777 ELMS PANEL REPAIR: WIRE INSULATION REMOVAL

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777 ELMS PANEL REPAIR: WIRE INSULATION REMOVAL

1. GENERAL DATA

A. Necessary Conditions

Refer to Subject 20-00-15 for the necessary condtions that are applicable for:

- The removal of an outer jacket from the end of a shielded wire
- The removal of the primary insulation from the end of a wire.

2. SHIELDED WIRE JACKET AND WIRE INSULATION REMOVAL

A. Jacket and Insulation Removal Tools

CAUTION: THE TOOLS SPECIFIED IN TABLE 1 AND TABLE 2 MUST NOT BE USED TO REMOVE THE OUTER JACKET FROM A SHIELDED CABLE OR A SHIELDED WIRE THAT DOES NOT HAVE A CIRCULAR CROSS SECTION. DAMAGE TO THE SHIELD AND THE WIRES OF THE CABLE CAN OCCUR.

Table 1
WIRE INSULATION REMOVAL TOOLS

Wire Size (AWG)	Insulation Removal Tool
22	45-1513
20	45-1513
18	45-1513
16	45-1513
14	45-1611
12	45-1611
10	45-1611
8	45-163
6	45-165
4	45-164
2	45-164

Table 2
SHIELDED WIRE JACKET REMOVAL TOOLS

Wire Size (AWG)	Jacket Removal Tool
22	45-162
20	45-162
18	45-162
16	45-162
14	45-162
12	45-163

Table 2 SHIELDED WIRE JACKET REMOVAL TOOLS (Continued)

Wire Size (AWG)	Jacket Removal Tool
10	45-163
8	45-163
6	45-165
4	45-164
2	45-164

Table 3
REMOVAL TOOL REPLACEMENT BLADES

Removal Tool	Replacement Blade
45-1513	45-1513-1
45-1611	45-1611-1
45-162	L-9225
45-163	L-9225
45-164	L-9226
45-165	L-9225

B. Insulation Removal for AWG 10 and Smaller Wire

This Paragraph gives the procedure to remove the primary insulation from the end of a wire.

For the procedure to remove the outer jacket from the end of a shielded wire, refer to Paragraph 2.D.

NOTE: It is recommended that a test of the tool with a sample of the wire is done before the operation is done on a wire that is installed or must be installed on the airplane.

(1) Make a selection of a wire insulation removal tool from Table 1.

(2) Put the wire in the correct hole in the tool.

(3) Close the handles of the tool until the tool makes a click.
Make sure the handles stay closed.

(4) Remove the wire from the tool.

(5) Release the handles of the tool.

(6) Examine the wire for damage. Refer to Paragraph 1.A.

C. Insulation Removal for AWG 8 and Larger Wire

This Paragraph gives the procedure to remove the primary insulation from the end of a wire.

For the procedure to remove the outer jacket from the end of a shielded wire, refer to Paragraph 2.D.

NOTE: It is recommended that a test of the tool with a sample of the wire is done before the operation is done on a wire that is installed or must be installed on the airplane.

(1) Make a selection of a wire insulation removal tool from Table 1.

(2) Adjust the blades of the tool for the correct depth that is applicable for the wire.

(3) Put the wire in the hole in the tool.

(4) Close the handles of the tool until the tool makes a click.
Make sure the handles stay closed.

(5) Remove the wire from the tool.

(6) Release the handles of the tool.

(7) Examine the wire for damage. Refer to Paragraph 1.A.

D. Shielded Wire Jacket Removal

This Paragraph gives the procedure to remove the outer jacket from the end of a shielded wire.

For the procedure to remove the primary insulation from the end of:

- An AWG 10 or smaller wire, refer to Paragraph 2.B.
- An AWG 8 or larger wire, refer to Paragraph 2.C.

NOTE: It is recommended that a test of the tool with a sample of the wire is done before the operation is done on a wire that is installed or must be installed on the airplane.

(1) Make a selection of a wire insulation removal tool from Table 2.

(2) Adjust the blades of the tool for the correct depth that is applicable for the wire.

(3) Put the wire in the hole in the tool.

(4) Close the handles of the tool until the tool makes a click.
Make sure the handles stay closed.

(5) Remove the wire from the tool.

(6) Release the handles of the tool.

(7) Examine the wire for damage. Refer to Paragraph 1.A.

3. APPROVED TOOL SUPPLIERS

A. Jacket and Insulation Removal Tools

Table 4
JACKET AND INSULATION REMOVAL TOOL SUPPLIERS

Removal Tool	Supplier
45-1513	Ideal Industries
45-1513-1	Ideal Industries

Table 4 JACKET AND INSULATION REMOVAL TOOL SUPPLIERS (Continued)

Removal Tool	Supplier
45-1611	Ideal Industries
45-1611-1	Ideal Industries
45-162	Ideal Industries
45-163	Ideal Industries
45-163	Ideal Industries
45-164	Ideal Industries
45-165	Ideal Industries
L-9225	Ideal Industries
L-9226	Ideal Industries

777 ELMS PANEL REPAIR: TERMINAL LUGS AND TERMINAL BOLTS

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777 ELMS PANEL REPAIR: TERMINAL LUGS AND TERMINAL BOLTS

1. PART NUMBERS AND DESCRIPTION

A. Terminal Lug Part Numbers

Table 1
RESTRICTIVE ENTRY TERMINAL LUG PART NUMBERS

Crimp Barrel Size	Stud Size	Part Number	Insulation Color		Supplier
			Sleeve	Band	
22	4	40-716-1155	Red	Green	Smiths Industries
	6	40-716-1175	Red	Green	Smiths Industries
	8	40-716-1167	Red	Green	Smiths Industries
	10	40-716-1160	Red	Green	Smiths Industries
	1/4	40-716-1162	Red	Green	Smiths Industries
20	4	40-716-1178	Red	Red	Smiths Industries
	6	40-716-1174	Red	Red	Smiths Industries
	8	40-716-1165	Red	Red	Smiths Industries
	10	40-716-1159	Red	Red	Smiths Industries
	1/4	40-716-1161	Red	Red	Smiths Industries
	5/16	40-716-1177	Red	Red	Smiths Industries
18	4	40-716-1179	Red	White	Smiths Industries
	6	40-716-1181	Red	White	Smiths Industries
	8	40-716-1166	Red	White	Smiths Industries
	10	40-716-1158	Red	White	Smiths Industries
	1/4	40-716-1180	Red	White	Smiths Industries
16	6	40-716-1173	Blue	Blue	Smiths Industries
	8	40-716-1169	Blue	Blue	Smiths Industries
	10	40-716-1172	Blue	Blue	Smiths Industries
14	6	40-716-1140	Blue	Green	Smiths Industries
	8	40-716-1168	Blue	Green	Smiths Industries
	10	40-716-1170	Blue	Green	Smiths Industries
12	8	40-716-1164	Yellow	Yellow	Smiths Industries
	10	40-716-1157	Yellow	Yellow	Smiths Industries
10	8	40-716-1163	Yellow	Brown	Smiths Industries
	10	40-716-1156	Yellow	Brown	Smiths Industries

777 ELMS PANEL REPAIR: TERMINAL LUGS AND TERMINAL BOLTS

Table 2
ALTERNATIVE RESTRICTIVE ENTRY TERMINAL LUG PART NUMBERS

Specified Terminal Lug		Alternative Terminal Lug	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-716-1140	Smiths Industries	51864-8	AMP
40-716-1155	Smiths Industries	52273	AMP
40-716-1156	Smiths Industries	2-36161-4	AMP
40-716-1157	Smiths Industries	2-36161-3	AMP
40-716-1158	Smiths Industries	2-36153-5	AMP
40-716-1159	Smiths Industries	2-36153-4	AMP
40-716-1160	Smiths Industries	2-36153-3	AMP
40-716-1161	Smiths Industries	2-320571-4	AMP
40-716-1162	Smiths Industries	2-320571-3	AMP
40-716-1163	Smiths Industries	2-320568-3	AMP
40-716-1164	Smiths Industries	2-320568-2	AMP
40-716-1165	Smiths Industries	1-320551-3	AMP
40-716-1166	Smiths Industries	1-320551-4	AMP
40-716-1167	Smiths Industries	1-320551-2	AMP
40-716-1168	Smiths Industries	1-51864-1	AMP
40-716-1169	Smiths Industries	1-51864-0	AMP
40-716-1170	Smiths Industries	51864-9	AMP
40-716-1172	Smiths Industries	51864-7	AMP
40-716-1173	Smiths Industries	51864-6	AMP
40-716-1174	Smiths Industries	51863-3	AMP
40-716-1175	Smiths Industries	51863-2	AMP
40-716-1177	Smiths Industries	2-320572-3	AMP
40-716-1178	Smiths Industries	52273-1	AMP
40-716-1179	Smiths Industries	52273-2	AMP
40-716-1180	Smiths Industries	2-320571-5	AMP
40-716-1181	Smiths Industries	51863-4	AMP

777 ELMS PANEL REPAIR: TERMINAL LUGS AND TERMINAL BOLTS

Table 3
GENERAL PURPOSE TERMINAL LUG PART NUMBERS

Crimp Barrel Size	Stud Size	Part Number	Insulation Color	Supplier
8	8	51408-016	Red	Smiths Industries
	10	40-716-6120	Red	Smiths Industries
		40-716-6120U	Red	Smiths Industries
	1/4	40-716-6121U	Red	Smiths Industries
	3/8	40-716-6123	Red	Smiths Industries
		40-716-6123U	Red	Smiths Industries
6	8	51408-017	Blue	Smiths Industries
	10	40-716-6199	Blue	Smiths Industries
	1/4	40-716-6201	Blue	Smiths Industries
4	1/4	40-716-6128U	Yellow	Smiths Industries
	3/8	40-716-6130U	Yellow	Smiths Industries
2	1/4	40-716-6131U	Red	Smiths Industries
	3/8	40-416-6132U	Red	Smiths Industries

CAUTION: MS25036-() TERMINAL LUGS THAT ARE MADE FROM TUBE STOCK MUST NOT BE USED.

Table 4
ALTERNATIVE GENERAL PURPOSE TERMINAL LUG PART NUMBERS

Specified Terminal Lug		Alternative Terminal Lug	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-416-6132U	Smiths Industries	MS25036-127 Flat Stock	QPL
40-716-6120	Smiths Industries	324043	AMP
40-716-6120U	Smiths Industries	MS25036-115 Flat Stock	QPL
40-716-6121U	Smiths Industries	MS25036-116 Flat Stock	QPL
40-716-6123	Smiths Industries	324045	AMP
40-716-6123U	Smiths Industries	MS25036-118 Flat Stock	QPL
40-716-6128U	Smiths Industries	MS25036-123 Flat Stock	QPL
40-716-6130U	Smiths Industries	MS25036-125 Flat Stock	QPL
40-716-6131U	Smiths Industries	MS25036-126 Flat Stock	QPL
40-716-6199	Smiths Industries	324046	AMP
40-716-6201	Smiths Industries	324047	AMP
51408-016	Smiths Industries	D-756-08	Molex
51408-017	Smiths Industries	E-760-08	Molex

777 ELMS PANEL REPAIR: TERMINAL LUGS AND TERMINAL BOLTS

2. INSTALLATION OF TERMINAL BOLTS

A. Terminal Bolt Installation

Table 5
NECESSARY MATERIALS

Part Number	Description	Supplier
RTV-162	Potting, flexible, electrical sealing, -75 degrees F to 480 degrees F	General Electric

(1) Put the bolt in the terminal section hole from underneath. Align the rectangular head of the bolt to fit the hole in the plastic. Hand tighten the nut to hold the bolt in place.

(2) Push the bolt up into the hole until the bolt is fully seated in the lug.

(3) Put the bolt in the terminal section hole from underneath. Align the rectangular head of the bolt to fit the hole in the plastic. Hand tighten the nut to hold the bolt in place.

(4) Make a selection of RTV potting compound. Refer to Table 5.

(5) Fill the plastic area of the mounting plate damaged during disassembly with RTV potting compound.

3. ASSEMBLY OF TERMINAL LUGS

A. Assembly of Restrictive Entry Terminal Lugs

Table 6
RESTRICTIVE ENTRY TERMINAL LUG CRIMP TOOLS

Terminal Lug		Crimp Tool	
Crimp Barrel Size	Insulation Color	Basic Unit	Insulation Grip Support Setting
22	Red	525690	1
20	Red	525690	1
18	Red	525690	1
16	Blue	525691	1
14	Blue	525691	1
12	Yellow	525692	1
10	Yellow	525692	1

(1) Make a selection of a crimp tool from Table 6.

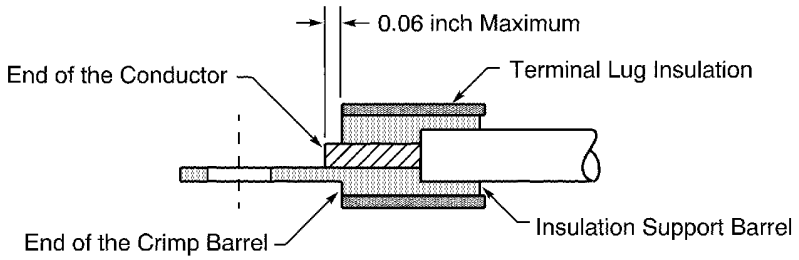
(2) Remove the necessary length of insulation from the end of the wire. Refer to Subject 20-15-04.

(3) Put the terminal lug in the crimp tool.

(4) Put the wire in the crimp barrel of the terminal lug. Refer to Figure 1.

Make sure that:

- The end of the conductor can be seen
- The maximum distance from the end of the conductor to the forward end of the crimp barrel is 0.06 inch.



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POSITION OF THE WIRE IN THE CRIMP BARREL
Figure 1

(5) Crimp the terminal lug.

B. Assembly of General Purpose Terminal Lugs

Table 7
GENERAL PURPOSE TERMINAL LUG CRIMP TOOLS

Terminal Lug		Crimp Tool		
Crimp Barrel Size	**Insulation Color**	**Basic Unit**	**Die**	**Locator**
8	Red	400B-HD	414DA-8IT	5008-1
6	Blue	400B-HD	414DA-6IT	5006-1
4	Yellow	400B-HD	414DA-4IT	5007
2	Red	400B-HD	414DA-2IT	5007-1
1/0	Blue	400B-HD	414DA-1/0IT	5039-1
2/0	-	69099	45439	-

(1) Make a selection of a crimp tool from Table 7.

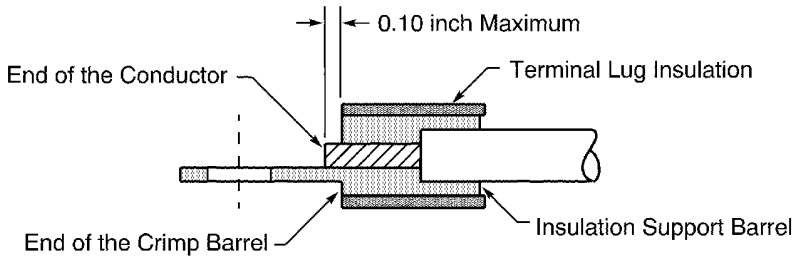
(2) Remove the necessary length of insulation from the end of the wire. Refer to Subject 20-15-04.

(3) Put the terminal lug in the tool.

(4) Put the wire in the crimp barrel the of terminal lug. Refer to Figure 2.

Make sure that:

- The end of the conductor can be seen
- The maximum distance from the end of the conductor to the forward end of the crimp barrel is 0.10 inch.



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POSITION OF THE WIRE IN THE CRIMP BARREL
Figure 2

(5) Crimp the terminal lug.

4. APPROVED TOOL SUPPLIERS

A. Crimp Tools

Table 8
CRIMP TOOL SUPPLIERS

Crimp Tool	Supplier
400B-HD	Pico
414DA-1/0IT	Pico
414DA-2IT	Pico
414DA-4IT	Pico
414DA-6IT	Pico
414DA-8IT	Pico
45439	AMP
5006-1	Pico
5007	Pico
5007-1	Pico
5008-1	Pico
5039-1	Pico
525690	AMP
525691	AMP
525692	AMP
69099	AMP

777 ELMS PANEL REPAIR: TORQUE VALUES, ELECRICAL BONDING, AND MECHANICAL ATTACHEMENT PROCEDURES

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777 ELMS PANEL REPAIR: TORQUE VALUES, ELECRICAL BONDING, AND MECHANICAL ATTACHEMENT PROCEDURES

This subject gives the installation torque values and bonding procedures for both mechanical hardware and electrical terminations of the 777 ELMS panels.

1. TORQUE VALUES

A. Torque Values

Table 1
LOCATION OF TORQUE DATA

Fastener Type	Location of Torque Data
Screws that Engage Self-Locking Nuts	Table 2
Screws that Do Not Engage Self-Locking Nuts	Table 3
Installation Screws for Relays Mounted on Cabinet Structure	Table 2
Installation Screws for Ground Blocks	Table 2
Installation Screws for Terminal Junction Modules	Table 2
Installation Screws for Connector Adapter Plates	Table 2
Installation Screws for Connectors	Table 2
Internal Connections to Power Terminal Studs	Table 2
Installation Screws for Door to Cabinet Attachment	Table 2
Installation Screws for Relay Panel to Cabinet Attachment	Table 2
Installation Screws for Electronics Unit to Cabinet Attachment	Table 2
Installation Screws or Nuts for Relays Mounted in Relay Sockets	Table 4
Installation Screws or Nuts for Relay Sockets	Table 5
Installation Screws or Nuts for Circuit Breakers	Table 6
Screws or Nuts for Circuit Breaker Terminals	Table 7

Table 2
TORQUE VALUES FOR SCREWS THAT ENGAGE SELF-LOCKING NUTS

Thread Size	Torque (inch-pounds)	Tolerance (percent)
4-40	7.0	±10
6-32	13.0	±10
8-32	23.0	±10
10-32	39.0	±10
1/4	86.0	±10

Table 3
TORQUE VALUES FOR SCREWS THAT DO NOT ENGAGE SELF-LOCKING NUTS

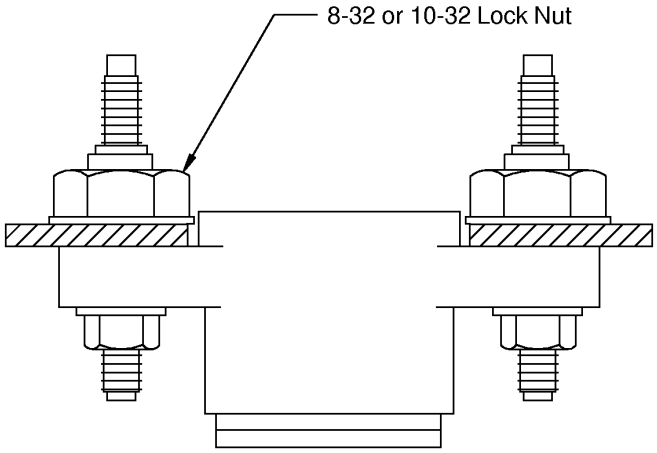
Thread Size	Torque (inch-pounds)	Tolerance (percent)
4-40	6.5	±10
6-32	12.0	±10
8-32	20.0	±10
10-32	35.0	±10
1/4	80.0	±10

Table 4
TORQUE VALUES FOR RELAYS MOUNTED IN RELAY SOCKETS

Thread Size	Torque (inch-pounds)	Tolerance (inch-pounds)
4-40	4.0	±1
10-32	15.0	±1

Table 5
TORQUE VALUES FOR PANEL MOUNTED RELAYS SOCKETS

Thread Size	Torque (inch-pounds)	Tolerance (inch-pounds)
4-40	6.5	±0.5
8-32	10.0	±1
10-32	15.0	±1



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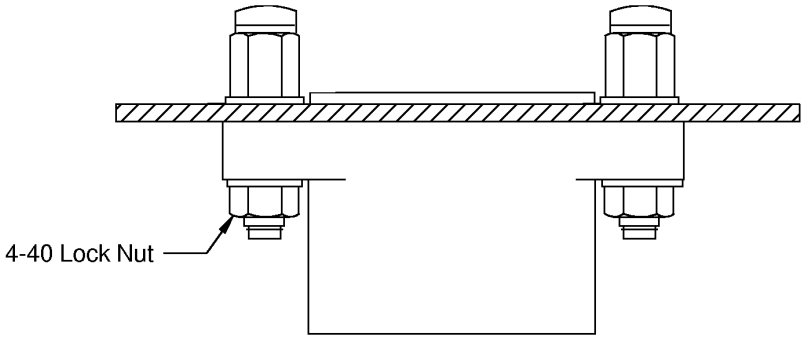
PANEL MOUNTED RELAY SOCKETS - TYPE A
Figure 1



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PANEL MOUNTED RELAY SOCKETS - TYPE B
Figure 2

Table 6
TORQUE VALUES FOR ATTACHMENT OF CIRCUIT BREAKERS ON THE PANEL

Number of Mounting Screws	Circuit Breaker Mounting Method	Torque (inch-pounds)	Tolerance (percent)
2	-	10	±10
1	0.4588-32UNS Ring Nut	30	±10

Table 7
TORQUE VALUES FOR CIRCUIT BREAKER TERMINALS

Circuit Breaker	Thread Size	Torque (inch-pounds)	Tolerance (percent)
BACC18AD()	8-32	15.0	±10
BACC18X()	8-32	15.0	±10
BACC18R50()	8-32	15.0	±10
BACC18R60()	1/4	32.0	±10
BACC18R75()	1/4	32.0	±10
BACC18R100()	1/4	32.0	±10
BACC18AC()	8-32	15.0	±10
BACC18AE()	8-32	15.0	±10

2. ELECTRICAL BONDING PROCEDURES

A. Surface Preparation for Electrical Bonds

(1) Clean the surfaces to be bonded.

Make a selection of an abrasive cleaning method.

Refer to Subject 20-20-00.

Refer to Table 8, Table 9, and Table 10 for the size and the shape of the area to be cleaned.

CAUTION: MAKE SURE THAT AFTER SURFACES ARE CLEANED, THE COMPONENTS ARE ASSEMBLED WITHIN 24 HOURS. IF COMPONENTS ARE NOT ASSEMBLED WITHIN 24 HOURS, SURFACES MUST BE CLEANED AGAIN.

Table 8
PREPARATION AREA FOR GROUND BLOCKS

Fastener Size	Ground Block Size	Preparation Area	
		Shape	Size (inch)
10-32 UNJF	-	Circular	0.50 diameter
1/4-28 UNJF	-	Circular	0.63 diameter
3/8-24 UNJF	-	Circular	0.75 diameter
-	20	Rectangular	2.2 x 0.5

Table 9
PREPARATION AREA FOR SQUARE FLANGE CONNECTORS

Connector Shell Size	Preparation Area Dimensions	
	Length (inches)	Width (inches)
10	1.5	1.5
12	1.8	1.8
14	1.8	1.8
16	2.0	2.0
18	2.0	2.0
20	2.3	2.3
22	2.3	2.3
24	2.3	2.3
28	2.5	2.5

Table 10
PREPARATION OF OTHER AREAS

Application	Notes
Bonding Strap or Jumper Attachement to Captive Nuts	Remove the finish and clean the circular area 0.63 inch diameter centered on the screw hole.
Adjacent Structural Parts Where Bonding is Specified	Remove the finish on all of both adjacent engaging surfaces
Mounting Bracket Faying Surface Bond	Remove the finish on all of both adjacent engaging surfaces

B. Assembly of 777 ELMS Panel Fasteners, Ground Studs, and Terminal Attachment

Table 11
COMPONENT PART NUMBERS FOR THREAD SIZE 10-32 AND 1/4-28

Description	Thread Size			
	10-32 UNJF		1/4-28 UNJF	
	Part Number	Supplier	Part Number	Supplier
Bolt	NAS1801-3-XL	QPL	NAS1801-4-XL	QPL
	30-295-656-()	GE	30-295-657-()	GE
Split Washer	MS35338-43	QPL	MS35338-44	QPL
	30-298-212-05	GE	30-298-212-06	GE
Corrosion Protective Washer	AN960D10L	QPL	AN960D416L	QPL
	30-298-127-15	GE	30-298-127-16	GE
Nut	MS35650 305T	QPL	MS35650 3255T	QPL
	30-297-622-06	GE	30-297-622-07	GE
Pressure Washer	AN960D10L	QPL	AN960D416L	QPL
	30-298-127-15	GE	30-298-127-16	GE

Table 11 COMPONENT PART NUMBERS FOR THREAD SIZE 10-32 AND 1/4-28 (Continued)

Description	Thread Size			
	10-32 UNJF		1/4-28 UNJF	
	Part Number	Supplier	Part Number	Supplier
Self Locking Nut	MS21042L-3	QPL	MS21042L-4	QPL
	30-297-6602-05	GE	30-297-6601-06	GE

Table 12
COMPONENT PART NUMBERS FOR THREAD SIZE 3/8-24

Description	Thread Size 3/8-24 UNJF			
	Cabinet to Airplane Structure		Panel to Airplane Structure	
	Part Number	Supplier	Part Number	Supplier
Bolt	NAS1801-6-18	QPL	51207-736	GE
	30-251-448-11	GE		
Split Washer	MS35338-46	QPL	30-298-212-08	GE
	30-298-212-08	GE	30-298-212-08	GE
Corrosion Protection Washer	AN960D616L	QPL	51704-270	GE
	30-298-127-18	GE		
Nut	MS35650 3285T	QPL	43874-004	GE
	30-297-622-09	GE		
Pressure Washer	AN960D616L	QPL	-	-
	30-298-127-18	GE		
Self Locking Nut	MS21042L-6	QPL	-	-
	30-297-6602-08	GE		

Table 13
TORQUE VALUES

Thread Size	Torque inch-lbs	
	Nut	Self Locking Nut
10-32 UNJF	25 to 30	22 to 30
1/4-28 UNJF	85 to 90	63 to 77

NOTE: The thread size of door or panel to cabinet fasteners is 1/4-28 UNJF.

(1) Make a selection of these components:

- A bolt
- A split washer
- Two corrosion protection washers
- A nut

- A pressure washer
- A self-locking nut.

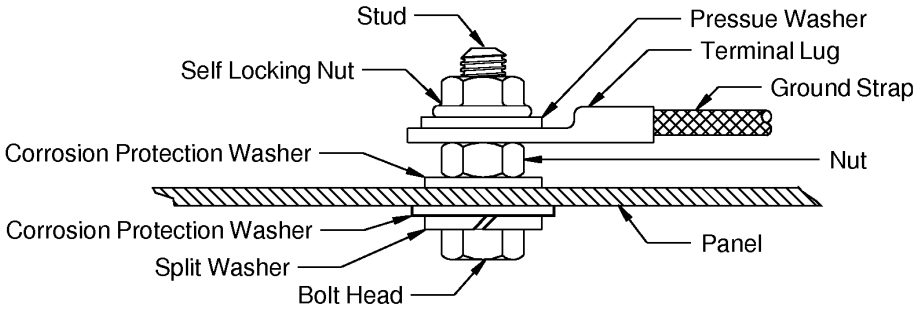
Refer to:

- Table 11 for stud size 10-32 and 1/4-28 fasteners
- Table 12 for stud size 3/8-24 fasteners

(2) Assemble the bolt, split washer, two corrosion protection washers, and the nut on the panel in this order:

- The bolt
- The split washer
- A corrosion protection washer
- The panel
- A corrosion protection washer
- The nut.

Refer to Figure 3:



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ASSEMBLY OF A GROUND STRAP TERMINAL ON A PRE-INSTALLED GROUND STUD
Figure 3

(3) Torque the nut.

Refer to Table 13 for the torque value.

(4) Assemble a terminal lug, the pressure washer and the self-locking nut on the stud in this order:

- The terminal lug
- The pressure washer
- The self-locking nut.

Refer to Figure 3.

(5) Torque the self-locking nut.

Refer to Table 13 for the torque value.

(6) Measure the electrical resistance between the bonded components.

Refer to Paragraph 2.F..

(7) If it is necessary, apply sealant on the electrical bond.

Refer to Paragraph 4.A..

C. Assembly of 777 ELMS Panel Fasteners, Ground Studs, and Terminal Attachment with a Captive Nut

Table 14
COMPONENT PART NUMBERS FOR A STUD SIZE 1/4-28 GROUND STUD IN A CAPTIVE NUT

Description	1/4-28 UNJF	
	Part Number	Supplier
Corrosion Protection Washer	AN960D416L	QPL
	30-298-127-16	GE
Pressure Washer	AN960D416L	QPL
	30-298-127-16	GE
Bolt	NAS1801-4-XL	QPL
	30-295-657	GE

Table 15
TORQUE VALUES

Bolt Thread Size	Torque inch-lbs
1/4-28 UNJF	80 to 90

(1) Make a selection of these components:

- The bolt
- The pressure washer
- The corrosion protection washer

.

Refer to:

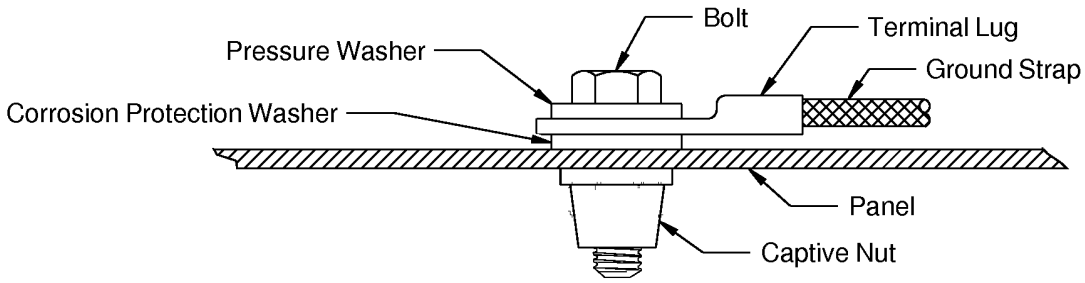
- Table 14.

(2) Assemble the bolt, the pressure washer, the terminal lug, the corrosion protection washer on the panel and captive nut in this order:

- The bolt
- The pressure washer
- The terminal lug
- The corrosion protection washer

- The panel
- The captive nut.

Refer to Figure 4:



ASSEMBLY OF A GROUND STRAP TO A GROUND STUD IN A CAPTIVE NUT
Figure 4

(3) Torque the bolt.
Refer to Table 15 for the torque value.

