

TO: DISTRIBUTION
FROM: C NEUMEYER
SUBJECT: NEW DESIGN FOR OH GROUND PLANE CONNECTOR

Reference:

[1] 13-980720-CLN-01, "OH Ground Plane Rework and Grounding Connections"

Upon removal of the OH coil to repair the ground fault, some pitting and was noticed on the surface of the Tecknit ground plane paint over which the existing ground plane connector was installed. See figure 1, area just above flexible braid.



Figure 1 – Pitting Under Existing OH Ground Plane Connector

It appears that the existing ground plane connector, consisting of a flexible braid pulled tight around the coil and secured with a G-10 clamp, does not make good contact with the ground plane. Although the current should be small (around 100 mA) and short lived (see reference [1]), it appears to be sufficient to cause the observed arcing and pitting if the contact is poor. In

fact, during recent troubleshooting activities related to the characterization of the OH ground fault, the two connectors on the top of the coil were very loose and virtually open circuited.

The purpose of this memo is to present a design for an improved ground plane clamp and a different manner of connection.

A cross section of the new design is given in Figure 2.

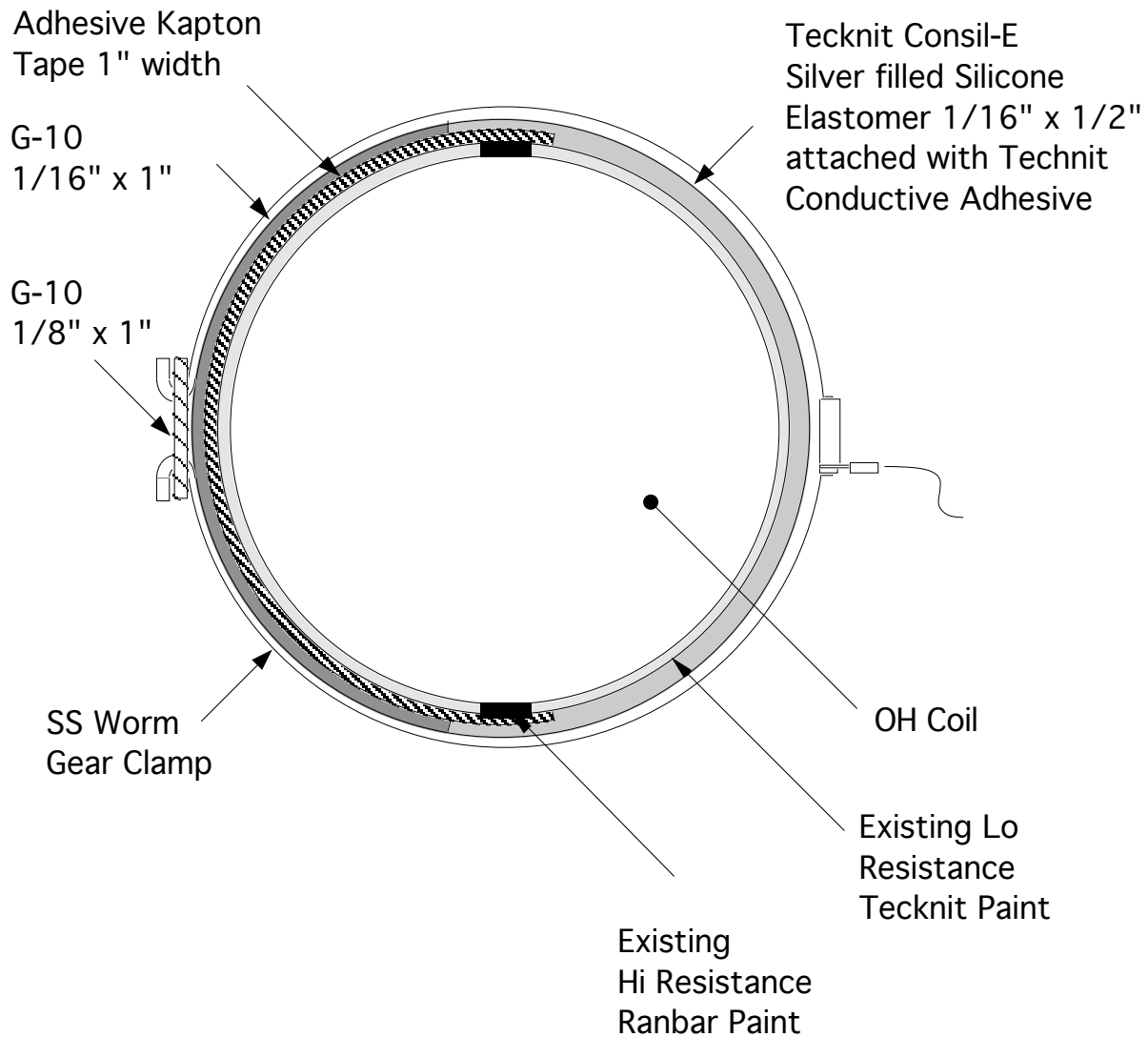


Figure 2 – New Ground Plane Connector

A description, from the inside working outwards, is as follows:

