



INSTALLATION INSTRUCTIONS

MS 0107-06 | 04.13.20

PRT® (1553)

⚠ WARNING:
Cancer and Reproductive Harm | www.P65Warnings.ca.gov

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ABOUT ZIPPERTUBING®

Since 1957, Zippertubing® has been solving every type of cable bundling, heat-shielding, EMI-shielding, specialized heat shrink and marine fairing component challenge. From under the sea to outer space, we have prototyped, manufactured, and shipped custom-engineered solutions for every type of industry. We specialize in creating unique custom solutions in-house from beginning to end, so you feel confident you will receive the perfect product every time.

No matter the size, shape, standards, or specifications, Zippertubing® will abide by any requirements to create a custom solution. If the project has material restrictions or weight limitations, we will create a solution to fit your unique application needs, rather than make your application fit the product. We will draw up, prototype, and refine to ensure the solution is exceeding your expectations.



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INTRODUCTION

PRT® (1553) combines the proven benefits of heat shrinkable tubing (SAE-AMS-DTL-23053/5), a hot melt adhesive environmental seal and EMI shielding with the installation ease of using Zippertubing's wrap around products. This product is designed to provide an environmentally sealed repair to both the shield and the outer jacket of damaged, shielded cables from 0.075" to 1.00" in diameter. Testing has shown that a PRT® (1553) repaired shielded cable will perform at or near the original shield cable performance levels. This product has an operational temperature range of -67° to 275°F.

BACKGROUND

The PRT® (1553) is a shielded cable repair kit designed to repair MIL-STD-1553 and other shielded cable which have minor insulation and shield braid damage. These repair kits are not "splice kits" and any cable exhibiting primary wire insulation damage and/or shield braid damage exceeding 50% of the braid circumference are not repairable using this kit alone! Never attempt to use this kit to repair cables with damaged primary wires unless an approved primary wire repair device has been installed prior to utilizing this kit. Each PRT® (1553) kit contains a strip of Z-3250 EMI shielding tape and a piece of PRT® (ES) tubing. The EMI tape will be utilized to repair the shield damage and the tubing will create an environmental seal and electrically insulated repair of the cable jacket.

THE PROBLEM

Photo 1 illustrates a classic example of a shielded electrical cable that has suffered outer insulation and shield damage. The damage level is severe enough to cause EMI leakage in addition to exposing the shield braid to corrosion. However, the primary wire insulation is still intact and cutting the wire in half to install a wire splice is typically undesirable as this type of repair may affect the wires overall electrical resistance and would create a very stiff area that may lead to future failure. The PRT® (1553) kit was developed to create a quick, reliable repair of both the shield and outer jacket insulation that is virtually as good as the original cable. The advantage of using a PRT® (1553) kit on minor insulation and shield damage is that it can be installed quickly with minimal harness and connector disassembly. The product is far more rugged and reliable than a temporary tape wrap repair. A properly installed PRT® (1553) repaired cable will provide many years of service.



Photo 1: Cable jacket and shield braid damage

SIZING

PRT® (1553) Size	Cable Diameter Inches (mm)	PRT®1553 Size	Cable Diameter Inches (mm)
-01	0.075 - 0.125 (2 - 3.2)	-11	0.50 - 0.62 (13 - 16)
-03	0.126 - 0.174 (3.2 - 4.5)	-13	0.63 - 0.74 (16 - 19)
-05	0.175 - 0.249 (4.5 - 6.3)	-15	0.75 - 0.87 (19 - 22)
-07	0.25 - 0.37 (6.3 - 9.5)	-17	0.88 - 0.99 (22 - 25)
-09	0.38 - 0.49 (9.5 - 13)		

INSTALLATION

STEP 01

PREPARATION & POSITIONING

1. Clean the cable jacket surface around the damaged area and at least 2.0 inches on either side. Use isopropyl alcohol (IPA) and a clean cloth to remove all dirt, grease and oil residue from the cable jacket.
2. Trim away any loose jacket material as necessary ([Photo 2 & 3](#))



Photo 2: Typical cable jacket damage.



Photo 3: Damaged insulation removed.

3. Determine if the cable damage has caused any broken or severely distorted shield braid strands ([Photo 3](#)). If no shield braid damage is evident proceed to number 7. If the shield braid is damaged, carefully inspect the primary wire insulation and determine if it is damaged. If the primary wire insulation is damaged, STOP! Primary wire damage is not repairable using this kit alone. If the primary wire insulation is not damaged proceed to number 4.
4. Remove the jacket insulation back 1.0 inches from each side of the central damaged area ([Photo 4](#)).



Photo 4: Insulation removed around braid damage

STEP
01
(cont.)

5. Fold and dress any broken shield braid strands back over the undamaged braid area. Ensure that all broken strands are facing away from the primary wire insulation so they cannot cause a puncture and short circuit. (Photo 5)



Photo 5. Broken shield strands dressed back smoothly.

6. Use the piece of Z-3250-Tape™ in the kit to repair the damaged EMI shield. Peel back the paper release liner from the adhesive side of the Z-3250-Tape™ approximately 1-inch. Apply the adhesive side of the tape directly to the metal shield braid, beginning where the jacket insulation stops. Spirally wrap the tape over the entire shield braid area using a 50% overlap technique. (Photo 6 & 7)



Photo 6: Wrap damaged shield braid with Z-3250-Tape™.



Photo 7: Finished shield braid repair.