(4) Measure the electrical resistance between the bonded components.
Refer to Paragraph 2.F..

(5) If it is necessary, apply sealant on the electrical bond.
Refer to Paragraph 4.A..

D. Attachment of Grounding blocks to Cabinet

(1) Clean these areas:
- The base of the ground block
- The rectangular area where the ground block will be attached.

Refer to Paragraph 2.A..

(2) Assemble the ground block to the surface within 24 hours.

(3) Measure the electrical resistance between the bonded locations.
Refer to Paragraph 2.F.

(4) If it is necessary, apply sealant on the electrical bond.
Refer to Paragraph 4.A..

E. Attachment of bonded Connectors

(1) Clean these areas:

- The flange of the connector
- The square area where the connector will be attached.

Refer to Paragraph 2.A..

(2) Assemble the connector to the surface within 24 hours.

(3) Measure the electrical resistance between the bonded locations.
Refer to Paragraph 2.F..

(4) If it is necessary, apply sealant on the electrical bond.
Refer to Paragraph 4.A..

F. Bond Resistance Measurement

Table 16
RECOMMENDED METERS

Part Number	Suppler
BT51	Megger
Microhmmeter CA10	Chauvin Amoux

Table 17
MAXIMUM RESISTANCES FOR METAL COMPONENTS OF THE ELMS PANEL

Location of the Test Probes		Maximum Resistance (Millohms)
From	To	
Door Lower Ground Screw	A Ground Block	2.0
	Another part of the door (before paint is applied)	5.0
Relay Panel Ground Screw	Another part of the Relay Panel	1.0
Cabinet or Backplane Ground Stud	Another 3/8 inch diameter ground stud	2.5
	Another 1/4 inch diameter ground stud	2.0
	Brackets for electrical components	4.0
	Brackets for relay panels	5.0
	Brackets for terminal block rails	No measurement is necessary
	Brackets for cable clamps	No measurement is necessary

Table 18
MAXIMUM RESISTANCES FOR ASSEMBLIES OF THE ELMS PANEL

Location of the Test Probes		Maximum Resistance (Millohms)
From	To	
Door Lower Ground Strap	Upper Ground Strap	1.5
	A Ground Block	2.0
Circuit Breaker Panel Ground Stud	Another part of the circuit breaker panel	1.0
	A Ground Block	2.0
Relay Panel	Another part of the Relay Panel	1.0
	A Ground Stud	2.0
Cabinet or Backplane	Another 3/8 inch diameter ground stud	2.5
	Another 1/4 inch diameter ground stud	2.0
	A Ground Block	2.5
	Another part of the chassis	2.5
	Door Ground Block	4.5
	Relay Panel	5.0
	The CCU, the SIU or the PPC Case	2.5
	A conductive connector shell	2.5
	Other electrical components in the ELMS panel	5.0

(1) Make a selection of a meter that has a sensitivity of 0.1 milliohms or less.
Refer to Table 16 for recommended meters.

(2) Measure the electrical resistance between the bonded locations.
Refer to Table 17 and Table 18.

(3) If the bond resistance measurement is not less than the maximum requirement specified:

(a) Disassemble the components.

(b) Clean the engaging surfaces again.

(c) Do Step 2.F.(2) again.

3. MECHANICAL ATTACHMENT PROCEDURES

A. Assembly of Cabinet Structure

(1) Clean the surfaces that will be joined.
Refer to Paragraph 2.A..

(2) Assemble the parts within 24 hours.

(3) Measure the electrical resistance between the bonded locations.
Refer to Paragraph 2.F..

(4) If it is necessary, apply sealant on the electrical bond.

Refer to Paragraph 4.A..

4. SEALS OF ATTACHMENT LOCATIONS

A. Seal of Electrical Bonds

(1) If the original finish has been removed, after assembly, use a brush to apply a layer of MIL-C-81706 material to bare metal surfaces

As an alternative, apply a layer of RTV162, GE Aviation code 1755-166 to seal the bare metal surfaces.

Make sure that the seal coat is applied within 7 days after the surface is cleaned.

(2) Apply the other finishes that are necessary to repair the fininsh.

777 ELMS PANEL REPAIR: SPLICES

TABLE OF CONTENTS

777 ELMS PANEL REPAIR: SPLICES

1. PART NUMBERS AND DESCRIPTION

A. Butt Splice Kit Part Numbers

Table 1
BUTT SPLICE KIT PART NUMBERS

CAU Range		Crimp Barrel Size	Part Number	Color Stripe	Supplier
Minimum	Maximum				
3	15	26-20	40-716-6079	Red	Smiths Industries
8	27	20-16	40-716-6080	Blue	Smiths Industries
19	67	16-12	40-716-6096	Yellow	Smiths Industries

Table 2
EQUIVALENT BUTT SPLICE KIT PART NUMBERS

Splice Kit	Equivalent Splice Kit	
	Part Number	Supplier
40-716-6079	D-436-36	Raychem
40-716-6080	D-436-37	Raychem
40-716-6096	D-436-38	Raychem

B. Parallel Splice Part Numbers

Table 3
PARALLEL SPLICE PART NUMBERS

CAU Range		Crimp Barrel Size	Part Number	Supplier
Minimum	Maximum			
20	52	16-14	40-716-6157-02	Smiths Industries
52	131	12-10	40-716-6157-03	Smiths Industries
131	208	8	40-716-6157-04	Smiths Industries

Table 4
EQUIVALENT PARALLEL SPLICE PART NUMBERS

Parallel Splice	Equivalent Parallel Splice	
	Part Number	Supplier
40-716-6157-02	34137	AMP
40-716-6157-03	34138	AMP
40-716-6157-04	34318	AMP

Table 5
HEAT SHRINKABLE END CAP PART NUMBERS

Parallel Splice	Heat Shrinkable End Cap	
	Part Number	Supplier
40-716-6157-02	40-716-6183-03	Smiths Industries
40-716-6157-03	40-716-6183-04	Smiths Industries
40-716-6157-04	40-716-6183-04	Smiths Industries

Table 6
EQUIVALENT HEAT SHRINKABLE END CAP PART NUMBERS

Heat Shrinkable End Cap	Equivalent Heat Shrinkable End Cap	
	Part Number	Supplier
40-716-6183-03	PD-CAP-1/4	Raychem
40-716-6183-04	PD-CAP-3/8	Raychem
40-716-6183-05	PD-CAP-1/2	Raychem

2. ASSEMBLY OF SPLICES

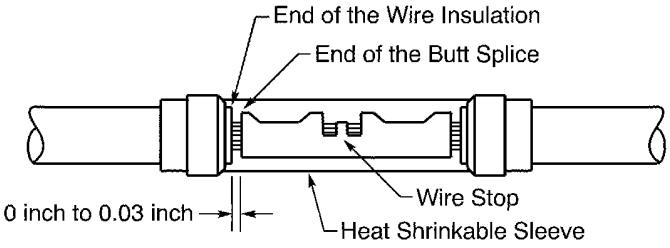
A. Selection of the Correct Size of Splice

If the splice configuration is not specified, refer to Subject 20-30-22.

B. Assembly of Butt Splices

Table 7
BUTT SPLICE CRIMP TOOLS

Crimp Barrel Size	Crimp Tool	
	Part Number	Nest
26-20	AD-1377	26-20
	GMT 232	26-20
20-16	AD-1377	20-16
	GMT 232	20-16
18-12	AD-1377	16-12
	GMT 232	16-12



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CONFIGURATION OF THE SEALED BUTT SPLICE ASSEMBLY
Figure 1

(1) Make a selection of a crimp tool from Table 7.

(2) Put the heat shrinkable sleeve on one wire of the wires.

(3) Remove 0.28 inch ±0.03 inch of insulation from the end of the wires. Refer to Subject 20-15-04.

(4) Put the splice in the crimp tool.

(5) If the splice has a seam, align the seam opposite the indentor.

(6) Hold the splice in the tool with light pressure.

(7) Put the end of one wire in the splice.

(8) Crimp the splice.

(9) Do Step 2.B.(4) through Step 2.B.(8) again for the other end of the splice.

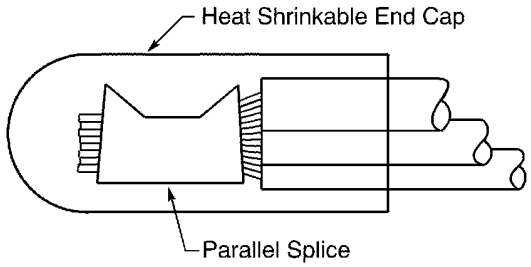
(10) Align the center of the heat shrinkable sleeve with the center of the splice.

(11) Shrink the sleeve in position. Refer to Subject 20-10-14.

C. Assembly of Parallel Splices

Table 8
PARALLEL SPLICE CRIMP TOOLS

Crimp Barrel Size	Crimp Tool	
	Part Number	Nest
16-14	525693	16-14
12-10	525693	12-10
8	69355	-



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CONFIGURATION OF THE PARALLEL SPLICE ASSEMBLY
Figure 2

(1) Make a selection of a heat shrinkable end cap from Table 5.

(2) Make a selection of a crimp tool from Table 8.

(3) Remove the 0.34 inch ±0.03 inch from the end of the wires. Refer to Subject 20-15-04.

(4) Put the splice in the crimp tool.

(5) If the splice has a seam, align the seam opposite the indentor.

(6) Hold the splice in the tool with light pressure.

(7) Put the wires in the splice.

(8) Crimp the splice.

(9) Put the end cap on the splice

(10) Shrink the end cap in position. Refer to Subject 20-10-14.

3. APPROVED TOOL SUPPLIERS

A. Crimp Tools

Table 9
CRIMP TOOL SUPPLIERS

Crimp Tool	Supplier
525693	AMP
69355	AMP
AD-1377	Raychem
GMT 232	Daniels

777 ELMS PANEL REPAIR: MIL-C-26500 TYPE CONNECTORS

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777 ELMS PANEL REPAIR: MIL-C-26500 TYPE CONNECTORS

1. PART NUMBERS AND DESCRIPTION

A. Connector Part Numbers

Table 1
CONNECTOR PART NUMBERS

Part Number	Supplier
40-742-2045-00	Smiths Industries
40-742-2045-26	Smiths Industries
40-742-2046-00	Smiths Industries
40-742-2046-26	Smiths Industries
40-742-4028-00	Smiths Industries
40-742-6024-00	Smiths Industries
40-742-6024-26	Smiths Industries
40-742-6025-29	Smiths Industries
40-743-1158-26	Smiths Industries
40-743-1159-00	Smiths Industries
40-743-1521-00	Smiths Industries
40-743-1521-26	Smiths Industries
40-743-1521-27	Smiths Industries
40-743-1521-28	Smiths Industries
40-743-1521-29	Smiths Industries
40-743-1530-00	Smiths Industries
40-743-1641-00	Smiths Industries
40-743-1641-27	Smiths Industries
40-743-1641-28	Smiths Industries
40-743-1644-28	Smiths Industries
40-743-1656-28	Smiths Industries
40-743-2325-26	Smiths Industries
40-743-3182-29	Smiths Industries
40-743-4761-00	Smiths Industries
40-743-4761-26	Smiths Industries
40-743-4761-27	Smiths Industries
40-743-4761-28	Smiths Industries
40-743-4768-28	Smiths Industries
40-743-4773-00	Smiths Industries
40-743-4773-26	Smiths Industries
40-743-5103-26	Smiths Industries
40-743-5120-00	Smiths Industries

Table 1 CONNECTOR PART NUMBERS (Continued)

Part Number	Supplier
40-743-6213-26	Smiths Industries
40-743-6213-27	Smiths Industries
40-743-6217-28	Smiths Industries
40-743-6347-00	Smiths Industries
40-743-6347-26	Smiths Industries
40-743-6348-00	Smiths Industries
40-743-7396-00	Smiths Industries
40-743-7396-26	Smiths Industries
40-743-7396-27	Smiths Industries
40-743-7396-28	Smiths Industries
40-743-7396-29	Smiths Industries
40-743-7399-00	Smiths Industries
40-743-7399-26	Smiths Industries
40-743-7413-26	Smiths Industries
40-743-7416-00	Smiths Industries
40-743-7416-28	Smiths Industries
40-743-7419-00	Smiths Industries
40-743-8581-29	Smiths Industries
40-743-9136-29	Smiths Industries
40-743-9137-26	Smiths Industries
40-743-9137-27	Smiths Industries
40-743-9142-00	Smiths Industries
40-743-9142-29	Smiths Industries

Table 2
ALTERNATIVE CONNECTOR PART NUMBERS

Specified Connector		Alternative Connector	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-742-2045-00	Smiths Industries	BACC63CB10-5S	Boeing
40-742-2045-26	Smiths Industries	BACC63CB10-5S6	Boeing
40-742-2046-00	Smiths Industries	BACC63CC10-5P	Boeing
40-742-2046-26	Smiths Industries	BACC63CC10-5P6	Boeing
40-742-4028-00	Smiths Industries	BACC45FN14-7S	Boeing
40-742-6024-00	Smiths Industries	BACC45FN18-8P	Boeing
40-742-6024-26	Smiths Industries	BACC45FN18-8P6	Boeing
40-742-6025-29	Smiths Industries	BACC45FN18-8S9	Boeing

777 ELMS PANEL REPAIR: MIL-C-26500 TYPE CONNECTORS

Table 2 ALTERNATIVE CONNECTOR PART NUMBERS (Continued)

Specified Connector		Alternative Connector	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-743-1158-26	Smiths Industries	BACC45FN18-14S6	Boeing
40-743-1159-00	Smiths Industries	BACC45FN18-14P	Boeing
40-743-1521-00	Smiths Industries	BACC45FN22-32S	Boeing
40-743-1521-26	Smiths Industries	BACC45FN22-32S6	Boeing
40-743-1521-27	Smiths Industries	BACC45FN22-32S7	Boeing
40-743-1521-28	Smiths Industries	BACC45FN22-32S8	Boeing
40-743-1521-29	Smiths Industries	BACC45FN22-32S9	Boeing
40-743-1530-00	Smiths Industries	BACC45FN22-32P	Boeing
40-743-1641-00	Smiths Industries	BACC45FN22-12S	Boeing
40-743-1641-27	Smiths Industries	BACC45FN22-12S7	Boeing
40-743-1641-28	Smiths Industries	BACC45FN22-12S8	Boeing
40-743-1644-28	Smiths Industries	BACC45FN22-12P8	Boeing
40-743-1656-28	Smiths Industries	BACC63CC22-12S8	Boeing
40-743-2325-26	Smiths Industries	BACC45FN20-16S6	Boeing
40-743-3182-29	Smiths Industries	BACC45FN22-19S9	Boeing
40-743-4761-00	Smiths Industries	BACC45FN16-24S	Boeing
40-743-4761-26	Smiths Industries	BACC45FN16-24S6	Boeing
40-743-4761-27	Smiths Industries	BACC45FN16-24S7	Boeing
40-743-4761-28	Smiths Industries	BACC45FN16-24S8	Boeing
40-743-4768-28	Smiths Industries	BACC63CC16-24S8	Boeing
40-743-4773-00	Smiths Industries	BACC63CC16-24P	Boeing
40-743-4773-26	Smiths Industries	BACC63CC16-24P6	Boeing
40-743-5103-26	Smiths Industries	BACC45FN20-25S6	Boeing
40-743-5120-00	Smiths Industries	BACC63CC20-25P	Boeing
40-743-6213-26	Smiths Industries	BACC63CC24-30S6	Boeing
40-743-6213-27	Smiths Industries	BACC63CC24-30S7	Boeing
40-743-6217-28	Smiths Industries	BACC63CC24-30P8	Boeing
40-743-6347-00	Smiths Industries	BACC63CC18-31P	Boeing
40-743-6347-26	Smiths Industries	BACC63CC18-31P6	Boeing
40-743-6348-00	Smiths Industries	BACC45FN18-31S	Boeing
40-743-7396-00	Smiths Industries	BACC45FN24-43S	Boeing
40-743-7396-26	Smiths Industries	BACC45FN24-43S6	Boeing
40-743-7396-27	Smiths Industries	BACC45FN24-43S7	Boeing
40-743-7396-28	Smiths Industries	BACC45FN24-43S8	Boeing

Table 2 ALTERNATIVE CONNECTOR PART NUMBERS (Continued)

Specified Connector		Alternative Connector	
Part Number	Supplier	Part Number	Supplier
40-743-7396-29	Smiths Industries	BACC45FN24-43S9	Boeing
40-743-7399-00	Smiths Industries	BACC45FN24-43P	Boeing
40-743-7399-26	Smiths Industries	BACC45FN24-43P6	Boeing
40-743-7413-26	Smiths Industries	BACC45FN20-41P6	Boeing
40-743-7416-00	Smiths Industries	BACC63CC24-43S	Boeing
40-743-7416-28	Smiths Industries	BACC63CC24-43S8	Boeing
40-743-7419-00	Smiths Industries	BACC63CC28-42S	Boeing
40-743-8581-29	Smiths Industries	BACC45FN22-88S9	Boeing
40-743-9136-29	Smiths Industries	BACC45FN24-61S9	Boeing
40-743-9137-26	Smiths Industries	BACC45FN24-61P6	Boeing
40-743-9137-27	Smiths Industries	BACC45FN24-61P7	Boeing
40-743-9142-00	Smiths Industries	BACC63CC24-61S	Boeing
40-743-9142-29	Smiths Industries	BACC63CC24-61S9	Boeing

B. Contact Part Numbers

Table 3
CONTACT PART NUMBERS

Contact Size		Contact Type	Part Number	Supplier
Engaging End	Crimp Barrel			
20	20	Pin	30-867-6750-01	Smiths Industries
			30-867-6753-01	Smiths Industries
		Socket	30-867-6751-01	Smiths Industries
			30-867-6752-01	Smiths Industries
16	16	Pin	30-867-6750-02	Smiths Industries
		Socket	30-867-6751-02	Smiths Industries
	14	Socket	30-867-6826	Smiths Industries
12	12	Pin	30-867-6750-03	Smiths Industries
		Socket	30-867-6751-03	Smiths Industries

Table 4
ALTERNATIVE CONTACT PART NUMBERS

Specified Contact		Alternative Contact	
Part Number	**Supplier**	**Part Number**	**Supplier**
30-867-6750-01	Smiths Industries	BACC47CN1A	Boeing
30-867-6750-02	Smiths Industries	BACC47CN2A	Boeing
30-867-6750-03	Smiths Industries	BACC47CN3A	Boeing
30-867-6751-01	Smiths Industries	BACC47CP1A	Boeing
30-867-6751-02	Smiths Industries	BACC47CP2A	Boeing
30-867-6751-03	Smiths Industries	BACC47CP3A	Boeing
30-867-6752-01	Smiths Industries	BACC47CP1S	Boeing
30-867-6753-01	Smiths Industries	BACC47CN1S	Boeing
30-867-6826	Smiths Industries	10-807155-16T	Amphenol

2. INSERT CONFIGURATIONS

Refer to Subject 20-61-11.

3. CONNECTOR DISASSEMBLY

Refer to Subject 20-61-11.

4. CONNECTOR ASSEMBLY

A. Necessary Conditions

All empty contact cavities must be sealed. Refer to Subject 20-60-08.

B. Connector Assembly

Refer to Subject 20-61-11.

777 ELMS PANEL REPAIR: MIL-C-38999 TYPE CONNECTORS

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777 ELMS PANEL REPAIR: MIL-C-38999 TYPE CONNECTORS

1. PART NUMBERS AND DESCRIPTION

A. Connector Part Numbers

Table 1
CONNECTOR PART NUMBERS

Part Number	Supplied	Supplier
40-743-3196-00U	Without Contacts	Smiths Industries
40-743-6821-00U	Without Contacts	Smiths Industries
40-743-9445-00U	Without Contacts	Smiths Industries
40-743-9445-05U	Without Contacts	Smiths Industries
40-743-9445-06U	Without Contacts	Smiths Industries
40-743-9445-07U	Without Contacts	Smiths Industries
40-743-9744-00U	Without Contacts	Smiths Industries
40-743-9744-05U	Without Contacts	Smiths Industries
40-743-9744-06U	Without Contacts	Smiths Industries
40-743-9744-07U	Without Contacts	Smiths Industries

Table 2
EQUIVALENT CONNECTORS SUPPLIED WITH CONTACTS

Connector	Equivalent Connectors Supplied With Contacts	
	Part Number	Supplier
40-743-3196-00U	40-743-3189-00U	Smiths Industries
40-743-6821-00U	40-743-6987-00U	Smiths Industries
40-743-9445-00U	40-743-9414-00U	Smiths Industries
40-743-9445-05U	40-743-9414-05U	Smiths Industries
40-743-9445-06U	40-743-9414-06U	Smiths Industries
40-743-9445-07U	40-743-9414-07U	Smiths Industries
40-743-9744-00U	40-743-9734-00U	Smiths Industries
40-743-9744-05U	40-743-9734-05U	Smiths Industries
40-743-9744-06U	40-743-9734-06U	Smiths Industries
40-743-9744-07U	40-743-9734-07U	Smiths Industries

777 ELMS PANEL REPAIR: MIL-C-38999 TYPE CONNECTORS

Table 3
EQUIVALENT CONNECTOR PART NUMBERS

Connector	Equivalent Connector	
	Part Number	Supplier
40-743-3189-00U	MS27467T15B19SN	QPL
40-743-3196-00U	MS27467T15B19BN	QPL
40-743-6821-00U	MS27467T15B35BN	QPL
40-743-6987-00U	MS27467T15B35SN	QPL
40-743-9414-00U	MS27467T23B35SN	QPL
40-743-9414-05U	MS27467T23B35SB	QPL
40-743-9414-06U	MS27467T23B35SC	QPL
40-743-9414-07U	MS27467T23B35SA	QPL
40-743-9445-00U	MS27467T23B35BN	QPL
40-743-9445-05U	MS27467T23B35BB	QPL
40-743-9445-06U	MS27467T23B35BC	QPL
40-743-9445-07U	MS27467T23B35BA	QPL
40-743-9734-00U	MS27467T25B35SN	QPL
40-743-9734-05U	MS27467T25B35SB	QPL
40-743-9734-06U	MS27467T25B35SC	QPL
40-743-9734-07U	MS27467T25B35SA	QPL
40-743-9744-00U	MS27467T25B35BN	QPL
40-743-9744-05U	MS27467T25B35BB	QPL
40-743-9744-06U	MS27467T25B35BC	QPL
40-743-9744-07U	MS27467T25B35BA	QPL

B. Contact Part Numbers

Table 4
CONTACT PART NUMBERS

Contact Size		Contact Type	Part Number	Color Code		Supplier
Engaging End	Crimp Barrel			Band	Color	
22D	22D	Socket	30-867-6654U	1	Orange	Smiths Industries
				2	Yellow	
				3	Grey	
20	20	Socket	30-867-6656U	1	Orange	Smiths Industries
				2	Brown	
				3	Green	

777 ELMS PANEL REPAIR: MIL-C-38999 TYPE CONNECTORS

Table 5
EQUIVALENT CONTACT PART NUMBERS

Contact	Equivalent Contact	
	Part Number	Supplier
30-867-6654	M39029/56-348	QPL
30-867-6656U	M39029/56-351	QPL

C. Connector Backshell Part Numbers

Table 6
BACKSHELL PART NUMBERS

Part Number	Supplier
40-741-1632	Smiths Industries

Table 7
EQUIVALENT BACKSHELL PART NUMBERS

Backshell	Equivalent Backshell	
	Part Number	Supplier
40-741-1632	340FS001N-14-2F12B	Glenair

D. Strain Relief Clamp Part Numbers

Table 8
STRAIN RELIEF CLAMP PART NUMBERS

Part Number	Configuration	Supplier
40-741-1603-08U	45 degrees	Smiths Industries
40-741-1603-09U	45 degrees	Smiths Industries
40-741-1604-04U	90 degrees	Smiths Industries
40-741-1604-08U	90 degrees	Smiths Industries
40-741-1604-09U	90 degrees	Smiths Industries

Table 9
EQUIVALENT STRAIN RELIEF CLAMP PART NUMBERS

Clamp	Equivalent Clamp	
	Part Number	Supplier
40-741-1603-08U	M85049/57-22W	QPL
40-741-1603-09U	M85049/57-24W	QPL
40-741-1604-04U	M85049/63-14W	QPL
40-741-1604-08U	M85049/63-22W	QPL
40-741-1604-09U	M85049/63-24W	QPL

Table 10
APPROVED SUPPLIERS OF M85049 STRAIN RELIEF CLAMPS

Clamp	Supplier
M85049/57-22W	Glenair
M85049/57-24W	Glenair
M85049/63-14W	Glenair
M85049/63-22W	Glenair
M85049/63-24W	Glenair

2. INSERT CONFIGURATIONS

Refer to Subject 20-63-19.

3. CONNECTOR DISASSEMBLY

Refer to Subject 20-63-19.

4. CONNNECTOR ASSEMBLY

A. Contact Assembly

Refer to Subject 20-63-19.

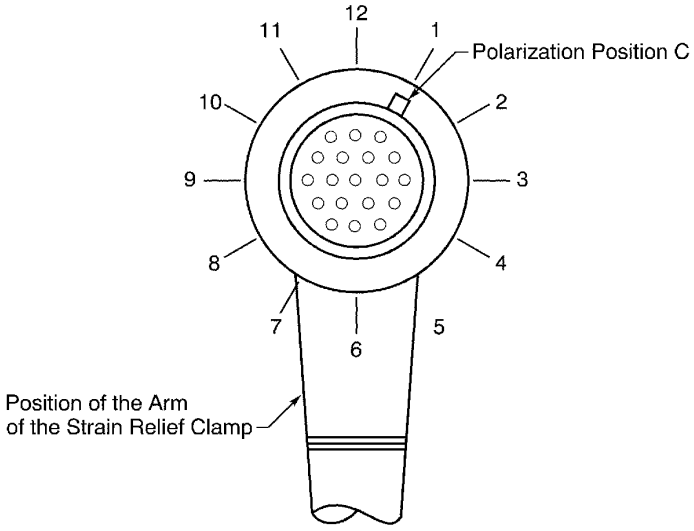
B. Contact Insertion

Refer to Subject 20-63-19.

C. Strain Relief Clamp Installation

Table 11
STRAIN RELIEF CLAMP TORQUE VALUES

Shell Size		Torque (inch-pounds)		
Connector	Clamp	Target	Minumum	Maximum
15	14	30	30	35
23	22	69	69	74
25	24	83	83	88



POSITION OF THE STRAIN RELIEF CLAMP
Figure 1

(1) Engage the threads of the clamp and the connector.

(2) Set the angle of the clamp. Refer to Figure 1.

(3) Tighten the threads until the teeth on the connector shell are fully engaged with the teeth on the clamp.

(4) Torque the clamp. Refer to Table 11.

D. Backshell Installation

(1) Engage the threads of the backshell and the connector.

(2) Tighten the threads until the teeth on the connector shell are fully engaged with the teeth on the backshell.

(3) Torque the backshell 30 inch-pounds +5 inch-pounds, -0 inch-pounds.

777 ELMS PANEL REPAIR: MIL-C-5015 TYPE CONNECTORS

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777 ELMS PANEL REPAIR: MIL-C-5015 TYPE CONNECTORS

1. PART NUMBERS AND DESCRIPTION

A. Connector Part Numbers

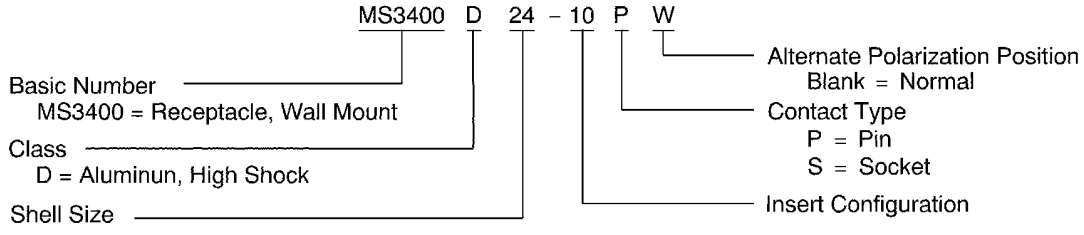
NOTE: If the replacement of a connector is necessary, the Boeing BACC63D connector with an equivalent configuration is a satisfactory alternative. Refer to Subject 20-61-19.

Table 1
CONNECTOR PART NUMBERS

Part Number	Supplier
40-742-3211-00U	Smiths Industries
40-742-4026-00U	Smiths Industries
40-742-4026-01U	Smiths Industries
40-742-4030-00U	Smiths Industries
40-742-7044-01U	Smiths Industries
40-742-7045-01U	Smiths Industries

Table 2
EQUIVALENT CONNECTOR PART NUMBERS

Connector	Equivalent Connector	
	Part Number	Supplier
40-742-3211-00U	MS3400D28-22PN	QPL
40-742-4026-00U	MS3400D24-10P	QPL
40-742-4026-01U	MS3400D24-10PW	QPL
40-742-4030-00U	MS3400D24-10S	QPL
40-742-7044-01U	MS3400D24-11SW	QPL
40-742-7045-01U	MS3400D24-11PW	QPL



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MS3400() PART NUMBER STRUCTURE
Figure 1

B. Contact Part Numbers

Table 3
CONTACT PART NUMBERS

Contact Size		Contact Type	Part Number	Supplier
Engaging End	Crimp Barrel			
16	16	Pin	30-867-6700U	Smiths Industries
		Socket	30-867-6704U	Smiths Industries
12	12	Pin	30-867-6702U	Smiths Industries
		Socket	30-867-6706U	Smiths Industries
8	8	Pin	30-867-6703U	Smiths Industries
		Socket	30-867-6707U	Smiths Industries
4	4	Pin	30-867-6816U	Smiths Industries
		Socket	30-867-6815U	Smiths Industries

Table 4
ALTERNATIVE CONTACT PART NUMBERS

Contact Type	Specified Contact		Alternative Contact	
	Part Number	Supplier	Part Number	Supplier
Pin	30-867-6700U	Smiths Industries	M39029/44-288	QPL
	30-867-6702U	Smiths Industries	M39029/44-290	QPL
	30-867-6703U	Smiths Industries	M39029/44-291	QPL
	30-867-6816U	Smiths Industries	M39029/44-292	QPL
Socket	30-867-6704U	Smiths Industries	M39029/45-295	QPL
	30-867-6706U	Smiths Industries	M39029/45-297	QPL
	30-867-6707U	Smiths Industries	M39029/45-298	QPL
	30-867-6815U	Smiths Industries	M39029/45-299	QPL

2. INSERT CONFIGURATIONS

Refer to Subject 20-61-19.

