Large External Fixator—Delta Frame Ankle Bridge. Using pin clamps with outrigger posts.
Large External Fixator—Delta Frame Ankle Bridge

Technique Overview

1. **Insert Steinmann pin**
   Insert a centrally threaded Steinmann pin through the calcaneal tuberosity.

2. **Attach open adjustable clamps**

3. **Insert Schanz screws**
   Use the 6-Position Drill Guide Handle (392.963) or pin clamp technique to ensure proper pin spacing.

4. **Attach pin clamp**
   Tighten the vise plates.

5. **Attach outrigger posts**
   Thread a post into each vise plate to a hard stop. For angled posts, turn the post counterclockwise to the desired orientation. Lock in position by turning the lock nut clockwise until tight.

6. **Attach carbon fiber rods**
   Attach carbon fiber rods to outrigger posts with combination clamps and to open adjustable clamps on the Steinmann pin.

7. **Reduce fracture**
   Reduce the fracture and tighten all clamps.

**Notes:**
For ease of reduction, tighten the proximal clamp first and then reduce.

To prevent equinus contracture, Schanz screws can be placed in the metatarsals as shown on the Optional Frame Configurations page.

Lateral x-ray showing frame radiolucency
## Recommended Components for Basic Frame

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Item</th>
<th>Quantity Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>293.xx</td>
<td>5.0 mm Steinmann Pin, with central thread</td>
<td>1</td>
</tr>
<tr>
<td>294.78x</td>
<td>5.0 mm Self-Drilling Schanz Screw</td>
<td>2</td>
</tr>
<tr>
<td>390.005</td>
<td>Large Combination Clamp</td>
<td>2</td>
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<tr>
<td>390.008</td>
<td>Large Open Adjustable Clamp</td>
<td>2</td>
</tr>
<tr>
<td>390.010</td>
<td>Large Pin Clamp, 6 position</td>
<td>1</td>
</tr>
<tr>
<td>390.012</td>
<td>30° Outrigger Post, 11 mm</td>
<td>2</td>
</tr>
<tr>
<td>394.8x</td>
<td>11.0 mm Carbon Fiber Rod</td>
<td>2</td>
</tr>
<tr>
<td>394.97</td>
<td>Protective Cap, for 11.0 mm rods</td>
<td>4</td>
</tr>
<tr>
<td>394.993</td>
<td>Protective Cap, for 5.0 mm Fixation Pins</td>
<td>4</td>
</tr>
</tbody>
</table>

### MRI Conditions

Synthes MR Conditional devices have been tested for safety in an MR environment. The MR environment is described as the general environment present in the vicinity of an MR scanner and/or anywhere in the procedure room, including the center of the bore of the MR scanner. Testing was performed to determine displacement force, torque and RF heating induced in Synthes devices by the magnetic field of the MR scanner.

Testing was performed in compliance with ASTM F2052, ASTM F2213 and ASTM F2182. Induced displacement force was measured in 3.0 T active shielded MR scanners at a maximum spatial gradient of 45 mT/cm. The measured value was found to be lower than the acceptable limit established by ASTM F2052. Induced torque was measured in a 3.0 T active shielded MR scanner, and the measured value was found to be lower than the acceptable limit established by ASTM F2213. Testing for RF heating per ASTM F2182 was performed, and the measured value was found to be lower than the acceptable limit when normalized to an SAR of 2.0 W/kg.

### Field Conditions

<table>
<thead>
<tr>
<th>Field conditions</th>
<th>Limits</th>
</tr>
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<tbody>
<tr>
<td>Field strength (T)</td>
<td>1.5</td>
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<tr>
<td>SAR value (W/kg)</td>
<td>2.0</td>
</tr>
<tr>
<td>dB/dt (T/sec)</td>
<td>20</td>
</tr>
</tbody>
</table>

**Note:** The above field conditions should be compared with those of the user’s MR system in order to determine if the item can safely be brought into the user’s MR environment. If placed in the bore of the MR scanner during scanning, Synthes MR Conditional External Fixation devices may have the potential to cause artifact in the diagnostic imaging.

**WARNINGS**

All components of Synthes External Fixation frames must be identified as MR Conditional prior to being placed in or near an MR environment.
When to use
The purpose of this frame is to achieve a closed reduction through ligamentotaxis and maintain it until the soft tissue injury can resolve. The frame is recommended in conjunction with a two-stage treatment protocol for extra- and intra-articular fractures of the distal tibia with soft tissue injury (closed or open). The recommended protocol includes immediate open reduction and internal fixation (ORIF) of the fractured fibula, then application of the spanning external fixator in order to maintain tibial reduction, followed by delayed ORIF of the tibia.1,2,3

Relevant anatomy and pin placement

- In the tibia, insert Schanz screws within the safe zone.  
- Tibial Schanz screws should be placed in the AP plane (as shown in the illustrated frame) for maximum stability. Alternatively, they may be placed anteromedially to avoid drilling along the crest. In dense cortical bone, it may be necessary to predrill.
- Schanz screws are placed proximal to the fracture in the midsagittal plane of the diaphysis, approximately one-half fingerbreadth medial to the tibial crest.
- The proximal Schanz screws should be placed outside the proposed future operative site to avoid the risk of contamination.
- In the calcaneus, a centrally threaded Steinmann pin is placed through the calcaneal tuberosity. In order to avoid the neurovascular bundle, this pin should be placed well posterior and inferior and can be placed with image intensification. Typically, the ideal insertion site lies two fingerbreadths from the plantar aspect of the heel and two fingerbreadths anterior to the dorsal aspect of the heel.

