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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF CONNECTOR CONTACTS WITH THE ADJUSTMENT OF THE CONDUCTOR SIZE

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For training purposes only!

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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF CONNECTOR CONTACTS WITH THE ADJUSTMENT OF THE CONDUCTOR SIZE

This Subject gives the procedures for the assembly of a connector contact with a wire that is smaller than the size of the contact crimp barrel.

#### 1. GENERAL CONDITIONS

##### A. Size of the Contact Crimp Barrel and the Wire

If the size of the wire conductor is smaller than the size of the contact crimp barrel, it is possible that the size of the conductor must be adjusted.

These are alternative configurations of the contact assembly:

- The conductor is folded back on itself; refer to Paragraph 2.A.
- One or more filler wires are installed adjacent to the conductor; refer to Paragraph 2.B.
- An eyelet is installed in the contact crimp barrel; refer to Paragraph 2.C.

#### 2. CONTACT ASSEMBLY WITH THE ADJUSTMENT OF THE CONDUCTOR SIZE

##### A. Contact Assembly with a Conductor That Is Folded Back

Table 1  
APPLICABLE CONTACT CRIMP TOOLS

Wire Size (AWG)	Crimp Barrel Size	Necessary Data for the Selection of a Crimp Tool	
		Adjusted Wire Size (AWG)	Crimp Barrel Size
24	16	20	16
22	16	20	16
20	12	16	12
18	12	14	12

- (1) Find the insulation removal length for the specified contact. Refer to the Subject that is applicable for the assembly of the connector.

Make sure that the insulation removal length is the length that is specified for:

- The crimp barrel size of the contact
- A wire size that is the same size as the size of the crimp barrel.

- (2) Multiply the insulation removal length by two.

NOTE: This becomes the necessary length of insulation to remove.

- (3) Remove the necessary length of insulation from the end of the wire.

Refer to Figure 1 and Subject 20-00-15.

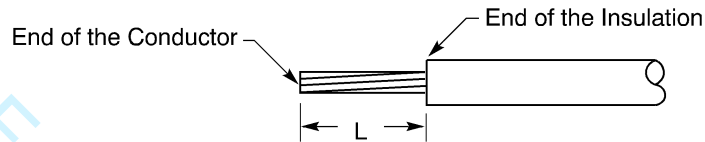
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### ASSEMBLY OF CONNECTOR CONTACTS WITH THE ADJUSTMENT OF THE CONDUCTOR SIZE

**CAUTION:** DO NOT CUT OR CAUSE DAMAGE TO THE STRANDS OF THE CONDUCTOR. THE MECHANICAL STRENGTH OF THE WIRE CAN BE DECREASED.

**CAUTION:** MAKE SURE THAT THE END OF THE INSULATION IS EQUAL AND SYMMETRICAL AROUND THE CIRCUMFERENCE OF THE CONDUCTOR. UNWANTED INSULATION IN THE CRIMP JOINT CAN INCREASE THE ELECTRICAL RESISTANCE.

**CAUTION:** MAKE SURE THAT THE BASE METAL OF THE CONDUCTOR CANNOT BE SEEN. CORROSION OF THE CONDUCTOR CAN OCCUR.



**INSULATION REMOVAL LENGTH**

**Figure 1**

- (4) Fold the conductor back. Refer to Figure 2.

Make sure that the distance from the end of the insulation to the end of the conductor is  $\frac{1}{2}$  of the length of the insulation that is removed.



**CONDUCTOR FOLDED BACK**

**Figure 2**

- (5) Make a selection of a contact crimp tool.

Refer to:

- Table 1
- The Subject that is applicable for the assembly of the connector.

Make sure that the crimp tool from the applicable Subject for the connector is a tool that is specified for:

- The adjusted wire size that is specified for the selection of a crimp tool in Table 1
- The crimp barrel size that is specified for the selection of a crimp tool in Table 1.

- (6) Make the necessary adjustment of the crimp tool setting.

Make sure that the setting is applicable for the adjusted wire size that is specified for the selection of a crimp tool in Table 1.

- (7) Put the end of the wire in the crimp barrel of the contact. Refer to Figure 3.

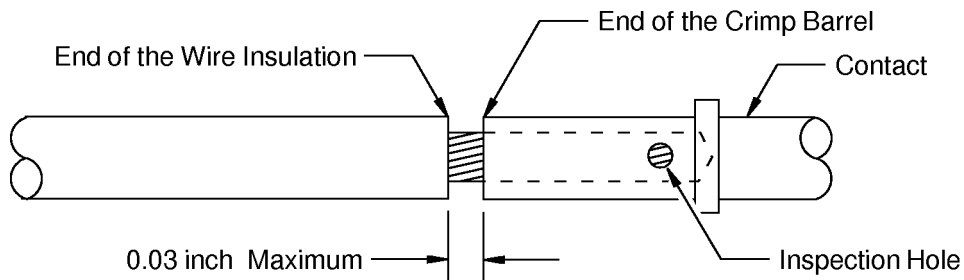
Make sure that:

- All of the strands of the conductor are in the crimp barrel
- The conductor can be seen in the inspection hole
- The distance from the end of the insulation to the end of the crimp barrel is not more than 0.03 inch.

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**POSITION OF THE WIRE IN THE CRIMP BARREL**

**Figure 3**

(8) Crimp the contact.

Make sure that:

- All of the strands of the conductor are in the crimp barrel
- The conductor can be seen in the inspection hole
- The distance from the end of the insulation to the end of the crimp barrel is not more than 0.03 inch.

#### B. Contact Assembly with Filler Wire

**Table 2**

**APPLICABLE CONTACT CRIMP TOOLS AND FILLER WIRE**

Wire Size (AWG)	Crimp Barrel Size	Filler Wire		Necessary Data for the Selection of a Crimp Tool	
		Quantity	Wire Size (AWG)	Adjusted Wire Size (AWG)	Crimp Barrel Size
24	16	1	18	16	16
22	16	1	18	16	16
20	12	2	16	12	12
	8	4	14	8	8
18	12	1	14	12	12
	8	4	14	8	8
16	8	4	14	8	8
14	8	2	12	8	8
12	8	2	12	8	8
10	8	3	16	8	8

- (1) Find the quantity and size of filler wire that are applicable for the wire size and crimp barrel size in Table 2.
- (2) Find the insulation removal length for the specified contact. Refer to the Subject that is applicable for the assembly of the connector.

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Make sure that the insulation removal length is the length that is specified for:

- The crimp barrel size of the contact
- A wire size that is the same size as the size of the crimp barrel.

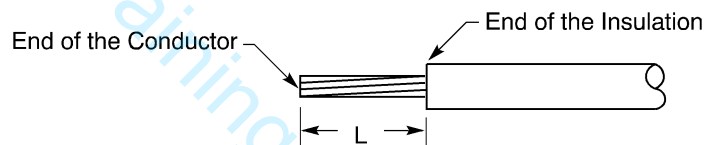
**NOTE:** This length is the necessary length of insulation to remove.

- (3) Remove the necessary length of insulation from the end of the wire and the end of each filler wire. Refer to Figure 4 and Subject 20-00-15.

**CAUTION:** DO NOT CUT OR CAUSE DAMAGE TO THE STRANDS OF THE CONDUCTOR. THE MECHANICAL STRENGTH OF THE WIRE CAN BE DECREASED.

**CAUTION:** MAKE SURE THAT THE END OF THE INSULATION IS EQUAL AND SYMMETRICAL AROUND THE CIRCUMFERENCE OF THE CONDUCTOR. UNWANTED INSULATION IN THE CRIMP JOINT CAN INCREASE THE ELECTRICAL RESISTANCE.

**CAUTION:** MAKE SURE THAT THE BASE METAL OF THE CONDUCTOR CANNOT BE SEEN. CORROSION OF THE CONDUCTOR CAN OCCUR.



**INSULATION REMOVAL LENGTH**

**Figure 4**

- (4) Make a selection of a contact crimp tool.

Refer to:

- Table 2
- The Subject that is applicable for the assembly of the connector.

Make sure that the crimp tool from the applicable Subject for the connector is a tool that is specified for:

- The adjusted wire size that is specified for the selection of a crimp tool in Table 2
- The crimp barrel size that is specified for the selection of a crimp tool in Table 2.

- (5) Make the necessary adjustment of the crimp tool setting.

Make sure that the setting is applicable for the adjusted wire size that is specified for the selection of a crimp tool in Table 2.

- (6) Put the end of the wire and the end of each filler wire in the crimp barrel of the contact. Refer to Figure 5.

**NOTE:** If it is possible, put the primary wire in the center of the crimp barrel.

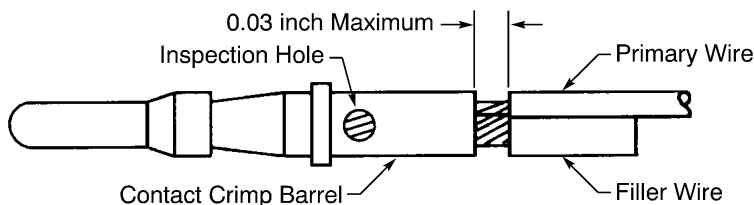
Make sure that:

- All of the strands of each conductor are in the crimp barrel
- The conductor can be seen in the inspection hole
- The distance from the end of the insulation of the primary wire to the end of the crimp barrel is not more than 0.03 inch.

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**POSITION OF THE WIRE AND THE FILLER WIRES IN THE CRIMP BARREL**

**Figure 5**

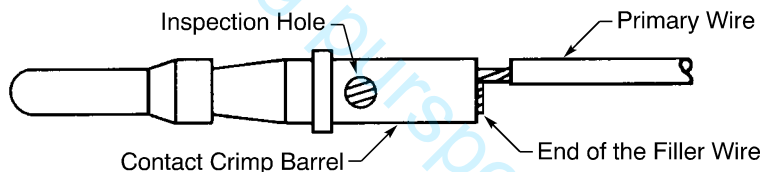
(7) Crimp the contact.

Make sure that:

- All of the strands of each conductor are in the crimp barrel
- The conductor can be seen in the inspection hole
- The distance from the end of the insulation of the primary wire to the end of the crimp barrel is not more than 0.03 inch.

(8) Remove the unwanted length of the filler wires as close as possible to the end of the crimp barrel. Refer to Figure 6.

**CAUTION:** DO NOT CUT OR CAUSE DAMAGE TO THE STRANDS OF THE PRIMARY WIRE. THE MECHANICAL STRENGTH OF THE WIRE CAN BE DECREASED.



**REMOVAL OF THE UNWANTED LENGTH OF THE FILLER WIRE**

**Figure 6**

#### C. Contact Assembly with an Eyelet

**Table 3**

**APPLICABLE CONTACT CRIMP TOOLS AND EYELETS**

Wire Size (AWG)	Crimp Barrel Size	Eyelet	Necessary Data for the Selection of a Crimp Tool		
			Adjusted Wire Size (AWG)	Crimp Barrel Size	Special Instructions
24	16	CE46FC	20	16	-
		Y-6015-C	20	16	-
	12	CE66FC	14	12	Fold the conductor back
		Y-9015-C	14	12	Fold the conductor back

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## ASSEMBLY OF CONNECTOR CONTACTS WITH THE ADJUSTMENT OF THE CONDUCTOR SIZE

Table 3 (continued)

Wire Size (AWG)	Crimp Barrel Size	Eyelet	Necessary Data for the Selection of a Crimp Tool		
			Adjusted Wire Size (AWG)	Crimp Barrel Size	Special Instructions
22	16	CE46FC	20	16	-
		Y-6015-C	20	16	-
	12	CE66FC	14	12	Fold the conductor back
		Y-9015-C	14	12	Fold the conductor back
20	12	CE66FC	14	12	-
		Y-9015-C	14	12	-
18	12	CE66FC	14	12	-
		Y-9015-C	14	12	-

Table 4  
EYELET PART NUMBERS

Part Number	Plating Material	Supplier
CE46FC	Gold	Circon
CE66FC	Gold	Circon
Y-6015-C	Gold	International Eyelets Inc.
Y-9015-C	Gold	International Eyelets Inc.

Table 5  
ALTERNATIVE EYELET PART NUMBERS

Specified Eyelet		Alternative Eyelet	
Part Number	Supplier	Part Number	Supplier
Y-6015-C	International Eyelets Inc.	S-6049CUAU	Global Supply
Y-9015-C	International Eyelets Inc.	S-5934CUAU	Global Supply

- (1) Make a selection of the applicable eyelet from Table 3.
- (2) Find the insulation removal length for the specified contact. Refer to the Subject that is applicable for the assembly of the connector.

Make sure that the insulation removal length is the length that is specified for:

- The crimp barrel size of the contact
- A wire size that is the same size as the size of the crimp barrel.

**NOTE:** If a folded back conductor is not specified in Table 3, this length is the necessary length of insulation to remove.

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- (3) If a folded back conductor is specified in Table 3, multiply the insulation removal length by two.

**NOTE:** This becomes the necessary length of insulation to remove.

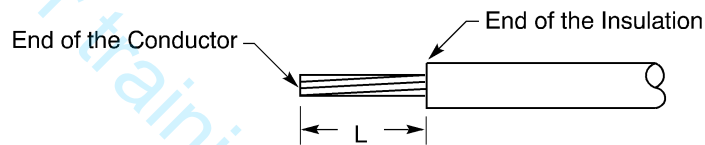
- (4) Remove the necessary length of insulation from the end of the wire.

Refer to Figure 7 and Subject 20-00-15.

**CAUTION:** DO NOT CUT OR CAUSE DAMAGE TO THE STRANDS OF THE CONDUCTOR. THE MECHANICAL STRENGTH OF THE WIRE CAN BE DECREASED.

**CAUTION:** MAKE SURE THAT THE END OF THE INSULATION IS EQUAL AND SYMMETRICAL AROUND THE CIRCUMFERENCE OF THE CONDUCTOR. UNWANTED INSULATION IN THE CRIMP JOINT CAN INCREASE THE ELECTRICAL RESISTANCE.

**CAUTION:** MAKE SURE THAT THE BASE METAL OF THE CONDUCTOR CANNOT BE SEEN. CORROSION OF THE CONDUCTOR CAN OCCUR.



**INSULATION REMOVAL LENGTH**

**Figure 7**

- (5) If a folded back conductor is specified in Table 3, fold the conductor back. Refer to Figure 8.

Make sure that the distance from the end of the insulation to the end of the conductor is 1/2 of the length of the insulation that is removed.



**CONDUCTOR FOLDED BACK**

**Figure 8**

- (6) Make a selection of a contact crimp tool.

Refer to:

- Table 3
- The Subject that is applicable for the assembly of the connector.

Make sure that the crimp tool from the applicable Subject for the connector is a tool that is specified for:

- The adjusted wire size that is specified for the selection of a crimp tool in Table 3
- The crimp barrel size that is specified for the selection of a crimp tool in Table 3.

- (7) Make the necessary adjustment of the crimp tool setting.

Make sure that the setting is applicable for the adjusted wire size that is specified for the selection of a crimp tool in Table 3.

- (8) Put the eyelet in the crimp barrel of the contact.

Make sure that the shoulder of the eyelet is against the end of the crimp barrel.

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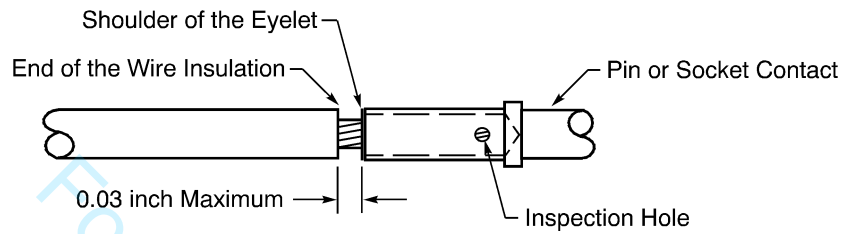
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- (9) Put the end of the wire in the eyelet. Refer to Figure 9.

Make sure that:

- All of the strands of the conductor are in the crimp barrel
- The conductor can be seen in the inspection hole
- The distance from the end of the insulation to the shoulder of the eyelet is not more than 0.03 inch.



**POSITION OF THE WIRE IN THE CRIMP BARREL**

**Figure 9**

- (10) Crimp the contact.

Make sure that:

- All of the strands of the conductor are in the crimp barrel
- The conductor can be seen in the inspection hole
- The distance from the end of the insulation to the shoulder of the eyelet is not more that 0.03 inch.



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### CLEANING OF ELECTRICAL CONNECTORS

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**STANDARD WIRING PRACTICES MANUAL****CLEANING OF ELECTRICAL CONNECTORS**

This Subject gives procedures to clean an electrical connector when the connector has too much contamination on the connector interface, but the replacement of the connector is not necessary.

**1. GENERAL DATA****A. Recommended Solvents**

In order, the recommended solvents to clean all electrical connectors are:

- Isopropyl alcohol
- Methyl alcohol
- Denatured ethyl alcohol
- Acetone.

**NOTE:** When a fast turnaround is necessary, high temperature connectors can be cleaned with the recommended procedure. To clean general purpose connectors with acetone. Refer to Paragraph 3.B.

Before any solvent is used, obey:

- The local environmental regulations
- The local necessary conditions for personnel safety.

**NOTE:** The solvents must only be used for authorized or approved purposes.

**B. Conditions of Inspection**

After an inspection:

- The connector must be replaced if the steel bayonet pins on the receptacle shell are worn
- The contacts must be replaced if the contacts are worn.

**C. Personnel Safety**

To make sure that the solvent does not touch the skin, any of these items can be used if they do not permit the solvent to touch the skin:

- Aprons
- Boots
- Coveralls
- Neoprene gloves
- Rubber gloves.

To make sure that the solvent does not touch an eye, any of these items can be used:

- Chemical goggles
- Approved eye protection.

To make sure that the solvent vapors do not get breathed, any of these conditions must occur:

- The area has a good air flow
- Respiratory protection is used.

**D. Fire Safety Precautions**

Refer to Subject 20-00-10 for the precautions in relation to the electrical power of the circuits.

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These conditions are applicable in an area where there are flammable solvents or vapors:

- All flames, smoking, sparks, and other sources of ignition must not occur
- Tools that are used must not make sparks
- Clothing, materials, or processes that can make electrostatic discharges must not be used
- All electrical equipment, such as motors, wiring, etc., must meet the necessary electrical and fire codes
- Use work lights that are approved for fuel vapors while work is done in a flammable vapor zone
- The accumulation of vapors must be prevented by sufficient ventilation.
- Flammable solvents must be kept in closed containers
- Only the sufficient quantity of a flammable solvent must be used or kept near.

**2. CLEANING OF GENERAL PURPOSE CONNECTORS WITH ISOPROPYL, ETHYL, OR METHYL ALCOHOL**

**WARNING:** ETHYL ALCOHOL, METHYL ALCOHOL AND ISOPROPYL ALCOHOL ARE FLAMMABLE. MAKE SURE THAT THE QUANTITY ON HAND IS NO MORE THAN IS NECESSARY TO CLEAN THE CONNECTOR.

**A. Necessary Materials and Tools**

These are the necessary tools and materials:

- Isopropyl alcohol, methyl alcohol, or denatured ethyl alcohol
- A small, fine brush that is long enough to reach the bottom of the connector and has bristles that are not affected by alcohol
- Swabs that do not have any lint
- A container of the sufficient size to catch any solvent
- Compressed air or nitrogen that is clean and dry.

**B. Connector Cleaning with Isopropyl, Ethyl, or Methyl Alcohol**

- (1) Separate the plug and the receptacle.
- (2) Clean each connector:
  - (a) Apply the alcohol with a brush or swab.
  - (b) Brush the face of the connector until the contaminants have been dissolved.
  - (c) Flush the face of the connector with the sufficient quantity of alcohol to remove the contamination.
  - (d) Let the connector dry in the air for one hour.

When it is possible, put the connector in a position so that it is not fully on its side to let the solvent drain.

**NOTE:** A satisfactory alternative to decrease the time that is necessary for the connector to dry is to use compressed air or nitrogen.

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**WARNING:** COMPRESSED GAS CAN BE DANGEROUS. TO PREVENT AN INJURY, CAREFULLY APPLY THE GAS IN THE DIRECTION AWAY FROM THE EYES, THE FACE, AND OTHER PERSONNEL.

**CAUTION:** THE CONNECTOR MUST BE FULLY DRY BEFORE THE PLUG IS INSTALLED. ANY REMAINING SOLVENT CAN CAUSE DAMAGE TO THE CONNECTOR OR UNSATISFACTORY PERFORMANCE OF THE SYSTEM, OR BOTH.

- (3) Install the connectors again. Refer to the applicable maintenance manual.

**NOTE:** To make the installation easier, a silicone lubricant compound can be applied to the inner O-ring.

**CAUTION:** DO NOT PUT SILICONE LUBRICANT ON THE CONNECTOR INSERT OR THE CONTACTS. SILICONE CONTAMINATION CAUSES UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

- (4) Do the necessary functional tests.

**3. CLEANING OF GENERAL PURPOSE CONNECTORS WITH ACETONE**

**WARNING:** ACETONE IS VERY FLAMMABLE. MAKE SURE THAT THE QUANTITY ON HAND IS NO MORE THAN 0.25 PINT (0.125 LITER) IN A CLOSED, ONE PINT (0.5 LITER) SQUEEZE CONTAINER.

**A. Necessary Materials and Tools**

These are the necessary tools and materials:

- 0.25 pint (0.125 liter) of acetone
- A closed, one pint (0.5 liter) squeeze container
- A small, fine brush that is long enough to reach the bottom of the connector and has bristles that are not affected by acetone
- Swabs that do not have any lint
- An container of the sufficient size to catch any solvent
- Compressed air or nitrogen that is clean and dry.

**B. Connector Cleaning with Acetone**

- (1) Separate the plug and the receptacle.

**WARNING:** DO NOT SEPARATE THE CONNECTORS UNTIL THE TEMPERATURE IS LESS THAN 150 DEGREES F (65 DEGREES C). DAMAGE TO THE PLUG OR THE RECEPTACLE, OR BOTH CAN OCCUR.

**CAUTION:** DO NOT SEPARATE THE CONNECTORS UNTIL THE TEMPERATURE IS SUFFICIENTLY COOL ENOUGH, APPROXIMATELY 100 DEGREES F (28 DEGREES C), TO TOUCH WITH BARE HANDS.

**NOTE:** The use of acetone can remove these data printed on connectors:

- Part numbers
- Contact cavity identifications.

- (2) Clean each connector:

- (a) Put 3 cc to 5 cc of acetone into the connector with the squeeze container.

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**WARNING:** DO NOT PERMIT ANY DROPS OF ACETONE TO FALL ON THE ENGINE.

- (b) Brush the face of the connector until all of the contamination has been loosened.
- (c) Let any remaining solvent drain from the connector into a container.
- (d) Remove the unwanted solvent in the container from the work area.
- (e) Flush the connector with no more than 5 cc of the solvent to remove the thin film of contamination from the connector.

Make sure to catch the solvent in the container.

- (f) Remove the unwanted solvent in the container from the work area.
- (g) If the connector has any remaining contamination, do Step (e) again.
- (h) Dry the connector with compressed air or nitrogen.

Make sure the inside of the socket contacts and the inserts around the socket contacts are fully dry.

**WARNING:** COMPRESSED GAS CAN BE DANGEROUS. TO PREVENT AN INJURY, CAREFULLY APPLY THE GAS IN THE DIRECTION AWAY FROM THE EYES, THE FACE, AND OTHER PERSONNEL.

**CAUTION:** THE CONNECTOR MUST BE FULLY DRY BEFORE THE PLUG IS INSTALLED. ANY REMAINING SOLVENT CAN CAUSE DAMAGE TO THE CONNECTOR OR UNSATISFACTORY PERFORMANCE OF THE SYSTEM, OR BOTH.

- (3) Install the connectors again. Refer to the applicable maintenance manual.

**NOTE:** To make the installation easier, a silicone lubricant compound can be applied to the inner O-ring.

**CAUTION:** DO NOT PUT SILICONE LUBRICANT ON THE CONNECTOR INSERT OR THE CONTACTS. SILICONE CONTAMINATION CAUSES UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

- (4) Do the necessary functional tests.

**4. CLEANING OF WALTER KIDDE FIRE DETECTION SYSTEM CONNECTORS****A. General Conditions for Connector Cleaning**

Before any plug and receptacle in the sensing element loop are connected, they must be free from contamination.

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### CLEANING OF ELECTRICAL CONNECTORS

These conditions are applicable for connectors with contamination:

- If it is thought that the connector is contaminated, the connector must be cleaned with acetone or alcohol; refer to Paragraph 4.D. or Paragraph 4.C.
- If any of the connectors in the fire detection system show possible contamination from liquids, the connector must be cleaned with acetone or alcohol; refer to Paragraph 4.D. or Paragraph 4.C.
- Whenever the flex cable connector has been disconnected, the sensing element connectors must be inspected and, if it is necessary, cleaned.