- 1) Adhesive Kapton tape, 1" width, is applied over approximately 200° of the circumference, covering one of the regions of the existing low resistance Technit paint and the two bands of high resistance Ranbar paint.
- 2) Technit Conductive Adhesive (spec sheet attached) is used to secure a length of Technit Consil-E silver filled silicone elastomer 1/16" thick x 1/2" wide, covering one of the regions of the existing low resistance Technit paint and part of the Kapton tape applied in step 1), over approximately 200° of the circumference.
- 3) A 1/16" thick G-10 spacer is applied over the remaining 160° of the circumference, and secured via an all stainless steel worm gear hose clamp (spec sheet attached), which has been modified to include a toroidal break by cutting the banding and bending tabs back and securing through a slotted piece of 1/8" x 1" G-10.
- 4) A wire pigtail is attached via a lug under the screw head of the hose clamp.
- 5) A total of four such connectors are required, two on top to service the two ground plane halves, and two on the bottom.

The Technit Conductive Adhesive (0.01 Ω -cm) and Consil-E elastomer (0.03 Ω -cm) have very low resistivities and will conform very well to the irregular ground plane surface and the clamp, serving to efficiently collect the current with very uniform current density. The Elastomer is a resilient, springy material which should exhibit very little creep, and thereby not lead to the loosening of the clamp after thermal cycling.

Sufficient materials should be ordered for one installation plus one spare, i.e. $4 \times 2 = 8$ hose clamps, $4 \times 200/360 \times 40'' \times 2 = 170'' \approx 180'' = 15'$ of Consil-E, and two tubes of Conductive Adhesive.

cc:

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NSTX File

Tecknit (<http://tecknit.com/>) Conductive Adhesive

GENERAL DESCRIPTION

TECKNIT CON/RTV-I system is a pure silver loaded, one component RTV silicone adhesive-sealant. It is ready to use without mixing and cures quickly at room temperature on exposure to moisture in the air to form a flexible, resilient, conductive bond or seal.

APPLICATION INFORMATION

TECKNIT CON/RTV-I can be used in the following applications:

1. Bonding or installing various conductive silicone elastomer EMI gaskets. These include silver filled silicone (CONSIL[®]), silicone filled with stainless steel fiber, (TECKFELT[™]), silicone impregnated woven (DUOLASTIC[™]), expanded (TECKSPAN[™]), metal aluminum wire or silicone filled oriented wire (ELASTOMET[®]). It can also be used for attaching porous or wire mesh materials.
2. For joining strips of conductive elastomers to form continuous shield/seal rings or gaskets.
3. To form-in-place conductive gasketing to attach shielding windows to frames or bezels, and in turn, installing the framed window on a shielding enclosure; for in place EMI gasketing of shield penetrating components such as connectors or switches; conductively attaching small screens, honeycomb or metal shielding vents to enclosures.
4. For flow-in-place EMI gasketing for grooves in cast boxes or covers or as a conductive seam sealant. Generally, these are field repair or "fix" applications.

CURING CHARACTERISTICS

CON/RTV-I cures on exposure to moisture in the air. A skin forms on the surface of a .250 in. [6.35 mm] diameter bead in 3-4 minutes at standard room temperature conditions 72°F [23°C] and 50% RH. Lower temperature and humidity slow the cure, while higher temperature and humidity accelerate it. In all adhering and joining operations the adhesive must be spread and parts assembled before the adhesive becomes "tack free." Thin films (less than .005 in. [0.13 mm]) should be avoided as cure is rapid. Early in the cure stage an odor caused by acetic acid will be evident and will disappear after complete cure.



