

REFERENCE:	Nova Bus Manuals
SECTION:	09: Engine and Cooling
RS N°:	MQR 7621-1695
EFFECTIVE IN PROD.:	LC32 (2019MR)
NHTSA RECALL N°:	19V274

APPLICATION DEADLINE: N/A
CLAIM REFERENCE NUMBER: SR-4601

SUBJECT:	Engine Door Fan Connector Replacement.
JUSTIFICATION:	Connectors, terminals and wiring damaged due to excessive heat.

LEVEL	DESCRIPTION	DIRECT CHARGES		TIME
		LABOUR	MATERIAL	
1	Replacement of the connectors and terminals on the fan and bus wiring sides.	Nova Bus	Nova Bus	1.5 hr

**MATERIAL**

QTY	NOVA PN	REV.	PREVOST PN	DESCRIPTION	REPLACES PART N°.
<b>LEVEL 1</b>					
1	N77235	-	N8910118	HDSCS Connector Plug - Power - Series 6.3	-
2	N97874-01	-	N8908509	HDSCS Terminal Socket	-
1	N77185	-	N8910119	HDSCS Connector Receptacle - Power - Series 6.3	-
2	N97874-02	-	N8908508	HDSCS Terminal Pin	-
2	N77238	-	993747	HDSCS Seal Green for 10 AWG	-
1	N82710	-	N82710	DT Connector Male 2 Pos. w/ Boot	-
2	G5900714	-	N8910153	Terminal Female (Socket) Deutsch Size 16 Solid	-
1	N25892-01	-	N25892-01	DT Secondary Lock (Wedge Lock) 2 Pos. Male Side	-
1	N82711	-	N82711	DT Connector Female 2 Pos. w/ Boot	-
2	G5900719	-	562286	Terminal Male (Pin) Deutsch Size 16 Solid	-
1	N26398	-	562487	DT Secondary Lock (Wedge Lock) 2 Pos Female Side	-
4	N56339	A	N56339	TEFZEL Blue Cable Ties	-
2	N77237	-	993749	HDSCS Seal Blue for 12 AWG	-
10.5 in	N82227-04	-	N82227-04	Tubing Heat Shrink Dual Wall	-
6 in	N82227-13	-	N82227-13	Tubing Heat Shrink Dual Wall	-
40 in	N74787	A	N74787	Electrical Cloth Tape	-
<b>LEVEL 2</b>					
35%	N11690-30	-	N11690-30	Circuit Breaker - 30A	-
5%	N91996	-	N91996	Fan Axial BLDC	-
<b>SPECIAL TOOLING</b>					
1	-	-	N8910120	HDSCS 6.3 Crimping Hand Tool	-
1	-	-	N8910121	HDSCS 6.3 Die Set	-
1	-	-	-	Deutsch DT Crimping Hand Tool (not included)	-

## DISPOSAL OF PARTS

REMOVED PARTS ARE:	DISCARDED *	RETAINED	* Dispose of the unused parts and the defective parts in accordance with local environmental standards in effect.
	Yes	—	

## REVISION HISTORY

REV.	DATE	CHANGE DESCRIPTION	WRITTEN BY
NR	2019-07-04	Initial Release	Yuvaraj

CLIENT	ORDER	ROAD NUMBER		VIN (2NVY/4RKY...)		QTY
		FROM	TO	FROM	TO	
New York City Transit - New York	L841	8094	8134	L82J2F4500959	L82JXF4501034	41
New York City Transit - New York	L841	8184	8206	L82J1F4501035	L82J0F4501057	23
New York City Transit - New York	L841	8252	8269	L82J2F4501058	L82J2F4501075	18
New York City Transit - New York	L842	8090	8093	L82J4F4501076	L82JXF4501079	4
New York City Transit - New York	L842	8207	8213	L82J6F4501161	L82J7F4501170	7
New York City Transit - New York	L842	8399	8408	L82J6F4501080	L82J2F4501089	10
New York City Transit - New York	L842	8318	8332	L82J9F4501090	L82J7F4501105	15
New York City Transit - New York	L842	8359	8373	L82J9F4501106	L82J3F4501120	15
New York City Transit - New York	L842	8409	8432	L82J5F4501121	L82JXF4501146	24
New York City Transit - New York	L842	8481	8491	L82J1F4501147	L82J8F4501159	11
New York City Transit - New York	L843	8135	8153	L82J5F4501197	L82J9F4501221	19
New York City Transit - New York	L843	8214	8230	L82J9F4501171	L82J1F4501195	17
New York City Transit - New York	L843	8270	8293	L82J0F4501222	L82J7F4501251	24
New York City Transit - New York	L843	8333	8347	L82J9F4501252	L82J1G9775016	15
New York City Transit - New York	L843	8374	8380	L82J3G9775017	L82J9G9775023	7
New York City Transit - New York	L844	8381	8170	L82J0G9775024	L82J0G9775105	82
New York City Transit - New York	L845	8171	8480	L82J2G9775106	L82J6G9775187	82
New York City Transit - New York	L958	5439	5442	S92J9G9775533	S92J9G9775631	4

**WARNING**

Follow your internal safety procedures.

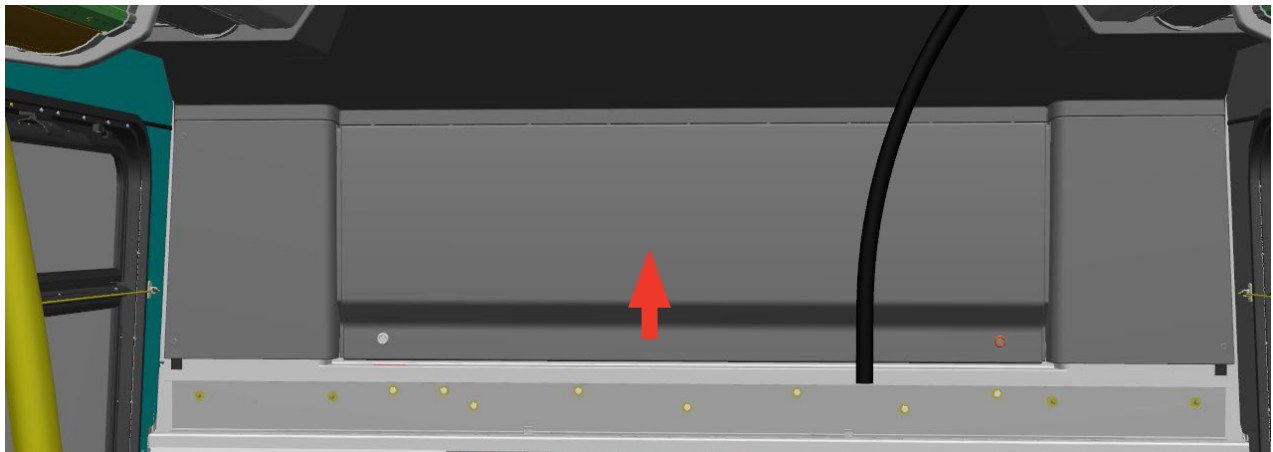
**PROCEDURE****VEHICLE PREPARATION**

- 1.1. Park the vehicle on an even surface with transmission on neutral (N) and apply the parking brake.
- 1.2. Before starting any work on the vehicle, make sure that the vehicle is completely and securely stationary.