These conditions are applicable for connectors with corrosion:

- If the internal part of a connector shows corrosion or does not have the correct color, the connector must be cleaned with a grit blast; refer to Paragraph 4.E.
- If the connector is connected to the aircraft wiring, it is possible that it is better to replace it with a new connector
- If the connector is part of a sensing element, it possible that it is better to replace the sensing element with a serviceable spare and clean the connector in the maintenance facility.

#### B. Necessary Materials

**CAUTION:** ONLY THOSE CLEANERS SPECIFIED IN TABLE 1 CAN BE USED. OTHER SOLVENTS, ESPECIALLY ANY THAT ARE MADE WITH CHLORIDES MUST NOT BE USED.

**Table 1**  
**NECESSARY MATERIALS**

Material	Part Number or Specification	Supplier
Acetone	-	Any source
Alcohol, Ethyl, Denatured	-	Any source
Alcohol, Isopropyl	-	Any source
Alcohol, Methyl	-	Any source
Contact, Hooded Socket	802508	Walter Kidde
Grit, 100 Mesh Aluminum Oxide	AEX ( 6 oz )	Hunter Associates
Grit Blast Kit	Model AEC-K	Hunter Associates
Lubricant, Silicone	DC-4	Dow Chemical
	MIL-S-8660	QPL

**NOTE:** The grit blast kit has the sufficient quantity of aluminum oxide abrasive to clean approximately ten connectors.

#### C. Connector Cleaning with Isopropyl, Ethyl, or Methyl Alcohol

This procedure is used to clean a connector if there is contamination from oil or other solutions in the connector cavity.

**WARNING:** METHYL ALCOHOL AND ISOPROPYL ALCOHOL ARE FLAMMABLE. MAKE SURE THAT THE QUANTITY ON HAND IS NO MORE THAN IS NECESSARY TO CLEAN THE CONNECTOR.

- (1) Separate the plug and the receptacle.
- (2) If it is necessary, remove the hooded socket contact:

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- (a) Carefully pull the contact out with a small pair of needle nose pliers.
- (b) Discard the contact; it cannot be used again.
- (3) Clean each connector:
  - (a) Apply the alcohol with a brush or swab.
  - (b) Brush the applicable surface of the connector until all of the contamination has been loosened.
  - (c) Flush the face of the connector with the sufficient quantity of alcohol to remove the contamination.
  - (d) Let the connector dry in the air for one hour.

When it is possible, put the connector in a position so that it is not fully on its side to let the solvent drain.

**NOTE:** A satisfactory alternative to decrease the time that is necessary for the connector to dry is to use compressed air or nitrogen.

**WARNING:** COMPRESSED GAS CAN BE DANGEROUS. TO PREVENT AN INJURY, CAREFULLY APPLY THE GAS IN THE DIRECTION AWAY FROM THE EYES, THE FACE, AND OTHER PERSONNEL.

**CAUTION:** THE CONNECTOR MUST BE FULLY DRY BEFORE THE PLUG IS INSTALLED. ANY REMAINING SOLVENT CAN CAUSE DAMAGE TO THE CONNECTOR OR UNSATISFACTORY PERFORMANCE OF THE SYSTEM, OR BOTH.

**D. Connector Cleaning with Acetone**

This procedure is used to clean a connector if there is contamination from oil or other solutions in the connector cavity.

**WARNING:** ACETONE IS VERY FLAMMABLE. MAKE SURE THAT THE QUANTITY ON HAND IS NO MORE THAN 0.25 PINT (0.125 LITER) IN A CLOSED, ONE PINT (0.5 LITER) SQUEEZE CONTAINER.

**NOTE:** The use of acetone can remove these data printed on connectors:

- Part numbers
- Contact cavity identifications.

- (1) Separate the plug and the receptacle.
- (2) If it is necessary, remove the hooded socket contact:
  - (a) Carefully pull the contact out with a small pair of needle nose pliers.
  - (b) Discard the contact; it cannot be used again.
- (3) Clean each connector:
  - (a) Put 3 cc to 5 cc of acetone into the connector with the squeeze container.
  - (b) Brush the face of the connector until all of the contamination has been loosened.
  - (c) Let any remaining solvent drain from the connector into a container.
  - (d) Remove the unwanted solvent in the container from the work area.
  - (e) Flush the connector with no more than 5 cc of the solvent to remove the thin film of contamination from the connector.

Make sure to catch the solvent in the container.

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**STANDARD WIRING PRACTICES MANUAL****CLEANING OF ELECTRICAL CONNECTORS**

- (f) Remove the unwanted solvent in the container from the work area.
- (g) If the connector has any remaining contamination, do Step (e) again.
- (h) Dry the connector with compressed air or nitrogen.

Make sure the inside of the socket contacts and the inserts around the socket contacts are fully dry.

**WARNING:** COMPRESSED GAS CAN BE DANGEROUS. TO PREVENT AN INJURY, CAREFULLY APPLY THE GAS IN THE DIRECTION AWAY FROM THE EYES, THE FACE, AND OTHER PERSONNEL.

**CAUTION:** THE CONNECTOR MUST BE FULLY DRY BEFORE THE PLUG IS INSTALLED. ANY REMAINING SOLVENT CAN CAUSE DAMAGE TO THE CONNECTOR OR UNSATISFACTORY PERFORMANCE OF THE SYSTEM, OR BOTH.

**E. Connector Cleaning with Grit Blast**

A grit blast gun:

- Can be used to clean a connector either on or off the aircraft
- Is used to clean a connector with corrosion or heavy contamination.

**WARNING:** THE GRIT BLAST GUN MUST BE USED ONLY IN AREAS WITH SUFFICIENT VENTILATION. A RESPIRATOR WITH A DUST FILTER AND EYE PROTECTION MUST BE WORN BY THE OPERATOR SO THAT THE OPERATOR DOES NOT BREATHE THE ALUMINUM OXIDE DUST.

**CAUTION:** DUST FROM THE GRIT BLAST GUN IS ABRASIVE. OBEY THESE PRECAUTIONS:

- PUT A COVER ON OR REMOVE THE ACTUATOR RODS OR ANY OTHER POLISHED FINISHES
- KEEP THE COVER ON THE OIL TANK SCUPPER IN ORDER TO PREVENT CONTAMINATION OF THE ENGINE OIL SYSTEM.

- (1) Separate the plug and the receptacle.
- (2) If it is necessary, remove the hooded socket contact:
  - (a) Carefully pull the contact out with a small pair of needle nose pliers.
  - (b) Discard the contact; it cannot be used again.
- (3) Clean each connector:
  - (a) With a fine tool, carefully scrape away as much of the corrosion as possible.
  - (b) Attach the source of clean, dry compressed air or nitrogen to the grit blast gun.
  - (c) Set the air pressure of the grit blast gun at 20 psi to 25 psi.
  - (d) Clean the internal part of the connector with the grit blast.  
Make sure to clean the bottom of the connector and around the base of the pin.
  - (e) Flush the connector with acetone or methyl alcohol.
  - (f) Dry the connector with compressed air or nitrogen.

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**WARNING:** COMPRESSED GAS CAN BE DANGEROUS. TO PREVENT AN INJURY, CAREFULLY APPLY THE GAS IN THE DIRECTION AWAY FROM THE EYES, THE FACE, AND OTHER PERSONNEL.

**CAUTION:** THE CONNECTOR MUST BE FULLY DRY BEFORE THE PLUG IS INSTALLED. ANY REMAINING SOLVENT CAN CAUSE DAMAGE TO THE CONNECTOR OR UNSATISFACTORY PERFORMANCE OF THE SYSTEM, OR BOTH.

**F. Connector Installation**

- (1) After the connector is cleaned, install a new hooded socket contact, if it was removed:
  - (a) Putt the glazed end of the hooded socket contact on a 0.060 maximum diameter pin.
  - (b) Push the unglazed end onto the connector pin until it touches the bottom.
- (2) Install the plug in the receptacle to make the environmental seal.

**CAUTION:** IT IS ABSOLUTELY NECESSARY THAT THE ENVIRONMENTAL SEAL IS MADE.

- (a) Put a very light layer of silicone lubricant on the copper sealing gasket of the plug connector.

**CAUTION:** DO NOT PUT SILICONE LUBRICANT ON THE CONNECTOR INSERT OR THE CONTACTS. SILICONE CONTAMINATION CAUSES UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

- (b) Push the nose of the plug connector into the threaded bushing of the receptacle.
- (c) Engage the threads of the nut and the threaded bushing.
- (d) Torque the nut approximately 50 inch-pounds to 70 inch-pounds.

**NOTE:** Use two wrenches to so that the connectors do not turn.

- (3) Do the fire detection cockpit test.



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## STANDARD WIRING PRACTICES MANUAL

### REPLACEMENT OF CONTACTS

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For training purposes only!

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## STANDARD WIRING PRACTICES MANUAL

### REPLACEMENT OF CONTACTS

#### 1. CONTACT REPLACEMENT

##### A. General Conditions

The replacement of a contact on a wire in a wire harness can occur a minimum of two times before the wire does not have sufficient length.

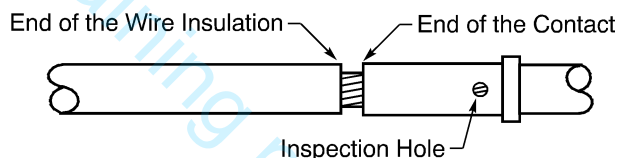
##### B. Replacement of a Contact

- (1) If applicable, remove the contact from the connector. Refer to the applicable Subject for the connector.
- (2) Cut the wire near the end:
  - The solder cup for solder type contacts
  - The crimp barrel for crimp type contacts.

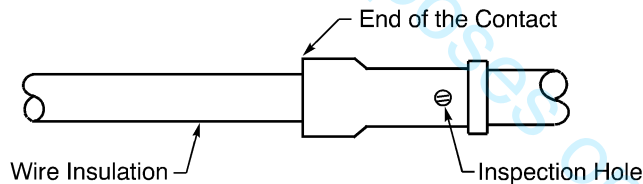
Make sure to keep as much length of the wire as possible.

Refer to:

- Figure 1 for a contact without a wire insulation grip
- Figure 2 for a contact with a wire insulation grip.



**CONTACT WITHOUT A WIRE INSULATION GRIP**  
**Figure 1**



**CONTACT WITH A WIRE INSULATION GRIP**  
**Figure 2**

- (3) Assemble a new contact. Refer to the applicable Subject for the connector.

**CAUTION:** DO NOT CRIMP THE AREA OF A CONDUCTOR THAT HAS BEEN CRIMPED BEFORE. UNSATISFACTORY PERFORMANCE AND RELIABILITY OF THE CRIMP JOINT CAN OCCUR.



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## STANDARD WIRING PRACTICES MANUAL

### SPECIAL PROTECTION OF ELECTRICAL CONNECTORS

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**STANDARD WIRING PRACTICES MANUAL****SPECIAL PROTECTION OF ELECTRICAL CONNECTORS**

This subject gives the procedures to:

- Give special protection to an existing connector
- Give special protection to a replacement connector.

**1. GENERAL DATA****A. Applicable Connectors**

Connectors that must have special protection are specified in:

- The Aircraft Maintenance Manual
- The applicable Service Bulletin or Service Letter.

**CAUTION:** THE SPECIAL PROTECTION OF CONNECTORS IS MANDATORY ONLY FOR THE CONNECTORS IDENTIFIED IN THE AIRCRAFT MAINTENANCE MANUAL, THE SERVICE BULLETINS OR THE SERVICE LETTER.

The applicable Service Bulletins and Service Letter are:

- SB 737-26-1112
- SB 737-26-1114
- SB 737-24A1148
- SB 737-24-1149
- SL 737-24-171

Special protection of connectors can be applied to cadmium plated aluminum connectors located in an unpressurized area of the airplane. Refer to Table 1 for a list of cadmium plated connectors installed on Boeing aircraft.

**CAUTION:** IF THE PROTECTION FROM CORROSION IS NOT SUFFICIENT, DAMAGE TO THE CONNECTORS OCCURS.

**Table 1**  
**CADMIUM PLATED CONNECTORS**

<b>Part Number</b>	<b>Supplier</b>
1167A()G()	Cinch
8D0()J()	Souriau
8D5()J()	Souriau
BACC63BP()C()	Boeing
BACC63BV()F()	Boeing
BACC63CB()-()	Boeing
BACC63CC()	Boeing
BACC63CD()	Boeing
BACC63CE()	Boeing
BACC63CP()	Boeing
BACC63CR()	Boeing
BACC63CS()G()	Boeing
BACC63CT()D()	Boeing

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## STANDARD WIRING PRACTICES MANUAL

### SPECIAL PROTECTION OF ELECTRICAL CONNECTORS

Table 1 (continued)

Part Number	Supplier
BACC63CU()D()	Boeing
BACC63DD()G()	Boeing
CA66279-()	ITT Cannon
CA66286-()	ITT Cannon
CA66287-()	ITT Cannon
CA66420-()	ITT Cannon
CA66422-()	ITT Cannon
CA66432-()	ITT Cannon
CA66434-()	ITT Cannon
CN0966()G()	Cinch
CN0967()G()	Cinch
CN1020A()G()	Cinch
CN1021A()G()	Cinch
CSF3440C()-()CD	Cinch
CSF3446C()-()CE	Cinch
D38999()W()	QPL
FC3400D()-()-140	Flight
FC3406D()-()-144	Flight
FRA6()	ITT Cannon
FRF6()	ITT Cannon
MS27467()B()	QPL
MS27473()B()	QPL
MS3456W()	QPL
MS3476W()	QPL
PC()CE()	Bendix
PC()SE()	Bendix
PT()CE()	Bendix
R0710()C()	RMS
R0710()G()	RMS
R0710()J()	RMS
R0711()F()	RMS
R0711()J()	RMS
SF3440C()-()	IPI

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**STANDARD WIRING PRACTICES MANUAL****SPECIAL PROTECTION OF ELECTRICAL CONNECTORS****Table 1 (continued)**

<b>Part Number</b>	<b>Supplier</b>
SF3446C()-()	IPI
WFB0()-()CD	ITT Cannon
WFB6()-()CE	ITT Cannon
ZZY-F()	Pyle-National

**B. Necessary Intervals for Special Protection**

Special protection must be applied to a connector:

- Again if the protection is removed or is not sufficient
- Again if the plug and receptacle are disconnected
- At 24 month intervals.

**C. Necessary Conditions for Personal Safety**

These conditions are applicable when you use a corrosion inhibiting compound:

- The conditions for personal safety specified by the manufacturer must be obeyed
- The necessary local conditions for personal safety must be obeyed
- A corrosion inhibiting compound must not touch the skin or the eyes
- The fumes from a corrosion inhibiting compound must not be breathed.

It is recommended to use this personal protection equipment:

- Nitrile or latex rubber gloves
- Protective clothes
- Respiratory protection
- Chemical goggles or approved eye protection.

**D. Necessary Conditions for Fire Safety**

These conditions are applicable when you use a corrosion inhibiting compound:

- The conditions for fire safety specified by the manufacturer must be obeyed
- The necessary local conditions for fire safety must be obeyed
- The material must be kept in an approved closed container
- Only the quantity of material that is necessary to give protection to the connectors must be kept near the airplane
- The airplane must be electrostatically grounded; refer to the Aircraft Maintenance Manual.

For more safety practices, refer to Subject 20-00-10.

**STANDARD WIRING PRACTICES MANUAL****SPECIAL PROTECTION OF ELECTRICAL CONNECTORS****E. Necessary Materials and Tools**

**WARNING:** CORROSION INHIBITING COMPOUNDS CAN BE DANGEROUS TO THE HEALTH. THE INSTRUCTIONS FROM THE MANUFACTURER SPECIFY THE NECESSARY SAFETY CONDITIONS. IF THE SPECIFIED CONDITIONS ARE NOT OBEYED, INJURY TO A PERSON CAN OCCUR.

**WARNING:** CORROSION INHIBITING COMPOUNDS ARE FLAMMABLE. THE INSTRUCTIONS FROM THE MANUFACTURER OF THE MATERIAL SPECIFY THE NECESSARY SAFETY CONDITIONS. IF THE SPECIFIED CONDITIONS ARE NOT OBEYED, INJURY TO A PERSON CAN OCCUR.

**CAUTION:** CORROSION INHIBITING COMPOUNDS ARE FLAMMABLE. THE INSTRUCTIONS FROM THE MANUFACTURER OF THE MATERIAL SPECIFY THE NECESSARY SAFETY CONDITIONS. IF THE SPECIFIED CONDITIONS ARE NOT OBEYED, DAMAGE TO EQUIPMENT CAN OCCUR.

**Table 2****CORROSION INHIBITING COMPOUNDS FOR THE ENGAGING FACE OF A CONNECTOR**

Part Number	Description	Supplier
D5026NS	11 ounce aerosol can	Zip Chem
ZC-026	Non-aerosol bulk container	Zip Chem

**Table 3****CORROSION INHIBITING COMPOUNDS FOR THE EXTERNAL SURFACE OF A CONNECTOR**

Part Number	Description	Supplier
AV25	13.5 ounce aerosol can	Ardrox
	Non-aerosol bulk container	Ardrox

**Table 4****INSULATING COMPOUNDS**

Part Number	Supplier
DC4	Dow Corning

**Table 5****NECESSARY TOOLS**

Tool	Supplier
Spray Equipment, Pump Action	An available source

**2. INSPECTION FOR CORROSION****A. Connector Assembly Inspection**

- (1) If it is necessary to remove dirt or other contamination to examine the surfaces for corrosion, clean the connector. Refer to Subject 20-10-04.

Make sure that you only remove contamination that prevents the inspection of the connector for corrosion. Do not remove the corrosion or corrosion products at this time.

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- (2) Disconnect the backshell. Refer to the applicable connector subject.

NOTE: Corrosion can make the operation of the backshell threads or coupling mechanism impossible.

- (3) Find the damage condition and the repair condition of the operation of the backshell threads and the coupling mechanism. Refer to Table 8.

- (4) Examine the internal and the external surfaces of the backshell for:

- Corrosion material
- Damage to the plated finish
- Damage to the base metal
- Damage to the threads.

- (5) Find the damage conditions and the repair conditions of the internal and external surfaces of the backshell. Refer to Table 8.

- (6) Examine the external surface of the connector for:

- Corrosion material
- Damage to the plated finish
- Damage to the base metal
- Damage to the threads or coupling mechanism.

- (7) Find the damage conditions and the repair conditions of the external surface of the connector. Refer to Table 6.

- (8) Disconnect the plug and the receptacle. Refer to the applicable subject for the connector.

NOTE: Corrosion can make the operation of the connector coupling mechanism impossible.

- (9) Find the damage condition and the repair condition of the connector coupling mechanism. Refer to Table 6.

- (10) Examine the internal surface of the connector shell for:

- Corrosion materials
- Damage to the plated finish
- Damage to the base metal.

- (11) Examine the connector contacts for:

- Base metal that can be seen
- Blue-green deposits
- Black stains or red stains
- Pits in the base metal.

- (12) Examine the connector for moisture.

- (13) Find the damage condition and the repair condition for the internal surfaces of the connector. Refer to Table 7.

# STANDARD WIRING PRACTICES MANUAL

## SPECIAL PROTECTION OF ELECTRICAL CONNECTORS

### B. Damage Conditions and Repair Conditions

Table 6

**DAMAGE AND REPAIR CONDITIONS - CONNECTOR EXTERNAL SURFACES**

Type of Damage	Damage Condition	Repair Condition	Reference
Layer of corrosion material	A layer of white corrosion materials on more than 20% of the surface area	Replacement of the connector	The applicable subject for the connector
	A layer of white corrosion materials on less than 20% of the surface area	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C. Paragraph 5.C.
Damage to the plated finish on the shell	The color of the finish is completely gone in the areas with corrosion	Replacement of the connector	The applicable subject for the connector
	The color of the finish is faded in some areas	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C. Paragraph 5.C.
Damage to the base metal of the shell	Many pits or holes in the connector shell	Replacement of the connector	The applicable subject for the connector
	Some pits in the connector shell	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C. Paragraph 5.C.
Damage to the coupling mechanism	The coupling mechanism is impossible to operate because of the corrosion	Replacement of the connector	The applicable subject for the connector
	The coupling mechanism does not operate easily because of the corrosion	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C. Paragraph 5.C.
	The coupling mechanism operates easily	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C. Paragraph 5.C.
Damage to the threads	The threads are impossible to engage or disengage because of the corrosion	Replacement of the connector	The applicable subject for the connector
	The threads do not engage or disengage easily because of the corrosion	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C. Paragraph 5.C.
	The threads engage and disengage easily	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C. Paragraph 5.C.

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# STANDARD WIRING PRACTICES MANUAL

## SPECIAL PROTECTION OF ELECTRICAL CONNECTORS

**Table 7**  
**CORROSION DAMAGE AND REPAIR CONDITIONS - CONNECTOR INTERNAL SURFACES**

Type of Damage	Damage Condition	Repair Condition	Reference
Layer of corrosion material	Corrosion materials on the surface of the shell	Replacement of the connector	The applicable subject for the connector
	Damage to the plated finish	Replacement of the connector	The applicable subject for the connector
	Pits in the base metal	Replacement of the connector	The applicable subject for the connector
Damage to a contact	Bare base metal	Replacement of the contact	The applicable subject for the connector
	Pits in the base metal	Replacement of the contact	The applicable subject for the connector
	Blue-green contamination	Replacement of the contact	The applicable subject for the connector
	Black stains or red stains	Replacement of the contact	The applicable subject for the connector
Damage to the connector	Moisture in the connector	Replacement of the connector	The applicable subject for the connector

**Table 8**  
**CORROSION DAMAGE AND REPAIR CONDITIONS - BACKSHELL**

Type of Damage	Damage Condition	Repair Condition	Reference
Layer of corrosion material	A layer of corrosion materials on more than 20% of the surface area	Replacement of the backshell	Subject 20-60-09
	A layer of corrosion materials on less than 20% of the surface area	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C.
			Paragraph 5.C.
Damage to the plated finish	The color of the finish is completely gone in the areas with corrosion	Replacement of the backshell	Subject 20-60-09
	The color of the finish is faded in some areas	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C.
			Paragraph 5.C.

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# STANDARD WIRING PRACTICES MANUAL

## SPECIAL PROTECTION OF ELECTRICAL CONNECTORS

Table 8 (continued)

Type of Damage	Damage Condition	Repair Condition	Reference
Damage to the base metal	Many pits or holes in the connector shell	Replacement of the backshell	Subject 20-60-09
	Some pits in the connector shell	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C.
			Paragraph 5.C.
Damage to the coupling mechanism	The coupling mechanism is impossible to operate because of the corrosion	Replacement of the backshell	Subject 20-60-09
	The coupling mechanism cannot operate easily because of the corrosion	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C.
			Paragraph 5.C.
	The threads or the coupling mechanism operate easily	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C.
			Paragraph 5.C.
Damage to the threads	The threads are impossible to engage or disengage because of the corrosion	Replacement of the backshell	Subject 20-60-09
	The threads cannot engage or disengage easily because of the corrosion	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C.
			Paragraph 5.C.
	The threads engage and disengage easily	Protection of the external surface with corrosion inhibiting compound	Paragraph 3.C.
			Paragraph 5.C.

### 3. CONNECTORS THAT CONNECT TO AN LRU

#### A. Applicable Conditions

Corrosion inhibiting compound must be applied to a connector:

- That is a replacement of a connector that has protection with corrosion inhibiting compound
- Again if the plug and the receptacle that have protection with corrosion inhibiting compound are disconnected
- Again if the corrosion inhibiting compound is removed or is not sufficient
- At 24 month intervals.

**CAUTION:** PROTECTION WITH CORROSION INHIBITING COMPOUND MUST BE SUFFICIENT. IF THE PROTECTION FROM CORROSION IS NOT SUFFICIENT, DAMAGE TO THE CONNECTOR CAN OCCUR.

#### B. Protection of the Engaging Faces

- (1) Clean the internal surfaces of the connector with isopropyl alcohol. Refer to Subject 20-60-01.
- (2) Make a selection of a corrosion inhibiting compound from Table 2.
- (3) If the corrosion inhibiting compound is not in an aerosol can, make a selection of equipment that can be used to apply the compound as a spray from Table 5.
- (4) Apply the compound to the engaging face of the plug connector as a spray. Refer to Figure 1.

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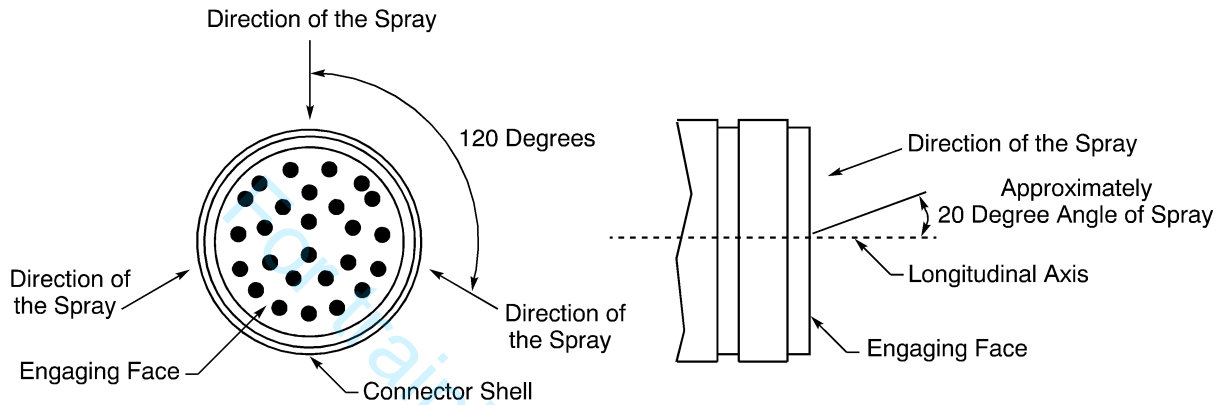
## STANDARD WIRING PRACTICES MANUAL

### SPECIAL PROTECTION OF ELECTRICAL CONNECTORS

Make sure that a layer of compound is fully applied on each of these surfaces:

- The metal surfaces on the engaging face of the connector
- The rubber grommet
- The ground springs.