SPECIFICATIONS

MATERIAL DESCRIPTION

- **Number of Components:** One
- **Resin:** Silicone
- **Filler:** Ag

AS SUPPLIED

- **Color:** Silver-Tan
- **Consistency:** Thick paste
- **Final Condition:** Flexible
- **Solids:** N/A
- **Mix Ratio:** N/A
- **Volume:** 1.7 in.³
- **Weight:** 2 oz.
- **Density, g/cc (ASTM D-792):** 3.06 ± 13%
- **Pot Life @ 25°C:** 5 minutes
- **Shelf Life, unopened container:** 5½ months
- **Tack Free:** 20 minutes
- **Full Cure:** 72 hours

CURED

- **Volume Resistivity, 25°C & 50% RH (QA-1038), max.:** 0.01 ohm-cm
- **Shear Strength, min. (ASTM D-1002):** 150 psi
- **Peel Strength, min. (ASTM D-1876) (silicone aluminum):** 2 psi
- **Shrinkage, max.:** 1.0%
- **Temperature Range:** -75°F to 400°F [-59°C to 204°C]

PART NUMBER

- 72-00002
- **Transportation Class:** Nonflammable

A preliminary check of the affect of acetic acid on surfaces to be bonded is recommended. Cure is optimum in 24 hours in most cases. Parts may be handled 2 hours after assembly.

SURFACE PREPARATION AND BONDING TECHNIQUES

1. Roughen both surfaces to be bonded with Scotchbrite® or equivalent.
2. Degrease both surfaces with VM&P Naphtha or an equivalent and then solvent wipe with acetone or methyl ethyl keytone. Allow to dry before applying adhesive.
3. Apply adhesive from tube directly to bond area in spots or as a bead. *CAP TUBE TO KEEP OUT MOISTURE.*
4. Spread adhesive to approximately twice the desired final film thickness. Work quickly. Remember assembly must be complete within 3-4 minutes! Large areas must be bonded in stages.
5. Place conductive gasket in position on top of adhesive and work into place with slight circular motion.
6. A hand roller is useful to evenly distribute adhesive if film is not spread to uniform thickness. This technique removes "lumps."
7. Handle only after 2 hours. 24 hours will provide

cure. Remember impermeable materials slow the moisture penetration necessary to obtain full cure.

8. Though not required, slight pressure applied during cure will increase bond strength.
9. Vertical bonds must be made with gasket materials held in place during cure.

*Scotchbright is a registered trademark of 3M Co.

GASKET PREPARATION AND JOINING TECHNIQUES

1. Wipe cut ends of elastomer to be joined with clean isopropanol alcohol moistened cloth.
2. Apply adhesive to both faces to be joined.
3. Join ends together and hold in position with pins or other holding devices until cure is completed.

TECKNIT P/N	UNIT DESCRIPTION
72-00002	2.0 oz.[56 g] CON/RTV-I packaged in collapsible aluminum tube, spreading tool, instructions.

ORDERING INFORMATION

When ordering TECKNIT CON/RTV-I, specify number of units and TECKNIT **Part Number 72-00002**. For assistance, contact your nearest TECKNIT area representative or factory location.

Tecknit (<http://tecknit.com/>) Conductive Elastomer

GENERAL DESCRIPTION

CONSIL-E is a continuously extruded silicone elastomer filled with silver-plated inert particles. It is a medium hardness material providing high electrical conductivity and moisture sealing. CONSIL-E is available in a variety of standard cross-sections: rectangular, round, "D" shape, "U" channels, "P" shapes and various thin wall constructions. Custom cross-sections are available per customer specifications. CONSIL-E is designed to provide reliable cost effective shielding and is especially ideal for a wide range of commercial and telecommunications EMI applications.

APPLICATION INFORMATION

CONSIL-E is intended primarily for groove and flange mounting applications. In order to assure electrical conductivity and sealing reliability, recommended design compression is 7%-15% of original height for rectangular strips, 12%-30% for solid round and "D" shapes, and 20%-60% for tubing and "P" shapes. For small cross sections refer to the force vs. deflection graph on page D-10. The hollow shapes are designed for low closure pressure applications. Excessive deflection is not recommended since it can result in permanent compression set and degradation of electrical conductivity.

BONDING AND SPLICING

TECKNIT two part RTV Conductive Silicone Adhesive (Part Number 72-00036) is recommended for splicing, joining, and bonding 811 CONSIL-E gaskets to enclosures. The material provides a flexible bond and resilient seal.

EMI SHIELDING PERFORMANCE

TECKNIT CONSIL-E Shielding Effectiveness has been tested in accordance with TECKNIT Test Method TSETS-01 and based upon modified MIL-STD-285. Typical values are based on a 5" x 5" Aperture.