7. Using the PRT® (1553) insulation tubing supplied in the kit, wrap the tubing around the cable so the amber colored hot melt adhesive material faces the cable. In all cases, the PRT® (1553) tubing should extend beyond the shield repair area by at least 1/2-inch on each end. Peel back the paper release liner covering the adhesive strip on the outside of the tubing about half way. Overlap the tubing so the edge without the adhesive just covers all of the exposed adhesive, but no more! Peel back the remaining release liner and finish sealing the tubing. (Photo 8)

Note: For small damage areas you can cut the repair tubing and shielding tape to an appropriate length using a pair of scissors. Ensure the tubing overlap each end of the original cable jacket a minimum of 1/2 inch.

8. Center the PRT® (1553) tubing over the damaged cable area and orient so the overlap seam covers the defect area.



Photo 8: PRT® (1553) Tubing sealed around cable

STEP 02

SHRINKING

Tools for installation (recommended): Heat gun (500° to 750°F), reducer nozzle, and gloves.

PRT® (ES) tubing requires the use of a heat gun with a temperature setting of 194°F minimum. For best results, use a heat gun with a 3/8" reducer nozzle that will localize the heat stream (Photo 3). Generally, a heat gun temperature of 302°F is sufficient to shrink the PRT® (ES-135) material and allow the hot-melt adhesive to flow. 257°F is sufficient to shrink PRT® (ES-100). (Photo 9)

Caution:

When shrinking PRT® (1553) do not use a heat reflector designed to spread the heat evenly around the tubing.

Begin shrinking the PRT® (1553) tubing by directing the heat source at the adhesive overlap area near the center of the repair tubing. (Photo 9) Apply heat to the adhesive overlap area only! The overlap area will tend to curl up into a "U" shape as it is heated. 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 area, as it will take extra dwell time for the inside layer of the overlap to begin 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. Do not squeeze the PRT® (ES) when tapping the lifted lip down. Use extreme caution when touching the tubing as it will be hot and sticky. Shrink the overlap seam area over its entire length before attempting to recover the remaining tubing. (Photo 10)

Once the overlap seam area has fully shrunk you may apply heat to any remaining areas of the tubing that have not yet shrunk. Continue to apply heat until the hot melt adhesive begins to ooze out and creates a fillet around the cable circumference at each end. (Photo 11) Heat the remaining tubing slowly and evenly. Too much heat, applied too quickly in one location will cause the hot melt adhesive to expand unevenly and possibly rupture the overlap seam.

Once complete and while the assembly is just warm to the touch, use your thumb to rub the tubing overlap seam area and remove any exposed closure adhesive. The excess adhesive will ball up ahead of your thumb. Discard any residue.



CAUTION: DO NOT attempt to remove excess closure adhesive using solvents. Tubing and adhesive will be hot. Use gloves to form tubing and remove adhesive or allow tubing to cool before handling.

Allow the assembly to fully cool to room temperature before placing assembly back in service.

It is possible to create a similar repair on large diameter cable using the materials shown in Table 2. This type of repair is limited to cable diameter larger than 1-inch (25mm). The difference is that the PRT® Tubing, Z-3250-Tape™ and Z-Block® (135) ¹ tape must be procured separately.



Photo 9: Reducer nozzle on heat gun.



Photo 10: Overlap seam curled up prior to full shrinkage.



Photo 11: Finished PRT® (1553) jacket with good adhesive fillet

1. Use the table to find the measured cable diameter in column 1 and select the sizes of each material listed in columns 2, 3 and 4.
2. Prepare the cable as described in "Preparation & Positioning" steps 1 to 5.
3. Cut a strip of Z-3250-Tape™ from the roll long enough to wrap the shield defect area on the cable using a 50% overlap technique (see "Preparation & Positioning" step 6).
4. If necessary, cut the Z-Block®¹ hot melt tape (P/N: ZT02-03-002) to the width shown in table using a pair of scissors. Ensure that the paper release liner has been removed from the amber colored hot melt tape prior to wrapping the cable. Helically wrap the tape over the previously installed shielding tape and overlap the original cable jacket a minimum of 1-inch at both ends. Use a soldering iron or the hot tip of the heat gun to melt the last tape wrap so the tape sticks to itself. (Photo 12)



Photo 12: Z-Block® tape wrapped around cable.



CAUTION: Keep the Z-Block® tape wrap buildup to a minimum. Too much tape may cause a seam rupture in the PRT® Tubing.

5. Install the PRT® tubing around the cable as described in the "Preparation & Positioning" step 7 and follow the shrinking instructions to complete the installation.

Table 2: Raw Material Part Numbers & Sizes

Cable Diameter Inches (mm)	PRT® Size p/n: ZT98-04-016-#	Z-3250 Tape p/n: ZT93-03-003-* (width, in.)	Z-Block (135) Tape ¹ p/n: ZT02-03-002 (width, in.)
1.0 - 1.12 (25-29)	#9	1.0	1.0
1.13 - 1.24 (29-32)	#10	1.0	1.0
1.25 - 1.37 (32-35)	#11	1.0	1.0
1.38 - 1.49 (35 - 38)	#12	1.0	1.0
1.50 - 1.62 (38 - 41)	#13	1.0	2.0
1.63 - 1.74 (41 - 44)	#14	1.0	2.0
1.75 - 1.87 (44 - 48)	#15	1.0	2.0


¹ Z-Block® tape is available in two melt temperature ratings. Z-Block® (100) will melt and flow around 110°C while Z-Block® (135) flow at around 140°C. Standard PRT® (ES) materials use the Z-Block® (135) material but either can be used and is dependant on operating temperature of the system being repaired.

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