps ensure alignment of the screw head into the plate hole
- Tapered threaded head minimizes screw back-out and construct pullout
- T-15 drive
- Available in lengths of 10 – 70 mm
- Screw (Cat. No. 8161-35-XXX) uses a 2.7 mm Drill Bit (Cat. No. 2142-27-070)

3.5 mm Low Profile Non-Locking Screw Cat No. 1312-18-XXX):
- Low profile head design reduces prominence beyond the plate
- Self tapping tip eases screw insertion
- 2.2 mm Square drive to maximize torque delivery
- Type 2 anodized material for increased fatigue strength compared to standard Ti Alloys and stainless steels
- Available low profile washer converts screw head to traditional non-locking screw head size for use in active compression holes
- Screw (Cat. No.1312-18-XXX) uses a 2.5 mm Drill Bit (Cat. No. 8290-29-070) and can be installed in any of the threaded holes in the plate
- Available in lengths of 14 – 75 mm

Active Compression Conversion Washer (Cat. No. 1312-18-000):
- Cobalt chrome washer designed to snap onto the head of low profile 3.5 mm non-locking screw
- Washer converts low profile screw head into a standard profile non locking screw
- Allows for active compression in any of the oblong slots

Note: The washer is for use ONLY with the 3.5 mm Low Profile Non-Locking Screw (Cat. No. 1312-18-XXX).

3.5 mm Locking Multi-Directional Screw (Cat. No. 8163-35-XXX):
- Cobalt chrome screw with large core diameter
- Multi-Directional capability offers a 25 degree cone of angulation
- Creates own thread in plate to help provide strong and stable construct
- Self tapping tip minimizes the need for pre-tapping and eases screw insertion
- 2.2 mm square drive
- Available in lengths of 20 – 60 mm
- Screw uses a 2.7 mm Drill Bit (Cat. No. 2142-27-070)
Anatomy

Soft Tissue of the Elbow

Anterior view in extension

Posterior view in extension

Biceps Brachii m.

Brachialis m.

Brachioradialis m.

Extensor Carpi Radialis Longus

Extensor Carpi Radialis Brevis m.

Extensor Carpi Ulnaris m.

Flexor Carpi Ulnaris m.

Flexor Digitorum Superficialis m.

Triceps Brachii Tendon

Brachioradialis m.

Common Extensor Tendon

Anconeus m.

Extensor Carpi Radialis Ulnaris m.

Extensor Digitorum m.

Extensor Carpi Radialis Brevis m.

Ulna Nerve

Flexor Carpi Ulnaris m.
Patient Position

For treatment of distal humerus and/or olecranon fractures, the patient may be placed in either the supine, lateral or prone positions, depending on surgeon preference.

In the supine position, the arm is placed across the chest. The surgeon stands on the fractured side of the patient, who is brought to the very edge of the table. Inclining the table 20 to 30 degrees away from the operating surgeon will help keep the arm positioned across the chest (Figure 1).

After sterile preparation and drape, the arm is placed across a small bolster which can help maintain the position and flexion of the proximal forearm. For optimum exposure, the arm should accommodate over 100 degrees of flexion. The surgeon stands facing the elbow and is ready to begin the procedure.

The prone position can also be used. An arm board is placed parallel to the table to extend the table laterally, and a bolster is placed on the arm board to adjust for height. The elbow and forearm are positioned over the bolster. The forearm may be wrapped to prevent swelling of the dependent hand.

This position requires more involvement of the anesthesia team, but for surgeons that are comfortable with this position it can provide good operative exposure and gravitational aid in reduction of the fracture fragments (Figure 2).
Exposing the Distal Humerus through an Olecranon Osteotomy

Step 1
The incision starts approximately 10 cm proximal to the tip of the olecranon and approximately 10 cm distal to the tip of the olecranon. Full thickness skin flaps are elevated (Step 1). Incise the medial and lateral joint capsule to visually identify and mark the central aspect of the greater sigmoid notch. This area is typically devoid of cartilage.

The ulnar nerve should be identified in the cubital tunnel, isolated and mobilized to protect it before the osteotomy is performed.

An osteotomy of the olecranon is performed to expose the distal humerus. This can be a chevron type or straight transverse osteotomy. We have decided to use a chevron osteotomy to gain exposure to the distal humerus. The point of the chevron osteotomy should face the wrist to maximize bone on the olecranon fragment.

Step 2
The olecranon plate multiplanar side arms should be removed if the plate will be used specifically for olecranon osteotomy fixation. When removing the arms, they should be broken off by bending toward the underside of the plate so that any rough edges are left underneath the plate.

The plate is positioned on the intact olecranon. A K-wire is drilled (using a K-wire Adapter placed in the F.A.S.T. Guide) through the home run screw hole of the plate. A distal K-wire through the plate can also be used to secure the plate to the bone. Then drill and insert the twin proximal olecranon 3.5 mm locking screws. These screws and K-wire are then removed and the plate removed. These screw and K-wire holes will serve as reference points for anatomic reduction and fixation of the olecranon osteotomy later in the procedure.
Exposing the Distal Humerus through an Olecranon Osteotomy

Step 3
A standard chevron or transverse osteotomy is then performed. This should be done under full visualization of the olecranon articular surface to be sure the trajectory of the osteotomy enters the bare area. If the osteotomy is performed too distal, reduction may be more difficult. If the osteotomy is performed too proximal, exposure of the distal humerus may be poor.

The osteotomy is performed using a narrow sawblade. The osteotomy is completed with an osteotome. Use the osteotome as a lever to allow for interdigitation of the rough edges at the end of the procedure, allowing for optimum fragment reduction and fixation.

