



novinium
cable life extension

Rejuvenation Instructions Power Cables IA (Injection Adaptor) Installation – Dead-front Termination

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- Ultrinium™ sustained pressure injection method (U.S. Patent 7,615,247)
- Ultrinium™ formulation optimization injection method (U.S. Patent 7,611,748)
- Injection Adaptor (U.S. Patent 7,195,504 and 7,538,274)
- Perfectium™ single switch injection (U.S. Patent 7,353,601)
- Predicting performance of Electrical Power cables (patent pending)
- Formulation of Ultrinium™ & Perficio™ components (patents pending)
- N-Rex™ submarine cable injection process (patent pending)
- N-Ter™ injection or Novinium thermally enhanced rejuvenation (patent pending)
- Reticular Flash Preventer (RFP) provides safer operation of conventional injection elbows (patent pending)

Version 20100702

Installing IAs in Dead-front Termination



Caution: Working around energized high-voltage systems may cause serious injury or death. Installation should be performed by personnel familiar with good safety practice in handling high-voltage electrical equipment. De-energize, test and ground all electrical systems before installing Injection Adaptors.

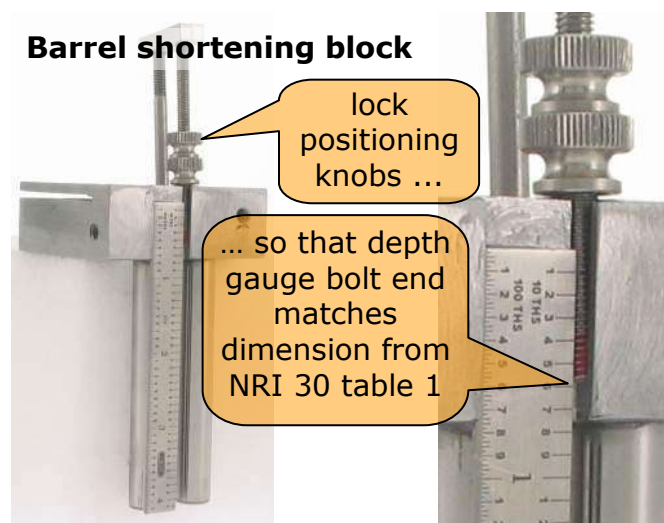
1. Perform the instructions in NRI 30 "IA Installation – Connector Replacement".
 - If no substitution or modifications to the compression connector are required skip to step 3.
 - If a substitution is required, make the required substitution and skip to step 3.
 - If the compression connector barrel length needs to be shortened proceed to step 2.
2. Shorten the barrel length of the compression connector as called for in NRI 30 Table 1.



choose largest diameter depth gauge that can be inserted into compression connector barrel

- a. Select the U-shaped depth gauge with the largest diameter depth probe leg that slides into the compression connector barrel. This step may be omitted if it was performed previously for an identical connector.
- b. Adjust and lock the two positioning knobs to the value required in Table 1 by aligning the end of the depth adjustment leg with the integral metal rule on the barrel shortening block (NPN: 0-LT-BSB01) underside. This step may be omitted if it was performed previously for an identical connector.