3. CONNECTOR DISASSEMBLY

Refer to Subject 20-61-19.

4. CONNECTOR ASSEMBLY

A. Necessary Conditions

All empty contact cavities must be sealed. Refer to Subject 20-60-08.

B. Connector Assembly

Refer to Subject 20-61-19.

777 ELMS PANEL REPAIR: D SUBMINIATURE CONNECTORS

TABLE OF CONTENTS

777 ELMS PANEL REPAIR: D SUBMINIATURE CONNECTORS

1. PART NUMBERS AND DESCRIPTION

A. Connector Part Numbers

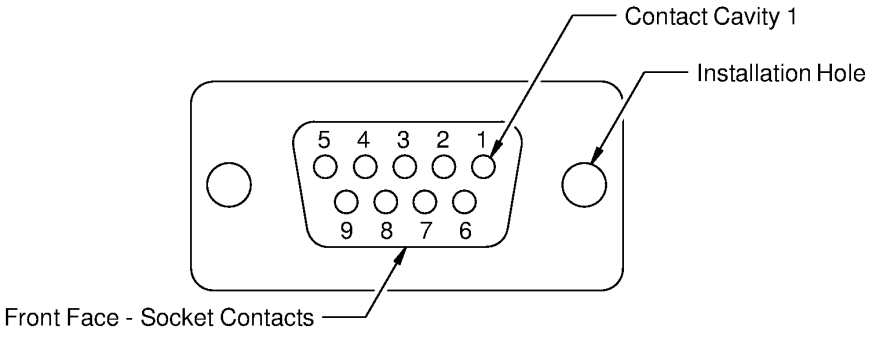
NOTE: For D-Subminiature connectors, if the connector has socket contacts, the connector is called a receptacle.

Table 1
CONNECTOR PART NUMBERS

Part Number	Type	Connector Insert Configuration	Supplier
40-742-7056	Receptacle	9	GE/Smiths Industries
40-743-2196U	Receptacle	15	GE/Smiths Industries
M24308/2-1F	Receptacle	9	QPL

Table 2
ALTERNATIVE CONNECTOR PART NUMBERS

Specified Connector		Alternative Connector	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-742-7056	GE/Smiths Industries	EVD9F00000	Positronic Industries
40-743-2196U	GE/Smiths Industries	M24308/2-2	QPL



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9 SOCKET CONTACT D-SUBMINIATURE RECEPTACLE
Figure 1

B. Contact Part Numbers

Table 3
CONTACT PART NUMBERS

Contact Size		Contact Type	Part Number	Supplier
Engaging End	Crimp Barrel			
20	20	Socket	30-867-6742U	GE/Smiths Industries

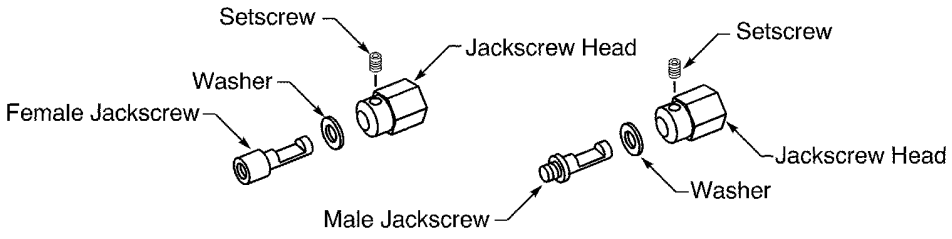
Table 4
ALTERNATIVE CONTACT PART NUMBERS

Specified Contact		Alternative Contact	
Part Number	Supplier	Part Number	Supplier
30-867-6742U	GE/Smiths Industries	M39029/63-368	QPL

C. Jackscrew Part Numbers

Table 5
JACKSCREW PART NUMBERS

Part Number	Type	Supplier
40-741-1759	Male	GE/Smiths Industries
40-741-1760	Female	GE/Smiths Industries



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MALE AND FEMALE JACKSCREWS
Figure 2

2. INSERT CONFIGURATIONS

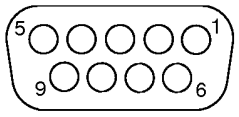
A. GE/Smiths D-Subminiature Connectors

NOTE: The contact cavity size that is specified in Table 6 is equivalent to the size of the engaging end of the contact.

NOTE: Figure 3 and Figure 4 show the front face of an receptacle insert that has socket contacts. The view of the rear face of a receptacle insert that has socket contacts is the mirror image of this view.

Table 6
CONNECTOR INSERT CONFIGURATIONS

Insert Configuration	Contact Cavity		Reference
	Count	Size	
9	9	20	Figure 3
15	15	20	Figure 4



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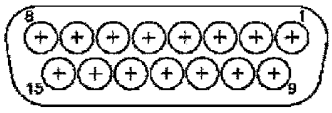
9 CONTACT SOCKET FRONT INSERT CONFIGURATION
Figure 3



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15 CONTACT SOCKET FRONT INSERT CONFIGURATION
Figure 4

3. CONNECTOR DISASSEMBLY

A. Separation of the Plug and the Receptacle

Table 7
NECESSARY TOOLS

Tool	Size (inch)
Screwdriver, Flat	-
Nut Driver	1/4

(1) Make a selection of a tool from Table 7.

(2) Turn one jackscrew counterclockwise two or three turns.

(3) Turn the other jackscrew counterclockwise two or three turns.

(4) Do Step 3.A.(2) through Step 3.A.(3) again until the jackscrews are fully disengaged.

(5) Pull the connector away from the contactor.

B. Removal of a Connector from a Panel

Table 8
NECESSARY TOOLS

Tool	Description
Screwdriver	Phillips

(1) Make a selection of a tool from Table 8.

(2) Remove the two connector installation screws.

(3) Pull the connector out of the slot in the panel.

C. Contact Removal

Table 9
CONTACT REMOVAL TOOLS

Contact Size	Removal Tool	
	Part Number	Color
20	M81969/1-02	White

(1) Make a selection of a contact removal tool from Table 9.

(2) Examine the removal tool.

WARNING: DO NOT USE A REMOVAL TOOL THAT HAS A BENT TIP OR BIT. AN INJURY CAN OCCUR.

(3) Put the tip of the removal tool on the wire near the grommet.

(4) Axially align the removal tool and the contact cavity.

(5) Carefully push the removal tool into the contact cavity until it stops.

CAUTION: DO NOT TURN THE TOOL WHILE IT IS IN THE CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(6) Carefully pull the wire and the removal tool out of the contact cavity at the same time.

(7) If the contact cannot be released:

(a) Pull the contact removal tool out of the contact cavity.

(b) Turn the removal tool approximately 90 degrees.

(c) Do Step 3.C.(3) through Step 3.C.(6) again.

4. CONNECTOR ASSEMBLY

A. Assembly of the Connector Installation Hardware

Table 10
JACKSCREWS PART NUMBERS AND POSITIONS

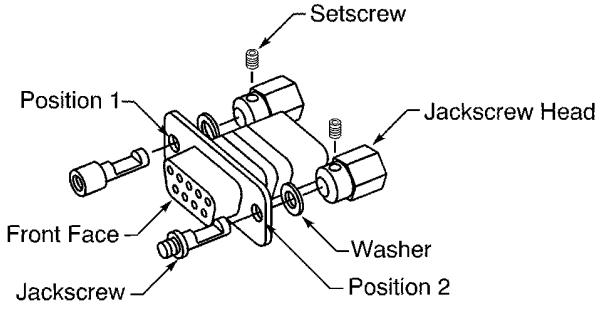
Contactor	Position Code	Jackscrew Position	Jackscrew
ELM1057-1	B	1	40-741-1759
		2	40-741-1759
ELM1058-1	C	1	40-741-1759
		2	40-741-1760
ELM1059-1	A	1	40-741-1760
		2	40-741-1759

Table 11
NECESSARY MATERIALS

Material	Part Number	Supplier
Thread Locking Compound	221	Loctite Corporation
	222	Loctite Corporation

Table 12
NECESSARY TOOLS

Tool	Size (inch)
Allen Wrench	0.05



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ASSEMBLY OF THE JACKSCREW
Figure 5

Refer to Figure 5.

(1) Make a selection of a thread locking compound from Table 11.

(2) Make a selection of an Allen wrench from Table 12.

(3) Make a selection of the necessary jackscrews from Table 10.

(4) From the front face of the connector, put a jackscrew through the installation hole in the specified position. Refer to Table 10.

(5) Put the washer on the jackscrew.

(6) Put the jackscrew head on the jackscrew.

(7) Put a drop of thread locking compound on the first two threads of the setscrew.

(8) Engage the threads of the setscrew with the threads in the jackscrew head.

(9) Tighten the setscrew.

(10) Do Step 4.A.(4) through Step 4.A.(9) again for the other jackscrew.

B. Contact Assembly

Table 13
INSULATION REMOVAL LENGTH

Wire Size (AWG)	Crimp Barrel Size	Removal Length L (inch)	
		Target	Tolerance
22	20	0.15	0.03
20	20	0.15	0.03

Table 14
CONTACT CRIMP TOOLS

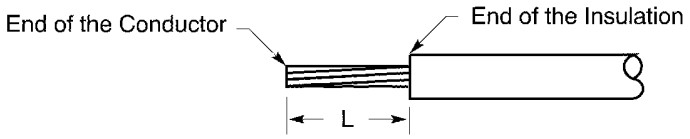
Wire Size (AWG)	Crimp Barrel Size	Crimp Tool		
		Basic Unit		Locator
		Part Number	Setting	
22	20	M22520/2-01	6	M22520/2-08
20	20	M22520/2-01	7	M22520/2-08

(1) Make a selection of a crimp tool from Table 14.

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

Refer to:

- Figure 6
- Table 13 for the insulation removal length
- Subject 20-15-04 for the insulation removal procedures.



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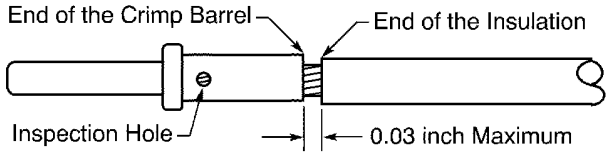
WIRE PREPARATION
Figure 6

(3) Put the end of the wire in the crimp barrel of the contact. Refer to Figure 7.
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 crimp barrel is not more than 0.03 inch.



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POSITION OF THE WIRE IN THE CRIMP BARREL
Figure 7

(4) Crimp the contact.

(5) Examine the contact assembly for these types of damage:
- A strand of the conductor is broken
- The base metal of a strand of the conductor can be seen
- The crimp barrel of the contact has a crack.

(6) If the contact or the wire has damage, replace the contact.

C. Contact Insertion

Table 15
CONTACT INSERTION TOOLS

Contact Size	Insertion Tool	
	Part Number	Color
20	M81969/1-02	Red

(1) Make a selection of a contact insertion tool from Table 15.

CAUTION: DO NOT USE A TOOL WITH A TIP THAT:
- IS BENT
- IS FLARED
- IS BROKEN
- HAS A CRACK.

WARNING: A DEFECTIVE TOOL CAN CAUSE INJURY TO THE OPERATOR.

NOTE: As an alternative, the contacts can be inserted with the hand.

(2) Put the contact assembly into the applicable end of the insertion tool.

(3) At the rear face of the connector, axially align the contact and the tool with the contact cavity.

(4) Push the tool into the contact cavity until it stops.

CAUTION: DO NOT TURN THE TOOL WHILE IT IS IN THE CONTACT CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(5) Carefully remove the tool from the contact cavity.

Make sure to keep the tool perpendicular to the rear face of the connector.

(6) Lightly pull the wire to make sure that the contact is locked in position.

CAUTION: DO NOT PULL THE WIRE WITH A STRONG OR A SUDDEN FORCE. THE FORCE CAN CAUSE DAMAGE TO THE CONNECTOR OR THE CONTACT.

CAUTION: DO NOT MAKE A DENT IN THE WIRE INSULATION WITH THE FINGERNAILS. DAMAGE TO THE WIRE INSULATION CAN CAUSE UNSATISFACTORY PERFORMANCE AND RELIABILITY OF THE WIRE.

(7) If the contact is not locked in the contact cavity:

(a) Pull the contact out of the cavity.

(b) Do Step 4.C.(2) through Step 4.C.(6) again.

5. CONNECTOR INSTALLATION

A. Connection of the Plug and the Receptacle

Table 16
NECESSARY TOOLS

Tool	Size (inch)
Screwdriver, Flat	-
Nut Driver	1/4

(1) Make a selection of a tool from Table 16.

(2) Push the plug into the receptacle in the contactor.

(3) Engage the threads of each jackscrew with the threads in the contactor.

(4) Turn one jackscrew clockwise two or three turns.

(5) Turn the other jackscrew clockwise two or three turns.

(6) Do Step 5.A.(4) through Step 5.A.(5) again until the jackscrews are fully engaged.

B. Installation of the Connector in the Panel

(1) Push the connector into the slot in panel the until the connector flange is against the panel.

(2) Engage the threads of the connector installation screws with the threads of the panel.

(3) Tighten each screw.

6. APPROVED TOOL SUPPLIERS

A. Contact Insertion and Removal Tools

Table 17
CONTACT INSERTION AND REMOVAL TOOL SUPPLIERS

Tool	Supplier
M81969/1-02	QPL

B. Contact Crimp Tools

Table 18
CONTACT CRIMP TOOL SUPPLIERS

Tool	Supplier
M22520/2-01	QPL
M22520/2-08	QPL

777 ELMS PANEL REPAIR: HIGH DENSITY D SUBMINIATURE CONNECTORS

TABLE OF CONTENTS

777 ELMS PANEL REPAIR: HIGH DENSITY D SUBMINIATURE CONNECTORS

1. PART NUMBERS AND DESCRIPTION

A. Connector Part Numbers

Table 1
CONNECTOR PART NUMBERS

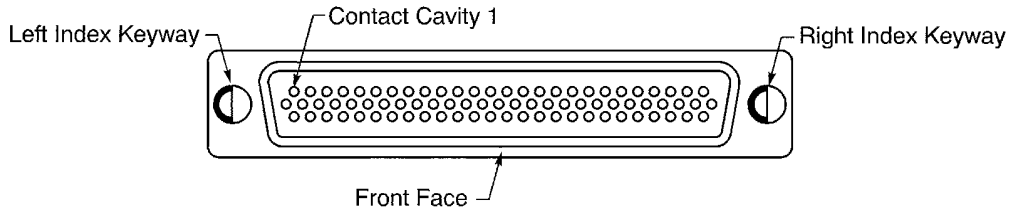
Part Number	Type	Supplier
40-743-862	Plug	Smiths Industries

Table 2
EQUIVALENT CONNECTORS

Connector	Equivalent Connector Supplied With Contacts	
	Part Number	Supplier
40-743-862	40-743-927	Smiths Industries
MRM8439	MRM7935	Miles Roystone

Table 3
EQUIVALENT CONNECTOR PART NUMBERS

Connector	Equivalent Connector	
	Part Number	Supplier
40-743-862	MRM8439	Miles Roystone
40-743-927	MRM7935	Miles Roystone



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HIGH DENSITY D SUBMINIATURE PLUG
Figure 1

B. Contact Part Numbers

Table 4
CONTACT PART NUMBERS

Contact Size		Contact Type	Part Number	Supplier
Engaging End	Crimp Barrel			
22	22	Pin	30-867-6757	Smiths Industries

Table 5
EQUIVALENT CONTACT PART NUMBERS

Contact	Equivalent Contact	
	Part Number	Supplier
30-867-6757	MR22P	Miles Roystone

C. Backshell Part Numbers

Table 6
BACKSHELL PART NUMBERS

Part Number	Supplier
ELM655-1	Smiths Industries

D. Connector Installation Hardware Part Numbers

Table 7
CONNECTOR INSTALLATION HARDWARE

Hardware	Part Number	Supplier
Dowel Pin	40-741-1741	Smiths Industries
End Cap	40-741-1793	Smiths Industries
Index Keyway, Long	MRM8401-2	Miles Roystone
Index Keyway, Short	MRM8401-1	Miles Roystone
Index Keyway Kit	40-741-1738	Smiths Industries
Jackscrew	MRM8396	Miles Roystone
Jackscrew Assembly Kit	40-741-1740	Smiths Industries

Table 8
INSTALLATION HARDWARE KIT COMPONENTS

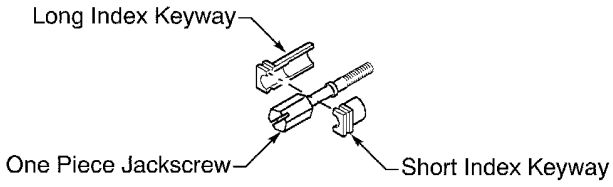
Kit	Kit Components
Index Keyway	Index Keyway, Long
	Index Keyway, Short

Table 8 INSTALLATION HARDWARE KIT COMPONENTS (Continued)

Kit	Kit Components
Jackscrew Assembly	Index Keyway, Long
	Index Keyway, Short
	Jackscrew

Table 9
ALTERNATIVE CONNECTOR INSTALLATION HARDWARE

Specified Hardware	Alternative Hardware	
	Part Number	Supplier
40-741-1741	MRM5951	Miles Roystone
40-741-1793	MRM8526	Miles Roystone



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JACKSCREW ASSEMBLY
Figure 2

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OBSOLETE JACKSCREW ASSEMBLY
Figure 3

2. CONNECTOR DISASSEMBLY

A. Separation of the Plug and the Receptacle

Table 10
NECESSARY TOOLS

Tool	Size (inch)
Flat screwdriver	-
Nut Driver	1/8

Refer to Figure 2 and Figure 3 for the different configurations of the jackscrews.

(1) Make a selection of a tool from Table 10.

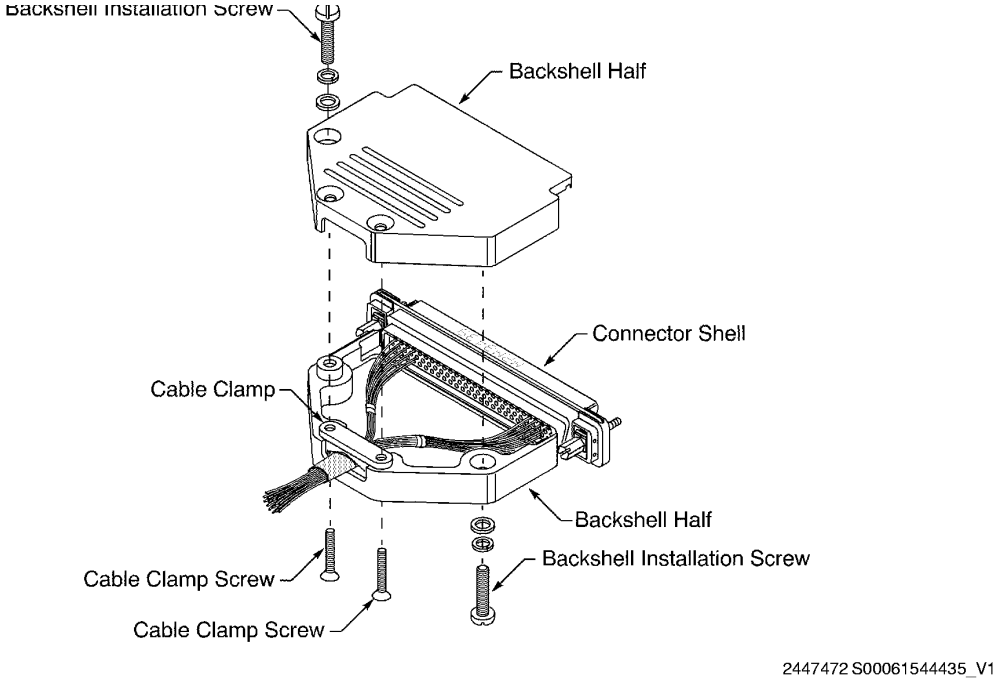
(2) Turn one jackscrew counterclockwise two or three turns.

(3) Turn the other jackscrew counterclockwise two or three turns.

(4) Do Step 2.A.(2) through Step 2.A.(3) again until the jackscrews are fully disengaged.

(5) Pull the plug away from the receptacle.

B. Backshell Removal



BACKSHELL REMOVAL
Figure 4

Refer to Figure 4.

(1) Remove the backshell installation screws.

(2) Lift the free backshell half off the wire harness and the connector shell.

(3) Remove the cable clamp installation screws.

(4) Remove the cable clamp.

(5) Pull the other backshell half off the wire harness and the connector shell.

C. Contact Removal

Table 11
CONTACT REMOVAL TOOLS

Engaging End Size	Removal Tool	
	Basic Unit	Tip
22	DHK 160	DHK160-PR-2

(1) Make a selection of a contact removal tool from Table 11.

(2) Examine the removal tool.

WARNING: DO NOT USE A REMOVAL TOOL THAT HAS A BENT TIP OR BIT. AN INJURY CAN OCCUR.

(3) At the front face of the connector, axially align the tool and the contact cavity.

CAUTION: DO NOT INSERT THE TOOL INTO THE REAR GROMMET OF THE CONNECTOR. DAMAGE TO THE CONNECTOR WILL OCCUR.

(4) Push the tool until the shoulder of the contact is pushed out farther than the retention clips.

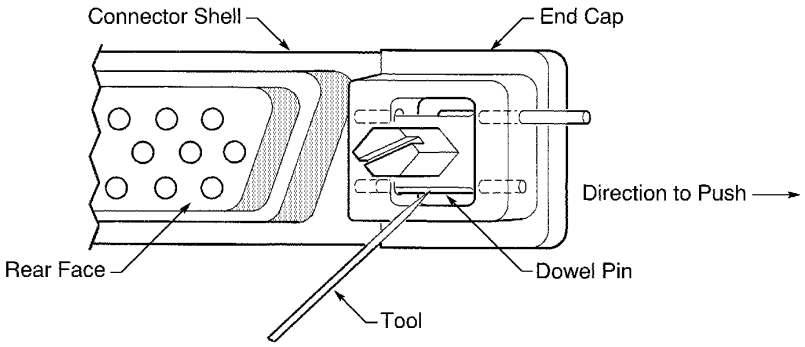
CAUTION: DO NOT USE MORE THAN THE NECESSARY AMOUNT OF FORCE TO PUSH THE REMOVAL TOOL INTO THE CONTACT CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(5) Carefully pull the tool out of the contact cavity.

(6) Pull the contact out of the rear of the connector.

D. Connector Installation Hardware Removal

(1) Remove the two dowel pins in the endcap. Refer to Figure 5.



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DOWEL PIN REMOVAL
Figure 5

(a) Put the point of a pointed metal tool on the side of the dowel pin.

(b) Push the dowel pin out of the end cap until the dowel pin can be held with pliers.

(c) Pull the dowel pin out of the end cap with pliers.

(d) Do Step (a) through Step (c) again for the other dowel pin.

(2) Pull the jackscrew and the index keyway out of the installation hole.

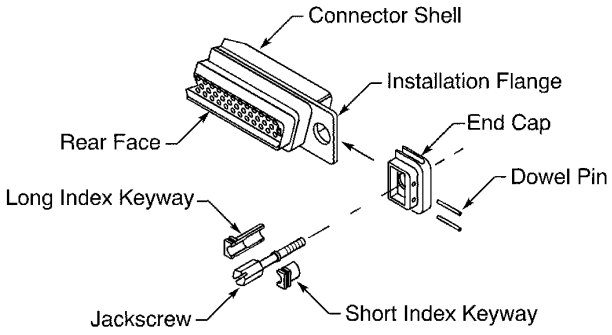
(3) Do Step 2.D.(1) through Step 2.D.(2) again to remove the other index keyway and jackscrew.

(4) Put the connector installation hardware in a safe location, they are necessary to install the connector again.

(5) If new connector installation hardware is necessary, refer to Table 7 for replacement hardware.

3. CONNECTOR ASSEMBLY

A. Assembly of the Connector Installation Hardware



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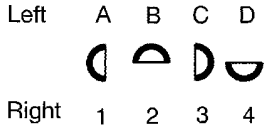
CONNECTOR INSTALLATION HARDWARE ASSEMBLY
Figure 6



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INDEX KEYWAY POLARIZATION POSITIONS
Figure 7

Refer to Figure 6 and Figure 7.

(1) Put an end cap on installation flange of the connector.
Make sure the dowel pin holes are on the rear side of the connector.

(2) Align the hole in the end cap with the hole of the flange.

(3) For an index keyway with two halves, put each half of the index keyway around the jackscrew.

(4) From the rear of the connector, put the jackscrew assembly in the installation hole with the long index keyway in the specified polarization position.

Refer to:

- Figure 1 for the location of the index keyways at the front face of the connector
- Figure 2 and Figure 3 for the different configurations of the jackscrews
- Figure 7 for the index keyway polarization positions.

(5) Push a dowel pin into each hole from the outer edge of the end cap through the groove in the index keyway.

Make sure that the dowel pins are fully installed.

(6) Do Step 3.A.(1) through Step 3.A.(5) again for the connector installation hardware on the other side of the connector.

Make sure that from the front face of the connector, the left and right index keyways are in the specified polarization position.

Refer to:

- Figure 1 for the location of the index keyways at the front face of the connector
- Figure 7 for the polarization positions.

B. Contact Assembly

Table 12
INSULATION REMOVAL LENGTH

Wire Size (AWG)	Crimp Barrel Size	Removal Length L (inch)	
		Target	Tolerance
22	22	0.125	0.03

Table 13
CONTACT CRIMP TOOLS

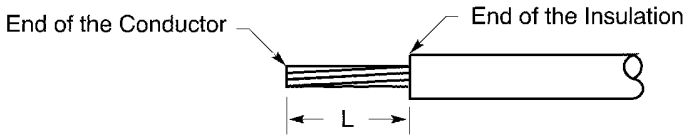
Wire Size (AWG)	Crimp Barrel Size	Crimp Tool		
		Basic Unit		Locator Part Number
		Part Number	Setting	
22	22	M22520/2-01	5	K154

(1) Make a selection of a crimp tool from Table 13.

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

Refer to:

- Figure 8
- Table 12 for the insulation removal length
- Subject 20-15-04 for the insulation removal procedures.



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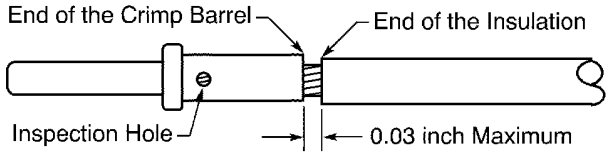
WIRE PREPARATION
Figure 8

(3) Put the end of the wire in the crimp barrel of the contact. 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 crimp barrel is not more than 0.03 inch.



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POSITION OF THE WIRE IN THE CRIMP BARREL
Figure 9

(4) Crimp the contact.

(5) Examine the contact assembly for these types of damage:
- A strand of the conductor is broken
- The base metal of a strand of the conductor can be seen
- The crimp barrel of the contact has a crack.

(6) If the contact or the wire has damage, replace the contact.

C. Contact Insertion

Table 14
CONTACT INSERTION TOOLS

Crimp Barrel Size	Removal Tool	
	Basic Unit	Tip
22	DHK 160	DHK160-26-2

(1) Make a selection of a contact insertion tool from Table 14.

WARNING: A DEFECTIVE TOOL CAN CAUSE INJURY TO THE OPERATOR.

CAUTION: DO NOT USE A TOOL WITH A TIP THAT:
- IS BENT
- IS FLARED
- IS BROKEN
- HAS A CRACK.

CAUTION: A DEFECTIVE TOOL CAN CAUSE DAMAGE TO THE GROMMET OF THE CONNECTOR OR THE CONTACT RETENTION CLIPS.

(2) Put the contact in the applicable end of the insertion tool.

(3) At the rear face of the connector, axially align the contact and the tool with the contact cavity.

(4) Carefully push the tool into the contact cavity until it stops.

CAUTION: DO NOT TURN THE TOOL WHEN IT IS IN THE CONTACT CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(5) Carefully pull the tool out of the contact cavity.

(6) Lightly pull the wire to make sure that the contact is locked in its position.

CAUTION: DO NOT PULL THE WIRE WITH A STRONG OR A SUDDEN FORCE. THE FORCE CAN CAUSE DAMAGE TO THE CONNECTOR OR THE CONTACT.

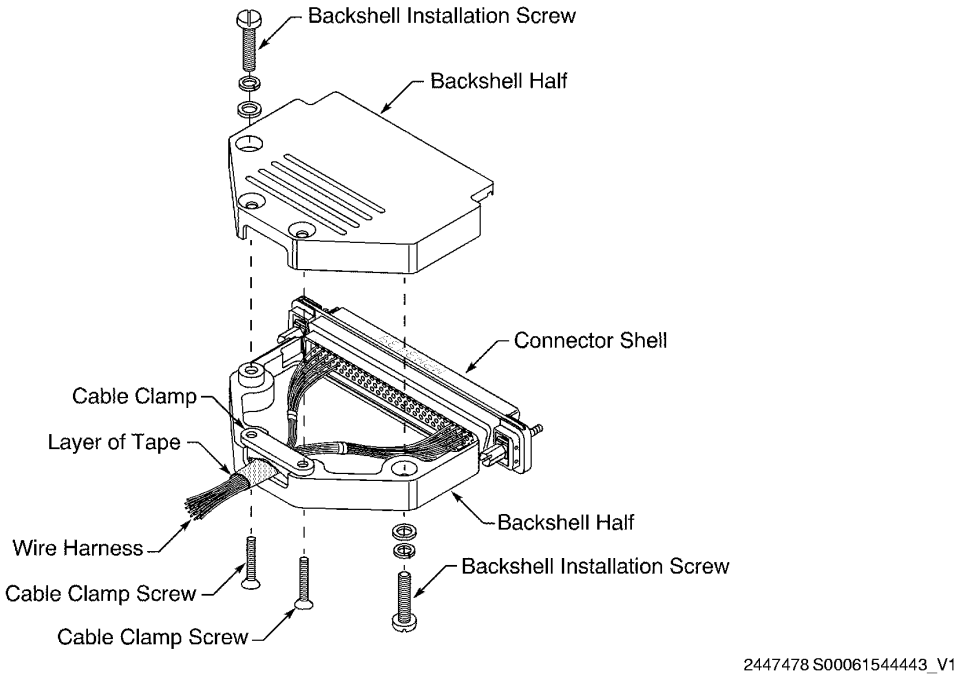
CAUTION: DO NOT MAKE A DENT IN THE WIRE INSULATION WITH THE FINGERNAILS. DAMAGE TO THE WIRE INSULATION CAN CAUSE UNSATISFACTORY PERFORMANCE AND RELIABILITY OF THE WIRE.