COMPOUND	H-FIELD	E-FIELD	PLANE WAVE	
	100 kHz	10 MHz	1GHz	10 GHz
	dB	dB	dB	dB
811	65	130+	100+	90+
815	65	130+	100+	90+



SPECIFICATIONS

MATERIAL DESCRIPTION

Consil-E Compound No.	811	815
Elastomer Binder	Silicone	Silicone
Conductive Filler Type	Silver-plated glass particles	
Color	Tan	Tan
Form Available	Extruded X-Sections	

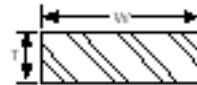
PERFORMANCE CHARACTERISTICS

Specific Gravity ASTM D-792	1.86 ± .25	
Volume Res. (Max.) QA-1043	0.03 ohm-cm	0.03 ohm-cm
Hardness (Shore A) ASTM D-2240	60 ± 5	60 ± 5
Tensile Strength (Min.) ASTM D-412	50 psi [345 kPa]	50 psi [345 kPa]
Elongation to break (Min.) ASTM D-412	50%	
Tear Strength (Min.) ASTM D-624	35 pli	20 pli
Temperature Range	-60°F to +350°F [-55°C to +177°C]	-60°F to +350°F [-55°C to +177°C]

ORDERING INFORMATION

Extruded materials are available in continuous lengths. For cross sections not listed above or custom specification requirements, contact your nearest TECKNIT area representative or factory location.

STANDARD RECTANGULAR

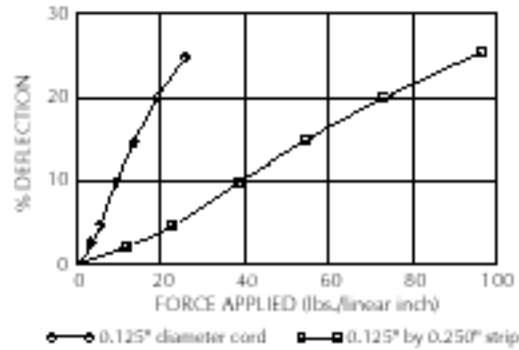


Thickness T	Com- pound	Width - W				
		.125 [3.18]	.188 [4.78]	.250 [6.35]	.375 [9.53]	.500 [12.70]
.032 [0.76]	811	81-20023	81-20024	81-20025	81-20026	81-20027
.062 [1.57]	811	81-20028	81-20029	81-20030	81-20031	81-20032
.093 [2.35]	811	81-20033	81-20034	81-20035	81-20036	81-20037
.125 [3.18]	811	81-20038	81-20039	81-20040	81-20041	81-20042
.188 [4.78]	811	-	81-20044	81-20045	81-20046	81-20047
.250 [6.35]	811	-	-	81-20050	81-20051	81-20052

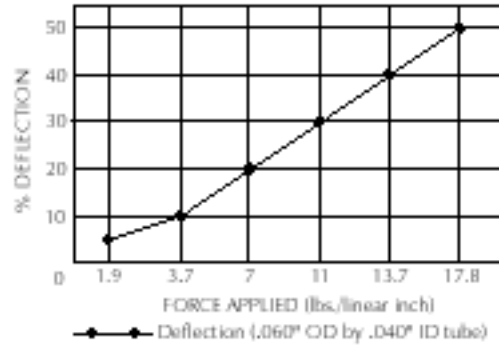
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COMPRESSION AND DEFLECTION DATA

COMPRESSION/DEFLECTION CURVE, CONSIL-C C871



FORCE vs. DEFLECTION



Hose Clamp (<http://www.hosexpress.com/clampsandtools/wormgearclamps.htm>)

Worm Gear Clamps *(Style HSS Clamps)*



All stainless construction 5/16" Hexagon and Screwdriver Slotted Screw - SAE 300 series stainless band and housing with SAE Upgraded to four piece construction.

Max. Recommended Torque 30 in. lbs.

	Dia. Range		Part #	Price
	From:	To:		(Sold 10 per box)
9/16" Band Width	5 5/8"	8 1/2"	HSS128	\$16.76
	7 1/8"	10"	HSS152	\$18.17
	9 3/8"	12 1/4"	HSS188	\$19.70
	10 1/8"	13"	HSS200	\$20.42
	10 7/8"	13 3/4"	HSS212	\$21.58
	11 5/8"	14 1/2"	HSS224	\$22.90
	12 3/8"	15 1/4"	HSS236	\$25.38
	13 1/8"	16"	HSS248	\$28.34
	17 1/8"	20"	HSS312	\$32.30

<http://www.hosexpress.com/clampsandtools/wormgearclamps.htm>