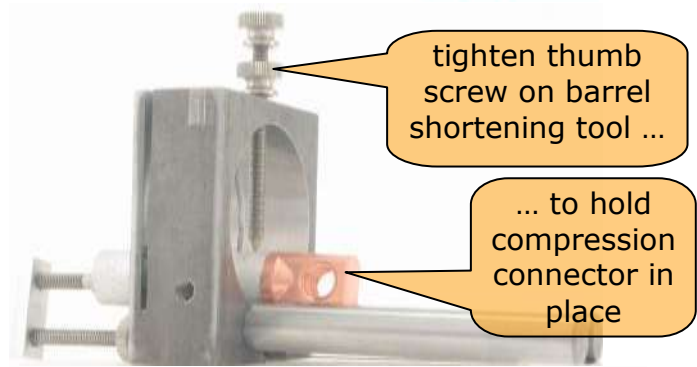
Barrel shortening block



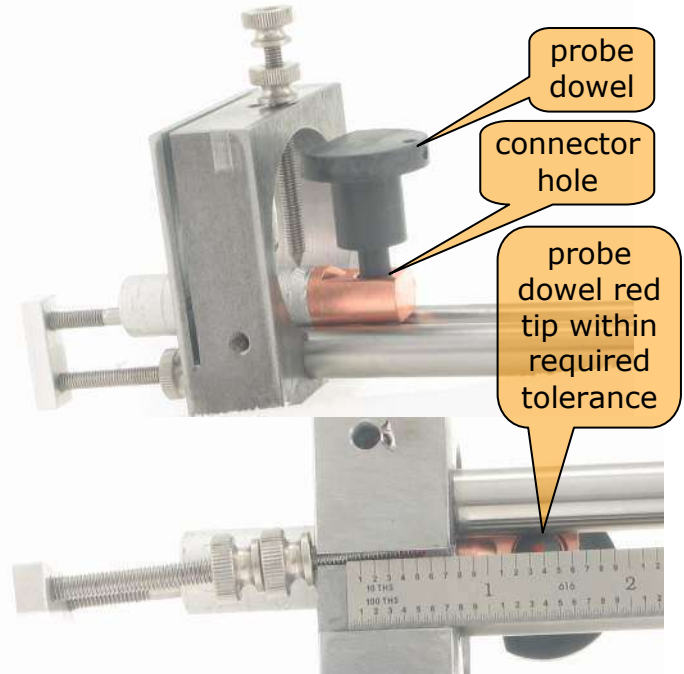
lock positioning knobs ...

... so that depth gauge bolt end matches dimension from NRI 30 table 1

- c. Clamp the compression connector into the barrel shortening block with the thumb screw.



- d. Insert the probe dowel into the threaded connector hole and confirm that the dowel pointer (red tip) is within the required tolerance range of Table 1 found in NRI 30 "IA Installation – Connector Replacement". If the pointer is outside of the tolerance range the compression connector must be discarded or modified.



- e. With the depth gauge fully inserted, tighten the clamp screw to hold the connector firmly in place. Remove the depth gauge, and saw off the excess barrel length using a fine hacksaw blade with at least 24 teeth per inch (25 mm). File or sand sharp edges and clean all filings or shavings from the inside and outside of the compression connector.



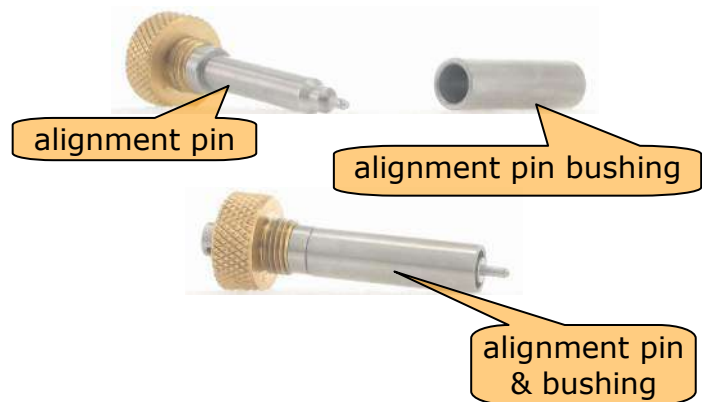
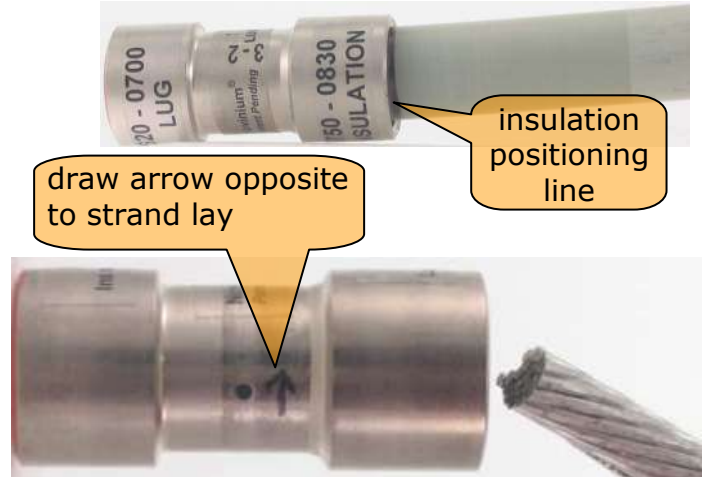
3. If the dead-front device includes a cable adaptor, position it on the cable before installing the IA.

