

NAVAIR 01-1A-505-3
TO 00-25-255-2
TM 1-1500-323-24-3
1 September 2007

TECHNICAL MANUAL

INSTALLATION AND REPAIR PRACTICES

VOLUME III

**AIRCRAFT RECTANGULAR ELECTRICAL
CONNECTORS AND ACCESSORIES**

This manual is incomplete without volume 1 (NAVAIR 01-1A-505-1)

For U.S. Air Force Users Only- It is incomplete without T. O. 1-1A-14

For U.S. Army Users Only - It is incomplete without 1-1500-323-24-1

This manual supersedes: NAVAIR 01-1A-505.15, 01-1A-505.16, 01-1A-505.17, 01-1A-505.18, 01-1A-505.19, 01-1A-505.20, 01-1A-505.22, 01-1A-505.23 and Air Force T.O. 00-25-255-2, dated 15 February 1993.

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.
DESTRUCTION NOTICE - For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL AIR SYSTEMS COMMAND

0801LP1068153

NUMERICAL INDEX OF EFFECTIVE WORK PACKAGES/PAGES

List of Current Changes

Original.....0.....1 September 2007

Only those work packages/pages assigned to the manual are listed in this index. Insert Change _____, dated _____. Dispose of superseded and deleted work packages/pages. If changed pages are issued to a work package, insert the changed pages in the applicable work package. The portion of text affected in a changed or revised work package is indicated by change bars or the change symbol "R" in the outer margin of each column of text. Changes to illustrations are indicated by point hands or change bars, as applicable. Changes to wiring diagrams and schematics are indicated by shading.

WP Number	Title	WP Number	Title
Title		WP 005 03	Connector Accessories MIL-DTL-28748
Page A	Numerical Index of Effective Work Packages/Pages	WP 006 00	Alphabetical Index for Connectors MIL-DTL-28804
TPDR	List of Technical Publications	WP 006 01	Introduction to Connectors MIL-DTL-28804
HMWS	Discrepancy Reports Incorporated	WP 006 02	Connectors MIL-DTL-28804
	Warnings Applicable to Hazardous Waste materials	WP 006 03	Connector Accessories Connectors MIL-DTL-28804
001 00	Alphabetical Index	WP 007 00	Alphabetical Index for Connectors MIL-C-81659
WP 002 00	Introduction	WP 007 01	Introduction to Connectors MIL-C-81659
WP 003 00	Alphabetical Index for Connectors MIL-C-24308	WP 007 02	Connectors MIL-C-81659
WP 003 01	Introduction to Connectors MIL-DTL-24308	WP 007 03	Connector Accessories for Connectors MIL-C-81659
WP 003 02	Connectors MIL- DTL-24308	WP 008 00	Alphabetical Index for Connectors MIL-DTL-83733
WP 003 03	Connector Accessories MIL- DTL-24308	WP 008 01	Introduction to Connectors MIL-DTL-83733
WP 004 00	Alphabetical Index for Connectors MIL-DTL-28731	WP 008 02	Connectors MIL-DTL-83733
WP 004 01	Introduction to Connectors MIL-DTL-28731	WP 008 03	Connector Accessories for Connectors MIL-DTL-83733
WP 004 02	Connectors MIL-DTL-28731	WP 009 00	Alphabetical Index for Connectors MIL-C-21617
WP 004 03	Connector Accessories MIL-DTL-28731	WP 009 01	Introduction to Connectors MIL-C-21617
WP 005 00	Alphabetical Index for Connectors MIL-DTL-28748	WP 009 02	Connectors MIL-C-21617
WP 005 01	Introduction to Connectors MIL-DTL-28748		
WP 005 02	Connectors MIL-DTL-28748		

**NAVAIR 01-1A-505-3
T.O. 00-25-255-2
TM1-1500-323-24-3**

WP Number	Title	WP Number	Title
WP 009 03	Connector Accessories for Connectors MIL-C-21617	WP 011 03	Connector Accessories for Connectors MIL-DTL-83513
WP 010 00	Alphabetical Index for Connectors MIL-DTL-26518	WP 012 00	Alphabetical Index for Connectors MIL-C-85028
WP 010 01	Introduction to Connectors MIL-DTL-26518	WP 012 01	Introduction to Connectors MIL-C-85028
WP 010 02	Connectors MIL-DTL-26518	WP 012 02	Connectors MIL-C-85028
WP 010 03	Connector Accessories for Connectors MIL-DTL-26518	WP 012 03	Connector Accessories for Connectors MIL-C-85028
WP 011 00	Alphabetical Index for Connectors MIL-DTL-83513	WP 013 00	Alphabetical Index for Connectors MTC Series
WP 011 01	Introduction to Connectors MIL-DTL-83513	WP 013 01	Introduction to Connectors MTC Series
WP 011 02	Connectors MIL-DTL-83513	WP 013 02	Connectors MTC Series
		Appendix	Part Numbers Status

Total number of pages in this publication is 396 consisting of the following:

WP/Page No.	Change No.	WP/Page No.	Change No.	WP/Page No.	Change No.
Title	0	004 02		1	0
A-B	0	1 - 28.....	0	2 Blank	0
C Blank.....	0	004 03		007 01	
TPDR-1	0	1 - 6.....	0	1	0
TPDR-Blank.....	0	005 00		2 Blank	0
HMWS-1 – HMWS-4.....	0	1	0	007 02	
001 00		2 Blank.....	0	1 - 31	0
1	0	005 01		32 Blank	0
2 Blank	0	1	0	007 03	
002 00		2 Blank.....	0	1 - 5	0
1 - 4.....	0	005 02		6 Blank	0
003 00		1 - 39.....	0	008 00	
1	0	40 Blank.....	0	1	0
2 Blank	0	005 03		2 Blank	0
003 01		1 - 5.....	0	008 01	
1	0	6 Blank.....	0	1	0
2 Blank	0	006 00		2 Blank	0
003 02		1	0	008 02	
1 - 38.....	0	2 Blank.....	0	1 - 21	0
003 03		006 01		22 Blank	0
1 - 8.....	0	1	0	008 03	
004 00		2 Blank.....	0	1 - 4	0
1	0	006 02		009 00	
2 Blank	0	1 - 10.....	0	1	0
004 01		006 03		2 Blank	0
1	0	1 - 2.....	0	009 01	
2 Blank	0	007 00		1	0

**NAVAIR 01-1A-505-3
T.O. 00-25-255-2
TM1-1500-323-24-3**

WP/Page No.	Change No.	WP/Page No.	Change No.	WP/Page No.	Change No.
	2 Blank	0		A-14 Blank.....	0
009 02	1 - 10.....	0			
009 03	1 - 2.....	0			
010 00	1.....	0			
	2 Blank	0			
010 01	1.....	0			
	2 Blank	0			
010 02	1 - 21	0			
	22 Blank	0			
010 03	1 - 3.....	0			
	4 Blank	0			
011 00	1.....	0			
	2 Blank	0			
011 01	1.....	0			
	2 Blank	0			
011 02	1 - 8.....	0			
011 03	1 - 10.....	0			
012 00	1.....	0			
	2 Blank	0			
012 01	1.....	0			
	2 Blank	0			
012 02	1 - 16.....	0			
012 03	1 - 3.....	0			
	4 Blank	0			
013 00	1.....	0			
	2 Blank	0			
013 01	1.....	0			
	2 Blank	0			
013 02	1 - 24.....	0			
Appendix	A-1 - A-13.....	0			

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

TPDR-1/(2 Blank)

LIST OF TECHNICAL PUBLICATION DEFICIENCY REPORTS INCORPORATED

INSTALLATION PRACTICES

CONNECTORS MIL-DTL- 28731

**Identification No/
QA Sequence No.**

Service

None

Record of Applicable Technical Directives

Type/No.	Date	Title and ECP No.	Date Inc.	Remarks
		None		

HAZARDOUS MATERIAL WARNING AND SAFETY

Record of Applicable Technical Directives

Code of Federal Regulations	49 CFR, Parts 171-179
OPNAVINST	5100 Series
Navy Occupational Safety and Health	5100.23
Hazardous Material Handling.....	5100.28
Air Force Occupational Safety & Health Program.....	AFOSH 161-17
Hazard Communication Program	AFOSH 161-21

Alphabetical Index

<u>Subject</u>	Page No.
General Safety Precautions.....	1
Introduction	1
Explanation of Hazardous Symbols	5
Specific Hazardous Material Warnings.....	6
Hazardous Material Warnings	3
General Warnings and Cautions.....	2

Support Equipment Required

None

Materials Required

None

1. **INTRODUCTION.** This work package (WP) addresses hazardous materials precautions (HAZMAT).
2. **HAZARDOUS MATERIAL WARNINGS.**
3. Warnings for hazardous materials listed in this manual are designed to warn personnel of hazards associated with such items when they come in contact with them by actual use. Additional information related to hazardous materials is provided in OPNAVINST 5100.23, Navy Occupational Safety and Health (NAVOSH) Program Manual, NAVSUPINST 5100.27, Navy Hazardous Material Control Program, and the DOD 6050.5, Hazardous

Materials Information System (HMIS) series publications. For each hazardous material used within the Navy, a material safety data sheet (MSDS) is required to be provided and available for review by users. Consult your local safety and health staff concerning any question on hazardous chemicals, MSDS's, personal protective equipment requirements, and appropriate handling and emergency procedures and disposal guidance.

4. Complete warnings for hazardous materials referenced in this manual are identified by use of an icon, nomenclature and specification or part number of the material, and a numeric identifier. The numeric identifiers have been assigned to the

NAVAIR 01-1A-505-3
TO 00-25-255-2
TM 1-1500-323-24-3

HMWS-2

hazardous materials in the order of their appearance in the manual. Each hazardous material is assigned only one numeric identifier. Repeated use of a specific hazardous material references the numeric identifier assigned at its initial appearance.

5. In the text of the manual, the caption WARNING will not be used for hazardous materials. Such warnings will be identified by an icon and numeric identifier. The material nomenclature will also be provided. The user is directed to refer to the corresponding numeric identifier listed below for the complete warning applicable to the hazardous materials

6. EXPLANATION OF HAZARDOUS SYMBOLS

**NAVAIR 01-1A-505-3
TO 00-25-255-2
TM 1-1500-323-24-3**

HMWS-3

Biological



The abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to your life or health.

Chemical



The symbol of drops of a liquid onto a hand shows that the material will cause burns or irritation of human skin or tissue.

Explosion



The rapidly expanding symbol shows that the material may explode if subjected to high temperatures, sources of ignition, or high pressure.

Eye Protection



The symbol of a person wearing goggles shows that the material will injure your eyes.

Fire



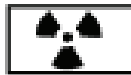
The symbol of a flame shows that a material can ignite and burn you.

Poison



The symbol of a skull and crossbones shows that a material is poisonous or is a danger to life.

Radiation



The symbol of three circular wedges shows that the material emits radioactive energy and can injure human tissue or organs.

Vapor



The symbol of a human figure in a cloud shows that vapors of a material present a danger to your life or health.

Cryogenic



The symbol of a hand in a block of ice shows that the material is extremely cold and can injure human skin or tissue.

7. SPECIFIC HAZARDOUS MATERIALS WARNINGS



1. **Isopropyl Alcohol** (TT-I-735). Flammable and mildly toxic to eyes, skin, and respiratory tract. Skin and eye protection is required. Avoid repeated and/or prolonged contact. Use only in well-ventilated areas. Keep away from open flames or other sources of ignition. Poison by ingestion.



2. **Flux** (Mil-F-14256). Flux fumes during soldering may cause irritation to the eyes. Soldering flux may also cause irritation to the skin and respiratory system. Containers may burst at elevated temperatures. Avoid breathing vapors. Avoid skin and eye contact. Use only in well ventilated areas. Keep away from heat, sparks, flames, and incompatible materials.



3. **Lead, Solder** (SNGOWRMAP3, or SN63WRMAP3). Poison by unspecified route. Skin, eye, and respiratory irritant. Skin and eye protection required. Do not breathe smoke during soldering. High temperatures may produce heavy metal fumes, dust, and/or vapor.

ALPHABETICAL INDEX

INSTALLATION AND REPAIR PRACTICES

AIRCRAFT RECTANGULAR ELECTRICAL CONNECTORS AND ACCESSORIES

<u>Title</u>	<u>WP Number</u>
Alphabetical Index	001 00
Components Part Number Index	Appendix
Introduction	002 00
Connectors MIL-DTL-24308	003 00
Connectors MIL-DTL-28731	004 00
Connectors MIL-DTL-28748	005 00
Connectors MIL-DTL-28804	006 00
Connectors MIL-C-81659	007 00
Connectors MIL-DTL-83733	008 00
Connectors MIL-DTL-21617	009 00
Connectors MIL-DTL-26518	010 00
Connectors MIL-DTL-83513	011 00
Connectors MIL-C-85028	012 00
Connectors MTC Series	013 00
Hazardous Material Waste Safety	HMWS
List of Technical Publication Discrepancy Reports Incorporated	TPDR

INTRODUCTION

INSTALLATION AND REPAIR PRACTICES

AIRCRAFT RECTANGULAR ELECTRICAL CONNECTORS AND ACCESSORIES

1. **PURPOSE AND SCOPE.**

2. This manual was prepared for the following reasons:

a. To gather under one cover the recommended practices and techniques to be used for installing, repairing, and maintaining aircraft rectangular electrical connectors and accessories.

b. To standardize these techniques and methods so that electrical installations will be done in a uniform manner.

c. To indoctrinate all personnel with the importance of good workmanship.

d. To point out the failures which, may result from poor workmanship.

e. To promote safety by pointing out and prohibiting unsafe practices.

3. This manual provides updated data and procedures on the most commonly encountered, general and special purpose rectangular electrical connectors and accessories employed on military aircraft. It also includes applicable tooling, consumables and equipment required to maintain these rectangular connectors, cables and accessories.

4. **ARRANGEMENT AND USE.**

5. This manual is divided into work packages (WPs) which are self-contained procedures that may be used to support specific tasks.

6. Each WP is maintained separately. The WPs are identified by five-digit numbers in the upper right corner of each page. This number aids in rapid assembly of a complete manual and is used for referencing within a manual.

7. This manual was prepared using Navy series manual numbers throughout the text as references to reduce the amount of text required. When other services are using this joint service manual refer to Table 1 for an explanation of their corresponding manual number (i.e. 01-1A-505-1 Navy, is 1-1A-14 Air Force, or 1-1500-323-24-1 Army). When a conflict exists between this series of manuals and other manuals the precedence is as follows:

- a. OEM drawings
- b. Platform Specific Manuals
- c. SAE AS50881
- d. NAVAIR 01-1A-505 (series)

Table 1. Joint Services Manuals

Manual Topic	Service		
	Navy	Air Force	Army
General Wiring	01-1A-505-1	1-1A-14	1-1500-323-24-1
Circular Connectors	01-1A-505-2	00-25-255-1	1-1500-323-24-2
Rectangular Connectors	01-1A-505-3	00-25-255-2	1-1500-323-24-3

8. **REQUISITIONING AND AUTOMATIC DISTRIBUTION.**

9. Procedures to be used by Naval activities and other Department of Defense activities requiring NAVAIR technical manuals are defined in NAVAIR 00-25-100.

10. **QUALITY ASSURANCE.**

11. Maintenance procedure steps, essential to equipment performance or to the safety of personnel, are highlighted by the addition of the abbreviation (QA) following the procedure. Quality Assurance action shall be taken on all steps designated (QA) prior to proceeding to the next step.

12. **SUPPORT EQUIPMENT REQUIRED.**

13. Each individual WP identifies the support equipment required to maintain the components covered within it. When alternate repair procedures exist, different tools may be required. Where possible, the alternate tools are identified.

14. **CONSUMABLE MATERIALS REQUIRED.**

15. Each individual WP identifies the consumable materials required to maintain the components covered within it. The materials required for each maintenance task are listed in the corresponding WP. When alternate repair procedures exist, different materials may be required. Where possible, the alternate materials are identified.

16. **REFERENCE MATERIAL.**

17. Each WP identifies the applicable list of reference material required to install, maintain or repair the applicable rectangular connector and/or accessory.

18. **TECHNICAL DIRECTIVES.**

19. A record of applicable technical directives will also appear in each WP in this manual, but will list only technical directives that affect the text and illustrations of that particular WP.

20. **WARNINGS, CAUTIONS, AND NOTES.**

21. Warnings, Cautions, and Notes are used throughout this manual. They are defined as follows:

WARNING

An operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, could result in injury to, or death of personnel.

CAUTION

An operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

An essential operating or maintenance procedure, condition, or statement, which must be highlighted.

22. **GENERAL SAFETY PRECAUTIONS.** The following general safety precautions shall apply:

a. Observe and follow all written safety precautions while performing procedures given in the methods of this and other work packages contained within this manual.

b. Observe and adhere to all Warning/Caution/Advisory signs on equipment and materials.

c. Observe and adhere to all Warning/Caution/Advisories/Notes in the applicable Type/Model/Series aircraft manuals for repair of, and operational verification of wiring and interconnect systems.

d. The following are general safety precautions which are not related to any specific procedure and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel

shall understand and apply during many phases of operation and maintenance.

23. KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel shall observe all safety regulations at all times. Do not replace components inside the equipment when potentially lethal voltages are present. Turn off system power before making/breaking electrical connections. Regard any exposed connector, terminal board, or circuit boards as a possible shock hazard. Components that retain a charge shall be discharged only when such grounding does not result in equipment damage. If a test connection to energized equipment is required, make the test equipment ground connection before probing the voltage or signal to be tested. Adhere to all lock out/tag out requirements.

24. DO NOT SERVICE OR ADJUST ALONE.

Personnel shall not under any circumstance reach into or enter any enclosure for the purpose of servicing, or adjusting the equipment alone, without immediate presence, or assistance of another person capable of rendering aid.

25. RESUSCITATION. Personnel working with, or near high voltages or hazardous materials shall be familiar with modern methods of resuscitation. More information may be obtained by consulting with: the Office of Bioenvironmental Health (Air Force), Navy Safety Center, Activity HAZMAT Officer (Navy), or the local Red Cross organization.

26. DO NOT WEAR JEWELRY. Remove rings, watches, and other metallic objects which may cause electric shock, or burn hazard.

27. GENERAL WARNINGS AND CAUTIONS.

WARNING

Do not perform hot work without specific authorization of activity Aviation Gas Free Engineer (AVGFE) or Gas Free Engineer (GFE).

The HT-900B, HT-920B, HT-71002 and MCH-100-A heat guns are the only authorized heat guns to be used when working on aircraft that have not been defueled and purged. The aircraft must be defueled and purged before using any other heat guns listed in this manual. Aircraft with open fuel cells or broken or open fuel lines shall be certified gas free in accordance with NAVAIR 01-1A-35, or AF T.O. 1-1-3.

Only the HT-900B/HT-920B, HT-71002, MCH-100-A heating tools are authorized for use on any aircraft whenever AVGAS, JP-4 or the presence of any type of fuel is imposing an immediate danger.

When using heat guns with electric motors, re-certification may be required as work progresses, as directed by the Aviation Gas Free Engineering Technician (AVGFET).

The MCH-100-A heat gun has been Electro-magnetic interference (EMI) qualified for flight line or flight deck use. All other electric motor type heat guns are not authorized for flight line or flight deck use due to electro-magnetic interference (EMI). hangar deck/flight line environment, provided the aircraft meets the gas-free environment criteria (NAVAIR 01-1A-35, or AF T.O. 1-1-3), and there are no EMI restrictions.

WARNING

Do not perform wire repair while using explosive solvent /paint products on the aircraft. When using a heat tool, do not use electrical power from the aircraft being repaired. Use electrical power from a ground power unit. Use of nitrogen with the HT-900B/HT-920B heat gun in an enclosed area can be hazardous. Discharge of nitrogen into a poorly ventilated area can result in asphyxiation.

CAUTION

Be careful if using metal tools (M81969). These tools can damage the wire sealing grommet in the connector. Plastic tools are

preferred. Inspect tool tips for damage or distortion before use.

Damage to the connector wire sealing grommet can occur. Avoid using metal tooling to remove and install backshells. These tools can damage the backshell and connector. Non-metallic tools are designed to wear before damaging connector or backshell.

Do not remove a contact attached to a broken wire with an unwired contact removal tool. The tool and connector may be damaged. Wire strands may be encountered at any point up to 5/16 inch of tool insertion. Do not force tool if wire strands are encountered. Withdraw tool any time it cannot be advanced into connector.

Inspect tool tip for nicks, cracks, mushrooming, and other damage that will prevent proper functioning. Replace removal tool and repeat procedure if required.