Step 4
At the end of the procedure, when the olecranon osteotomy is ready to be reduced, placing the twin 3.5 mm Locking Screws in the proximal fragment first will allow the plate to be used as a handle to aid in reduction. Once satisfactory reduction is obtained, follow the steps described in the olecranon Fracture Fixation section (Pages 37-38) to complete fixation of the olecranon osteotomy.

Step 3
The posterior two-thirds of the olecranon is cut with a saw. The osteotome is then used as a lever to break off the articular surface of the olecranon.

Step 4
At the end of the procedure olecranon osteotomy is repaired with plate.
Step 1
The first step to reduction is to identify the major fracture fragments and develop a plan for reassembly of the fracture. Typically, the best approach is to reassemble from distal to proximal reducing the articular surface first.

When placing K-wires or isolated lag screws for provisional fixation, care should be taken to place them in the area of the bone that will not interfere with plates or screws.

If a segment of the distal humerus is missing or comminuted, a bone graft may be positioned to maintain the proper width of the distal humerus.

Note: The most important fragments to assemble accurately are the anterior trochlea and the capitellum. The anterior and medial aspect of the distal humerus is most important for stability whereas fracture fragments of the posterior trochlea and posterior aspect of the capitellum can be sacrificed if significant comminution has taken place (Step 1).

Step 2
Once the distal segment of the humerus containing the articular surface has been reconstructed, this fracture construct can be connected to the humeral shaft using K-wires. Often two K-wires may be needed to cross the fracture site to gain stability and preliminary reduction of the fracture (Step 2).
Once reduction and/or ORIF of the articular surface with isolated lag screws is accomplished, and satisfactory reduction of the shaft component of the fracture is achieved, plates can then be positioned either on the medial, and lateral columns or on the posterior lateral aspect of the humerus (Figures 1 and 2).

Note: When applying the Medial and Lateral plates, there is an increased chance of hitting screws with the drill bit when drilling towards the side with screws already inserted.

Multi-directional screws are available to assist in avoiding other screws that are already placed (Figure 3).
Humeral Fracture Plate Fixation

Determine, and place first, the plate which will gain best initial stability. The placement technique is the same for Medial, Lateral and Posterior Lateral plates.

The less involved fragment can often be reduced better anatomically than the more comminuted side. This allows the more comminuted side to be built off of the more stable side to limit the possibility of non-anatomic angulation.

**Step 1**
The first plate is placed onto the condyle manually and then one of the Large Reduction Clamps (Cat. No.’s. 1920 and 13577) may be used to hold this in position (Step 1). Often it is possible to place both column plates in a parallel fashion and use the large fracture Reduction Clamp to secure both plates at once to the distal humerus.

**Step 2**
Alternatively, the plates may be secured to the bone by using K-wire Adapters (Cat. No. 2312-18-007) and inserting fixed angle 2.0 mm K-wires (Cat. No. 14179-6) through the F.A.S.T. Guide inserts in the proximal and distal segments of the plates (Step 2).
Step 3
During placement it is possible to contour the plate for optimal fit by using the Plate Benders (Cat. No.'s 2312-18-003 and 2312-18-004). The plate can be further contoured if needed in-situ (Step 3).

Note: For further information on plate contouring refer to Appendix A on page 39-40.

Step 4
Apply the plate to the bone and insert a K-wire through the distal 3rd position and verify that it exits on the opposite condyle (Step 4).

Step 4b – Posterior Lateral Plate
The plate is designed to be placed in the area of the posterior lateral epicondyle. Implantation of the plate should not impinge on the articulating surface. Select the most appropriate size to fit the individual.

Once the fracture has been reduced using the surgeons preferred method, the posterior lateral plate can be secured to the bone by using K-wire Adapters (Cat. No. 2312-18-007) and inserting fixed angle 2.0 mm K-wires (Cat. No. 14179-6) through the F.A.S.T. Guide inserts in a hole distal and proximal to the fracture. This will stabilize the plate to the bone (Step 4b).
Humeral Fracture Plate Fixation

Step 5
Use the Large Reduction Clamp to compress the plate to the bone.

A 2.0 mm K-wire is inserted through a K-wire Adapter in a hole proximal to the fracture. This will stabilize the plate to the bone. Once inserted, the distal aspect of the plate can be contoured in-situ for optimal fit (Step 5).

Step 6
The medial plate is now positioned on the bone.
Repeat Step 4 (Step 6).

Step 7
Use the Large Reduction Clamp to compress the medial plate to the bone, and repeat Step 5 (Step 7).
**Step 8**
Insert the distal screws to secure the distal fragment. The screw insertion should alternate from one side to the other side.

**Step 8b – Posterior Lateral Plate**
Insert the distal screws to secure the distal fragment. The screw insertion should continue proximally to secure the capitulum to the plate. The distal condylar screws should be placed as long as possible, without exiting the opposite cortex. Use fluoroscopy to confirm that the screw placement is not violating the articulating surface.

**Step 9a**
If axial compression of the fracture is needed through the plate, the proximal K-wire is removed and a low profile Non-Locking screw with a washer is inserted in the active compression slot (Step 9a).
Humeral Fracture Plate Fixation

Step 9b - Alternative method

If compression at the fracture site was achieved with a clamp, the proximal screw holes may be filled with Locking or Non-Locking screws (Step 9b).

It is recommended to use a Non-Locking screw in the most proximal screw holes to facilitate an optimal transition of stress from plate construct to the un plated bone.

See Appendix B on pages 42-45 for screw insertion.

The distal screws should be placed as long as possible, ideally exiting the opposite column. It is not recommended to use short locking screws as the goal is to attempt to incorporate as many fracture fragments as possible reaching the opposite column.

Step 10

Non-Locking, Locking or Multi-Directional Screws may now be used to fill the remaining screw holes (Step 10).

