



“PRT” TRANSITION BOOT INSTALLATION

(ZT05-98-001)

CAUTION:

Prior to beginning any work on production assemblies it is suggested that installers practice using this material and instructions on mockup assemblies. Personnel familiar with installing heat shrinkable tubing will be aware of some of the general do's and don'ts when installing these types of materials. However, working with a split heat shrinkable material and a pressure sensitive adhesive presents some different handling requirements from standard tubing. Good results will be obtained by closely following the installation procedure below

INSTALLATION

1. Use a micrometer and determine the outside diameter of the connector or backshell where you want to locate the PRT Boot.
 - a) On standard backshells this is usually the small diameter between two flange lips with a rough surface.
 - b) If you are fabricating EMI hardened assemblies, install all shields and band clamp assemblies first and then measure diameter over the same area of the backshell.

Note:

If the backshell has a lip or flange at the end, ignore the flange diameter.

2. Repeat this procedure and determine the outside diameter of the wire bundle in the area where the boot will make contact (Photo 1).
- 3) Use Table 1 and find the Connector/Backshell diameter in column one that is closest to your measured hardware diameter. Select the corresponding PRT boot size from column two.

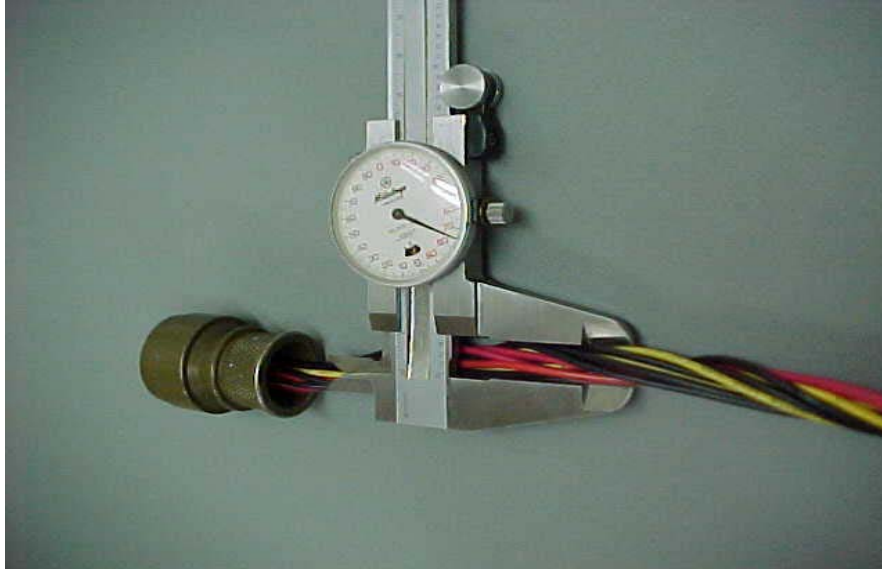


Photo 1: Measure Backshell and Cable diameter

Table 1. PRT Transition Boot Sizes (c)

Backshell O.D. Range (Inches)	PRT Boot Size Code	Cable O.D. (minimum) (a)	Boot Length (b)	Isodyne Backshell Size Code (Ref)
3/8 – 1/2	-01	.200	6.0	02
1/2 - 5/8	-03	.240	6.0	03
5/8 – 3/4	-05	.365	6.0	04
3/4 - 7/8	-07	.421	6.0	05
7/8 – 1.0	-09	.530	6.0	06
1.0 – 1-1/8	-11	.600	6.0	07
1-1/8 – 1-1/4	-13	.681	6.0	---
1-1/4 – 1-1/2	-15	.800	6.0	---

Notes:

- a) For wire and cable smaller than indicated in Column 3, build up the cable diameter to at least the minimum diameter shown using standard PRT wrap-around tubing (p/n: ZT98-04-016-size).

- b) Boot lengths can be shortened prior to installation using scissors or a razor knife. It is recommended that boot length extend at least 2.0 inches beyond the end of the backshell or connector body.
- c) Using an adhesive to bond the boot to the backshell body is not recommended or necessary to insure boot attachment. Boot strength is typically high enough to cause the boot to tear before it will be pulled off the backshell. Applying adhesive will make installation more difficult since the boot will want to squirt off the backshell during heating due to the lubricating effect of the molten adhesive. Furthermore, since the installation is blind, there is no guarantee that the adhesive will fill all the voids and provide an environmental seal (this especially true when using an EMI braid and backshell band clamp). If an adhesive is used, be sure the total diameter build up does not exceed the range shown in Column 1 or the boot may not stay together during the shrinking process.

Note: The wire bundle can be “water blocked” at the boot end if desired using Zippertubing’s Z-Block (100) or (135) Hot Melt adhesive. Follow the “water blocking” instructions described in Zippertubing process procedure ZT02-98-001.

4. Wrap the transition boot around the wire or cable so the paper release liner faces the installer. Peel back a short portion of the release liner (not all) and expose the adhesive. Position the non-adhesive edge of the tubing over the exposed adhesive section and align so all the adhesive is covered but no more. Never over-wrap the tubing so much that a loose flap of material is left at the overlap edge. Doing so could result in an undersized tubing condition and lead to the tubing tearing apart during the heating process. Begin bonding the tubing overlap edge to the adhesive. Avoid contacting the adhesive with your fingers as much as possible. Remove short sections of the release liner until the entire tubing length is sealed closed. Rub the overlap seam area firmly using your thumb and work out any wrinkles. Minor wrinkles will disappear upon shrinking.