Legend

- Optimal zones for Schanz screw insertion
- Safe zones for Schanz screw insertion

Tibial safe zones

Calcaneal pin insertion site

**Pin clamp technique**

1. **Insert first Schanz screw**
   Insert a Schanz screw through the drill sleeve and end position of the Large Pin Clamp (390.009 or 390.010), using the clamp as an insertion guide.

   **Note:** The clamp should be parallel, and the Schanz screws perpendicular, to the bone.

2. **Insert second Schanz screw**
   Insert a second Schanz screw through the opposite end of the clamp. Tighten vise plates.

   **Note:** Additional Schanz screws may be inserted as needed.

**Pin clamp**
Large Pin Clamp, 6 position (390.010)

**Outrigger posts**

- Straight (390.011)
- 30° Post (390.012)
- 90° Post (390.013)

**Vise plate tightening point**

**Stargrind cover: remove to add outrigger posts**

**Note:** Each side of the pin clamp can accept either an outrigger post or a rod attachment.
The delta frame ankle bridge can also be built using the straight or 90° outrigger posts, as shown.
Optional Frame Configurations continued

**Enhancing the frame for additional stability**

To prevent equinus contracture, several options are available. A 4.0 mm Schanz screw can be placed in the proximal-third portion of the first metatarsal, with a second Schanz screw in the third, fourth or fifth metatarsal. These Schanz screws can each be directly connected to the delta frame rods or to each other with a transverse carbon fiber rod. Alternatively, a single Schanz screw can be carefully placed in the middle cuneiform.

Two additional posterior carbon fiber rods act as “kickstands” to elevate the foot, protecting the soft tissues.

Schanz screws in metatarsals

**Conversion to a hybrid frame**

If ORIF cannot be performed due to the degree of soft tissue injury or because of the amount of metaphyseal or articular comminution, the delta frame can be converted to a hybrid frame.

With the delta frame in position, place two spade-point reduction wires through the distal bony fragment. Attach a 3/4 ring and connect to the previously placed outrigger posts. Remove the Steinmann pin from the calcaneus.

For further information, please refer to the *Distal Tibia Hybrid Frame Technique Guide*. 

**Note:** The hybrid frame is NOT MR Conditional. MR Conditional frames are composed of:
- color-coded clamps etched
- carbon fiber rods etched
- Synthes stainless steel or titanium Schanz screws labeled MR Conditional
Large External Fixator Set with Self-Drilling Schanz Screws
Stainless Steel (115.720) or Titanium (115.740)

Graphic Case
690.315 Large External Fixator Graphic Case

Implants in Set 115.720 (MR Conditional)
293.74  5.0 mm Steinmann Pin with Central Thread,
        200 mm, 4 ea.
294.56  5.0 mm Schanz Screw, blunted trocar point,
        200 mm, 8 ea.
        5.0 mm Self-Drilling Schanz Screws
294.784 150 mm, 4 ea.
294.785 175 mm, 8 ea.
294.786 200 mm, 8 ea.
294.950 6.0 mm Transfixation Pin, 225 mm,
        4 ea.

Implants in Set 115.740 (MR Conditional)
293.74  5.0 mm Steinmann Pin with Central Thread,
        200 mm, 4 ea.
294.56  5.0 mm Schanz Screw, blunted trocar point,
        200 mm, 8 ea.
294.950 6.0 mm Transfixation Pin, 225 mm,
        4 ea.
        5.0 mm Titanium Self-Drilling Schanz Screws
494.784 150 mm, 4 ea.
494.785 175 mm, 8 ea.
494.786 200 mm, 8 ea.

Instruments (for both sets)
310.37  3.5 mm Drill Bit, quick coupling, 195 mm, 2 ea.
310.48  4.5 mm Drill Bit, quick coupling, 195 mm, 2 ea.
321.20  Ratchet Wrench, 11 mm width across flats, 2 ea.
355.14  Cannulated Socket Wrench
392.951 8.0 mm/6.0 mm Threaded Drill Sleeve, short
392.952 8.0 mm/6.0 mm Threaded Drill Sleeve, long
392.963 6-Position Drill Guide Handle
393.10  Universal Chuck with T-Handle
393.103 Drive Adaptor with quick coupling,
        for 5.0 mm Schanz Screws
393.104 Drive Adaptor with quick coupling,
        for 6.0 mm Schanz Screws

Note: For additional information, please refer to package insert.