(7) If the contact is not locked in the contact cavity:

(a) Pull the contact out of the cavity.

(b) Do Step 3.C.(2) through Step 3.C.(6) again.

D. Backshell Assembly



BACKSHELL ASSEMBLY
Figure 10

Refer to Figure 10.

Table 15
NECESSARY MATERIALS

Material	Part Number	Supplier
Tape	Scotch 70	3M

(1) Make a selection of a tape from Table 15.

(2) Increase the O.D. of the wire harness with tape:

(a) Put a backshell half on the connector.

(b) Make a mark on the wire harness at the location of the center of the cable clamp.

(c) Remove the backshell.

(d) Wind the necessary layers of tape around the wire harness at the mark to make a tight fit in the cable clamp.

(3) Put a backshell half on the connector shell and the wire harness.

(4) Put the cable clamp on the wire harness.

(5) Install each cable clamp screw.

Make sure that:

- The screws are tight

• The clamp holds the wire harness tightly.

(6) Put the other half of the backshell on the connector shell and the wire harness.

(7) Install each backshell installation screw.
Make sure that the screws are tight.

4. CONNECTOR INSTALLATION

A. Connection of the Plug and the Receptacle

Table 16
NECESSARY TOOLS

Tool	Size (inch)
Flat screwdriver	-
Nut Driver	1/8

(1) Make a selection of a tool from Table 16.

(2) Align the plug and the receptacle.

(3) Push the plug into the receptacle.

(4) Engage the threads of each jackscrew with the threads in the nut.

(5) Turn one jackscrew on the plug clockwise two or three turns.

(6) Turn the other jackscrew on the plug clockwise two or three turns.

(7) Do Step 4.A.(5) through Step 4.A.(6) again until the jackscrews are fully engaged.

(8) Torque each screw 1.3 inch-pounds.

5. APPROVED TOOL SUPPLIERS

A. Contact Insertion and Removal Tools

Table 17
CONTACT INSERTION AND REMOVAL TOOL SUPPLIERS

Tool	Supplier
DHK 160	Daniels
DHK160-26-2	Daniels
DHK160-PR-2	Daniels

B. Contact Crimp Tools

Table 18
CONTACT CRIMP TOOL SUPPLIERS

Tool	Supplier
M22520/2-01	QPL
K154	Daniels

777 ELMS PANEL REPAIR: HYPERTAC HPW CONNECTORS

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777 ELMS PANEL REPAIR: HYPERTAC HPW CONNECTORS

1. PART NUMBERS AND DESCRIPTION

A. Connector Part Numbers

Table 1
CONNECTOR PART NUMBERS

Part Number	Type	Contact Configuration			Supplier
		Count	Size	Type	
40-743-9525	Receptacle	77	22	Socket	Smiths Industries
		30	16	Socket	
40-743-9698	Plug	46	22	Pin	Smiths Industries
		46	16	Pin	
40-743-9699	Receptacle	46	22	Socket	Smiths Industries
		46	16	Socket	

Table 2
ALTERNATIVE CONNECTOR PART NUMBERS

Specified Connector		Alternative Connector	
Part Number	Supplier	Part Number	Supplier
40-743-9525	Smiths Industries	HPW1070F0CA004	Hypertac
40-743-9698	Smiths Industries	HPW0920M0TA004	Hypertac
40-743-9699	Smiths Industries	HPW0920F0CA004	Hypertac

B. Contact Part Numbers

Table 3
CONTACT PART NUMBERS

Contact				Supplier
Engaging End Size	Crimp Barrel Size	Type	Part Number	
22	22	Pin	30-867-6819	Smiths Industries
		Socket	30-867-6820	Smiths Industries
16	16	Pin	30-867-6818	Smiths Industries
		Socket	30-867-6821	Smiths Industries

Table 4
ALTERNATIVE CONTACT PART NUMBERS

Specified Contact		Equivalent Contact	
Part Number	**Supplier**	**Part Number**	**Supplier**
30-867-6818	Smiths Industries	HPW-208-7	Hypertac
30-867-6819	Smiths Industries	HPW-200-7	Hypertac
30-867-6820	Smiths Industries	HPW-210-9	Hypertac
30-867-6821	Smiths Industries	HPW-213-9	Hypertac

C. Necessary Materials

Table 5
NECESSARY MATERIALS

Material	Part Number or Description	Supplier
Lockwire	DTD189A	Alloy Wire International
Sleeve, Heat Shrinkable	Grade B, Class 1Heat Shrinkable Sleeve	Refer to Subject 20-00-11

2. CONNECTOR DISASSEMBLY

A. Connector Separation

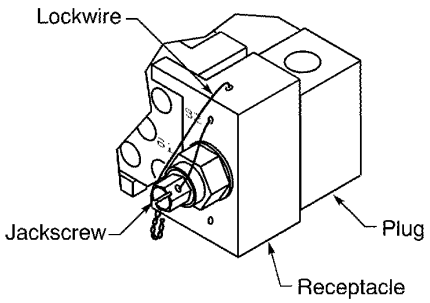
Table 6
NECESSARY TOOLS

Tool	Type	Size
Cutter	Diagonal Cutters	-
	Knife	-
Driver	Nutdriver, Hex	1/8 inch
	Screwdriver, Flat Blade	Small

(1) Make a selection of these tools from Table 6:

- A cutter
- A driver.

(2) Cut the lockwire on the jackscrew assembly on the receptacle. Refer to Figure 1.



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LOCKWIRE REMOVAL
Figure 1

(3) Remove the lockwire from the receptacle and the jackscrew.

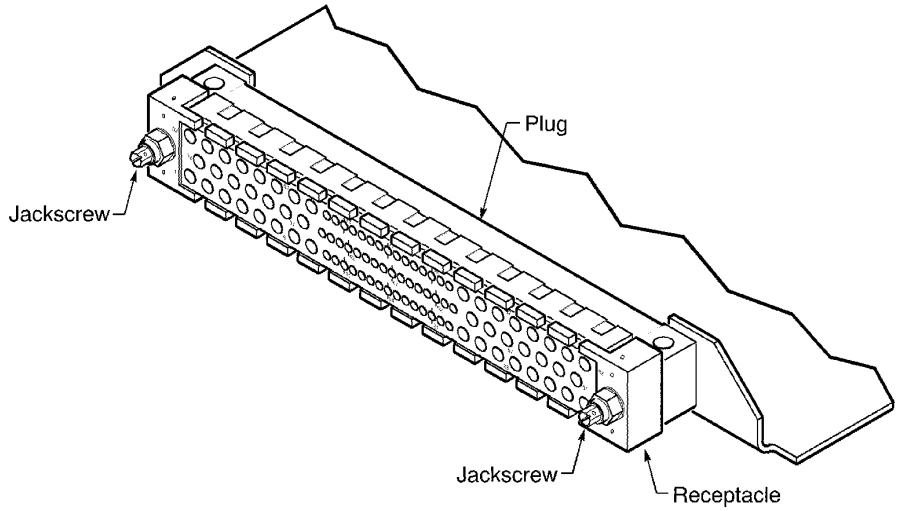
(4) Disengage the jackscrews:

(a) On one end of the receptacle, loosen the jackscrew a small amount.

(b) On the other end of the receptacle, loosen the jackscrew a small amount.

(c) Do Step (a) and Step (b) again until the jackscrews are fully disengaged.

(5) Pull the receptacle from the plug. Refer to Figure 1.



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RECEPTACLE AND PLUG SEPARATION
Figure 2

B. Contact Removal

Table 7
CONTACT REMOVAL TOOLS

Contact Engaging End Size	Removal Tool
22	HPW521
16	HPW512

(1) Make a selection of a contact removal tool from Table 4.

(2) At the front face of the connector, axially align the removal tool and the contact cavity.

(3) Carefully push the removal tool into the contact cavity until it stops.

(4) From the rear of the connector, pull the contact out of the contact cavity.

3. CONNECTOR ASSEMBLY

A. Contact Assembly

Table 8
INSULATION REMOVAL LENGTH

Wire Size (AWG)	Contact Crimp Barrel Size	Removal Length (inch)		Special Instructions
		Target	Tolerance	
22	22	0.16	±0.03	-
	16	0.56	±0.03	Fold the conductor back
20	16	0.29	±0.03	-
18	16	0.29	±0.03	-
16	16	0.29	±0.03	-

Table 9
CONTACT CRIMP TOOLS

Wire Size (AWG)	Crimp Barrel Size	Crimp Tool		
		Basic Unit		Locator
		Part Number	Setting	
22	22	M22520/7-01	3	86-263
	16	M22520/1-01	4	TP1177
20	16	M22520/1-01	4	TP1177
18	16	M22520/1-01	5	TP1177
16	16	M22520/1-01	6	TP1177

(1) Make a selection of a heat shrinkable sleeve from Table 5.
Make sure that the sleeve has the smallest diameter that can move easily on the wire.

NOTE: For alternative heat shrinkable sleeves, refer to Subject 20-00-11.

(2) Make a selection of a crimp tool from Table 9.

(3) Put a 1 inch length of the heat shrinkable sleeve on the wire.

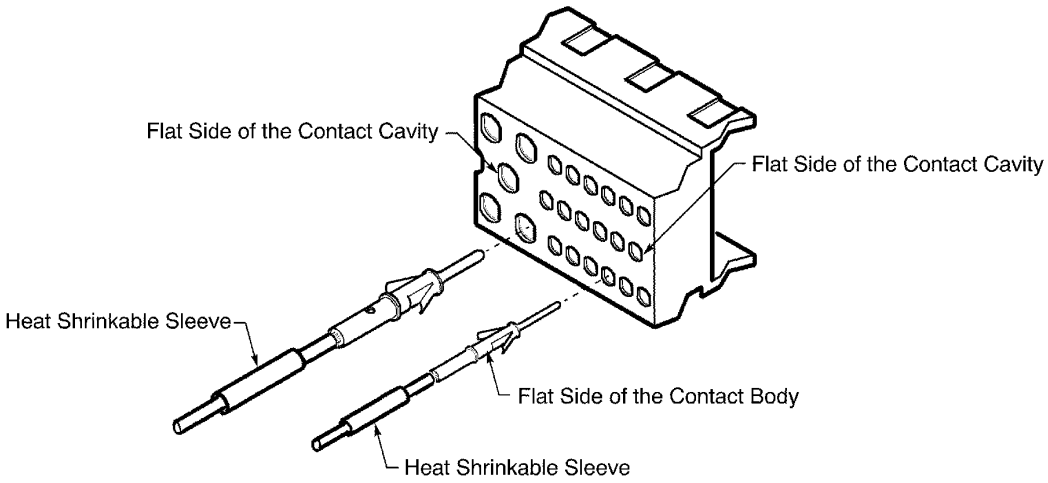
(4) Remove the necessary length of insulation from the end of the wire. Refer to Table 8.

(5) Put the end of the wire in the crimp barrel of the contact.

(6) Crimp the contact.

B. Contact Insertion

(1) Align the flat sides of the body of the contact with the flat sides of the contact cavity. Refer to Figure 3.



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ALIGNMENT OF THE CONTACT AND CONTACT CAVITY
Figure 3

(2) Carefully push the contact into the contact cavity until it stops.

(3) Lightly pull the wire to make sure the contact is locked in the contact cavity.

(4) If the contact is not locked in the contact cavity, do Step 3.B.(1) through Step 3.B.(3) again.

(5) Push the heat shrinkable sleeve forward until the forward end of the sleeve is against the rear surface of the connector.

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

4. CONNECTOR INSTALLATION

A. Assembly of the Plug Jackscrew Socket

Table 10
NECESSARY MATERIALS

Material	Part Number	Supplier
Activator	Loctite 7471	Loctite
Sealant	Loctite 221	Loctite
	Loctite 222	Loctite

Table 11
NECESSARY TOOLS

Tool	Type	Size
Driver	Nutdriver, Hex	1/4 inch

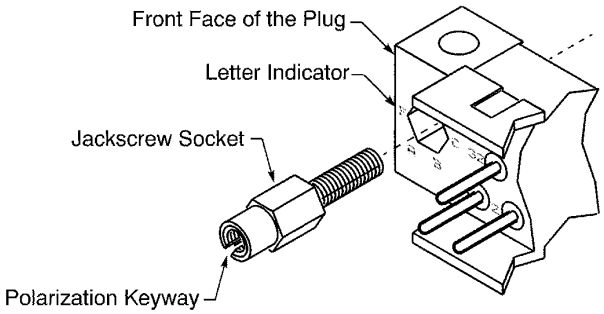
(1) Make a selection of these materials from Table 10:

- A sealant
- An activator.

(2) Make a selection of a driver from Table 11.

(3) Put the jackscrew socket in the hole in the left side of the front face of the plug. Refer to Figure 4.

Make sure that the polarization keyway is aligned with the correct letter indicator.



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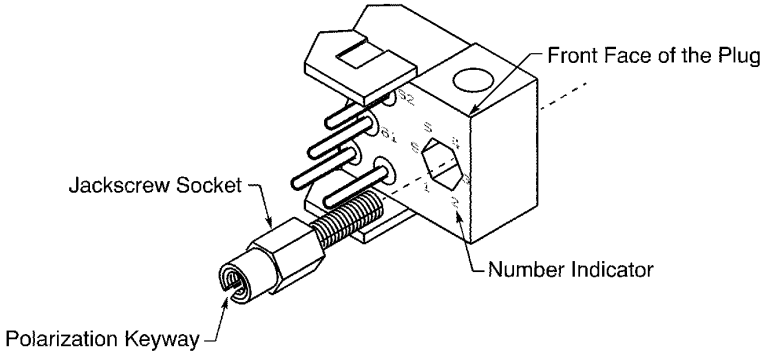
LEFT JACKSCREW SOCKET POLARIZATION
Figure 4

(4) Put the jackscrew socket in the hole in the right side of the front face of the plug. Refer to Figure 5.

Make sure that the polarization keyway is aligned with the correct number indicator.



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RIGHT JACKSCREW SOCKET POLARIZATION
Figure 5

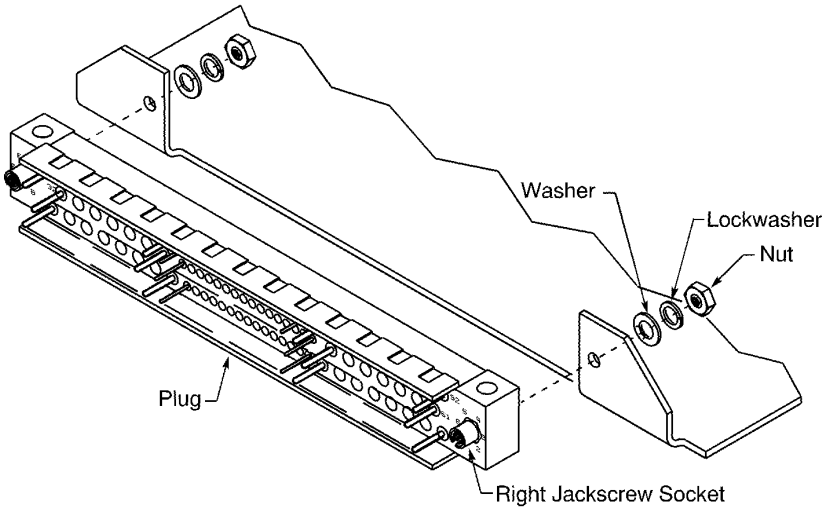
(5) Prepare the installation nuts:

(a) Put a small amount of the activator on the threads of each installation nut.

(b) Let the activator dry for 10 minutes minimum.

(c) Put a small amount of sealant on the threads of each nut.

(6) Install the plug. Refer to Figure 6.



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PLUG INSTALLATION
Figure 6

(a) Put the threads of the jackscrew socket in the installation holes of the structure.

(b) Put a washer on each of the jackscrew sockets.

(c) Put a lock washer on each of the jackscrew sockets.

(d) Fully engage the threads of each nut with the threads of the applicable jackscrew socket.

(e) Torque each nut 4 inch-pounds ±0.4 inch-pounds.

B. Assembly of the Receptacle Jackscrew

Table 12
NECESSARY TOOLS

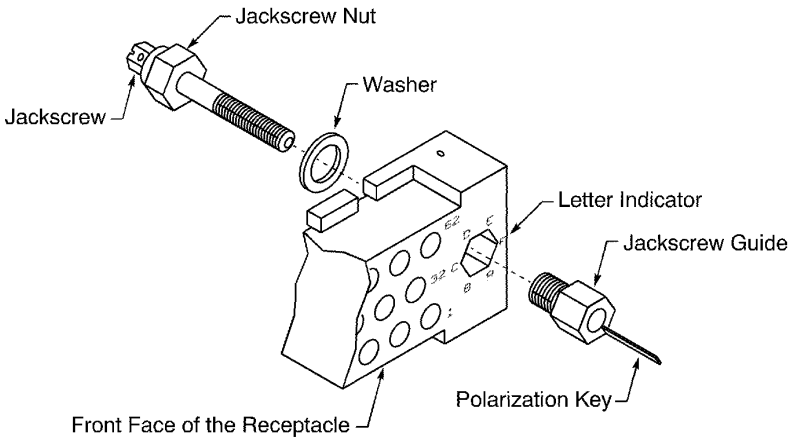
Tool	Type	Size
Driver	Nutdriver, Hex	1/4 inch

(1) Make a selection of a driver from Table 12.

(2) Put one of the jackscrew guides in the hole in the right side of the front face of the receptacle. Refer to Figure 7.

Make sure that the polarization key:

- Is aligned with the correct letter indicator
- Is pointed away from the connector.



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RIGHT JACKSCREW POLARIZATION
Figure 7

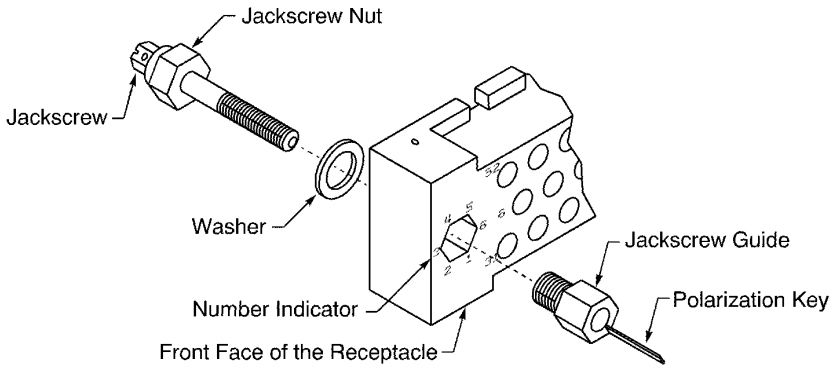
(3) Put a washer on the end of one of the jackscrews.

(4) From the rear of the connector, fully engage the threads of the jackscrew and the jackscrew guide.

(5) Put the other jackscrew guide in the hole in the left side of the front face of the receptacle.

Make sure that the polarization key:

- Is aligned with the correct number indicator
- Is pointed away from the connector.



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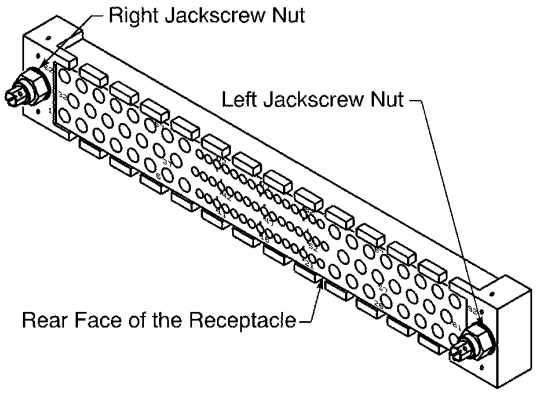
LEFT JACKSCREW POLARIZATION
Figure 8

(6) Put a washer on the end of the other jackscrew.

(7) From the rear of the connector, fully engage the threads of the jackscrew and the jackscrew guide.

(8) From the rear of the connector, torque each jackscrew nut 4 inch-pounds ±0.4 inch-pounds. Refer to Figure 9.



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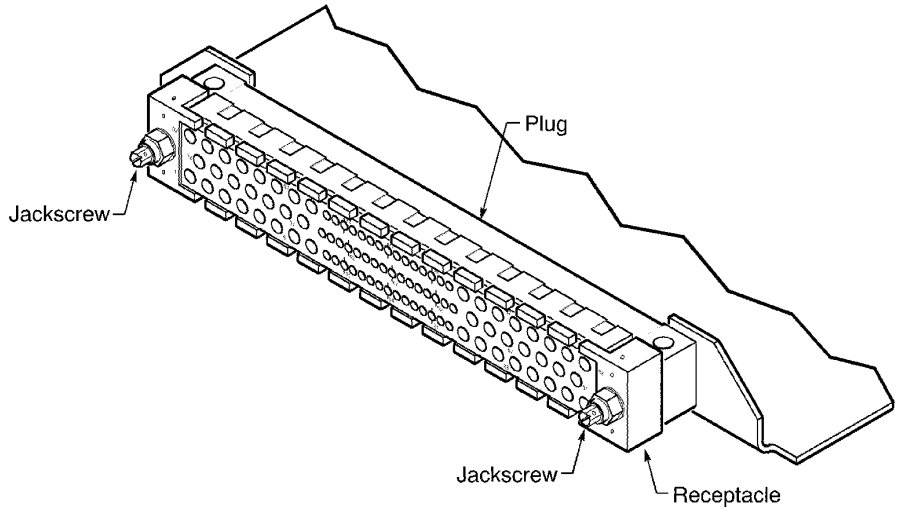
RECEPTACLE JACKSCREW ASSEMBLY
Figure 9

C. Plug and Receptacle Connection

Table 13
NECESSARY TOOLS

Tool	Type	Size
Driver	Nutdriver, Hex	1/8 inch
	Screwdriver, Flat Blade	Small
Pliers	Lock	-
	Wire Twister	-



RECEPTACLE AND PLUG CONNECTION
Figure 10

Refer to Figure 10.

(1) Make a selection of a driver from Table 13.

(2) Align the engaging face of the receptacle with the engaging face of the plug.

(3) Push the receptacle straight against the plug.

(4) On one end of the receptacle, engage the threads of the jackscrew and the jackscrew a small amount.

(5) On the other end of the receptacle, engage the threads of the jackscrew and the jackscrew a small amount.

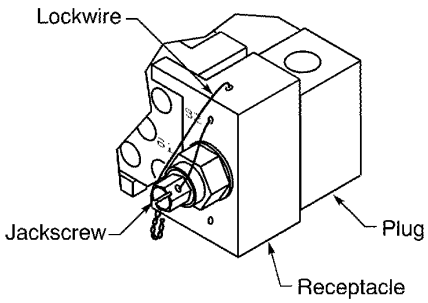
(6) Tighten one of the jackscrews a small amount.

(7) Tighten the other jackscrew a small amount.

(8) Do Step 4.C.(6) and Step 4.C.(7) again until the jackscrews are fully tightened.

(9) Torque each jackscrew 1.3 inch-pounds ±0.1 inch-pounds.

(10) Install the necessary length of lockwire on one end of the receptacle. Refer to Figure 11.



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LOCKWIRE INSTALLATION
Figure 11

(a) Make a selection of lockwire from Table 5.

(b) Make a selection of pliers from Table 13.

(c) Push one end of the lockwire through the hole in the jackscrew.

(d) Push the same end of the lockwire into the hole on the rear surface of the receptacle.

(e) Pull the end of the lockwire from the hole on the top surface of the receptacle.

(f) Twist the ends of the lockwire together.

(g) Remove the necessary length of the twisted lockwire to make the distance from the end of the lockwire to the jackscrew equal to approximately 0.25 inch.

(h) Fold the end of the twisted lockwire:

- Back against the rear surface of the receptacle
- Away from the nearest contact cavities.

5. APPROVED TOOL SUPPLIERS

A. Contact Removal Tools

Table 14
CONTACT REMOVAL TOOL SUPPLIERS

Removal Tool	Supplier
HPW512	Hypertac

Table 14 CONTACT REMOVAL TOOL SUPPLIERS (Continued)

Removal Tool	Supplier
HPW521	Hypertac

B. Contact Crimp Tools

Table 15
CONTACT CRIMP TOOL SUPPLIERS

Crimp Tool	Supplier
86-263	Daniels
M22520/1-01	QPL
M22520/7-01	QPL
TP1177	Daniels

777 ELMS PANEL REPAIR: HARWIN M80 DATAMATE CONNECTORS

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777 ELMS PANEL REPAIR: HARWIN M80 DATAMATE CONNECTORS

1. PART NUMBERS AND DESCRIPTION

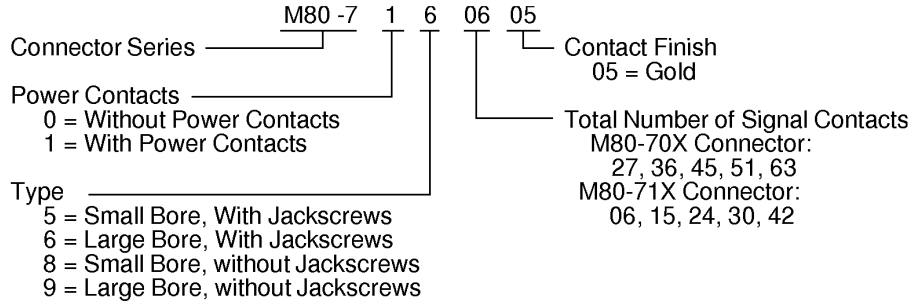
A. Connector Part Numbers

Table 1
CONNECTOR PART NUMBERS

Part Number	Type	Connector Contact Cavities			Supplier
		Count	Size	Type	
40-742-6045	Receptacle	6	22	Socket	GE Aviation
		2	16	Socket	

Table 2
ALTERNATIVE CONNECTOR PART NUMBERS

Specified Connector		Alternative Connector	
Part Number	Supplier	Part Number	Supplier
40-742-6045	GE Aviation	M80-7160605	Harwin



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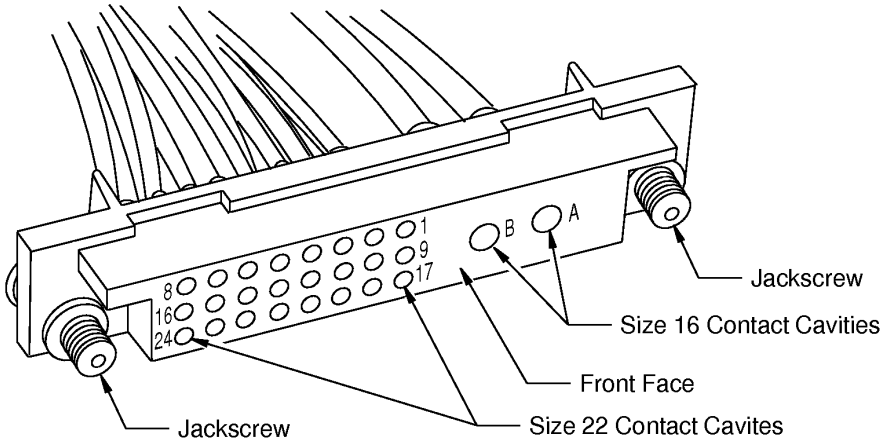
HARWIN M80 DATAMATE CONNECTOR PART NUMBER STRUCTURE
Figure 1



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HARWIN M80 DATAMATE CONNECTOR
Figure 2

B. Contact Part Numbers

Table 3
CONTACT PART NUMBERS

Contact				Supplier
Engaging End Size	Crimp Barrel Size	Type	Part Number	
22	22	Socket	M80-0130005	Harwin
16	16	Socket	M80-0550005	Harwin

C. Necessary Materials

Table 4
NECESSARY MATERIALS

Material	Description	Supplier
Sleeve, Heat Shrinkable	Grade B, Class 1 Heat Shrinkable Sleeve	Refer to Subject 20-00-11

2. CONNECTOR DISASSEMBLY

A. Connector Separation

Table 5
NECESSARY TOOLS

Tool	Type	Size
Driver	Hex driver or Allen wrench	2.0 millimeters

(1) Make a selection of a driver from Table 5.

(2) Disengage the jackscrews:

(a) On one end of the receptacle, loosen the jackscrew a small amount.

(b) On the other end of the receptacle, loosen the jackscrew a small amount.

(c) Do Step (a) and Step (b) again until the jackscrews are fully disengaged.

(3) Pull the receptacle from the plug.

B. Removal of Contacts

CAUTION: THE REMOVAL OF A CONTACT CAUSES NON-REPAIRABLE DAMAGE TO THE CONNECTOR. THE CONTACT CAVITY OF THE CONNECTOR CAN NOT HOLD A CONTACT AFTER A CONTACT HAS BEEN REMOVED.

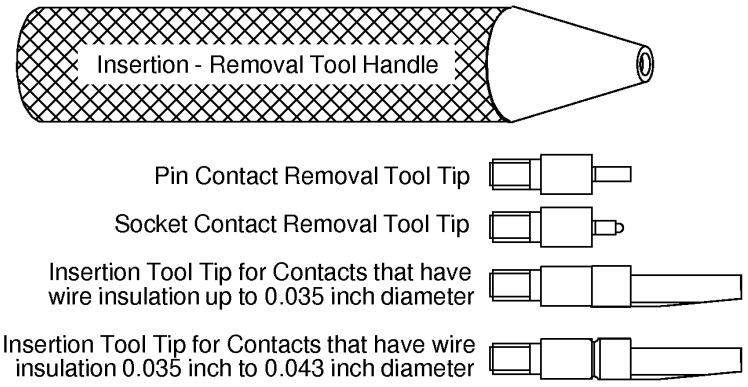
CAUTION: IF A CONTACT IS REMOVED, THE CONNECTOR MUST BE DISCARDED AND A NEW CONNECTOR MUST BE ASSEMBLED.