**NOTE:** It is not necessary to remove the corrosion inhibiting compound that gets on the contacts.



#### DIRECTION TO APPLY A SPRAY

Figure 1

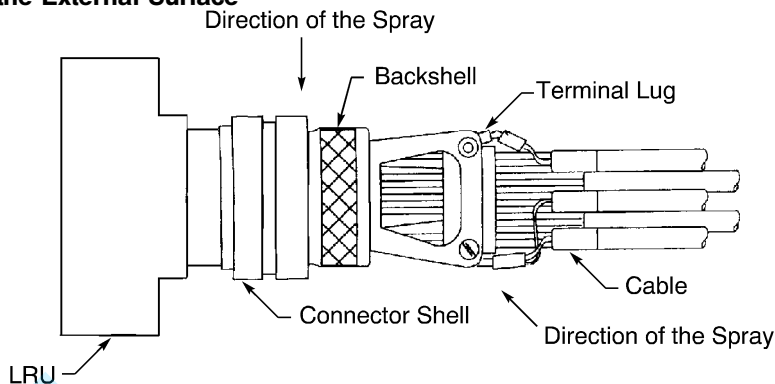
- Hold the nozzle 4 to 8 inches away from the engaging face of the connector approximately at a 20 degree angle from the longitudinal axis of the connector.
  - Apply the compound across the engaging face with sprays of 2 seconds to 4 seconds.
  - Move the nozzle direction approximately 120 degrees around the engaging face of the connector.
- NOTE:** As an alternative, the connector can be turned approximately 120 degrees.
- Do Step (a) through Step (c) again for the next 120 degree segment of the connector.
  - Do Step (a) through Step (b) again for the last 120 degree segment of the connector.
- Do Step (4) again for the engaging face of the receptacle connector.
  - Let the connector dry in the air for a minimum of 20 minutes before it is assembled.

**CAUTION:** THE CONNECTOR MUST BE GIVEN PROTECTION FROM CONTAMINATION AFTER THE CORROSION INHIBITING COMPOUND IS APPLIED. CONTAMINATION IN THE CONNECTOR CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

## STANDARD WIRING PRACTICES MANUAL

### SPECIAL PROTECTION OF ELECTRICAL CONNECTORS

#### C. Protection of the External Surface



#### APPLICATION OF THE CORROSION INHIBITING COMPOUND

Figure 2

Refer to Figure 2.

**CAUTION:** THE NECESSARY BOND TESTS MUST BE DONE BEFORE THE CORROSION INHIBITING COMPOUND IS APPLIED.

**CAUTION:** THE NECESSARY OPERATIONAL TESTS MUST BE DONE BEFORE THE CORROSION INHIBITING COMPOUND IS APPLIED.

- (1) If the plug and receptacle are not connected, connect them. Refer to the applicable Subject for the connector and the Aircraft Maintenance Manual.
- (2) Clean the external surfaces of the connector with isopropyl alcohol. Refer to Subject 20-10-04.
- (3) Make a selection of a corrosion inhibiting compound from Table 3.
- (4) Make a selection of equipment that can be used to apply the compound as a spray from Table 5.
- (5) Apply compound to the external surface of the connector from the side of the connector until drops of the compound start to fall from the connector.

Make sure that a layer of compound is fully applied on each of these surfaces:

- The connector shell
- The backshell.

**CAUTION:** NONE OF THE CORROSION INHIBITING COMPOUND MUST BE REMOVED. DAMAGE TO THE CONNECTOR FROM CORROSION CAN OCCUR.

- (a) Hold the nozzle 4 inches to 8 inches away from the side of the connector.
- (b) Apply the compound along the longitudinal axis of the connector with sprays of 2 seconds to 4 seconds.
- (c) Move the nozzle approximately 120 degrees around the outer surface of the connector.
- (d) Do Step (a) through Step (c) again.
- (e) Do Step (a) through Step (b) again.
- (6) Apply compound to the external surface of the connector from the rear of the connector until drops of the compound start to fall from the connector.

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**STANDARD WIRING PRACTICES MANUAL****SPECIAL PROTECTION OF ELECTRICAL CONNECTORS**

Make sure that a layer of compound is fully applied on each of these surfaces:

- The connector shell
- The backshell
- The rubber grommet
- The terminal lugs.

**CAUTION:** NONE OF THE CORROSION INHIBITING COMPOUND MUST BE REMOVED. DAMAGE TO THE CONNECTOR FROM CORROSION CAN OCCUR.

- (a) Hold the nozzle 4 inches to 8 inches away from the rear of the connector approximately at a 45 degree angle from the longitudinal axis of the connector.
- (b) Apply the compound across the connector and the backshell with sprays of 2 seconds to 4 seconds.
- (c) Move the nozzle approximately 120 degrees around the connector.
- (d) Do Step (a) through Step (c) again.
- (e) Do Step (a) through Step (b) again.

**4. FENWAL CONNECTORS****A. Necessary Conditions**

Insulating compound must be applied to a connector:

- If the connector is a replacement of a connector that has protection with insulating compound
- Again if the compound is removed or is not sufficient.

**CAUTION:** IF THE PROTECTION FROM CORROSION WITH INSULATING COMPOUND IS NOT SUFFICIENT, DAMAGE TO THE CONNECTOR CAN OCCUR.

**B. Protection of the Engaging Faces**

- (1) Make a selection of an insulating compound from Table 4.
- (2) Fill a syringe or an equivalent tool with the insulating compound.
- (3) Fill the inner surfaces of the connector full with insulating compound. Refer to Figure 3.

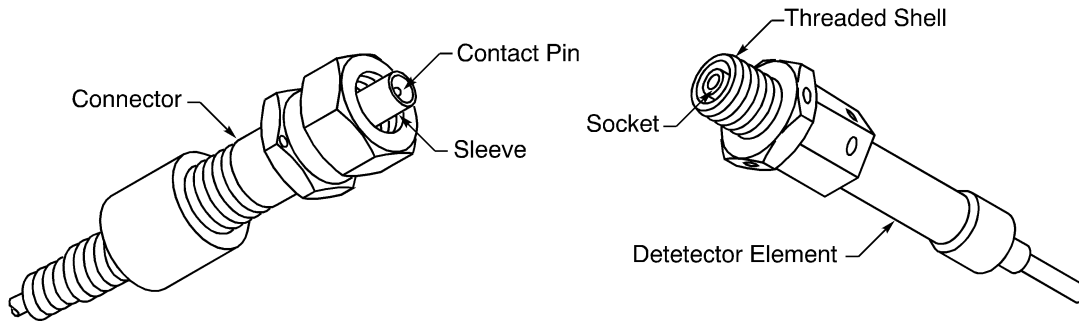
Make sure to fully fill these areas:

- The space between the sleeve and the contact pin
- The socket of the detector element
- The space between the socket and the threaded shell on the detector element connector.

**CAUTION:** THE CONNECTOR MUST BE ASSEMBLED OR GIVEN PROTECTION FROM CONTAMINATION AFTER THE INSULATING COMPOUND IS APPLIED. CONTAMINATION CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

## STANDARD WIRING PRACTICES MANUAL

### SPECIAL PROTECTION OF ELECTRICAL CONNECTORS



#### PROTECTION OF THE CONNECTOR

Figure 3

### 5. OTHER CONNECTORS

#### A. Applicable Conditions

Corrosion inhibiting compound must be applied to a connector:

- That is a replacement of a connector that has protection with corrosion inhibiting compound
- Again if the plug and the receptacle that have protection with corrosion inhibiting compound are disconnected
- Again if the corrosion inhibiting compound is removed or is not sufficient
- At 24 month intervals.

**CAUTION:** PROTECTION WITH CORROSION INHIBITING COMPOUND MUST BE SUFFICIENT. IF THE PROTECTION FROM CORROSION IS NOT SUFFICIENT, DAMAGE TO THE CONNECTOR CAN OCCUR.

#### B. Protection of the Engaging Faces

- (1) Clean the internal surfaces of the connector using isopropyl alcohol. Refer to Subject 20-60-01.
- (2) Make a selection of a corrosion inhibiting compound from Table 2.
- (3) If the corrosion inhibiting compound is not in an aerosol can, make a selection of equipment that can be used to apply the compound as a spray from Table 5.
- (4) Apply the compound to the engaging face of the plug connector as a spray. Refer to Figure 4.

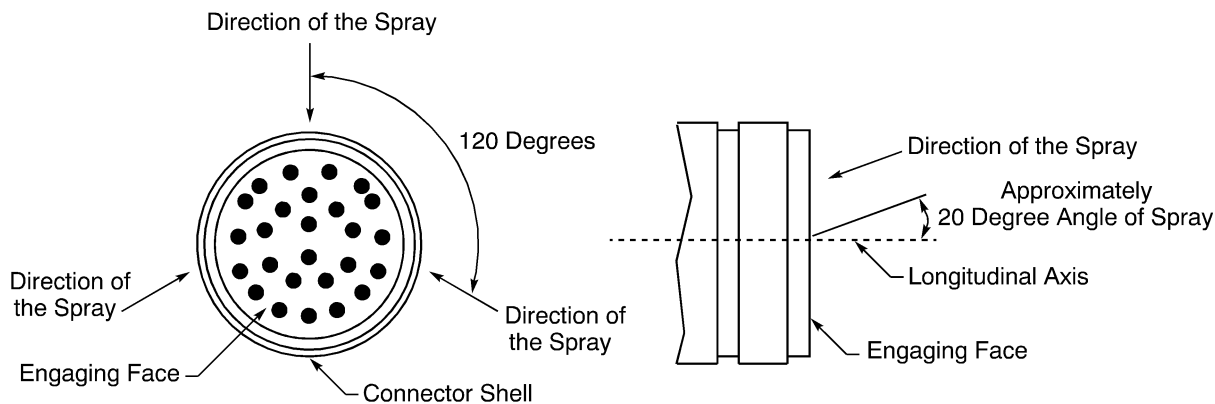
Make sure that a layer of compound is fully applied on each of these surfaces:

- The metal surfaces on the engaging face of the connector
- The rubber grommet
- The ground springs.

**NOTE:** It is not necessary to remove the corrosion inhibiting compound that gets on the contacts.

## STANDARD WIRING PRACTICES MANUAL

### SPECIAL PROTECTION OF ELECTRICAL CONNECTORS



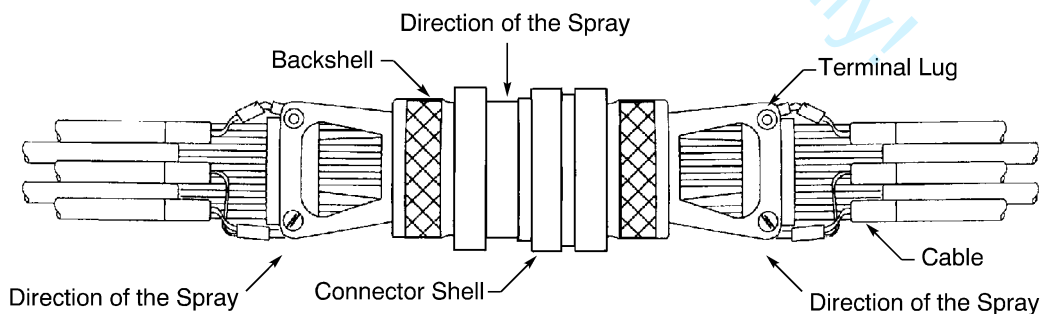
#### DIRECTION TO APPLY A SPRAY

Figure 4

- Hold the nozzle 4 inches to 8 inches away from the engaging face of the connector approximately at a 20 degree angle from the longitudinal axis of the connector.
  - Apply the compound across the engaging face with sprays of 2 seconds to 4 seconds.
  - Move the nozzle direction approximately 120 degrees around the engaging face of the connector.
- NOTE:** As an alternative, the connector can be turned approximately 120 degrees.
- Do Step (a) through Step (c) again for the next 120 degree segment of the connector.
  - Do Step (a) through Step (b) again for the last 120 degree segment of the connector.
- Do Step (4) again for the engaging face of the receptacle connector.
  - Let the connector dry in the air for a minimum of 20 minutes before it is assembled.

**CAUTION:** THE CONNECTOR MUST GIVEN PROTECTION FROM CONTAMINATION AFTER THE CORROSION INHIBITING COMPOUND IS APPLIED. CONTAMINATION IN THE CONNECTOR CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

#### C. Protection of the External Surface



#### APPLICATION OF THE CORROSION INHIBITING COMPOUND

Figure 5

Refer to Figure 5.

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**STANDARD WIRING PRACTICES MANUAL****SPECIAL PROTECTION OF ELECTRICAL CONNECTORS**

**CAUTION:** THE NECESSARY BOND TESTS MUST BE DONE BEFORE THE CORROSION INHIBITING COMPOUND IS APPLIED.

**CAUTION:** THE NECESSARY OPERATIONAL TESTS MUST BE DONE BEFORE THE CORROSION INHIBITING COMPOUND IS APPLIED.

- (1) If the plug and receptacle are not connected, connect them. Refer to the applicable Subject for the connector.
- (2) Clean the external surfaces of the connector using Isopropyl Alcohol. Refer to Subject 20-60-01.
- (3) Make a selection of a corrosion inhibiting compound from Table 3.
- (4) Make a selection of equipment that can be used to apply the compound as a spray from Table 5.
- (5) Apply compound to the external surface of the connector from the side of the connector until drops of the compound start to fall from the connector.

Make sure that a layer of compound is fully applied on each of these surfaces:

- The connector shell
- The backshell.

**CAUTION:** NONE OF THE CORROSION INHIBITING COMPOUND MUST BE REMOVED. DAMAGE TO THE CONNECTOR FROM CORROSION CAN OCCUR.

- (a) Hold the nozzle 4 inches to 8 inches away from the side of the connector.
  - (b) Apply the compound along the longitudinal axis of the connector with sprays of 2 seconds to 4 seconds.
  - (c) Move the nozzle approximately 120 degrees around the outer surface of the connector.
  - (d) Do Step (a) through Step (c) again.
  - (e) Do Step (a) through Step (b) again.
- (6) Apply compound to the external surface of the connector from the rear of the connector until drops of the compound start to fall from the connector.

Make sure that a layer of compound is fully applied on each of these surfaces:

- The connector shells
- The backshells
- The rubber grommets
- The terminal lugs.

**CAUTION:** NONE OF THE CORROSION INHIBITING COMPOUND MUST BE REMOVED. DAMAGE TO THE CONNECTOR FROM CORROSION CAN OCCUR.

- (a) Hold the nozzle 4 inches to 8 inches away from the rear of the connector approximately at a 45 degree angle from the longitudinal axis of the connector.
- (b) Apply the compound across the connector and the backshell with sprays of 2 seconds to 4 seconds.
- (c) Move the nozzle approximately 120 degrees around the connector.
- (d) Do Step (a) through Step (c) again.
- (e) Do Step (a) through Step (b) again.

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**STANDARD WIRING PRACTICES MANUAL****SPECIAL PROTECTION OF ELECTRICAL CONNECTORS****6. REPLACEMENT OF CONNECTORS****A. Replacement of Connectors that Connect to an LRU**

- (1) Clean the connector.

Refer to:

- Subject 20-10-04 for the procedures to clean the external surfaces of a connector
- Subject 20-60-01 for the procedures to clean the internal surfaces of a connector.

- (2) Disassemble the connector. Refer to the applicable Subject for the connector.
- (3) Clean the contacts. Refer to Subject 20-60-01.
- (4) Examine these wire harness components:
  - The contacts
  - The backshell
  - The wires.
- (5) Replace or repair a component that has damage. Refer to the applicable Subject for the component.
- (6) Assemble the new connector. Refer to the applicable Subject for the connector.
- (7) Apply corrosion inhibiting compound on the engaging faces of the connector. Refer to Paragraph 3.B.

**CAUTION:** THE CONNECTOR MUST BE ASSEMBLED OR GIVEN PROTECTION FROM CONTAMINATION AFTER THE CORROSION INHIBITING COMPOUND IS APPLIED. CONTAMINATION CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

- (8) Connect the connector to the LRU. Refer to the applicable Subject for the connector and the Aircraft Maintenance Manual.
- (9) After the connector is connected to the LRU, apply corrosion inhibiting compound on the external surface of the connector. Refer to Paragraph 3.C.

**B. Replacement of a Fenwal Connector**

- (1) Disassemble the connector. Refer to Subject 20-62-14.
- (2) Assemble the new connector. Refer to Subject 20-62-14.
- (3) Apply insulation compound on the engaging faces of the connector and the detector element. Refer to Paragraph 4.B.

**CAUTION:** THE CONNECTOR MUST BE ASSEMBLED OR GIVEN PROTECTION FROM CONTAMINATION AFTER THE INSULATING COMPOUND IS APPLIED. CONTAMINATION CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

- (4) After the connector is connected to the detector element, remove the insulating compound that is on the outer surface of the connector.

**C. Replacement of Other Connectors**

- (1) Clean the connector.

Refer to:

- Subject 20-10-04 for the procedures to clean the external surfaces of a connector
- Subject 20-60-01 for the procedures to clean the internal surfaces of a connector.

- (2) Disassemble the connector. Refer to the applicable Subject for the connector.

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### SPECIAL PROTECTION OF ELECTRICAL CONNECTORS

- (3) Clean the contacts. Refer to Subject 20-60-01.
- (4) Examine these wire harness components:
  - The contacts
  - The backshell
  - The wires.
- (5) Replace or repair a component that has damage. Refer to the applicable Subject for the component.
- (6) Assemble the new connector. Refer to the applicable Subject for the connector.
- (7) Apply corrosion inhibiting compound on the engaging faces of the connector. Refer to Paragraph 5.B.

**CAUTION:** THE CONNECTOR MUST BE ASSEMBLED OR GIVEN PROTECTION FROM CONTAMINATION AFTER THE CORROSION INHIBITING COMPOUND IS APPLIED. CONTAMINATION CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR.

- (8) Connect the plug and the receptacle. Refer to the applicable Subject for the connector.
- (9) Apply corrosion inhibiting compound on the external surface of the connector. Refer to Paragraph 5.C.

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## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF ELECTRICAL CONNECTORS

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

### 1. CIRCULAR CONNECTOR INSTALLATION TOOLS

#### A. Tool Part Numbers

NOTE: The tools given in Table 1 are:

- Used to install connectors and connector hardware
- Designed to be used in the field.

**Table 1**  
**CIRCULAR CONNECTOR TOOLS**

Part Number	Description	Supplier	Special Instructions
600-006	Backshell Assembly Tool	Glenair	-
BT-BS-618W	Strap Wrench	Daniels	For small, threaded connectors
G77015	Replacement Jaws	Glenair	For TG69 pliers
M83507/15-0	Circular Connector Tool Kit	Glenair	-
TG69	Universal Soft Jaw Pliers	Glenair	For medium size connector shells
TG70	Mini Strap Wrench	Glenair	For small, threaded connectors
TG80	Circular Connector Tool Kit	Glenair	-

### 2. INSTALLATION OF RECEPTACLE CONNECTORS

#### A. General Conditions

For firewall receptacles, refer to Paragraph 2.C.

Receptacles must be installed with:

- The installation hardware in Table 2
- The screws located in 2 diagonally opposite installation holes
- The heads of the screws on the same side as the related plug
- The major keyway in the UP or FORWARD position, if it is not specified differently.

An adapter plate:

- Is not used when the shield of a cable is terminated through the connector or the cable clamp, or both
- Must have a conductive finish for a coax connector.

Refer to Paragraph 6. for the procedure to install an adapter plate.

**Table 2**  
**NECESSARY INSTALLATION HARDWARE FOR RECEPTACLES**

Hardware	Quantity	Specification or Standard	Supplier	Special Instructions
Nut	2	BACN10NW1	QPL	Clip Nut
	2	BACN10JC04	QPL	Locknut
	2	BACN10XP()	QPL	Locknut

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

Table 2 (continued)

Hardware	Quantity	Specification or Standard	Supplier	Special Instructions
Screw	2	NAS1801-04	QPL	-
Washer	2	AN960-D4L	QPL	Installed under the screw head; necessary only in unpressurized areas

### B. Installation of Coax Receptacle Connectors

Table 3  
NECESSARY MATERIALS

Description	Part Number	Supplier
Thread Lock Compound	222	Loctite
	271	Loctite

Table 4  
SIZE 4-40 FASTENERS FOR COAX CONNECTOR INSTALLATION

Part Name	Necessary Quantity	Part Number	Description	Notes
Screw	4	BACS12HN()-()	The screw head does not have a drilled hole.	-
		BACS12HN()-()D	The screw head has a drilled hole for the installation of lockwire.	Use screws that have a drilled head where lock wire is necessary.
Nut	4	BACN10JC04	Hex	The nut is not necessary if the mounting flange of the connector has threaded holes.
Washer	4	AN960JD4L	Flat washer	-
		NAS1149DN416J	Flat washer	-
		NAS620A4L	Flat washer that has a reduced outside diameter	Use washers that have a reduced outside diameter if it is necessary.

Table 5  
SIZE 2-56 FASTENERS FOR COAX CONNECTOR INSTALLATION

Part Name	Necessary Quantity	Part Number
Screw	4	MS51957-()
Nut	4	NAS671-2
Washer	4	NAS1149DN216J

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### INSTALLATION OF ELECTRICAL CONNECTORS

- (1) Put a 4-40 size screw in a mounting hole in the connector flange.
- (2) If the 4-40 size screw makes a fit with the hole, make a selection of the necessary quantity of size 4-40 screws, nuts and washers from Table 4.

**NOTE:** If the installation is in an unpressurized area, or if the initial installation had lockwire, select screws that have drilled heads.

**NOTE:** Select flat washers that have a reduced outside diameter if it is necessary to make a fit with the connector.

**NOTE:** Nuts are not necessary if the mounting flange of the connector has threaded holes.

- (3) If the 4-40 size screw will not make a fit with the hole, make a selection of the necessary quantity of size 2-56 screws, nuts and washers from Table 5.
- (4) Make a selection of a thread lock compound from Table 3.
- (5) Put one drop of thread lock compound on the threads of:
  - Each screw if the connector flange does not have threaded holes
  - Each hole in the connector flange if the flange has threaded holes.
- (6) Put a washer on each screw.
- (7) Put each screw in the panel mounting holes.
- (8) While the screw is in the panel hole, put the screw through the hole in the connector flange.
- (9) Engage the threads of the each screw and:
  - A nut if the connector flange does not have threaded holes
  - A hole in the connector flange if the flange has threaded holes.
- (10) Tighten and torque the screws:
  - 6 to 8 inch-pounds for size 4-40
  - 2 to 4 inch-pounds for size 2-56.
- (11) Install lockwire through the heads of the mounting screws if the installation is in an unpressurized area, or if the initial installation had lockwire. Refer to Subject 20-60-07.

#### C. Firewall Receptacles

**NOTE:** If it is necessary for the receptacle to have an electrical bond, refer to paragraph 2.D..

Firewall receptacles must be installed with:

- The installation hardware in Table 6
- The screws located in the 4 installation holes
- A layer of sealant from Table 7 on the applicable surfaces of the connector flange
- The major keyway in the UP or FORWARD position, if it is not specified differently.

**Table 6**  
**NECESSARY INSTALLATION HARDWARE FOR FIREWALL RECEPTACLES**

Hardware	Quantity	Specification or Standard	Supplier
Locknut	4	BACN10JC()C	QPL
Screw	4	NAS1801-04	QPL
Washer	4	AN960C()L	QPL

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

**Table 7**  
**NECESSARY INSTALLATION MATERIALS FOR FIREWALL RECEPTACLES**

Material	Specification	Supplier
Sealant	BMS5-63, Type II, Class B.	QPL

### D. Electrical Bonds

An electrical bond is necessary for:

- Receptacles that are installed on disconnect brackets and are attached to plugs that have specified torque values
- Engine firewall disconnects.

Refer to Subject 20-20-00.