For detailed cleaning and sterilization instructions, please refer to
http://us.synthes.com/Medical+Community/Cleaning+and+Sterilization.htm
or to the below listed inserts, which will be included in the shipping container:
—Processing Synthes Reusable Medical Devices—Instruments, Instrument Trays
  and Graphic Cases—DJ1305
—Processing Non-sterile Synthes Implants—DJ1304
Instruments (for both sets) continued

<table>
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<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>393.746</td>
<td>Split Tissue Protection Sleeve, 5.0 mm</td>
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<tr>
<td>393.76</td>
<td>Open Compressor, 2 ea.</td>
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<tr>
<td>394.181</td>
<td>3.5 mm Trocar, short</td>
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<tr>
<td>394.182</td>
<td>3.5 mm Trocar, long</td>
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<tr>
<td>395.911</td>
<td>Drill Sleeve Handle</td>
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<td>395.912</td>
<td>5.0 mm/3.5 mm Drill Sleeve, short</td>
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<td>395.913</td>
<td>5.0 mm/3.5 mm Drill Sleeve, long</td>
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<td>395.921</td>
<td>6.0 mm/5.0 mm Threaded Drill Sleeve, short</td>
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<tr>
<td>395.923</td>
<td>6.0 mm/5.0 mm Threaded Drill Sleeve, long</td>
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Fixation Material (for both sets) (MR Conditional)

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<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>390.002</td>
<td>Large Multi-Pin Clamp, 6 position, 4 ea.</td>
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<td>390.003</td>
<td>Rod Attachment, for Large Multi-Pin Clamp, 6 ea.</td>
</tr>
<tr>
<td>390.004</td>
<td>Large Multi-Pin Clamp, 4 position, 2 ea.</td>
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<td>390.005</td>
<td>Large Combination Clamp, 12 ea.</td>
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<td>390.006</td>
<td>Dynamization Clip, for Large Combination Clamp, 4 ea.</td>
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<tr>
<td>390.007</td>
<td>Tube-to-Tube Clamp, 2 ea.</td>
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<tr>
<td>390.008</td>
<td>Large Open Adjustable Clamp, 8 ea.</td>
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<tr>
<td></td>
<td>11.0 mm Carbon Fiber Rods, 4 ea.</td>
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<td>394.80</td>
<td>100 mm</td>
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<td>394.82</td>
<td>150 mm</td>
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<td>400 mm</td>
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<td></td>
<td>Protective Caps</td>
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<tr>
<td>394.97</td>
<td>For 11.0 mm Rods, 1 pkg. of 10</td>
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<tr>
<td>394.993</td>
<td>For 5.0 mm Fixation Pins, 1 pkg. of 10</td>
</tr>
<tr>
<td>394.994</td>
<td>For 6.0 mm Fixation Pins, 1 pkg. of 10</td>
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Fixation Material (not tested for safety in the MR environment))

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>393.66*</td>
<td>Transverse Clamp, 2 ea.</td>
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</table>

Synthes: Large External Fixator—Delta Frame Ankle Bridge Technique Guide
Implants (MR Conditional)

Schanz Screws
294.43–.48  4.0 mm, spade point, 60 mm–150 mm
294.52–.57  5.0 mm, blunted trocar point, 100 mm–250 mm
294.71–.76  4.5 mm, blunted trocar point, 80 mm–200 mm

Self-Drilling Schanz Screws
294.774–.779 4.0 mm, 60 mm–175 mm
294.782–.788 5.0 mm, 100 mm–250 mm
294.792–.798 6.0 mm, 100 mm–250 mm

Titanium Self-Drilling Schanz Screws
494.774–.779 4.0 mm, 60 mm–175 mm
494.782–.788 5.0 mm, 100 mm–250 mm
494.792–.798 6.0 mm, 100 mm–250 mm

Fixation Material (MR Conditional)
390.009  Large Pin Clamp, 4 position
390.010  Large Pin Clamp, 6 position
390.011  Straight Outrigger Post, 11 mm
390.012  30° Outrigger Post, 11 mm
390.013  90° Outrigger Post, 11 mm

Fixation Material (not tested for safety in the MR environment)
393.43   Spring-Loaded Nut
393.64   Adjustable Clamp
393.69   Open Clamp
393.71   Universal Joint for Two Tubes
393.75   Universal Clamp

Protective Caps
394.991   For 4.0 mm Fixation Pins (10/pkg.)
394.992   For 4.5 mm Fixation Pins (10/pkg.)

Sterile-Packaged Large External Fixator Kits
03.301.010S Large External Fixator Ankle Frame Kit, sterile
03.301.011S Large External Fixator Trauma Kit, sterile
03.301.012S Large External Fixator Pelvic Frame Kit, sterile

Sets
105.957   Power Drive Set
150.16    ComPact Air Drive Set

Accessories for Graphic Case
690.315.12 Label Sheet Pack, for Large External Fixator Clamps
690.315.13 Label Sheet Pack, for Schanz Screws
690.315.14 Replacement Brackets (3 sizes)
690.315.15 Replacement Screws (10/pkg.)
690.315.17 Label Sheet, for Large External Fixator MR Conditional clamps