Table 6
CONTACT REMOVAL TOOLS

Part Number	Supplier
T5748-19	Harwin
Z80-280	Harwin

(1) Make a selection of a contact removal tool from Table 6.

(2) Make a selection of a removal tool tip. Refer to Figure 3.



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CONTACT INSERTION - REMOVAL TOOL
Figure 3

(3) Put the removal tool tip on the handle.

(4) At the front face of the connector, put the removal tool tip on the engaging end of the contact.

(5) Push the tool and the contact toward the rear of the connector until the contact is removed.

NOTE: THE CONNECTOR NOW HAS DAMAGE

NOTE: THE CONNECTOR MUST BE DISCARDED

NOTE: A NEW CONNECTOR MUST BE ASSEMBLED.

3. CONNECTOR ASSEMBLY

A. Contact Assembly

Table 7
INSULATION REMOVAL LENGTH

Wire Size (AWG)	Contact Crimp Barrel Size	Removal Length (inch)	
		Target	Tolerance
22	22	0.08	±0.03
18	16	0.08	±0.03

Table 8
CONTACT CRIMP TOOLS

Crimp Barrel Size	Wire Size (AWG)	Crimp Tool				
		Basic Unit			Locator	
		Part Number	Setting	Supplier	Part Number	Supplier
22	22	M22520/2-01	6	QPL	K778-1	Glenair
		AFM8	6	Daniels	K778-1	Glenair
16	18	M22520/7-01	7	QPL	86-306	Daniels
		MH860	7	Daniels	86-306	Daniels

(1) Make a selection of a heat shrinkable sleeve from Table 4.
Make sure that the sleeve has the smallest diameter that can move easily on the wire.

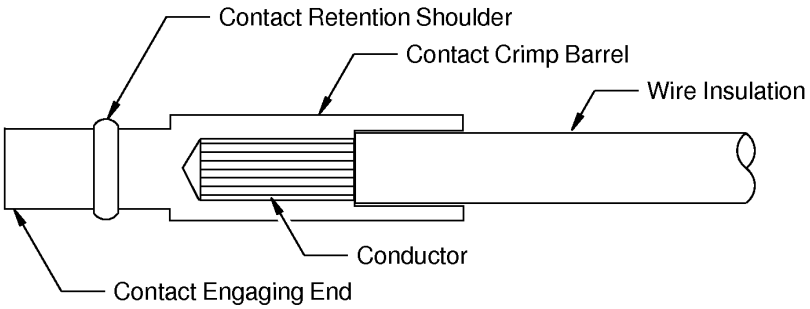
NOTE: For alternative heat shrinkable sleeves, refer to Subject 20-00-11.

(2) Make a selection of a crimp tool from Table 8.

(3) Put a 1.0 inch ±0.1 inch length of the heat shrinkable sleeve on the wire.

(4) Remove the necessary length of insulation from the end of the wire. Refer to Table 7.

(5) Put the end of the wire in the contact crimp barrel. Refer to Figure 4.



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POSITION OF THE CONDUCTOR IN THE CONTACT CRIMP BARREL
Figure 4

(6) Crimp the contact.

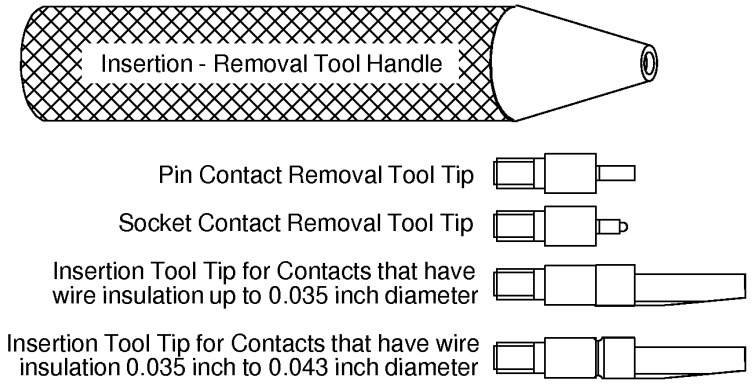
B. Contact Insertion

Table 9
CONTACT INSERTION TOOLS

Part Number	Supplier
T5748-19	Harwin
Z80-280	Harwin

(1) Make a selection of a contact insertion tool from Table 9.

(2) Make a selection of an insertion tool tip. Refer to Figure 5.



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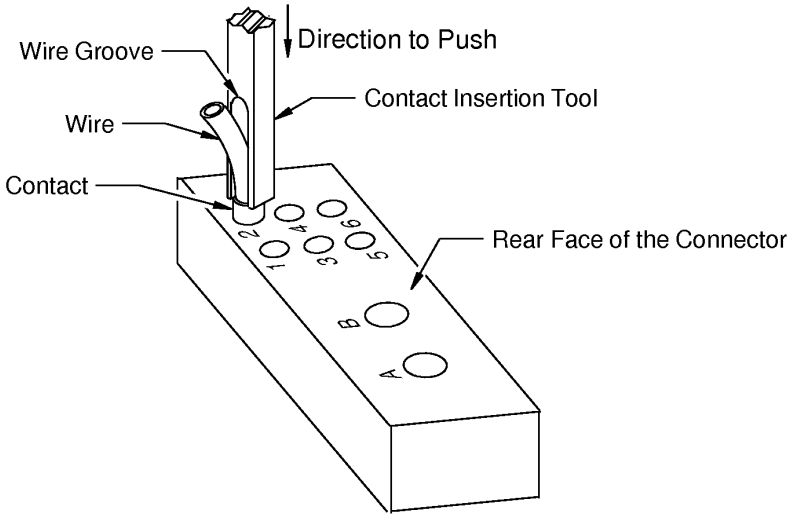
CONTACT INSERTION - REMOVAL TOOL
Figure 5

(3) Put the insertion tool tip on the handle.

(4) At the rear face of the connector, put the engaging end of the contact assembly into the correct contact cavity.

(5) Put the insertion tool tip on the end of the crimp barrel of the contact. Refer to Figure 6.



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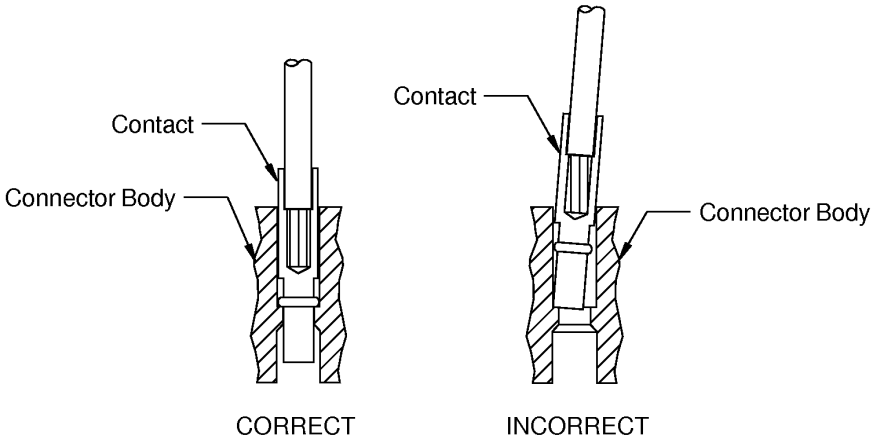
CONTACT INSERTION
Figure 6

(6) Push the insertion tool into the contact cavity until the contact makes a click. Refer to Figure 7.

NOTE: It is recommended to hold the plastic part of the connector against a hard surface during contact insertion.

CAUTION: MAKE SURE THAT THE INSERTION TOOL STAYS PERPENDICULAR TO THE REAR FACE OF THE CONNECTOR DURING CONTACT INSERTION. DAMAGE TO THE CONTACTS OR THE CONNECTOR CAN OCCUR.

CAUTION: MAKE SURE THAT THE FORCE THAT IS APPLIED DURING CONTACT INSERTION IS NOT ON THE JACKSCREWS, OR OTHER CONTACTS DURING CONTACT INSERTION. DAMAGE TO THE PLASTIC CONNECTOR BODY, CONTACTS, OR OTHER COMPONENTS CAN OCCUR.



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CORRECT AND INCORRECT POSITIONS OF THE CONTACT IN THE CAVITY
Figure 7

(7) Push the heat shrinkable sleeve forward until the forward end of the sleeve is against the rear surface of the connector.

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

Make sure that the forward end of the sleeve is against the rear surface of the connector.

4. CONNECTOR INSTALLATION

A. Plug and Receptacle Connection

Table 10
NECESSARY TOOLS

Tool	Type	Size
Driver	Hex driver or Allen wrench	2.0 millimeters

(1) Make a selection of a driver from Table 10.

(2) Push the receptacle straight against the plug.

(3) Engage the threads of the jackscrews of the receptacle with the plug connector:

(a) On one end of the receptacle, tighten the jackscrew a small amount.

(b) On the other end of the receptacle, tighten the jackscrew a small amount.

(c) Do Step (a) and Step (b) again until the jackscrews are fully tightened.

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

TABLE OF CONTENTS

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

1. PART NUMBERS AND DESCRIPTION

A. Relay Socket Part Numbers

Table 1
RELAY SOCKET PART NUMBERS

Part Number	Installation Configuration	Relay Configuration	Supplied	Supplier	Reference
40-617-2010	Type 1	4 Pole	With Contacts	GE/Smiths Industries	Figure 4
40-617-2013	Type 4	2 Pole	Without Contacts	GE/Smiths Industries	Figure 2
40-617-2014	Type 4	2 Pole	Without Contacts	GE/Smiths Industries	Figure 2
40-617-2015	Type 4	3 Pole	Without Contacts	GE/Smiths Industries	Figure 3
40-617-2016	Type 4	3 Pole	Without Contacts	GE/Smiths Industries	Figure 3
40-617-2017	Type 4	4 Pole	Without Contacts	GE/Smiths Industries	Figure 4
40-617-2018	Type 4	4 Pole	Without Contacts	GE/Smiths Industries	Figure 4
40-617-286	Type 2	4 Pole	Without Contacts	GE/Smiths Industries	Figure 4
40-617-287	Type 2	2 Pole	Without Contacts	GE/Smiths Industries	Figure 2
40-617-288	Type 2	3 Pole	Without Contacts	GE/Smiths Industries	Figure 3
40-617-289	Type 2	4 Pole	Without Contacts	GE/Smiths Industries	Figure 4
40-617-290	Type 2	4 Pole	Without Contacts	GE/Smiths Industries	Figure 4
40-617-291	Type 2	2 Pole	Without Contacts	GE/Smiths Industries	Figure 2
40-617-292	Type 2	2 Pole	Without Contacts	GE/Smiths Industries	Figure 2
40-617-293	Type 2	1 Pole	Without Contacts	GE/Smiths Industries	Figure 1
40-617-294	Type 2	3 Pole	Without Contacts	GE/Smiths Industries	Figure 3
40-617-295	Type 2	3 Pole	Without Contacts	GE/Smiths Industries	Figure 3
40-617-296	Type 2	1 Pole	Without Contacts	GE/Smiths Industries	Figure 1

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

Table 1 RELAY SOCKET PART NUMBERS (Continued)

Part Number	Installation Configuration	Relay Configuration	Supplied	Supplier	Reference
40-617-298	Type 3	2 Pole	With Contacts	GE/Smiths Industries	Figure 2

Table 2
ALTERNATIVE RELAY SOCKETS SUPPLIED WITH CONTACTS

Specified Relay Socket		Alternative Relay Socket Supplied With Contacts	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-617-2010	GE/Smiths Industries	RSE120049	Amphenol/PCD
40-617-286	GE/Smiths Industries	40-617-269	GE/Smiths Industries
40-617-287	GE/Smiths Industries	40-617-270	GE/Smiths Industries
40-617-288	GE/Smiths Industries	40-617-271	GE/Smiths Industries
40-617-289	GE/Smiths Industries	40-617-272	GE/Smiths Industries
40-617-290	GE/Smiths Industries	40-617-274	GE/Smiths Industries
40-617-291	GE/Smiths Industries	40-617-275	GE/Smiths Industries
40-617-292	GE/Smiths Industries	40-617-282	GE/Smiths Industries
40-617-293	GE/Smiths Industries	40-617-276	GE/Smiths Industries
40-617-294	GE/Smiths Industries	40-617-277	GE/Smiths Industries
40-617-295	GE/Smiths Industries	40-617-278	GE/Smiths Industries
40-617-296	GE/Smiths Industries	40-617-279	GE/Smiths Industries
RSE120025	Amphenol/PCD	RSE120028	Amphenol/PCD
RSE500211	Amphenol/PCD	RSE500201	Amphenol/PCD
RSE500212	Amphenol/PCD	RSE500202	Amphenol/PCD
RSE500311	Amphenol/PCD	RSE500301	Amphenol/PCD
RSE500312	Amphenol/PCD	RSE500302	Amphenol/PCD
RSE500314	Amphenol/PCD	RSE500304	Amphenol/PCD
RSE500315	Amphenol/PCD	RSE500305	Amphenol/PCD
RSE500316	Amphenol/PCD	RSE500306	Amphenol/PCD
RSE500411	Amphenol/PCD	RSE500401	Amphenol/PCD
RSE500412	Amphenol/PCD	RSE500402	Amphenol/PCD
RSE500413	Amphenol/PCD	RSE500403	Amphenol/PCD
RSE500414	Amphenol/PCD	RSE500404	Amphenol/PCD

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

Table 3
ALTERNATIVE RELAY SOCKET PART NUMBERS

Specified Relay Socket		Alternative Relay Socket	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-617-2010	GE/Smiths Industries	RSE120049	Amphenol/PCD
40-617-2013	GE/Smiths Industries	JRS200210	Amphenol/PCD
40-617-2014	GE/Smiths Industries	JRS200310	Amphenol/PCD
40-617-2015	GE/Smiths Industries	JRS300110	Amphenol/PCD
40-617-2016	GE/Smiths Industries	JRS310110	Amphenol/PCD
40-617-2017	GE/Smiths Industries	JRS400110	Amphenol/PCD
40-617-2018	GE/Smiths Industries	JRS400510	Amphenol/PCD
40-617-269	GE/Smiths Industries	RSE500201	Amphenol/PCD
40-617-270	GE/Smiths Industries	RSE500202	Amphenol/PCD
40-617-271	GE/Smiths Industries	RSE500301	Amphenol/PCD
40-617-272	GE/Smiths Industries	RSE500302	Amphenol/PCD
40-617-274	GE/Smiths Industries	RSE500304	Amphenol/PCD
40-617-275	GE/Smiths Industries	RSE500305	Amphenol/PCD
40-617-276	GE/Smiths Industries	RSE500401	Amphenol/PCD
40-617-277	GE/Smiths Industries	RSE500402	Amphenol/PCD
40-617-278	GE/Smiths Industries	RSE500403	Amphenol/PCD
40-617-279	GE/Smiths Industries	RSE500404	Amphenol/PCD
40-617-282	GE/Smiths Industries	RSE500306	Amphenol/PCD
40-617-286	GE/Smiths Industries	RSE500211	Amphenol/PCD
40-617-287	GE/Smiths Industries	RSE500212	Amphenol/PCD
40-617-288	GE/Smiths Industries	RSE500311	Amphenol/PCD
40-617-289	GE/Smiths Industries	RSE500312	Amphenol/PCD
40-617-290	GE/Smiths Industries	RSE500314	Amphenol/PCD
40-617-291	GE/Smiths Industries	RSE500315	Amphenol/PCD
40-617-292	GE/Smiths Industries	RSE500316	Amphenol/PCD
40-617-293	GE/Smiths Industries	RSE500411	Amphenol/PCD
40-617-294	GE/Smiths Industries	RSE500412	Amphenol/PCD
40-617-295	GE/Smiths Industries	RSE500413	Amphenol/PCD
40-617-296	GE/Smiths Industries	RSE500414	Amphenol/PCD
40-617-298	GE/Smiths Industries	RSE120028	Amphenol/PCD

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

B. Contact Part Numbers

Table 4
CONTACT PART NUMBERS

Contact Size		Contact Type	Part Number	Supplier
Engaging End	Crimp Barrel			
22	22	Socket	30-867-6709-01U	GE/Smiths Industries
	20	Socket	30-867-6797	GE/Smiths Industries
20	20	Socket	30-867-6710-02U	GE/Smiths Industries
16	20	Socket	30-867-6709-04U	GE/Smiths Industries
	16	Socket	30-867-6709-03U	GE/Smiths Industries
12	16	Socket	30-867-6709-06U	GE/Smiths Industries
	12	Socket	30-867-6709-05U	GE/Smiths Industries

Table 5
ALTERNATIVE CONTACT PART NUMBERS

Specified Contact		Alternative Contact	
Part Number	Supplier	Part Number	Supplier
30-867-6709-01U	GE/Smiths Industries	M39029/92-531	QPL
30-867-6797	GE/Smiths Industries	CNS109900	Amphenol/PCD
30-867-6710-02U	GE/Smiths Industries	M39029/101-553	QPL
30-867-6709-03U	GE/Smiths Industries	M39029/92-533	QPL
30-867-6709-04U	GE/Smiths Industries	M39029/92-534	QPL
30-867-6709-05U	GE/Smiths Industries	M39029/92-535	QPL
30-867-6709-06U	GE/Smiths Industries	M39029/92-536	QPL

C. Relay Socket Installation Hardware Part Numbers

Table 6
RELAY SOCKET INSTALLATION HARDWARE PART NUMBERS

Installation Configuration	Hardware	Part Number	Supplier	Size	Outer Dimension (inch)	Note
Type 1	Hex Lock Nut	200007201	Amphenol/PCD	8-32	7/32	-
	Spacer	ELM359	GE/Smiths Industries	-	-	Not supplied with relay socket
Type 2	Mounting Stud	200500111	Amphenol/PCD	-	-	-
	Flat Washer	200500401	Amphenol/PCD	4	0.281 O.D. 0.030 Thick	-
	Hex Lock Nut	NAS679C04MW	QPL	4-40	1/4	-

Table 6 RELAY SOCKET INSTALLATION HARDWARE PART NUMBERS (Continued)

Installation Configuration	Hardware	Part Number	Supplier	Size	Outer Dimension (inch)	Note
Type 3	Mounting Stud	200006601	Amphenol/PCD	-	-	-
	Lock Washer	NAS1676C4	QPL	4	-	-
	Flat Washer	30-298-116-03	GE/Smiths Industries	4	-	Not supplied with relay socket
	Hex Nut	200006901	Amphenol/PCD	4-40	3/16	-
Type 4 (Snap-In)	None	-	-	-	-	-

Table 7
RELAY INSTALLATION HARDWARE PART NUMBERS

Installation Configuration	Hardware	Part Number	Supplier	Size	Outer Dimension (inch)	Notes
Type 1	Hex Lock Nut	200003801	Amphenol/PCD	4-40	5/32	-
	Flat Washer	200000401	Amphenol/PCD	4	-	-
Type 2	Phillips Pan Head Screw	MS51957-12	QPL	4-40	-	-
	Lock Washer	NAS1676C4	QPL	4	-	-
	Flat Washer	30-298-116-03	GE/Smiths Industries	4	-	-
Type 3	Phillips Pan Head Screw	MS51957-12	QPL	4-40	-	-
	Flat Washer	30-298-116-03	GE/Smiths Industries	4	-	-
	Lock Washer	NAS1676C4	QPL	4	-	-
	Spacer	ELM1019-1	GE/Smiths Industries	-	-	Not supplied with relay socket
Type 4	Phillips Pan Head Screw	200002200	Amphenol/PCD	4-40	-	Supplied with relay socket
	Compression Spring	200692200	Amphenol/PCD	-	-	Supplied with relay socket
	Spacer	200002600	Amphenol/PCD	-	-	Supplied with relay socket

Table 8
ALTERNATIVE INSTALLATION HARDWARE PART NUMBERS

Specified Hardware		Alternative Hardware	
Part Number	**Supplier**	**Part Number**	**Supplier**
MS51957-12	QPL	200006701	Amphenol/PCD
NAS1676C4	QPL	200006301	Amphenol/PCD
200003801	Amphenol/PCD	MS21042-04	QPL
200000401	Amphenol/PCD	NAS620-4L	QPL
200007201	Amphenol/PCD	MS21042-08	QPL
200006901	Amphenol/PCD	NAS671-C4	QPL

2. RELAY SOCKET CONTACT CONFIGURATIONS

A. Relay Sockets

NOTE: The contact cavity size specified in Table 9 is equivalent to the engaging end size of the contact.

Table 9
RELAY SOCKET CONTACT CONFIGURATIONS

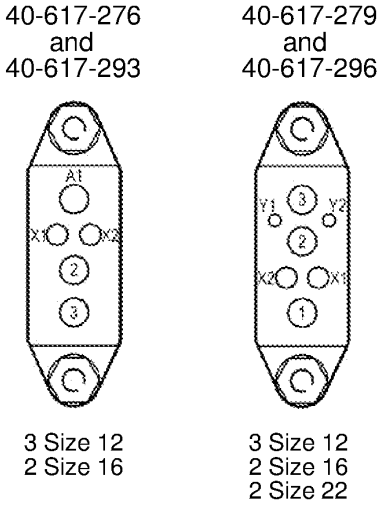
Relay Socket Part Number	Contact Cavity	
	Quantity	**Size**
40-617-269	14	20
40-617-270	8	20
40-617-271	5	16
	6	12
40-617-272	14	16
40-617-273	14	16
40-617-274	16	16
40-617-275	8	16
40-617-276	2	16
	3	12
40-617-277	2	16
	9	12
40-617-278	2	16
	9	12
40-617-279	2	22
	2	16
	3	12
40-617-282	8	16

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

Table 9 RELAY SOCKET CONTACT CONFIGURATIONS (Continued)

Relay Socket Part Number	Contact Cavity	
	Quantity	Size
40-617-286	14	20
40-617-287	8	20
40-617-288	5	16
	6	12
40-617-289	14	16
40-617-290	16	16
40-617-291	8	16
40-617-292	8	16
40-617-293	2	16
	3	12
40-617-294	2	16
	9	12
40-617-295	2	16
	9	12
40-617-296	2	22
	2	16
	3	12
40-617-298	8	20
40-617-2010	14	20
40-617-2013	8	16
40-617-2014	8	16
40-617-2015	2	16
	9	12
40-617-2016	5	16
	6	12
40-617-2017	14	16
40-617-2018	16	16

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS



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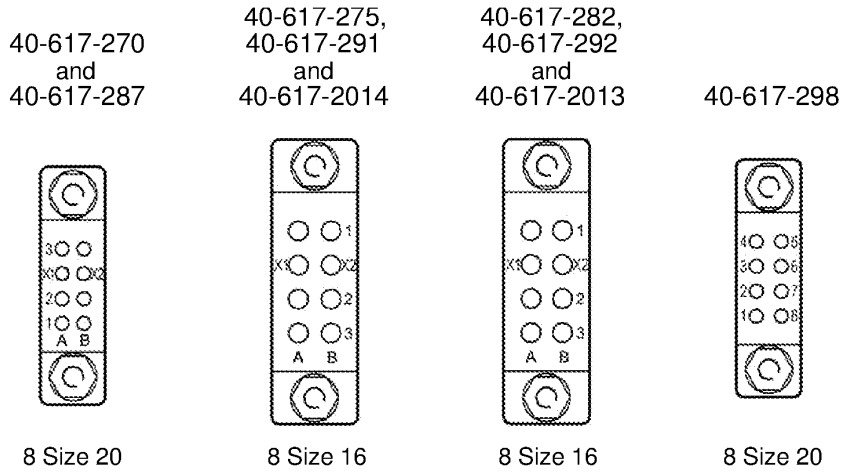
ONE POLE CONTACT CONFIGURATIONS
Figure 1



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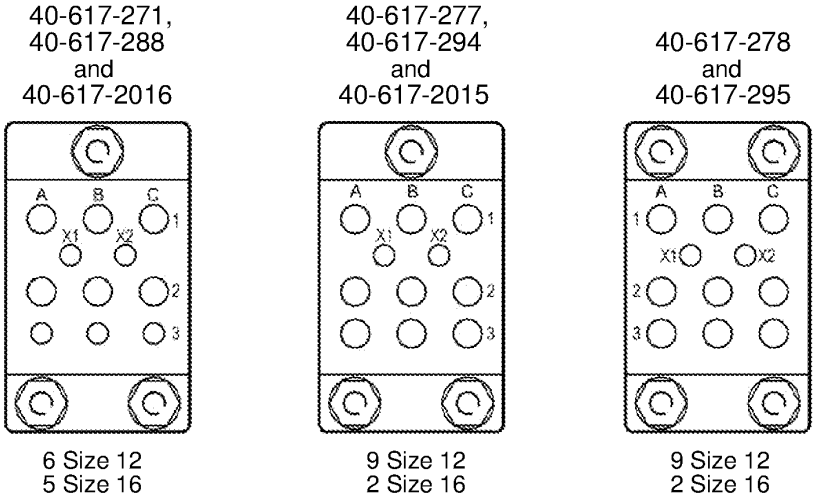
TWO POLE CONTACT CONFIGURATIONS
Figure 2

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS



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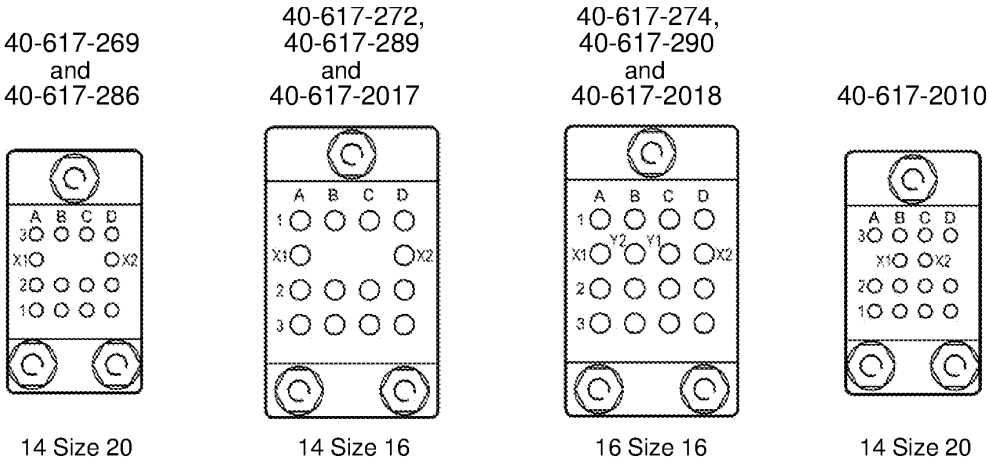
THREE POLE CONTACT CONFIGURATIONS
Figure 3



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FOUR POLE CONTACT CONFIGURATIONS
Figure 4

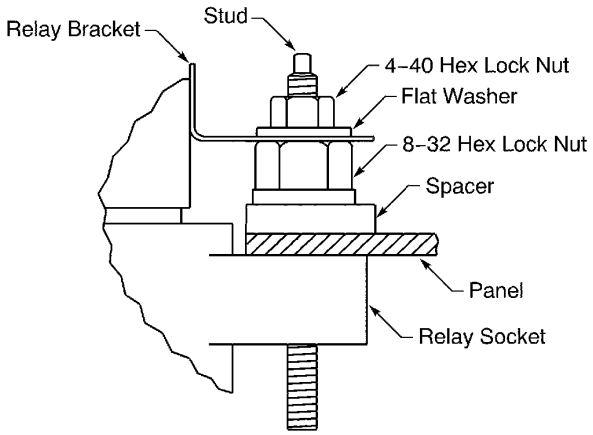
777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

3. RELAY SOCKET DISASSEMBLY

A. Relay Removal - Type 1 Installation Configuration

Table 10
NECESSARY TOOLS

Tool	Size (inch)
Hex Nut Driver	5/32



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RELAY REMOVAL - TYPE 1 INSTALLATION CONFIGURATION
Figure 5

Refer to Figure 5.

(1) Make a selection of a hex nut driver from Table 10.

(2) Remove the 4-40 hex lock nut.

(3) Remove the flat washer.

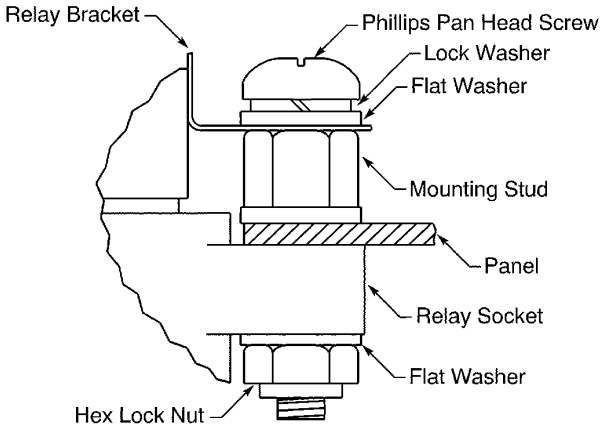
(4) Do Step 3.A.(2) and Step 3.A.(3) again for each remaining relay installation hardware.

(5) Pull the relay from the relay socket.

B. Relay Removal - Type 2 and Type 3 Installation Configurations

Table 11
NECESSARY TOOLS

Tool	Type
Screwdriver	Phillips



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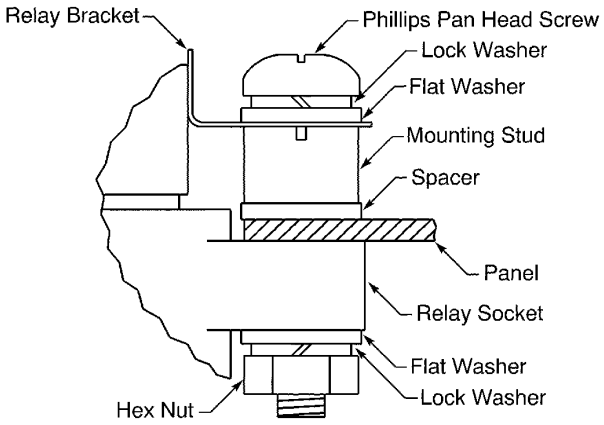
RELAY REMOVAL - TYPE 2 INSTALLATION CONFIGURATION
Figure 6



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RELAY REMOVAL - TYPE 3 INSTALLATION CONFIGURATION
Figure 7

Refer to:

- Figure 6 for a Type 2 installation configuration
- Figure 7 for a Type 3 installation configuration.