**ENGINE FAN TEST**

- 1.3. Open the interior back panel (see figure 1) and locate the circuit breaker of the engine fan. Refer to the table below to locate the circuit breaker position.

Order Number	Circuit Breaker Location
L841	+IB-CB99AU2
L842	+IB-CB99AU2
L843	+IB-CB99AU2
L844	+IB-CB99AU2
L845	+IB-CB99AU2
L958	+IB-CB99AT2



*Figure 1 - Bus Interior Back Panel Location*

- 1.4. Insert the circuit breaker PN N11690-30 into the engine fan circuit breaker socket.
- 1.5. Start the vehicle and confirm that the engine fan is working.
- 1.6. If the engine fan connector and/or terminals are too damaged to test the engine fan, replace the damaged fan with a spare known working fan PN N91996.

**ENGINE FAN CONNECTORS REPLACEMENT**

- 1.7. Set the Master Control Switch in the STOP position (see figure 2).

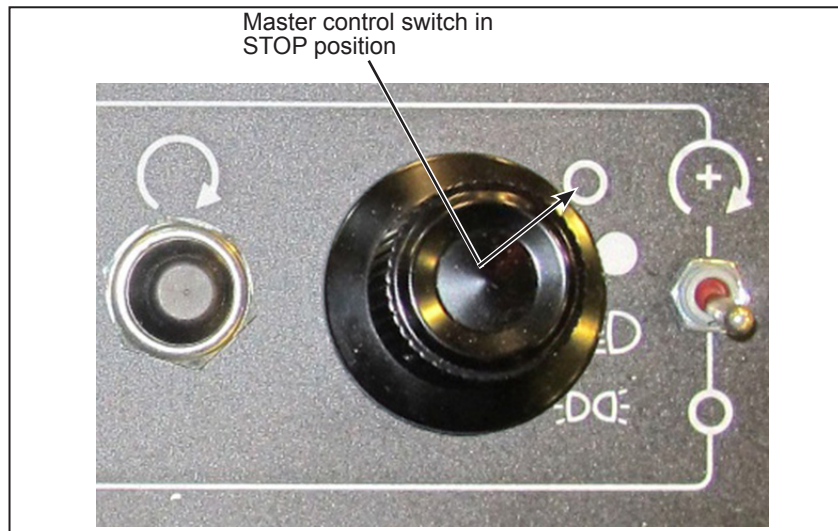


Figure 2 - Master Control Switch in STOP Position

- 1.8. Disconnect the starting circuit on the control box at the rear of the vehicle and place the battery disconnect switch in the OFF position.

**Removal of Delphi Connectors**

- 1.9. Open the engine compartment door and locate the engine fan Delphi connectors (see figure 3).

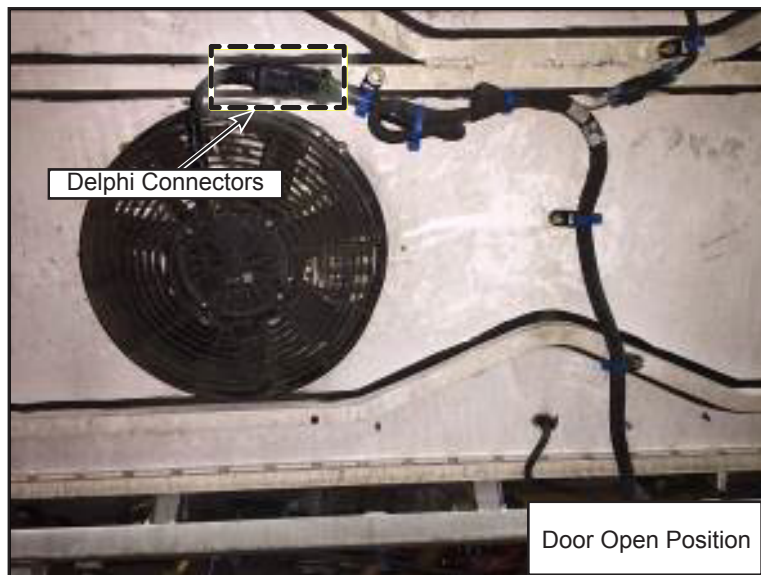


Figure 3 - Typical Engine Door Fan Delphi Connectors Installation

- 1.10. Cut the two blue cable ties from the harness side wiring (see figure 4).
- 1.11. Remove the heat shrink tubing and the Coroplast tape from the connectors (see figure 4) and then disconnect the connectors. To help removing the heat shrink tubing, trace a shallow line on the heat shrink tubing with a sharp cutting blade (X-ACTO tool or equivalent) and then, using a heat gun, heat the tubing until it splits.

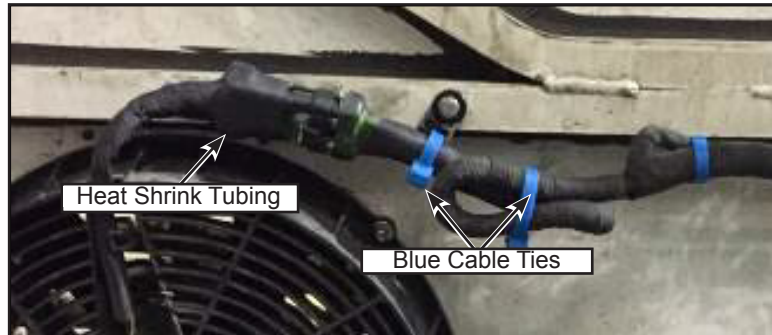


Figure 4 - Cut Cable Ties on Harness Side Wiring and Remove Heat Shrink Tubing on Delphi Connectors

- 1.12. On the fan side, extract the four wire terminals inside the connector using a Delphi extraction tool or a small flat blade screwdriver. Then cut the terminals keeping the maximum wire length (see figure 5). Remove black protective sleeve segment on the outer part of the fan protection shroud (see figure 6) and clean the wires with contact cleaner, if glue or dirt is present.

