Synergy™ IQ
Low Back Surgical Technique
Developed in conjunction with J. Abbott Byrd III, M.D.

Universal system

Modular packaging maximizes screw options

Low-profile design

Easy-to-use instrumentation
Pedicle hole preparation is begun with a sharp *Awl* that penetrates the pedicle hole starting point to a depth of 9mm.

The blunt tip *Pedicle Probe* is used to extend the starting hole through the pedicle and into the vertebral body with a gentle back and forth twisting motion. This motion allows the probe to follow a path of least resistance. Normally, the *Pedicle Probe* is inserted to a depth of 35-45mm.
Confirmation of bony continuity on all sides and bottom of the prepared holes is achieved with a Ball Tip Probe. The Ball Tip Probe is used to palpate all four sides and the bottom of the pedicle hole to ensure that it is within bone.

The position of the pedicle hole should be checked with a PA and Lateral radiograph prior to screw implantation, using the Trial Pins to mark the pedicle hole.

Taps are available for each of the six screw diameters.
Screw Insertion

In patients with osteoporotic, or poor quality bone, a larger diameter screw may be required to achieve proper screw purchase and fixation.
The VLS Screwdriver with the axial Ratcheting Handle, Z-Connect is used to drive the screw. Place the tip of the VLS Screwdriver over the external hex of the VLS Screw Head.

Lower the outer tube of the VLS Screwdriver and thread it onto the seat. Care should be taken not to over-tighten or cross-thread the outer tube.

The screw is inserted to the appropriate depth; typically when the seat nears contact with the bony surface. The screwdriver is disengaged by rotating the VLS Screwdriver’s outer tube counterclockwise.

The insertion depth of the subsequent screws should be such that the seat channels line up to facilitate rod placement.

The open VLS Seat should be positioned so that the alignment indicator dots are medial.
Rod Preparation And Insertion

**Step 1**
The appropriate length rod should be chosen according to the construct, allowing approximately 4-5mm of rod overhang on either end of the construct.

**Step 2**
The rod is bent to fit the desired spinal contours as closely as possible using the French Rod Bender set for a 6.35mm rod. The rod should be bent so that it lies at the base of the rod channel.

Harmonious rod bends should be achieved, avoiding sharp angles that would make rod insertion difficult or reduce fatigue life.
The rod is placed into the rod channel using the Rod Holder.

Should further contouring be desired after the rod is inserted, In-Situ Benders are available.

The paired In-Situ Benders (L & R) are constructed to receive the rod at 70° on one end and at 90° on the other. These instruments address lordotic and kyphotic in-situ bending procedures.
The **Screw Fork** is designed to straddle the implant and rod while introducing the rod into the open implant.

**Option 2**

The **Rod Pusher** is used to apply gentle force to the rod while engaging the cap nut.

**Option 3**

The **Talon** is designed to straddle the implant while introducing the rod into the open rod channel, allowing placement of the cap nut.

*As with all rod pushers, control is essential. Excessive force should be avoided.*
Once the rod is properly seated in the rod channel, the **VLS Aligning Cap Nut** is placed with the **Cap Nut Starter**. To avoid cross-threading of the cap nut with the **VLS Seat**, align the three alignment dots on the cap nut with the three alignment dots on the seat and turn clockwise.

When using the **Closed VLS Seat**, a **Closed VLS Set Screw** is placed in the seat using the **Cap Nut Starter**.

The **Cap Nut Starter** should be used only to start the Cap Nut and Closed VLS Set Screw and can become damaged if used to aggressively tighten.
Compression, Distraction, Rotation

Once the rod has been captured in the rod channel, compression and distraction maneuvers can be easily accomplished utilizing the **Screw Compressor** and **Screw Spreader**.
Rod Rotation
The **Rod Rotator** is used to firmly grasp the rod for rotation or to establish a purchase point for distraction or compression if necessary.

Final Tightening

*Instruments Used For Final Tightening*

VLS™ Cap Nut

**Step 1**

Assemble the **Torque Limiting T-Handle** and the **Cap Nut/Closed VLS Driver**. Place the driver through the appropriate arm of the **Cap Nut/Closed VLS Torque Stabilizer**.
**STEP 2**

Place the tip of the **Driver** into the **Cap Nut** and lower the **Stabilizer** over the **Cap Nut** and rod.

**STEP 3**

Begin turning the **Torque Limiting T-Handle** to tighten the cap nut. The **Torque Limiting T-Handle** is pre-set to 120 in-lbs and will ‘click’ once the proper torque is achieved.

Closed VLS™

**STEP 4**

**Closed VLS Set Screw**

Follow the same method for tightening the **Closed VLS Set Screw** as you would for the **Cap Nut**, but utilize the ‘Closed VLS’ end of the stabilizer.
**Cross Connectors**

**OPTION 1**

**Cross Connector**

The appropriate length **Cross Connector** is selected, placed over the rods, and slid into place. The longer connectors can be bent with the **Cross Connector Benders** to accommodate non-parallel rods.