(1) Make a selection of a screwdriver from Table 11.

(2) Remove the Phillips screw.

(3) Remove the lock washer.

(4) Remove the flat washer.

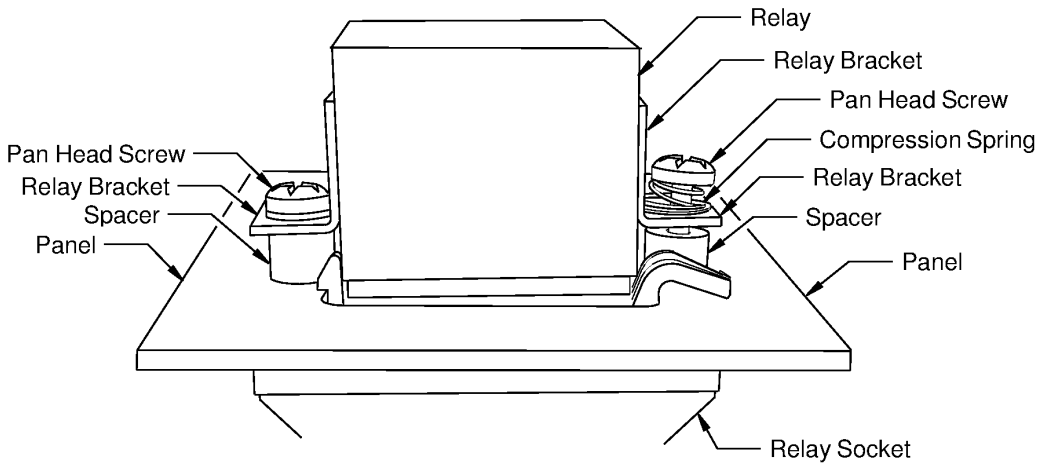
(5) Do Step 3.B.(2) through Step 3.B.(4) again for each relay installation hardware.

(6) Pull the relay from the relay socket.

C. Relay Removal - Type 4 Installation Configuration

Table 12
NECESSARY TOOLS

Tool	Type
Screwdriver	Phillips



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RELAY REMOVAL - TYPE 4 INSTALLATION CONFIGURATION
Figure 8

Refer to Figure 8.

(1) Make a selection of a screwdriver from Table 12.

(2) Turn the pan head screw in the counterclockwise direction until the screw is disengaged from the relay socket..

(3) Do Step 3.C.(2) again for each pan head screw.

(4) Pull the relay from the relay socket.

NOTE: The pan head screws, the compression springs, and the spacers will remain on the relay brackets.

(5) To remove the installation components from the relay bracket, hold the spacer with the hand and turn the pan head screw in the counterclockwise direction until the components disengage.

D. Contact Removal

Table 13
CONTACT REMOVAL TOOLS

Contact Size		Part Number
Engaging End	Crimp Barrel	
22	22	M81969/8-04
		M81969/14-01
	20	M81969/8-06
		M81969/14-02
20	20	M81969/8-06
		M81969/14-02
16	20	M81969/8-08
		M81969/14-03
	16	M81969/8-08
		M81969/14-03
12	16	M81969/8-10
		M81969/14-04
	12	M81969/8-10
		M81969/14-04

(1) Make a selection of a contact removal tool from Table 13.

(2) Examine the removal tool.

WARNING: DO NOT USE A REMOVAL TOOL THAT HAS A BENT TIP OR BIT. AN INJURY CAN OCCUR.

(3) Put the tip of the removal tool on the wire near the grommet.

(4) Axially align the removal tool and the contact cavity.

(5) Carefully push the removal tool straight into the contact cavity until it stops.

CAUTION: DO NOT TURN THE TOOL WHILE IT IS IN THE CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(6) Carefully pull the wire and the removal tool straight out of the contact cavity at the same time.

(7) If the contact cannot be released:

(a) Pull the contact removal tool out of the contact cavity.

(b) Turn the removal tool approximately 90 degrees.

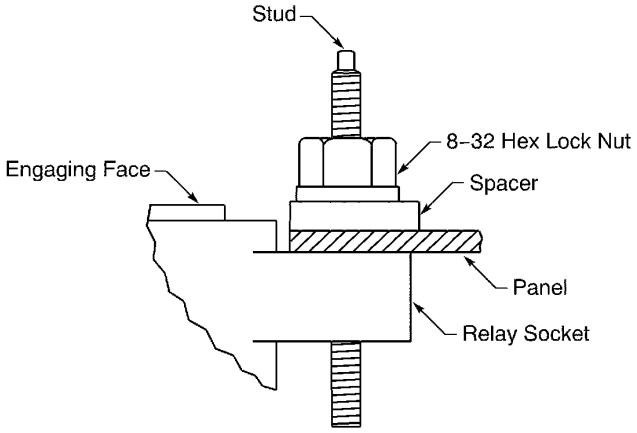
(c) Do Step 3.D.(3) through Step 3.D.(6) again.

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

E. Relay Socket Removal - Type 1 Installation Configuration

Table 14
NECESSARY TOOLS

Tool	Size (inch)
Hex Nut Driver	7/32



2447440 S00061544474_V1

RELAY SOCKET REMOVAL - TYPE 1 INSTALLATION CONFIGURATION
Figure 9

Refer to Figure 9.

(1) Remove the relay. Refer to Paragraph 3.A.

(2) Make a selection of a hex nut driver from Table 14.

(3) Remove the 8-32 hex lock nut.

(4) Remove the spacer.

(5) Do Step 3.E.(3) and Step 3.E.(4) again for each remaining installation hardware for the relay socket.

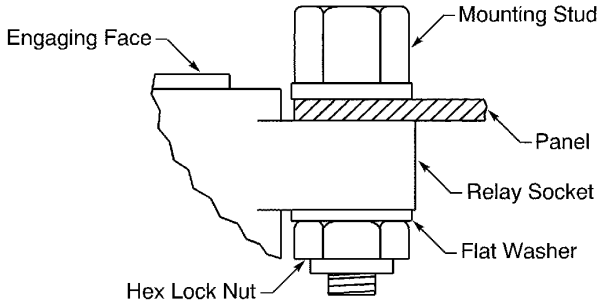
(6) Pull the relay socket from the panel.

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

F. Relay Socket Removal - Type 2 Installation Configuration

Table 15
NECESSARY TOOLS

Tool	Size (inch)
Hex Nut Driver	1/4



2447441 S00061544475_V1

RELAY SOCKET REMOVAL - TYPE 2 INSTALLATION CONFIGURATION
Figure 10

Refer to Figure 10.

(1) Remove the relay. Refer to Paragraph 3.B.

(2) Make a selection of a hex nut driver from Table 15.

(3) Remove the 4-40 hex lock nut.

(4) Remove the flat washer.

(5) Remove the mounting stud.

(6) Do Step 3.F.(3) through Step 3.F.(5) again for each remaining installation hardware for the relay socket.

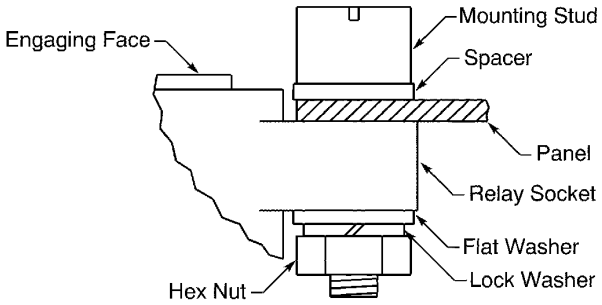
(7) Pull the relay socket from the panel.

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

G. Relay Socket Removal - Type 3 Installation Configuration

Table 16
NECESSARY TOOLS

Tool	Size (inch)
Hex Nut Driver	3/16



2447442 S00061544476_V1

RELAY SOCKET REMOVAL - TYPE 3 INSTALLATION CONFIGURATION
Figure 11

Refer to Figure 11.

(1) Remove the relay. Refer to Paragraph 3.B.

(2) Make a selection of a hex nut driver from Table 16.

(3) Remove the 4-40 hex nut.

(4) Remove the lock washer.

(5) Remove the flat washer.

(6) Remove the mounting stud.

(7) Remove the spacer.

(8) Do Step 3.G.(3) through Step 3.G.(7) again for each remaining installation hardware for the relay socket.

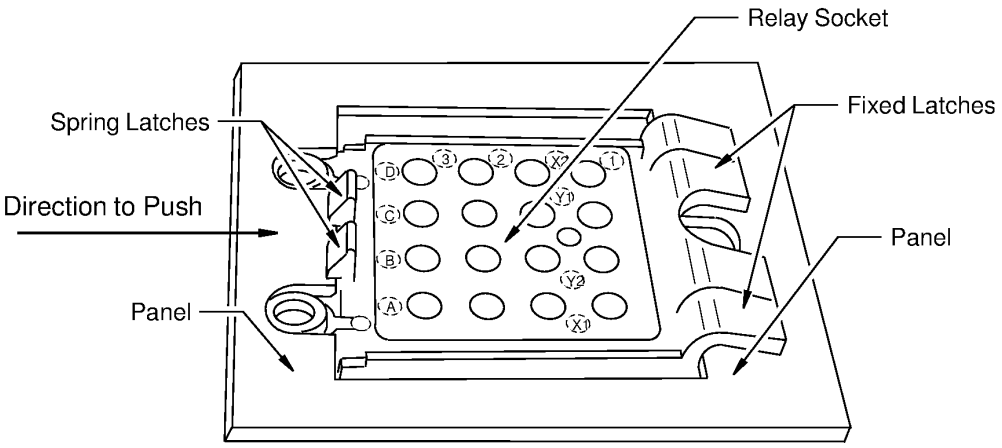
(9) Pull the relay socket from the panel.

777 ELMS PANEL REPAIR: RELAY SOCKETS AND RELAYS

H. Relay Socket Removal - Type 4 Installation Configuration

(1) Remove the relay. Refer to Paragraph 3.C.

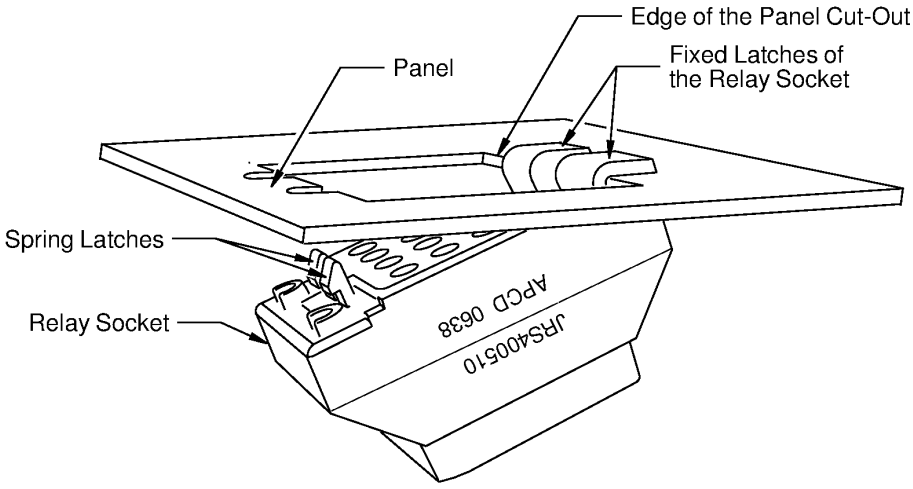
(2) Push on the spring latches with the hand until the relay socket is released from the panel. Refer to Figure 12.



2449737 S00061544477_V1

DIRECTION TO PUSH THE SPRING LATCHES TO RELEASE THE RELAY SOCKET FROM THE PANEL
Figure 12

(3) Rotate the relay socket away from the panel. Refer to Figure 13.



2449735 S00061544478_V1

SPRING LATCHES RELEASED FROM THE PANEL
Figure 13

(4) Move the end of the relay socket that has the fixed latches away from the edge of the panel cut-out. Refer to Figure 13.

Make sure that the fixed latches are away from the edge of the panel cut-out.

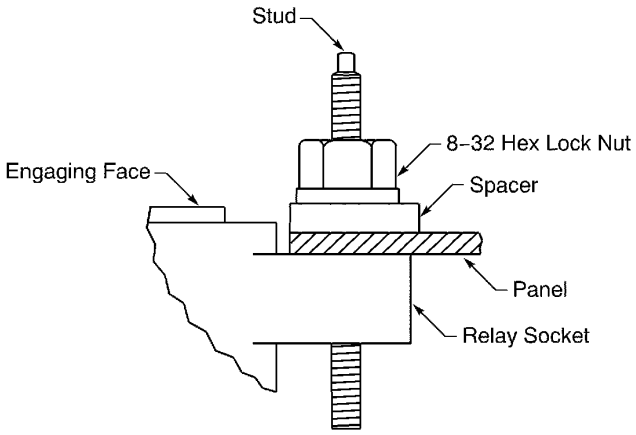
(5) Pull the relay socket from the panel.

4. RELAY SOCKET ASSEMBLY

A. Relay Socket Installation - Type 1 Installation Configuration

Table 17
NECESSARY TOOLS

Tool	Size (inch)	Special Instructions
Torque	-	Tool must measure 9 inch-pounds minimum
Socket	7/32	-



2447440 S00061544474_V1

RELAY SOCKET INSTALLATION - TYPE 1 INSTALLATION CONFIGURATION
Figure 14

Refer to Figure 14.

(1) Make a selection of a torque tool from Table 17.

(2) Make a selection of a spacer for a Type 1 installation configuration from Table 6.

(3) Make a selection of a 8-32 hex lock nut for a Type 1 installation configuration from Table 6.

(4) Align the studs on the relay socket with the holes in the panel.

(5) Put the relay socket against the panel.

(6) Put the spacer on the stud.

(7) Engage the threads of the 8-32 hex lock nut with the threads of the stud.

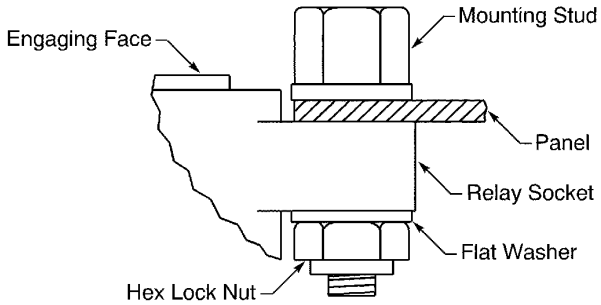
(8) Torque the lock nut to 10 inch-pounds ±1 inch-pound.

(9) Do Step 4.A.(2) through Step 4.A.(8) again for each remaining installation hardware for the relay socket.

B. Relay Socket Installation - Type 2 Installation Configuration

Table 18
NECESSARY TOOLS

Tool	Size (inch)	Special Instructions
Torque	-	Tool must measure 6 inch-pounds minimum
Socket	1/4	-



2447441 S00061544475_V1

RELAY SOCKET INSTALLATION - TYPE 2 INSTALLATION CONFIGURATION
Figure 15

Refer to Figure 15.

(1) Make a selection of a torque tool from Table 18.

(2) Make a selection of a socket from Table 18.

(3) Make a selection of a mounting stud for a Type 2 installation configuration from Table 6.

(4) Make a selection of a flat washer for a Type 2 installation configuration from Table 6.

(5) Make a selection of a 4-40 hex lock nut for a Type 2 installation configuration from Table 6.

(6) Put the relay socket against the panel.

(7) Install the mounting stud through the panel and the relay socket.

(8) Put the flat washer on the mounting stud.

(9) Engage the threads of the 4-40 hex lock nut with the threads of the mounting stud.

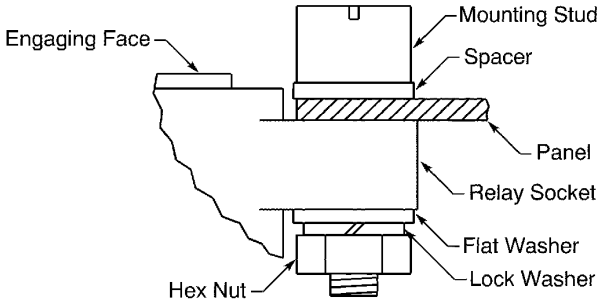
(10) Torque the hex lock nut to 6.5 inch-pounds ±0.5 inch-pound.

(11) Do Step 4.B.(3) through Step 4.B.(10) again for each remaining installation hardware for the relay socket.

C. Relay Socket Installation - Type 3 Installation Configuration

Table 19
NECESSARY TOOLS

Tool	Size (inch)	Special Instructions
Torque	-	Tool must measure 6 inch-pounds minimum
Socket	3/16	-



2447442 S00061544476_V1

RELAY SOCKET INSTALLATION - TYPE 3 INSTALLATION CONFIGURATION
Figure 16

Refer to Figure 16.

(1) Make a selection of a torque tool from Table 19.

(2) Make a selection of a socket from Table 19.

(3) Make a selection of a mounting stud for a Type 3 installation configuration from Table 6.

(4) Make a selection of a 4-40 hex nut for a Type 3 installation configuration from Table 6.

(5) Make a selection of a lock washer for a Type 3 installation configuration from Table 6.

(6) Make a selection of a flat washer for a Type 3 installation configuration from Table 6.

(7) Put the relay socket against the panel.

(8) Install the mounting stud through the panel and the relay socket.

(9) Put the flat washer on the mounting stud.

(10) Put the lock washer on the flat washer.

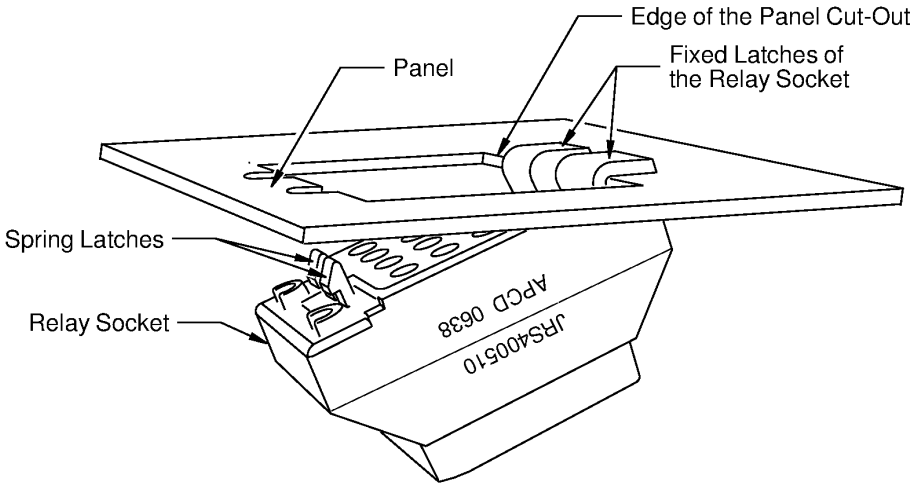
(11) Engage the threads of the 4-40 hex nut with the threads of the mounting stud.

(12) Torque the hex nut to 6.5 inch-pounds ±0.5 inch-pound.

(13) Do Step 4.C.(3) through Step 4.C.(12) again for each remaining installation hardware for the relay socket.

D. Relay Socket Installation - Type 4 Installation Configuration

(1) Put the fixed latches of the relay socket through the panel cutout and against the edge of the panel cutout. Refer to Figure 17.

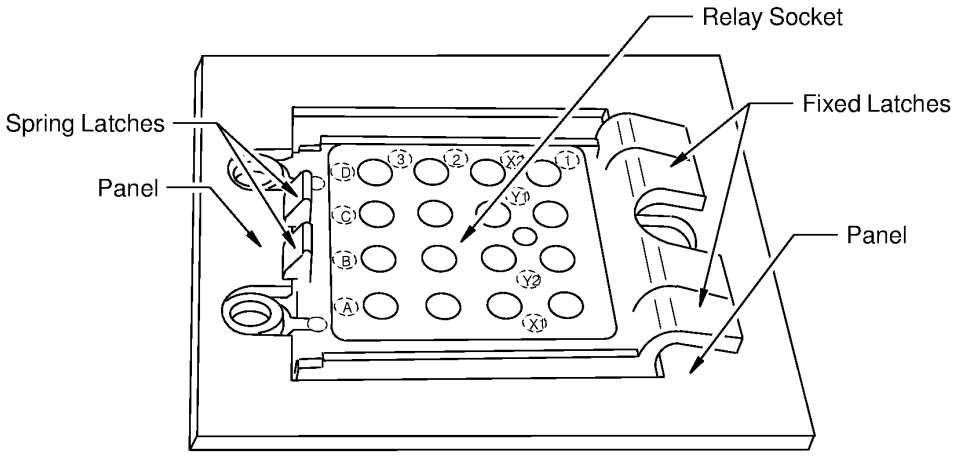


2449735 S00061544478_V1

INSTALLATION OF THE FIXED LATCHES - TYPE 4 INSTALLATION CONFIGURATION
Figure 17

(2) Rotate the relay socket toward the panel until the spring latches of the relay socket make a click. Refer to Figure 18.

Make sure that both of the spring latches of the relay socket are locked against the edge of the panel.



2449736 S00061544479_V1

INSTALLATION OF THE SPRING LATCHES - TYPE 4 INSTALLATION CONFIGURATION
Figure 18

E. Contact Assembly

Table 20
CONTACT CRIMP TOOLS

Wire Size (AWG)	Contact Size		Crimp Tool		
	Engaging End	Crimp Barrel	Basic Unit		Locator
			Part Number	Setting	
22	22	22	M22520/2-01	3	M22520/2-23
		20	M22520/2-01	6	M22520/2-11
	20	20	M22520/2-01	6	M22520/2-02
			M22520/1-01	3	M22520/1-02
	16	20	M22520/1-01	3	M22520/1-02
		16	M22520/1-01	4	M22520/1-02
20	22	20	M22520/2-01	7	M22520/2-11
	20	20	M22520/2-01	7	M22520/2-02
			M22520/1-01	4	M22520/1-02
	16	20	M22520/1-01	4	M22520/1-02
		16	M22520/1-01	4	M22520/1-02
	12	16	M22520/1-01	4	M22520/1-02

Table 20 CONTACT CRIMP TOOLS (Continued)

Wire Size (AWG)	Contact Size		Crimp Tool		
	Engaging End	Crimp Barrel	Basic Unit		Locator
			Part Number	Setting	
18	16	20	M22520/1-01	5	M22520/1-02
		16	M22520/1-01	5	M22520/1-02
	12	16	M22520/1-01	5	M22520/1-02
16	16	16	M22520/1-01	6	M22520/1-02
	12	16	M22520/1-01	6	M22520/1-02
14	12	12	M22520/1-01	7	M22520/1-02
12	12	12	M22520/1-01	8	M22520/1-02

Table 21
INSULATION REMOVAL LENGTH

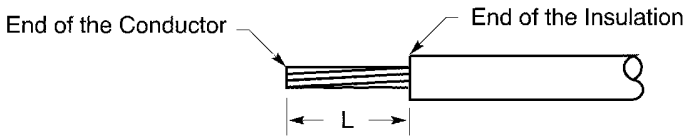
Wire Size (AWG)	Contact Size		Removal Length L (inch)		Special Instructions
	Engaging End	Crimp Barrel	Target	Tolerance	
22	22	22	0.13	0.03	-
		20	0.18	0.03	-
	20	20	0.18	0.03	-
	16	16	0.50	0.03	Fold Back Conductor
		20	0.18	0.03	-
	12	16	0.50	0.03	Fold Back Conductor
20	22	20	0.18	0.03	-
	20	20	0.18	0.03	-
	16	16	0.25	0.03	-
		20	0.18	0.03	-
	12	16	0.25	0.03	-
18	16	16	0.25	0.03	-
	12	16	0.25	0.03	-
16	16	16	0.25	0.03	-
	12	16	0.25	0.03	-
14	12	12	0.25	0.03	-
12	12	12	0.25	0.03	-

(1) Make a selection of a crimp tool from Table 20.

(2) Remove the necessary length of insulation from the end of the wire.
Refer to:

- Figure 19

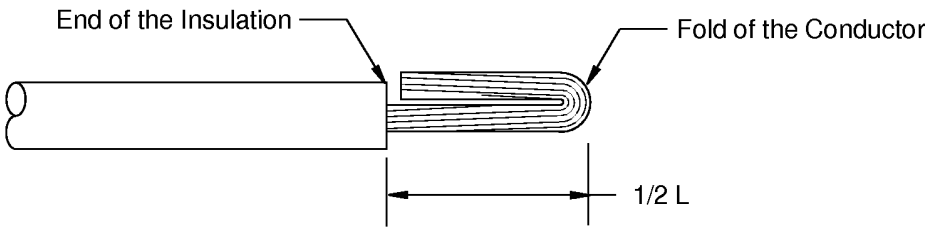
- Table 21 for the insulation removal length
- Subject 20-00-15 for the insulation removal procedures.



2446656 S00061544391_V1

WIRE PREPARATION
Figure 19

(3) If it is specified, fold the conductor back. Refer to Figure 20.

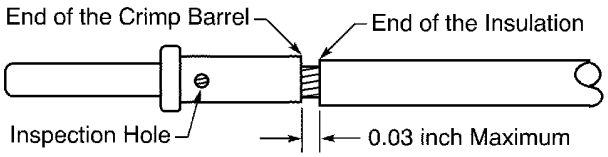


2446657 S00061544480_V1

CONDUCTOR FOLDED BACK
Figure 20

(4) Put the end of the wire in the crimp barrel of the contact. Refer to Figure 21.
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 crimp barrel is not more than 0.03 inch.



2446855 S00061544427_V1

POSITION OF THE WIRE IN THE CRIMP BARREL
Figure 21

(5) Crimp the contact.

(6) Examine the wired contact for these types of damage:

- A strand of the conductor is broken
- The base metal of a strand of the conductor can be seen
- The crimp barrel of the contact has a crack.

(7) If the contact or the wire has damage, replace the contact.

F. Contact Insertion

Table 22
CONTACT INSERTION TOOLS

Contact Size		Insertion Tool Part Number
Engaging End	Crimp Barrel	
22	22	M81969/8-03
		M81969/14-01
	20	M81969/8-05
		M81969/14-02
20	20	M81969/8-05
		M81969/14-02
16	20	M81969/8-07
		M81969/14-03
	16	M81969/8-07
		M81969/14-03
12	16	M81969/8-09
		M81969/14-04
	12	M81969/8-09
		M81969/14-04

(1) Make a selection of a contact insertion tool from Table 22.

NOTE: As an alternative, the contacts can be inserted with the hand.

CAUTION: DO NOT USE A TOOL WITH A TIP THAT:

- IS BENT
- IS FLARED
- IS BROKEN
- HAS A CRACK.

WARNING: A DEFECTIVE TOOL CAN CAUSE INJURY TO THE OPERATOR.

(2) Put the contact assembly into the applicable end of the insertion tool.

(3) At the rear face of the relay socket, axially align the contact and the tool with the contact cavity.

(4) Push the tool into the contact cavity until the tool stops.

CAUTION: DO NOT TURN THE TOOL WHILE IT IS IN THE CONTACT CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(5) Carefully remove the tool from the contact cavity.

Make sure to keep the tool perpendicular to the face of the relay socket.

(6) Lightly pull the wire to make sure that the contact is locked in position.

CAUTION: DO NOT PULL THE WIRE WITH A STRONG OR A SUDDEN FORCE. THE FORCE CAN CAUSE DAMAGE TO THE RELAY SOCKET OR THE CONTACT.

CAUTION: DO NOT MAKE A DENT IN THE WIRE INSULATION WITH THE FINGERNAILS. DAMAGE TO THE WIRE INSULATION CAN CAUSE UNSATISFACTORY PERFORMANCE AND RELIABILITY OF THE WIRE.

(7) If the contact is not locked in the contact cavity:

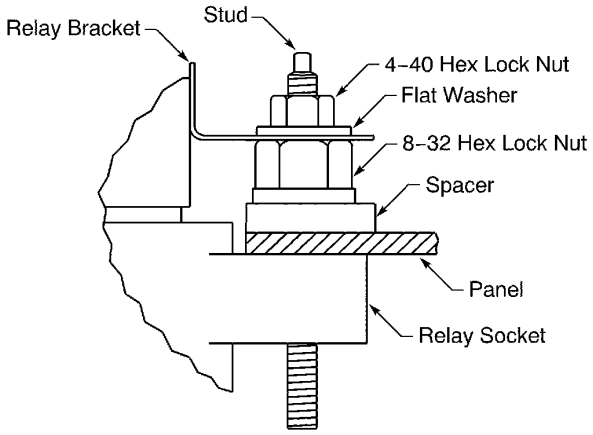
(a) Pull the contact out of the cavity.

(b) Do Step 4.F.(2) through Step 4.F.(6) again.

G. Relay Installation - Type 1 Installation Configuration

Table 23
NECESSARY TOOLS

Tool	Size (inch)	Special Instructions
Torque	-	Tool must measure 3 inch-pounds minimum
Socket	3/32	-



2447437 S00061544470_V1

RELAY INSTALLATION - TYPE 1 INSTALLATION CONFIGURATION
Figure 22

Refer to Figure 22.

(1) Make a selection of a torque tool from Table 23.

(2) Make a selection of a socket from Table 23.

(3) Make a selection of a flat washer for a Type 1 installation configuration from Table 7.

(4) Make a selection of 4-40 hex lock nut for a Type 1 installation configuration from Table 7.

(5) Align the relay with the relay socket.

(6) Push the relay into the relay socket.

(7) Put the flat washer on the stud.

(8) Engage threads of the lock nut with the threads of the stud.

(9) Torque the lock nut to 4 inch-pounds ±1 inch-pound.

(10) Do Step 4.G.(3) through Step 4.G.(9) again for each remaining relay installation hardware.