Specific instructions on inserting screws can be found in Appendix B pages 42-45.
Exposing the Radial Head

Patient Positioning
The patient is placed in the supine position with the arm placed across the chest.

Step 1
The radial head may be approached from either a direct posterior skin incision (Step 1) in which a flap is raised to expose the radiocapitellar joint area or through a direct lateral approach.

If there is a concurrent coronoid fracture or significant medial instability a single posterior incision is recommended.

Additionally, a posterior incision is placed through a watershed area between the medial and lateral cutaneous nerves and to avoid potential surgical trauma to these sensory nerves.

After the radiocapitellar area is exposed either through a direct lateral or posterior incision, there are two potential avenues of approach to the radial head.

Step 2
The most common approach is the Kocher interval approach which is through the interval between the anconeus and the extensor carpi ulnaris muscles. This approach avoids the radial nerve and its branches, and it is fairly easy to define (Step 2).

Note: A potential disadvantage is that the Anconeus/Extensor Carpi Ulnaris interval will put the surgical approach directly over the lateral ulnar collateral ligament which is the main stabilizer of the lateral side of the elbow.
Exposing the Radial Head

If the surgical approach is carried straight through the anconeus/extensor carpi ulnaris interval into the joint, the lateral ulnar collateral ligament can be violated. The proper approach using the Kocher interval is to develop the interval between the anconeus and the extensor carpi ulnaris and then elevate anteriorly the extensor carpi ulnaris off of the lateral ulnar collateral ligament until the equator or midpoint of the radiocapitellar joint is exposed. To preserve the integrity of the lateral ulnar collateral ligament complex, the capsule should be incised horizontally at the equator of the radiocapitellar joint. Note: If the capsular incision is placed further posterior in the radiocapitellar joint, then potential violation of the lateral ulnar collateral ligament might occur.

Step 3
Once the radiocapitellar joint has been well exposed and the area of the posterior interosseous nerve protected, adequate exposure of the radial head fracture may be undertaken (Step 3).

If the fracture involves only a wedge of the radial head with the majority of the radial head intact, a buried 2.5 mm Non-Locking screw (SPXX000) may be used to reduce and hold the small fragment. In many fractures, the fracture occurs at the neck level with additional comminution of the radial head itself. In this situation, the radial neck area is often compressed and this needs to be elevated and fixed.

In addition to the Kocher interval approach, a more direct approach to the radial head that has recently become popular is a direct split of the common extensor tendon directly over the equator of the radiocapitellar joint. This incision is carried directly through the extensor digitorum communis to the level of the radiocapitellar joint capsule, and the capsule at this point of the equator of the radiocapitellar joint is incised to expose the radial head and neck. Fixation of the radial head and neck fracture is commenced as described previously.
Radial Head Fracture Fixation

Step 1
Use the Fragment Plate Holder (Cat. No. 2312-07-012) to position the plate appropriately on the radial head. The plates are designed to be placed in the area of the radial neck that does not impinge on the proximal radioulnar joint and off the articular surface of the radial head (Step 1).

Step 2
Two sizes of proximal radial plates are available, small and large. Select the most appropriate size to fit the individual. Use the supplied 2.5 Plate Benders (Cat. No. 2312-18-005) to tailor the fit of the plate to the individual anatomy of the patient (Step 2).

Note: For further information on plate bending refer to Appendix A on page 41.

Note: For small individuals the distal hole of the plate can be broken off to limit the distal exposure needed for plate fixation. It is recommended that a minimum of two screws be placed into the radial shaft.

The radial head and neck is then elevated and reduced into its normal position, and the plate is positioned. The first screw can be applied into the shaft region to hold the plate in place. Screw selection will allow for either a Non-Locking or Locking screw to be placed through the plate. The standard Locking screw placed through the plate will provide good stability for the fracture construct.

Step 3
Drill through the F.A.S.T. Guide with the 2.0 mm Drill Bit (Step 3).

Step 4
Remove the F.A.S.T. Guide with the 1.3 mm Square Screwdriver (Cat. No. 2312-18-012) (Step 4).
Radial Head Fracture Fixation

Step 5
Measure the drilled hole by taking a direct reading from the NON-L line on the Depth Gauge (Cat. No. 2142-35-100) (Step 5).

*Note: When measuring for a Locking screw, the Depth Gauge is used through the F.A.S.T. Guide and measured off of the LOCK line. When inserting a Non-Locking screw, the F.A.S.T. Guide is removed and the screw is measured off of the NON-L line.*

Step 6
Insert the 2.5 mm Non-Locking Screw with the 1.3 mm Square Driver coupled to the Quick Connect Handle (Cat. No. QCH) (Step 6). The remaining screws (Locking or Non-Locking) can now be placed starting with the radial head region.

*Note: The plate should rest distal to the articular surface of the radial head surface and be positioned by hand in neutral rotation. The nonarticular region of the radial head and neck will now be facing laterally toward the surgeon.*

Step 7
Small wedge fractures of the radial head will need to be fixed with a screw placed outside the plate. These screws should be placed obliquely through the radial head into the distal far cortex in an oblique fashion. It is not uncommon for one or two screws to be placed in this fashion, buried deep to the articular cartilage, for optimal fixation. The 2.5 mm Counterbore (Cat. No. 2312-18-014) can be used to create a recess where the screw head will sit below the level of the cortex (Step 7).
If greater than 15 - 20% of the coronoid is fractured, internal fixation may be considered. The coronoid may potentially be approached from the lateral side if the radial head is significantly fractured and needs to be excised in preparation for radial head replacement. Through the void in the radial head, the coronoid can often be visualized and with posteriorly directed screws (usually at least two screws), the coronoid may be secured.

In those cases when the radial head is not fractured or only partially fractured, it is recommended to approach the coronoid from the medial side.