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

003 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 24308**

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-DTL-24308.....	003 03
Connectors MIL- DTL-24308	003 02
Introduction	003 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-DTL-24308**

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-DTL-24308. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-DTL-24308

Reference Material

Connectors, Electric, Rectangular, Non-Environmental,
Miniature, Polarized Shell, Rack and Panel MIL-DTL-24308
Installation Practices, Aircraft Electric and Electronic Wiring NAVAIR 01-1A-505-1

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	32
Contact Crimping	32
Connector Sealing	33
Contact Insertion	33
Contact Removal	34
Wire Stripping.....	32
Connector Cleaning and Preservation	38
Connector Removal and Installation	38
Introduction	2
Description	2
MIL-DTL-24308 Connectors	2
Connector Shells	2
Contacts	32
Design and Construction	31
Insert Arrangement	31
Connectors M24308/1	31
Connectors M24308/2	31
Connectors M24308/3	31
Connectors M24308/4	32
Connectors M24308/5	32
Connectors M24308/6	32
Connectors M24308/7.....	32
Connectors M24308/8.....	32
Connectors M24308/9.....	32
Connectors M24308/23	32
Connectors M24308/24	32
Connectors M24308/27.....	32
Connectors M24308/28.....	32
Insert Configuration	32
Inserts	31
Interchangeability	31
Mounting	3
Part Number	3
Dash Number	31
Military Designation	3
Specification Sheet.....	3
Polarization	2

Record of Applicable Technical Directives
None

Support Equipment Required

Part No./ Type Designation	Nomenclature
M22520/2-01	Tool, Crimp Frame
M22520/2-06	Positioner
M22520/2-08	Positioner
M22520/2-09	Positioner
M22520/3-1	Gage, Inspection
M81969/14-01	Tool, Insertion and Removal
M81969/14-02	Tool, Insertion and Removal

(6) K - Hermetic for space borne missions where high reliability is required.

b. Termination Style. These connectors are classified by the following termination types:

- (1) Crimp contacts.
- (2) Solder contacts.
- (3) Insulation displacement contacts (IDC).
- (4) Printed wiring board (PWB).

Materials Required

Specification/ Part No.	Nomenclature
	None

c. Types. These connectors are classified by the following types:

- (1) I - Standard density (size 20 contacts).
- (2) II - High density (size 22D contacts).
- (3) III - Standard density (size 20 IDC contacts).

1. **INTRODUCTION.**

2. This Work Package (WP) covers non-environmental, polarized shell, miniature, rack and panel connectors, both military and commercial, having pin and socket, crimp removable, solder non-removable, or insulation displacement non-removable contacts with rigid or float mounting, designed for -67°F (-55°C) to 257°F (+125°C) operating temperature.

3. **DESCRIPTION.** The connectors covered by MIL-DTL-24308 are classified according to the following:

a. Classes. There are six classes for these connectors and are classified as follows:

- (1) G - General purpose
- (2) N - Nonmagnetic
- (3) H - Hermetic
- (4) M - Nonmagnetic for space borne missions
- (5) D - General purpose for space borne missions where high reliability is required.

WARNING

This document includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. Consult applicable health and environmental regulations regarding its use, handling and disposition.

NOTE

Nickel plated parts are not for Navy use, or new design.

4. **MIL-DTL-24308 CONNECTORS.**

5. **CONNECTOR SHELLS.** The connector shells are designed to positively retain the insert and so constructed that the insert cannot be removed.

6. **POLARIZATION.** Polarization is accomplished by a keystone shape shell design with polarization accomplished before engagement of pins or sockets.

7. **MOUNTING.** Connectors shall be provided with means to fasten the shell securely to a mounting surface. Class H and K connectors shall be provided with solder mounting provisions, or with provisions for external mounting hardware.

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At

times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

8. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 1 thru 13, connectors shown in Figure 14).

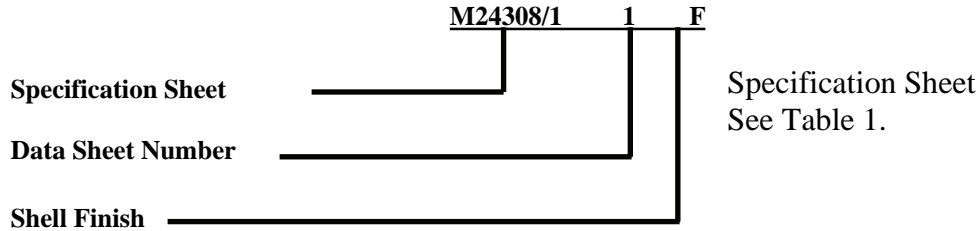
9. Military Designation. The military designations are denoted by the letter M.

10. Specification Sheet Number. The specification sheet number denotes the basic number of the specification sheet. (Table 1)

Table 1. MIL-DTL-24308 Specification Sheets

Specification Sheet	Class	Mounting Method	Contact Type	Termination Type	Contact Size	Insert Arrangements (See Figure 14)	Part Number Breakdown
M24308/1	D, G	Panel	Socket	Solder cup 2/	20 22D	9,15, 25, 37, 50 none	Figure 1
M24308/2	D, G	Panel	Socket	Crimp	20 22D	9,15, 25, 37, 50 15, 26, 44, 62, 78, 104	Figure 2
M24308/3	D, G	Panel	Pin	Solder cup 2/	20 22D	9,15, 25, 37, 50 none	Figure 3
M24308/4	D, G	Panel	Pin	Crimp	20 22D	9,15, 25, 37, 50 15, 26, 44, 62, 78, 104	Figure 4
M24308/5	M, N	Panel	Socket	Solder cup 2/	20 22D	9,15, 25, 37, 50 none	Figure 5
M24308/6	M, N	Panel	Socket	Crimp	20 22D	9,15, 25, 37, 50 15, 26, 44, 62, 78, 104	Figure 6
M24308/7	M, N	Panel	Pin	Solder cup 2/	20 22D	9,15, 25, 37, 50 none	Figure 7
M24308/8	M, N	Panel	Pin	Crimp	20 22D	9,15, 25, 37, 50 15, 26, 44, 62, 78, 104	Figure 8
M24308/9	H, K	Panel	Pin	Solder cup, eyelet 2/	20 22D	9,15, 25, 37, 50 none	Figure 9
M24308/23	G	PCB	Socket	Straight, right angle	20 22D	9,15, 25, 37, 50 15, 26, 44, 62, 78	Figure 10
M24308/24	G	PCB	Pin	Straight, right angle	20 22D	9,15, 25, 37, 50 15, 26, 44, 62, 78	Figure 11
M24308/25	Male screw lock						WP 003 03
M24308/26	Female screw lock						WP 003 03
M24308/27	G	Panel	Socket	IDC	20 22D	9,15, 25, 37	Figure 12
M24308/28	G	Panel	Pin	IDC	20 22D	9,15, 25, 37	Figure 13

PART NUMBER DESIGNATION



DATA SHEET NUMBER

Dash Number Class G	Dash Number PIN Class D	Insert arrangement (Figure 14)
M24308/1-1	M24308/1-34	A-1-1
M24308/1-2	M24308/1-35	A-2-1
M24308/1-3	M24308/1-36	A-3-1
M24308/1-4	M24308/1-37	A-4-1
M24308/1-5	M24308/1-38	A-5-1
M24308/1-12	M24308/1-45	A-1-1
M24308/1-13	M24308/1-46	A-2-1
M24308/1-14	M24308/1-47	A-3-1
M24308/1-15	M24308/1-48	A-4-1
M24308/1-16	M24308/1-49	A-5-1
M24308/1-23	M24308/1-56	A-1-1
M24308/1-24	M24308/1-57	A-2-1
M24308/1-25	M24308/1-58	A-3-1
M24308/1-26	M24308/1-59	A-4-1
M24308/1-27	M24308/1-60	A-5-1

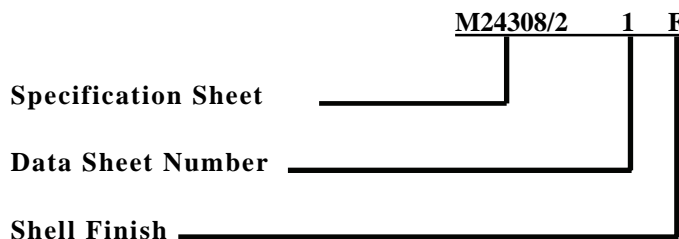
NOTES:

1. These connectors mate with connectors specified in MIL-DTL-24308/3, MIL-DTL-24308/4, MIL-DTL-24308/9, and MIL-DTL-24308/24.
2. Dash Numbers M24308/1-12 through M24308/1-16 and M24308/1-45 through M24308/1-49 are inactive for new design, use M24308/1-23 through M24308/1-27 and M24308/1-56 through M24308/1-60.

SHELL FINISH (Class G Connectors Only)	
F	Standard Cadmium
BLANK	Zinc Plated
SHELL FINISH (Class D Connectors Only)	
BLANK	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 1. MIL-DTL-24308/1 Part Number Breakdown

PART NUMBER DESIGNATION



Specification Sheet
See Table 1.

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert Arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/2-1	M24308/2-516	A-1-1	M39029/63-368	M24308/2-6	M24308/2-521
M24308/2-2	M24308/2-517	A-2-1	M39029/63-368	M24308/2-7	M24308/2-522
M24308/2-3	M24308/2-518	A-3-1	M39029/63-368	M24308/2-8	M24308/2-523
M24308/2-4	M24308/2-519	A-4-1	M39029/63-368	M24308/2-9	M24308/2-524
M24308/2-5	M24308/2-520	A-5-1	M39029/63-368	M24308/2-10	M24308/2-525
M24308/2-11	M24308/2-526	A-1-2	M39029/57-354	M24308/2-17	M24308/2-532
M24308/2-12	M24308/2-527	A-2-2	M39029/57-354	M24308/2-18	M24308/2-533
M24308/2-13	M24308/2-528	A-3-2	M39029/57-354	M24308/2-19	M24308/2-534
M24308/2-14	M24308/2-529	A-4-2	M39029/57-354	M24308/2-20	M24308/2-535
M24308/2-15	M24308/2-530	A-5-2	M39029/57-354	M24308/2-21	M24308/2-536
M24308/2-16	M24308/2-531	A-6-1	M39029/57-354	M24308/2-22	M24308/2-537
M24308/2-23 *	M24308/2-538 *	A-1-1	M39029/63-368	M24308/2-34 *	M24308/2-549 *
M24308/2-24 *	M24308/2-539 *	A-2-1	M39029/63-368	M24308/2-35 *	M24308/2-550 *
M24308/2-25 *	M24308/2-540 *	A-3-1	M39029/63-368	M24308/2-36 *	M24308/2-551 *
M24308/2-26 *	M24308/2-541 *	A-4-1	M39029/63-368	M24308/2-37 *	M24308/2-552 *
M24308/2-27 *	M24308/2-542 *	A-5-1	M39029/63-368	M24308/2-38 *	M24308/2-553 *
M24308/2-28 *	M24308/2-543 *	A-1-2	M39029/57-354	M24308/2-39 *	M24308/2-554 *
M24308/2-29 *	M24308/2-544 *	A-2-2	M39029/57-354	M24308/2-40 *	M24308/2-555 *
M24308/2-30 *	M24308/2-545 *	A-3-2	M39029/57-354	M24308/2-41 *	M24308/2-556 *
M24308/2-31 *	M24308/2-546 *	A-4-2	M39029/57-354	M24308/2-42 *	M24308/2-557 *
M24308/2-32 *	M24308/2-547 *	A-5-2	M39029/57-354	M24308/2-43 *	M24308/2-558 *
M24308/2-33 *	M24308/2-548 *	A-6-1	M39029/57-354	M24308/2-44 *	M24308/2-559 *

Figure 2. MIL-DTL-24308/2 Part Number Breakdown (Sheet 1 of 4)

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/2-281	M24308/2-560	A-1-1	M39029/63-368 ^	N/A	N/A
M24308/2-282	M24308/2-561	A-2-1	M39029/63-368 ^	N/A	N/A
M24308/2-283	M24308/2-562	A-3-1	M39029/63-368 ^	N/A	N/A
M24308/2-284	M24308/2-563	A-4-1	M39029/63-368 ^	N/A	N/A
M24308/2-285	M24308/2-564	A-5-1	M39029/63-368 ^	N/A	N/A
M24308/2-286	M24308/2-565	A-1-2	M39029/57-354 ^	N/A	N/A
M24308/2-287	M24308/2-566	A-2-2	M39029/57-354 ^	N/A	N/A
M24308/2-288	M24308/2-567	A-3-2	M39029/57-354 ^	N/A	N/A
M24308/2-289	M24308/2-568	A-4-2	M39029/57-354 ^	N/A	N/A
M24308/2-290	M24308/2-569	A-5-2	M39029/57-354 ^	N/A	N/A
M24308/2-291	M24308/2-570	A-6-1	M39029/57-354 ^	N/A	N/A
M24308/2-292 *	M24308/2-571 *	A-1-1	M39029/63-368 ^	N/A	N/A
M24308/2-293 *	M24308/2-572 *	A-2-1	M39029/63-368 ^	N/A	N/A
M24308/2-294 *	M24308/2-573 *	A-3-1	M39029/63-368 ^	N/A	N/A
M24308/2-295 *	M24308/2-574 *	A-4-1	M39029/63-368 ^	N/A	N/A
M24308/2-296 *	M24308/2-575 *	A-5-1	M39029/63-368 ^	N/A	N/A
M24308/2-297 *	M24308/2-576 *	A-1-2	M39029/57-354 ^	N/A	N/A
M24308/2-298 *	M24308/2-577 *	A-2-2	M39029/57-354 ^	N/A	N/A
M24308/2-299 *	M24308/2-578 *	A-3-2	M39029/57-354 ^	N/A	N/A
M24308/2-300 *	M24308/2-579 *	A-4-2	M39029/57-354 ^	N/A	N/A
M24308/2-301 *	M24308/2-580 *	A-5-2	M39029/57-354 ^	N/A	N/A
M24308/2-302 *	M24308/2-581 *	A-6-1	M39029/57-354 ^	N/A	N/A
M24308/2-335 *	M24308/2-582 *	A-3-1	M39029/63-368	N/A	N/A
M24308/2-336 *	M24308/2-583 *	A-4-1	M39029/63-368	N/A	N/A
M24308/2-341 *	M24308/2-584 *	A-2-1	M39029/63-368	N/A	N/A
M24308/2-342	M24308/2-585	A-1-1	M39029/63-368	M24308/2-353	M24308/2-596
M24308/2-343	M24308/2-586	A-2-1	M39029/63-368	M24308/2-354	M24308/2-597

Figure 2. MIL-DTL-24308/2 Part Number Breakdown (Sheet 2)

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/2-344	M24308/2-587	A-3-1	M39029/63-368	M24308/2-355	M24308/2-598
M24308/2-345	M24308/2-588	A-4-1	M39029/63-368	M24308/2-356	M24308/2-599
M24308/2-346	M24308/2-589	A-5-1	M39029/63-368	M24308/2-357	M24308/2-600
M24308/2-347	M24308/2-590	A-1-2	M39029/57-354	M24308/2-358	M24308/2-601
M24308/2-348	M24308/2-591	A-2-2	M39029/57-354	M24308/2-359	M24308/2-602
M24308/2-349	M24308/2-592	A-3-2	M39029/57-354	M24308/2-360	M24308/2-603
M24308/2-351	M24308/2-594	A-6-1	M39029/57-354	M24308/2-362	M24308/2-605
M24308/2-352	M24308/2-595	A-6-1	M39029/57-354	M24308/2-363	M24308/2-606
M24308/2-482	M24308/2-607	A-1-1	M39029/63-368 ^	N/A	N/A
M24308/2-483	M24308/2-608	A-2-1	M39029/63-368 ^	N/A	N/A
M24308/2-484	M24308/2-609	A-3-1	M39029/63-368 ^	N/A	N/A
M24308/2-485	M24308/2-610	A-4-1	M39029/63-368 ^	N/A	N/A
M24308/2-486	M24308/2-611	A-5-1	M39029/63-368 ^	N/A	N/A
M24308/2-487	M24308/2-612	A-1-2	M39029/57-354 ^	N/A	N/A
M24308/2-488	M24308/2-613	A-2-2	M39029/57-354 ^	N/A	N/A
M24308/2-489	M24308/2-614	A-3-2	M39029/57-354 ^	N/A	N/A
M24308/2-490	M24308/2-615	A-4-2	M39029/57-354 ^	N/A	N/A
M24308/2-491	M24308/2-616	A-5-2	M39029/57-354 ^	N/A	N/A
M24308/2-492	M24308/2-617	A-6-1	M39029/57-354 ^	N/A	N/A
M24308/2-509 **	M24308/2-621 **	A-3-1	M39029/63-368	N/A	N/A
M24308/2-510 **	M24308/2-622 **	A-4-1	M39029/63-368	N/A	N/A
M24308/2-515 **	M24308/2-627 **	A-2-1	M39029/63-368	N/A	N/A

NOTES:

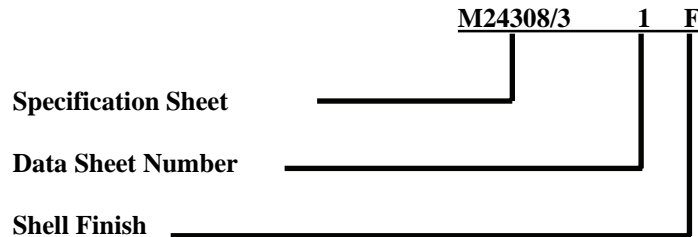
1. These connectors mate with connectors specified in MIL-DTL- 24308/3, MIL-DTL-24308/4, MIL-DTL-24308/9, and MIL-DTL-24308/24.
2. * Indicates, P/Ns M24308/2-23 through M24308/2-44, M24308/2-538 through M24308/2-559 and M24308/2-292 through M24308/2-341, M24308/2-571 through M24308/2-584 are inactive for new design. Use M24308/2-342 through M24308/2-352, and M24308/2-585 through M24308/2-595.
3. ** Indicates P/Ns M24308/2-509, M24308/2-510, M24308/2-515, M24308/2-621, M24308/2-622, and M24308/2-627 are inactive for new design. Use M24308/2-344, M24308/2-345, M24308/2-343, M24308/2-587, M24308/2-588, and M24308/2-586, respectively.
4. ^ Indicates pins are not supplied with connector.

Figure 2. MIL-DTL-24308/2 Part Number Breakdown (Sheet 3)

SHELL FINISH (Class G Connectors Only)	
F	Standard Cadmium
BLANK	Zinc Plated
SHELL FINISH (Class D Connectors Only)	
BLANK	Electroless Nickel For Air Force Space Application
(Not For Navy Use Or New Design)	

Figure 2. MIL-DTL-24308/2 Part Number Breakdown (Sheet 4)

PART NUMBER DESIGNATION



DATA SHEET NUMBER

Dash Number Class G	Dash Number PIN Class D	Insert arrangement (Figure 14)
M24308/3-1	M24308/3-23	A-1-1
M24308/3-2	M24308/3-24	A-2-1
M24308/3-3	M24308/3-25	A-3-1
M24308/3-4	M24308/3-26	A-4-1
M24308/3-5	M24308/3-27	A-5-1
M24308/3-12	M24308/3-34	A-1-1
M24308/3-13	M24308/3-35	A-2-1
M24308/3-14	M24308/3-36	A-3-1
M24308/3-15	M24308/3-37	A-4-1
M24308/3-16	M24308/3-38	A-5-1
M24308/3-17	M24308/3-39	A-1-1
M24308/3-18	M24308/3-40	A-2-1
M24308/3-19	M24308/3-41	A-3-1
M24308/3-20	M24308/3-42	A-4-1
M24308/3-21	M24308/3-43	A-5-1

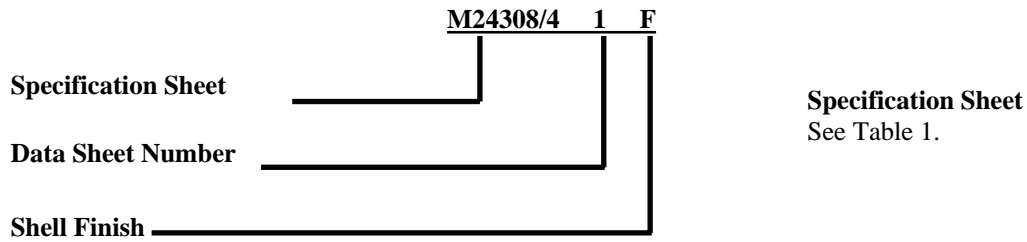
SHELL FINISH (Class G Connectors Only)	
F	Standard Cadmium
BLANK	Zinc Plated
SHELL FINISH (Class D Connectors Only)	
BLANK	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

NOTES:

1. These connectors mate with connectors specified in MIL-DTL-24308/1, MIL-DTL-24308/2, and MIL-DTL-24308/23.
2. Dash Sheet Numbers M24308/3-12 through M24308/3-16 and M24308/3-34 through M24308/3-38 are inactive for new design, see M24308/3-17 through M24308/3-21 and M24308/3-39 through M24308/3-43.

Figure 3. MIL-DTL-24308/3 Part Number

PART NUMBER DESIGNATION



Specification Sheet
 See Table 1.