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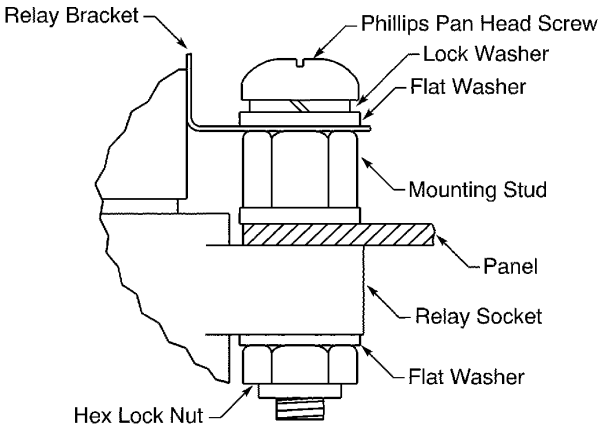
H. Relay Installation - Type 2 Installation Configuration

Table 24
NECESSARY TOOLS

Tool	Special Instructions
Torque	Tool must measure 3 inch-pounds minimum
Phillips Bit	-



2447438 S00061544471_V1

RELAY INSTALLATION - TYPE 2 INSTALLATION CONFIGURATION
Figure 23

Refer to Figure 23.

(1) Make a selection of a torque tool from Table 24.

(2) Make a selection of a Phillips bit from Table 24.

(3) Make a selection of a lock washer for a Type 2 installation configuration from Table 7.

(4) Make a selection of a flat washer for a Type 2 installation configuration from Table 7.

(5) Make a selection of a Phillips pan head screw for a Type 2 installation configuration from Table 7.

(6) Align the relay with the relay socket.

(7) Push the relay into the relay socket.

(8) Put the lock washer on the screw.

(9) Put the flat washer on the screw.

(10) Engage the threads of the screw with the threads of the mounting stud.

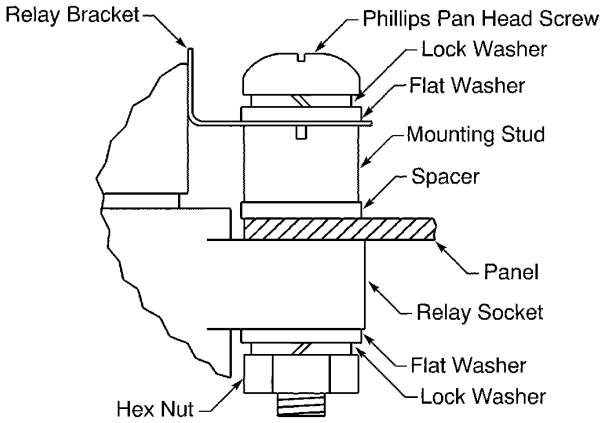
(11) Torque the screw to 4 inch-pounds ±1 inch-pound.

(12) Do Step 4.H.(3) through Step 4.H.(11) again for each remaining relay installation hardware.

I. Relay Installation - Type 3 Installation Configuration

Table 25
NECESSARY TOOLS

Tool	Special Instructions
Torque	Tool must measure 3 inch-pounds minimum
Phillips Bit	-



2447439 S00061544472_V1

RELAY INSTALLATION - TYPE 3 INSTALLATION CONFIGURATION
Figure 24

Refer to Figure 24.

(1) Make a selection of a torque tool from Table 25.

(2) Make a selection of a Phillips bit from Table 25.

(3) Make a selection of a lock washer for a Type 3 installation configuration from Table 7.

(4) Make a selection of a flat washer for a Type 3 installation configuration from Table 7.

(5) Make a selection of a Phillips pan head screw for a Type 3 installation configuration from Table 7.

(6) Align the relay with the relay socket.

(7) Push the relay into the relay socket.

(8) Put the lock washer on the screw.

(9) Put the flat washer on the screw.

(10) Engage the threads of the screw with the threads of the mounting stud.

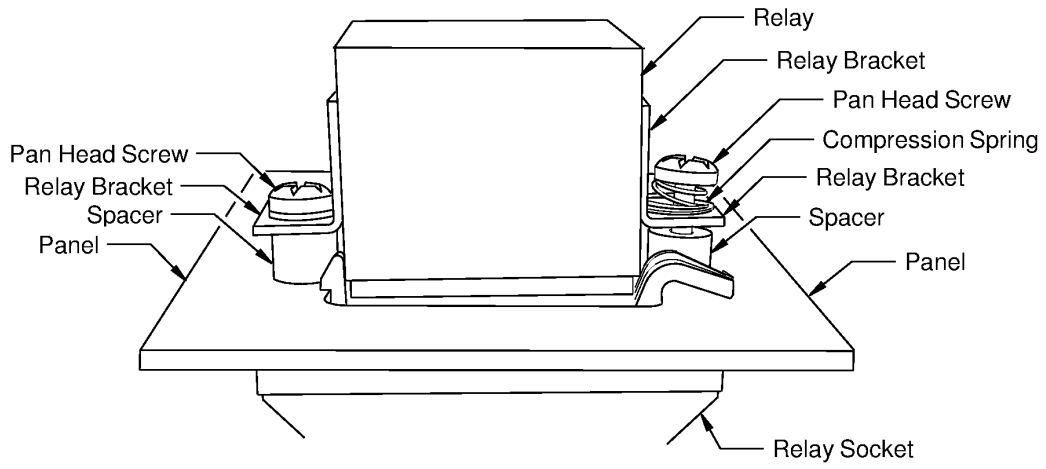
(11) Torque the screw to 4 inch-pounds ±1 inch-pound.

(12) Do Step 4.I.(3) through Step 4.I.(11) again for each remaining relay installation hardware.

J. Relay Installation - Type 4 Installation Configuration

Table 26
NECESSARY TOOLS

Tool	Special Instructions
Torque	Tool must measure 3 inch-pounds minimum
Phillips Bit	-



2449734 S00061544473_V1

RELAY INSTALLATION - TYPE 4 INSTALLATION CONFIGURATION
Figure 25

Refer to Figure 25:

(1) Make a selection of a torque tool from Table 26.

(2) Make a selection of a Phillips bit from Table 26.

(3) Make a selection of a spacer for a Type 4 installation configuration from Table 7.

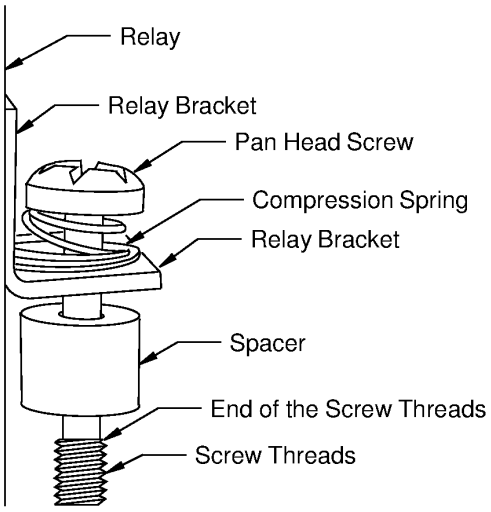
(4) Make a selection of a compression spring for a Type 4 installation configuration from Table 7.

(5) Make a selection of a Phillips pan head screw for a Type 4 installation configuration from Table 7.

(6) Put the compression spring on the screw.
Make sure that the small end of the spring is against the head of the screw.

(7) Put the engaging end of the screw through the hole in a relay bracket.

(8) Engage the threads of the screw with the threads of the spacer until the spacer is in a location on the screw shaft that is farther than the end of the screw threads. Refer to Figure 26.



2449738 S00061544482_V1

POSITION OF THE SPACER ON THE SCREW ON THE RELAY BRACKET
Figure 26

(9) Do Step 4.J.(6) through Step 4.J.(8) again for each remaining relay bracket.

(10) Align the relay with the relay socket.

(11) Engage the threads of the screw with the threads of relay socket.

(12) Torque the screw to 4.0 inch-pounds ±1.0 inch-pound.

(13) Do Step 4.J.(11) and Step 4.J.(12) again for each remaining screw.

5. APPROVED TOOL SUPPLIERS

A. Contact Insertion and Removal Tools

Table 27
CONTACT INSERTION AND REMOVAL TOOL SUPPLIERS

Tool	Supplier
M81969/8-03	QPL
M81969/8-04	QPL
M81969/8-05	QPL
M81969/8-06	QPL
M81969/8-07	QPL
M81969/8-08	QPL

Table 27 CONTACT INSERTION AND REMOVAL TOOL SUPPLIERS (Continued)

Tool	Supplier
M81969/8-09	QPL
M81969/8-10	QPL
M81969/14-01	QPL
M81969/14-02	QPL
M81969/14-03	QPL
M81969/14-04	QPL

B. Contact Crimp Tools

Table 28
CONTACT CRIMP TOOL SUPPLIERS

Tool	Supplier
M22520/1-01	QPL
M22520/1-02	QPL
M22520/2-01	QPL
M22520/2-02	QPL
M22520/2-11	QPL
M22520/2-23	QPL

777 ELMS PANEL REPAIR: AIR LB TERMINAL JUNCTION SYSTEM

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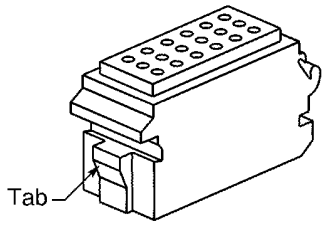
777 ELMS PANEL REPAIR: AIR LB TERMINAL JUNCTION SYSTEM

1. PART NUMBERS AND DESCRIPTION

A. Terminal Junction System Description

The terminal junction system has these components:

- Terminal modules
- Tracks
- Ground modules
- Terminal stud modules.



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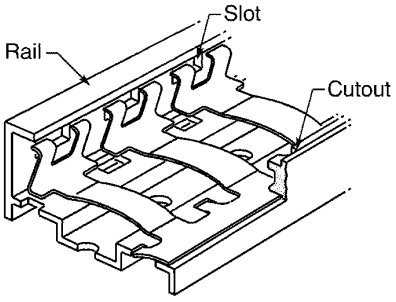
TERMINAL MODULE
Figure 1



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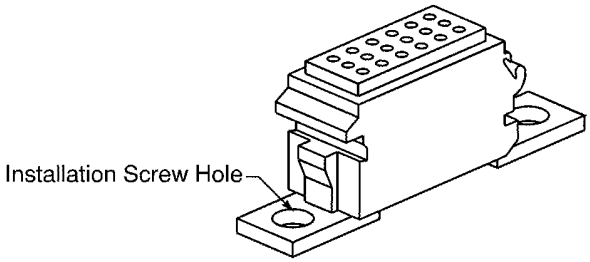
TRACK
Figure 2



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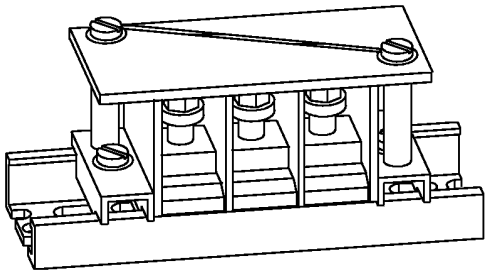
GROUND MODULE
Figure 3



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TERMINAL STUD MODULE
Figure 4

B. Terminal Module Part Numbers

Table 1
TERMINAL MODULE PART NUMBERS

Part Number	Description	Mount Type	Supplier
40-718-5238	Terminal Module	Track	Smiths Industries
40-718-5240	Terminal Module	Track	Smiths Industries
40-718-5254	Terminal Module, Low Profile	Track	Smiths Industries
40-718-5256	Terminal Module, Low Profile	Track	Smiths Industries
40-718-5257	Terminal Module, Low Profile	Track	Smiths Industries
40-718-5258	Terminal Module, Low Profile	Track	Smiths Industries
40-718-5259	Terminal Module, Low Profile	Track	Smiths Industries
40-718-5266	Resistor Terminal Module	Track	Smiths Industries
40-718-5268	Resistor Terminal Module	Track	Smiths Industries
40-718-5269	Resistor Terminal Module	Track	Smiths Industries
40-718-5270	Resistor Terminal Module	Track	Smiths Industries
40-718-5271	Resistor Terminal Module	Track	Smiths Industries

Table 1 TERMINAL MODULE PART NUMBERS (Continued)

Part Number	Description	Mount Type	Supplier
40-718-5272	Resistor Terminal Module	Track	Smiths Industries
40-718-5273	Resistor Terminal Module	Track	Smiths Industries
40-718-5274	Resistor Terminal Module	Track	Smiths Industries
40-718-5276	Resistor Terminal Module	Track	Smiths Industries
40-718-5278	Resistor Terminal Module	Track	Smiths Industries
40-718-5282	Diode Terminal Module	Track	Smiths Industries
40-718-5285	Terminal Stud Module	Panel	Smiths Industries
40-718-5290	Resistor Terminal Module	Track	Smiths Industries
40-718-5404	Resistor Terminal Module	Track	Smiths Industries
40-718-5405	Resistor Terminal Module	Track	Smiths Industries
40-718-5406	Resistor Terminal Module	Track	Smiths Industries
40-718-5407	Resistor Terminal Module	Track	Smiths Industries

Table 2
ALTERNATIVE TERMINAL MODULE PART NUMBERS

Specified Terminal Module		Alternative Terminal Module	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-718-5238	Smiths Industries	001755-305-02	Air LB
40-718-5240	Smiths Industries	001755-101-02	Air LB
40-718-5254	Smiths Industries	001756-202-02	Air LB
40-718-5256	Smiths Industries	001756-204-02	Air LB
40-718-5257	Smiths Industries	001756-205-02	Air LB
40-718-5258	Smiths Industries	001756-206-02	Air LB
40-718-5259	Smiths Industries	001756-207-02	Air LB
40-718-5266	Smiths Industries	001766-101-02	Air LB
40-718-5268	Smiths Industries	001766-103-02	Air LB
40-718-5269	Smiths Industries	001766-107-02	Air LB
40-718-5270	Smiths Industries	001766-108-02	Air LB
40-718-5271	Smiths Industries	001767-101-02	Air LB
40-718-5272	Smiths Industries	001767-102-02	Air LB
40-718-5273	Smiths Industries	001767-103-02	Air LB
40-718-5274	Smiths Industries	001767-107-02	Air LB
40-718-5276	Smiths Industries	001768-101-02	Air LB
40-718-5278	Smiths Industries	001768-103-02	Air LB
40-718-5282	Smiths Industries	001765-101-02	Air LB
40-718-5285	Smiths Industries	0011-0000-053BB	Air LB

Table 2 ALTERNATIVE TERMINAL MODULE PART NUMBERS (Continued)

Specified Terminal Module		Alternative Terminal Module	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-718-5290	Smiths Industries	001767-109-02	Air LB
40-718-5404	Smiths Industries	001766-112-02	Air LB
40-718-5405	Smiths Industries	001766-111-02	Air LB
40-718-5406	Smiths Industries	001767-111-02	Air LB
40-718-5407	Smiths Industries	001767-110-02	Air LB

C. Terminal Module Track Part Numbers

Table 3
TRACK PART NUMBERS

Part Number	Supplier	Maximum Number of Modules
40-718-938	Smiths Industries	2
40-718-939	Smiths Industries	3
40-718-940	Smiths Industries	4
40-718-942	Smiths Industries	6
40-718-944	Smiths Industries	8
40-718-946	Smiths Industries	10
40-718-950	Smiths Industries	14
40-718-960	Smiths Industries	18

Table 4
ALTERNATIVE TRACK PART NUMBERS

Specified Track		Alternative Track	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-718-938	Smiths Industries	001751-102-00	Air LB
40-718-939	Smiths Industries	001751-103-00	Air LB
40-718-940	Smiths Industries	001751-104-00	Air LB
40-718-942	Smiths Industries	001751-106-00	Air LB
40-718-944	Smiths Industries	001751-108-00	Air LB
40-718-946	Smiths Industries	001751-110-00	Air LB
40-718-950	Smiths Industries	001751-114-00	Air LB
40-718-960	Smiths Industries	001751-118-00	Air LB

D. Ground Module Part Numbers

Table 5
GROUND MODULE PART NUMBERS

Part Number	Mount Type	Supplier
40-718-5262	Panel	Smiths Industries
40-718-5263	Panel	Smiths Industries

Table 6
ALTERNATIVE GROUND MODULE PART NUMBERS

Specified Ground Module		Alternative Ground Module	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-718-5262	Smiths Industries	001758-202-02	Air LB
40-718-5263	Smiths Industries	001758-101-02	Air LB

E. Contact Part Numbers

Table 7
CONTACT PART NUMBERS

Contact Size		Contact Type	Part Number	Supplier
Engaging End	**Crimp Barrel**			
22	22	Pin	30-867-6730	Smiths Industries
20	20	Pin	30-867-6724	Smiths Industries
16	16	Pin	30-867-6727	Smiths Industries
12	12	Pin	30-867-6729	Smiths Industries

Table 8
ALTERNATIVE CONTACT PART NUMBERS

Specified Contact		Alternative Contact	
Part Number	**Supplier**	**Part Number**	**Supplier**
30-867-6730	Smiths Industries	001104-100-02	Air LB
30-867-6724	Smiths Industries	001104-200-02	Air LB
30-867-6727	Smiths Industries	001104-300-02	Air LB
30-867-6729	Smiths Industries	001104-400-02	Air LB

2. TERMINAL MODULE AND GROUND MODULE CONFIGURATIONS

A. Air LB Terminal Modules

NOTE: The size of the contact cavity is equivalent to the size of the contact crimp barrel.

Table 9
TERMINAL MODULE CONFIGURATIONS

Terminal Module	Contact Cavities		Bus Configuration	
	Size	Quantity	Sets	Contact Cavities
40-718-5238	16	10	1	10
40-718-5240	22	36	18	2
40-718-5254	20	18	6	3
40-718-5256	20	18	3	6
40-718-5257	20	18	1	18
40-718-5258	20	18	1	12
			1	6
40-718-5259	20	18	2	3
			3	4

Table 10
DIODE MODULE CONFIGURATIONS

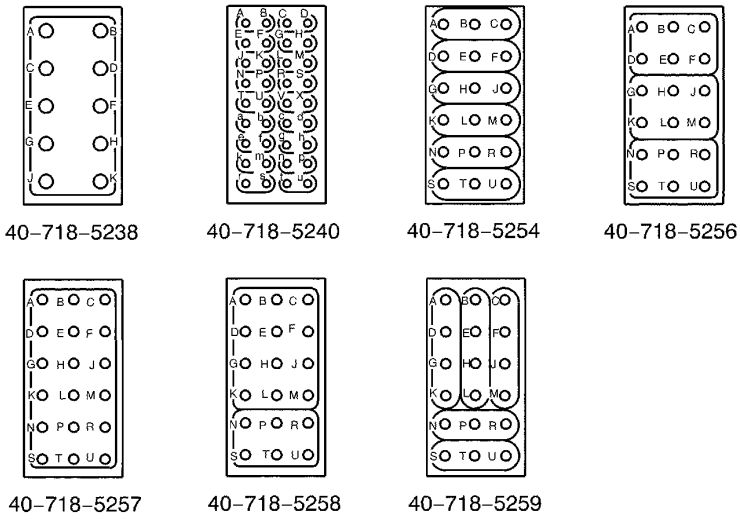
Diode Module		Contact Cavities	
Part Number	Diode Current (amps)	Size	Quantity
40-718-5282	2	20	4
		16	4

Table 11
RESISTOR MODULE CONFIGURATIONS

Resistor Module		Contact Cavities	
Part Number	Resistance (ohms)	Size	Quantity
40-718-5266	6.8k	20	8
40-718-5268	47k	20	8
40-718-5269	4.7k	20	8
40-718-5270	33k	20	8
40-718-5271	6.8k	20	4
		12	4
40-718-5272	4.7k	20	4
		12	4

Table 11 RESISTOR MODULE CONFIGURATIONS (Continued)

Resistor Module		Contact Cavities	
Part Number	**Resistance (ohms)**	**Size**	**Quantity**
40-718-5273	47k	20	4
		12	4
40-718-5274	4.7k	20	4
		12	4
40-718-5276	6.8k	20	4
		16	4
40-718-5278	47k	20	4
		16	4
40-718-5290	33k	20	4
		12	4
40-718-5404	1k	20	8
40-718-5405	18k	20	8
40-718-5406	1k	20	4
		12	4
40-718-5407	18k	20	4
		12	4



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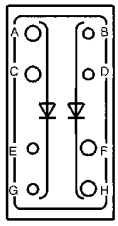
TERMINAL MODULE BUS CONFIGURATIONS
Figure 5



40–718–5282

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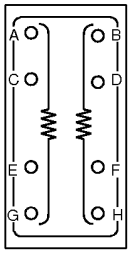
DIODE MODULE BUS CONFIGURATIONS
Figure 6



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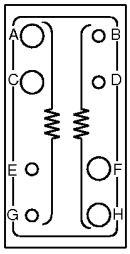

40-718-5406

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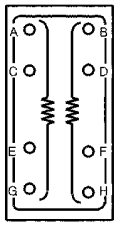
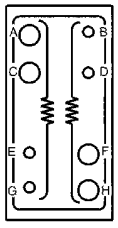
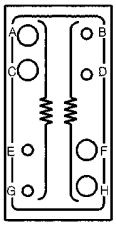
1.0K OHM RESISTOR MODULE BUS CONFIGURATIONS
Figure 7



40–718–5269



40–718–5272



40–718–5274

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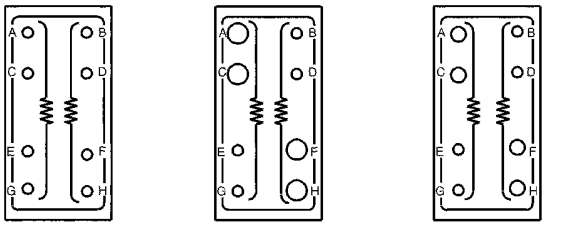
4.7K OHM RESISTOR MODULE BUS CONFIGURATIONS
Figure 8



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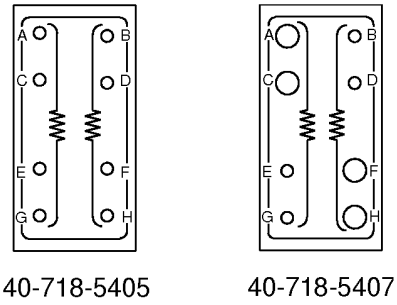
6.8K OHM RESISTOR MODULE BUS CONFIGURATIONS
Figure 9



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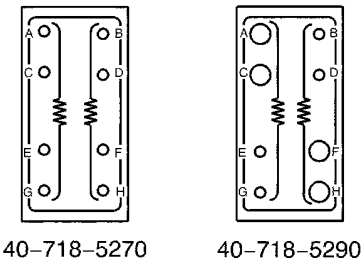
18K OHM RESISTOR MODULE BUS CONFIGURATIONS
Figure 10



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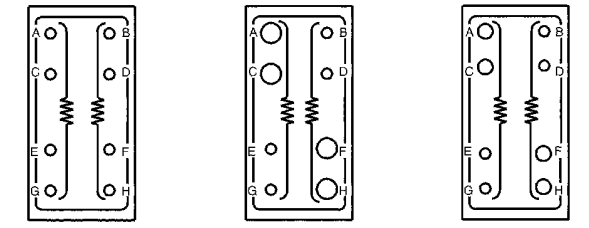
33K OHM RESISTOR MODULE BUS CONFIGURATIONS
Figure 11



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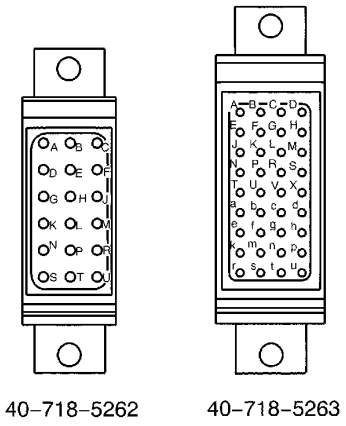
47K OHM RESISTOR MODULE BUS CONFIGURATIONS
Figure 12

B. Air LB Ground Modules

Table 12
GROUND MODULE CONFIGURATIONS

Ground Module	Contact	
	Size	Quantity
40-718-5262	20	18
40-718-5263	22	36

NOTE: The size of the contact cavity is equivalent to the size of the contact crimp barrel.



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GROUND MODULE CONFIGURATIONS
Figure 13

3. TERMINAL JUNCTION SYSTEM DISASSEMBLY

A. Contact Removal

Table 13
CONTACT REMOVAL TOOLS

Crimp Barrel Size	Removal Tool	
	Part Number	Color
22	M81969/8-04	-
	M81969/14-01	White
20	M81969/8-06	-
	M81969/14-02	White
16	M81969/8-08	-
	M81969/14-03	White
12	M81969/8-10	-
	M81969/14-04	White

(1) Make a selection of a contact removal tool from Table 13.

(2) Put the end of the removal tool on the wire.

(3) Carefully push the tool into the contact cavity until it stops.

CAUTION: DO NOT TURN THE TOOL WHILE IT IS IN THE CONTACT CAVITY. DAMAGE TO THE RETENTION CLIPS CAN OCCUR.

(4) Pull the wire and the tool out of the contact cavity at the same time.

(5) If the contact does not come out of the contact cavity:

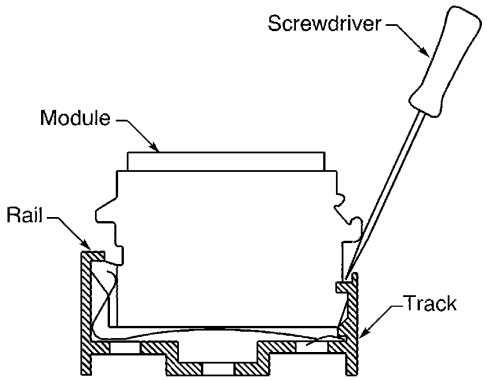
(a) Pull the tool out of the contact cavity.

(b) Turn the tool 90 degrees.

(c) Do Step 3.A.(2) through Step 3.A.(4) again.

B. Removal of a Terminal Module from a Track

(1) Put a flat screwdriver or an equivalent tool on the module against the side of the track that is opposite the rail. Refer to Figure 14.



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POSITION OF THE TOOL
Figure 14

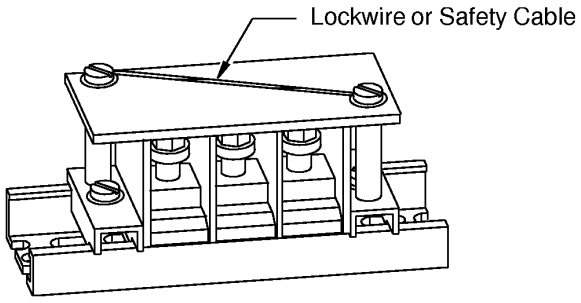
(2) Push the module up until it is disengaged from the track.

C. Removal or Replacement of Wires on a Terminal Stud Module

Table 14
NECESSARY TOOLS

Tool	Torque tool	Size (Across Flats) (inch)	Supplier
Wrench or Socket and Driver	-	7/32	An available source
Torque tool and hex socket	The tool can measure 24.0 inch-pounds ±2.4 inch-pounds	7/32	An available source

(1) Cut the lockwire or safety cable from the cover retaining screws. Refer to Figure 15.



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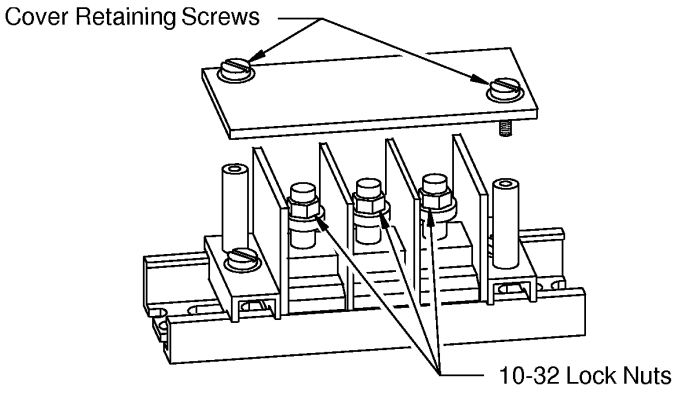
LOCATION OF THE LOCKWIRE OR SAFETY CABLE
Figure 15

(2) Disengage the cover retaining screws and remove the cover. Refer to Figure 16.



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COVER OF THE TERMINAL STUD MODULE REMOVED
Figure 16

(3) Make a selection of the correct stud for the wire to be removed.

(4) Make a selection of a 7/32 inch tool from Table 14.

(5) Disengage the 10-32 lock nut from the stud.

(6) Remove the terminal lug from the stud.

(7) If a wire and terminal lug assembly is to be attached to the stud,.

(a) Put the terminal lug on the stud.

(b) Engage the threads of the 10-32 lock nut on the stud.

(c) Make a selection of a torque tool and a 7/32 inch socket from Table 14.

(d) Tighten and torque the lock nut to 24.0 inch-pounds 2.4 inch pounds.

(e) Put the cover on the module and engage the threads of the cover retaining screws.

(f) Tighten the screws.

(g) Put lockwire or safety wire on the heads of the screws.

Refer to:

- Figure 15
- Subject 20-60-07.

4. TERMINAL JUNCTION SYSTEM ASSEMBLY

A. Contact Assembly

Table 15
CONTACT CRIMP TOOLS

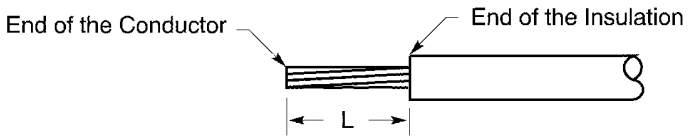
Wire Size (AWG)	Crimp Barrel Size	Crimp Tool		
		Basic Unit		Locator Part Number
		Part Number	Setting	
22	22	M22520/2-01	3	K673
	20	M22520/1-01	3	M22520/1-02
	22	M22520/1-01	4	M22520/1-02
20	20	M22520/1-01	4	M22520/1-02
	16	M22520/1-01	4	M22520/1-02
18	20	M22520/1-01	5	M22520/1-02
	16	M22520/1-01	5	M22520/1-02
16	16	M22520/1-01	6	M22520/1-02
14	12	M22520/1-01	7	M22520/1-02
12	12	M22520/1-01	8	M22520/1-02

Table 16
INSULATION REMOVAL LENGTH

Wire Size (AWG)	Crimp Barrel Size	Removal Length L (inch)		Special Instructions
		Target	Tolerance	
22	22	0.16	0.03	-
	20	0.16	0.03	-
	16	0.56	0.03	Fold the conductor back
20	20	0.16	0.03	-
	16	0.28	0.03	-
18	20	0.16	0.03	-
	16	0.28	0.03	-
16	16	0.28	0.03	-
14	12	0.28	0.03	-
12	12	0.28	0.03	-

(1) Remove the necessary length of insulation from the end of the wire.
Refer to:

- Figure 17
- Table 16 for the insulation removal length
- Subject 20-00-15 for the insulation removal procedures.