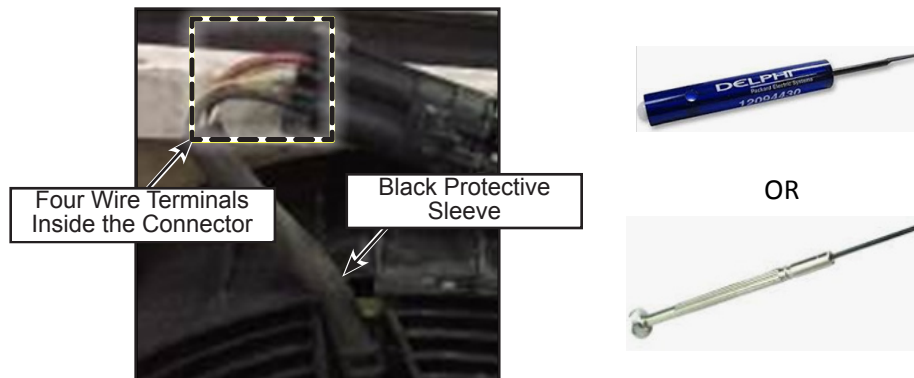


Figure 5 - Fan Side Connector Removal and Tool Options for Terminals Extraction from the Connector Housing

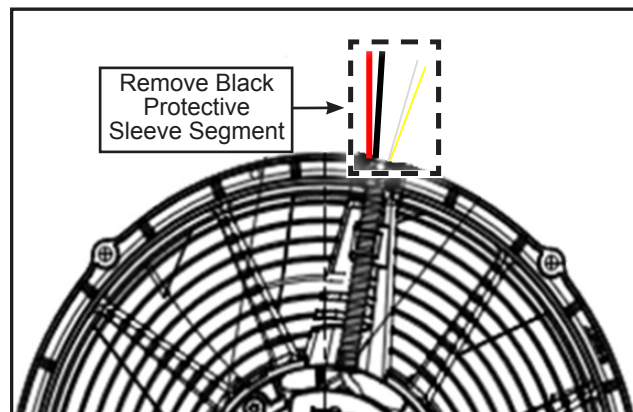


Figure 6 - Black Protective Sleeve Segment Removal



- 1.13. On the harness side, cut the connector with the terminals directly at the back end of the connector housing (see figure 7) and clean the wires with contact cleaner, if glue or dirt is present.

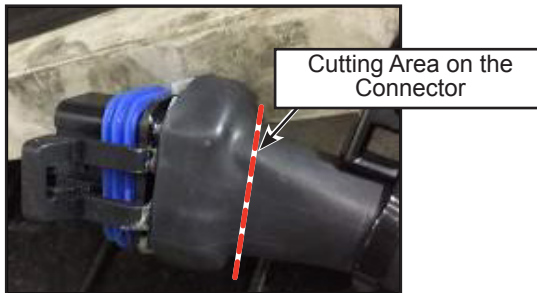


Figure 7 - Harness Side Connector Removal

#### Installation of HDSCS Connector at Fan Side

- 1.14. Using the HDSCS crimping tool (see figure 8), crimp the socket terminal PN N97874-01 with the blue seal PN N77237 on both RED and BLACK power wires (see figure 9). Refer to the figure below showing a typical HDSCS terminal crimp example and to Annex 1 for more information about the HDSCS connectors terminal crimping quality guidelines.



Figure 8 - TE Connectivity HDSCS Crimping Hand Tool

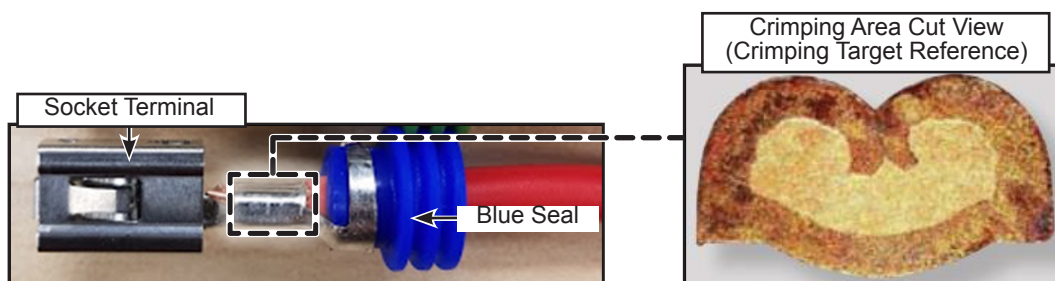


Figure 9 - TE Connectivity HDSCS Socket Terminal and Blue Seal

- 1.15. Insert 1.75 in (total of 3.5 in) of heat shrink tubing PN N82227-04 over both RED and BLACK power wires. Then, using a heat gun, apply the small heat shrink tubing PN N82227-04 over the power wires while leaving a 1/8 in gap with respect to each seal in order to avoid any interference with the terminal wire seals.
- 1.16. Insert 1.5 in of large heat shrink tubing PN N82227-13 over the power wires bundle but do not shrink immediately.
- 1.17. Insert the RED wire terminal into position 1 and the BLACK wire terminal into position 2 of the HDSCS plug connector PN N77235 (see figure 10). Make sure that the yellow secondary lock of the plug connector is completely pressed (to move it from the unlocked to the locked position) after inserting both terminals. Refer to Annex 2 for detailed instructions about terminals insertion and secondary lock.

- 1.18. Using a heat gun, apply the large heat shrink tubing PN N82227-13 starting from the boot adapter of HDSCS plug connector finishing directly over the smaller heat shrink tubes previously installed on the power wires (see figure 10). Make sure to fill any gap between the two power wires with the inner adhesive liner glue (do not apply heat shrink tubing over tape or loom).