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/4-1	M24308/4-335	A-1-1	M39029/64-369	M24308/4-6	M24308/4-340
M24308/4-2	M24308/4-336	A-2-1	M39029/64-369	M24308/4-7	M24308/4-341
M24308/4-3	M24308/4-337	A-3-1	M39029/64-369	M24308/4-8	M24308/4-342
M24308/4-4	M24308/4-338	A-4-1	M39029/64-369	M24308/4-9	M24308/4-343
M24308/4-5	M24308/4-339	A-5-1	M39029/64-369	M24308/4-10	M24308/4-344
M24308/4-11	M24308/4-345	A-1-1	M39029/58-360	M24308/4-17	M24308/4-351
M24308/4-12	M24308/4-346	A-2-1	M39029/58-360	M24308/4-18	M24308/4-352
M24308/4-13	M24308/4-347	A-3-1	M39029/58-360	M24308/4-19	M24308/4-353
M24308/4-14	M24308/4-348	A-4-1	M39029/58-360	M24308/4-20	M24308/4-354
M24308/4-15	M24308/4-349	A-5-1	M39029/58-360	M24308/4-21	M24308/4-355
M24308/4-16	M24308/4-350	A-6-1	M39029/58-360	M24308/4-22	M24308/4-356
M24308/4-259	M24308/4-357	A-1-1	M39029/64-369 ^	N/A	N/A
M24308/4-260	M24308/4-358	A-2-1	M39029/64-369 ^	N/A	N/A
M24308/4-261	M24308/4-359	A-3-1	M39029/64-369 ^	N/A	N/A
M24308/4-262	M24308/4-360	A-4-1	M39029/64-369 ^	N/A	N/A
M24308/4-263	M24308/4-361	A-5-1	M39029/64-369 ^	N/A	N/A
M24308/4-264	M24308/4-362	A-1-1	M39029/58-360 ^	N/A	N/A
M24308/4-265	M24308/4-363	A-2-1	M39029/58-360 ^	N/A	N/A
M24308/4-266	M24308/4-364	A-3-1	M39029/58-360 ^	N/A	N/A
M24308/4-267	M24308/4-365	A-4-1	M39029/58-360 ^	N/A	N/A
M24308/4-268	M24308/4-366	A-5-1	M39029/58-360 ^	N/A	N/A
M24308/4-269	M24308/4-367	A-6-1	M39029/58-360 ^	N/A	N/A
M24308/4-302 *	M24308/4-368	A-1-1	M39029/64-369	M24308/4-313 *	M24308/4-368

Figure 4. MIL-DTL-24308/4 Part Number Breakdown (Sheet 1 of 3)

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert Arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/4-303 *	M24308/4-369	A-2-1	M39029/64-369	M24308/4-314 *	M24308/4-369
M24308/4-304 *	M24308/4-370	A-3-1	M39029/64-369	M24308/4 -315 *	M24308/4-370
M24308/4-305 *	M24308/4-371	A-4-1	M39029/64-369	M24308/4-316 *	M24308/4-382
M24308/4-306 *	M24308/4-372	A-5-1	M39029/64-369	M24308/4-317 *	M24308/4-383
M24308/4-307 *	M24308/4-373	A-1-1	M39029/58-360	M24308/4-318 *	M24308/4-384
M24308/4-308 *	M24308/4-374	A-2-1	M39029/58-360	M24308/4-319 *	M24308/4-385 *
M24308/4-309 *	M24308/4-375	A-3-1	M39029/58-360	M24308/4-320 *	M24308/4-386 *
M24308/4-310 *	M24308/4-376	A-4-1	M39029/58-360	M24308/4-321 *	M24308/4-387 *
M24308/4-311 *	M24308/4-377	A-5-1	M39029/58-360	M24308/4-322 *	M24308/4-388 *
M24308/4-312 *	M24308/4-378	A-6-1	M39029/58-360	M24308/4-323 *	M24308/4-389 *
M24308/4-324 *	M24308/4-390 *	A-1-1	M39029/64-369 ^	N/A	N/A
M24308/4-325 *	M24308/4-391 *	A-2-1	M39029/64-369 ^	N/A	N/A
M24308/4-326 *	M24308/4-392 *	A-3-1	M39029/64-369 ^	N/A	N/A
M24308/4-327 *	M24308/4-393 *	A-4-1	M39029/64-369 ^	N/A	N/A
M24308/4-328 *	M24308/4-394 *	A-5-1	M39029/64-369 ^	N/A	N/A
M24308/4-329 *	M24308/4-395 *	A-1-1	M39029/58-360 ^	N/A	N/A
M24308/4-330 *	M24308/4-396 *	A-2-1	M39029/58-360 ^	N/A	N/A
M24308/4-331 *	M24308/4-397 *	A-3-1	M39029/58-360 ^	N/A	N/A
M24308/4-332 *	M24308/4-398 *	A-4-1	M39029/58-360 ^	N/A	N/A
M24308/4-333 *	M24308/4-399 *	A-5-1	M39029/58-360 ^	N/A	N/A
M24308/4-334 *	M24308/4-400 *	A-6-1	M39029/58-360 ^	N/A	N/A
M24308/4-435	M24308/4-401	A-1-1	M39029/64-369	M24308/4-446	M24308/4-412
M24308/4-436	M24308/4-402	A-2-1	M39029/64-369	M24308/4-447	M24308/4-413
M24308/4-437	M24308/4-403	A-3-1	M39029/64-369	M24308/4-448	M24308/4-414
M24308/4-438	M24308/4-404	A-4-1	M39029/64-369	M24308/4-449	M24308/4-415
M24308/4-439	M24308/4-405	A-5-1	M39029/64-369	M24308/4-450	M24308/4-416
M24308/4-440	M24308/4-406	A-1-1	M39029/58-360	M24308/4-451	M24308/4-417
M24308/4-441	M24308/4-407	A-2-1	M39029/58-360	M24308/4-452	M24308/4-418
M24308/4-442	M24308/4-408	A-3-1	M39029/58-360	M24308/4-453	M24308/4-419

Figure 4. MIL-DTL-24308/4 Part Number Breakdown (Sheet 2)

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/4-443	M24308/4-409	A-4-1	M39029/58-360	M24308/4-454	M24308/4-420
M24308/4-444	M24308/4-410	A-5-1	M39029/58-360	M24308/4-455	M24308/4-421
M24308/4-445	M24308/4-411	A-6-1	M39029/58-360	M24308/4-456	M24308/4-422
M24308/4-457	M24308/4-423	A-1-1	M39029/64-369 ^	N/A	N/A
M24308/4-458	M24308/4-424	A-2-1	M39029/64-369 ^	N/A	N/A
M24308/4-459	M24308/4-425	A-3-1	M39029/64-369 ^	N/A	N/A
M24308/4-460	M24308/4-426	A-4-1	M39029/64-369 ^	N/A	N/A
M24308/4-461	M24308/4-427	A-5-1	M39029/64-369 ^	N/A	N/A
M24308/4-462	M24308/4-428	A-1-1	M39029/58-360 ^	N/A	N/A
M24308/4-463	M24308/4-429	A-2-1	M39029/58-360 ^	N/A	N/A
M24308/4-464	M24308/4-430	A-3-1	M39029/58-360 ^	N/A	N/A
M24308/4-465	M24308/4-431	A-4-1	M39029/58-360 ^	N/A	N/A
M24308/4-466	M24308/4-432	A-5-1	M39029/58-360 ^	N/A	N/A
M24308/4-467	M24308/4-433	A-6-1	M39029/58-360 ^	N/A	N/A

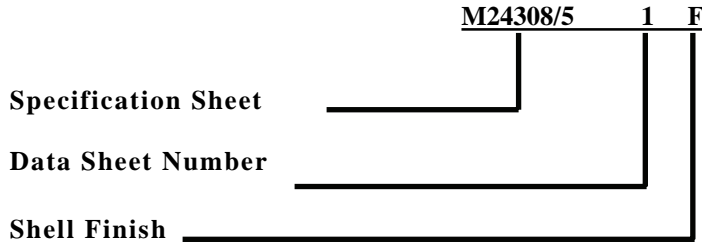
NOTES:

1. These connectors mate with connectors specified in MIL-DTL- 24308/1, MIL-DTL-24308/2, and MIL-DTL-24308/23.
2. * Indicates, P/Ns are inactive for new design. Use M24308/4-435 through M24308/4-467, and M24308/4-401 through M24308/4-433.
3. ^ Indicates pins are not supplied with connector.

SHELL FINISH (Class G Connectors Only)	
F	Standard Cadmium
BLANK	Zinc Plated
SHELL FINISH (Class D Connectors Only)	
BLANK	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 4. MIL-DTL-24308/4 Part Number Breakdown (Sheet 3)

PART NUMBER DESIGNATION



Specification Sheet
See Table 1.

DATA SHEET NUMBER

Dash Number Class G	Dash Number PIN Class D	Insert arrangement (Figure 14)
M24308/1-1	M24308/1-34	A-1-1
M24308/1-2	M24308/1-35	A-2-1
M24308/1-3	M24308/1-36	A-3-1
M24308/1-4	M24308/1-37	A-4-1
M24308/1-5	M24308/1-38	A-5-1
M24308/1-12	M24308/1-45	A-1-1
M24308/1-13	M24308/1-46	A-2-1
M24308/1-14	M24308/1-47	A-3-1
M24308/1-15	M24308/1-48	A-4-1
M24308/1-16	M24308/1-49	A-5-1
M24308/1-23	M24308/1-56	A-1-1
M24308/1-24	M24308/1-57	A-2-1
M24308/1-25	M24308/1-58	A-3-1
M24308/1-26	M24308/1-59	A-4-1
M24308/1-27	M24308/1-60	A-5-1

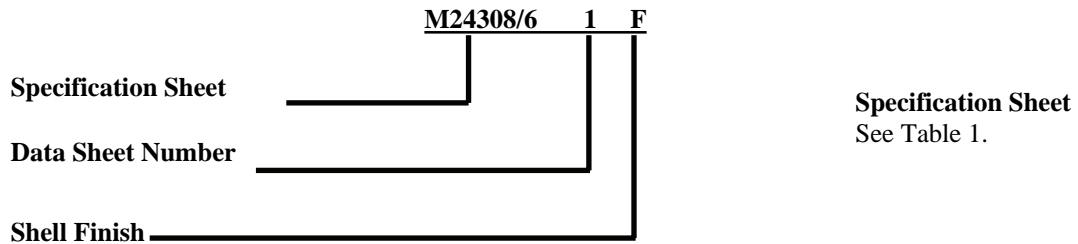
NOTES:

1. These connectors mate with connectors specified in MIL-DTL-24308/7, MIL-DTL-24308/8, MIL-DTL-24308/9, and MIL-DTL-24308/24.
2. Dash Numbers M24308/1-12 through M24308/1-16 and M24308/1-45 through M24308/1-49 are inactive for new

SHELL FINISH (Class G Connectors Only)	
F	Standard Cadmium
BLANK	Zinc Plated
SHELL FINISH (Class D Connectors Only)	
BLANK	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 5. MIL-DTL-24308 Part Number Breakdown

PART NUMBER DESIGNATION



DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/6-1	M24308/6-502	A-1-1	M39029/63-368	M24308/6-6	M24308/6-507
M24308/6-2	M24308/6-503	A-2-1	M39029/63-368	M24308/6-7	M24308/6-508
M24308/6-3	M24308/6-504	A-3-1	M39029/63-368	M24308/6-8	M24308/6-509
M24308/6-4	M24308/6-505	A-4-1	M39029/63-368	M24308/6-9	M24308/6-510
M24308/6-5	M24308/6-506	A-5-1	M39029/63-368	M24308/6-10	M24308/6-511
M24308/6-11	M24308/6-512	A-1-1	M39029/57-354	M24308/6-17	M24308/6-518
M24308/6-12	M24308/6-513	A-2-1	M39029/57-354	M24308/6-18	M24308/6-519
M24308/6-13	M24308/6-514	A-3-1	M39029/57-354	M24308/6-19	M24308/6-520
M24308/6-14	M24308/6-515	A-4-1	M39029/57-354	M24308/6-20	M24308/6-521
M24308/6-15	M24308/6-516	A-5-1	M39029/57-354	M24308/6-21	M24308/6-522
M24308/6-16	M24308/6-517	A-6-1	M39029/57-354	M24308/6-22	M24308/6-523
M24308/6-281	M24308/6-540	A-1-1	M39029/63-368 ^	N/A	N/A
M24308/6-282	M24308/6-541	A-2-1	M39029/63-368 ^	N/A	N/A
M24308/6-283	M24308/6-542	A-3-1	M39029/63-368 ^	N/A	N/A
M24308/6-284	M24308/6-543	A-4-1	M39029/63-368 ^	N/A	N/A
M24308/6-285	M24308/6-544	A-5-1	M39029/63-368 ^	N/A	N/A
M24308/6-286	M24308/6-545	A-1-1	M39029/57-354 ^	N/A	N/A
M24308/6-287	M24308/6-546	A-2-1	M39029/57-354 ^	N/A	N/A
M24308/6-288	M24308/6-457	A-3-1	M39029/57-354 ^	N/A	N/A
M24308/6-289	M24308/6-548	A-4-1	M39029/57-354 ^	N/A	N/A
M24308/6-290	M24308/6-549	A-5-1	M39029/57-354 ^	N/A	N/A
M24308/6-291	M24308/6-550	A-6-1	M39029/57-354 ^	N/A	N/A
M24308/6-259 *	M24308/6-518	A-1-1	M39029/63-368	M24308/6-270 *	M24308/6-529 *

Figure 6. MIL-DTL-24308/6 Part Number Breakdown (Sheet 1 of 3)

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/6-260 *	M24308/6-519	A-2-1	M39029/63-368	M24308/6-271 *	M24308/6-530 *
M24308/6-261 *	M24308/6-520	A-3-1	M39029/63-368	M24308/6-272 *	M24308/6-531 *
M24308/6-262 *	M24308/6-521	A-4-1	M39029/63-368	M24308/6-273 *	M24308/6-532 *
M24308/6-263 *	M24308/6-522	A-5-1	M39029/63-368	M24308/6-274 *	M24308/6-533 *
M24308/6-264 *	M24308/6-523	A-1-1	M39029/57-354	M24308/6-275 *	M24308/6-534 *
M24308/6-265 *	M24308/6-524	A-2-1	M39029/57-354	M24308/6-276 *	M24308/6-535 *
M24308/6-266 *	M24308/6-525	A-3-1	M39029/57-354	M24308/6-277 *	M24308/6-536 *
M24308/6-267 *	M24308/6-526	A-4-1	M39029/57-354	M24308/6-278 *	M24308/6-537 *
M24308/6-268 *	M24308/6-527	A-5-1	M39029/57-354	M24308/6-279 *	M24308/6-538 *
M24308/6-269 *	M24308/6-528	A-6-1	M39029/57-354	M24308/6-280 *	M24308/6-539 *
M24308/6-453	M24308/6-551	A-1-1	M39029/63-368	M24308/6-464	M24308/6-563
M24308/6-454	M24308/6-552	A-2-1	M39029/63-368	M24308/6-465	M24308/6-564
M24308/6-455	M24308/6-553	A-3-1	M39029/63-368	M24308/6-466	M24308/6-565
M24308/6-456	M24308/6-554	A-4-1	M39029/63-368	M24308/6-467	M24308/6-566
M24308/6-457	M24308/6-555	A-5-1	M39029/63-368	M24308/6-468	M24308/6-567
M24308/6-458	M24308/6-556	A-1-1	M39029/57-354	M24308/6-469	M24308/6-568
M24308/6-459	M24308/6-557	A-2-1	M39029/57-354	M24308/6-470	M24308/6-569
M24308/6-460	M24308/6-558	A-3-1	M39029/57-354	M24308/6-471	M24308/6-570
M24308/6-461	M24308/6-559	A-4-1	M39029/57-354	M24308/6-472	M24308/6-571
M24308/6-462	M24308/6-560	A-5-1	M39029/57-354	M24308/6-473	M24308/6-572
M24308/6-463	M24308/6-561	A-6-1	M39029/57-354	M24308/6-474	M24308/6-573
M24308/6-491	M24308/6-574	A-1-1	M39029/63-368	N/A	N/A
M24308/6-492	M24308/6-575	A-2-1	M39029/63-368	N/A	N/A
M24308/6-493	M24308/6-576	A-3-1	M39029/63-368	N/A	N/A
M24308/6-494	M24308/6-577	A-4-1	M39029/63-368	N/A	N/A
M24308/6-495	M24308/6-578	A-5-1	M39029/63-368	N/A	N/A

Figure 6. MIL-DTL-24308/6 Part Number Breakdown (Sheet 2)

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/6-496	M24308/6-579	A-1-1	M39029/57-354	N/A	N/A
M24308/6-497	M24308/6-580	A-2-1	M39029/57-354	N/A	N/A
M24308/6-498	M24308/6-581	A-3-1	M39029/57-354	N/A	N/A
M24308/6-499	M24308/6-582	A-4-1	M39029/57-354	N/A	N/A
M24308/6-500	M24308/6-583	A-5-1	M39029/57-354	N/A	N/A

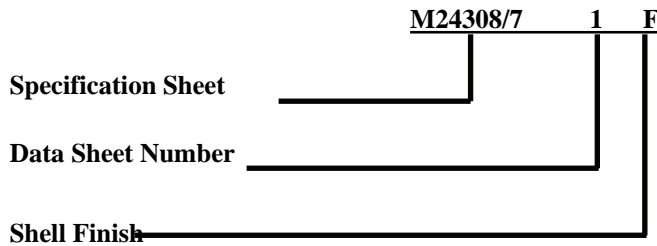
NOTES:

1. These connectors mate with connectors specified in MIL-DTL- 24308/7 and MIL-DTL-24308/8.
2. * Indicates, P/Ns M24308/6-259 through M24308/6-280, and M24308/6-518 through M24308/6-539 are inactive for new design. Use M24308/6-453 through M24308/6-501 and M24308/6-551 through M24308/6-561.
3. ^ Indicates pins are not supplied with connector.

SHELL FINISH (Class N Connectors Only)	
F	Standard Cadmium
P	Passivated Stainless Steel
BLANK	Zinc Plated
SHELL FINISH (Class M Connectors Only)	
BLANK	Class M Connectors Have A Gold Finish, No Suffix Is Required

Figure 6. MIL-DTL-24308/6 Part Number Breakdown (Sheet 3)

PART NUMBER DESIGNATION



Specification Sheet
See Table 1.

DATA SHEET NUMBER

Dash Number Class G	Dash Number PIN Class D	Insert arrangement (Figure 14)
M24308/7-1	M24308/7-23	A-1-1
M24308/7-2	M24308/7-24	A-2-1
M24308/7-3	M24308/7-25	A-3-1
M24308/7-4	M24308/7-26	A-4-1
M24308/7-5	M24308/7-27	A-5-1
M24308/7-12 *	M24308/7-34 *	A-1-1
M24308/7-13 *	M24308/7-35 *	A-2-1
M24308/7-14 *	M24308/7-36 *	A-3-1
M24308/7-15 *	M24308/7-37 *	A-4-1
M24308/7-16 *	M24308/7-38 *	A-5-1
M24308/7-17	M24308/7-39	A-1-1
M24308/7-18	M24308/7-40	A-2-1
M24308/7-19	M24308/7-41	A-3-1
M24308/7-20	M24308/7-42	A-4-1
M24308/7-21	M24308/7-43	A-5-1

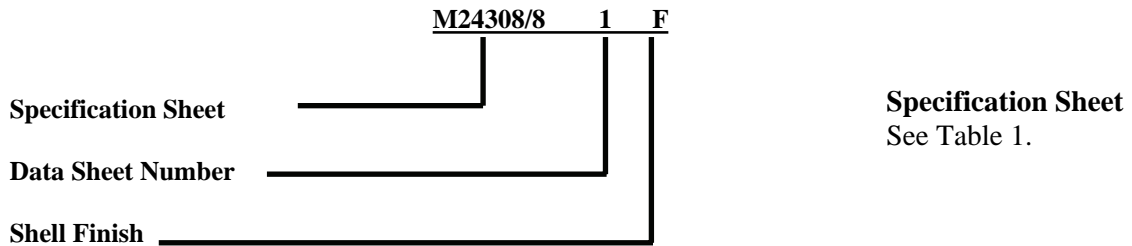
SHELL FINISH (Class N Connectors Only)	
F	Standard Cadmium
P	Passivated Stainless Steel
BLANK	Zinc Plated
SHELL FINISH (class m connectors only)	
BLANK	Class M Connectors Have A Gold Finish, No Suffix Is Required

NOTES:

1. These connectors mate with connectors specified in MIL-DTL-24308/5 and MIL-DTL-24308/6.
2. * Indicates Dash Numbers M24308/7-12 through M24308/7-16 and M24308/7-34 through M24308/7-38 are inactive for new design, use M24308/7-17 through M24308/7-21 and M24308/7-39 through M24308/7-43.

Figure 7. MIL-DTL-24308/7 Part Number Breakdown

PART NUMBER DESIGNATION



Specification Sheet
 See Table 1.