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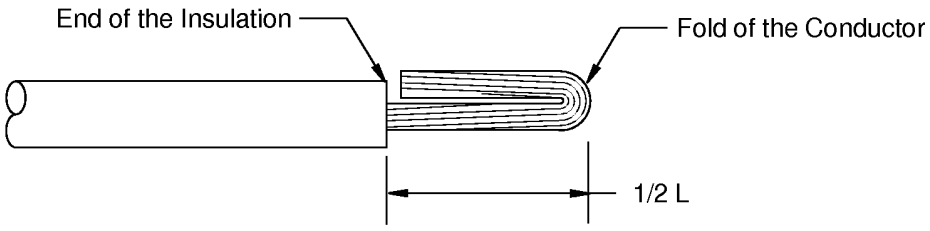
WIRE PREPARATION
Figure 17

(2) If it is specified, fold the conductor back. Refer to Figure 18.



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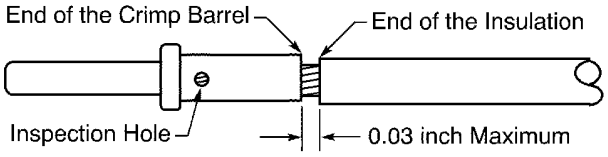
CONDUCTOR FOLDED BACK
Figure 18

(3) Make a selection of a crimp tool from Table 15.

(4) Push the conductor into the crimp barrel of the contact. Refer to Figure 19.

Make sure that:

- All of the strands of the conductor are in the crimp barrel
- The strands of 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 a maximum of 0.03 inch.



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THE POSITION OF THE WIRE IN THE CRIMP BARREL
Figure 19

(5) Crimp the contact.

(6) Examine the wired contact for these types of damage:

- A strand of the conductor is broken
- The base metal of a strand of the conductor can be seen
- The crimp barrel of the contact has a crack.

(7) If the contact or the wire has damage, replace the contact.

B. Contact Insertion

Table 17
CONTACT INSERTION TOOLS

Crimp Barrel Size	Insertion Tool	
	Part Number	Color
22	M81969/8-03	-
	M81969/14-01	Green
20	M81969/8-05	-
	M81969/14-02	Red
16	M81969/8-07	-
	M81969/14-03	Blue
12	M81969/8-09	-
	M81969/14-04	Yellow

(1) Make a selection of a contact insertion tool from Table 17.

CAUTION: DO NOT USE A TOOL WITH A TIP THAT:
- IS BENT
- IS FLARED
- IS BROKEN
- HAS A CRACK.

WARNING: A DEFECTIVE TOOL CAN CAUSE INJURY TO THE OPERATOR.

CAUTION: A DEFECTIVE TOOL CAN CAUSE DAMAGE TO THE GROMMET OF THE CONNECTOR OR THE CONTACT RETENTION CLIPS.

(2) Put the contact in the insertion end of the insertion tool.

CAUTION: AN UNWIRED CONTACT MUST NOT BE INSTALLED IN A MODULE. IT CANNOT BE REMOVED.

(3) Axially align the contact and the tool with the contact cavity.

(4) Carefully push the tool straight into the contact cavity until it stops.

CAUTION: DO NOT TURN THE TOOL WHILE IT IS IN THE CONTACT CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(5) Carefully pull the tool straight out of the contact cavity.

(6) Lightly pull the wire to make sure that the contact is locked in position.

CAUTION: DO NOT PULL THE WIRE WITH A STRONG OR A SUDDEN FORCE. THE FORCE CAN CAUSE DAMAGE TO THE TERMINAL MODULE OR THE CONTACT.

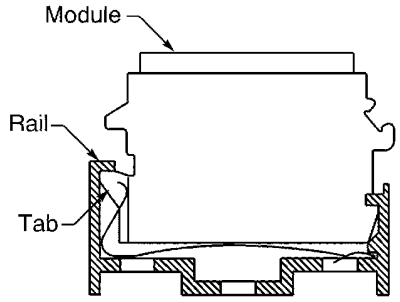
CAUTION: DO NOT MAKE A DENT IN THE WIRE INSULATION WITH THE FINGERNAILS. DAMAGE TO THE WIRE INSULATION CAN CAUSE UNSATISFACTORY PERFORMANCE AND RELIABILITY OF THE WIRE.

(7) If the contact is not locked in the contact cavity:

(a) Pull the contact out of the cavity.

(b) Do Step 4.B.(2) through Step 4.B.(6) again.

C. Installation of a Terminal Module on a Track



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POSITION OF THE MODULE IN THE TRACK
Figure 20

Refer to Figure 20.

(1) Put the tab of the terminal module in the slot below the rail of the track.

(2) Align the tab on the opposite side of the module with the cutout on the opposite side of the track.

(3) Push the module down until it makes click and the module is locked in position.

D. Installation of a Ground Module on a Panel

Table 18
GROUND MODULE INSTALLATION FASTENERS

Fastener	Size	Quantity
Screw, Hex	6-32	2
Washer, Flat	6	2
Washer, Lock	6	2

(1) Make a selection of the necessary fasteners from Table 18.

(2) Put a lock washer on each screw.

(3) Put a flat washer on each screw.

(4) Align the installation screw holes on the ground module with the installation holes in the panel.

(5) Engage the threads of the screws and the installation holes.

(6) Torque each screw 13 inch-pounds ±1 inch-pound.

E. Assembly of a Terminal Stud Module

Refer to Paragraph 3.C..

5. APPROVED TOOL SUPPLIERS

A. Contact Removal and Insertion Tools

Table 19
CONTACT REMOVAL AND INSERTION TOOL SUPPLIERS

Tool	Supplier
M81969/8-03	QPL
M81969/8-04	QPL
M81969/8-05	QPL
M81969/8-06	QPL
M81969/8-07	QPL
M81969/8-08	QPL
M81969/8-09	QPL
M81969/8-10	QPL
M81969/14-01	QPL
M81969/14-02	QPL
M81969/14-03	QPL
M81969/14-04	QPL

B. Contact Crimp Tools

Table 20
CRIMP TOOL SUPPLIERS

Crimp Tool	Supplier
K673	Daniels
M22520/1-01	QPL
M22520/1-02	QPL
M22520/2-01	QPL

777 ELMS PANEL REPAIR: M81714 SERIES II TERMINAL JUNCTION SYSTEM

TABLE OF CONTENTS

777 ELMS PANEL REPAIR: M81714 SERIES II TERMINAL JUNCTION SYSTEM

1. PART NUMBERS AND DESCRIPTION

A. Terminal Junction System Description

The terminal junction system has these components:

- Terminal modules
- Tracks
- Ground modules
- Resistive wire splices.

B. Terminal Module Part Numbers

Table 1
TERMINAL MODULE PART NUMBERS

Part Number	Size	Mount Type	Supplier
53710-001	22	Track	Smiths Industries
53710-002	22	Track	Smiths Industries
53710-003	22	Track	Smiths Industries

Table 2
ALTERNATIVE TERMINAL MODULE PART NUMBERS

Specified Terminal Module		Alternative Terminal Module	
Part Number	**Supplier**	**Part Number**	**Supplier**
53710-001	Smiths Industries	M81714/60-22-01	QPL
53710-002	Smiths Industries	M81714/60-22-02	QPL
53710-003	Smiths Industries	M81714/60-22-06	QPL

C. Resistor and Diode Module Part Numbers

Table 3
RESISTOR MODULE PART NUMBERS

Value (Ohms)	Value (Watts)	Tolerance	Part Number	Supplier
18K	1W	1%	40-518-213-18	Smiths Industries
47K	3W	5%	43656-001	Smiths Industries

Table 4
DIODE MODULE PART NUMBERS

Value (Volts)	Value (Amps)	Part Number	Supplier
1000	1	40-666-2555T	Smiths Industries

D. Terminal Module Track Part Numbers

Table 5
TRACK PART NUMBERS

Part Number	Supplier	Maximum Number of Modules
53270-002	Smiths Industries	4
53270-003	Smiths Industries	8
53270-005	Smiths Industries	7

Table 6
ALTERNATIVE TRACK PART NUMBERS

Specified Track		Alternative Track	
Part Number	Supplier	Part Number	Supplier
53720-002	Smiths Industries	M81714/67-04	QPL
53720-003	Smiths Industries	M81714/67-08	QPL
53720-005	Smiths Industries	M81714/67-07	QPL

E. Ground Module Part Numbers

Table 7
GROUND MODULE PART NUMBERS

Part Number	Mount Type	Supplier
53710-005	Panel	Smiths Industries
40-718-5368-01	Panel	Smiths Industries

Table 8
ALTERNATIVE GROUND MODULE PART NUMBERS

Specified Ground Module		Alternative Ground Module	
Part Number	Supplier	Part Number	Supplier
53710-005	Smiths Industries	M81714/63-16F	QPL
40-718-5368-01	Smiths Industries	M81714/63-20F	QPL

777 ELMS PANEL REPAIR: M81714 SERIES II TERMINAL JUNCTION SYSTEM

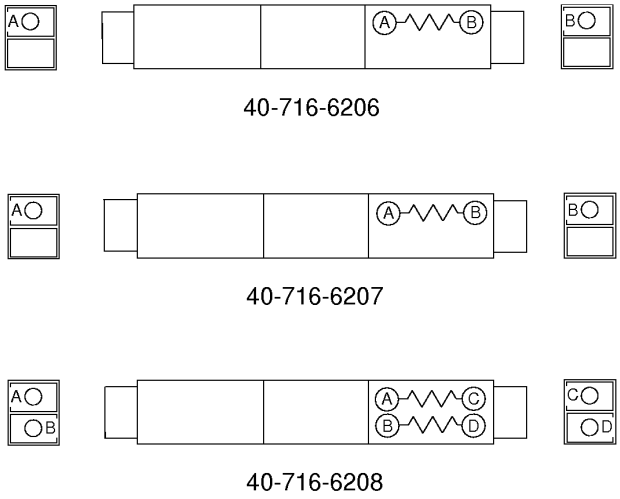
F. Resistive Wire Splice Part Numbers

Table 9
RESISTIVE WIRE SPLICE PART NUMBERS

Part Number	Size	Mount Type	Supplier
40-716-6206	20	Wired Inline	Smiths Industries
40-716-6207	20	Wired Inline	Smiths Industries
40-716-6208	20	Wired Inline	Smiths Industries

Table 10
RESISTIVE WIRE SPLICE CONFIGURATIONS

Resistive Wire Splice			Contact	
Part Number	Resistance (Ohms)	Number of Resistors	Size	Quantity
40-716-6206	1K	1	20	2
40-716-6207	18K	1	20	2
40-716-6208	18K	2	20	4



RESISTIVE SPLICE CONFIGURATIONS
Figure 1

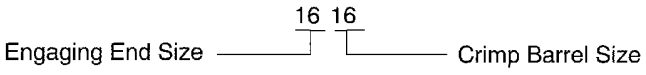
Table 11
ALTERNATIVE RESISTIVE WIRE SPLICE PART NUMBERS

Specified Resistive Wire Splice		Alternative Resistive Wire Splice	
Part Number	**Supplier**	**Part Number**	**Supplier**
40-716-6206	Smiths Industries	TJSE20551	PCD
40-716-6207	Smiths Industries	TJSE20552	PCD
40-716-6208	Smiths Industries	TJSE20554	PCD

G. Contact Part Numbers

Table 12
CONTACT PART NUMBERS

Contact Size	Contact Type	Part Number	Color Code		Supplier
			Band	**Color**	
2222	Socket	30-867-6811U	1	Brown	Smiths Industries
			2	White	
			3	Brown	
2020	Pin	30-867-6519-01	1	Brown	Smiths Industries
			2	Black	
			3	Brown	
	Socket	30-867-6839U	1	Brown	Smiths Industries
			2	White	
			3	Red	
1616	Socket	30-867-6812U	1	Brown	Smiths Industries
			2	White	
			3	Orange	



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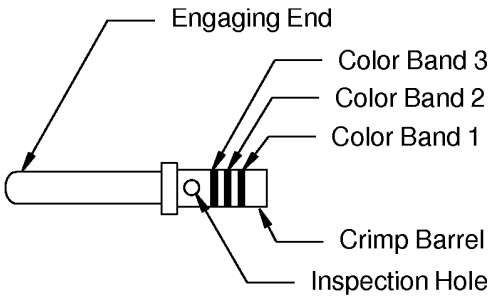
EXAMPLE OF CONTACT SIZE
Figure 2



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PIN CONTACT
Figure 3

Table 13
ALTERNATIVE CONTACT PART NUMBERS

Specified Contact		Alternative Contact	
Part Number	**Supplier**	**Part Number**	**Supplier**
30-867-6811U	Smiths Industries	M39029/22-191	QPL
30-867-6812U	Smiths Industries	M39029/22-193	QPL
30-867-6519-01	Smiths Industries	M39029/1-101	QPL
30-867-6839U	Smiths Industries	M39029/22-192	QPL

2. TERMINAL MODULE AND GROUND MODULE CONFIGURATIONS

A. M81714 Series II Terminal Module Configurations

Table 14
TERMINAL MODULE CONFIGURATIONS

Terminal Module	Contact Cavities		Bus Configuration	
	Size	**Quantity**	**Sets**	**Contact Cavities**
53710-001	22	20	1	20
53710-002	22	20	2	10
53710-003	22	20	4	4
			2	2

NOTE: The size of the contact cavity is equivalent to the size of the contact crimp barrel.

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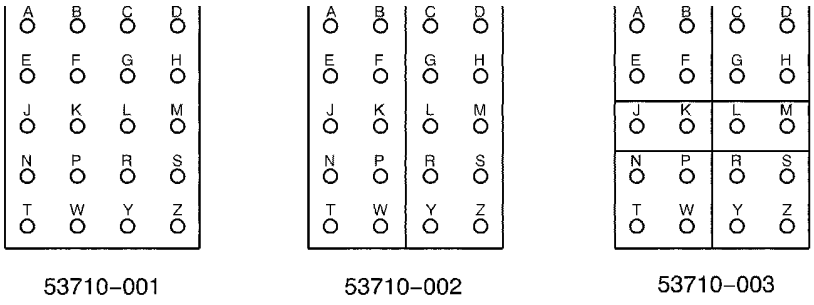


2447343 S00061544507_V1

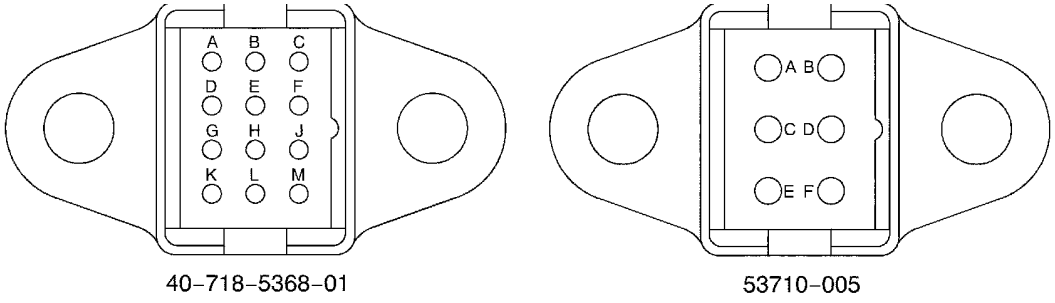
TERMINAL MODULE BUS CONFIGURATIONS
Figure 4

B. M81714 Series II Ground Module Configurations

Table 15
GROUND MODULE CONFIGURATIONS

Ground Module	Contact	
	Size	Quantity
53710-005	16	6
40-718-5368-01	20	12

NOTE: The size of the contact cavity is equivalent to the size of the contact crimp barrel.



2447344 S00061544508_V1

GROUND MODULE CONFIGURATIONS
Figure 5

3. TERMINAL JUNCTION SYSTEM DISASSEMBLY

A. Contact Removal

Table 16
CONTACT REMOVAL TOOLS

Crimp Barrel Size	Removal Tool	
	Part Number	Color
22	M81969/14-01	White
	M81969/16-04	White
20	M81969/14-02	White
	M81969/16-01	White
16	M81969/14-03	White
	M81969/16-02	White

(1) Make a selection of a contact removal tool from Table 16.

(2) Put end of the removal tool on the wire near the grommet.

(3) Carefully push the tool into the contact cavity until it stops.

CAUTION: DO NOT TURN THE TOOL WHILE IT IS IN THE CONTACT CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(4) Pull the wire and the tool out of the contact cavity at the same time.

(5) If the contact does not come out of the contact cavity:

(a) Pull the tool out of the contact cavity.

(b) Pull the tool out of the contact cavity.

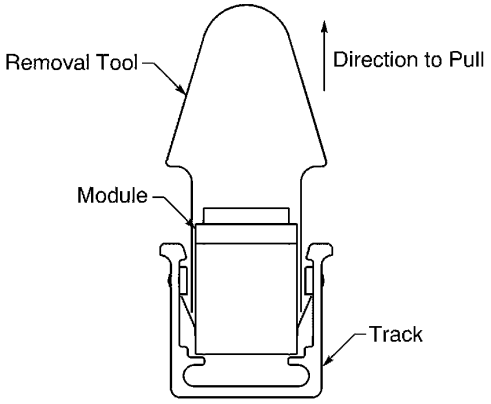
(c) Turn the tool 90 degrees.

(d) Do Step 3.A.(2) through Step 3.A.(4) again.

B. Removal of a Terminal Module from a Track

Table 17
MODULE REMOVAL TOOLS

Terminal Module Size	Tool Part Number
22	CNA051300
	M81714/69-01



2447351 S00061544509_V1

REMOVAL OF THE MODULE
Figure 6

Refer to Figure 6.

(1) Make a selection of a terminal module removal tool from Table 17.

(2) Put each end of the tool on opposite sides of the module.

(3) Push the tool to the track until it is fully inserted.

(4) Push the ends of the tool together.

(5) Pull the module from the track.

4. TERMINAL JUNCTION SYSTEM ASSEMBLY

A. Contact Assembly

Table 18
INSULATION REMOVAL LENGTH

Wire Size (AWG)	Crimp Barrel Size	Removal Length L (inch)		Special Instructions
		Target	Tolerance	
22	22	0.156	0.030	-
	20	0.156	0.030	-
	16	0.312	0.030	Fold the conductor back

Table 18 INSULATION REMOVAL LENGTH (Continued)

Wire Size (AWG)	Crimp Barrel Size	Removal Length L (inch)		Special Instructions
		Target	Tolerance	
20	20	0.156	0.030	-
	16	0.156	0.030	-
18	16	0.156	0.030	-
16	16	0.156	0.030	-

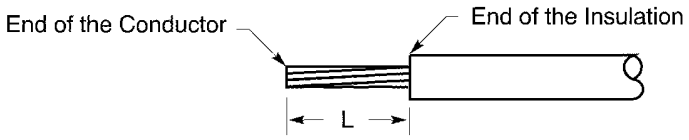
Table 19
CONTACT CRIMP TOOLS

Wire Size (AWG)	Crimp Barrel Size	Crimp Tool		
		Basic Unit		Locator Part Number
		Part Number	Setting	
22	22	M22520/2-01	5	K330-3
	20	M22520/2-01	6	M22520/2-08
		M22520/7-01	4	M22520/7-12
	16	M22520/7-01	6	M22520/7-13
20	20	M22520/7-01	5	M22520/7-12
		M22520/2-01	7	M22520/2-08
	16	M22520/7-01	6	M22520/7-13
18	16	M22520/7-01	7	M22520/7-13
16	16	M22520/7-01	8	M22520/7-13

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

Refer to:

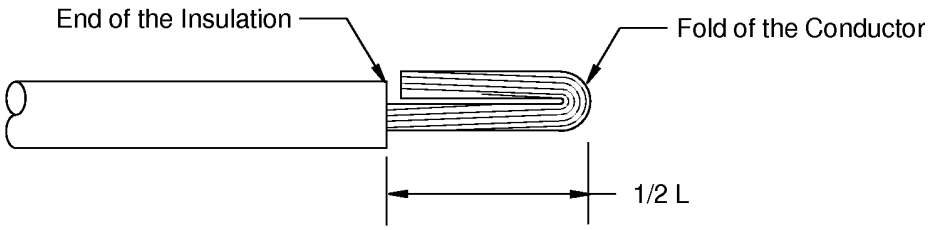
- Figure 7
- Table 18 for the insulation removal length
- Subject 20-00-15 for the insulation removal procedures.



2446656 S00061544391_V1

WIRE PREPARATION
Figure 7

(2) If it is specified, fold the conductor back. Refer to Figure 8.



2446657 S00061544480_V1

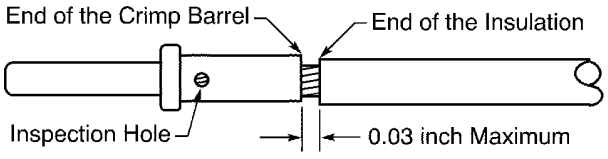
CONDUCTOR FOLDED BACK
Figure 8

(3) Make a selection of a crimp tool from Table 19.

(4) Push the end of the wire into the crimp barrel of the contact. Refer to Figure 9.

Make sure that:

- All of the strands of the conductor are in the crimp barrel
- The strands of the conductor can be seen in the inspection hole
- The distance from the end of the insulation to the end of the crimp barrel a maximum of 0.03 inch.



2446855 S00061544427_V1

POSITION OF THE WIRE IN THE CRIMP BARREL
Figure 9

(5) Crimp the contact.

(6) Examine the wired contact for these types of damage:

- A strand of the conductor is broken
- The base metal of a strand of the conductor can be seen
- The crimp barrel of the contact has a crack.

(7) If the contact or the wire has damage, replace the contact.

B. Contact Insertion

Table 20
CONTACT INSERTION TOOLS

Crimp Barrel Size	Insertion Tool	
	Part Number	Color
22	M81969/14-01	Green
	M81969/16-04	Green
20	M81969/14-02	Red
	M81969/16-01	Red
16	M81969/14-03	Blue
	M81969/16-02	Blue

(1) Make a selection of a contact insertion tool from Table 20.

CAUTION: DO NOT USE A TOOL WITH A TIP THAT:
- IS BENT
- IS FLARED
- IS BROKEN
- HAS A CRACK.

WARNING: A DEFECTIVE TOOL CAN CAUSE INJURY TO THE OPERATOR.

CAUTION: A DEFECTIVE TOOL CAN CAUSE DAMAGE TO THE GROMMET OF THE CONNECTOR OR THE CONTACT RETENTION CLIPS.

(2) Put the contact in the insertion end of the insertion tool.

CAUTION: AN UNWIRED CONTACT MUST NOT BE INSTALLED IN A MODULE. IT CANNOT BE REMOVED.

(3) Axially align the contact and the tool with the contact cavity.

(4) Carefully push the tool straight into the contact cavity until it stops.

CAUTION: DO NOT TURN THE TOOL WHEN IT IS IN THE CONTACT CAVITY. DAMAGE TO THE CONTACT RETENTION CLIPS CAN OCCUR.

(5) Carefully pull the tool straight out of the contact cavity.

(6) Lightly pull the wire to make sure that the contact is locked in position.

CAUTION: DO NOT PULL THE WIRE WITH A STRONG OR A SUDDEN FORCE. THE FORCE CAN CAUSE DAMAGE TO THE TERMINAL MODULE OR THE CONTACT.

CAUTION: DO NOT MAKE A DENT IN THE WIRE INSULATION WITH THE FINGERNAILS. DAMAGE TO THE WIRE INSULATION CAN CAUSE UNSATISFACTORY PERFORMANCE AND RELIABILITY OF THE WIRE.

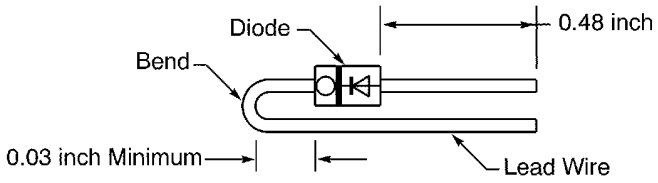
(7) If the contact is not locked in the contact cavity:

(a) Pull the contact out of the cavity.

(b) Do Step 4.B.(2) through Step 4.B.(6) again.

C. Installation of a Diode

(1) Prepare the lead wires of the diode. Refer to Figure 10.



2447345 S00061544510_V1

LEAD WIRE PREPARATION
Figure 10

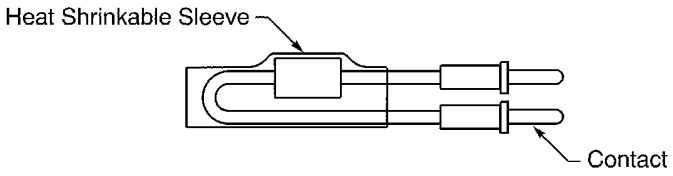
(a) Bend one lead wire back to make it parallel with the other lead wire.

Make sure that the bend is not less than 0.03 inch from the body of the diode.

(b) Cut each lead wire on the diode to make the length from the end of the diode to the end of the wire equal to 0.48 inch.

(2) Assemble a contact on the end of each lead wire. Refer to Paragraph 4.A.

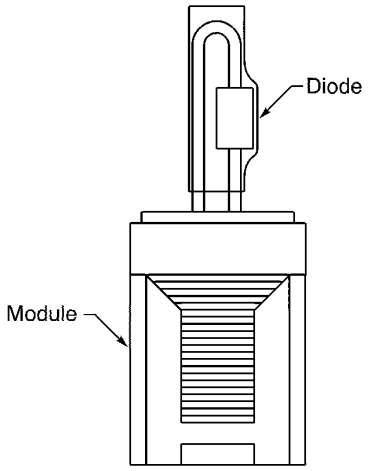
(3) Put a length of heat shrinkable sleeve on the diode and the lead wires. Refer to Figure 11.



2447346 S00061544511_V1

POSITION OF THE HEAT SHRINKABLE SLEEVE
Figure 11

(4) Insert the contacts of the diode into the terminal module. Refer to Paragraph 4.B. and Figure 12.

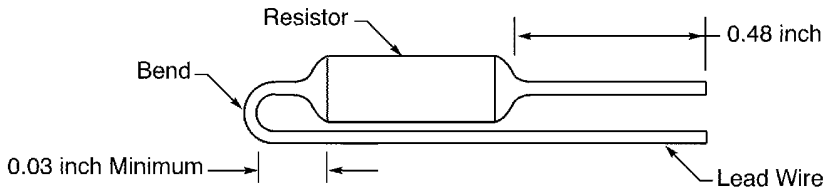


2447347 S00061544512_V1

INSTALLATION OF THE DIODE
Figure 12

D. Installation of a Resistor

(1) Prepare the lead wires of the resistor. Refer to Figure 13.



2447348 S00061544513_V1

LEAD WIRE PREPARATION
Figure 13

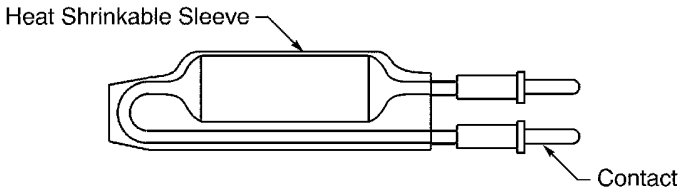
(a) Bend one lead wire back to make it parallel with the other lead wire.

Make sure that the bend is not less than 0.03 inch from the body of the resistor.

(b) Cut each lead wire on the resistor to make the length from the end of the resistor to the end of the wire equal to 0.48 inch.

(2) Assemble a contact on the end of each lead wire. Refer to Paragraph 4.A.

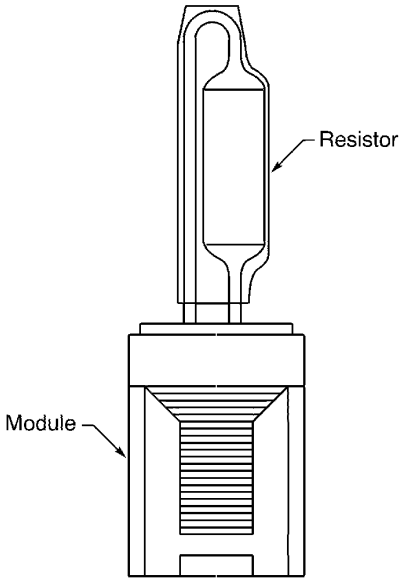
(3) Put a length of heat shrinkable sleeve on the resistor. Refer to Figure 14.



2447349 S00061544514_V1

POSITION OF THE HEAT SHRINKABLE SLEEVE
Figure 14

(4) Insert the contacts of the resistor into the terminal module. Refer to Paragraph 4.B. and Figure 15.



2447350 S00061544515_V1

INSTALLATION OF THE RESISTOR
Figure 15

E. Installation of a Terminal Module on a Track

(1) Put the terminal module in the correct position on the top of the rail.

(2) Push down on the module until it makes a click is heard and the module is locked in position.

F. Installation of a Ground Module on a Panel

Table 21
GROUND MODULE INSTALLATION FASTENERS

Fastener	Size	Quantity
Screw, Hex	8-32	2
Washer, Flat	8	2
Washer, Lock	8	2

(1) Make a selection of the necessary fasteners from Table 21.

(2) Put a lock washer on each screw.

(3) Put a flat washer on each screw.

(4) Align the installation screw holes on the ground module with the installation holes in the panel.

(5) Engage the threads of the screws and the installation holes.

(6) Torque each screw 17 inch-pounds ±2 inch-pounds.

5. APPROVED TOOL SUPPLIERS

A. Contact Removal and Insertion Tools

Table 22
CONTACT REMOVAL AND INSERTION TOOL SUPPLIERS

Removal Tool	Supplier
M81969/14-01	QPL
M81969/14-02	QPL
M81969/14-03	QPL
M81969/16-01	QPL
M81969/16-02	QPL
M81969/16-04	QPL

B. Terminal Module Removal Tools

Table 23
TERMINAL MODULE REMOVAL TOOL SUPPLIERS

Removal Tool	Supplier
CNA051300	Precision Connector Design
M81714/69-01	QPL

C. Contact Crimp Tools

Table 24
CRIMP TOOL SUPPLIERS

Crimp Tool	Supplier
K330-3	Daniels
M22520/2-01	QPL
M22520/7-01	QPL
M22520/7-12	QPL
M22520/7-13	QPL