Notes: a) PRT will always appear extremely large versus the cable size.
b) The closure adhesive has no cure time, you may apply heat immediately.

5. PRT Transition boots begin to shrink at 90°C (194°F), however to achieve a timely and uniform installation it’s desirable to use a heat gun temperature setting of 120 -130°C. Always use a small reducer nozzle that will allow you to localize the heat stream (Photo 2). Never use a tubing reflector designed to spread the heat evenly or an Infrared type of heat gun.



Photo 2: Heat gun with reducer nozzle

6. Shrinking

- a) Slide the closed boot over the connector or backshell. Locate the boot so the end is up against the area where the backshell diameter increases beyond the dimension that was measured in step 1.
- b) Begin shrinking the boot at the backshell end by directing the heat source at the tubing side opposite the adhesive overlap area. Apply the heat slowly and in short bursts. You may find that you will need to continually push the boot onto the backshell as it shrinks to maintain good backshell coverage. Never attempt to heat the entire backshell area all at once! Continue applying heat to the tubing and work around the backshell diameter until all the tubing is shrunk except the adhesive overlap area. Now begin applying heat to the overlap seam area from the side opposite the seam lip. Again, heat this area in short bursts only. The tubing overlap lip will tend to curl back and lift off the adhesive. When this occurs pull the heat away and lightly tap the lip back down with a wooden Popsicle stick. Repeat this quick heating cycle several times until the overlap area has fully shrunk.
- c) By now the tubing has usually started to shrink tightly around the backshell flange (if so equipped) and is beginning to make contact with the wire bundle. At this point, stop heating the backshell area and allow it to cool briefly. Begin applying heat to the adhesive overlap seam, focusing the stream at the overlap area only and moving back and forth over the entire seam length. The overlap area will tend to curl up into a “U” shape as it is heated (Photo 3). Continue applying heat in short bursts to this area until the surrounding tubing begins to pull the “U” shape back down flat. Do not be afraid to apply extra heat to the overlap seam, extra dwell time is

required for the inside layer of the tubing to shrink. Do not be alarmed if the outer layer of the overlap flap tends to lift off the adhesive and curl back slightly during initial heat exposure. With continued heating this lifted area will generally lay back down on its own, if not, lightly tap the lifted edge as necessary with a wooden Popsicle stick? Completely shrink the overlap seam area along its entire length before making any attempt the shrink the remaining tubing.



Photo 3: Adhesive overlap seam curling into a “U” shape

Once the overlap seam has pulled back down flat allow the area to cool briefly. Finally, begin heating the remaining tubing so that the tube is snug around the wire bundle. Allow to cool approximately 60 seconds. After the assembly has cooled, heat the entire part evenly and insure that all areas of the tubing are shrunk and that no cold spots or “fisheyes” remain.

- d) While the tubing is hot you may form the PRT tubing and cable as necessary. Once properly positioned allow the finished assembly to cool to the point of being warm to the touch.
- e) The finished assembly may have a shiny, sticky area, parallel to the overlap seam. This is residual adhesive that was exposed as the overlap material pulled back. The excess adhesive can be removed while the tubing is warm by rubbing your thumb along the overlap seam line. Rubbing the seam area will insure good overlap contact and the excess adhesive will ball up ahead of your thumb. Remove and discard the excess adhesive as necessary (Photo 4).

CAUTION:

Never attempt to clean the overlap area of excess adhesive using solvents
The adhesive system used is extremely solvent resistant.

- f) Properly installed PRT Transition Boots will look similar to those shown in Photos 5 and 6.



Photo 4: Adhesive ball removed with thumb pressure



Non-Shielded



EMI Shielded

Photo 5: Typical finished boots on flanged backshells



Photo 6: PRT Transition Boots (Sizes -01 thru -09)

Troubleshooting

- 1) The most common problem likely to occur when installing any type of PRT™ tubing or boot is a overlap seam rupture. This is a condition where the overlap seam pulls apart during installation. Seam ruptures are most likely to occur during the learning phase of PRT™ installations. Once the proper installation technique has been mastered this problem will disappear. Being in a rush to complete an installation is also a big factor in creating a seam rupture.
- 2) Seam ruptures occur for two reasons and both are controllable by the installer.
 - a) **Incorrect size:** The PRT™ tubing selected was too small for the cable diameter being repaired.
 - b) **Excessive Heat:** Too much heat was applied too quickly to the PRT™ tubing.

- 3) If a rupture does occur the tubing must be replaced. Verify that the tubing size was correct? If correct, then adjust the heating technique by applying heat more slowly and only in shorts bursts. Minimize heat exposure to the tubing beyond the overlap flap during initial heating. Use the “sneak up on it” approach where the heat is repeatedly removed from the tubing for a few seconds allowing it to cool and is then re-applied. In awkward installations, where it may be difficult to control selective heating, a piece of Aluminum foil can be useful to block heat from the surrounding tubing.

Installer Note:

Using the PRT™ tubing repair method will generally eliminate a large amount of cable harness disassembly and rework time. As a result, don't be in a rush to complete the installation. Take the few extra minutes to plan the installation, heat the sleeve slowly and work the materials as necessary to insure a good first time repair. The extra time spent doing this will be small in comparison to the time required to perform a classic repair that involves connector disassembly.