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/8-1	M24308/8-335	A-1-1	M39029/64-369	M24308/8-6	M24308/8-340
M24308/8-2	M24308/8-336	A-2-1	M39029/64-369	M24308/8-7	M24308/8-341
M24308/8-3	M24308/8-337	A-3-1	M39029/64-369	M24308/8-8	M24308/8-342
M24308/8-4	M24308/8-338	A-4-1	M39029/64-369	M24308/8-9	M24308/8-343
M24308/8-5	M24308/8-339	A-5-1	M39029/64-369	M24308/8-10	M24308/8-344
M24308/8-11	M24308/8-345	A-1-2	M39029/58-360	M24308/8-17	M24308/8-351
M24308/8-12	M24308/8-346	A-2-2	M39029/58-360	M24308/8-18	M24308/8-352
M24308/8-13	M24308/8-347	A-3-2	M39029/58-360	M24308/8-19	M24308/8-353
M24308/8-14	M24308/8-348	A-4-2	M39029/58-360	M24308/8-20	M24308/8-354
M24308/8-15	M24308/8-349	A-5-2	M39029/58-360	M24308/8-21	M24308/8-355
M24308/8-16	M24308/8-350	A-6-1	M39029/58-360	M24308/8-22	M24308/8-356
M24308/8-259	M24308/8-357	A-1-1	M39029/64-369 ^	N/A	N/A
M24308/8-260	M24308/8-358	A-2-1	M39029/64-369 ^	N/A	N/A
M24308/8-261	M24308/8-359	A-3-1	M39029/64-369 ^	N/A	N/A
M24308/8-262	M24308/8-360	A-4-1	M39029/64-369 ^	N/A	N/A
M24308/8-263	M24308/8-361	A-5-1	M39029/64-369 ^	N/A	N/A
M24308/8-264	M24308/8-362	A-1-2	M39029/58-360 ^	N/A	N/A
M24308/8-265	M24308/8-363	A-2-2	M39029/58-360 ^	N/A	N/A
M24308/8-266	M24308/8-364	A-3-2	M39029/58-360 ^	N/A	N/A
M24308/8-267	M24308/8-365	A-4-2	M39029/58-360 ^	N/A	N/A
M24308/8-268	M24308/8-366	A-5-2	M39029/58-360 ^	N/A	N/A
M24308/8-269	M24308/8-367	A-6-1	M39029/58-360 ^	N/A	N/A
M24308/8-302 *	M24308/8-368	A-1-1	M39029/64-369	M24308/8-313	M24308/8-379

Figure 8. MIL-DTL-24308/8 Part Number Breakdown (Sheet 1 of 3)

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/8-303 *	M24308/8-369	A-2-1	M39029/64-369	M24308/8-314	M24308/8-380
M24308/8-304 *	M24308/8-370	A-3-1	M39029/64-369	M24308/8-315	M24308/8-381
M24308/8-305	M24308/8-371	A-4-1	M39029/64-369	M24308/8-316	M24308/8-382
M24308/8-306	M24308/8-372	A-5-1	M39029/64-369	M24308/8-317	M24308/8-383
M24308/8-307	M24308/8-373	A-1-2	M39029/58-360	M24308/8-318	M24308/8-384
M24308/8-308	M24308/8-374	A-2-2	M39029/58-360	M24308/8-319	M24308/8-385
M24308/8-309	M24308/8-375	A-3-2	M39029/58-360	M24308/8-320	M24308/8-386
M24308/8-310	M24308/8-376	A-4-2	M39029/58-360	M24308/8-321	M24308/8-387
M24308/8-311	M24308/8-377	A-5-2	M39029/58-360	M24308/8-322	M24308/8-388
M24308/8-312	M24308/8-378	A-6-1	M39029/58-360	M24308/8-323	M24308/8-389
M24308/8-324 *	M24308/8-390 *	A-1-1	M39029/64-369 ^	N/A	N/A
M24308/8-325 *	M24308/8-391 *	A-2-1	M39029/64-369 ^	N/A	N/A
M24308/8-326 *	M24308/8-392 *	A-3-1	M39029/64-369 ^	N/A	N/A
M24308/8-327 *	M24308/8-393 *	A-4-1	M39029/64-369 ^	N/A	N/A
M24308/8-328 *	M24308/8-394 *	A-5-1	M39029/64-369 ^	N/A	N/A
M24308/8-329 *	M24308/8-395 *	A-1-2	M39029/58-360 ^	N/A	N/A
M24308/8-330 *	M24308/8-396 *	A-2-2	M39029/58-360 ^	N/A	N/A
M24308/8-331 *	M24308/8-397 *	A-3-2	M39029/58-360 ^	N/A	N/A
M24308/8-332 *	M24308/8-398 *	A-4-2	M39029/58-360 ^	N/A	N/A
M24308/8-333 *	M24308/8-399 *	A-5-2	M39029/58-360 ^	N/A	N/A
M24308/8-334 *	M24308/8-400 *	A-6-1	M39029/58-360 ^	N/A	N/A
M24308/8-435	M24308/8-401	A-1-1	M39029/64-369	M24308/8-446	M24308/8-412
M24308/8-436	M24308/8-402	A-2-1	M39029/64-369	M24308/8-447	M24308/8-413
M24308/8-437	M24308/8-403	A-3-1	M39029/64-369	M24308/8-448	M24308/8-414
M24308/8-438	M24308/8-404	A-4-1	M39029/64-369	M24308/8-449	M24308/8-415
M24308/8-439	M24308/8-405	A-5-1	M39029/64-369	M24308/8-450	M24308/8-416

Figure 8. MIL-DTL-24308/8 Part Number Breakdown (Sheet 2)

DATA SHEET NUMBER

Dash Number Class G	Dash Number Class D	Insert arrangement (Figure 14)	Contact Part Number	Connector Kit (Connector plus insert/removal tool)	
				Dash Number Class G	Dash Number Class D
M24308/8-440	M24308/8-406	A-1-2	M39029/58-360	M24308/8-451	M24308/8-417
M24308/8-441	M24308/8-407	A-2-2	M39029/58-360	M24308/8-452	M24308/8-418
M24308/8-442	M24308/8-408	A-3-2	M39029/58-360	M24308/8-453	M24308/8-419
M24308/8-443	M24308/8-409	A-4-2	M39029/58-360	M24308/8-454	M24308/8-420
M24308/8-444	M24308/8-410	A-5-2	M39029/58-360	M24308/8-455	M24308/8-421
M24308/8-445	M24308/8-411	A-6-1	M39029/58-360	M24308/8-456	M24308/8-422
M24308/8-457	M24308/8-423	A-1-1	M39029/64-369 ^	N/A	N/A
M24308/8-458	M24308/8-424	A-2-1	M39029/64-369 ^	N/A	N/A
M24308/8-459	M24308/8-425	A-3-1	M39029/64-369 ^	N/A	N/A
M24308/8-460	M24308/8-426	A-4-1	M39029/64-369 ^	N/A	N/A
M24308/8-461	M24308/8-427	A-5-1	M39029/64-369 ^	N/A	N/A
M24308/8-462	M24308/8-428	A-1-2	M39029/58-360 ^	N/A	N/A
M24308/8-463	M24308/8-429	A-2-2	M39029/58-360 ^	N/A	N/A
M24308/8-464	M24308/8-430	A-3-2	M39029/58-360 ^	N/A	N/A
M24308/8-465	M24308/8-431	A-4-2	M39029/58-360 ^	N/A	N/A
M24308/8-466	M24308/8-432	A-5-2	M39029/58-360 ^	N/A	N/A
	M24308/8-433	A-6-1	M39029/58-360 ^	N/A	N/A

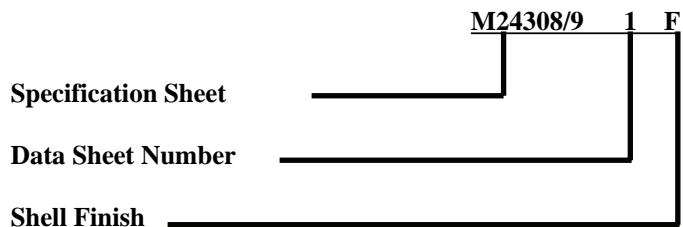
NOTES:

1. These connectors mate with connectors specified in MIL-DTL- 24308/5 and MIL-DTL-24308/6.
2. * Indicates, P/Ns M24308/8-302 through M24308/8-334 and M24308 /8-368 through M24308/8-400 are inactive for new design.
3. ^ Indicates pins are not supplied with connector.

SHELL FINISH (Class N Connectors Only)	
F	Standard Cadmium
P	Passivated Stainless Steel
BLANK	Zinc Plated
SHELL FINISH (Class M Connectors Only)	
BLANK	Class M Connectors Have A Gold Finish, No Suffix Is Required

Figure 8. MIL-DTL-24308/8 Part Number Breakdown (Sheet 3)

PART NUMBER DESIGNATION



Specification Sheet
See Table 1.

DATA SHEET NUMBER

Dash Number Class G	Dash Number PIN Class D	Insert arrangement (Figure 14)
M24308/9-1	M24308/9-21	A-1-1
M24308/9-2	M24308/9-22	A-2-1
M24308/9-3	M24308/9-23	A-3-1
M24308/9-4	M24308/9-24	A-4-1
M24308/9-5	M24308/9-25	A-5-1
M24308/9-6	M24308/9-26	A-1-1
M24308/9-7	M24308/9-27	A-2-1
M24308/9-8	M24308/9-28	A-3-1
M24308/9-9	M24308/9-29	A-4-1
M24308/9-10	M24308/9-30	A-5-1
M24308/9-11	M24308/9-31	A-1-1
M24308/9-12	M24308/9-32	A-2-1
M24308/9-13	M24308/9-33	A-3-1
M24308/9-14	M24308/9-34	A-4-1
M24308/9-15	M24308/9-35	A-5-1
M24308/9-16	M24308/9-36	A-1-1
M24308/9-17	M24308/9-37	A-2-1
M24308/9-18	M24308/9-38	A-3-1
M24308/9-19	M24308/9-39	A-4-1
M24308/9-20	M24308/9-40	A-5-1

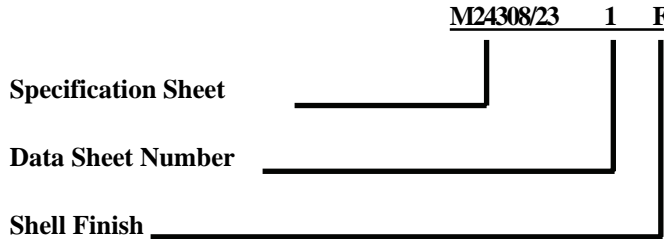
SHELL FINISH (Class H Connectors Only)
BLANK Tin Finish, No Suffix Is Required
SHELL FINISH (Class M Connectors Only)
BLANK Gold Finish, No Suffix Is Required

NOTES:

1. These connectors mate with connectors specified in MIL-DTL-24308/1, /2 and MIL-DTL-24308/23.

Figure 9. MIL-DTL-24308/9 Part Number Breakdown

PART NUMBER DESIGNATION



Specification Sheet

Data Sheet Number

Shell Finish

Specification Sheet
See Table 1.

PIN Class G	PIN Class M	PIN Class N	PIN Class D	Insert Arrangement (Figure 14)	Contact	
					Mating end	PWB tail
M24308/23-1	M24308/23-101	M24308/23-201	M24308/23-301	A-1-1	Size 20	Straight
M24308/23-2	M24308/23-102	M24308/23-202	M24308/23-302	A-2-1	Size 20	Straight
M24308/23-3	M24308/23-103	M24308/23-203	M24308/23-303	A-3-1	Size 20	Straight
M24308/23-4	M24308/23-104	M24308/23-204	M24308/23-304	A-4-1	Size 20	Straight
M24308/23-5	M24308/23-105	M24308/23-205	M24308/23-305	A-5-1	Size 20	Straight
M24308/23-7	M24308/23-107	M24308/23-207	M24308/23-307	A-1-1	Size 20	Straight
M24308/23-8	M24308/23-108	M24308/23-208	M24308/23-308	A-2-1	Size 20	Straight
M24308/23-9	M24308/23-109	M24308/23-209	M24308/23-309	A-3-1	Size 20	Straight
M24308/23-10	M24308/23-110	M24308/23-210	M24308/23-310	A-4-1	Size 20	Straight
M24308/23-11	M24308/23-111	M24308/23-211	M24308/23-311	A-5-1	Size 20	Straight
M24308/23-13	M24308/23-113	M24308/23-213	M24308/23-313	A-1-1	Size 20	Straight
M24308/23-14	M24308/23-114	M24308/23-214	M24308/23-314	A-2-1	Size 20	Straight
M24308/23-15	M24308/23-115	M24308/23-215	M24308/23-315	A-3-1	Size 20	Straight
M24308/23-16	M24308/23-116	M24308/23-216	M24308/23-316	A-4-1	Size 20	Straight
M24308/23-17	M24308/23-117	M24308/23-217	M24308/23-317	A-5-1	Size 20	Straight
M24308/23-19	M24308/23-119	M24308/23-219	M24308/23-319	A-1-1	Size 20	Straight
M24308/23-20	M24308/23-120	M24308/23-220	M24308/23-320	A-2-1	Size 20	Straight
M24308/23-21	M24308/23-121	M24308/23-221	M24308/23-321	A-3-1	Size 20	Straight
M24308/23-22	M24308/23-122	M24308/23-222	M24308/23-322	A-4-1	Size 20	Straight
M24308/23-23	M24308/23-123	M24308/23-223	M24308/23-323	A-5-1	Size 20	Straight
M24308/23-25	M24308/23-125	M24308/23-225	M24308/23-325	A-1-1	Size 20	Rt Angle
M24308/23-26	M24308/23-126	M24308/23-226	M24308/23-326	A-2-1	Size 20	Rt Angle
M24308/23-27	M24308/23-127	M24308/23-227	M24308/23-327	A-3-1	Size 20	Rt Angle
M24308/23-28	M24308/23-128	M24308/23-228	M24308/23-328	A-4-1	Size 20	Rt Angle
M24308/23-29	M24308/23-129	M24308/23-229	M24308/23-329	A-5-1	Size 20	Rt Angle
M24308/23-31	M24308/23-131	M24308/23-231	M24308/23-331	A-1-1	Size 20	Rt Angle
M24308/23-32	M24308/23-132	M24308/23-232	M24308/23-332	A-2-1	Size 20	Rt Angle
M24308/23-33	M24308/23-133	M24308/23-233	M24308/23-333	A-3-1	Size 20	Rt Angle
M24308/23-34	M24308/23-134	M24308/23-234	M24308/23-334	A-4-1	Size 20	Rt Angle
M24308/23-35	M24308/23-135	M24308/23-235	M24308/23-335	A-5-1	Size 20	Rt Angle

Figure 10. MIL-DTL-24308/23 Part Number Breakdown (Sheet 1 of 3)

DATA SHEET NUMBER

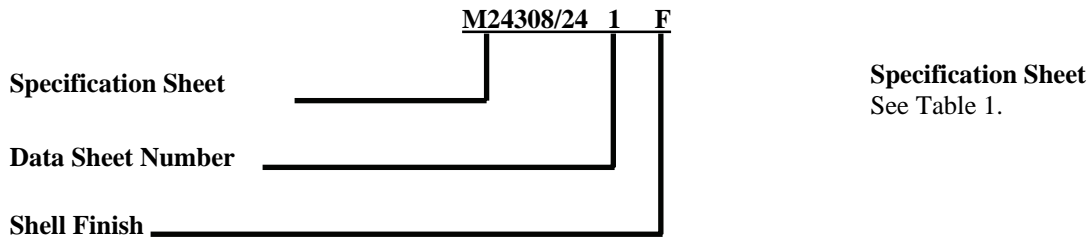
PIN Class G	PIN Class M	PIN Class N	PIN Class D	Insert arrangement (Figure 14)	Contact	
					Mating tail	PWB end
M24308/23-37	M24308/23-137	M24308/23-237	M24308/23-337	A-1-1	Size 20	Rt Angle
M24308/23-38	M24308/23-138	M24308/23-238	M24308/23-338	A-2-1	Size 20	Rt Angle
M24308/23-39	M24308/23-139	M24308/23-239	M24308/23-339	A-3-1	Size 20	Rt Angle
M24308/23-40	M24308/23-140	M24308/23-240	M24308/23-340	A-4-1	Size 20	Rt Angle
M24308/23-41	M24308/23-141	M24308/23-241	M24308/23-341	A-5-1	Size 20	Rt Angle
M24308/23-43	M24308/23-143	M24308/23-243	M24308/23-343	A-1-1	Size 20	Rt Angle
M24308/23-44	M24308/23-144	M24308/23-244	M24308/23-344	A-2-1	Size 20	Rt Angle
M24308/23-45	M24308/23-145	M24308/23-245	M24308/23-345	A-3-1	Size 20	Rt Angle
M24308/23-46	M24308/23-146	M24308/23-246	M24308/23-346	A-4-1	Size 20	Rt Angle
M24308/23-47	M24308/23-147	M24308/23-247	M24308/23-347	A-5-1	Size 20	Rt Angle
M24308/23-49	M24308/23-149	M24308/23-249	M24308/23-349	A-1-1	Size 20	Rt Angle
M24308/23-50	M24308/23-150	M24308/23-250	M24308/23-350	A-2-1	Size 20	Rt Angle
M24308/23-51	M24308/23-151	M24308/23-251	M24308/23-351	A-3-1	Size 20	Rt Angle
M24308/23-52	M24308/23-152	M24308/23-252	M24308/23-352	A-4-1	Size 20	Rt Angle
M24308/23-53	M24308/23-153	M24308/23-253	M24308/23-353	A-5-1	Size 20	Rt Angle
M24308/23-55	M24308/23-155	M24308/23-255	M24308/23-355	A-1-1	Size 20	Rt Angle
M24308/23-56	M24308/23-156	M24308/23-256	M24308/23-356	A-2-1	Size 20	Rt Angle
M24308/23-57	M24308/23-157	M24308/23-257	M24308/23-357	A-3-1	Size 20	Rt Angle
M24308/23-58	M24308/23-158	M24308/23-258	M24308/23-358	A-4-1	Size 20	Rt Angle
M24308/23-59	M24308/23-159	M24308/23-259	M24308/23-359	A-5-1	Size 20	Rt Angle
M24308/23-61	M24308/23-161	M24308/23-261	M24308/23-361	A-1-2	Size 22	Straight
M24308/23-62	M24308/23-162	M24308/23-262	M24308/23-362	A-2-2	Size 22	Straight
M24308/23-63	M24308/23-163	M24308/23-263	M24308/23-363	A-3-2	Size 22	Straight
M24308/23-64	M24308/23-164	M24308/23-264	M24308/23-364	A-4-2	Size 22	Straight
M24308/23-65	M24308/23-165	M24308/23-265	M24308/23-3 65	A-5-2	Size 22	Straight
M24308/23-67	M24308/23-167	M24308/23-267	M24308/23-367	A-1-2	Size 22	Straight
M24308/23-68	M24308/23-168	M24308/23-268	M24308/23-368	A-2-2	Size 22	Straight
M24308/23-69	M24308/23-169	M24308/23-269	M24308/23-369	A-3-2	Size 22	Straight
M24308/23-70	M24308/23-170	M24308/23-270	M24308/23-370	A-4-2	Size 22	Straight
M24308/23-71	M24308/23-171	M24308/23-271	M24308/23-371	A-5-2	Size 22	Straight
M24308/23-73	M24308/23-173	M24308/23-273	M24308/23-373	A-1-2	Size 22	Rt Angle
M24308/23-74	M24308/23-174	M24308/23-274	M24308/23-374	A-2-2	Size 22	Rt Angle
M24308/23-75	M24308/23-175	M24308/23-275	M24308/23-375	A-3-2	Size 22	Rt Angle
M24308/23-76	M24308/23-176	M24308/23-276	M24308/23-376	A-4-2	Size 22	Rt Angle
M24308/23-77	M24308/23-177	M24308/23-277	M24308/23-377	A-5-2	Size 22	Rt Angle

Figure 10. MIL-DTL-24308/23 Part Number Breakdown (Sheet 2)

SHELL FINISH (Class G And N Connectors Only)	
F	Standard Cadmium
P	Passivated Steel
BLANK	Zinc Plated
SHELL FINISH (Class M Connectors Only)	
BLANK	Gold Finish, No Suffix Is Required
SHELL FINISH (Class D Connectors Only)	
BLANK	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 10. MIL-DTL-24308/23 Part Number Breakdown (Sheet 3)

PART NUMBER DESIGNATION



PIN Class G	PIN Class D	PIN Class N	PIN Class M	Insert arrangement (Figure 14)	Contact	
					Mating end	PWB tail
M24308/24-1	M24308/24-101	M24308/24-201	M24308/24-301	A-1-1	Size 20	Straight
M24308/24-2	M24308/24-102	M24308/24-202	M24308/24-302	A-2-1	Size 20	Straight
M24308/24-3	M24308/24-103	M24308/24-203	M24308/24-303	A-3-1	Size 20	Straight
M24308/24-4	M24308/24-104	M24308/24-204	M24308/24-304	A-4-1	Size 20	Straight
M24308/24-5	M24308/24-105	M24308/24-205	M24308/24-305	A-5-1	Size 20	Straight
M24308/24-7	M24308/24-107	M24308/24-207	M24308/24-307	A-1-1	Size 20	Straight
M24308/24-8	M24308/24-108	M24308/24-208	M24308/24-308	A-2-1	Size 20	Straight
M24308/24-9	M24308/24-109	M24308/24-209	M24308/24-309	A-3-1	Size 20	Straight
M24308/24-10	M24308/24-110	M24308/24-210	M24308/24-310	A-4-1	Size 20	Straight
M24308/24-11	M24308/24-111	M24308/24-211	M24308/24-311	A-5-1	Size 20	Straight
M24308/24-13	M24308/24-113	M24308/24-213	M24308/24-313	A-1-1	Size 20	Straight
M24308/24-14	M24308/24-114	M24308/24-214	M24308/24-314	A-2-1	Size 20	Straight
M24308/24-15	M24308/24-115	M24308/24-215	M24308/24-315	A-3-1	Size 20	Straight
M24308/24-16	M24308/24-116	M24308/24-216	M24308/24-316	A-4-1	Size 20	Straight
M24308/24-17	M24308/24-117	M24308/24-217	M24308/24-317	A-5-1	Size 20	Straight
M24308/24-19	M24308/24-119	M24308/24-219	M24308/24-319	A-1-1	Size 20	Straight
M24308/24-20	M24308/24-120	M24308/24-220	M24308/24-320	A-2-1	Size 20	Straight
M24308/24-21	M24308/24-121	M24308/24-221	M24308/24-321	A-3-1	Size 20	Straight
M24308/24-22	M24308/24-122	M24308/24-222	M24308/24-322	A-4-1	Size 20	Straight
M24308/24-23	M24308/24-123	M24308/24-223	M24308/24-323	A-5-1	Size 20	Straight
M24308/24-25	M24308/24-125	M24308/24-225	M24308/24-325	A-1-1	Size 20	Rt Angle
M24308/24-26	M24308/24-126	M24308/24-226	M24308/24-326	A-2-1	Size 20	Rt Angle
M24308/24-27	M24308/24-127	M24308/24-227	M24308/24-327	A-3-1	Size 20	Rt Angle
M24308/24-28	M24308/24-128	M24308/24-228	M24308/24-328	A-4-1	Size 20	Rt Angle
M24308/24-29	M24308/24-129	M24308/24-229	M24308/24-329	A-5-1	Size 20	Rt Angle
M24308/24-31	M24308/24-131	M24308/24-231	M24308/24-331	A-1-1	Size 20	Rt Angle
M24308/24-32	M24308/24-132	M24308/24-232	M24308/24-332	A-2-1	Size 20	Rt Angle
M24308/24-33	M24308/24-133	M24308/24-233	M24308/24-333	A-3-1	Size 20	Rt Angle
M24308/24-34	M24308/24-134	M24308/24-234	M24308/24-334	A-4-1	Size 20	Rt Angle
M24308/24-35	M24308/24-135	M24308/24-235	M24308/24-335	A-5-1	Size 20	Rt Angle