### 3. INSTALLATION OF FEEDTHROUGH CONNECTORS

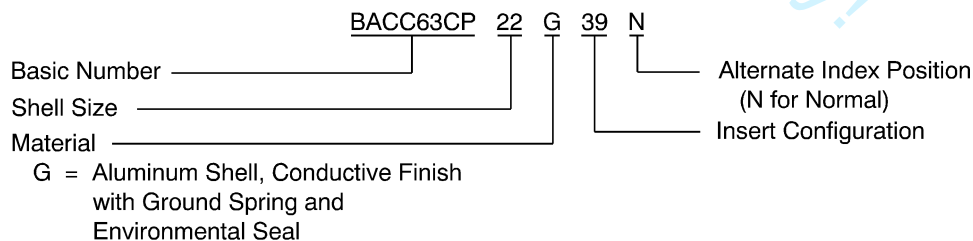
#### A. Connector Part Numbers

**Table 8**  
**FEEDTHROUGH CONNECTOR PART NUMBERS**

Part Number or Standard	Description	Supplier
BACC63CP()	Single Hole Mount	Boeing
BACC63CR()	Flange Mount	Boeing
CN1068A22A55N	Flange Mount	Cinch

**Table 9**  
**APPROVED SUPPLIERS OF BOEING STANDARD FEEDTHROUGH CONNECTORS**

Boeing Standard	Supplier
BACC63CP()	RMS
BACC63CR()	RMS

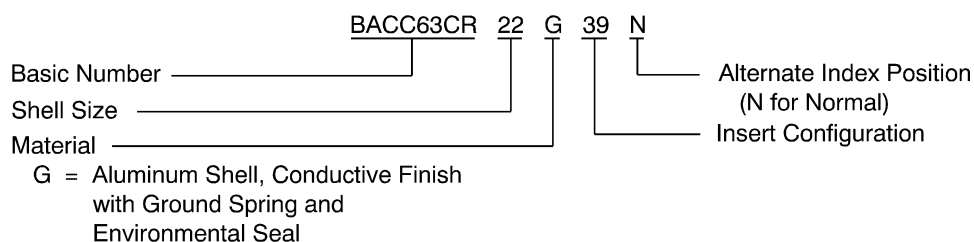


### BACC63CP() CONNECTOR PART NUMBER STRUCTURE

**Figure 1**

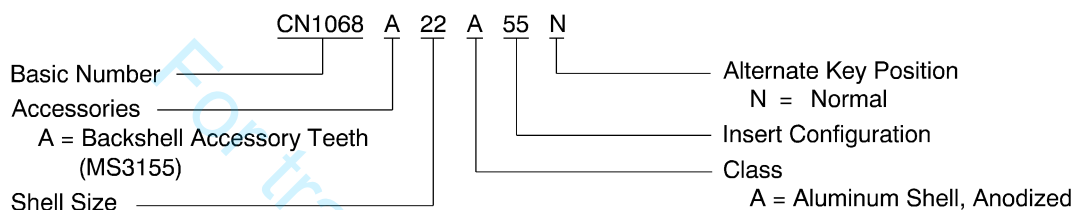
## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF ELECTRICAL CONNECTORS



#### BACC63CR() CONNECTOR PART NUMBER STRUCTURE

Figure 2



#### CN1068() CONNECTOR PART NUMBER STRUCTURE

Figure 3

### B. Necessary Materials

Table 10

#### ABRASIVE MATERIALS

Description	Specification	Supplier
Scotch-Brite Pad	Type A Very Fine	3M
Garnet Sandpaper	ANSI B74.18	An available source
Wet/Dry Sandpaper	ANSI B74.18 Grit size 280 or finer	An available source

Table 11

#### CLEANING SOLVENTS

Solvent	Specification	Supplier
Ethyl Alcohol, Denatured	AMS 3002	An available source
	ASTM E 1145 Type II	An available source
Isopropyl Alcohol	TT-I-735 Grade A	An available source
	TT-I-735 Grade B	An available source
Toluene	TT-T-548	An available source
Acetone	O-A-51	An available source
	ASTM D 329	An available source
Methyl Ethyl Keytone	ASTM D 740 Type I	An available source

# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

**Table 12**  
**FINISH MATERIALS**

Description	Cure Time (Hours)	Tack Free Time (Hours)	Specification	Supplier
Primer	4	1.5	BMS10-11 Type 1	QPL
Chemical Conversion Coating	-	-	Alodine 600	An available source

**Table 13**  
**APPROVED SUPPLIERS OF BOEING STANDARD PRIMERS**

Boeing Specification	Supplier
BMS10-11 Type 1	Deft
	Tempo Paint
	Nihon Tokushu Toryo
	Hiratsuka
	Akzo Nobel
	Dexter Aerospace
	PRC-DeSoto
	Courtlands Aerospace

**Table 14**  
**APPROVED SUPPLIERS OF CHEMICAL CONVERSION COATING**

Material	Supplier
Alodine 600	Henkel
	Nihon Parkerizing

### C. Feedthrough Connector Installation - BACC63CP() Single Hole Mount

**Table 15**  
**NECESSARY TOOLS**

Connector	Tool			
	Description	Part Number	Special Instructions	Supplier
BACC63CP18	Torque Wrench	-	Tool must measure 600 inch-pounds minimum	An available source
	Breaker Bar, 1/2 inch Drive	-	Use with connector socket assembly	An available source
	Box end wrench tool	ST2580-436B-1	-	Boeing
	Connector socket	ST2580-436B-6	-	Boeing

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

Table 15 (continued)

Connector	Tool			
	Description	Part Number	Special Instructions	Supplier
BACC63CP22	Torque Wrench	-	Tool must measure 600 inch-pounds minimum	An available source
	Breaker Bar, 1/2 inch Drive	-	Use with connector socket assembly	An available source
	Box end wrench tool	ST2580-436B-1	-	Boeing
	Connector socket	ST2580-436B-5	-	Boeing

Table 16  
THRUST WASHER PART NUMBERS

Connector Part Number	Thrust Washer	
	Part Number	Supplier
BACC63CP10G05X	5967-10-0003	RMS
BACC63CP18G11X	5967-22-0003	RMS
BACC63CP22G39X	5967-22-0003	RMS
BACC63CP22S39X	5967-22-0101	RMS
BACC63CP22G55X	5967-22-0003	RMS

- (1) Make a selection of an abrasive from Table 10.
- (2) Make a selection of a cleaning solvent from Table 11.
- (3) Make a selection of a sealant that is applicable for an electrical connector shell bond. Refer to Subject 20-20-00.
- (4) Make a selection of a torque wrench, breaker bar, connector socket tool and box end wrench tool from Table 15.
- (5) Prepare the faying surface on the pressurized side of the structure. Refer to Subject 20-20-00. Make sure that the abrasive cleaning method is used.
- (6) Clean the faying surfaces of the structure with solvent and a clean wiper.
  - (a) Put solvent on a clean wiper.
  - (b) Rub the faying surface with the wiper.
  - (c) When the wiper is dirty, replace it with a clean wiper.
  - (d) Do Step (a) through Step (c) again until the wiper is clean.
  - (e) Immediately dry the surface with a clean cloth.
- (7) Clean the faying surface of the connector with solvent and a clean wiper.
- (8) Apply a thin layer of sealant on the surface of the connector flange that will be against the structure.
- (9) From the pressurized side of the structure, align the flat side of the connector with the flat side of the cutout.

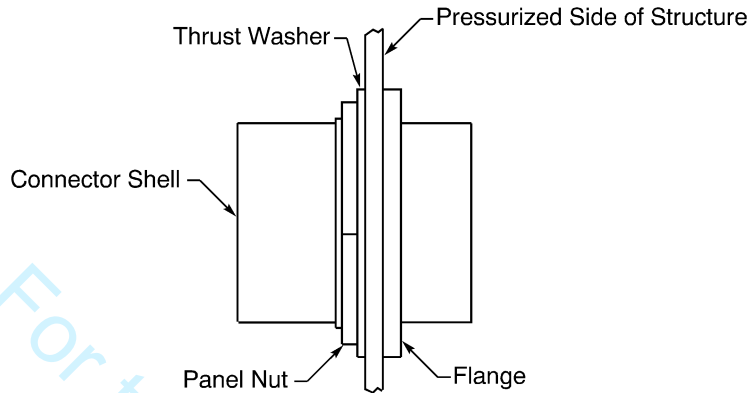
# 20-60-06

## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF ELECTRICAL CONNECTORS

- (10) Install the connector in the cutout in the structure from the pressurized side of the structure. Refer to Figure 4.

Make sure that the pin contacts are on the pressurized side of the structure.



**CONNECTOR INSTALLATION**  
**Figure 4**

- (11) If the thrust washer has damage, make a selection of a new thrust washer from Table 16.
- (12) Apply a thin layer of sealant on the surface of the thrust washer that will be against the structure.
- (13) Put the thrust washer on the unpressurized side of the connector. Refer to Figure 4.
- Make sure that the sealant on the thrust washer is against the structure.
- (14) On the unpressurized side of the structure, engage the threads of the panel nut with the threads of the connector. Refer to Figure 4.
- (15) Tighten the panel nut with the hand.
- (16) If there is too much sealant, remove the unwanted sealant from the thrust washer.
- (17) On the unpressurized side of the structure, put the connector socket tool into the feedthrough connector.
- (18) Engage the box end wrench on the connector panel nut.
- (19) Torque the connector panel nut to 144 inch pounds.
- (20) Use the connector socket tool and breaker bar tool to align the flat side of the connector with the flat side of the cutout.
- Turn the connector clockwise and record the wrench position at the point of resistance.
  - Turn the connector counter clockwise and record the wrench position at the point of resistance.
  - Turn the connector to the point in the middle of the two recorded positions.
- (21) Hold the connector and, at the same time, torque the panel nut to 600 inch pounds.

**CAUTION:** DO NOT LET THE FLAT SIDE OF THE CONNECTOR AND THE FLAT SIDE OF THE CUTOUT IN THE STRUCTURE HOLD THE CONNECTOR WHILE THE PANEL NUT IS TIGHTENED. DAMAGE TO THE CONNECTOR OR THE STRUCTURE CAN OCCUR.

- (22) Remove the connector socket tool and box end wrench tool.
- (23) Do a test of the electrical resistance between the connector shell and the structure. Refer to Subject 20-20-00.

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

- (24) Apply a fillet seal on the pressurized side of the connector.  
Make sure that the fillet seal is between the edge of the connector flange and the structure.
- (25) Apply the fillet seals on the unpressurized side of the connector.
  - (a) Apply a fillet seal between the structure and the thrust washer.
  - (b) Apply a fillet seal between the thrust washer and the edge of the panel nut.
  - (c) Apply a fillet seal between the edge of the panel nut and the connector.
- (26) If the area of the structure adjacent to the connector has bare metal:
  - (a) Make a selection of a primer from Table 12.
  - (b) Apply the primer to the bare metal on the pressurized side of the structure.
  - (c) Apply the primer to the bare metal on the unpressurized side of the structure.

### D. Feedthrough Connector Installation - BACC63CR() Flange Mount

**Table 17**  
**NECESSARY TOOLS**

Tool	Special Instructions	Supplier
Torque Wrench	Tool must measure 9 inch-pounds minimum	An available source

**Table 18**  
**CONNECTOR INSTALLATION HARDWARE**

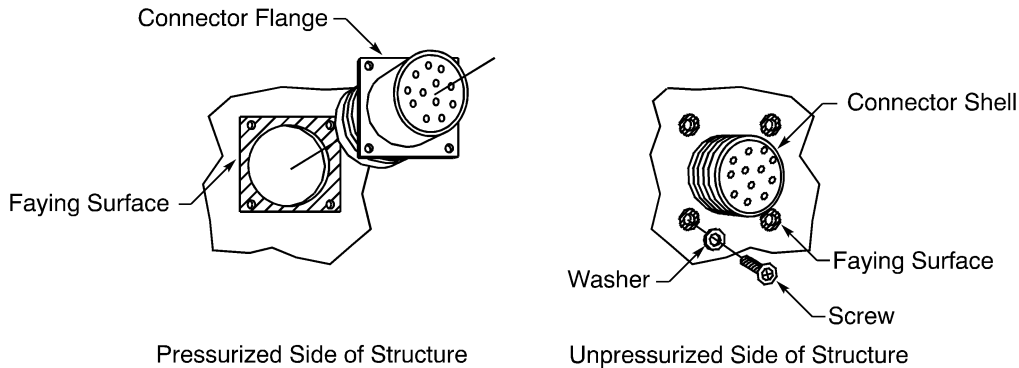
Hardware	Part Number	Quantity	Supplier
Screw	NAS1801-()-()	4	An available source
Washer	NAS1149D()J	4	An available source

- (1) Make a selection of an abrasive from Table 10.
- (2) Make a selection of a cleaning solvent from Table 11.
- (3) Make a selection of a chemical conversion coat material from Table 12.
- (4) Make a selection of a sealant that is applicable for an electrical connector shell bond. Refer to Subject 20-20-00.
- (5) Make a selection of a torque wrench from Table 17.
- (6) Prepare the faying surface of the structure that touches the connector flange. Refer to Figure 5 and Subject 20-20-00.  
Make sure that the abrasive cleaning method is used.

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## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF ELECTRICAL CONNECTORS



#### LOCATION OF THE FAYING SURFACES

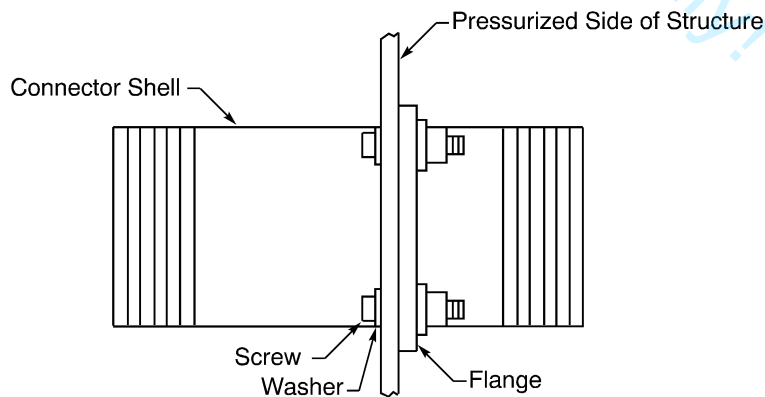
Figure 5

- (7) Prepare the faying surfaces of the structure for each screw. Refer to Figure 5 and Subject 20-20-00. Make sure that the abrasive cleaning method is used.
- (8) Clean the faying surfaces on the structure.
  - (a) Dispense solvent onto a clean wiper.
  - (b) Rub the faying surface with the solvent soaked wiper.
  - (c) When the wiper is dirty, replace it with a clean wiper.
  - (d) Do Step (a) through Step (c) again until the wiper is clean.
- (9) Apply the chemical conversion coat material to the faying surface that touches the connector flange.

**CAUTION:** DO NOT APPLY CHEMICAL CONVERSION COAT MATERIAL TO THE CLEANED AREA THAT TOUCHES THE SCREW HEAD AND WASHER. THESE AREAS MUST BE BARE ALUMINUM.

- (10) Clean each side of the connector flange with solvent and a clean wiper.
- (11) Align and insert the connector through the cutout from the pressurized side of the structure. Refer to Figure 6.

Make sure that the pin contacts are on the pressurized side of the structure.



#### CONNECTOR INSTALLATION

Figure 6

**20-60-06**

# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

- (12) Put a washer on each mounting screw. Refer to Figure 6.
- (13) Fully engage the threads of the mounting screws and the threads of the clinch nuts.
- (14) Torque the screws 9 inch-pounds to 12 inch-pounds.
- (15) Do a test of the electrical resistance between the connector shell and the structure. Refer to Subject 20-20-00.
- (16) Apply a fillet seal to the pressurized side of the connector.
  - (a) Apply a fillet seal between the edge of the connector flange and the structure.
  - (b) Apply a fillet seal to the clinch nuts.
  - (c) Apply a fillet seal to the screw threads.

**NOTE:** It is permitted to encapsulate the clinch nuts and screw threads with sealant.

- (17) Apply a fillet seal to the unpressurized side of the connector.
  - (a) Apply a fillet seal between the connector shell and the structure.
  - (b) Apply a fillet seal to the screw heads and washers.

**NOTE:** It is permitted to encapsulate the screw heads and washers with sealant.

- (18) If the area adjacent to the connector has bare metal:
  - (a) Make a selection of a primer from Table 12.
  - (b) Apply the primer to the bare metal on the pressurized side of the structure.
  - (c) Apply the primer to the bare metal on the unpressurized side of the structure.

### E. Feedthrough Connector Installation - CN1068() Flange Mount

**Table 19**  
**NECESSARY TOOLS**

Tool	Special Instructions	Supplier
Torque Wrench	Tool must measure 9 inch-pounds minimum	An available source

**Table 20**  
**CONNECTOR INSTALLATION HARDWARE**

Hardware	Part Number	Quantity	Supplier
Nut	BACN11AG04	4	Boeing
	MS21042L04	4	An available source
Screw	NAS1801-04-8	4	An available source
Washer	AN960JD4	4	An available source
	NAS1149DN432J	4	An available source

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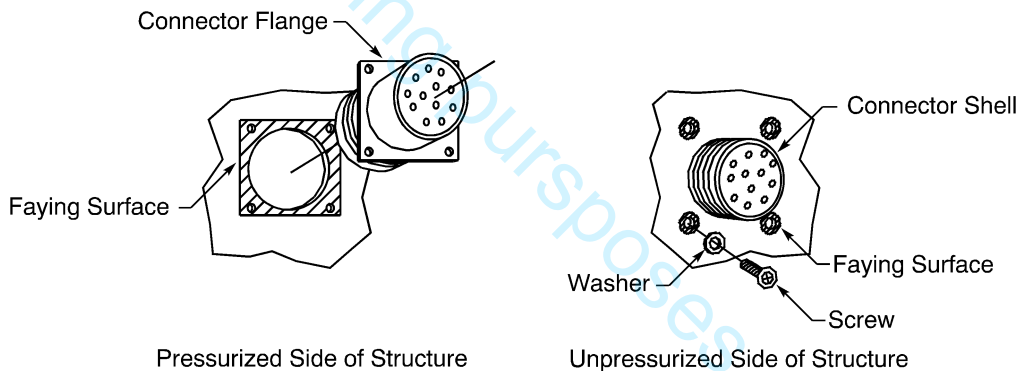
## INSTALLATION OF ELECTRICAL CONNECTORS

**Table 21**  
**ALTERNATIVE CONNECTOR INSTALLATION HARDWARE**

Specified Hardware		Alternative Hardware	
Part Number	Supplier	Part Number	Supplier
MS21042L04	QPL	BACN11AG04	Boeing
AN960JD4	QPL	NAS1149DN432J	An available source

- (1) Make a selection of an abrasive from Table 10.
- (2) Make a selection of a cleaning solvent from Table 11.
- (3) Make a selection of a chemical conversion coat material from Table 12.
- (4) Make a selection of a sealant that is applicable for an electrical connector shell bond. Refer to Subject 20-20-00.
- (5) Make a selection of a torque wrench from Table 19.
- (6) Prepare the faying surface of the structure that touches the connector flange. Refer to Figure 7 and Subject 20-20-00.

Make sure that the abrasive cleaning method is used.



**LOCATION OF THE FAYING SURFACES**  
**Figure 7**

- (7) Prepare the faying surfaces of the structure for each screw. Refer to Figure 7 and Subject 20-20-00. Make sure that the abrasive cleaning method is used.
- (8) Clean the faying surfaces on the structure.
  - (a) Dispense solvent onto a clean wiper.
  - (b) Rub the faying surface with the solvent soaked wiper.
  - (c) When the wiper is dirty, replace it with a clean wiper.
  - (d) Do Step (a) through Step (c) again until the wiper is clean.
- (9) Apply the chemical conversion coat material to the faying surface that touches the connector flange.

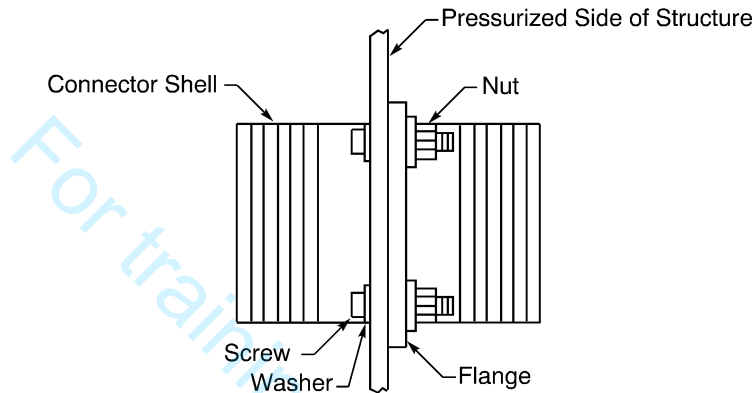
## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF ELECTRICAL CONNECTORS

**CAUTION:** DO NOT APPLY CHEMICAL CONVERSION COAT MATERIAL TO THE CLEANED AREA THAT TOUCHES THE SCREW HEAD AND WASHER. THESE AREAS MUST BE BARE ALUMINUM.

- (10) Clean each side of the connector flange with solvent and a clean wiper.
- (11) Align and insert the connector through the cutout from the pressurized side of the structure. Refer to Figure 8.

Make sure that the pin contacts are on the pressurized side of the structure.



**CONNECTOR INSTALLATION**  
**Figure 8**

- (12) Put a washer on each mounting screw. Refer to Figure 8.
- (13) Fully engage the threads of the mounting screws and the threads of the nuts.
- (14) Torque the screws 7 inch-pounds to 9 inch-pounds.
- (15) Do a test of the electrical resistance between the connector shell and the structure. Refer to Subject 20-20-00.

Make sure that the resistance is less than 1.5 milliohms.

- (16) Apply a fillet seal to the pressurized side of the connector.
  - (a) Apply a fillet seal between the edge of the connector flange and the structure.
  - (b) Apply a fillet seal to the nuts.
  - (c) Apply a fillet seal to the screw threads.

**NOTE:** It is permitted to encapsulate the nuts and screw threads with sealant.

- (17) Apply a fillet seal to the unpressurized side of the connector.
  - (a) Apply a fillet seal between the connector shell and the structure.
  - (b) Apply a fillet seal to the screw heads and washers.

**NOTE:** It is permitted to encapsulate the screw heads and washers with sealant.

- (18) If the area adjacent to the connector has bare metal:
  - (a) Make a selection of a primer from Table 12.
  - (b) Apply the primer to the bare metal on the pressurized side of the structure.
  - (c) Apply the primer to the bare metal on the unpressurized side of the structure.

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

### 4. INSTALLATION OF PLUG CONNECTORS

#### A. ARINC 600 Connectors

ARINC 600 rack and panel connectors must be installed so that the connector tab at the lower edge of the connector touches the bottom of the tray while the mounting screws are tightened.

#### B. Matrix 42839KS14S5SX-190 Plugs of the Systron Donner Engine Fire Detector

These conditions are applicable:

- The connector must be torqued 50 inch-pounds +5 inch-pounds, -0 inch-pounds
- Putty must be put on the coupling ring of the plug and the receptacle body so that it can be seen if the connectors become loose.

### 5. CONNECTION OF PLUGS AND RECEPTACLES

#### A. Satisfactory Connections

Before mating a plug and a receptacle that have fiber optic termini, inspect and, if necessary, clean the fiber optic termini. Refer to Subject 20-12-20.

**Table 22**  
**CONDITIONS OF A SATISFACTORY CONNECTION**

Coupling Mechanism	Full Connection	
	Reference	Condition
Bayonet Coupling	Three axial stripes on the coupling ring of the plug and receptacle shell; three holes around coupling ring	Stripes on the plug and receptacle are aligned
		Bayonet pins can be seen in the holes of the coupling ring
		A click can be heard or felt
	Three holes around the plug coupling ring	Bayonet pins can be seen in the holes of the coupling ring
		A click can be heard or felt
	Holes in the plug coupling ring and a color band around the circumference of the receptacle	The coupling ring on the plug cannot be turned more in the clockwise direction.
		A click can be heard or felt
		Bayonet pins can be seen in the holes of the coupling ring
		The coupling ring of the plug covers the mated indicator color band.
		The mated indicator color band on the receptacle connector cannot be seen.
Breech Coupling	Axial stripe on the receptacle key and the coupling ring of the plug; a color stripe around the rear shell of the plug	Color stripe on the rear shell of the plug cannot be seen
		Stripes on the receptacle key and coupling ring are aligned

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

Table 22 (continued)

Coupling Mechanism	Full Connection	
	Reference	Condition
Threaded Coupling	None	Tightened by hand plus a maximum 1/8 turn more
		Lockwire installed if specified
	The receptacle connector shell has a mated indicator color band around its circumference.	Tightened by hand plus a maximum 1/8 turn more
		The coupling ring on the plug is fully tightened and cannot be turned more in the clockwise direction.
		The coupling ring of the plug covers the mated indicator color band.
Threaded, Self-Locking Coupling	Indicator windows with color stripe on the coupling ring of the plug	The mated indicator color band on the receptacle connector cannot be seen.
		Tightened by hand plus a maximum 1/8 turn more
		Flag in the windows of the indicator is aligned with the color stripes
	Indicator slots in the coupling ring of the plug	Clicks that are heard and felt can be ignored
		Tightened by hand plus a maximum 1/8 turn more
		Indicator slots are filled with colored indicators
	The receptacle connector shell has a mated indicator color band around its circumference. For example: BACC63BV and BACC63CU	The coupling ring is fully tightened
		The coupling ring on the plug cannot be turned more in the clockwise direction.
		The coupling ring of the plug covers the mated indicator color band.
		The mated indicator color band on the receptacle connector cannot be seen.