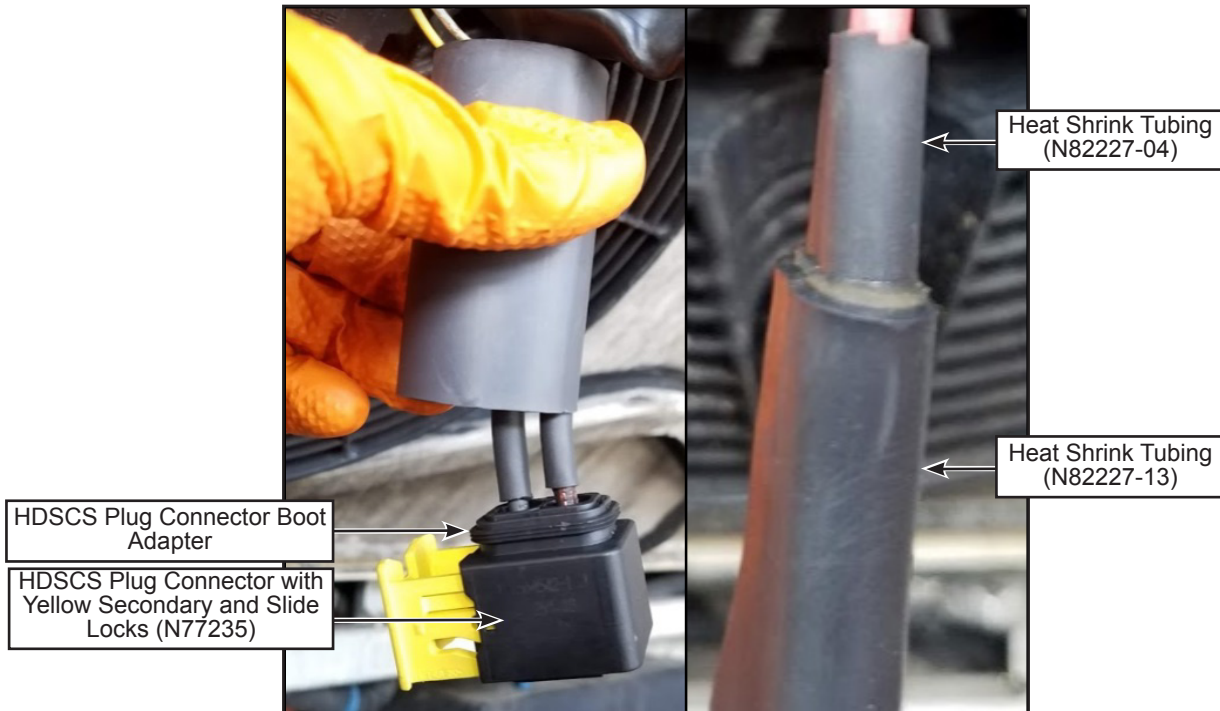


Figure 10 - Heat Shrink Tubing Installation on HDSCS Plug Connector Wiring at Fan Side

**Installation of DT Connector at Fan Side**

- 1.19. Using the Deutsch DT crimping tool (see figure 11), crimp the socket terminal PN G5900714 on both WHITE and YELLOW control wires (see figure 12). Refer to the figure below showing a typical Deutsch DT solid socket terminal crimp example and to Annex 3 for more information about the TE Connectivity's Deutsch DT solid terminals crimping quality guidelines.



Figure 11 - Deutsch DT Crimping Hand Tool

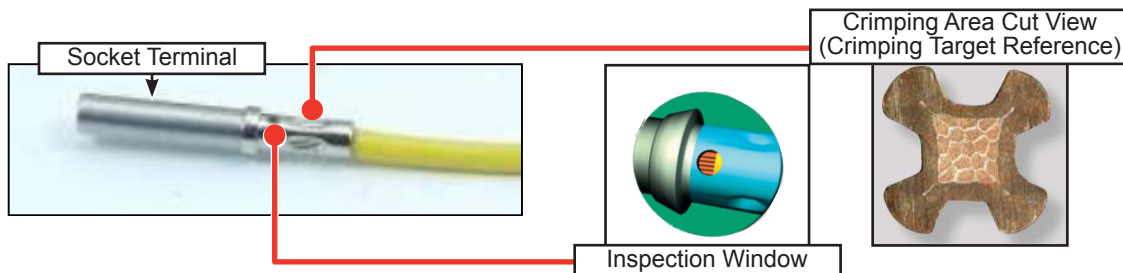


Figure 12 - Deutsch DT Socket Terminal

- 1.20. Insert a single 1.75 in length of heat shrink tubing PN N82227-04 over **the paired** WHITE and YELLOW control wires. Then, using a heat gun, apply the small heat shrink tubing PN N82227-04 over the paired control wires while leaving a 1/4 in gap with respect to the terminals in order to avoid any interference or stress on the DT connector back end wire seal.
- 1.21. Insert 1.5 in of large heat shrink tubing PN N82227-13 over the control wires bundle but do not shrink immediately.
- 1.22. Insert the WHITE wire terminal into position 1 and the YELLOW wire terminal into position 2 of the DT plug connector PN N82710. Insert the wedge lock PN N25892-01 into the DT plug connector (see figure 13).



Figure 13 - Wedge Lock Insertion into Deutsch DT Plug Connector

- 1.23. Using a heat gun, apply the large heat shrink tubing PN N82227-13 starting from the boot adapter of DT plug connector finishing directly over the smaller heat shrink tube previously installed on the paired control wires (see figure 14). Make sure to fill any gap with the inner adhesive liner glue (do not apply heat shrink tubing over tape or loom).

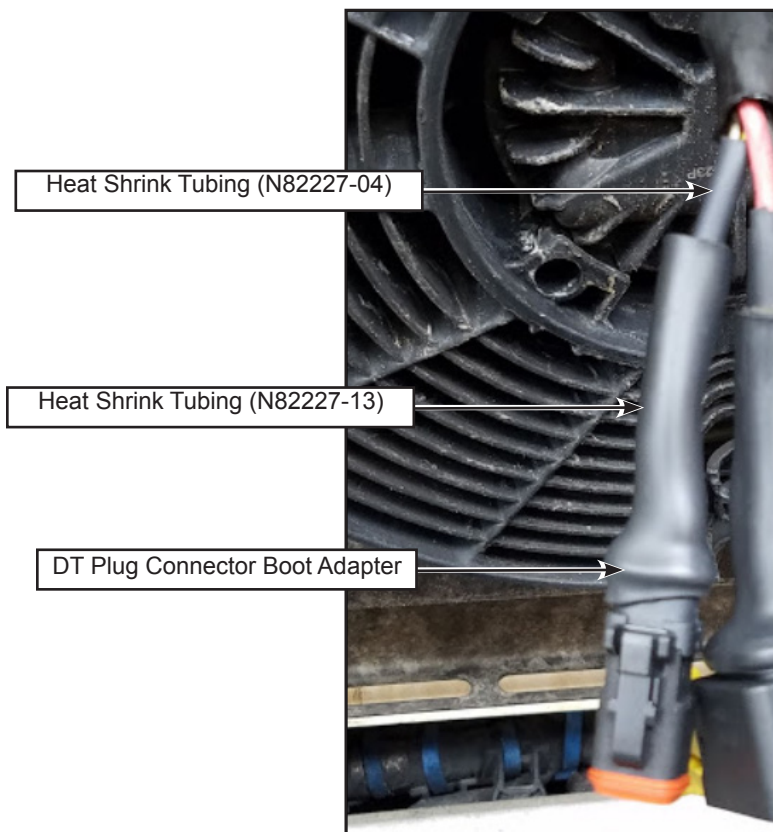


Figure 14 - Heat Shrink Tubing Installation on DT Plug Connector Wiring at Fan Side