Figure 11. MIL-DTL-24308/24 Part Number Breakdown (Sheet 1 of 3)

DATA SHEET NUMBER

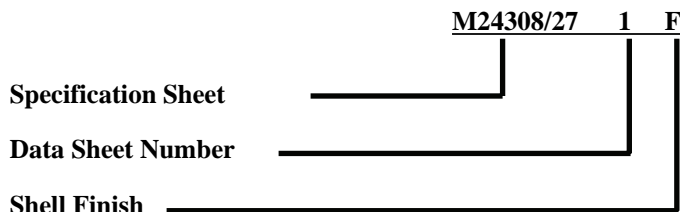
PIN Class G	PIN Class D	PIN Class N	PIN Class M	Insert arrangement (Figure 14)	Contact	
					Mating end	PWB tail
M24308/24-37	M24308/24-137	M24308/24-237	M24308/24-337	A-1-1	Size 20	Rt Angle
M24308/24-38	M24308/24-138	M24308/24-238	M24308/24-338	A-2-1	Size 20	Rt Angle
M24308/24-39	M24308/24-139	M24308/24-239	M24308/24-339	A-3-1	Size 20	Rt Angle
M24308/24-40	M24308/24-140	M24308/24-240	M24308/24-340	A-4-1	Size 20	Rt Angle
M24308/24-41	M24308/24-141	M24308/24-241	M24308/24-341	A-5-1	Size 20	Rt Angle
M24308/24-43	M24308/24-143	M24308/24-243	M24308/24-343	A-1-1	Size 20	Rt Angle
M24308/24-44	M24308/24-144	M24308/24-244	M24308/24-344	A-2-1	Size 20	Rt Angle
M24308/24-45	M24308/24-145	M24308/24-245	M24308/24-345	A-3-1	Size 20	Rt Angle
M24308/24-46	M24308/24-146	M24308/24-246	M24308/24-346	A-4-1	Size 20	Rt Angle
M24308/24-47	M24308/24-147	M24308/24-247	M24308/24-347	A-5-1	Size 20	Rt Angle
M24308/24-49	M24308/24-149	M24308/24-249	M24308/24-349	A-1-1	Size 20	Rt Angle
M24308/24-50	M24308/24-150	M24308/24-250	M24308/24-350	A-2-1	Size 20	Rt Angle
M24308/24-51	M24308/24-151	M24308/24-251	M24308/24-351	A-3-1	Size 20	Rt Angle
M24308/24-52	M24308/24-152	M24308/24-252	M24308/24-352	A-4-1	Size 20	Rt Angle
M24308/24-53	M24308/24-153	M24308/24-253	M24308/24-353	A-5-1	Size 20	Rt Angle
M24308/24-55	M24308/24-155	M24308/24-255	M24308/24-355	A-1-1	Size 20	Rt Angle
M24308/24-56	M24308/24-156	M24308/24-256	M24308/24-356	A-2-1	Size 20	Rt Angle
M24308/24-57	M24308/24-157	M24308/24-257	M24308/24-357	A-3-1	Size 20	Rt Angle
M24308/24-58	M24308/24-158	M24308/24-258	M24308/24-358	A-4-1	Size 20	Rt Angle
M24308/24-59	M24308/24-159	M24308/24-259	M24308/24-359	A-5-1	Size 20	Rt Angle
M24308/24-61	M24308/24-161	M24308/24-261	M24308/24-361	A-1-2	Size 22	Straight
M24308/24-62	M24308/24-162	M24308/24-262	M24308/24-362	A-2-2	Size 22	Straight
M24308/24-63	M24308/24-163	M24308/24-263	M24308/24-363	A-3-2	Size 22	Straight
M24308/24-64	M24308/24-164	M24308/24-264	M24308/24-364	A-4-2	Size 22	Straight
M24308/24-65	M24308/24-165	M24308/24-265	M24308/24-365	A-5-2	Size 22	Straight
M24308/24-67	M24308/24-167	M24308/24-267	M24308/24-367	A-1-2	Size 22	Straight
M24308/24-68	M24308/24-168	M24308/24-268	M24308/24-368	A-2-2	Size 22	Straight
M24308/24-69	M24308/24-169	M24308/24-269	M24308/24-369	A-3-2	Size 22	Straight
M24308/24-70	M24308/24-170	M24308/24-270	M24308/24-370	A-4-2	Size 22	Straight
M24308/24-71	M24308/24-171	M24308/24-271	M24308/24-371	A-5-2	Size 22	Straight
M24308/24-73	M24308/24-173	M24308/24-273	M24308/24-373	A-1-2	Size 22	Rt Angle
M24308/24-74	M24308/24-174	M24308/24-274	M24308/24-374	A-2-2	Size 22	Rt Angle
M24308/24-75	M24308/24-175	M24308/24-275	M24308/24-375	A-3-2	Size 22	Rt Angle
M24308/24-76	M24308/24-176	M24308/24-276	M24308/24-376	A-4-2	Size 22	Rt Angle
M24308/24-77	M24308/24-177	M24308/24-277	M24308/24-377	A-5-2	Size 22	Rt Angle

Figure 11. MIL-DTL-24308/24 Part Number Breakdown (Sheet 2)

SHELL FINISH (Class G and N Connectors Only)	
F	Standard Cadmium
P	Passivated Steel
BLANK	Zinc Plated
SHELL FINISH (Class M Connectors Only)	
BLANK	Gold Finish, No Suffix Is Required
SHELL FINISH (Class D Connectors Only)	
BLANK	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 11. MIL-DTL-24308/24 Part Number Breakdown (Sheet 3)

PART NUMBER DESIGNATION



Specification Sheet
See Table 1.

Dash Sheet Number	Number of Contacts	Insert Arrangement (Figure 14)
M24308/27-01	9	A-1-1
M24308/27-02	15	A-2-1
M24308/27-03	25	A-3-1
M24308/27-04	37	A-4-1

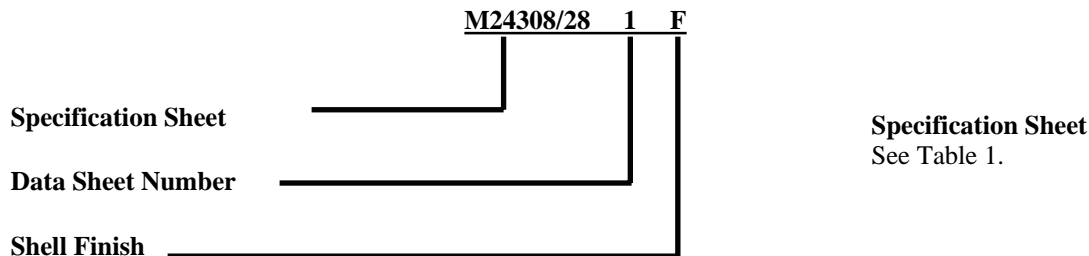
1. Mating connector: MIL-DTL-24308/3, MIL-DTL-2408/4, MIL-DTL-24308/7, MIL-DTL-24308/8, MIL-DTL-24308/9, MIL-DTL-24308/28.

2. Conductor accommodation: 28 AWG stranded round conductor flat cable with conductors on .050 inch (1.27 mm) centers.

SHELL FINISH	
F	Standard Cadmium
BLANK	Zinc Plated

Figure 12. MIL-DTL-24308/27 Part Number Breakdown

PART NUMBER DESIGNATION



Dash Sheet Number	Number of Contacts	Insert Arrangement (Figure 14)
M24308/28-01	9	A-1-1
M24308/28-02	15	A-2-1
M24308/28-03	25	A-3-1
M24308/28-04	37	A-4-1

1. Mating connector: MIL-DTL-24308/1, MIL-DTL-24308/2, MIL-DTL-24308/5, MIL-DTL-24308/6, MIL-DTL-24308/23, MIL-DTL-24308/27.
2. Conductor accommodation: 28 AWG stranded round conductor flat cable with conductors on .050 inch (1.27 mm) centers.

SHELL FINISH	
F	Standard Cadmium
BLANK	Zinc Plated

Figure 13. MIL-DTL-24308/28 Part Number Breakdown

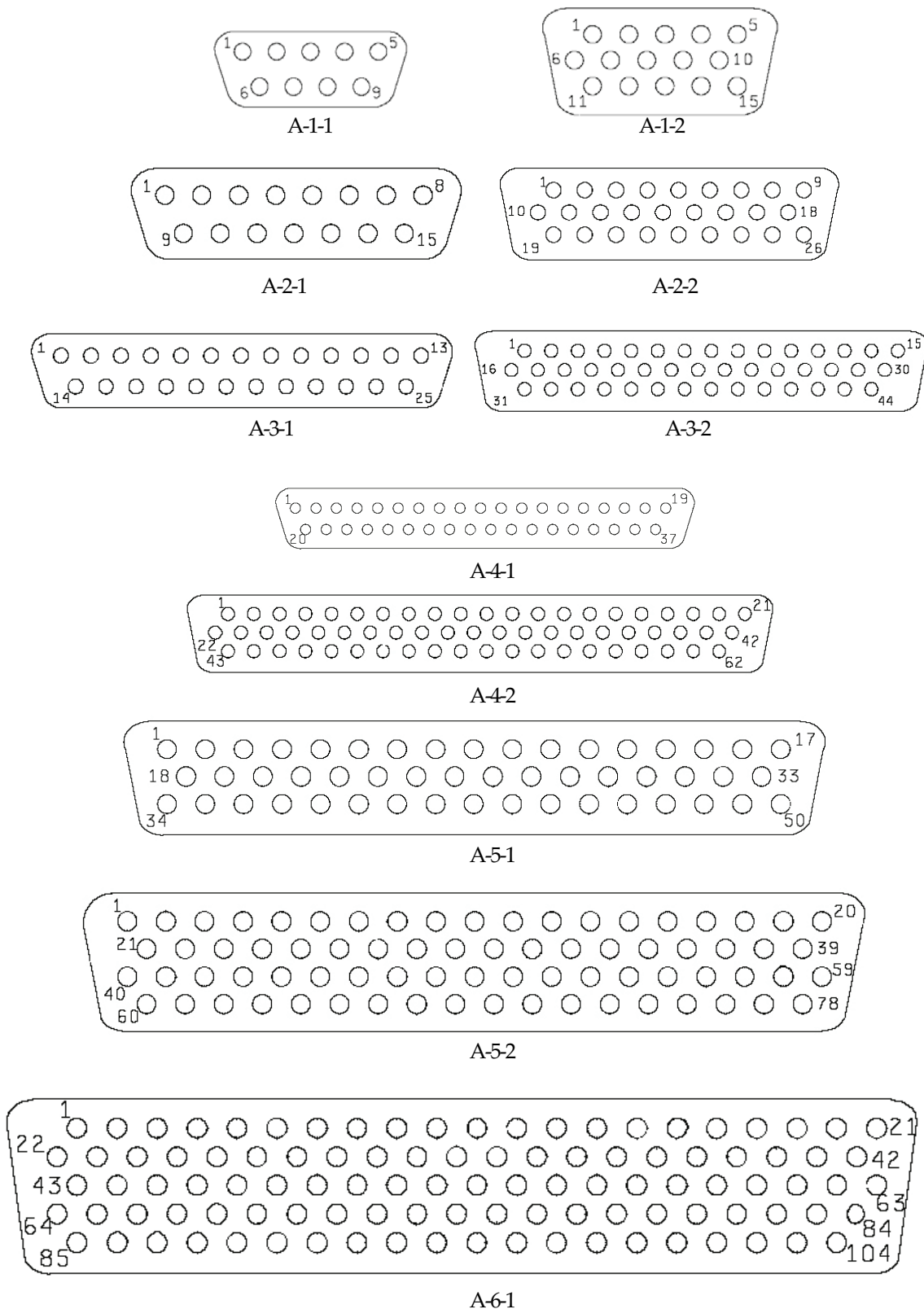


Figure 14. MIL-DTL-24308 Insert Arrangement

DATA SHEET NUMBER

Contact Part Number	Basic Crimping Tool	Positioner	Installing Tool	Removal Tool	Unwired Removal Tool
M39029/57-354	M22520/2-01 M22520/7-01	M22520/2-06 M22520/7-06	M81969/14-01 M81969/1-04	M81969/14-01 M81969/1-04	DRK-105 (or equivalent)
M39029/58-360	M22520/2-01 M22520/7-01	M22520/2-09 M22520/7-07	M81969/14-01 M81969/1-04	M81969/14-01 M81969/1-04	DRK-105 (or equivalent)
M39029/63-368	M22520/2-01	M22520/2-08	M81969/39-01 M81969/1-02	M81969/39-01 M81969/1-02	DRK-105 (or equivalent)
M39029/64-369	M22520/2-01	M22520/2-08	M81969/39-01 M81969/1-02	M81969/39-01 M81969/1-02	DRK-105 (or equivalent)

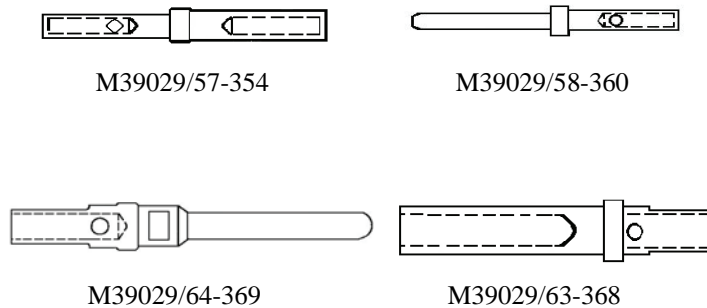


Figure 15. MIL-DTL-24308 Contacts and Tools

11. **Dash Number.** The dash number denotes the connector type and contacts.

12. **DESIGN AND CONSTRUCTION.** Connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.

13. **INSERTS.** Inserts are molded or bonded one-piece construction, except for IDC. The inserts are so designed that the inserts cannot be removed from shells. The contact retention system for removable crimp contact connectors is a metal retention clip.

14. **INTERCHANGEABILITY.** All connectors having the same military part number are completely interchangeable with respect to installation and performance. Solder and crimp contact connectors are intermateable (Table 1 and Figures 1 thru 13).

15. **INSERT ARRANGEMENT.** The insert

arrangement (Figure 14) contained in the connector part number (Figures 1 thru 13), for each connector. Shell size is equal to the second number in the insert arrangement (Example: Insert arrangement "A-2-2" = Shell size 2, Insert arrangement "A-5-1" = Shell size 5).

16. **Connectors M24308/1.** The M24308/1 connectors are class G, general purpose receptacles with solder type socket contacts. For the insert arrangements refer to Figure 1.

17. **Connectors M24308/2.** The M24308/2 connectors are class G, general purpose receptacles with removable crimp type socket contacts. For insert arrangements refer to Figure 2.

18. **Connectors M24308/3.** The M24308/3 connectors are class G, general Purpose plugs with solder type pin contacts. For the insert arrangements refer to Figure 3.

19. Connectors M24308/4. The M24308/4 connectors are class G, general purpose plugs with removable crimp type pin contacts. For insert arrangements refer to Figure 4.

20. Connectors M24308/5. The M24308/5 connectors are class N, nonmagnetic receptacles with solder type socket contacts. For insert arrangements refer to Figure 5.

21. Connectors M24308/6. The M24308/6 connectors are class N, nonmagnetic receptacles with removable crimp type socket contacts. For insert arrangements refer to Figure 6.

22. Connectors M24308/7. The M24308/7 connectors are class N, nonmagnetic plugs with solder type pin contacts. For insert arrangements refer to Figure 7.

23. Connectors M24308/8. The M24308/8 connectors are class N, nonmagnetic plugs with removable crimp contacts. For insert arrangements refer to Figure 8.

24. Connectors M24308/9. The M24308/9 connectors are class H, hermetic plugs with solder type and eyelet type pin contacts. For insert arrangements refer to Figure 9.

25. Connectors M24308/23. The M24308/23 are receptacles with straight printed circuit board socket contacts. For insert arrangements refer to Figure 10.

26. Connectors M24308/24. The M24308/24 are plugs with straight and 90° printed circuit board socket contacts. For insert arrangements refer to Figure 11.

27. Connectors M24308/27. The M24308/27 are non-environmental rack and panel mounted receptacles with insulation displacement socket contacts. For insert arrangements refer to Figure 12.

28. Connectors M24308/28. The M24308/27 are non-environmental rack and panel mounted receptacles with insulation displacement socket contacts. For insert arrangements refer to Figure 13.

29. **INSERT CONFIGURATION**. The insert configuration is the manner in which contacts are placed within insert in a standard configuration. All

arrangements identified in Figures 1 through 13 are illustrated (Figure 14).

30. **CONTACTS**. The type of contacts used on this type connector are as follows:

a. Solder contacts. Solder contacts are non-removable from the insert and have either eyelet or solder cup terminals. The solder cups are so designed that during soldering, no components will be damaged and no liquid solder shall escape.

b. Crimp removable contacts. Removable crimp contacts M24308 have been superseded by M39029 contacts listed in Table 13.

c. Insulation Displacement Contacts (IDC). IDCs' are non-removable and accommodate 28 AWG stranded round conductor flat cable with conductors on .050 inch (1.27 mm) centers.

31. **CONNECTOR BUILDUP**.

32. **WIRE STRIPPING**. Strip wire in accordance with following procedure:

a. Cut wire to proper length. Ensure enough wire remains for adequate strain relief without leaving excess slack.

b. Strip insulation from end of wire, remove 3/16 to 15/64 in. of insulation (NAVAIR 01-1A-505-1, WP 009 00). Select contact (Figures 1 thru 13).

33. **CONTACT CRIMPING**. Crimp contact in accordance with following procedure:

a. Select correct crimp tool (Figure 15).

b. Perform die closure check, install positioner, and set selector knob for gage of wire (NAVAIR 01-1A-505-1, WP 013 00).

c. Insert stripped wire into contact conductor barrel. Ensure all wire strands are inside contact conductor barrel and visible in contact inspection hole (Figure 16).

d. Crimp contact to wire.

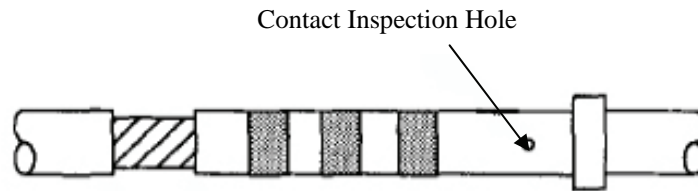


Figure 16. Insulation Gap

34. **CONTACT INSERTION.** Insert wired or unwired contacts in accordance with following procedure:

- a. Remove sealing plug and/or contact from contact cavity (Paragraph 38).
- b. Ensure wire or cable on contact is routed through connector backshell.
- c. Select correct insertion tool (Figure 15).
- d. Insert wire into insertion tool (Figure 17).

WARNING

Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

e. Insert tip of contact into cavity. Start contact insertion near connector center cavities and work outward.

f. Axially align contact with contact cavity.

g. With firm even pressure, press tool against contact shoulder and seat contact into cavity (Figure 18). A slight click may be heard as retention tines snap into place behind contact shoulder.

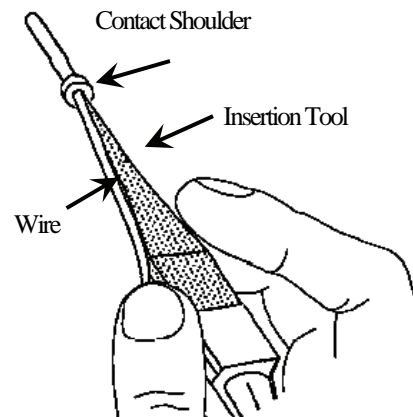


Figure 17. Inserting Contact into Insertion Tool

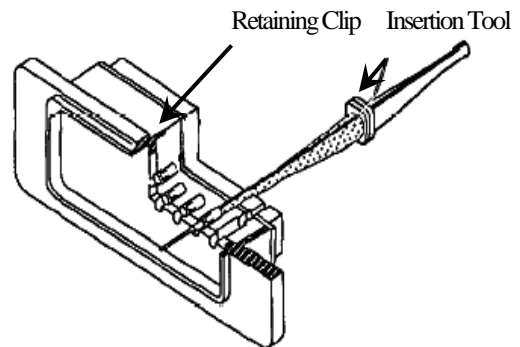


Figure 18. Contact Insertion

h. Pull tool straight out of contact cavity. Remove tool from wire. Pull back lightly on wire to ensure contact is properly seated.

i. Seal connector as required (Paragraph 35).