### B. Installation Torque for General Purpose, Threaded Connectors

NOTE: Connectors that need to be torqued are identified by a white or pink identification sleeve.

Table 23  
TORQUE VALUES FOR GENERAL PURPOSE CONNECTORS

Connector Shell Size	Torque (inch-pounds)	
	Minimum	Maximum
10	21	26
12	24	29
14	30	35
16	36	41

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

Table 23 (continued)

Connector Shell Size	Torque (inch-pounds)	
	Minimum	Maximum
18	45	50
20	60	65
22	69	74
24	83	88
28	99	104
32	115	120

### 6. INSTALLATION OF ADAPTER PLATES

#### A. Adapter Plate Part Numbers

Table 24

#### ADAPTER PLATES FOR CIRCULAR CONNECTORS BY CONNECTOR SHELL SIZE

Cutout Number	Connector Shell Size	Note	Boeing Standard Adapter Plate Part Number
BACD2010-299	Size 24	Connector too large for cutout	-
	Size 22	Connector too large for cutout	-
	Size 20	Connector too large for cutout	-
	Size 18	Adapter not necessary	-
	Size 16	Adapter not necessary	-
	Size 14	Adapter not necessary	-
	Size 12	-	66-14850-1
			BACA14BH10
	Size 10	-	66-13970-1
			BACA14BH7
	Size 8	-	BACA14BH5
	Coax	-	66-18337-1

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

Table 24 (continued)

Cutout Number	Connector Shell Size	Note	Boeing Standard Adapter Plate Part Number
BACD2010-492	Size 24	Connector too large for cutout	-
	Size 22	Connector too large for cutout	-
	Size 20	Connector too large for cutout	-
	Size 18	Connector too large for cutout	-
	Size 16	Adapter not necessary	-
	Size 14	Adapter not necessary	-
	Size 12	Adapter not necessary	-
	Size 10	-	BACA14BH8
	Size 8	Adapter not available	-
BACD2010-493	Size 24	Connector too large for cutout	-
	Size 22	Adapter not necessary	-
	Size 20	Adapter not necessary	-
	Size 18	Adapter not necessary	-
	Size 16	-	69-37164-3
			BACA14BH12
	Size 14	-	69-37164-3
			BACA14BH12
	Size 12	-	69-37164-3
			BACA14BH12
	Size 10	-	66-13970-1
			BACA14BH7
	Size 8	-	BACA14BH5
	Coax	-	66-18337-1

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

Table 24 (continued)

Cutout Number	Connector Shell Size	Note	Boeing Standard Adapter Plate Part Number
BACD2010-575	Size 24	Connector too large for cutout	-
	Size 22	Adapter not necessary	-
	Size 20	Adapter not necessary	-
	Size 18	Adapter not necessary	-
	Size 16	-	69-37164-3
			BACA14BH12
	Size 14	-	69-37164-3
			BACA14BH12
	Size 12	-	69-37164-3
			BACA14BH12
	Size 10	-	66-13970-1
			BACA14BH7
BACD2010-617	Size 8	-	BACA14BH5
	Coax	-	66-18337-1
	Size 24	Adapter not necessary	-
	Size 22	Adapter not available	-
	Size 20	Adapter not available	-
	Size 18	Adapter not available	-
	Size 16	Adapter not available	-
	Size 14	Adapter not available	-
	Size 12	Adapter not available	-
	Size 10	Adapter not available	-
	Size 8	Adapter not available	-

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# STANDARD WIRING PRACTICES MANUAL

## INSTALLATION OF ELECTRICAL CONNECTORS

Table 24 (continued)

Cutout Number	Connector Shell Size	Note	Boeing Standard Adapter Plate Part Number
BACD2010-640	Size 24	Adapter not necessary	-
	Size 22	Adapter not necessary	-
	Size 20	Adapter not necessary	-
	Size 18	-	BACA14BH14
	Size 16	-	69-37164-3
			BACA14BH12
	Size 14	-	69-37164-3
			BACA14BH12
	Size 12	-	69-37164-3
			BACA14BH12
	Size 10	Adapter not available	-
	Size 8	Adapter not available	-

Table 25

### ADAPTER PLATES FOR COAX CONNECTORS

Coax Connector Prefix	Boeing Standard Adapter Plate Part Number
KA	BACA14BH5A
	287T0028-1
	287T0028-3
	287T0028-4
KC	BACA14BH5A
	287T0028-1
	287T0028-3
	287T0028-4
KD	BACA14BH6A
	287T0028-2
	287T0028-5
KG	BACA14BH7A
	BACA14BH10A
KM	BACA14BH1A

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## INSTALLATION OF ELECTRICAL CONNECTORS

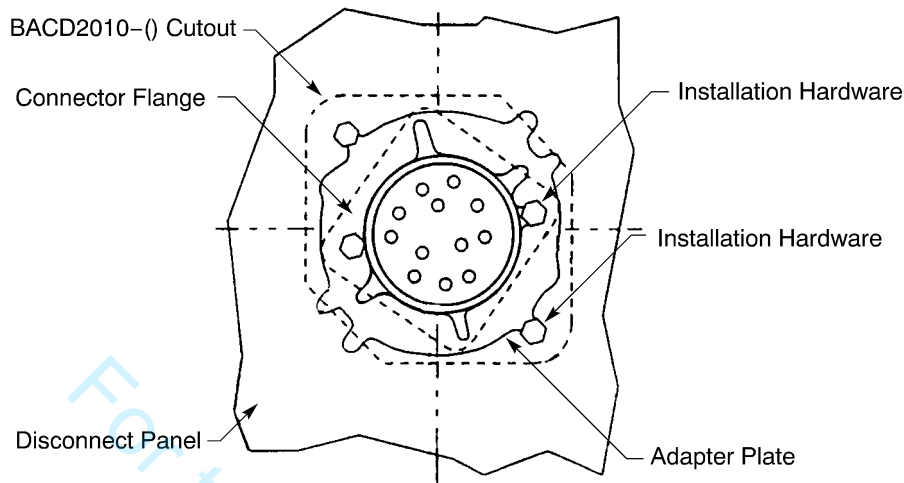
Table 25 (continued)

Coax Connector Prefix	Boeing Standard Adapter Plate Part Number
KN	BACA14BH6A
	287T0028-2
	287T0028-5
1201	BACA14BH6A
	287T0028-2
	287T0028-5
121	BACA14BH5A
	287T0028-1
	287T0028-3
	287T0028-4
122	BACA14BH16A
	BACA14BH26A
2431	BACA14BH6A
	287T0028-5
2439	287T0028-14
	287T0028-15
751	BACA14BH5A
	287T0028-1
	287T0028-3
	287T0028-4
791	BACA14BH6A
	287T0028-2
	287T0028-5
821	BACA14BH7A
	BACA14BH10A
892	BACA14BH1A

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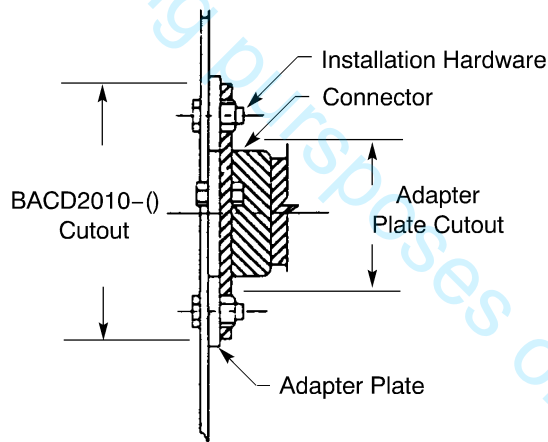
### INSTALLATION OF ELECTRICAL CONNECTORS

#### B. Adapter Plate Installation



**FRONT VIEW OF AN ADAPTER INSTALLATION**

**Figure 9**



**SIDE VIEW OF AN ADAPTER INSTALLATION**

**Figure 10**

- (1) Make a selection of an adapter plate from Table 24.
- (2) Put the adapter plate flat against the disconnect panel so that it is over the cutout.
- (3) Turn the adapter plate on the cutout to get the best fit:
  - The fastener holes on the adapter plate are aligned with the holes of the cutout
  - There is the minimum of plate movement when the screws and nuts are tightened.
- (4) Attach the adapter plate to the disconnect panel with the necessary installation hardware from Table 2 or Table 6.
- (5) Install the receptacle with the necessary installation hardware from Table 2 or Table 6. Refer to Figure 9 and Figure 10.

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## **STANDARD WIRING PRACTICES MANUAL**

### **INSTALLATION OF ELECTRICAL CONNECTORS**

- (6) If the receptacle installation screws cannot be fully installed in the adapter plate because of the interference from the disconnect panel:
  - (a) Remove the adapter plate.
  - (b) Turn the plate over to its opposite side.
  - (c) Attach the plate to the panel again.
  - (d) Attach the connector to the plate again.

For training purposes only!

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## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF LOCKWIRE AND SAFETY CABLE ON ELECTRICAL CONNECTORS, CONNECTOR BACKSHELL CABLE CLAMPS AND SWITCH GUARDS

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## 20-60-07 CONTENTS

**STANDARD WIRING PRACTICES MANUAL****INSTALLATION OF LOCKWIRE AND SAFETY CABLE ON ELECTRICAL CONNECTORS, CONNECTOR BACKSHELL CABLE CLAMPS AND SWITCH GUARDS**

This subject gives the procedure to install lockwire or safety cable on electrical connectors, connector backshell cable clamps and switch guards.

**1. GENERAL DATA****A. Definitions**

Lockwire:

- Is solid wire
- Gives the same performance as Safety Cable
- Requires no special tooling.

Safety Cable:

- Is stranded cable
- Gives the same performance as Lockwire
- Cannot be used on a connector jam nut that has holes drilled through the corners
- Requires a special tool that puts tension on the cable, crimps a ferrule on the end of the cable, and cuts off the excess cable.

**B. Conditions for Lockwire and Safety Cable on Connectors, Connector Backshell Cable Clamps and Switch Guards**

Lockwire or Safety Cable must be installed on a threaded connector when both of these conditions occur:

- The connector is not self-locking
- The connector is installed in an area that is not pressurized.

Lockwire or Safety Cable must be installed on a threaded connector if the connector had Lockwire or Safety cable before maintenance.

Lockwire or Safety Cable must be installed on the connector backshell cable clamp and the cable clamp screws if the backshell had lockwire or safety cable before maintenance.

Lockwire or Safety Cable must be installed on a switch guard if the switch guard had lockwire or safety cable before maintenance.

**CAUTION:** DO NOT INSTALL LOCKWIRE OR SAFETY CABLE ON SELF-LOCKING CONNECTORS BECAUSE SELF-LOCKING CONNECTORS DO NOT HAVE LOCKWIRE INSTALLATION HOLES.

**CAUTION:** IF IT IS NOT KNOWN IF LOCKWIRE OR SAFETY CABLE IS NECESSARY, INSTALL THE LOCKWIRE OR SAFETY CABLE.

The Lockwire or Safety Cable installed on electrical connectors and on connector backshell cable clamps:

- Must be 0.020 inch to 0.026 inch in diameter
- Must not be installed through an installation hole larger than 0.035 inch in diameter.

Lockwire or Safety Cable can be installed on a switch guard to prevent inadvertent switch operation.

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## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF LOCKWIRE AND SAFETY CABLE ON ELECTRICAL CONNECTORS, CONNECTOR BACKSHELL CABLE CLAMPS AND SWITCH GUARDS

#### C. Lockwire and Safety Cable Precautions

**CAUTION:** LOCKWIRE OR SAFETY CABLE THAT IS REMOVED FROM AN INSTALLATION MUST NOT BE USED AGAIN.

Lock Wire or Safety Cable must not be attached:

- From the cable clamp to the coupling nut of the connector
- From the grommet compression nut to the connector coupling nut
- To adjacent connector coupling nuts
- To fuel, oil, hydraulic, or oxygen lines.

**NOTE:** Safety Cable must not be attached to connector jam nuts that have holes drilled through the corners.

## 2. INSTALLATION OF LOCKWIRE

#### A. Selection of Lockwire

**Table 1**  
**0.020 INCH DIAMETER LOCKWIRE FOR CONNECTORS AND BACKSHELLS**

Specification	Material	Supplier
MS20995NC20	Monel	An available source
MS20995N20	Inconel	An available source
MS20995C20	Corrosion Resistant Steel	An available source
NASM20995NC20	Monel	An available source
NASM20995N20	Inconel	An available source
NASM20995C20	Corrosion Resistant Steel	An available source

**NOTE:** Monel lockwire, Inconel lockwire, and Corrosion Resistant Steel (CRES) lockwire are all satisfactory.

**Table 2**  
**0.020 INCH DIAMETER LOCKWIRE FOR SWITCH GUARDS**

Specification or Description	Material	Plating	Color	Supplier
MS20995CY20	Copper	Cadmium	Yellow	An available source
0.020 inch diameter	Copper per QQ-W-343, Type S Annealed	Cadmium per QQ-P-416 Type II, Class 2	Yellow	An available source

- (1) For connectors and backshell cable clamps, make a selection of a lockwire from Table 1.

**NOTE:** Monel lockwire, Inconel lockwire, and CRES lockwire give the same performance on electrical connectors.

**CAUTION:** WHEN LOCKWIRE IS INSTALLED, ONLY USE NEW LOCKWIRE.

- (2) For switch guards, make a selection of a lockwire from Table 2.

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## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF LOCKWIRE AND SAFETY CABLE ON ELECTRICAL CONNECTORS, CONNECTOR BACKSHELL CABLE CLAMPS AND SWITCH GUARDS

**CAUTION:** WHEN LOCKWIRE IS INSTALLED, ONLY USE NEW LOCKWIRE.

#### B. Lockwire Installation

- (1) Cut a length of the lockwire.  
Make sure that the length is twice the distance between the points where the lockwire will be attached.
- (2) Put one end of the lockwire through the lockwire installation hole at the first attachment point.
- (3) Pull the end of the lockwire until it is aligned with the other end.
- (4) Twist the lockwire.  
Make sure that there are 9 to 12 twists per inch between the attachment points.
- (5) Put one end of the lockwire through the lockwire installation hole at the next attachment point.  
Make sure that the lockwire is in the position that will keep the component from disengaging if the component becomes loose.
- (6) Twist the lockwire.  
Make sure that there are 9 to 12 twists per inch between the attachment points.
- (7) Repeat steps Step (5) through Step (6) for each attachment point.
- (8) Twist the ends of the wire.  
Make sure that there are 3 to 6 twists past the last attachment point.
- (9) Bend the end of the lockwire over.

### 3. INSTALLATION OF SAFETY CABLE

#### A. Necessary Materials

**Table 3**  
**0.020-0.026 INCH DIAMETER SAFETY CABLE KITS**

Safety Cable Kit				Components of the Kit		
Description	Kit Part Number	Safety Cable Length (inches)	Supplier	Safety Cable Part Number	Ferrule Part Number	Supplier
0.020 - 0.026 inch diameter safety cable and ferrule	K20B06	6	Bergen	C20B06	F20B	Bergen
	K20B09	9		C20B09		
	K20B12	12		C20B12		
	K20B15	15		C20B15		
	K20B18	18		C20B18		
	K20B21	21		C20B21		
	K20B24	24		C20B24		

## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF LOCKWIRE AND SAFETY CABLE ON ELECTRICAL CONNECTORS, CONNECTOR BACKSHELL CABLE CLAMPS AND SWITCH GUARDS

Table 3 (continued)

Safety Cable Kit				Components of the Kit		
Description	Kit Part Number	Safety Cable Length (inches)	Supplier	Safety Cable Part Number	Ferrule Part Number	Supplier
0.020 - 0.026 inch diameter safety cable and ferrule	C110-106	6	Daniels	A10-106	F10-1	Daniels
	C110-109	9		A10-109		
	C110-112	12		A10-112		
	C110-115	15		A10-115		
	C110-118	18		A10-118		
	C110-121	21		A10-121		
	C110-124	24		A10-124		
0.020 - 0.026 inch diameter safety cable and ferrule	BACC13AT2K6	6	Boeing	BACC13AT2C6	BACC13AT2F	Boeing
	BACC13AT2K9	9		BACC13AT2C9		
	BACC13AT2K12	12		BACC13AT2C12		
	BACC13AT2K15	15		BACC13AT2C15		
	BACC13AT2K18	18		BACC13AT2C18		
	BACC13AT2K21	21		BACC13AT2C21		
	BACC13AT2K24	24		BACC13AT2C24		

Table 4

#### SAFETY CABLE TOOLS FOR 0.020-0.026 INCH DIAMETER SAFETY CABLE

Part Number	Description	Nose Length (inch)
M203	Safety Cable Tool - Pre Set Tension	3
SCT203	Safety Cable Tool - Pre Set Tension	3
SCT207	Safety Cable Tool - Pre Set Tension	7
SCTP203	Safety Cable Tool - Pneumatic	3
SCTP207	Safety Cable Tool - Pneumatic	7
SCTN20-3	3 Inch nose assembly	3
SCTN20-7	7 Inch nose assembly	7

#### B. Safety Cable Installation

- (1) Make a selection of a safety cable tool from Table 4.
- (2) Find the necessary length of safety cable.

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## STANDARD WIRING PRACTICES MANUAL

### INSTALLATION OF LOCKWIRE AND SAFETY CABLE ON ELECTRICAL CONNECTORS, CONNECTOR BACKSHELL CABLE CLAMPS AND SWITCH GUARDS

- (a) Add together:
  - The distance in inches from the first attachment point to the last attachment point
  - The length in inches of the tool nose
  - 5 inches for the length of safety cable the tool needs to put tension on the safety cable.
- (3) Make a selection of a safety cable from Table 3.  
Make sure that the safety cable has sufficient length.
- (4) Put the end of the safety cable that does not have a ferrule through the installation hole at the first attachment point.
- (5) Put that same end of the cable through the installation holes in the other attachment points.  
Make sure that:
  - The safety cable will stop the parts from becoming loose
  - The maximum length of the safety cable between each component is 6 inches.
- (6) Put a safety cable ferrule on the end of the cable and push it against the last attachment point.
- (7) Put the end of the cable through the hole in the tool nose and push the tool along the cable until the ferrule is against the last attachment point.  
Make sure that:
  - The ferrule is fully seated in the tool nose
  - The tool nose is perpendicular to the safety cable.
- (8) Put the end of the safety cable in the cable entrance hole on the tool.
- (9) Increase the tension on the cable. Open and close the tool handle again and again until the cable has tension.  
Allow the tool handle to fully open before you close it again.
- (10) When the cable has tension, release the handle to the full open position.  
Make sure that the tool nose is perpendicular to the safety cable.
- (11) Fully close the handles to crimp the ferrule and cut the cable in one motion.
- (12) Pull the unwanted length of cable from the tool and discard it.

#### 4. APPROVED TOOL SUPPLIERS

##### A. Safety Cable Tool Suppliers

**Table 5**  
**SAFETY CABLE TOOL SUPPLIERS**

Part Number	Supplier
M203	Bergen
SCT203	Daniels
SCT207	Daniels
SCTP203	Daniels
SCTP207	Daniels
SCTN20-3	Daniels
SCTN20-7	Daniels

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## STANDARD WIRING PRACTICES MANUAL

### SEALING OF ELECTRICAL CONNECTORS

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## STANDARD WIRING PRACTICES MANUAL

### SEALING OF ELECTRICAL CONNECTORS

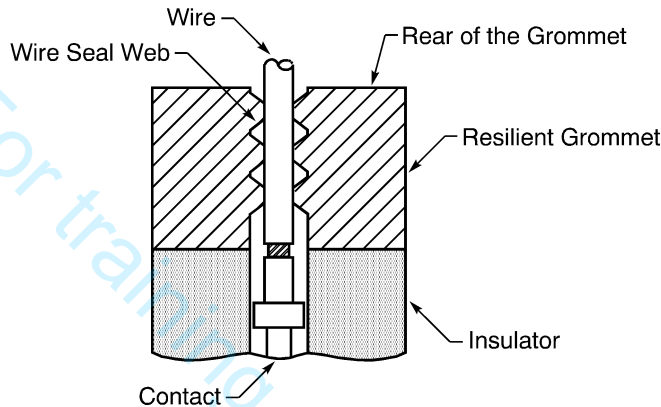
This Subject gives:

- The conditions that make the seal of an electrical connector necessary
- The procedures to seal an electrical connector.

#### 1. GENERAL DATA

##### A. Environmentally Sealed Connectors

An environmentally sealed connector has a resilient grommet with internal wire seal webs to seal the wires. Refer to Figure 1.



REAR END OF AN ENVIRONMENTALLY SEALED CONNECTOR

Figure 1

##### B. Applicable Conditions for the Seal of a Wire in a Contact Cavity

If it is specified for an environmentally sealed connector, and the O.D. of the wire is less than the minimum seal diameter of the grommet hole, the O.D. of the wire must be increased until the wire and the grommet make a seal.

Refer to the Subject that is applicable for the connector for the minimum O.D. for a satisfactory seal in the grommet hole.

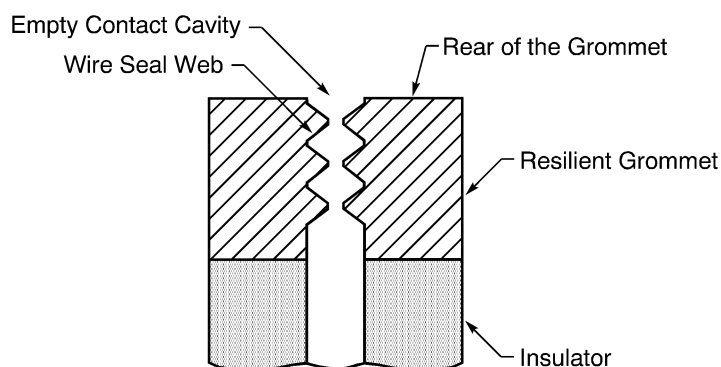
##### C. Applicable Conditions for the Seal of an Empty Contact Cavity

Refer to:

- Table 1 for the type of seal that is applicable for the type of connector and the location of the installation of the connector on the airplane
- Table 2 for the service conditions that are applicable for the seal of a contact cavity.

# STANDARD WIRING PRACTICES MANUAL

## SEALING OF ELECTRICAL CONNECTORS



**EMPTY CONTACT CAVITY**

**Figure 2**

Table 1 gives the procedures to restore connectors to their as-delevered configurations.

**Table 1**  
**TYPES OF SEALS FOR AN EMPTY CONTACT CAVITY**

Location of Installation	Connector Type	Type of Seal	Procedure
Firewall	Environmentally Sealed	A Temperature Grade D stub wire assembly in each empty contact cavity - The stub wire ends are protected, and the stub wires are held to prevent vibration damage to the adjacent wires.	Paragraph 3.E.
	Unsealed	None; unsealed connectors are not installed	-
Pressurized Area	Environmentally Sealed	A seal plug in each empty contact cavity	Paragraph 3.A.
		A seal rod in each empty contact cavity	Paragraph 3.B.
		An unwired contact and a seal plug in each empty contact cavity when it is specified in the connector assembly procedure	Paragraph 3.C.
		An unwired contact and a seal rod in each empty contact cavity when it is specified in the connector assembly procedure	Paragraph 3.D.
	Unsealed	None; an empty contact cavity can stay empty	-
Unpressurized Area	Environmentally Sealed	A seal plug in each empty contact cavity	Paragraph 3.A.
	Unsealed	None; unsealed connectors are not installed	-

# STANDARD WIRING PRACTICES MANUAL

## SEALING OF ELECTRICAL CONNECTORS

**Table 2**  
**APPLICABLE SERVICE CONDITIONS FOR THE SEAL OF A CONTACT CAVITY**

Location of Installation	Type of Seal	Type of Damage	Service Condition
Unpressurized Area	An unwired contact and a seal plug with the head out	The seal plug is missing	A seal plug must be installed with the head in when the first subsequent scheduled airplane maintenance occurs; refer to Table 1
	An unwired contact and a seal rod	The seal rod is missing	A seal plug must be installed with the head in when the first subsequent scheduled airplane maintenance occurs; refer to Table 1

### D. Applicable Conditions for the Replacement of a Connector That Is Sealed with Potting Compound

A replacement connector must be sealed with potting compound when the connector that must be replaced has one of these seals:

- A right angle cable backshell that is filled with potting compound
- A potting adapter that is filled with potting compound.

Refer to Paragraph 4.B.