- 1.24. Apply Coroplast tape PN N74787 over the exposed wiring / heat shrink tubing on the fan side both HDSC and DT plug connector.



**Installation of HDSCS Connector at Harness Side**

- 1.25. Using the HDSCS crimping tool (see figure 8), crimp the pin terminal PN N97874-02 with the green seal PN N77238 on both RED and BLACK power wires (see figure 15). Refer to the figure below showing a typical HDSCS terminal crimp example and to Annex 1 for more information about the HDSCS connectors terminal crimping quality guidelines.

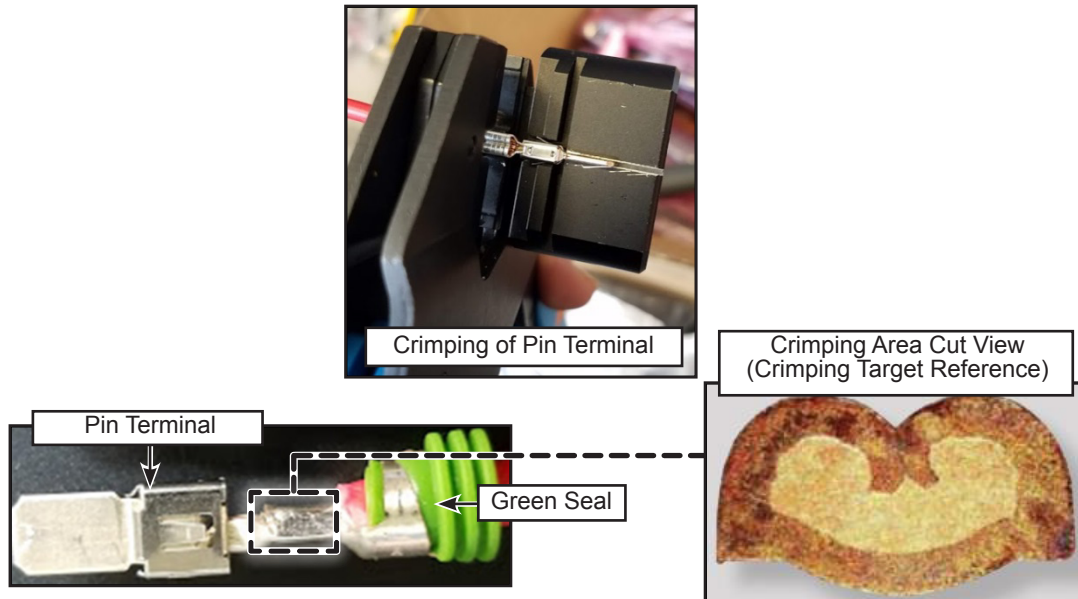


Figure 15 - TE Connectivity HDSCS Pin Terminal and Green Seal

- 1.26. Insert 1.75 in (total of 3.5 in) of heat shrink tubing PN N82227-04 over both RED and BLACK power wires. Then, using a heat gun, apply the small heat shrink tubing PN N82227-04 over the power wires while leaving a 1/8 in gap with respect to each seal in order to avoid any interference with the terminal wire seals.
- 1.27. Insert 1.5 in of large heat shrink tubing PN N82227-13 over the power wires bundle but do not shrink immediately.
- 1.28. Insert the RED wire into position 1 and the BLACK wire into position 2 of the HDSCS receptacle connector PN N77185. Make sure that the yellow secondary lock of the plug connector is completely pressed (to move it from the unlocked to the locked position) after inserting both terminals (see Figure 16). Refer to Annex 2 for detailed instructions about terminals insertion and secondary lock.

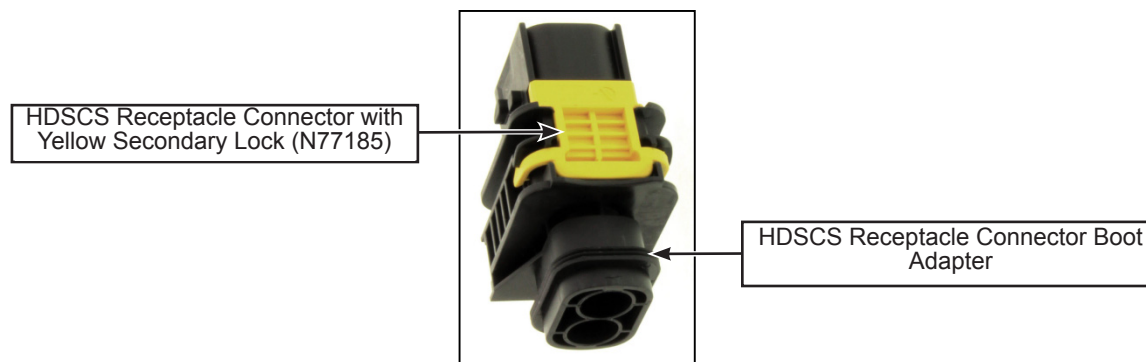


Figure 16 - TE Connectivity HDSCS Receptacle Connector

- 1.29. Using a heat gun, apply the large heat shrink tubing PN N82227-13 starting from the boot adapter of HDSCS receptacle connector finishing directly over the smaller heat shrink tubing previously installed on the power wires (see figure 10). Make sure to fill any gap between the two power wires with the inner adhesive liner glue (do not apply heat shrink tubing over tape or loom).

**Installation of DT Connector at Harness Side**

- 1.30. Using the Deutsch DT crimping tool (see figure 11), crimp the pin terminal PN G5900719 on both WHITE and RED control wires (see figure 17). Refer to the figure below showing a typical Deutsch DT solid socket terminal crimp example and to Annex 3 for more information about the TE Connectivity's Deutsch DT solid terminals crimping quality guidelines.