4. Insert the cable into the insulation end of the IA until the insulation seats on the internal IA shoulder. There must be no interference between the insulation and the IA inner diameter. If there is any interference the next larger size of IA is required, or the cable may be out-of-round and may need to be replaced.

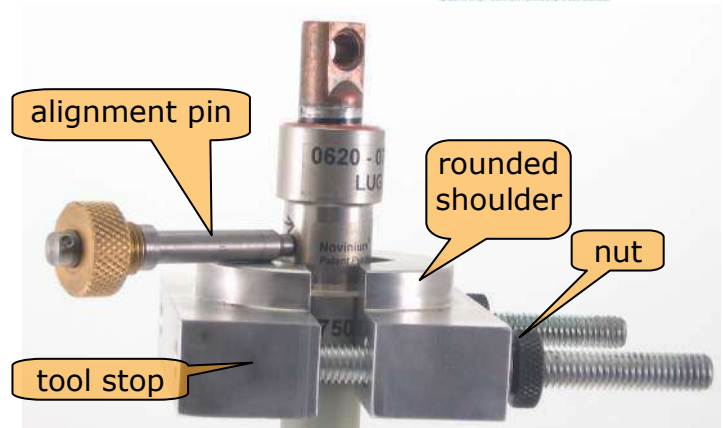
For cables with more than 34 conductor strands, draw an arrow in the direction opposite the lay of the outermost strand layer (the arrow should be in the direction required to straighten the outermost strand layer).

5. Loosely position the tool stop (**NPN: O-LT-TLSTP**) over the insulation compression portion of the IA. For IAs which use the URD size dies, place the tool stop so the rounded shoulder faces away from the insulation; For IAs which use the feeder size dies, place the rounded shoulder towards the insulation.

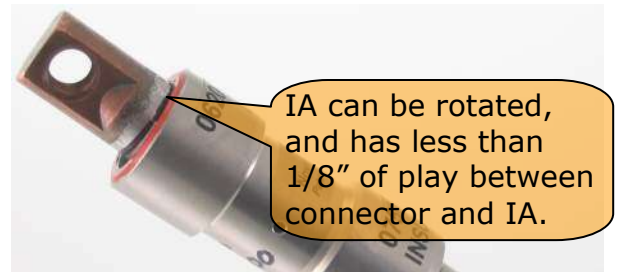
- a. For most IA's, slide the alignment pin bushing (**NPN: 2-LT-ALBUSH**) over the alignment pin (**NPN: 2-IT-ITOOL/PIN**) for accurate positioning in step 5b. If the part number of the IA ends with an "L", omit the alignment pin bushing. If a hex bushing is specified on the IA label, use a hex bushing in place of the alignment pin bushing. Follow specific instructions on the IA label if they are present.



- b. Insert the alignment pin into the injection port hole. Snug the tool stop against the bushing (if used) or alignment pin and tighten the knurled nuts. Remove the alignment pin.



6. Position the compression connector over the conductor strand ends and inside the IA. Verify the position of the IA, connector, and cutbacks with the appropriate Novinium template. There should be a small amount (less than 1/8") of play between the IA and the connector, and the IA should rotate freely. If installation is on a cable with 34 or more conductor strands, the connector should be oriented 15° in the direction opposite the arrow drawn in step 4 from its intended final position.