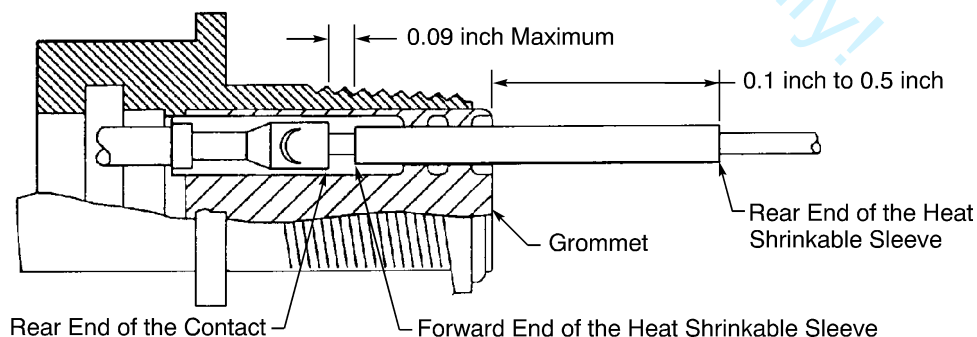
## 2. SEAL OF A WIRE IN A CONTACT CAVITY

### A. Wire with an O.D. Less than the Minimum Seal Diameter of the Grommet Hole

This paragraph gives the procedure to make the O.D. of the wire equal to or larger than the minimum seal diameter of the grommet hole.

**Table 3**  
**HEAT SHRINKABLE SLEEVES**

Temperature Grade	Class	Supplier
B	1	Refer to Subject 20-00-11
D	1	Refer to Subject 20-00-11



**POSITION OF THE HEAT SHRINKABLE SLEEVE ON THE WIRE**

**Figure 3**

Refer to Figure 3.

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## STANDARD WIRING PRACTICES MANUAL

### SEALING OF ELECTRICAL CONNECTORS

- (1) Make a selection of a heat shrinkable sleeve from Table 3.
- (2) Put the necessary length of the sleeve on the wire.

Make sure that:

- The forward end of the sleeve is a maximum of 0.09 inch from the end of the contact
- The rear end of the sleeve is 0.1 inch to 0.5 inch from the end of the grommet.

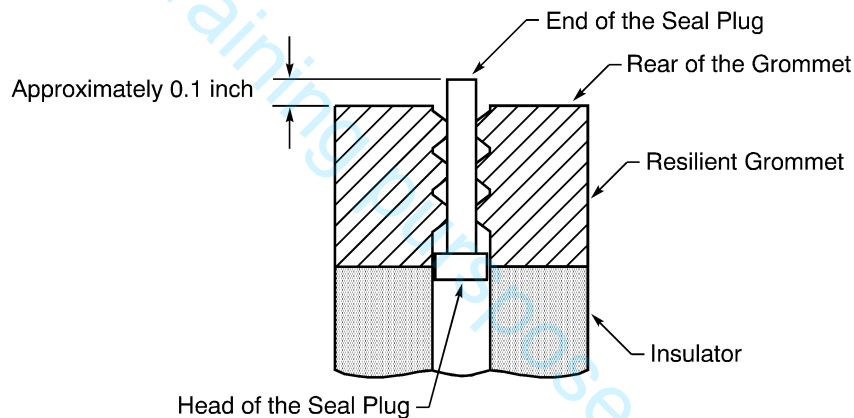
**NOTE:** If the necessary length of sleeve is not possible because a shield ground wire is installed, cut the sleeve to make the distance from the end of the sleeve to the insulation sleeve of the shield ground wire equal to a maximum of 0.12 inch.

- (3) Shrink the sleeve into its position. Refer to Subject 20-00-14.
- (4) If it is necessary to install one more sleeve, do Step (1) through Step (3) again.

### 3. SEAL OF AN EMPTY CONTACT CAVITY

#### A. Installation of a Seal Plug - Head In

For the conditions that are applicable for this procedure, refer to Paragraph 1.C.



**POSITION OF THE SEAL PLUG IN THE CONTACT CAVITY - HEAD IN**  
**Figure 4**

Refer to Figure 4.

- (1) Make a selection of a seal plug. Refer to Subject 20-00-11.
- (2) From the rear of the connector, put the head of the seal plug in the contact cavity.
- (3) Push the seal plug into the contact cavity until it stops.  
Make sure that the seal plug is fully installed.
- (4) Remove the necessary length from the end of the seal plug to make the distance from the rear of the grommet to the end of the seal plug equal to approximately 0.1 inch.

**CAUTION:** MAKE SURE THAT THE SEAL PLUG DOES NOT CAUSE INTERFERENCE WITH THE CABLE CLAMP.

#### B. Installation of a Seal Rod

For the conditions that are applicable for this procedure, refer to Paragraph 1.C.

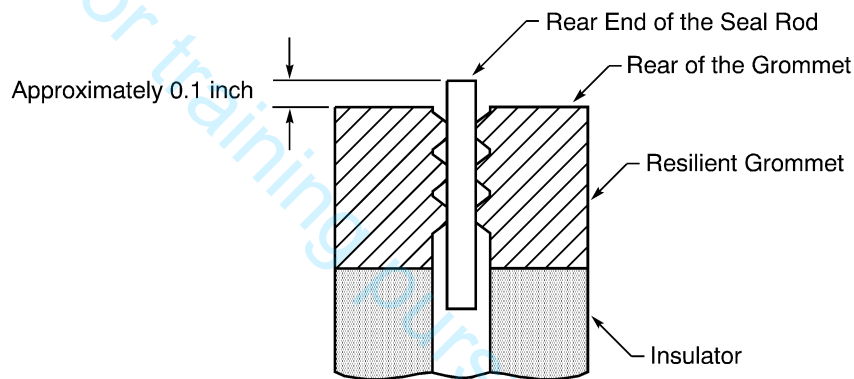
**20-60-08**

# STANDARD WIRING PRACTICES MANUAL

## SEALING OF ELECTRICAL CONNECTORS

Table 4  
SEAL ROD LENGTH

Contact Cavity Size	Seal Rod Length (inch)	
	Target	Tolerance
22	0.75	$\pm 0.05$
20	0.75	$\pm 0.05$
16	0.75	$\pm 0.05$
12	0.75	$\pm 0.05$
08	0.75	$\pm 0.05$



POSITION OF THE SEAL ROD IN THE CONTACT CAVITY  
Figure 5

Refer to Figure 5.

- (1) Make a selection of a seal rod. Refer to Subject 20-00-11.
- (2) Cut the necessary length of the seal rod. Refer to Table 4.
- (3) From the rear of the connector, put one end of the seal rod in the contact cavity.
- (4) Push the seal rod into the contact cavity until the distance from the rear of the grommet to the rear end of the seal rod is approximately 0.1 inch.

**CAUTION:** MAKE SURE THAT THE SEAL ROD DOES NOT CAUSE INTERFERENCE WITH THE CABLE CLAMP.

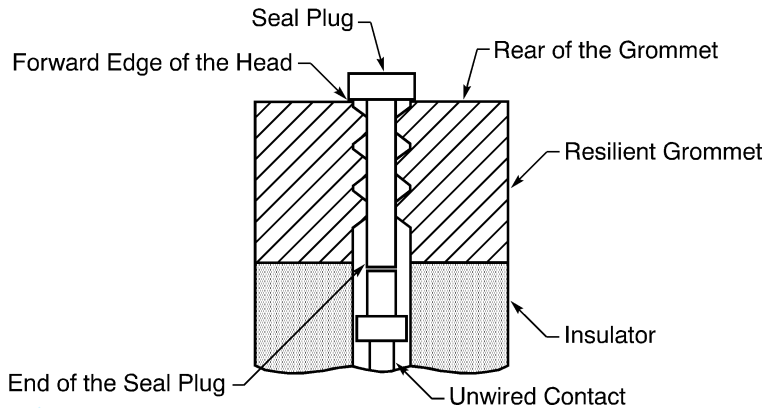
### C. Installation of an Unwired Contact and a Seal Plug

For the conditions that are applicable for this procedure, refer to Paragraph 1.C.

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# **STANDARD WIRING PRACTICES MANUAL**

## **SEALING OF ELECTRICAL CONNECTORS**



**POSITION OF THE SEAL PLUG IN A CONTACT CAVITY WITH AN UNWIRED CONTACT**  
**Figure 6**

Refer to Figure 6.

- (1) Install the unwired contact in the contact cavity. Refer to the Subject that is applicable for the assembly of the connector.

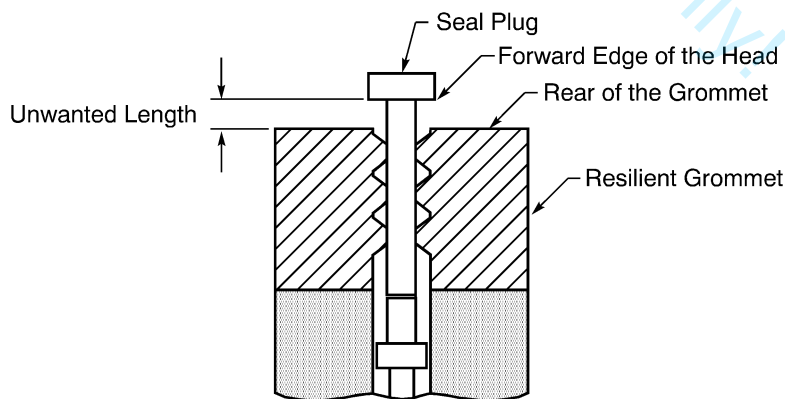
Make sure the contact is fully inserted in the contact cavity.

- (2) Make a selection of a seal plug. Refer to Subject 20-00-11.
- (3) From the rear of the connector, put the small end of the seal plug in the contact cavity.
- (4) Push the seal plug into the contact cavity until it stops.

Make sure that the forward edge of the head is against the rear of the grommet.

**CAUTION:** MAKE SURE THAT THE SEAL PLUG DOES NOT CAUSE AN INTERFERENCE WITH THE BACKSHELL.

- (5) If the forward edge of the head is not against the rear of the grommet, adjust the length of the seal plug.
  - (a) Measure the distance from the rear of the grommet to the forward edge of the head to find the unwanted length of the seal plug. Refer to Figure 7.



**UNWANTED LENGTH OF THE SEAL PLUG**  
**Figure 7**

# **20-60-08**

## STANDARD WIRING PRACTICES MANUAL

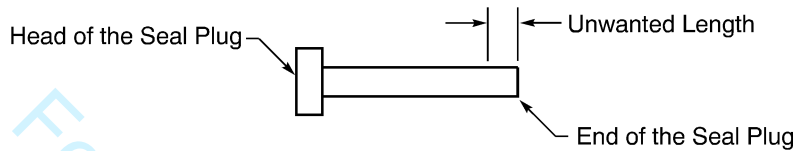
### SEALING OF ELECTRICAL CONNECTORS

- (b) Remove the unwanted length from the end of the seal plug. Refer to Figure 8.

Make sure that:

- The end of the seal plug is perpendicular to the longitudinal axis of the seal plug
- All the loose pieces are removed from the end of the seal plug.

**CAUTION:** LOOSE PIECES OF THE SEAL PLUG MUST NOT GO INTO THE CONTACT CAVITY. THE LOOSE PIECES CAN PREVENT THE SUBSEQUENT REMOVAL OF THE CONTACT.



#### REMOVAL OF THE UNWANTED LENGTH OF THE SEAL PLUG

Figure 8

- (c) Do Step (3) and Step (4) again.

#### D. Installation of an Unwired Contact and a Seal Rod

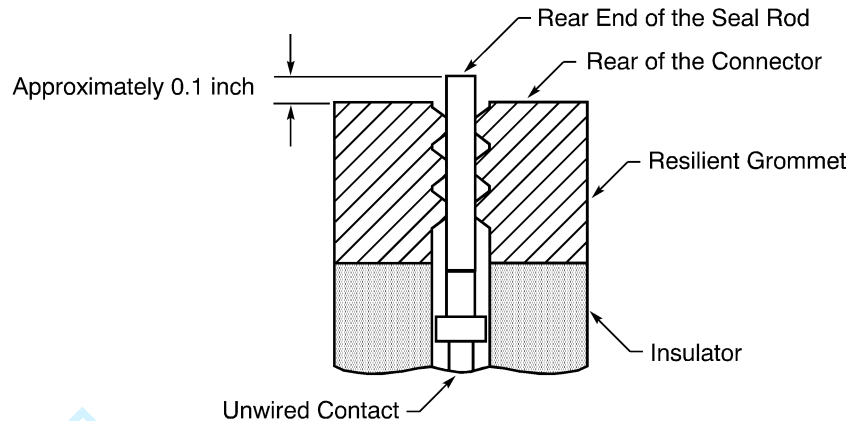
For the conditions that are applicable for this procedure, refer to Paragraph 1.C.

**Table 5**  
**SEAL ROD LENGTH**

Contact Cavity Size	Seal Rod Length (inch)	
	Target	Tolerance
22	0.75	± 0.05
20	0.75	± 0.05
16	0.75	± 0.05
12	0.75	± 0.05
08	0.75	± 0.05

## STANDARD WIRING PRACTICES MANUAL

### SEALING OF ELECTRICAL CONNECTORS



**POSITION OF THE SEAL ROD IN A CONTACT CAVITY WITH AN UNWIRED CONTACT**  
**Figure 9**

Refer to Figure 9.

- (1) Install the unwired contact in the contact cavity. Refer to the Subject that is applicable for the assembly of the connector.  
Make sure the contact is fully inserted in the contact cavity.
- (2) Make a selection of a seal rod. Refer to Subject 20-00-11.
- (3) Cut the necessary length of the seal rod. Refer to Table 5.
- (4) From the rear of the connector, put one end of the seal rod in the contact cavity.
- (5) Push the seal rod into the contact cavity until one of these conditions occurs:
  - The distance from the rear of the grommet to the rear end of the seal rod is approximately 0.1 inch.
  - The seal rod stops before the rear end is approximately 0.1 inch from the rear of the grommet.

**CAUTION:** MAKE SURE THAT THE SEAL ROD DOES NOT CAUSE INTERFERENCE WITH THE CABLE CLAMP.

- (6) If the seal rod stops before the rear end is approximately 0.1 inch from the rear of the grommet, remove the necessary length from the end of the rod.

#### E. Installation of Stub Wire Assemblies

Refer to Subject 20-10-11 for the assembly and installation of stub wires.

# STANDARD WIRING PRACTICES MANUAL

## SEALING OF ELECTRICAL CONNECTORS

### 4. SEAL OF A CONNECTOR WITH POTTING COMPOUND

#### A. Necessary Materials

**Table 6**  
**NECESSARY MATERIALS**

Material	Part Number	Supplier	Notes
Catalyst, RTV	F	Dow Corning	Only for 3110 RTV Potting Compound
	S	Dow Corning	Only for 3110 RTV Potting Compound
	S-TIN-NW	Dow Corning	Only for 3110 RTV Potting Compound
Naphtha, Aliphatic	TT-N-95	An available source	-

**Table 7**  
**POTTING COMPOUNDS**

Part Number	Supplier	Pot Life (minutes)	Cure Time (hours)	Special Instructions
3110 RTV	Dow Corning	25	2	10 Percent Catalyst F is necessary
		180	8.5	5 Percent Catalyst S is necessary
		120	6.5	10 Percent Catalyst S is necessary
		60	4	20 Percent Catalyst S is necessary
3145 RTV	Dow Corning	-	72	-
BMS8-68	Boeing	90	48	-

**Table 8**  
**APPROVED SUPPLIERS OF BOEING STANDARD POTTING COMPOUNDS**

Boeing Standard	Supplier
BMS8-68	Flamemaster Chem Seal Division

**Table 9**  
**POTTING COMPOUNDS PRIMERS**

Potting Compound	Part Number	Cure Time (hours)	Supplier
3110 RTV	1201 RTV	0.5	Dow Corning
3145 RTV	1200 RTV	1	Dow Corning
	1204 RTV	1	Dow Corning
BMS8-68	CS-3808	1	Flamemaster Chem Seal Division
	CS-9903	1	Flamemaster Chem Seal Division

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**STANDARD WIRING PRACTICES MANUAL****SEALING OF ELECTRICAL CONNECTORS****B. Seal of a Connector**

- (1) Make a selection of a potting compound from Table 7.
- (2) If a catalyst is specified, make a selection of a catalyst from Table 6.

**CAUTION:** IF A POT LIFE IS SPECIFIED, MAKE SURE THAT THE POTTING COMPOUND IS APPLIED BEFORE THE END OF THE POT LIFE. REFER TO TABLE 7.

- (3) Make a selection of a primer from Table 9.
- (4) Make a selection of an aliphatic naphtha from Table 6.
- (5) If the connector is assembled, remove the contacts. Refer to the applicable Subject for the connector.
- (6) Fully clean the inside of the right angle backshell or the potting adapter, the connector grommet, and the wires of the contact assemblies:
  - (a) Hold the connector in the vertical position with the rear face of the connector pointed down.
  - (b) Apply the necessary amount of naphtha with a soft brush to the rear face of the connector.

**NOTE:** Do not clean the coupling ring of the connector.

Make sure that the grey or white paint on the connector or the insert is not removed.

- (c) Immediately dry the connector with a wiper.

**CAUTION:** DO NOT LET NAPHTHA DRY ON THE CONNECTOR. WHEN NAPHTHA DRIES, AN UNWANTED FILM STAYS ON THE CLEAN SURFACES.

- (d) Apply the necessary quantity of naphtha with a soft brush to the wires of the wired contacts.

Make sure that the cleaned area of the wires extends at least one inch farther than the area of the wires that will potted.
- (e) Immediately dry the wires with a wiper.

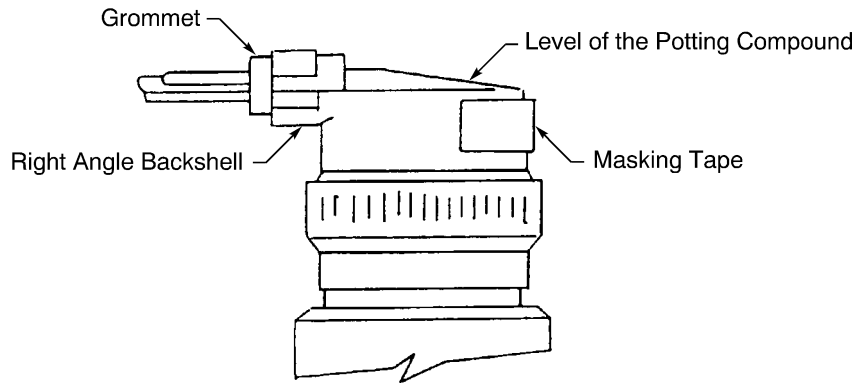
**CAUTION:** DO NOT LET NAPHTHA DRY ON THE WIRES. WHEN NAPHTHA DRIES, AN UNWANTED FILM STAYS ON THE CLEAN SURFACES.

- (7) Clean the insertion tool tip with the naphtha.
- (8) Install the contact assemblies. Refer to the applicable Subject for the connector assembly.
- (9) Put a layer of the primer on the cleaned area of the wires and the surface of the connector grommet.
- (10) Let the primer cure for the specified time. Refer to Table 9.
- (11) For connector that has a right angle backshell, fill the backshell with potting compound.

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# **STANDARD WIRING PRACTICES MANUAL**

## **SEALING OF ELECTRICAL CONNECTORS**



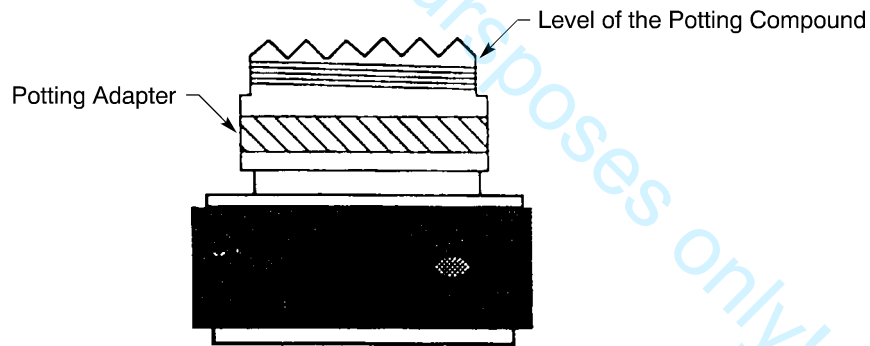
### **SEAL OF A CONNECTOR AND A RIGHT ANGLE BACKSHELL**

**Figure 10**

- (a) Put a layer of masking tape over the slot in the front of the backshell.
- (b) Fill the backshell with the potting compound until the compound is approximately level with the rear end of the backshell.

**CAUTION:** IF A POT LIFE IS SPECIFIED, MAKE SURE THAT THE POTTING COMPOUND IS APPLIED BEFORE THE END OF THE POT LIFE. REFER TO TABLE 7.

- (12) For a connector that has a potting adapter, fill the adapter with potting compound until the compound is level with the bottom of the teeth. Refer to Figure 11.



### **SEAL OF A CONNECTOR AND A POTTING ADAPTER**

**Figure 11**

- (13) Let the potting compound cure for the specified time. Refer to Table 7.



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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

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## 20-60-09 CONTENTS

## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

This Subject gives the procedures to assemble strain relief backshells that do not terminate a shield. For the procedures to assemble strain relief backshells with a shield termination, refer to:

- Subject 20-25-12 for the assembly of backshells that terminate shields with shield ground wires and terminal lugs
- Subject 20-25-13 for the assembly of backshells that terminate shields with inner and outer ground rings
- Subject 20-25-14 for the assembly of backshells that terminate shields with a shield terminator band
- Subject 20-25-15 for the assembly of backshells that have a braided shield sock.

#### 1. PART NUMBERS AND DESCRIPTION

##### A. Backshell Part Numbers

**Table 1**  
**BACKSHELL PART NUMBERS**

Part Number	Configuration	Description	Strain Relief	Material	Coupling Ring	Supplier
620AA028Z1(-)	Straight	Anti-Rotation Teeth	Saddle Clamp	Stainless Steel	Round	Glenair
627AS152XO32	Straight	Fixed Arm	Saddle Clamp	Composite	Hex	Glenair
AS85049-38S()	Straight	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	QPL
BACC10GH	Straight	Single Leg	Tie Tab	Aluminum	Round	Boeing
BACC10HD	Straight	-	Saddle Clamp	Stainless Steel	Round	Boeing
BACC10HE	90 Degree	-	Saddle Clamp	Stainless Steel	Round	Boeing
BACC10HF	Straight	-	Saddle Clamp	Aluminum	Round	Boeing
BACC10HG	90 Degree	-	Saddle Clamp	Aluminum	Round	Boeing
BACC10JC	90 Degree	Single Leg	Tie Tab	Aluminum	Round	Boeing
BACC10JV()A	Straight	Ground Spring	Saddle Clamp	Aluminum	Round	Boeing
BACC10JV()S	Straight	Ground Spring	Saddle Clamp	Stainless Steel	Round	Boeing
BACC10JW()A	90 Degree	Ground Spring	Saddle Clamp	Aluminum	Round	Boeing
BACC10JW()S	90 Degree	Ground Spring	Saddle Clamp	Stainless Steel	Round	Boeing
BACC10KA	Straight	Anti-Rotation Teeth	Saddle Clamp	Stainless Steel	Round	Boeing
BACC10KB	90 Degree	Anti-Rotation Teeth	Saddle Clamp	Stainless Steel	Round	Boeing

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# STANDARD WIRING PRACTICES MANUAL

## ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

Table 1 (continued)

Part Number	Configuration	Description	Strain Relief	Material	Coupling Ring	Supplier
BACC10KC	45 Degree	Anti-Rotation Teeth	Saddle Clamp	Stainless Steel	Round	Boeing
BACC10KD	Straight	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	Boeing
BACC10KE	90 Degree	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	Boeing
BACC10KF	45 Degree	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	Boeing
BACC10MK	Swing Arm	Anti Rotation Teeth	Saddle Clamp	Composite	Hex	Boeing
BACC10NC	Swing Arm	Anti Rotation Teeth	Saddle Clamp	Composite	Hex	Boeing
G65217	Straight	Anti Rotation Teeth	Cable Clamp	Aluminum	Round	Glenair
G8993-()	Straight	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	Glenair
G8993M()	Straight	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	Glenair
G8994-()	90 Degree	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	Glenair
G8994M()	90 Degree	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	Glenair
GTR21-()	90 Degree	Single Leg	Tie Tab	Aluminum	Round	Glenair
M85049-38S()	Straight	Anti-Rotation Teeth	Saddle Clamp	Aluminum	Round	QPL
S1347-()	90 Degree	-	Saddle Clamp	Aluminum	Round	Sunbank
S2277-()	45 Degree	-	Saddle Clamp	Aluminum	Round	Sunbank
S2408-()	Straight	-	Saddle Clamp	Aluminum	Round	Sunbank

Table 2

### ALTERNATIVE BACKSHELL PART NUMBERS

Specified Backshell		Alternative Backshell	
Part Number	Supplier	Part Number	Supplier
BACC10HD()	Boeing	BACC10HD()A	Boeing
		BACC10KA	Boeing

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# STANDARD WIRING PRACTICES MANUAL

## ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

Table 2 (continued)