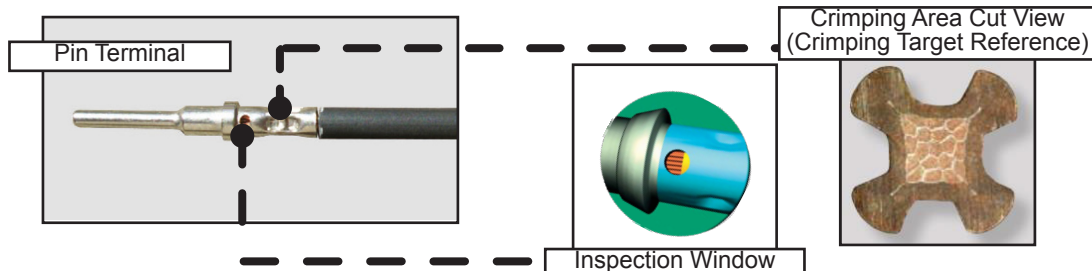


Figure 17 - Deutsch DT Pin Terminal

- 1.31. Insert a single 1.75 in length of heat shrink tubing PN N82227-04 over **the paired** WHITE and RED control wires. Then, using a heat gun, apply the small heat shrink tubing PN N82227-04 over the paired control wires while leaving a 1/4 in gap with respect to the terminals in order to avoid any interference or stress on the DT connector back end wire seal.
- 1.32. Insert 1.5 in of large heat shrink tubing PN N82227-13 over the control wires bundle but do not apply immediately.
- 1.33. Insert the WHITE wire terminal into position 1 and the RED wire terminal into position 2 of the DT receptacle connector PN N82711. Insert the wedge lock PN N26398 into the DT receptacle connector (see figure 18).

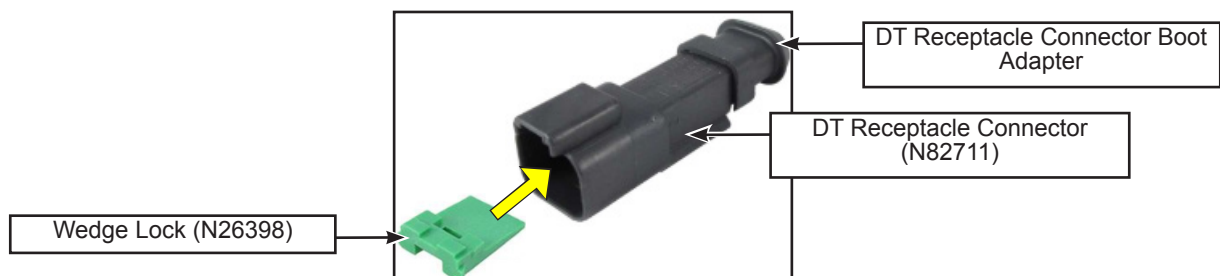


Figure 18 - Wedge Lock Insertion into Deutsch DT Receptacle Connector

- 1.34. Using a heat gun, apply the large heat shrink tubing PN N82227-04 starting from the boot adapter of DT receptacle connector finishing directly over the smaller heat shrink tube previously installed on the paired control wires (see figure 19). Make sure to fill any gap with the inner adhesive liner glue (do not apply heat shrink tubing over tape or loom).

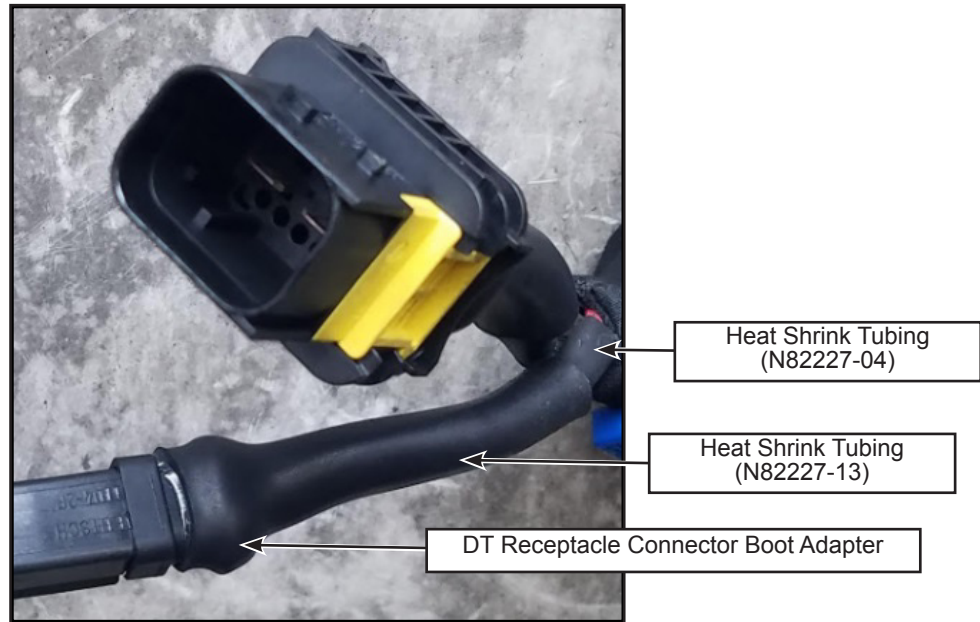


Figure 19 - Heat Shrink Tubing Installation on DT Receptacle Connector Wiring at Harness Side

- 1.35. Add Coroplast tape PN N74787 over the exposed wiring / heat shrink tubing on the harness side HDSCS and DT receptacle connector.

#### Final Preparation

- 1.36. Secure the fan wiring pigtail with a blue cable tie PN N56339 (1x) (see figure 20).

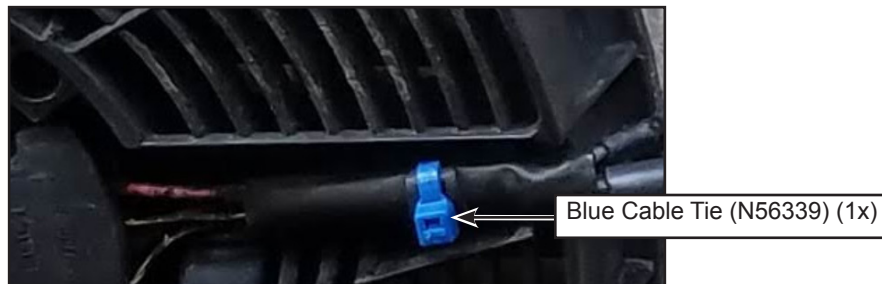


Figure 20 - Blue Cable Tie Securing the Wiring at Fan Side

- 1.37. Connect both connector mating parts on the fan side. While mating the HDSCS connector, press the yellow slide lock of the plug connector to latch and lock both connectors together.