**Patient Positioning**
The patient is placed in the supine position with the arm placed across the chest.

**Step 1**
In this situation with an isolated coronoid fracture, a medial approach is most efficient for operative exposure. Similar to a radial head fracture, either a direct posterior skin incision with elevation of a medial skin flap or a direct medial approach may be done to expose the coronoid (Step 1).

**Step 2**
After the skin incision, identify the ulnar nerve. This is then released in-situ to help positively identify it throughout the procedure and also to decompress it in case of post-operative swelling. Once the ulnar nerve is decompressed, exposure of the coronoid is achieved through the interval between the two heads of the flexor carpi ulnaris. It is easier to expose the coronoid by gently elevating the musculature of the flexor pronator group from the ulna from a distal to proximal direction.
Coronoid Fracture Fixation

While doing this it is important to gently retract the ulnar nerve posteriorly (Step 2, previous page). As the soft tissue is elevated from the ulna from a distal to proximal direction, the sublime tubercle can be easily palpated and identified as the insertion site of the medial collateral ligament. The elevation of the flexor pronator group is continued in a distal to proximal direction, elevating the musculature off of the medial collateral ligament, allowing exposure of the capsule of the joint and coronoid. The entire flexor pronator origin does not need to be released for exposure of the coronoid, only a small posterior portion.

The joint capsule which is anterior to the medial collateral ligament can be excised. This will allow for good visualization of the coronoid for accurate reduction and fixation. The medial collateral ligament is preserved and only a small area of the origin of the flexor pronator group needs to be elevated to gain adequate exposure. It should be noted that while elevating the musculature off of the ulna, care should be taken to identify any major branches of the ulnar nerve and protect them during exposure of the coronoid.

With the coronoid exposed, the appropriate plate is selected (right or left). It should be noted that the very medial edge of the ulna at the sublime tubercle makes a sharp almost 90-degree angle. The plate will be placed at the apex of this significant angle on the ulna.

Step 1
Use the Fragment Plate Holder (Cat. No. 2312-07-012) to position the plate appropriately on the coronoid fracture (Step 1).
Coronoid Fracture Fixation

Step 2
Due to individual anatomic variations in patients, the plate will need to be bent and fine tuned for the individual patient (Step 2).

*Note: For further information on plate bending refer to Appendix A on page 41.*

Screw selection will allow for either a 2.5 mm Non-Locking or Locking screw to be placed through the plate. In most situations, the standard Locking screw placed through the plate will provide good stability for the fracture construct.

One of the middle screws in the plate may be placed first for preliminary fixation of the implant.

Step 3
Drill through the F.A.S.T. Guide with the 2.0 mm Drill Bit (Cat. No. FDB20) (Step 3).

Step 4
Remove the F.A.S.T. Guide using the 1.3 mm Square Screwdriver (Cat. No. 2312-18-012) (Step 4).
Coronoid Fracture Fixation

Step 6
Measure the drilled hole by taking a direct reading from the NON-L line on the depth gauge (Cat. No. 2142-35-100) (Step 6).

Step 7
Insert the 2.5 mm Non-Locking Screw with the 1.3 mm Square Driver coupled to the Quick Connect Handle (Cat. No. QCH) (Step 7).

Progressive screws are then placed. Locking screws do not require bicortical fixation through the posterior aspect of the ulna but should be placed deep enough for accurate and stable fixation of the coronoid fracture. It should be noted that the most proximal screw holes in the plate are angled to help avoid intra-articular penetration of screws.

The most lateral tab on the plate should be checked to be sure it is bent down and acting as a buttress on the very lateral aspect of the coronoid. In a similar fashion, it should be checked that the very medial tab is buttressing on the very medial aspect of the coronoid in the area of the sublime tubercle and the medial collateral ligament.

Fluoroscopic views should be taken to be sure there is no penetration of the screws into the joint, and similar to the radial head plate, the plate can be shortened by breaking off any unneeded segments of the plate.

Step 8
All screw holes should be filled to fully anchor the plate for optimal fixation (Step 8).

After placement of the plate has been accomplished, the elevated portion of the flexor pronator group is allowed to fall back together. The ulnar nerve is checked to be sure that it is unhindered, and the wound closed in standard fashion.
Exposure of the Olecranon

The exposure for an olecranon fracture follows a standard posterior incision. Depending on the surgeon’s preference, the incision can be curved slightly laterally or medially over the tip of the olecranon itself. Once the skin incision is made, the fracture site is often quite evident.

Step 1
Elevation of the medial skin flap should be performed to accurately identify the ulnar nerve (Step 1). The ulnar nerve does not necessarily need to be released in situ or transposed but the area of the ulnar nerve should be recognized and protected throughout the procedure.

The olecranon fracture should be opened slightly and irrigated to remove any loose bone or hematoma. Examination of the articular surface of the humerus may be performed if damage to the cartilage of the distal humerus is suspected.
Reduction of the Olecranon
The olecranon fracture may be reduced using the surgeon’s preferred method. Described are two options that may be considered.

Option 1: Clamp and K-wire combination
A drill or K-wire is used to create a small hole in either the lateral or medial cortex, 3 - 4 cm distal to the fracture site. This small hole in the ulna serves as a point where a prong of the clamp can grab on to the distal fragment. The opposite clamp prong is placed on the proximal fragment and the clamp is closed to reduce fragments. A 2.0 mm K-wire is then drilled in an oblique fashion lateral to medial, across the fracture site and to secure the reduction. Care should be taken to place the K-wire out of the way of the plate.

Option 2: Reduction through the plate
The fracture is reduced and a clamp is placed to hold the reduction as described in Option 1.