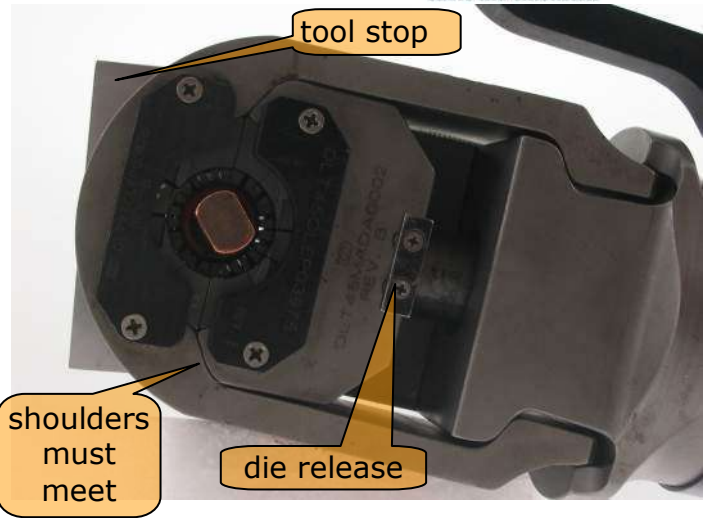
7. Install the 4-digit die in the swaging tool that matches the 4-digit number on the connector side of the IA. This 4-digit number is the nominal outside diameter of the IA after it is swaged in mils. A mil is 1/1000th of an inch. For example, die 0842 will swage to a nominal OD of 0.842". A die color code table can be found at the end of NRI 30.



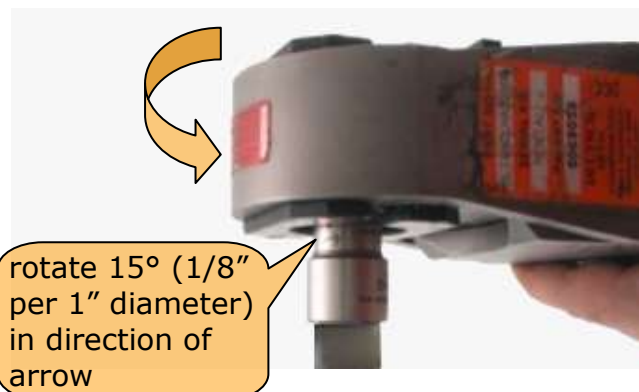
8. Swage the compression connector ...
 - a. With the die release facing away from the tool stop, hold the swaging tool head snugly against the tool stop and swage the IA, compression connector (lug) and strands until the shoulders of the tool head meet.



Keep fingers away from the closing portion of die and tool head.



- b. For cables with 34 or more conductor strands, use the tool head to rotate the IA 15° (roughly 1/8" for 1" O.D.) in the direction indicated by the arrow to create a flow path. Do not release the tool head until the rotation has been completed.



- c. If the label on the IA indicates that a double swage is necessary to obtain the optimum compression ratio, apply the second swage over the first swage with the second and smaller die indicated on the IA label. The NRI application table in NRI 30 specifies which IAs require a double swage.



- Loosen the nuts on the tool stop and slide the tool stop onto the insulation. Place the appropriate half-pipe spacer (NPN: 0-LT-HALF-PIPE) on the insulation adjacent to the IA. IA's marked with an "L" will require a wider spacer than standard. Snug the tool stop against the half-pipe spacer and tighten the nuts on the tool stop. Remove the half-pipe spacer.