35. CONNECTOR SEALING.

36. Sealing Plugs. Seal connector in accordance with following procedure:

a. Fill all unused cavities with uncrimped contacts (Paragraph 34).

b. Insert sealing plug, large diameter end first, until bottomed in contact cavity. Do not insert further than knob. Fill all cavities that have uncrimped contacts. For grommet sealing plug selection, refer to NAVAIR 01-1A-505-1, WP 023 00.

37. Moisture Barrier. For connector sealing procedures, including application of sealant to grommet sealed connectors, refer to NAVAIR 01-1A-505-1, WP 025 00.

38. **CONTACT REMOVAL**. Remove wired, unwired, and broken wire contacts in accordance with following paragraphs.

39. Wired Contact Removal.

a. Select correct removal tool (Figure 15).

WARNING

Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

b. Place wire of contact to be removed into removal tool, with white tip facing connector insert (Figure 19).

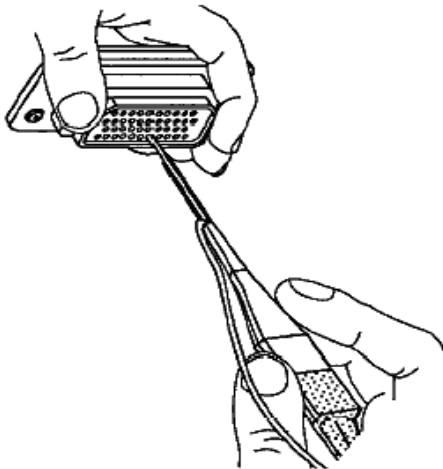


Figure 19. Inserting Wire into Removal Tool

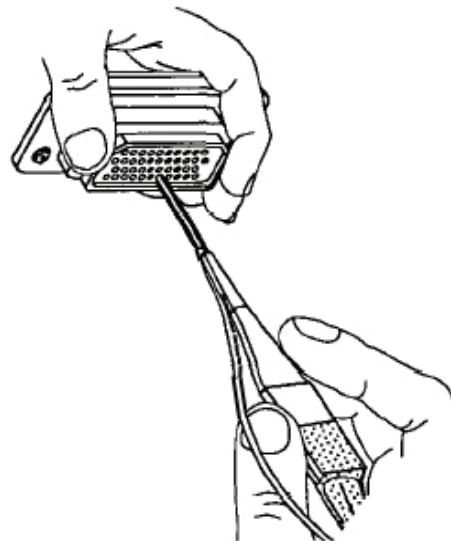


Figure 20. Removal Tool on Wire

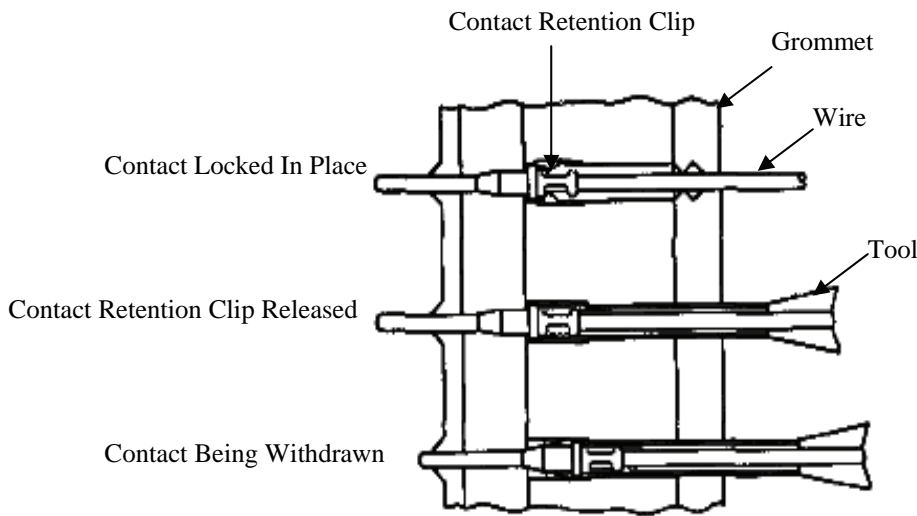


Figure 21. Unlocking Contact Mechanism

c. Slide removal tool along wire at a right angle to connector insert face and align with contact cavity (Figure 20).

d. Insert tool into contact cavity until tool tip bottoms against contact shoulder (Figure 21). A slight increase in resistance will be noticed just before the tool tip bottoms. This will spread the retention clip and release its hold on the contact.

e. Press wire firmly against serrated edge of removal tool and pull wire straight out from contact cavity (Figure 22)

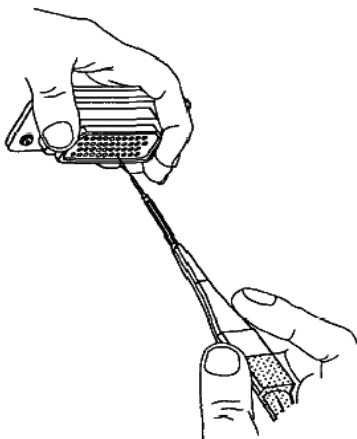


Figure 22. Removing Contact from Connector

40. Unwired Contact Removal.

WARNING

Metal tool tips are sharp and cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

- a. Select correct unwired removal tool (Figure 15 and 23).
- b. With rear of connector exposed, remove sealing plug from insert cavity of contact to be removed.
- c. Press and hold tool plunger until tip of tool is aligned with contact to be removed.
- d. Axially align removal tool with contact to be removed.

e. Insert removal tool tip into contact cavity to butt contact wire barrel; then slide removal tool sleeve over contact and exert pressure until sleeve bottoms (Figure 24)

f. Remove tool and unlocked contact from connector by withdrawing tool from connector (Figure 25).

g. Remove contact from removal tool by pressing plunger.

41. Broken Wire Contact Removal.

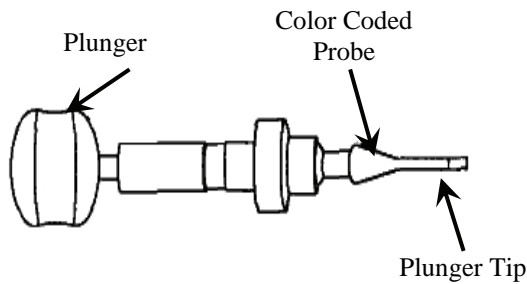


Figure 23. Unwired Contact Removal

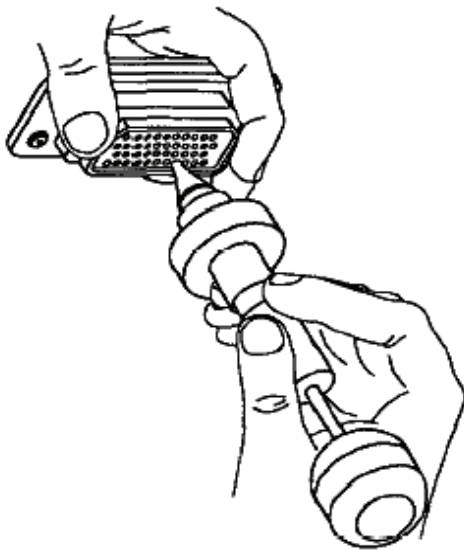


Figure 24. Unlocking Contact Retention Mechanism with Unwired Contact Removal Tool.

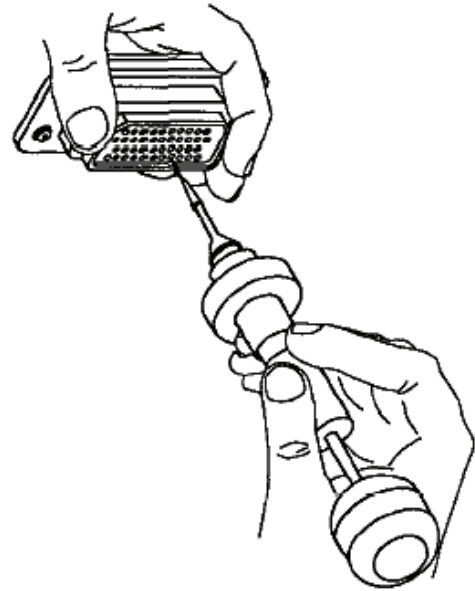


Figure 25. Extracting Contact from Connector

WARNING

Metal tool tips are sharp and cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors.

Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

- a. Select correct removal tool (Figure 15).
- b. Insert tip of removal tool about 1/8 inch into cavity at rear of connector.



Wire strands may be encountered at any point up to 5/16 inch of tool insertion. It is important not to jam any strands of wire up to his point.

Withdraw removal tool anytime during insertion when it cannot be advanced into connector using these procedures. Inspect tool tip for nicks, cracks, mushrooming, and other damage that will prevent is functioning. Replace removal tool and repeat procedure, if required.

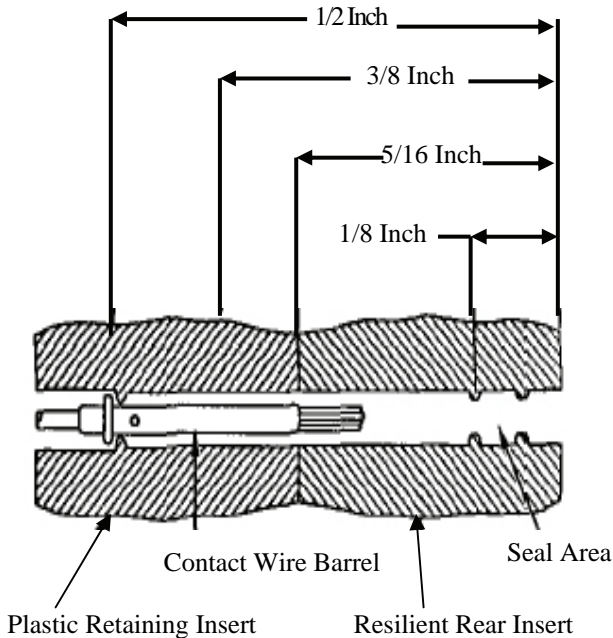


Figure 26. Typical Connector Dimensions

NOTE

Refer to figure 26 for approximate dimensions of a size 22 contact and cavity.

The dimensions in this procedure are based on a size 22 contact.

- c. Gently insert removal tool into cavity in about 1/16 inch units, releasing tool after each unit if resistance is felt.

NOTE

Rotating removal tool works splayed wire strands into slot of tool, allowing tool to pass.

Removal tool may be blocked at rear of contact by plastic insert or additional strands of broken wire.

- d. If resistance is felt before removal tool reaches back end of contact, withdraw tool slightly, rotate about 1/6 of a turn, and reinsert tool. Repeat rotating and insertion procedure until tool passes with minimum additional force to 5/16-inch depth back end of contact (Figure 26 and 27).

- e. Wiggle removal tool gently to help it into insert bore and over back of contact. Additional rotation may be required if broken strands are encountered.

- f. Continue insertion of removal tool until positive stop is felt at about 1/2 inch depth.

- g. Exert axial pressure on engaging end of contact, using appropriate pin or socket as pusher. (If contact does not move, seat removal tool more firmly).

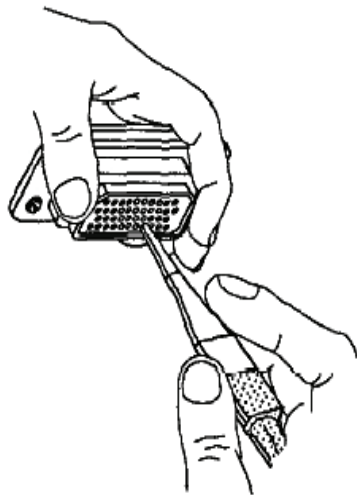


Figure 27. Unlocking Contact Retention Mechanism of Broken Wire Contact

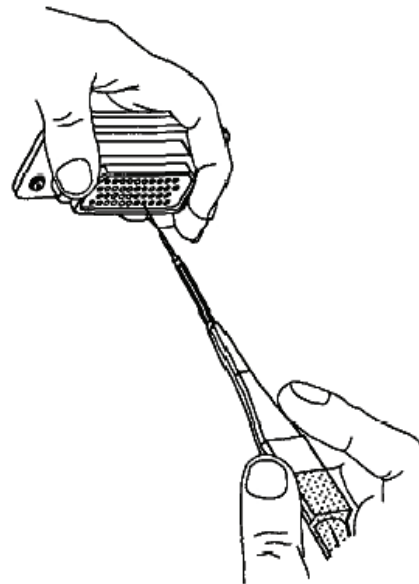


Figure 28. Broken Wire Contact Removal

h. Push contact completely out rear of connector before disengaging removal tool (Figure 28).

54. **CONNECTOR REMOVAL AND INSTALLATION.** If the connector is severely damaged or cannot be repaired using the above procedures, proceed as follows:

a. Starting from outside of damaged connector, tag wires and remove all contacts from connector (Paragraph 38). If contact cannot be removed, cut wire as close to connector as possible and attach new contact (Paragraphs 34 and 35).

b. Starting from center of new connector, insert contact into correct cavity (Paragraph 34). Remove tag from wire. Repeat procedure until all contacts are installed in new connector.

55. **CONNECTOR CLEANING AND PRESERVATION.**

56. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00.

CONNECTOR ACCESSORIES

MIL-DTL-24308

Reference Material

Connectors, Electric, Rectangular, Non-Environmental,
Miniature, Polarized Shell, Rack and Panel MIL-DTL-24308

Alphabetical Index

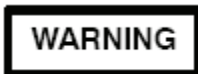
<u>Subject</u>	<u>Page No.</u>
Introduction	1
Cable Clamps/Strain Reliefs	1
Cable Clamps	1
Strain Reliefs	1
Connector Accessories	1
Deep Straight Shield with Clamp	2
Female Screwlock	2
Male Screwlock	2
Right Angle Shield with Clamp	1
Shield with Round Clamp	2
Straight Shield with Large Clamp	2

Record of Applicable Technical Directives

None

1. **INTRODUCTION**

2. This Work Package (WP) covers connector accessories used with MIL-DTL-24308 connectors, their function, and procurement information.



This document includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. Consult applicable health and environmental regulations regarding its use, handling and disposition.

NOTE

Nickel plated parts are not for Navy use or new design.

3. **CONNECTOR ACCESSORIES.**

4. Connector accessories are components added to a connector to enhance its operational characteristics.

5. **CABLE CLAMPS/STRAIN RELIEFS.** The following two paragraphs explain the two types of cable support or clamping devices.

6. Cable Clamps. A cable clamp is a support or clamping device which requires use of an intermediate component for attachment to back of connector (Figure 1).

7. Strain Reliefs. A strain relief is a support or clamping device which attaches directly to connector (Figure 1).

8. **RIGHT ANGLE SHIELD WITH CLAMP.** The right angle shield can be used on either a plug or receptacle. Cable opening is for a side exit configuration (Figure 2).

9. DEEP STRAIGHT SHIELD WITH CLAMP.

The deep straight shield is used with long connectors. It can be used on either a plug or receptacle. Cable opening is for a straight cable exit configuration (Figure 3).

10. SHIELD WITH ROUND CLAMP. The shield with round clamp can be used on either a plug or receptacle. The clamp is used with round cables. Cable opening is for a straight cable exit configuration. (Figure 4).

11. STRAIGHT SHIELD WITH LARGE CLAMP.

The straight shield can be used on either a plug or

receptacle. Cable opening is for a straight cable exit configuration (Figure 5).

12. MALE SCREWLOCK. The male screwlock is attached to one half of a two piece multiple contact connectors used to draw and hold both halves together and to separate them (Figure 6).

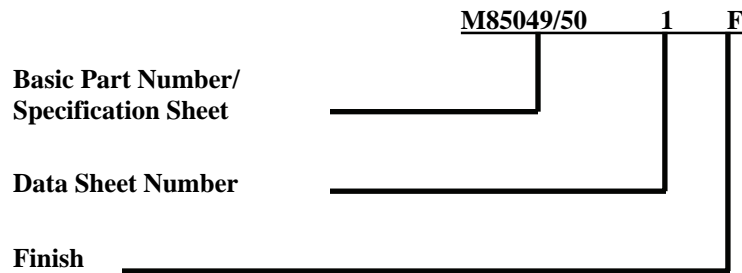
13. FEMALE SCREWLOCK. The female screwlock is attached to one half of a two piece multiple contact connectors used to draw and hold both halves together and to separate them (Figure 7).



Figure 1. Typical Strain Relief



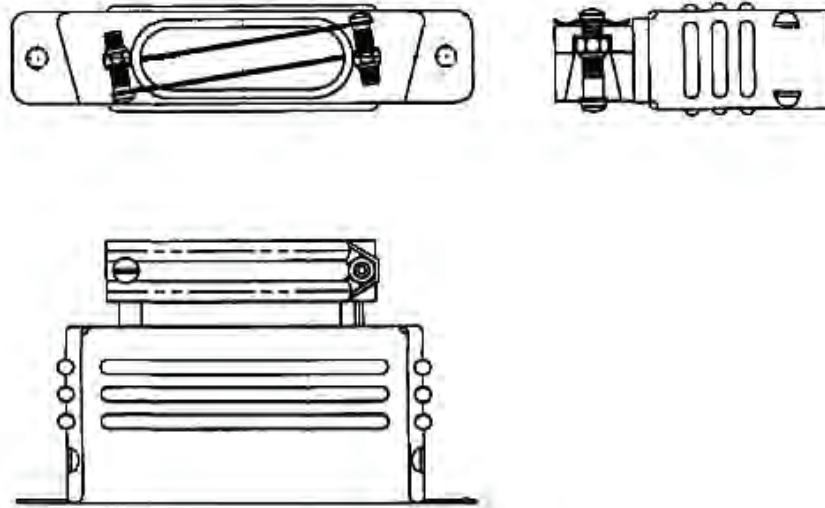
PART NUMBER DESIGNATION



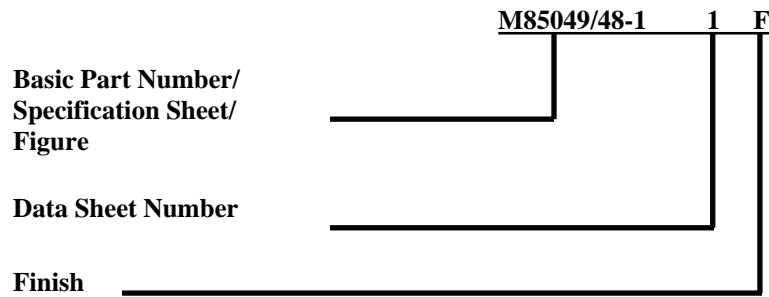
DASH SHEET NUMBER		Shell Size
Steel	Brass	
M85049/50-1	M85049/50-6	1
M85049/50-2	M85049/50-7	2
M85049/50-3	M85049/50-8	3
M85049/50-4	M85049/50-9	4
M85049/50-5	M85049/50-10	5

SHELL FINISH	
F	Standard Cadmium
N	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 2. Right Angle Shield with Clamp Part Number Breakdown



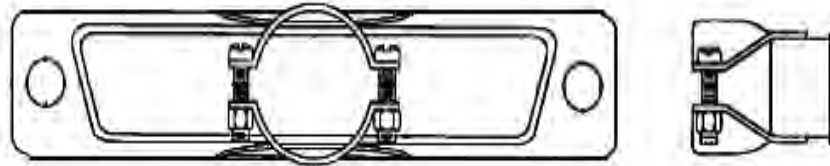
PART NUMBER DESIGNATION



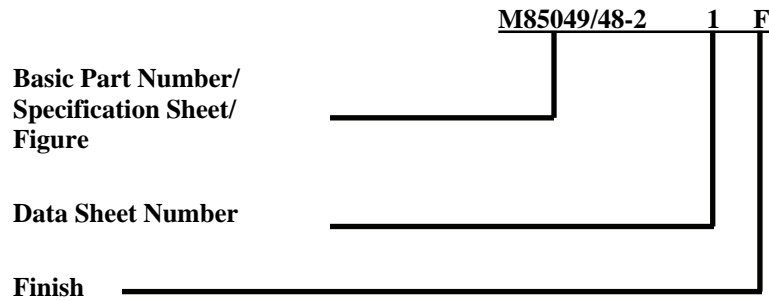
DASH SHEET NUMBER		Shell Size
Steel	Brass	
M85049/48-1-1	M85049/48-1-6	1
M85049/48-1-2	M85049/48-1-7	2
M85049/48-1-3	M85049/48-1-8	3
M85049/48-1-4	M85049/48-1-9	4
M85049/48-1-5	M85049/48-1-10	5

SHELL FINISH	
F	Standard Cadmium
N	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 3. Deep Straight Shield with Clamp Part Number Breakdown