Step 1
The plate is then positioned on the fracture site. A K-wire is drilled (using a K-wire Adapter placed in the F.A.S.T. Guide) through the home-run screw hole of the plate. The home-run screw hole may need to be contoured with the plate benders (Cat. No. 2312-18-008) for optimal trajectory. An additional K-wire is then drilled into the distal fragment of the ulna.

Step 2
The twin proximal olecranon 3.5 mm Locking screws are inserted with the T-15 Driver coupled to the 2.0 Nm Torque-limiting Screwdriver Handle (Cat. No. 2141-18-001) or Bi-Directional Torque Limiting Power Adapter (Cat. No. 2312-18-020). Remove the K-wire from the home-run screw hole.

Option 1
The more proximal prong on the clamp is used over the tip of the olecranon to reduce the fracture in place and a 2.0 mm K-wire is placed in an oblique fashion across the fracture site.

Option 2 - Step 1
If no additional compression is needed, insert a K-wire through the home-run screw hole to cross the osteotomy site and secure the reduction.

Option 2 - Step 2
Insert the 3.5 mm locking screws with the T-15 Driver.
Step 3
Drill the hole through the oblong active compression slot using the 2.7 mm Drill Bit (Cat. No. 2142-27-070). For every osteoporotic bone, use the 2.5 mm Drill Bit (Cat. No. 8290-29-070).

*Note: The K-wire is removed just before the 3.5 mm Compression Screw engages in the slot.*

Step 4
The 3.5 mm low profile Non-Locking screw should be inserted into the Conversion Washer (Cat. No. 1312-18-000) to allow it to perform active compression in the plate slot. If the Conversion Washer is not used, the screw head will not be wide enough to engage the plate slot.

Insert the 3.5 mm Compression screw using the 2.2 mm Square Driver (Cat. No. 8163-01-000). Remove the K-wire in the distal portion of the ulna just before the head of the Compression screw engages with the compression slot.

Step 5
Insert a Compression screw through the home-run screw hole, and fill screws in the shaft and coronoid area as needed. Multiplanar arms may be contoured or broken off with the plate benders, (Cat. No. 2312-18-008) if not thought to be necessary. Care should be taken when placing screws through the multiplanar side arms so that the appropriate length is selected, to avoid damage to the radial head. *Note: Arms should be broken off in the direction of the underside of the plate to prevent rough edges coming into contact with soft tissue.*

*Note: The plate may be bent and fine tuned for the individual patient. For further information on plate bending refer to Appendix A on page 39.*
Appendix A  Contouring for Medial and Lateral Plates

Note: The benders are not intended to work with the shorter, rounder low profile F.A.S.T. Guide inserts. The benders are to be used only with the tall F.A.S.T. Guide inserts to contour the plate.

1. Medial plate bent through a slot.
2. Distal end of medial plate bent towards medial condyle.
3. Planar bend at distal end of medial plate.
4. Lateral plate bent through a slot.
5. Planar bend at distal end of lateral plate.
6. Distal end of lateral plate bent towards lateral condyle.

Note: All bending features are designed to withstand a maximum total of 30 degrees of manipulation. Refer to Cat. No. 0612-29-510 for supplemental information on how to bend the shaft section of the long plates.
Appendix A Contouring for Posterior Lateral and Olecranon Plates

Note: The benders are not intended to work with the shorter, rounder low profile F.A.S.T. Guide inserts. The benders are to be used only with the tall F.A.S.T. Guide inserts to contour the plate.

1. Posterior lateral plate bent through a slot.
2. Planar bend applied to posterior lateral plate.
3. Lateral tab of posterior lateral plate bent toward the bone.
4. Olecranon plate bent through a slot.
5. Planar bend applied to olecranon plate.
6. If necessary, the benders can be used to break off the arms of the olecranon plate.
1. Planar bend applied to coronoid plate.

2. Lateral tab of coronoid plate bent toward the bone.

3. Planar bend applied to the shaft of proximal radius plate.

4. Planar bend applied to the arms of proximal radius plate.
Appendix B  Non-Locking Screw Insertion

Non-Locking Screw Insertion

Step 1
If Non-Locking Screws are to be used, the F.A.S.T. Guide is removed using the T-15 Driver (Cat. No. 2142-15-070) (Step 1).

Step 2
Insert the Drill Guide into the screw hole and drill through both cortices with the 2.7 mm Drill Bit (Cat. No. 2142-27-070) (Step 2).

Step 3
Measure the drilled hole by taking a direct reading from the NON-L line on the Depth Gauge (Cat. No. 2142-35-100) (Step 3).

Step 4
The screw is inserted by hand using the Black Ratchet Handle (Cat. No. 8261-66-000) with the 2.2 mm Square Driver (Cat. No. 8163-01-000) (Step 4).
Appendix B  Screw Insertion-Active Compression

Non-locking Screw Insertion
(Compression Mode)
If the compression hole is to be used, a low profile Non-Locking screw must be used in conjunction with a low-profile washer. This will convert the low-profile screw to a standard profile Non-Locking screw.

Step 1
Insert the Drill Guide into the screw hole and drill through both cortices with the 2.7 mm Drill Bit (Cat. No. 2142-27-070). Drill eccentrically in the slot furthest away from the fracture (Step 1).

Step 2
Measure the drilled hole by taking a direct reading from the NON-L line on the Depth Gauge (Step 2).

Step 3
Engage the appropriate 3.5 mm low profile Non-Locking screw with the 2.2 mm Square Driver (Cat. No. 8163-01-000). Once engaged, the screw is placed through the Low Profile Washer (Cat. No. 1312-18-000), which is in the cartridge, and pressure applied until an audible click is heard. Once the assembly is mated correctly, the screw can be advanced into the compression hole of the plate. Slide the screw down the cartridge remove and insert into the active compression slot (Step 3).

Step 4
The screw is inserted by hand using the Black Ratchet Handle (Cat. No. 8261-66-000) with the 2.2 mm Square Driver (Cat. No. 8163-01-000) (Step 4).