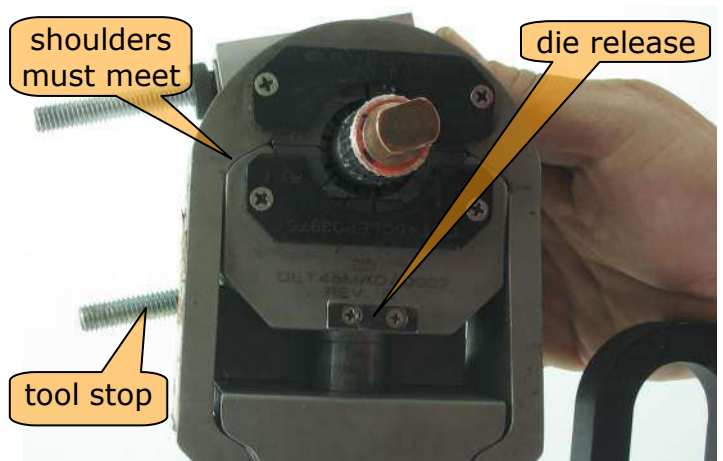
- Install the 4-digit die in the swaging tool which matches the 4-digit number on the insulation side of the IA.



- With the die release facing away from the tool stop, hold the swaging tool head snugly against the tool stop and swage the IA and insulation until the shoulders of the tool meet.



Keep fingers away from closing portion of die and tool head.

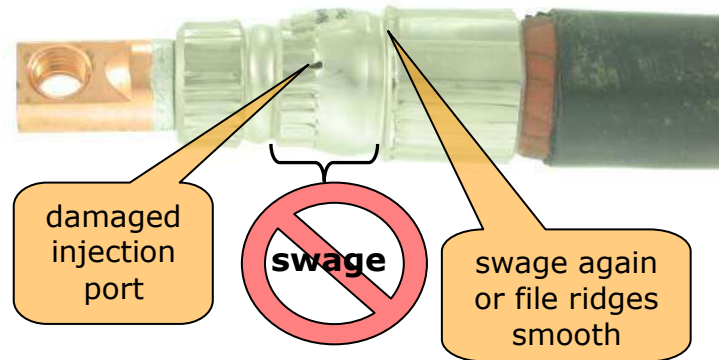


12. Rub a 3M® Scotch-brite™ pad around the circumference of the swages to remove any burrs.

13. For applications where some unswaged barrel length remains, additional swages or conventional crimps must be applied on the compression barrel before the IA is installed. Use the manufacturer specified die size and instructions.

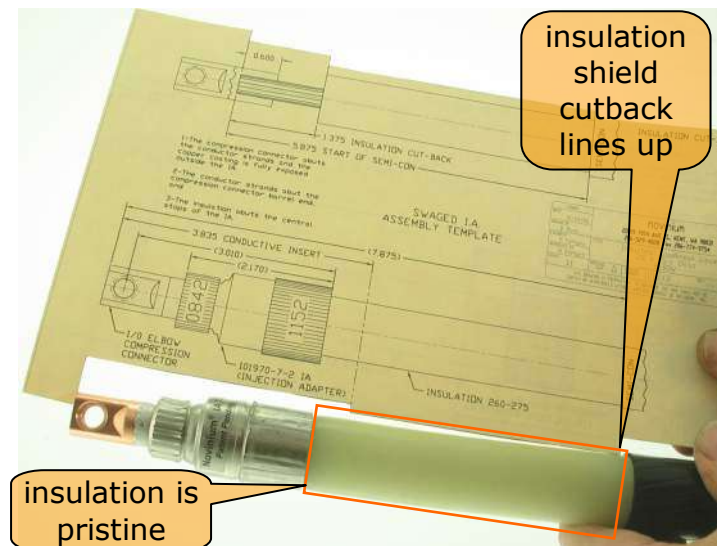


14. IA quality check: If the tools were correctly positioned there should be no marks on the central injection portion of the IA and the entire swage length will be compressed with no ridges at the end margins. Stray swages on the central portion of the IA may interfere with subsequent operation of the injection port. Any rough external edges may be filed or swaged again if necessary.