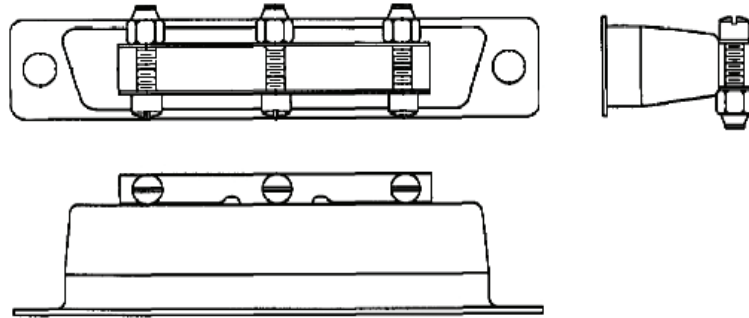
PART NUMBER DESIGNATION



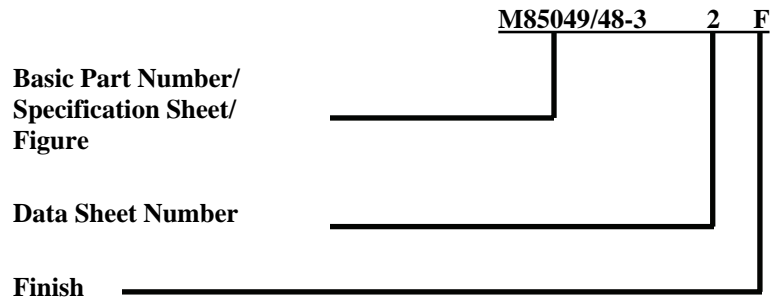
DASH SHEET NUMBER		Shell Size
Steel	Brass	
M85049/48-2-1	M85049/48-2-6	1
M85049/48-2-2	M85049/48-2-7	2
M85049/48-2-3	M85049/48-2-8	3
M85049/48-2-4	M85049/48-2-9	4
M85049/48-2-5	M85049/48-2-10	5

SHELL FINISH	
F	Standard Cadmium
N	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 4. Shield with Round Clamp Part Number Breakdown



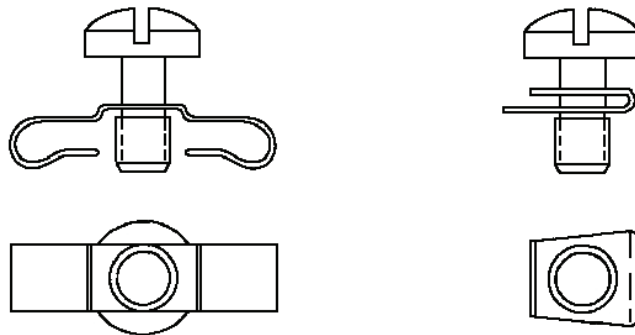
PART NUMBER DESIGNATION



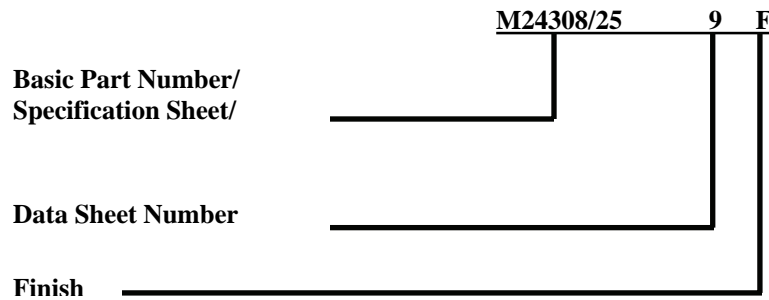
DASH SHEET NUMBER		Shell Size
Steel	Brass	
M85049/48-3-2	M85049/48-3-7	2
M85049/48-3-3	M85049/48-3-8	3
M85049/48-3-4	M85049/48-3-9	4
M85049/48-3-5	M85049/48-3-10	5

SHELL FINISH	
F	Standard Cadmium
N	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)

Figure 5. Straight Shield with Large Clamp Part Number Breakdown



PART NUMBER DESIGNATION

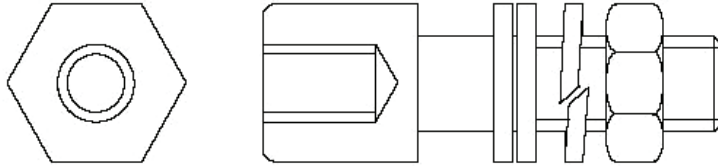


DASH NO.	APPLICABILITY			
	WITHOUT SHIELDS IN ACCORDANCE WITH SAE-AS85049/48-2, -3		WITH SHIELDS IN ACCORDANCE WITH SAE-AS85049/48-2, -3	
	CONNECTOR MIL-DTL-24308/	SHELL SIZE	CONNECTOR MIL-DTL-24308/	SHELL SIZE
-6	1, 2, 3, 4	1,2,3 4,5,6		
-7			3, 4	3, 4
-8			3, 4	5
-9 **	1, 2, 3, 4	1,2,3, 4	3, 4 1, 2	1,2 1,2,3 4
-10 **	1, 2, 3, 4	5	1, 2	5

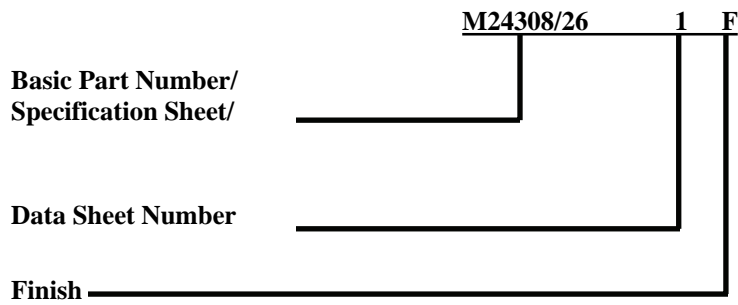
** M24308/25-1 through -5 are inactive for new design. New design or government logistic support should use M24308/25-9 or M24308/25-10.

SHELL FINISH	
F	Standard Cadmium
P	Passivated Stainless Steel
BLANK	Zinc

Figure 6. Male Screwlock Assembly Part Number Breakdown



PART NUMBER DESIGNATION



DASH NO.	LENGTH \pm .015
-1	.312
-2	.625

SHELL FINISH	
F	Standard Cadmium
P	Passivated Stainless Steel
BLANK	Zinc

Figure 7. Female Screwlock Assembly Part Number Breakdown

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

004 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 28731**

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-DTL-28731004 03
Connectors MIL-DTL-28731004 02
Introduction004 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 28731**

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-DTL-28731. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-DTL-28731

Reference Material

Connector Accessories004 03
Connectors, Electric, Rectangular, Non-Environmental, Miniature,
Polarized Shell, Rack and Panel MIL-DTL-28731
Installation Practices, Aircraft Electric and Electronic Wiring NAVAIR 01-1A-505-1

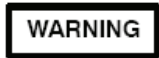
Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Introduction	2
Description	2
MIL-DTL-28731 Connectors	2
Connector Buildup	12
Contact Crimping	12
Wire Stripping.....	12
Connector Cleaning and Preservation	14
Connector Removal and Installation	14
Connector Buildup – Solder Contacts	14
Contact Insertion	12
Contact Removal	12
Coupling.....	2
Design and Construction	3
Insert Arrangement.....	11
Contact Availability	11
Crimp Removable Contacts	11
Fixed Contacts	11
Wrappost Contacts	11
Inserts	3
Interchangeability	3
Mil-DTL-28731.....	2
Part Number	2
Military Prefix.....	2
Modifier	3
Mounting Type.....	3
Polarization	2
Wire Wrapping.....	12
Manual Tool Wire Wrapping	13
Powered Tool Wire Wrapping	13
Wire Wrap Connection Inspection.....	13

Record of Applicable Technical Directives

None

Support Equipment Required



<u>Part No./ Type Designation</u>	<u>Nomenclature</u>
MIL-I-81969/13-01	Tool, Insertion
MIL-I-81969/11-01	Tool, Removal
06 1773 03	Tool, Polarizing
MIL-I-81969/5-01	Tool, Insertion
MIL-I-81969/4-02	Tool, Removal
MIL-C-22520/17-01	Tool, Crimp
Gardner-Denver Model 14BIAL (or equivalent)	Powered Tool, Wire Wrapping
Standard Pneumatic 615-1 (or equivalent)	Powered Tool, Wire Wrapping
Cooper Tools 14YB3 (or equivalent)	Powered Tool, Wire Wrapping
Cooper Tools 14HP1C (or equivalent)	Manual Tool, Wire Wrapping
Heat Sink	
Iron, Soldering	

Materials Required

<u>Specification/ Part No.</u>	<u>Nomenclature</u>
TT-I-735	Alcohol, Isopropyl
H-B-643 (or equivalent)	Brush, Acid Swabbing
MIL-F-14256 (or equivalent)	Flux, Liquid
SnGOWRMAP3 (or equivalent)	Solder

1. INTRODUCTION.

2. This Work Package (WP) pertains to connectors manufactured in accordance with MIL-DTL-28731. Repair procedures as well as ordering information is included. The connectors are divided into three series according to the manufacturer's series number.

3. **DESCRIPTION.** The connectors are rack and panel mounted and can be used for other applications. They feature front release, rear extract removable crimp, wrap post, and solder contacts. The contacts are of the formed blade fork type. A double wire crimp contact is available. The operating temperature range of these connectors is: -85°F (-65°C) to +257°F (+125°C).

This document includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. Consult applicable health and environmental regulations regarding its use, handling and disposition.

4. MIL-DTL-28731 CONNECTORS.

5. **MIL-DTL-28731** connectors are front release and rear removable with crimp, wrap post, or solder contacts.

6. **COUPLING.** Connectors shall be capable of being fully coupled and uncoupled without use of tools.

7. **POLARIZATION.** Polarization of the plug with its receptacle shall be accomplished by mechanical means with protective shell, bosses, guide pins, sockets, or jackscrews. See Figure 1.

8. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of the connector (Figure 2).

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

9. **Military Prefix.** The prefix denotes military standard. To determine the prefix refer to Table 1 and Figure 2, such as: M28731/10-0109-C where "M28731/10" is the military prefix..

10. Modifier. To determine the modifier, refer to Table 1 and Figure 2, such as: M28731/10-0109-C where "M28731/10" is the "-0109" denotes the modifier.

11. Mounting Type. The mounting type denotes the connector mounting configuration. To determine the type, refer to table 1 and figure 2., such as: M28731/10-0109-C where "-C" denotes the type..

12. Mounting types describe the actuating hardware design. To aid in the engagement of connectors, actuating hardware shall be used as required. This hardware shall be categorized as follows and be denoted by their associated type, refer to table 1.

a. Type: C jackscrew. Rotatable actuating member with a male thread (engages with a type F fixed socket). The actuating knob includes a screwdriver slot.

b. Type: D jack socket. Rotatable actuating member with a female thread (engages with a type E fixed screw).

c. Type: E fixed screw. Fixed actuating member with a male thread (engages with a type D or H jack socket).

d. Type: F fixed socket. Fixed actuating member with a female thread (engages with a type C or G jackscrew).

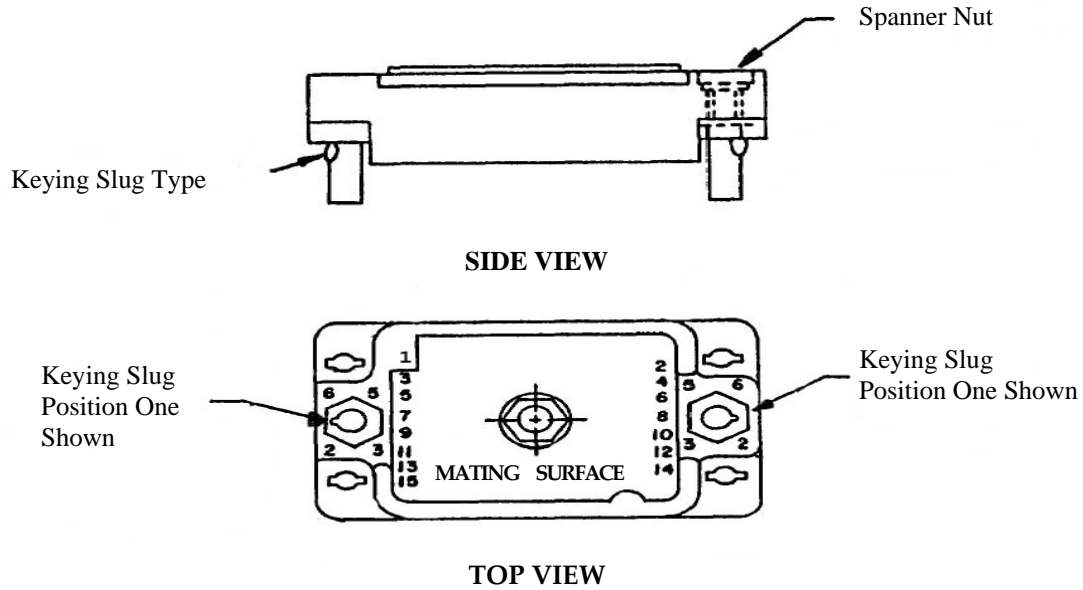
e. Type: G jackscrew. Rotatable actuating member with a male thread (engages with a type F fixed socket). Actuating knob is for hand tightening only.

f. Type: H jacksocket. Rotatable actuating member with a female thread (engages with type E fixed screw). Actuating knob includes a screwdriver slot.

13. **DESIGN AND CONSTRUCTION.** Connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.

14. **INSERTS.** Inserts are of diallyl phthalate material molded one-piece construction, having electrical and mechanical characteristics suitable for the purpose intended. The impact strength shall be such that material shall not chip, crack, or break during assembly, or normal maintenance.

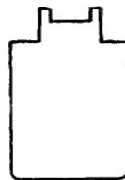
15. **INTERCHANGEABILITY.** All connectors having the same military part number shall be completely interchangeable with respect to installation and performance. All contacts shall be intermateable.



Polarizing position change
Keying position on both polarizing pins can be rotated to desired position by loosening spanner nut (counterclockwise), resetting the pin in one of six positions, then, retightening spanner nut (clockwise).

CAUTION

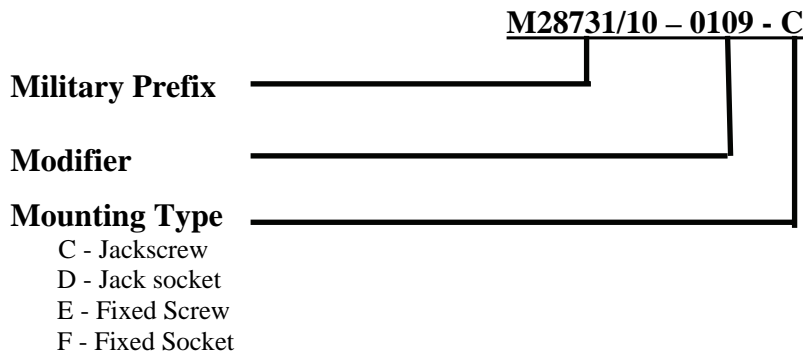
Over tightening of the spanner nut can fracture the connector. Typical spanner keying wrench shown below.



Spanner Wrench

Figure 1. Typical MIL-DTL-28731 Polarization

PART NUMBER DESIGNATION



Military Prefix	Description		
M28731/3	100 Contact	Male Insert	Plug Connector
M28731/4	100 Contact	Female Insert	Receptacle Connector
M28731/9	20 Contact	Male Insert	Plug Connector
M28731/10	20 Contact	Female Insert	Receptacle Connector
M28731/11	36 Contact	Male Insert	Plug Connector
M28731/12	38 Contact	Female Insert	Receptacle Connector
M28731/13	56 Contact	Male Insert	Plug Connector
M28731/14	56 Contact	Female Insert	Receptacle Connector
M28731/15	90 Contact	Male Insert	Plug Connector
M28731/16	90 Contact	Female Insert	Receptacle Connector
M28731/17	120 Contact	Male Insert	Plug Connector
M28731/18	120 Contact	Female Insert	Receptacle Connector
M28731/29	75 Contact	Male Insert	Plug Connector
M28731/30	75 Contact	Female Insert	Receptacle Connector
M28731/31	117 Contact	Male Insert	Plug Connector
M28731/32	117 Contact	Female Insert	Receptacle Connector
M28731/33	165 Contact	Male Insert	Plug Connector
M28731/34	165 Contact	Female Insert	Receptacle Connector

Figure 2. MIL-DTL-28731 Part Number Breakdown

Table 1. MIL-DTL-28731 Insert Arrangements (Sheet 1 of 6)

Military Part No.	Contact Type	Contact Part No.	No. of Contacts	Mounting Type
M28731/10-C	Less Contacts	---	20	Type C Jackscrew
M28731/10-D	Less Contacts	---	20	Type D Jacksocket
M28731/10-F	Less Contacts	---	20	Type F Fixed Socket
M28731/10-0109	Crimp	M28731/20	20	Type C Jackscrew
M28731/10-0110	Crimp	M28731/20	20	Type F Fixed Socket
M28731/10-0111	Crimp	M28731/20	20	Type D Jacksocket
M28731/10-0112	Solder	---	20	Type C Jackscrew
M28731/10-0113	Solder	---	20	Type F Fixed Socket
M28731/10-0114	Solder	---	20	Type D Jacksocket
M28731/10-0115	Wrappost	M28731/26	20	Type F Fixed Socket
M28731/11-C	Less Contacts	---	38	Type C Jackscrew
M28731/11-E	Less Contacts	---	38	Type E Fixed Screw
M28731/11-F	Less Contacts	---	38	Type F Fixed Socket
M28731/11-0073	Crimp	M28731/20	38	Type C Jackscrew
M28731/11-0074	Crimp	M28731/20	38	Type F Fixed Socket
M28731/11-0075	Solder	---	38	Type C Jackscrew
M28731/11-0076	Solder	---	38	Type F Fixed Socket
M28731/11-0077	Wrappost	M28731/26	38	Type F Fixed Socket
M28731/11-0078	Crimp	M28731/20	38	Type E Fixed Screw
M28731/11-0079	Solder	---	38	Type E Fixed Screw
M28731/11-0080	Wrappost	M28731/26	38	Type E Fixed Screw
M28731/12-C	Less Contacts	---	38	Type C Jackscrew
M28731/12-D	Less Contacts	---	38	Type D Jacksocket
M28731/12-F	Less Contacts	---	38	Type F Fixed Socket
M28731/12-0073	Crimp	M28731/20	38	Type C Jackscrew
M28731/12-0074	Crimp	M28731/20	38	Type F Fixed Socket

Table 1. MIL-DTL-28731 Insert Arrangements (Sheet 2)

Military Part No.	Contact Type	Contact Part No.	No. of Contacts	Mounting Type
M28731/12-0075	Solder	---	38	Type C Jackscrew
M28731/12-0076	Solder	---	38	Type F Fixed Socket
M28731/12-0077	Wrappost	M28731/26	38	Type F Fixed Socket
M28731/12-0078	Crimp	M28731/20	38	Type D Jacksocket
M28731/12-0079	Solder	---	38	Type D Jacksocket
M28731/13-C	Less Contacts	---	56	Type C Jackscrew
M28731/13-E	Less Contacts	---	56	Type E Fixed Screw
M28731/13-F	Less Contacts	---	56	Type F Fixed Socket
M28731/13-0073	Crimp	M28731/20	56	Type C Jackscrew
M28731/13-0074	Crimp	M28731/20	56	Type F Fixed Socket
M28731/13-0075	Solder	---	56	Type C Jackscrew
M28731/13-0076	Solder	---	56	Type F Fixed Socket
M28731/13-0077	Wrappost	M28731/26	56	Type F Fixed Socket
M28731/13-0078	Crimp	M28731/20	56	Type E Fixed Screw
M28731/13-0079	Solder	---	56	Type E Fixed Screw
M28731/13-0080	Wrappost	M28731/26	56	Type E Fixed Screw
M28731/14-C	Less Contacts	---	56	Type C Jackscrew
M28731/14-D	Less Contacts	---	56	Type D Jacksocket
M28731/14-F	Less Contacts	---	56	Type F Fixed Socket
M28731/14-0073	Crimp	M28731/20	56	Type C Jackscrew
M28731/14-0074	Crimp	M28731/20	56	Type F Fixed Socket
M28731/14-0075	Solder	---	56	Type C Jackscrew
M28731/14-0076	Solder	---	56	Type F Fixed Socket
M28731/14-0077	Wrappost	M28731/26	56	Type F Fixed Socket
M28731/14-0078	Crimp	M28731/20	56	Type D Jacksocket
M28731/14-0079	Solder	---	56	Type D Jacksocket
M28731/15-E	Less Contacts	---	90	Type E Fixed Screw
M28731/15-F	Less Contacts	---	90	Type F Fixed Socket
M28731/15-G	Less Contacts	---	90	Type G Jackscrew
M28731/15-0073	Crimp	M28731/20	90	Type G Jackscrew
M28731/15-0074	Crimp	M28731/20	90	Type F Fixed Socket
M28731/15-0075	Solder	---	90	Type G Jackscrew
M28731/15-0076	Solder	---	90	Type F Fixed Socket
M28731/15-0077	Wrappost	M28731/26	90	Type F Fixed Socket
M28731/15-0078	Crimp	M28731/20	90	Type E Fixed Screw

Table 1. MIL-DTL-28731 Insert Arrangements (Sheet 3)