Note: The washer is for use ONLY with the 3.5 mm low profile Non-Locking screw.
Locking Screw Insertion

Step 1
Slide the Measuring Drill Sleeve (Cat. No. 8163-01-005) onto the 2.7 mm Drill Bit (Cat. No. 2142-27-070). Drill through the F.A.S.T. Guide insert until the far cortex is reached. Slide the Measuring Drill Sleeve onto the top end of the F.A.S.T. Guide insert and read the measurement of the Locking Screw length from the proximal end of the Drill Measuring Sleeve (Step 1).

Note: If a second method of measurement is desired, remove the F.A.S.T. Guide insert, then measure the drilled hole by taking a direct reading from the LOCK line on the Depth Gauge.

Step 2

Step 3
Insert the 3.5 mm locking screw with the T-15 Driver coupled to the 2.0 Nm Torque-Limiting Screwdriver Handle or Bi-Directional Torque Limiting Power Adapter (Cat. No. 2312-18-020) (Step 3).

Once the screw is seated, an audible click will be heard from the driver noting that the screw is fully seated.
Appendix B Multi-Directional Screw Insertion (MDS)

Multi-Directional Screw (MDS) Insertion

Step 1
The MDS screw is inserted by removing the F.A.S.T. Guide using the T-15 Driver (2142-15-070) or the Short T-15 Driver (2312-18-021) (Step 1).

Step 2
Drill using the 2.7 mm Drill Bit (Cat. No. 2142-27-070). The drill bit can be angled up to a 25 degree cone of angulation and still have the screw lock into the plate (Step 2).

Step 3
Measure the drilled hole with the Depth Gauge (Cat. No. 2142-35-100) by taking a direct reading from the LOCK line on the Depth Gauge (Step 3).

Step 4 (diagram not shown)
Insert the 3.5 mm MDS screw with the 2.2 mm Square Driver (Cat. No. 8163-01-000) coupled to the 2.0 Nm Torque-Limiting Screwdriver Handle (2141-18-001).

Step 4a
Alternatively, the screw may be inserted under power using the 2.2 mm Square Driver (Cat. No. 8163-01-000) coupled to the Torque Limiting Power Adapter (Cat. No. 2312-18-020) (Step 4a).

Once the screw is seated, an audible click will be heard from the driver noting that the screw is fully seated.
Step 1

Note: Plate screws will often compete for space in a tight area, and the screws can often interdigitate with each other. This is especially relevant with the three distal screws on the Lateral and Medial plates (Step 1).

Therefore, it is important to remove the screws in reverse order (last in, first out), to avoid breaking the heads from the screws.

If the order of the screw placement is not known, the following procedure is recommended (Step 2):

1. Attempt to remove a screw. If it stalls within a turn or two, retighten using the Bi-Directional Torque Limiting Power Adapter.

Note: This is very important, as this screw may be interdigitated with another screw, which may cause difficulty during removal. It is critical to retighten the screw prior to moving on to the next screw as described in Step 2, otherwise both screws will be difficult to remove.

2. Move on to the next screw and repeat Step 1.

3. Keep moving from one screw to the next until all have been removed.
Instrument Trays

The Elbow Plating System
# Instrument Trays

## Instrument Tray

1. 2312-18-003  3.5 Medial/Lateral Straight Bender
2. 2312-18-004  3.5 Medial/Lateral L Bender
3. 2312-18-008 (2)  3.5 Post. Lateral/Olecranon Bender
4. 14179-6 (12)  2.0 mm K-wire
5. 2142-35-100  Small Frag Depth Gauge
6. 9399-99-435  Double Drill Guide 2.7/2.0mm
7. 8163-01-005 (2)  Drill Measuring Sleeve
8. 8290-29-070 (2)  Drill Bit 2.5 mm
9. 8290-32-070 (2)  Drill Twist Scp 3.5 x 70 mm
10. 2142-27-070 (3)  2.7 mm Calibrated Drill Bit
11. 8163-01-000 (2)  2.2 mm Square Screwdriver
12. 2142-15-070 (2)  T-15 Tapered Driver
13. 2312-18-007 (3)  2.0 mm K-wire Adapter
14. 1920  L Periarticular Tong
15. 2312-18-020  2.0 mm Torque Limiting Power Adapter
16. 2142-13-567  Plate End Retractor
17. 2141-18-001  Small Torque Limiting Handle
18. 13577 (2)  Reduction Forcep W/Points Lg
19. 8261-66-000  Cannulated Ratchet Handle

NP. 2312-18-021  T-15 Tapered Driver Short (Optional Instrument)
Instrument Trays