Specified Backshell		Alternative Backshell	
Part Number	Supplier	Part Number	Supplier
BACC10JS()	Boeing	457ES010	Boeing
		BACC10GH()	Boeing
BACC10JV()A	Boeing	BACC10KD()	Boeing
BACC10JV()S	Boeing	BACC10KA()	Boeing
BACC10MK17	Boeing	627H135XO17	Glenair
BACC10MK()	Boeing	627H135XO()	Glenair
BACC10HE()	Boeing	BACC10HE()A	Boeing
		BACC10KB	Boeing
BACC10HF()	Boeing	BACC10KD()	Boeing
BACC10HG()	Boeing	BACC10HG()A	Boeing
		BACC10KE	Boeing
G8993M()	Glenair	BACC10HF()A	Boeing
		G8993-()	Glenair
G8993M()NF	Glenair	BACC10HF()C	Boeing
G8994M()	Glenair	BACC10HG()A	Boeing
		G8993-()	Glenair
G8994M()NF	Glenair	BACC10HG()C	Boeing
M85049/38S	QPL	AS85049/38S	QPL

Table 3

### APPROVED SUPPLIERS OF BOEING STANDARD BACKSHELLS

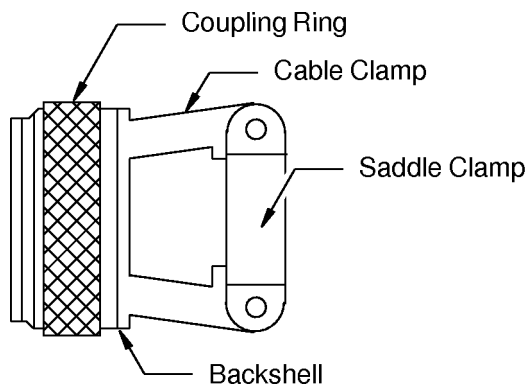
Backshell	Supplier
BACC10GH	Glenair
	Sunbank
BACC10HD	Electro Adapter
	Glenair
	Sunbank
BACC10HE	Electro Adapter
	Glenair
	Sunbank

# STANDARD WIRING PRACTICES MANUAL

## ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

Table 3 (continued)

Backshell	Supplier
BACC10HF	Electro Adapter
	Glenair
	Sunbank
BACC10HG	Electro Adapter
	Glenair
	Sunbank
BACC10JC	Glenair
	Sunbank
BACC10KA	Glenair
	Sunbank
BACC10KB	Glenair
	Sunbank
BACC10KC	Glenair
	Sunbank
BACC10KD	Glenair
	Sunbank
BACC10KE	Glenair
	Sunbank
BACC10KF	Glenair
	Sunbank
BACC10MK	Glenair
BACC10NC	Glenair

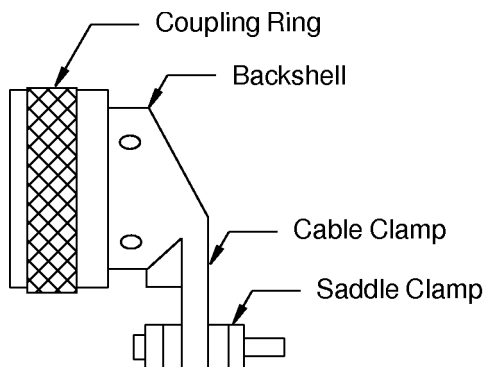


**STRAIGHT BACKSHELL - CABLE CLAMP STRAIN RELIEF**  
Figure 1

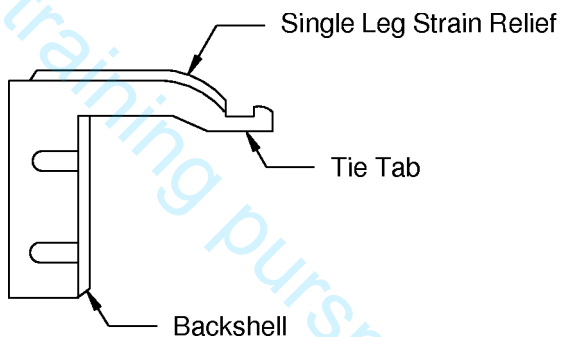
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## STANDARD WIRING PRACTICES MANUAL

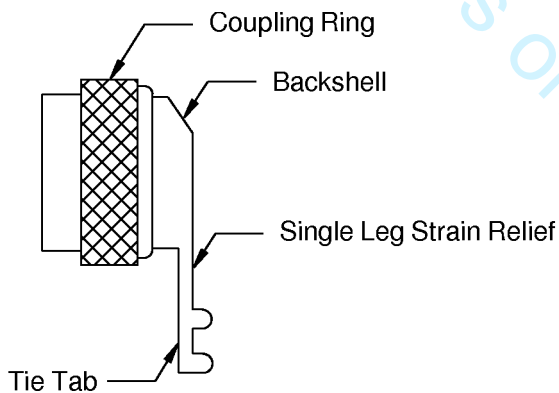
### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD



**90 DEGREE BACKSHELL - CABLE CLAMP STRAIN RELIEF**  
Figure 2



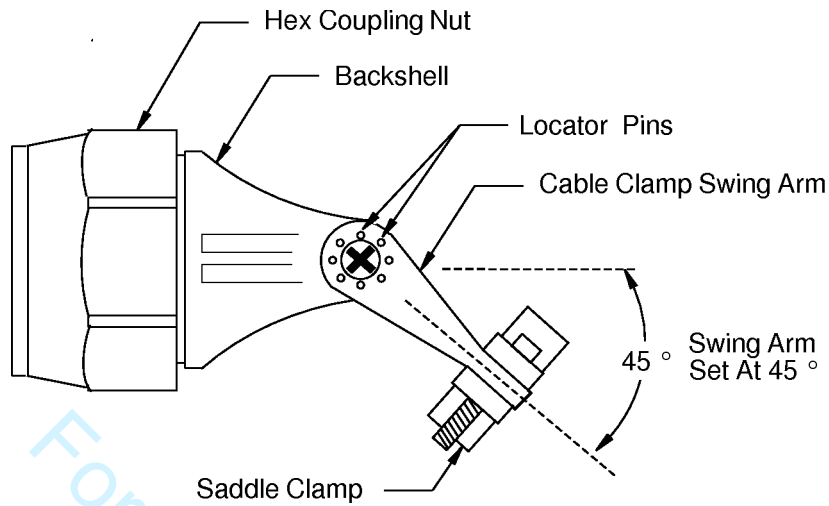
**STRAIGHT BACKSHELL - SINGLE LEG STRAIN RELIEF**  
Figure 3



**90 DEGREE BACKSHELL - SINGLE LEG STRAIN RELIEF**  
Figure 4

## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD



**BACKSHELL, SWING ARM**

**Figure 5**

#### B. Spacer Part Numbers

**Table 4**  
**SPACER PART NUMBERS**

Connector Shell Size		Spacer		Reference
Minimum	Maximum	Part Number	Supplier	
8	11	NAS42DD5-()	QPL	Figure 9
8	16	NAS1056C5-()	QPL	Figure 6
		NAS1056C6-()	QPL	Figure 6
		NAS1057T1-()	QPL	Figure 7
		NAS1057W1-()	QPL	Figure 7
		NAS43DD1-()	QPL	Figure 8
12	28	NAS42DD6-()	QPL	Figure 9
18	28	NAS1056E5-()	QPL	Figure 6
		NAS1056E6-()	QPL	Figure 6
		NAS1057T3-()	QPL	Figure 7
		NAS1057W3-()	QPL	Figure 7
		NAS43DD3-()	QPL	Figure 8
36	36	BACS13S297B	Boeing	-

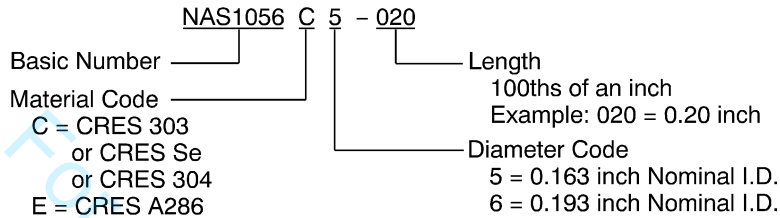
## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

Table 5  
APPROVED SUPPLIERS OF BOEING STANDARD SPACERS

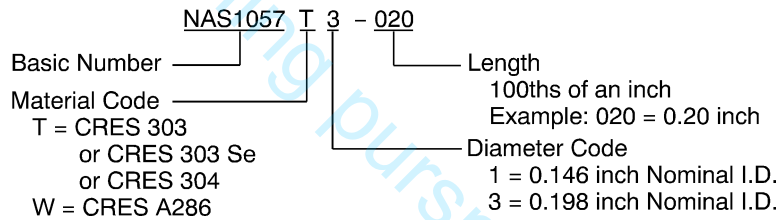
Spacer	Supplier
BACS13S	Thomas & Betts

**NOTE:** Refer to the D-590 Boeing to Vendor Cross Reference Index for the supplier part numbers for the BACS13S ferrules.



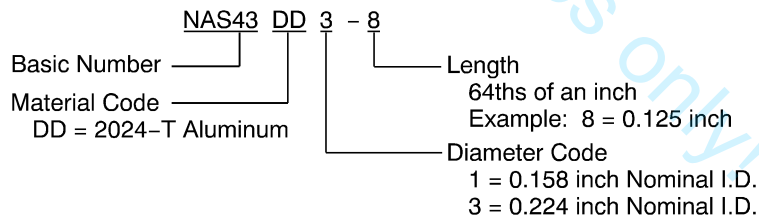
#### NAS1056 SPACER PART NUMBER STRUCTURE

Figure 6



#### NAS1057 SPACER PART NUMBER STRUCTURE

Figure 7

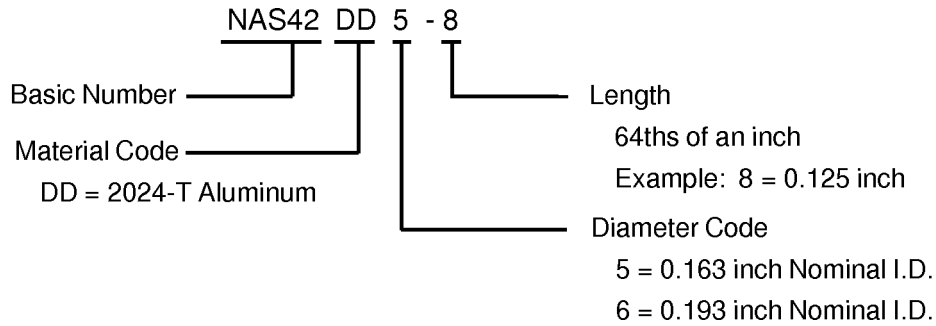


#### NAS43 SPACER PART NUMBER STRUCTURE

Figure 8

## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD



### NAS42 SPACER PART NUMBER STRUCTURE

Figure 9

## 2. NECESSARY TOOLS

### A. Tools for Backshells that have a Round Coupling Ring

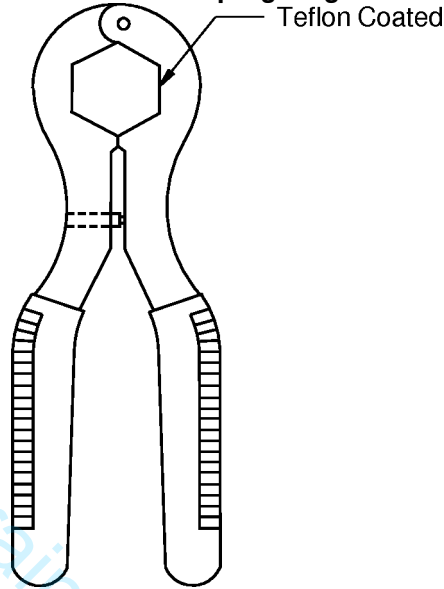
Table 6  
CONNECTOR BACKSHELL TOOLS

Backshell Tool	Part Number	Supplier
Screw Bit Driver	-	An available source
Strap Wrench	AT508K	Aircraft Tools
	ST2596G	Boeing
	ST2596C	Boeing
	TG-70	Glenair
Torque Driver	-	An available source

# STANDARD WIRING PRACTICES MANUAL

## ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

### B. Tools for Backshells that have a Hex Nut Coupling Ring



**BACKSHELL HEX NUT TOOL**

**Figure 10**

**Table 7**  
**HEX COUPLING NUT TOOLS**

Shell Size	Tool	
	Part Number	Supplier
8	600-091-08	Glenair
9	600-091-08	Glenair
10	600-091-10	Glenair
11	600-091-10	Glenair
12	600-091-12	Glenair
13	600-091-12	Glenair
14	600-091-14	Glenair
15	600-091-14	Glenair
16	600-091-16	Glenair
17	600-091-16	Glenair
18	600-091-18	Glenair
19	600-091-18	Glenair
20	600-091-20	Glenair
21	600-091-20	Glenair
22	600-091-22	Glenair

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# STANDARD WIRING PRACTICES MANUAL

## ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

Table 7 (continued)

Shell Size	Tool	
	Part Number	Supplier
23	600-091-22	Glenair
24	600-091-24	Glenair
25	600-091-24	Glenair
28	600-091-28	Glenair
32	600-091-32	Glenair

Table 8  
TORQUE TOOL

Backshell Shell Size		Tool		
Minimum	Maximum	Type	Minimum Torque Capability (inch-pounds)	Supplier
08	19	Torque Driver	35	An Available Source
20	28	Torque Driver	80	An Available Source
32	32	Torque Driver	115	An Available Source

Table 9  
CONNECTOR ADAPTER TOOL SETS

Connector	Tool	
	Part Number	Supplier
BACC63DB	CM-S-389T	Daniels
BACC63DC	CM-S-389TR	Daniels
BACC63CM	CM-S-837	Daniels
BACC63CN	600E005	Daniels
BACC63CT	CM-S-389T	Daniels
BACC63CU	CM-S-389TR	Daniels
BACC68E	CM-S-389TR	Daniels
BACC68F	CM-S-389T	Daniels
D38999/24	CM-S-389T	Daniels
MS27467	CM-S-389L	Daniels
MS3459	CM-S-5015	Daniels
MS3475	CM-S-5015	Daniels
MS3476	CM-S-5015	Daniels
MS3450	CM-S-5015R	Daniels

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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

Table 9 (continued)

Connector	Tool	
	Part Number	Supplier
MS83723/77	CM-S-387	Daniels

### 3. BACKSHELL DISASSEMBLY

#### A. Backshell Disassembly - Cable Clamp Strain Relief

- (1) If the backshell has safety wire, remove the safety wire from the cable clamp screws and the backshell coupling ring.
- (2) Remove the strain relief clamp screws.
- (3) Put the saddle bars, the screws, and the washers in a safe place.
- (4) Make a selection of a strap wrench from Table 6.
- (5) Disengage the threads of the backshell and the connector.

#### B. Backshell Disassembly - Single Leg Strain Relief

- (1) Cut the heat shrinkable sleeve or the wire harness tie that holds the wire harness.

**CAUTION:** DO NOT CUT THE WIRE INSULATION. DAMAGE TO THE INSULATION CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE WIRE OR THE CABLE.

- (2) Make a selection of a strap wrench from Table 6.
- (3) Disengage the threads of the backshell and the connector.

### 4. BACKSHELL ASSEMBLY - SINGLE LEG STRAIN RELIEF

#### A. Applicable Conditions for Backshell Assembly

These conditions are applicable for a wire harness in a backshell with a single leg strain relief:

- Strain must not be put on the wires
- The wires must not have tension that pulls the seal webs of the grommet out of their shape
- The crimp barrel of a contact cannot be seen in the rear grommet of an environmental connector
- Thread lock compound must be applied on the threads of the backshell in some assembly or installation configurations; refer to Table 10.

Table 10

#### CONDITIONS FOR BACKSHELL ASSEMBLY WITH THREAD LOCK COMPOUND

Assembly or Installation Configuration	Backshell Assembly Condition
A backshell on a Temperature Grade C or Temperature Grade D wire harness	Thread lock compound is not necessary
A backshell that has anti-rotation teeth	Thread lock compound is not necessary
A backshell that has thread lock compound on the initial assembly	Thread lock compound must be applied
A right angle backshell on a Temperature Grade A or Temperature Grade B wire harness in the unpressurized area that does not have anti-rotation teeth or safety wire	Thread lock compound must be applied

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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

Table 10 (continued)

Assembly or Installation Configuration	Backshell Assembly Condition
The initial assembly of a backshell that is supplied with thread lock compound	Thread lock compound is not necessary

#### B. Necessary Materials

Table 11  
NECESSARY MATERIALS

Material	Temperature Grade	Description	Part Number	Supplier
Sleeve, Heat Shrinkable	-	Single Wall	CRN	Raychem
	-	Meltable Inner Liner	DWP-125	Raychem
Tape	D	Silicone	912-10X12	Arlon
			Scotch 70	3M
		PTFE	P-212HD	Permacel
			P-421	Permacel
			P-440	Permacel
Thread Lock Compound	-	-	222	Loctite
			Vibratite	The Oakland Corporation

Table 12  
SOLVENTS

Part Number	Supplier
BMS11-7	Boeing
Turco 4460BK	ELF Atochem

Table 13  
APPROVED SUPPLIERS OF BOEING STANDARD SOLVENTS

Boeing Standard	Supplier
BMS11-7	Barton Solvents
	Elf Atochem
	AKZO/Dexter Aerospace
	Pratt and Lambert Industrial Coating Division

#### C. Backshell Assembly with a Heat Shrinkable Sleeve

- (1) Make a selection of a strap wrench from Table 6.

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## STANDARD WIRING PRACTICES MANUAL

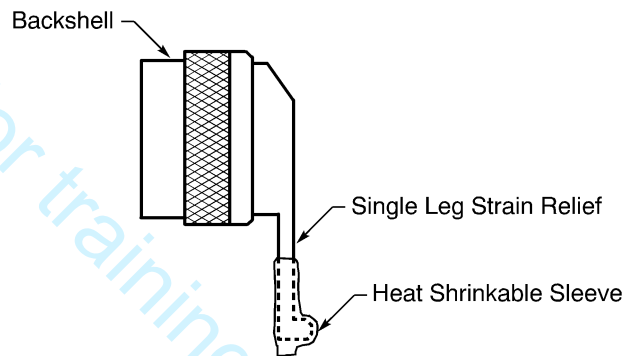
### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

- (2) Make a selection of a heat shrinkable sleeve from Table 11.

Make sure that the sleeve has the smallest diameter that can be moved easily on the wire harness and the strain relief leg.

**NOTE:** An equivalent sleeve is a satisfactory alternative. Refer to Subject 20-00-11.

- (3) If the backshell does not have a heat shrinkable sleeve installed on the strain relief leg:
- Make a selection of a heat shrinkable sleeve with a meltable inner liner from Table 11.
  - Put a 0.75 inch length of heat shrinkable sleeve on the end of the strain relief leg. Refer to Figure 11.



**POSITION OF THE HEAT SHRINKABLE SLEEVE**

**Figure 11**

- Shrink the sleeve into its position. Refer to Subject 20-10-14.
- (4) Put a length of heat shrinkable sleeve on the wire harness.  
Make sure that the length of the sleeve is approximately equal to the length of the strain relief leg.
- (5) Put the backshell on the wire harness.  
Make sure that the strain relief leg is pointed away from the end of the wire harness.
- (6) Install the contacts in the connector. Refer to the Subject that is applicable for the assembly of the connector.
- (7) If thread lock compound is necessary, apply the thread lock compound. Refer to Table 10.
- Make a selection a thread lock compound from Table 11.
  - Make a selection of a solvent from Table 12.
  - Clean the thread surfaces with solvent.
  - Dry the thread surfaces with an absorbent wiper.
  - Put one or two drops of the thread lock compound on the threads of the backshell.

**CAUTION:** THREAD LOCK COMPOUND MUST NOT BE APPLIED ON THE COUPLING MECHANISM OF THE CONNECTOR. UNSATISFACTORY OPERATION OF THE COUPLING MECHANISM CAN OCCUR.

- Fully engage the threads of the backshell and the connector.
- Tighten the backshell with the strap wrench.

Make sure that the backshell does not make more than 1/8 turn with the strap wrench.

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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

**CAUTION:** DO NOT TIGHTEN THE BACKSHELL MORE THAN NECESSARY. DAMAGE TO THE BACKSHELL CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR OR THE BACKSHELL.

- (10) Try to loosen the backshell manually.

**NOTE:** The backshell is installed correctly when the backshell does not move in relation to the connector.

- (11) If the backshell is loose, do Step (9) and Step (10) again.

- (12) Put the wires into their positions.

Make sure that:

- The wires do not go across each other where the wires are against the strain relief leg
- Strain is not put on the wires.

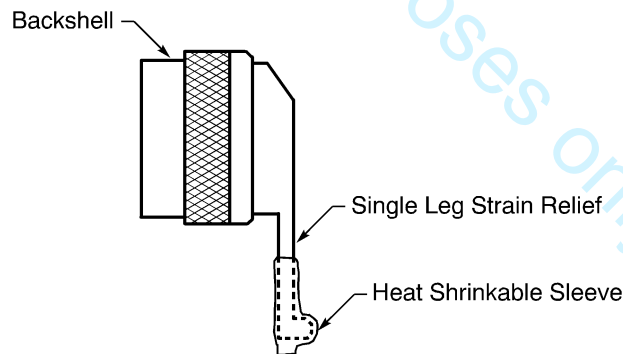
- (13) Push the heat shrinkable sleeve forward on the wire harness and the leg of the clamp until the rear end of the sleeve aligned with the end of the leg.

Make sure that the sleeve does not extend farther than the end of the strain relief leg.

- (14) Shrink the sleeve into its position. Refer to Subject 20-10-14.

#### D. Backshell Assembly with a Wire Harness Tie

- (1) Make a selection of a strap wrench from Table 6.
- (2) Make a selection of a tape from Table 11.
- (3) If the backshell does not have a heat shrinkable sleeve installed on the strain relief leg:
  - (a) Make a selection of a heat shrinkable sleeve with a meltable inner liner from Table 11.
  - (b) Put a 0.75 inch length of heat shrinkable sleeve on the end of the strain relief leg. Refer to Figure 12.



**POSITION OF THE HEAT SHRINKABLE SLEEVE**

**Figure 12**

- (c) Shrink the sleeve into its position. Refer to Subject 20-10-14.
- (4) Put the backshell on the wire harness.  
Make sure that the strain relief leg is pointed away from the end of the wire harness.
- (5) Install the contacts in the connector. Refer to the Subject that is applicable for the assembly of the connector.
- (6) If thread lock compound is necessary, apply the thread lock compound. Refer to Table 10.

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**STANDARD WIRING PRACTICES MANUAL****ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD**

- (a) Make a selection a thread lock compound from Table 11.
- (b) Make a selection of a solvent from Table 12.
- (c) Clean the thread surfaces with solvent.
- (d) Dry the thread surfaces with an absorbent wiper.
- (e) Put one or two drops of the thread lock compound on the threads of the backshell.

**CAUTION:** THREAD LOCK COMPOUND MUST NOT BE APPLIED ON THE COUPLING MECHANISM OF THE CONNECTOR. UNSATISFACTORY OPERATION OF THE COUPLING MECHANISM CAN OCCUR.

- (7) Fully engage the threads of the backshell and the connector.
- (8) Tighten the backshell with the strap wrench.

Make sure that the backshell does not make more than 1/8 turn with the strap wrench.

**CAUTION:** DO NOT TIGHTEN THE BACKSHELL MORE THAN NECESSARY. DAMAGE TO THE BACKSHELL CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR OR THE BACKSHELL.

- (9) Try to loosen the backshell manually.

**NOTE:** The backshell is installed correctly when the backshell does not move in relation to the connector.

- (10) If the backshell is loose, do Step (8) and Step (9) again.
- (11) Put the wires into their positions.

Make sure that:

- The wires do not go across each other where the wires are against the strain relief leg
  - Strain is not put on the wires.
- (12) Wind two or more layers of tape on the area of the wire harness that is against the strain relief leg.
  - (13) Assemble a lacing tape wire harness tie or a plastic tie strap wire harness tie on the wire harness and the leg of the backshell. Refer to Subject 20-10-11.

**5. BACKSHELL ASSEMBLY - CABLE CLAMP STRAIN RELIEF**

For the procedures to assemble a strain relief backshell with a shield termination, refer to Subject 20-25-12.

**A. Applicable Conditions for Backshell Assembly**

These conditions are applicable for a wire harness in a backshell with a cable clamp:

- Strain must not be put on the wires
- The wires must not have tension that pulls the seal webs of the grommet out of their shape
- The crimp barrel of a contact cannot be seen in the rear grommet of an environmental connector
- When a wire makes an exit from the rear of the connector grommet at an angle that is less than 60 degrees; the distance from the rear of the grommet to the bend must be 0.10 inch minimum
- Safety wire must be installed on the coupling ring of the backshell if the applicable conditions occur; refer to Subject 20-60-07
- Thread lock compound must be applied on the threads of the backshell in some assembly or installation configurations; refer to Table 14.