**OPTION 2**

**Adjustable Cross Connector**

The **Adjustable Cross Connector** consists of two components: the **Connector with Rod** and the **Connector Clamp**. Available lengths of the **Adjustable Cross Connector** are small (33.5mm-40.0mm), medium (40mm-55mm), and large (55mm-80mm).

If bending of the **Adjustable Cross Connector** is required, the **Cross Connector Benders** may be used.
The Double Hex Set Screw is used to attach the Cross Connector to the rod and to lock the two components together.

The Set Screw is held and manipulated with the One-Piece Magazine Socket. The Magazine Socket securely holds the external hex head portion of the set screw. Once started, the set screws can be left in place and revisited for implant adjustments.

**Final Tightening for Double Hex Set Screw**

Final tightening and hex head shear-off is attained with clockwise tightening of the Double Hex Set Screw. The sheared head is captured in the Magazine Socket shaft. Placing the socket tip over the next set screw with downward pressure feeds the previously sheared head into the magazine. The Magazine Socket will hold several hex heads and is emptied by pulling the pin on the shaft of the socket and letting the hex heads slide out of the T-Handle end. When the Magazine Socket is full, the socket cannot fully engage the head of another set screw, which may result in rounding of the external hex. Rounding may also occur if the socket is not fully seated during final tightening. If a set screw has been loosened and retightened several times, it is best to replace the set screw to ensure optimal fixation.
The Variable Reduction Locking Seat with extended arms is used to reduce spondylolisthesis if so desired by the surgeon. The extended portions of the seat are removed at the end of the procedure using the Reduction Screw Thread Gripper, breaking off the extended arms flush with the nut.

The VLS™ Easy Start™ Seat may be used for low grade spondylolisthesis reduction or other rod contouring difficulties. The extended Easy Start Seat arms facilitate rod capture in the seat. The extended arms on the seat are removed at the end of the procedure using the Reduction Screw Thread Gripper.
Provisional Implant Closure

When using a **Variable Locking Reduction Seat** or **Easy Start™ Seat**, a **Hex Nut** is used and is engaged with the **Reduction Seat Nut Starter**.

Final Tightening of the Hex Nuts

**STEP 1**

The **Torque Stabilizer** is placed over the nut with its notched end straddling the rod.

**STEP 2**

The **T-Wrench** is placed through the stabilizer and on the nut.

**STEP 3**

Connect the **Torque Limiting T-Handle** to the **T-Wrench** with the square drive to **Z-Connect Adapter**.

**STEP 4**

Turn the **Torque Limiting T-Handle** clockwise. The **Torque Limiting T-Handle** is pre-set to 120 in-lbs and will ‘click’ once the proper torque is achieved.
INTEGRAL™ Screws

Open INTEGRAL Screw

The appropriate size INTEGRAL Open Screw is selected and the INTEGRAL Open Screwdriver is introduced into the rod channel. The interference fit will hold the screw while it is inserted into the prepared hole. The depth of screw insertion should be at least to the last thread but may be deeper to facilitate implant alignment.

Implant Closure - Open INTEGRAL Screw

Once the rod has been placed in the channel of the open screw the Aligning Cap Nut is engaged with the Cap Nut Starter. To avoid cross-threading of the cap nut with the head of the screw, align the three dots on the cap nut with the three dots on the head of the open screw. Nut cross-threading can be detected immediately by abnormal resistance during tightening and can be avoided by aligning the three dots on the Cap Nut and screw. The Cap Nut Starter should be used only to start nuts and can become damaged if used to aggressively tighten the Cap Nut.

Final Tightening for Open INTEGRAL Screws

To achieve final tightening of the Aligning Cap Nut on the Open INTEGRAL Screw, assemble the Torque Limiting T-Handle, and the Cap Nut/Closed VLS Driver. Place the Driver through the Stabilizer utilizing the end marked ‘Cap Nut’.
Place the tip of the **Driver** into the cap nut and lower the stabilizer over the cap nut and rod.

**STEP 3**

Begin turning the **T-Handle** to tighten the **Cap Nut**. The **Torque Limiting T-Handle** is pre-set to 120 in-lbs. Once the specific torque level is achieved, the handle will ‘click’.

---

**Closed INTEGRAL™ Screw**

The **Closed INTEGRAL Screw** is implanted using the two-pronged **Closed INTEGRAL Screwdriver**. The screw is inserted between the prongs and held in place by an interference fit. This screwdriver is also used for insertion of the **Iliac Screws** and **Angled Closed Screws**.

---

**Implant Closure for Closed INTEGRAL Screws**

The **Double Hex Set Screw** is used to secure the rod in the **Closed INTEGRAL Screw**.

Use the **One-Piece Magazine Socket** to provisionally tighten the **Set Screw** into the **Closed INTEGRAL Screw**. Take care not to over tighten as the head of the set screw will shear off prematurely. Shearing off the head of the set screw should take place during final tightening.

When final tightening is desired, turn the **Magazine Socket** clockwise. The external hex head of the set screw will shear off when the proper tightening torque is achieved.