**Implant Tray**

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<th>Long Plate Module</th>
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<td>Medial Plates</td>
</tr>
<tr>
<td><strong>2.</strong> 1312-18-701 (4)</td>
<td>1312-18-704 13 Hole - 127 mm Right</td>
</tr>
<tr>
<td><strong>3.</strong> 1312-18-702 (4)</td>
<td>1312-18-707 13 Hole - 127 mm Left</td>
</tr>
<tr>
<td><strong>4.</strong> 1312-18-700 (4)</td>
<td>1312-18-705 17 Hole - 166 mm Right</td>
</tr>
<tr>
<td><strong>5.</strong> 1312-18-704 13 Hole - 127 mm Right</td>
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</tr>
<tr>
<td><strong>6.</strong> 1312-18-707 13 Hole - 127 mm Left</td>
<td></td>
</tr>
<tr>
<td><strong>7.</strong> 1312-18-705 17 Hole - 166 mm Right</td>
<td></td>
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<tr>
<td><strong>8.</strong> 1312-18-700 17 Hole - 166 mm Left</td>
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<tr>
<td><strong>9.</strong> 1312-18-202 (2)</td>
<td>Lateral Plates</td>
</tr>
<tr>
<td><strong>10.</strong> 1312-18-200 (2)</td>
<td>1312-18-204 11 Hole - 103 mm Right</td>
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<td><strong>11.</strong> 1312-18-203 (2)</td>
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<tr>
<td><strong>12.</strong> 1312-18-201 (2)</td>
<td>1312-18-205 15 Hole - 142 mm Right</td>
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<td><strong>13.</strong> 1312-18-208 15 Hole - 142 mm Left</td>
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<td><strong>14.</strong> 1312-18-204 11 Hole - 103 mm Right</td>
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</tr>
<tr>
<td><strong>15.</strong> 1312-18-207 11 Hole - 103 mm Left</td>
<td></td>
</tr>
<tr>
<td><strong>16.</strong> 1312-18-205 15 Hole - 142 mm Right</td>
<td></td>
</tr>
<tr>
<td><strong>17.</strong> 1312-18-208 15 Hole - 142 mm Left</td>
<td></td>
</tr>
<tr>
<td><strong>18.</strong> 1312-18-204 11 Hole - 103 mm Right</td>
<td></td>
</tr>
<tr>
<td><strong>19.</strong> 1312-18-207 11 Hole - 103 mm Left</td>
<td></td>
</tr>
<tr>
<td><strong>20.</strong> 1312-18-205 15 Hole - 142 mm Right</td>
<td></td>
</tr>
<tr>
<td><strong>21.</strong> 1312-18-208 15 Hole - 142 mm Left</td>
<td></td>
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</tbody>
</table>

**Olecranon Plates**

| **13.** 1312-18-600 (2) | 10 Hole - Small |
| **14.** 1312-18-601 (2) | 13 Hole - Large |

**Long Plate Module**

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<th>Olecranon Plates</th>
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</tr>
<tr>
<td><strong>1312-18-607</strong> 17 Hole - 154 mm Left</td>
</tr>
<tr>
<td><strong>1312-18-606</strong> 21 Hole - 194 mm Right*</td>
</tr>
<tr>
<td><strong>1312-18-609</strong> 21 Hole - 194 mm Left*</td>
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<td><strong>2312-18-016</strong> Short F.A.S.T. Guide® (10)</td>
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<td><strong>2312-18-001</strong> Long Plate Bender (2)</td>
</tr>
<tr>
<td><strong>2142-07-027</strong> 2.7 mm Locking Drill Guide (1)</td>
</tr>
</tbody>
</table>

*Special Order

Refer to Cat. No. 0612-29-510 for supplemental information regarding these components.
Instrument Trays

2.5 mm Implant Module

Proximal Radius Plates
1. 1312-18-400 (2) Small
2. 1312-18-401 (2) Large

Coronoid Plates
3. 1312-18-501 (2) Left
4. 1312-18-500 (2) Right

5. 2.5 mm SP Non-locking Screw
   SP14000 Peg Screw 2.5 x 14 mm
   SP16000 Peg Screw 2.5 x 16 mm
   SP18000 Peg Screw 2.5 x 18 mm
   SP20000 Peg Screw 2.5 x 20 mm
   SP22000 Peg Screw 2.5 x 22 mm
   SP24000 Peg Screw 2.5 x 24 mm
   SP26000 Peg Screw 2.5 x 26 mm
   SP28000 Peg Screw 2.5 x 28 mm
   SP30000 Peg Screw 2.5 x 30 mm
   SP32000 Peg Screw 2.5 x 32 mm
   SP34000 Peg Screw 2.5 x 34 mm
   SP36000 Peg Screw 2.5 x 36 mm
   SP38000 Peg Screw 2.5 x 38 mm
   SP40000 Peg Screw 2.5 x 40 mm

6. 2.5 FP Locking Screw
   FP14 Peg Full Thread 2.5 x 14 mm
   FP16 Peg Full Thread 2.5 x 16 mm
   FP18 Peg Full Thread 2.5 x 18 mm
   FP20 Peg Full Thread 2.5 x 20 mm
   FP22 Peg Full Thread 2.5 x 22 mm
   FP24 Peg Full Thread 2.5 x 24 mm
   FP26 Peg Full Thread 2.5 x 26 mm
   FP28 Peg Full Thread 2.5 x 28 mm
   FP30 Peg Full Thread 2.5 x 30 mm
   FP32 Peg Full Thread 2.5 x 32 mm
   FP34 Peg Full Thread 2.5 x 34 mm
   FP36 Peg Full Thread 2.5 x 36 mm
   FP38 Peg Full Thread 2.5 x 38 mm
   FP40 Peg Full Thread 2.5 x 40 mm

7. 14425-6 (12) 1.6 mm x 6 in. K-wire Half Bay PT
8. FDB20 (2) F.A.S.T. Drill Bit 2.0
9. 2312-18-012 (2) 1.3 mm Square Screwdriver
10. QCH Quick Connect Handle
11. 2312-18-014 2.5 mm Counterbore
12. 2312-07-012 Fragment Plate Holder
13. 2312-18-005 (2) 2.5 mm Bender
## Instrument Trays