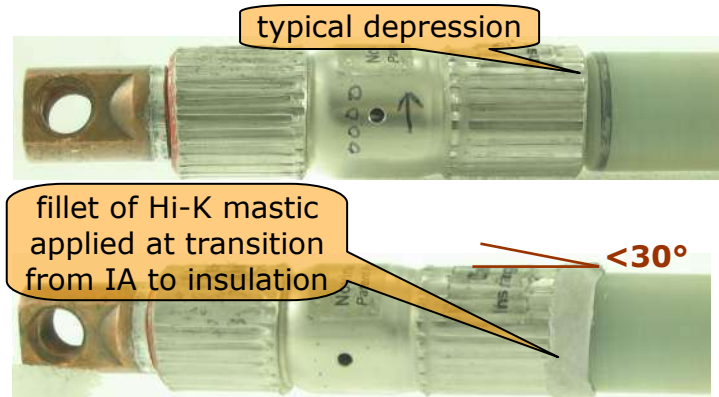


15. Component preparation quality check: Lay the post-swaged portion of the template next to the swaged assembly. Confirm:

- a. Insulation shield cutback falls within the required range. Adjust if necessary.
- b. Insulation is free of cracks, gouges, ripples, scratches, dirt, and other defects.



- c. Fill the depressions at the IA to insulation transition with 3M[®] Hi-K mastic (**NPN: 1-3M-HiK**) to create a smooth transition. The slope of the fillet (relative to the insulation surface) should be 30° or less and the mastic OD should be less than or equal to the diameter of the swaged IA. The mastic may not extend more than 3/16" (4.8mm) past the end of the IA.



16. When injection is complete, the plug pin is inserted flush with the IA exterior as described in NRI 40 "IT Installation & Removal", and the Novinium certified craftsman has verified the assembly against the template and attached their craft tag onto the IA, the component may be installed. Avoid applying torque to the IA.



17. Install the component as required by the more stringent of the manufacturer's installation instructions or circuit owner's standards. All neutrals on the cable must extend to 1" from the end of the elbow, with the exception of the drain wire, which must connect to the bonding point on the elbow.

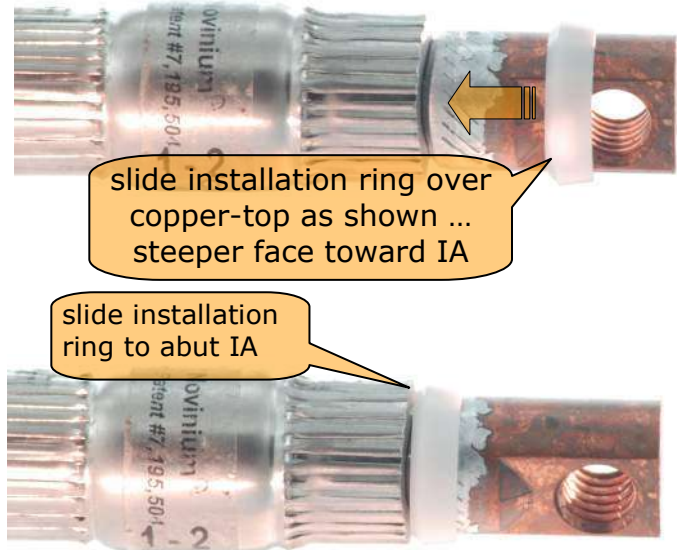
18. a. Silicone grease supplied by the component manufacturer may be applied to the IA exterior to facilitate the installation of molded components.



b. For Cooper elbows a plastic installation ring (**NPN: 1-IA-INST-RING**) should be abutted to the IA to facilitate the installation of the elbow.

In some elbows, the square edge of the IA encounters an internal square edge in the elbow. Without an installation ring significant force is required.

c. For tight fitting elbows in cold conditions, warming the component to no more than 120°F (49°C) facilitates installation.



d. For tight fitting elbows, use a tie-down strap with a ratchet-style handle. Cinch the strap around the neutrals and wrap the strap around the elbow along the cable axis. Ratchet the elbow into place while alternately twisting the elbow body clockwise and counter clockwise.