- 1.38. Remove and retain the four nuts around the fan and rotate it clockwise (*for the aluminium door configuration*) (see figure 21) to have the engine door fan routed horizontally wiring at the middle right and reinstall the four fan nuts.
- 1.39. Secure the wiring at the connectors and on the aluminium door at harness side with blue cable ties PN N56339 (3x) (see figure 21).

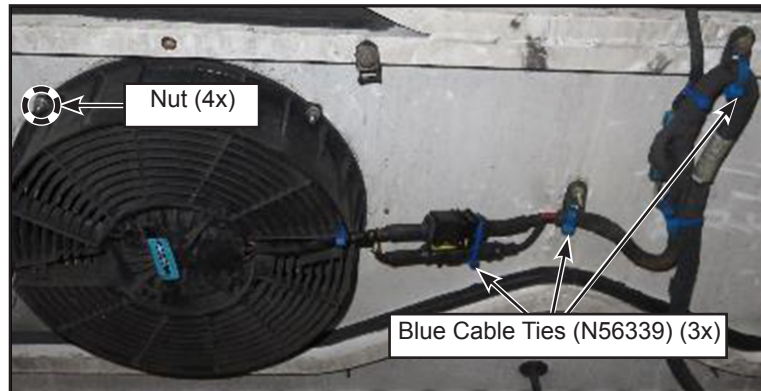


Figure 21 - Blue Cable Ties Securing the Fan Wiring at Harness Side



#### NOTE

The HDSCS and DT connectors should be both installed towards the door to avoid any interference with the belt guard.


- 1.40. Test the fan with the final configuration.
  - 1.40.1. Set the Master Control Switch in the START position.
  - 1.40.2. Reconnect the starting circuit on the control box at the rear of the vehicle and place the battery disconnect switch in the ON position.
  - 1.40.3. Start the vehicle and confirm that the engine fan is working.
- 1.41. If no issues are found, bus is ready for service.

Annex 1 - HDSCS Connectors Terminal Crimping Quality Guidelines



NOTE

The following procedure is provided by (TE Connectivity). Nova Bus cannot be held responsible for its content.



**TE**  
connectivity

INDUSTRIAL & COMMERCIAL  
TRANSPORTATION

**Heavy Duty Sealed Connector Series (HDSCS)**

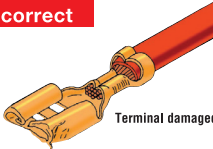
Catalog 1654326-1  
Issued 11-2013

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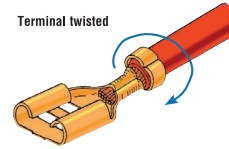
Quality Guidelines

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**Incorrect**



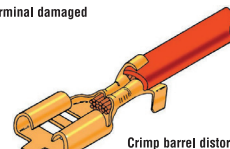
Terminal damaged



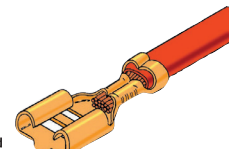
Terminal twisted




Cut off tab too long




Crimp barrel distorted




Cut off tab deformed




Crimp height too tight



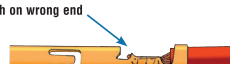
Insulation inside the wire crimp



Conductor Brush protruding into terminal body




Terminal bend




Bellmouth on wrong end

---


**INSULATION CRIMP**




Insulation is pierced and could damage conductor




Insulation material is pierced




Insulation is not securely held




Insulation is over crimped



Insulation legs are not closed



Insulation is not securely held




Legs do not overlap

---

**WIRE CRIMP**


Incorrect applicator adjustment

Asymmetric crimp



Terminal feed incorrectly adjusted


Unacceptable formation excessive flash and/or cracks



Anvil and crimper not aligned or worn


Incorrect terminal/wire selection

Wire size too large



Crimp barrel does not close


Wire size too small



Legs too close to bottom of crimp. Insufficient deformation of strands, showing voids


Incorrect crimp height adjustment

Crimp height too loose



Insufficient deformation, showing voids

Crimp height too tight



Flash at under side of crimp, due to over crimping

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VI

All specifications subject to change. Consult TE Connectivity for latest specifications.



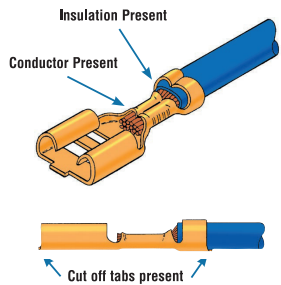


Heavy Duty Sealed Connector Series (HDSCS)

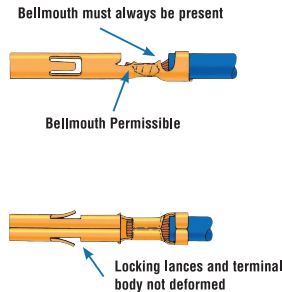
Catalog 1654326-1  
Issued 11-2013

Quality Guidelines

Correct



WIRE CRIMP



Correct selection of wire, terminal and applicator



Crimp barrel is closed, legs support each other



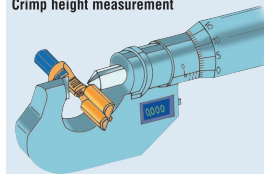
Sufficient gap between legs and bottom of crimp

All strands are equally distributed and deformed

Test

WIRE CRIMP

Crimp height measurement



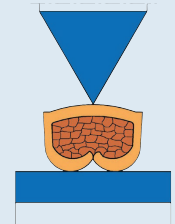
Crimp heights and tolerances

For crimp height tolerances for any given contact, please refer to the relevant application specification.