### 3.5 mm Screw Module

1. **3.5 mm Locking Cortical Screw**
   - 8161-35-010 3.5 mm Cortical Locking Screw 10 mm
   - 8161-35-012 3.5 mm Cortical Locking Screw 12 mm
   - 8161-35-014 3.5 mm Cortical Locking Screw 14 mm
   - 8161-35-016 3.5 mm Cortical Locking Screw 16 mm
   - 8161-35-018 3.5 mm Cortical Locking Screw 18 mm
   - 8161-35-020 3.5 mm Cortical Locking Screw 20 mm
   - 8161-35-022 3.5 mm Cortical Locking Screw 22 mm
   - 8161-35-024 3.5 mm Cortical Locking Screw 24 mm
   - 8161-35-026 3.5 mm Cortical Locking Screw 26 mm
   - 8161-35-028 3.5 mm Cortical Locking Screw 28 mm
   - 8161-35-030 3.5 mm Cortical Locking Screw 30 mm
   - 8161-35-032 3.5 mm Cortical Locking Screw 32 mm
   - 8161-35-034 3.5 mm Cortical Locking Screw 34 mm
   - 8161-35-036 3.5 mm Cortical Locking Screw 36 mm
   - 8161-35-038 3.5 mm Cortical Locking Screw 38 mm
   - 8161-35-040 3.5 mm Cortical Locking Screw 40 mm
   - 8161-35-042 3.5 mm Cortical Locking Screw 42 mm
   - 8161-35-044 3.5 mm Cortical Locking Screw 44 mm
   - 8161-35-046 3.5 mm Cortical Locking Screw 46 mm
   - 8161-35-048 3.5 mm Cortical Locking Screw 48 mm
   - 8161-35-050 3.5 mm Cortical Locking Screw 50 mm
   - 8161-35-052 3.5 mm Cortical Locking Screw 52 mm
   - 8161-35-054 3.5 mm Cortical Locking Screw 54 mm
   - 8161-35-056 3.5 mm Cortical Locking Screw 56 mm
   - 8161-35-058 3.5 mm Cortical Locking Screw 58 mm
   - 8161-35-060 3.5 mm Cortical Locking Screw 60 mm
   - 8161-35-065 3.5 mm Cortical Locking Screw 65 mm
   - 8161-35-070 3.5 mm Cortical Locking Screw 70 mm

2. **Multi-Directional Screw**
   - 8163-35-020 3.5 mm Multi-Directional Screw 20 mm
   - 8163-35-022 3.5 mm Multi-Directional Screw 22 mm
   - 8163-35-024 3.5 mm Multi-Directional Screw 24 mm
   - 8163-35-026 3.5 mm Multi-Directional Screw 26 mm
   - 8163-35-028 3.5 mm Multi-Directional Screw 28 mm
   - 8163-35-030 3.5 mm Multi-Directional Screw 30 mm
   - 8163-35-032 3.5 mm Multi-Directional Screw 32 mm
   - 8163-35-034 3.5 mm Multi-Directional Screw 34 mm
   - 8163-35-036 3.5 mm Multi-Directional Screw 36 mm
   - 8163-35-038 3.5 mm Multi-Directional Screw 38 mm
   - 8163-35-040 3.5 mm Multi-Directional Screw 40 mm
   - 8163-35-042 3.5 mm Multi-Directional Screw 42 mm
   - 8163-35-044 3.5 mm Multi-Directional Screw 44 mm
   - 8163-35-046 3.5 mm Multi-Directional Screw 46 mm
   - 8163-35-048 3.5 mm Multi-Directional Screw 48 mm
   - 8163-35-050 3.5 mm Multi-Directional Screw 50 mm
   - 8163-35-052 3.5 mm Multi-Directional Screw 52 mm
   - 8163-35-054 3.5 mm Multi-Directional Screw 54 mm
   - 8163-35-056 3.5 mm Multi-Directional Screw 56 mm
   - 8163-35-058 3.5 mm Multi-Directional Screw 58 mm
   - 8163-35-060 3.5 mm Multi-Directional Screw 60 mm
### Instrument Trays

#### 3.5 mm Screw Module (continued)

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#### 4. Low Profile Cortical Washer

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Screws, Plates, Intramedullary Nails, Compression Hip Screws, Pins and Wires

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 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: Screws, plates, intramedullary nails, compression hip screws, pins and wires 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 and/or fusion of the joints; conditions that restrict the patient’s ability or willingness to follow postoperative instructions during the healing process, foreign body sensitivity, and cases where the implant(s) would cross open epiphyseal plates in skeletally immature patients.

Additional Contraindications for Orthopaedic Screws and Plates only: Cases with malignant primary or metastatic tumors which preclude adequate bone support or screw fixations, unless supplemental fixation or stabilization methods are utilized.

Additional Contraindications for Fusion Nails only: Cases where there is an intact asymptomatic subtalar joint, cases of significant tibial misalignment (>10 degrees in either sagittal or coronal plane), cases of active soft tissue infection or osteomyelitis of foot and ankle and cases where there is a dysvascular limb.

Additional Contraindication for Retrograde Femoral Nailing only: A history of septic arthritis of the knee and knee extension contracture with inability to attain at least 45° of flexion.

Additional Contraindications for Compression Hip Screws only: Inadequate implant support due to the lack of medial buttress.

Warnings and Precautions: In using partial weight bearing or nonweight bearing appliances (orthopaedic devices other than prostheses), a surgeon should be aware that no partial weight bearing or nonweight bearing device can 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, plates, intramedullary nails, compression hip screws, pins and wires: 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, both deep and superficial; and allergies and other adverse reactions to the device material. Surgeons should take care when targeting, drilling and placing proximal screws through all tibial nail which include oblique locking options. Care should be taken as the drill bit is advanced to penetrate the far cortex. Advancing the drill bit too far in this area may cause injury to the deep peroneal nerve. Fluoroscopy should be used to verify correct positioning of the drill bit.

Additional Adverse Events for Compression Hip Screw only: Screw cutout of the femoral head (usually associated with osteoporotic bone).

Additional Contraindication for Fusion Nails only: Cases where there is an intact asymptomatic subtalar joint, cases of significant tibial misalignment (>10 degrees in either sagittal or coronal plane), cases of active soft tissue infection or osteomyelitis of foot and ankle and cases where there is a dysvascular limb.