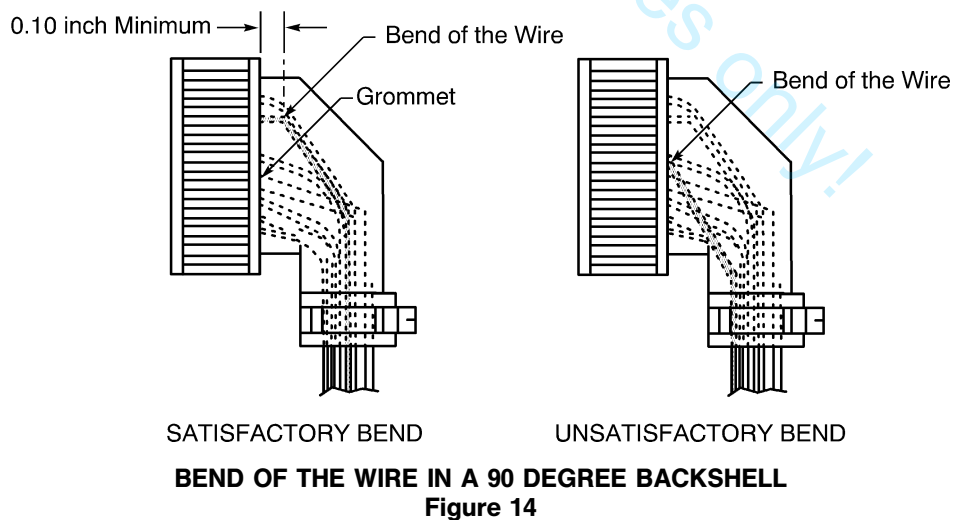
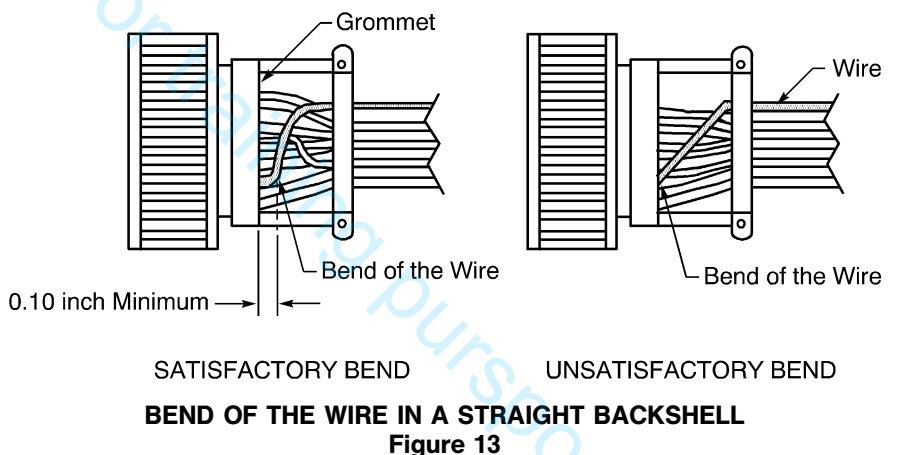
**20-60-09**

# STANDARD WIRING PRACTICES MANUAL

## ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

**Table 14**  
**CONDITIONS FOR BACKSHELL ASSEMBLY WITH THREAD LOCK COMPOUND**

Assembly or Installation Configuration	Backshell Assembly Condition
A backshell on a Temperature Grade C or Temperature Grade D wire harness	Thread lock compound is not necessary
A backshell that has anti-rotation teeth	Thread lock compound is not necessary
A backshell that has thread lock compound on the initial assembly	Thread lock compound must be applied
A right angle backshell on a Temperature Grade A or Temperature Grade B wire harness in the unpressurized area that does not have anti-rotation teeth or safety wire	Thread lock compound must be applied



## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

#### B. Applicable Conditions for Strain Relief Assembly

These conditions are applicable for the assembly of the strain relief:

- The wires must not go across each other in the cable clamp
- The wire harness must have a minimum of two layers of tape for protection
- The tape must not be between the saddle bar and the backshell leg
- The wire harness must be held tightly in the cable clamp
- The cable clamp must not crush the wire harness
- The cable clamp screws must be tight.

The diameter of a wire harness must be increased when these conditions occur:

- The cable clamp does not hold the wire harness tightly
- The wire harness has a small number of wires
- The contact assemblies are installed only near the outer edge of the connector grommet

These conditions are applicable for the layers of tape:

- The forward and rear edges of the tape must extend a minimum of 0.06 inch farther than the edges of the saddle bar
- The edge of one layer is a maximum of 0.05 inch from the edge of a different layer
- For U shaped tape, each layer makes a 100 percent overlap.

Spacers must be installed between the saddle bar and the backshell leg when these conditions occur:

- The diameter of the wire harness is much larger than the diameter of the clamp
- The clamp crushes the wire harness before the screws are fully tightened.

#### C. Necessary Materials

**Table 15**  
**NECESSARY MATERIALS**

Material	Temperature Grade	Description	Part Number or Specification	Supplier
Filler Rod	C	Silicone	69B47691-()	Boeing
			BMS1-52	Boeing
	D	PTFE	AMS 3656	QPL
Tape	D	Silicone	912-10X12	Arlon
			Scotch 70	3M
		PTFE	P-212HD	Permacel
			P-421	Permacel
			P-440	Permacel
Tape, U Shaped	C	Silicone, 0.5 inch width	10-62034-1	Boeing
		Silicone, 0.4 inch width	10-62034-2	Boeing
Thread Lock Compound	-	-	222	Loctite
			Vibratite	The Oakland Corporation

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**STANDARD WIRING PRACTICES MANUAL****ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD****Table 16**  
**SOLVENTS**

Part Number	Supplier
BMS11-7	Boeing
Turco 4460BK	ELF Atochem

**Table 17**  
**APPROVED SUPPLIERS OF BOEING STANDARD SOLVENTS**

Boeing Standard	Supplier
BMS11-7	Barton Solvents
	Elf Atochem
	AKZO/Dexter Aerospace
	Pratt and Lambert Industrial Coating Division

**D. Backshell Assembly**

- (1) Make a selection of a strap wrench from Table 6.
- (2) Put the necessary backshell components on the wire harness.  
Make sure that the cable clamp of the backshell is pointed away from the end of the wire harness.
- (3) Install the contacts in the connector. Refer to the Subject that is applicable for the assembly of the connector.
- (4) Put the wires into their positions.  
Make sure that:
  - The wires do not go across each other
  - The wires do not have tension that pulls the seal web out of its shape
  - Strain is not put on the wires.
- (5) If thread lock compound is necessary or specified, apply the thread lock compound. Refer to Table 14.
  - (a) Make a selection a thread lock compound from Table 15.
  - (b) Make a selection of a solvent from Table 16.
  - (c) Clean the thread surfaces with solvent.
  - (d) Dry the thread surfaces with an absorbent wiper.
  - (e) For a connector that is on the engine side of a firewall, put a thin layer of the thread lock compound on:
    - One or two threads of the backshell around the full circumference of the backshell
    - One or two threads of the connector around the full circumference of the connector.

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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

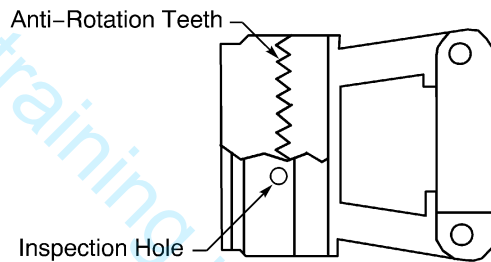
**CAUTION:** THREAD LOCK COMPOUND MUST NOT BE APPLIED ON THE COUPLING MECHANISM OF THE CONNECTOR. UNSATISFACTORY OPERATION OF THE COUPLING MECHANISM CAN OCCUR.

- (f) For a connector that is not on the engine side of a firewall, put one or two drops of the thread lock compound on the threads of the backshell.

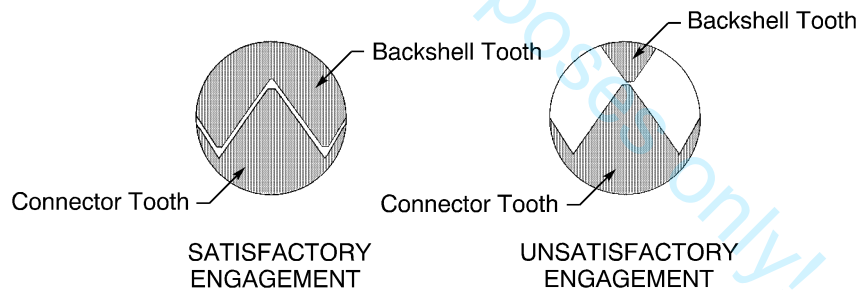
**CAUTION:** THREAD LOCK COMPOUND MUST NOT BE APPLIED ON THE COUPLING MECHANISM OF THE CONNECTOR. UNSATISFACTORY OPERATION OF THE COUPLING MECHANISM CAN OCCUR.

- (g) Fully engage the threads of the backshell and the connector.
- (6) If the backshell has anti-rotation teeth, examine the teeth of the backshell through the inspection hole. Refer to Figure 15.

Make sure that the backshell teeth are engaged with the connector teeth. Refer to Figure 16.



**BACKSHELL WITH ANTI-ROTATION TEETH**  
**Figure 15**



**ENGAGEMENT OF THE CONNECTOR TEETH AND THE BACKSHELL TEETH**  
**Figure 16**

- (7) Tighten the backshell on the connector with the strap wrench.

Make sure that:

- The backshell does not make more than 1/8 turn with the strap wrench
- The backshell is in the correct clock position.

**CAUTION:** DO NOT TIGHTEN THE BACKSHELL MORE THAN NECESSARY. DAMAGE TO THE BACKSHELL CAN CAUSE UNSATISFACTORY PERFORMANCE OF THE CONNECTOR OR THE BACKSHELL.

- (8) If the backshell has set screws, tighten one of the set screws.

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### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

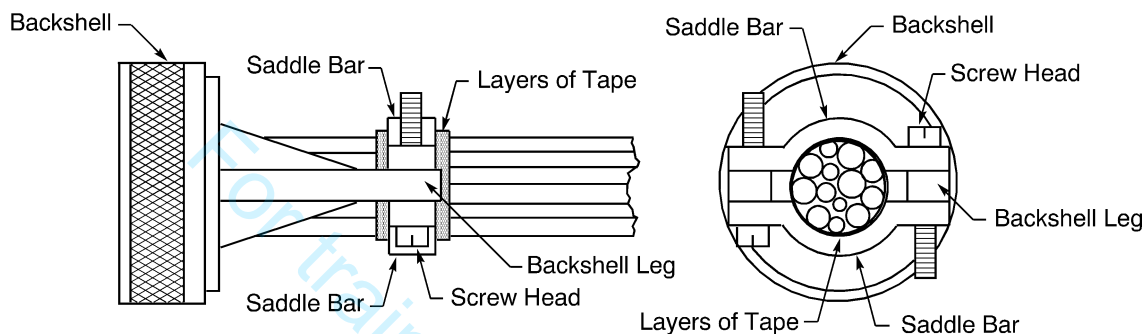
- (9) Try to loosen the backshell manually.

**NOTE:** The backshell is installed correctly when the backshell does not move in relation to the connector.

- (10) If the backshell is loose, do Step (7) again.

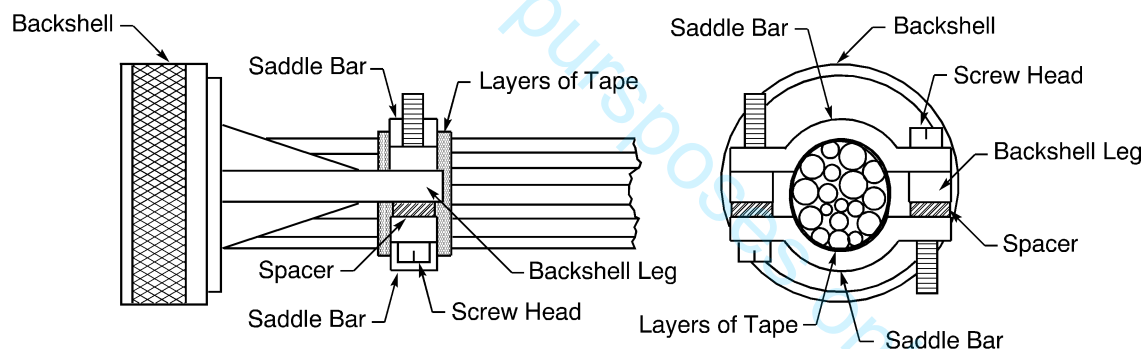
- (11) Assemble the strain relief. Refer to Paragraph 5.E.

#### E. Strain Relief Assembly - Straight Backshell



**CONFIGURATION OF THE CABLE CLAMP**

**Figure 17**



**CONFIGURATION OF THE CABLE CLAMP WITH SPACERS**

**Figure 18**

Refer to Figure 17 and Figure 18.

- (1) Align the screw holes in a saddle bar with the screw holes in the legs of the backshell.
- (2) Make a mark on the wire harness at the center of the width of the saddle bar.
- (3) Make a selection of a tape from Table 15.

Make sure that the tape is a minimum of 0.12 inch wider than the saddle bar.

**NOTE:** An equivalent tape is a satisfactory alternative. Refer to Subject 20-00-11.

**NOTE:** A thicker tape is recommended when the difference between the initial diameter of the wire harness and the inner diameter of the strain relief is large.

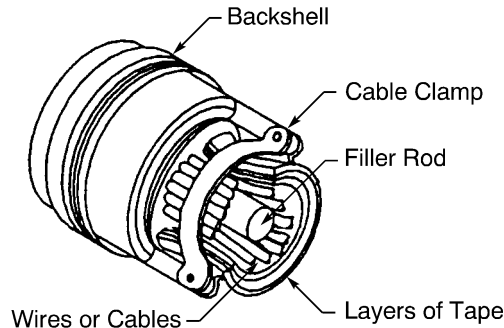
- (4) If the assembled contacts are installed only near the outer edge of the connector grommet:

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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

- (a) Make a selection of a filler rod from Table 15.
- (b) Put the filler rod in the center of the group of wires where the saddle bar goes across the wire harness. Refer to Figure 19.

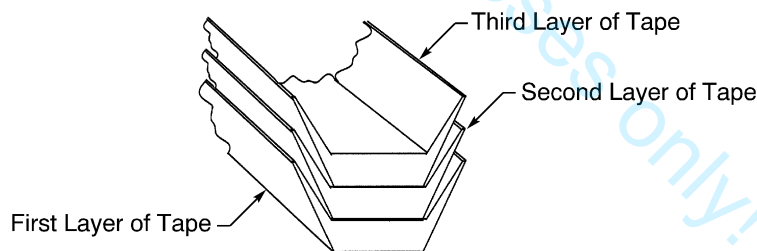


**POSITION OF THE FILLER ROD**  
**Figure 19**

- (5) Put a minimum of two layers of tape on the wires or cables at the location of the mark.

Make sure that:

- The outer diameter of the wire harness with the layers of tape is larger than the inner diameter of the strain relief
- The center of the layers of tape is aligned with the center of the saddle bar
- The edge of the tape extends a minimum of 0.06 inch farther than each edge of the saddle bar
- The edge of one layer of the tape is a maximum of 0.05 inch from the edge of a different layer of tape
- For U shaped tape, each layer of tape makes a 100 percent overlap.

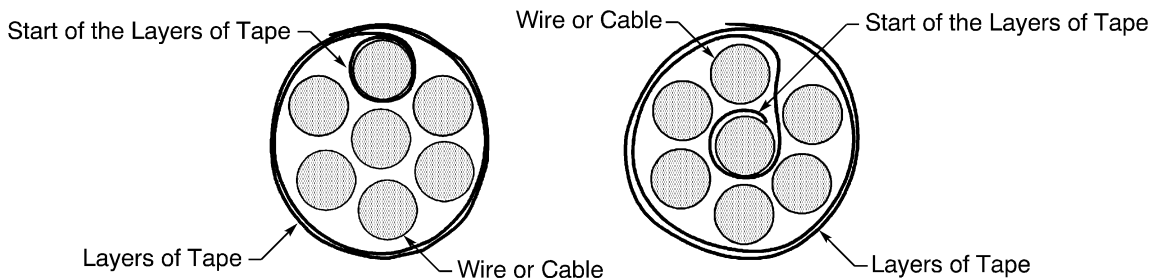


**CONFIGURATION OF THE LAYERS OF U SHAPED TAPE**  
**Figure 20**

- (a) Wind the tape around one wire to hold it in its position. Refer to Figure 21.

## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD



FIRST CONFIGURATION

SECOND CONFIGURATION

#### CONFIGURATIONS OF THE LAYERS OF TAPE

Figure 21

- (b) Continue to wind the tape around the wire harness until the tape is fully installed.
- (6) If lockwashers are supplied with the backshell, put a lockwasher on each screw.
- (7) Align the screw holes in the saddle bars with the screw holes in the legs of the backshell.
- (8) Put a screw through a hole in the saddle bar.  
From the rear of the backshell, make sure that the head of the screw on the right is pointed up and the head of the screw on the left is pointed down.
- (9) Put a screw through the hole in the saddle bar that is on the opposite side of the backshell legs.
- (10) If spacers are necessary, specified, or installed on the initial backshell assembly, install spacers:
  - (a) Make a selection of a spacer from Table 4.  
Make sure that the spacer is the smallest that can make a tight fit of the wire harness in the strain relief.  
**NOTE:** A minimum of two spacers are necessary, one for each screw.  
**NOTE:** The initial spacers can be installed again if they do not have damage.
  - (b) Put one spacer on each screw.  
Make sure that the spacers are on the same side of the backshell legs.
- (11) Engage the threads of screws and the threads of the nuts.
- (12) Tighten the cable clamp screws.  
Make sure that:
  - The cable clamp does not crush or pinch the wire harness
  - If the saddle bar and the backshell leg do not touch, the distance between the saddle bar and the backshell leg is approximately equal on each side of the cable clamp
  - The layers of tape are not pinched between the saddle bars and the backshell leg
  - The screws do not cause an interference with a wire harness or a component.**NOTE:** It is not necessary for the saddle bars to touch the legs of the backshell.
- (13) If the wire harness is not held tightly:
  - (a) Remove the cable clamp screws.
  - (b) Wind two layers of tape on the wire harness on the existing layers of tape.

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## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

- (c) Do Step (11) through Step (12) again.
- (14) If screws are too long and screws with a shorter length are not available, cut off the unwanted length. Make sure that the end of the screw is smooth and has no rough edges.

**CAUTION:** DO NOT LET METAL SAWDUST OR THE UNWANTED LENGTH OF THE SCREW FALL ON OR INTO THE WIRE HARNESS OR ON THE REAR GROMMET OF THE CONNECTOR. SHARP METAL PIECES CAN CAUSE DAMAGE TO THE WIRES AND THE CONNECTOR.

- (15) If safety wire is necessary, install safety wire on each screw.

Refer to Subject 20-60-07 for:

- The applicable conditions that make the installation of the safety wire on the cable clamp screw necessary
- The procedures to install the safety wire.

#### F. Strain Relief Assembly - 45 Degree or 90 Degree Backshell

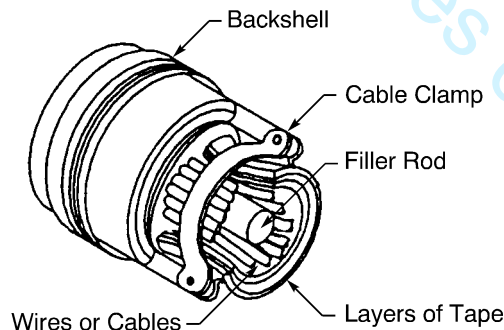
- (1) Align the screw holes in a saddle bar with the screw holes in the legs of the backshell.
- (2) Make a mark on the wire harness at the center of the width of the saddle bar.
- (3) Make a selection of a tape from Table 15.

Make sure that the tape is a minimum of 0.12 inch wider than the saddle bar.

**NOTE:** An equivalent tape is a satisfactory alternative. Refer to Subject 20-00-11.

**NOTE:** A thicker tape is recommended when the difference between the initial diameter of the wire harness and the inner diameter of the strain relief is large.

- (4) If the assembled contacts are installed only near the outer edge of the connector grommet:
  - (a) Make a selection of a filler rod from Table 15.
  - (b) Put the filler rod in the center of the group of wires where the saddle bar goes across the wire harness. Refer to Figure 22.



**POSITION OF THE FILLER ROD**  
**Figure 22**

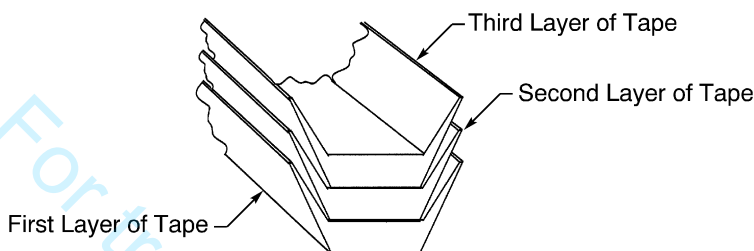
- (5) Put a minimum of two layers of tape on the wires or cables at the location of the mark.

## STANDARD WIRING PRACTICES MANUAL

### ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD

Make sure that:

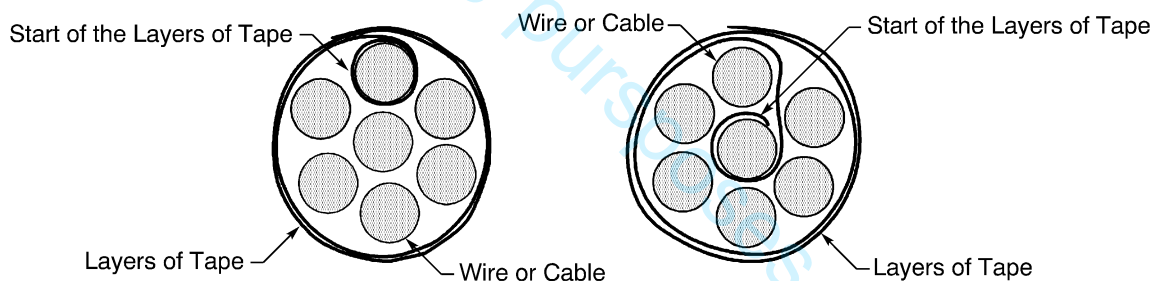
- The outer diameter of the wire harness with the layers of tape is larger than the inner diameter of the strain relief
- The center of the layers of tape is aligned with the center of the saddle bar
- The edge of the tape extends a minimum of 0.06 inch farther than each edge of the saddle bar
- The edge of one layer of the tape is a maximum of 0.05 inch from the edge of a different layer of tape
- For U shaped tape, each layer of tape makes a 100 percent overlap.



**CONFIGURATION OF THE LAYERS OF U SHAPED TAPE**

**Figure 23**

- (a) Wind the tape around one wire to hold it in its position. Refer to Figure 24.



**FIRST CONFIGURATION**

**SECOND CONFIGURATION**

**CONFIGURATIONS OF THE LAYERS OF TAPE**

**Figure 24**

- (b) Continue to wind the tape around the wire harness until the tape is fully installed.
- (6) If lockwashers are supplied with the backshell, put a lockwasher on each screw.
  - (7) Align the screw holes in the saddle bars with the screw holes in the legs of the backshell.
  - (8) Put a screw through each hole in the saddle bar.
  - (9) If spacers are necessary, specified, or installed on the initial backshell assembly, install spacers:
    - (a) Make a selection of a spacer from Table 4.

Make sure that the spacer is the smallest that can make a tight fit of the wire harness in the strain relief.

**NOTE:** A minimum of two spacers are necessary, one for each screw.

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**STANDARD WIRING PRACTICES MANUAL****ASSEMBLY OF STRAIN RELIEF BACKSHELLS THAT DO NOT TERMINATE A SHIELD**

NOTE: The initial spacers can be installed again if they do not have damage.

- (b) Put one spacer on each screw.
- (10) Engage the threads of screws and the threads of the nuts.
- (11) Tighten the cable clamp screws.

Make sure that:

- The cable clamp does not crush or pinch the wire harness
- If the saddle bar and the backshell leg do not touch, the distance between the saddle bar and the backshell leg is approximately equal on each side of the cable clamp
- The layers of tape are not pinched between the saddle bars and the backshell leg
- The screws do not cause an interference with a wire harness or a component.

NOTE: It is not necessary for the saddle bars to touch the legs of the backshell.

- (12) If the wire harness is not held tightly:
  - (a) Remove the cable clamp screws.
  - (b) Wind two layers of tape on the wire harness on the existing layers of tape.
  - (c) Do Step (10) through Step (11) again.
- (13) If screws are too long and screws with a shorter length are not available, cut off the unwanted length.  
Make sure that the end of the screw is smooth and has no rough edges.

**CAUTION:** DO NOT LET METAL SAWDUST OR THE UNWANTED LENGTH OF THE SCREW FALL ON OR INTO THE WIRE HARNESS OR ON THE REAR GROMMET OF THE CONNECTOR. SHARP METAL PIECES CAN CAUSE DAMAGE TO THE WIRES AND THE CONNECTOR.

- (14) If safety wire is necessary, install safety wire on each screw.

Refer to Subject 20-60-07 for:

- The applicable conditions that make the installation of the safety wire on the cable clamp screw necessary
- The procedures to install the safety wire.