Examples:

Contact	Part No.	Wire Range (mm <sup>2</sup> )	Tolerance (mm)	Application Spec.
MOS	962885 962886	0.2-0.5	±0.03	114-18025
JPT	927775	0.5-1.0	±0.05	114-18050
JPT	927773	1.5-2.5	±0.05	114-18050

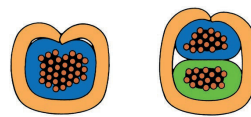
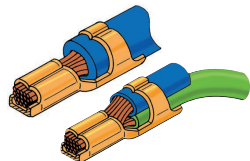
Digital Crimp Height Micrometer  
(0.001 mm increments) acc. to DIN ISO 9001  
Part No. 547203-1



INSULATION CRIMP

Correct Insulation Diameter, Applicator and Terminal

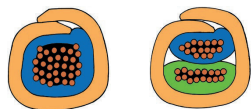
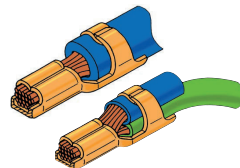
F-CRIMP



Insulation is securely held  
Crimp barrel closed

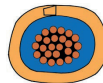
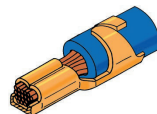
For double wire applications with different size wires always place wire with smallest outer diameter in the bottom

OVERLAP CRIMP



Insulation is securely held  
Legs overlap

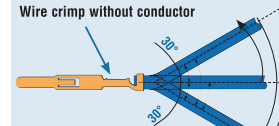
WRAP OVER CRIMP



Insulation securely held  
Legs must pass each other

INSULATION CRIMP

Wire crimp without conductor



Insulation must be securely held after bend test

All specifications subject to change. Consult TE Connectivity for latest specifications.

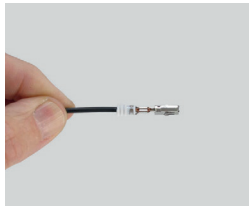
Annex 2 - HDSCS Connectors How-To Instructions



HDSCS CONNECTORS

HOW-TO INSTRUCTIONS

CONTACT INSERTION



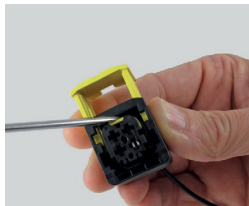
**STEP 1:**  
Grasp crimped contact approximately one inch behind the contact barrel.



**STEP 2:**  
Make sure the contact is in the correct orientation. Verify the integrated secondary lock is in the unlocked position.

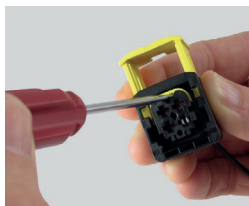


**STEP 3:**  
Push contact straight into connector grommet until a click is felt. A slight tug will confirm that it is properly locked in place.

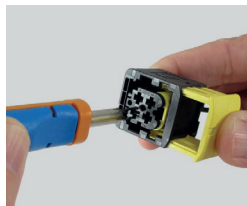


**STEP 4:**  
Push the integrated secondary lock into the locked position with a DT-RT1 or a screwdriver.

CONTACT REMOVAL



**STEP 1:**  
Using a DT-RT1 or a screwdriver, unlock the integrated secondary lock.



**STEP 2:**  
Using the appropriate extraction tool, insert the blades into the contact cavity until they stop.



**STEP 3:**  
Pull contact wire assembly out of connector.

HDSCS CONNECTORS

## Annex 3 - Deutsch DT Solid Terminal Crimping Quality Guidelines

**DEUTSCH Common Contacts****Crimping**

Crimping is defined as the act of joining a conductor to a pin or socket contact using a mechanical tool to compress and displace metal. In a good crimp joint, there is mutual flow of metal, causing a symmetrical distortion of wire strands.

**CRIMPING CONFIGURATIONS**

Stamped & formed contacts use a folded type of crimp (Fig. 1) while solid contacts use a 1, 2, or 4 indent crimp (Fig. 2). In both styles of crimps, the wire strands and the contact material are formed together in a solid mass creating a reduction of the wire strand area. The reduced wire strand area creates a minimum of voids allowing for excellent conductivity. Crimping may be accomplished with hand tools or power tools.

**BENEFITS OF CRIMPED CONTACTS**

Mechanically crimping contacts is the leading wire termination method for some very good reasons:

- With smaller wire, the crimp is as strong as the wire itself.
- The joint can be visually inspected. Viewing the wire through an inspection hole in the contact makes inspection quick and easy, both by the operator and the inspector.
- Plating thickness is not restricted, as in solder joints, so better corrosion resistance and contact reliability are achieved.
- Crimping can be done anywhere, without special preparation. Terminations are replaced or modified in the field exactly the same as in the shop, using the same tools and the same techniques, and with the same ease of operation and certainty of results.
- Total installed and maintenance costs are lower.

**helpful hint**

Solder should not be added to DEUTSCH terminals.

**Stamped & Formed Style**

Cross-Section Across Axis

**Figure 1****Solid Style**Indenter Crimp  
Cross-Section Across Axis**Figure 2****Note**

The use of dielectric grease is not recommended.

**DEUTSCH Common Contacts**

**CRIMP INSPECTION**

Crimping tools provide lower total installation and maintenance costs. However, controls are required to help confirm that the proper crimp tools designed for the type and size contact are used, the pin or socket is properly inserted into the tool, the wire insulation is stripped properly, and the wire fully inserts into the contact.

When a crimp is completed, correct termination can be visually inspected. The inspector should check for:

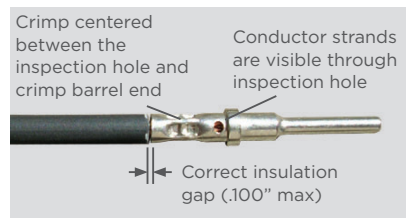
- The removed insulation should expose a conductor length that will pass beyond the inspection hole in the contact and still reveal the appropriate length of conductor between the contact and the insulation on the wire.
- Wire strands intact.
- All wire strands enter the contact barrel.
- Wire inserted to the proper depth in the contact.

When the correct crimp tool and process are used, a good termination results.

**Note**

For more detailed crimp dimensions please request a drawing.

**SOLID CONTACT CRIMP**

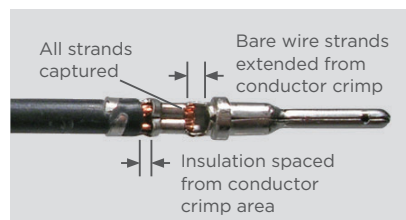


**Acceptable Crimp**

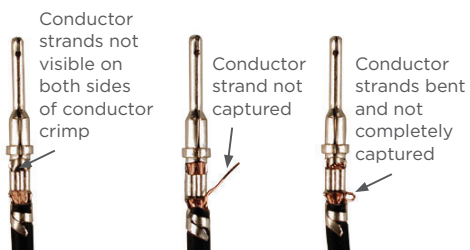


**Unacceptable Crimps**

**STAMPED & FORMED CONTACT CRIMP**



**Acceptable Crimp**



**Unacceptable Crimps**