Military Part No.	Contact Type	Contact Part No.	No. of Contacts	Mounting Type
M28731/15-0079	Solder	---	90	Type E Fixed Screw
M28731/15-0080	Wrappost	M28731/26	90	Type E Fixed Screw
M28731/16-F	Less Contacts	---	90	Type F Fixed Socket
M28731/16-G	Less Contacts	---	90	Type G Jackscrew
M28731/16-H	Less Contacts	---	90	Type E Fixed Screw
M28731/16-0073	Crimp	M28731/20	90	Type G Jackscrew
M28731/16-0074	Crimp	M28731/20	90	Type F Fixed Socket
M28731/16-0075	Solder	---	90	Type G Jackscrew
M28731/16-0076	Solder	---	90	Type F Fixed Socket
M28731/16-0077	Wrappost	M28731/26	90	Type F Fixed Socket
M28731/16-0078	Crimp	M28731/20	90	Type H Jacksocket
M28731/16-0079	Solder	---	90	Type H Jacksocket
M28731/17-E	Less Contacts	---	120	Type E Fixed Screw
M28731/17-F	Less Contacts	---	120	Type F Fixed Socket
M28731/17-G	Less Contacts	---	120	Type G Jackscrew
M28731/17-0109	Crimp	M28731/20	120	Type G Jackscrew
M28731/17-0110	Crimp	M28731/20	120	Type F Fixed Socket
M28731/17-0111	Crimp	M28731/20	120	Type E Fixed Screw
M28731/17-0112	Solder	---	120	Type G Jackscrew
M28731/17-0113	Solder	---	120	Type F Fixed Socket
M28731/17-0114	Solder	---	120	Type E Fixed Screw
M28731/17-0115	Wrappost	M28731/26	120	Type F Fixed Socket
M28731/17-0116	Wrappost	M28731/26	120	Type E Fixed Screw
M28731/18-D	Less Contacts	---	120	Type D Jacksocket
M28731/18-F	Less Contacts	---	120	Type F Fixed Socket
M28731/18-G	Less Contacts	---	120	Type G Jackscrew
M28731/18-0109	Crimp	M28731/20	120	Type G Jackscrew
M28731/18-0110	Crimp	M28731/20	120	Type F Fixed Socket
M28731/18-0111	Crimp	M28731/20	120	Type D Jacksocket
M28731/18-0112	Solder	---	120	Type G Jackscrew
M28731/18-0113	Solder	---	120	Type F Fixed Socket
M28731/18-0114	Solder	---	120	Type D Jacksocket
M28731/18-0115	Wrappost	M28731/26	120	Type F Fixed Socket

Table 1. MIL-DTL-28731 Insert Arrangements (Sheet 4)

Military Part No.	Contact Type	Contact Part No.	No. of Contacts	Mounting Type
M28731/29-D	Less Contacts	---	75	Type D Jacksocket
M28731/29-E	Less Contacts	---	75	Type E Fixed Screw
M28731/29-F	Less Contacts	---	75	Type F Fixed Socket
M28731/29-G	Less Contacts	---	75	Type G Jackscrew
M28731/29-0001	Crimp	M28731/35	75	Type G Jackscrew
M28731/29-0002	Crimp	M28731/35	75	Type D Jacksocket
M28731/29-0003	Crimp	M28731/35	75	Type F Fixed Socket
M28731/29-0004	Crimp	M28731/35	75	Type E Fixed Screw
M28731/29-0005	Wrappost	M28731/36	75	Type F Fixed Socket
M28731/29-0006	Wrappost	M28731/36	75	Type E Fixed Screw
M28731/3-C	Less Contacts	---	100	Type C Jackscrew
M28731/3-E	Less Contacts	---	100	Type E Fixed Screw
M28731/3-G	Less Contacts	---	100	Type G Jackscrew
M28731/3-0109	Crimp	M28731/20	100	Type C Jackscrew
M28731/3-0110	Crimp	M28731/20	100	Type G Jackscrew
M28731/3-0111	Crimp	M28731/20	100	Type E Fixed Screw
M28731/3-0112	Solder	---	100	Type C Jackscrew
M28731/3-0113	Solder	---	100	Type G Jackscrew
M28731/3-0114	Solder	---	100	Type E Fixed Screw
M28731/3-0015	Wrappost	M28731/26	100	Type E Fixed Screw
M28731/30-D	Less Contacts	---	75	Type D Jacksocket
M28731/30-E	Less Contacts	---	75	Type E Fixed Screw
M28731/30-F	Less Contacts	---	75	Type F Fixed Socket
M28731/30-G	Less Contacts	---	75	Type G Jackscrew
M28731/30-0001	Crimp	M28731/35	75	Type G Jackscrew
M28731/30-0002	Crimp	M28731/35	75	Type D Jacksocket
M28731/30-0003	Crimp	M28731/35	75	Type F Fixed Socket
M28731/30-0004	Crimp	M28731/35	75	Type E Fixed Screw
M28731/30-0005	Wrappost	M28731/36	75	Type F Fixed Socket
M28731/30-0006	Wrappost	M28731/36	75	Type E Fixed Screw
M28731/31-D	Less Contacts	---	117	Type D Jacksocket
M28731/31-E	Less Contacts	---	117	Type E Fixed Screw
M28731/31-F	Less Contacts	---	117	Type F Fixed Socket
M28731/31-G	Less Contacts	---	117	Type G Jackscrew
M28731/31-0001	Crimp	M28731/35	117	Type G Jackscrew

Table 1. MIL-DTL-28731 Insert Arrangements (Sheet 5)

Military Part No.	Contact Type	Contact Part No.	No. of Contacts	Mounting Type
M28731/31-0002	Crimp	M28731/35	117	Type D Jacksocket
M28731/31-0003	Crimp	M28731/35	117	Type F Fixed Socket
M28731/31-0004	Crimp	M28731/35	117	Type E Fixed Screw
M28731/31-0005	Wrappost	M28731/36	117	Type F Fixed Socket
M28731/31-0006	Wrappost	M28731/36	117	Type E Fixed Screw
M28731/32-D	Less Contacts	---	117	Type D Jacksocket
M28731/32-E	Less Contacts	---	117	Type E Fixed Screw
M28731/32-F	Less Contacts	---	117	Type F Fixed Socket
M28731/32-G	Less Contacts	---	117	Type G Jackscrew
M28731/32-0001	Crimp	M28731/35	117	Type G Jackscrew
M28731/32-0002	Crimp	M28731/35	117	Type D Jacksocket
M28731/32-0003	Crimp	M28731/35	117	Type F Fixed Socket
M28731/32-0004	Crimp	M28731/35	117	Type E Fixed Screw
M28731/32-0005	Wrappost	M28731/36	117	Type F Fixed Socket
M28731/32-0006	Wrappost	M28731/36	117	Type E Fixed Screw
M28731/33-D	Less Contacts	---	165	Type D Jacksocket
M28731/33-E	Less Contacts	---	165	Type E Fixed Screw
M28731/33-F	Less Contacts	---	165	Type F Fixed Socket
M28731/33-G	Less Contacts	---	165	Type G Jackscrew
M28731/33-0001	Crimp	M28731/35	165	Type G Jackscrew
M28731/33-0002	Crimp	M28731/35	165	Type D Jacksocket
M28731/33-0003	Crimp	M28731/35	165	Type F Fixed Socket
M28731/33-0004	Crimp	M28731/35	165	Type E Fixed Screw
M28731/33-0005	Wrappost	M28731/36	165	Type F Fixed Socket
M28731/33-0006	Wrappost	M28731/36	165	Type E Fixed Screw
M28731/34-D	Less Contacts	---	165	Type D Jacksocket
M28731/34-E	Less Contacts	---	165	Type E Fixed Screw
M28731/34-F	Less Contacts	---	165	Type F Fixed Socket
M28731/34-G	Less Contacts	---	165	Type G Jackscrew
M28731/34-H	Less Contacts	---	165	Type H Jacksocket
M28731/34-0001	Crimp	M28731/35	165	Type G Jackscrew
M28731/34-0002	Crimp	M28731/35	165	Type D Jacksocket
M28731/34-0003	Crimp	M28731/35	165	Type F Fixed Socket
M28731/34-0004	Crimp	M28731/35	165	Type E Fixed Screw
M28731/34-0005	Wrappost	M28731/36	165	Type F Fixed Socket

Table 1. MIL-DTL-28731 Insert Arrangements (Sheet 6)

Military Part No.	Contact Type	Contact Part No.	No. of Contacts	Mounting Type
M28731/34-0006	Wrappost	M28731/36	165	Type E Fixed Screw
M28731/34-0007	Crimp	M28731/35	165	Type H Jacksocket
M28731/4-F	Less Contacts	---	100	Type F Fixed Socket
M28731/4-0073	Crimp	M28731/20	100	Type F Fixed Socket
M28731/4-0074	Crimp	M28731/20	100	Type D Jacksocket
M28731/4-0075	Solder	---	100	Type F Fixed Socket
M28731/4-0076	Solder	---	100	Type D Jacksocket
M28731/40077	Wrappost	M28731/26	100	Type F Fixed Socket
M28731/9-C	Less Contacts	---	20	Type C Jackscrew
M28731/9-E	Less Contacts	---	20	Type E Fixed Screw
M28731/9-F	Less Contacts	---	20	Type F Fixed Socket
M28731/9-0109	Crimp	M28731/20	20	Type C Jackscrew
M28731/9-0110	Crimp	M28731/20	20	Type F Fixed Socket
M28731/9-0111	Crimp	M28731/20	20	Type E Fixed Screw
M28731/9-0112	Solder	---	20	Type C Jackscrew
M28731/9-0113	Solder	---	20	Type F Fixed Socket
M28731/9-0114	Solder	---	20	Type E Fixed Screw
M28731/9-0115	Wrappost	M28731/26	20	Type F Fixed Socket
M28731/9-0116	Wrappost	M28731/26	20	Type E Fixed Screw

16. **INSERT ARRANGEMENT.** The insert arrangement (Table 1) contains connector military part number, type of contact, contact part number, number of contacts, and type of mounting hardware. Refer to Figures 3 thru 5.

17. Contacts are designed to prevent damage to contact retention device or sealing member during insertion or removal of contacts.

18. Fixed Contacts. Fixed contacts are solderable and non-removable from the insert and have either eyelet or solder cup terminals. The solder cups are so designed that during soldering, no components will be damaged and no liquid solder shall escape.

19. Crimp Removable Contacts. There are two crimp removable contacts and the only difference between them is current rating for each contact. M2873U20

has current rating of 8.5 amps and M2873U35 has current rating of 5.0 amps. Refer to Figures 6 thru 10.

20. Wrappost Contacts. Wrappost, or wire wrapped contacts, are used for solderless wire wrapping which is a highly reliable method for making point-to-point mechanical and electrical connections between wires and terminals. Wire wrapping may be used in any application where low-cost, high density wiring is used. There are two wrappost contacts and the only difference between them is the tail length. M2873U26 has 0.170 in. tail length and M2873U36 has 0.580 in. tail length. Refer to Figures 11 thru 15. Refer to 01-1A-505-1, WP 003 00 Table 2 for more information on wire wrapping.

21. Contact Availability. Crimp contacts may be supplied with each connector unit package and consist of a full complement plus one spare per size

for connectors of 26 contacts or less. Connectors with more than 26 contacts will have two spares of each size used. Contacts may also be ordered in individual quantities when necessary.

22. CONNECTOR BUILDUP.

23. Wire Stripping. Strip wire in accordance with following procedure:

a. Cut wire to proper length. Ensure enough wire remains for adequate strain relief without leaving excess slack.

b. Strip insulation from end (NAVAIR 01-1A-505-1, WP 009 00). For removable contacts select contact using Table 1.

24. Contact Crimping. Crimp contact in accordance with following procedure:

a. Select correct crimp tool (Table 2).

b. Position contact in tool.

c. Insert stripped wire in contact.

d. Crimp contact to wire.

e. Pull contact lightly to ensure a good crimp was made.

f. Inspect crimp to ensure no wire strands are outside of contact.

25. CONTACT INSERTION.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

NOTE

Insert wired or unwired contacts in accordance with following procedure:

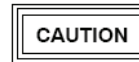
a. Insert contact squarely into insulator, by hand until resistance is felt. (See Figure 8 example of tool).

b. Select correct insertion tool (Table 2).

c. Position insertion tool at end of contact and apply pressure until contact locks in the insulator. A slight click may be heard as retention tines snap into place behind contact shoulder.

d. Pull tool straight out of contact cavity. Pull back lightly on wire to ensure contact is properly seated.

26. CONTACT REMOVAL.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

NOTE

Remove wired, unwired, and broken wire contacts in accordance with following procedure:

a. Select correct removal tool (Table 2) (see Figure 9 example of tool).

b. Position tool from front end of connector squarely over contact and slide tool until shoulder butts against insert (Figure 10).

c. Press and hold plunger and remove contact from rear of insert (Figure 11).

27. WIRE WRAPPING

28. Wire wrapped connections are formed by hand or by a power tool. In either case, use nickel-plated, solid copper wire, AWG sizes No. 20, 22, 24, or 26.



Wire wrapping shall only be accomplished when specified by equipment handbooks and when proper tools are available. Failure to comply with these requirements could result in a poor connection, damage to equipment or aircraft.

NOTE

Step 29 identifies the procedures to be followed when using a manual wire wrap tool such as the Cooper Tools 14HP1C (or equivalent). Omit step if using a powered tool and refer to step 30.

29. Manual Tool Wire Wrapping

a. Remove insulation with approved stripper to prevent conductor damage. Refer to NA 01-1 A-505-1, WP 009 00.

b. Remove sufficient insulation to allow 5 wraps of AWG No. 20 and No. 22 or 6 wraps of AWG No. 24 and No. 26 around the wrapping post.

c. Apply the first wrap as near the wire wrapping post base as practical. Figure 12 thru 14 illustrate the proper method of applying a wire wrapped connection using a wire wrapping tool.

d. Position the manual wrapping tool against post and rotate clockwise to achieve the required number of wraps (Figure 12 thru 14).

e. Omit step 30 and proceed to wire wrap connection inspection.

NOTE

Step 30 identifies the procedure to be followed when using a powered wire wrap tool such as the Gardner-Denver Model 14BIAL (or equivalent).

Refer to step 29 if using a manual wrap tool.

30. Powered Tool Wire Wrapping.

NOTE

Figure 12 thru 14 illustrate the proper method of applying a wire wrapped connection.

Refer to figure 16 for example of the tool in use.

a. Remove insulation from wire to be connected to pin of connector 1 3/4 inch (1.750 inch) back from end using wire stripper.

b. Insert stripped end of wire into the tip of the wire wrapping tool until insulation prevents further insertion. Bend wire into the slot in the tip of the wire wrapping tool (Figure 16).

c. Place the tip of the wire wrapping tool over the terminal to be wrapped. Orient the tool so that the wire is facing the direction required.

d. Depress and instantly release the trigger of the wire wrapping tool. The pressure needed and the time that the trigger must be depressed is comparable to firing a single round from a rifle.

e. Remove the wire wrapping tool from the terminal. Observe that the wire has a minimum wrap of seven turns with the insulated part having one wrap for a satisfactory connection.

31. Wire Wrap Connection Inspection. An acceptable wire wrap must meet the following connection requirements:

a. Adjacent wires must not overlap.

b. The space between individual turns must not exceed half the diameter of uninsulated wire.

c. The wire end must wrap a maximum of one uninsulated wire diameter past a terminal post corner to prevent pigtailed.

d. The wire must route from the terminal post such that the connection does not tend to unwrap.

32. Refer to figure 15 for examples of improper wire wrapping.

33. CONNECTOR REMOVAL AND INSTALLATION. If the connector is severely damaged or cannot be repaired using the above procedures, remove it as follows:

a. Starting from outside of damaged connector, tag wires and remove all contacts from connector (Paragraph 25). If contact cannot be removed, cut wire as close to connector as possible and attach new contact (Paragraphs 22 and 23).

b. Starting from center of new connector, insert contact into correct cavity (Paragraph 24): Remove tag from wire. Repeat procedure until all contacts are installed in new connector.

34. CONNECTOR BUILDUP SOLDER CONTACTS.

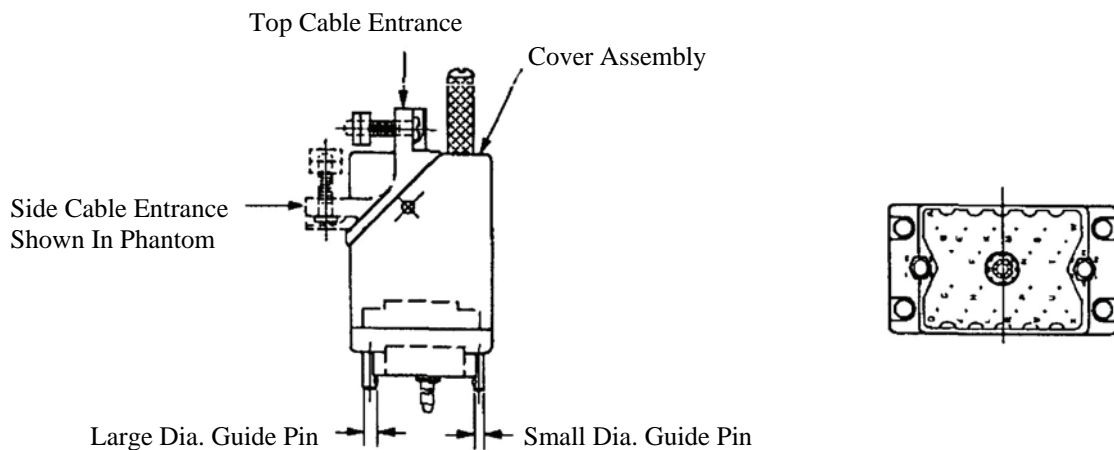
35. For buildup procedures for solder contacts refer to NAVAIR 01-1A-505-1, WP 016 00.

36. CONNECTOR CLEANING AND PRESERVATION.

37. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00.

20 CONTACTS

Plug (Exposed Contacts)
Military Prefix M28731/9



Military Prefix M28731/10

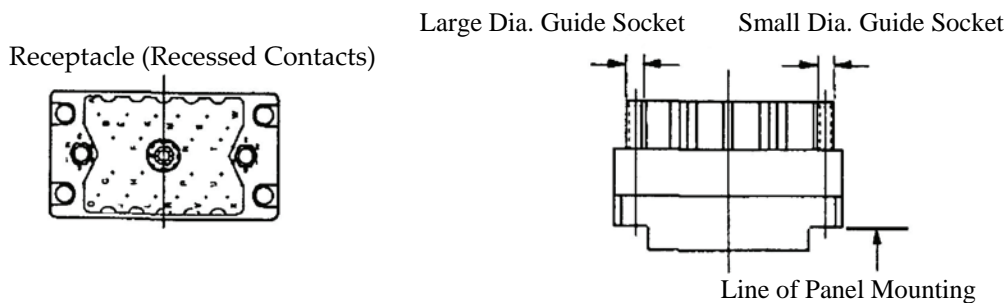
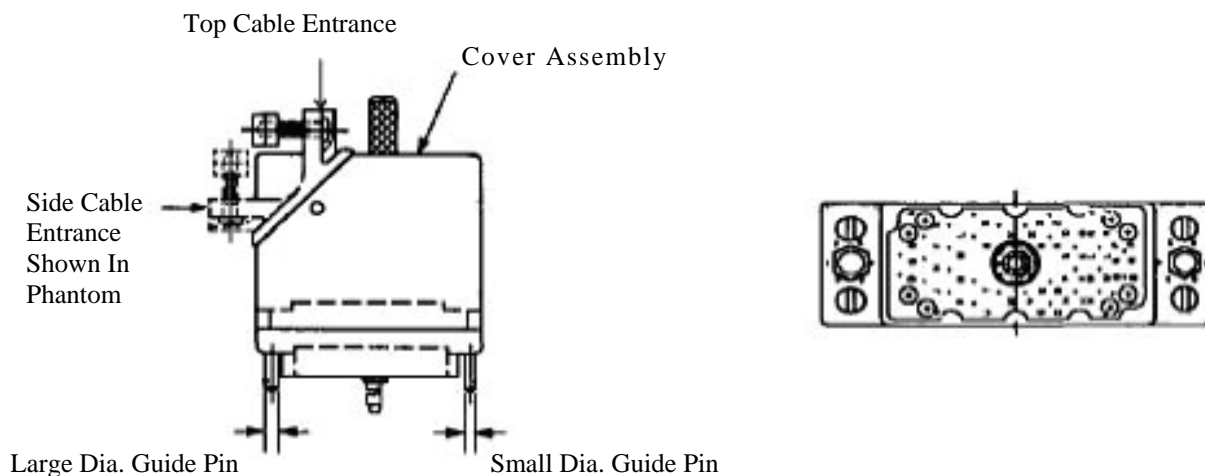


Figure 3. M28731/9 thru M28731/18 Insert Configuration (Sheet 1 of 5)



RECEPTACLE (RECESSED CONTACTS)
Military Prefix M28731/12

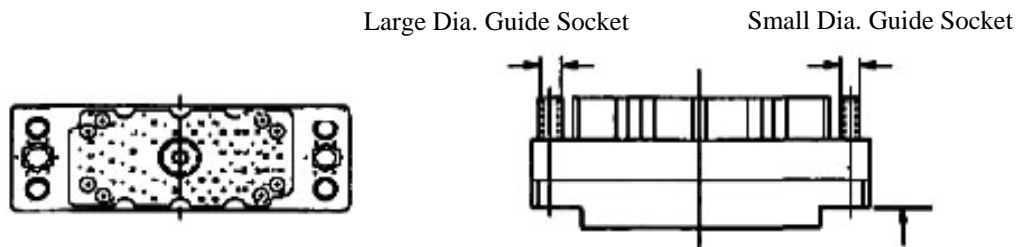
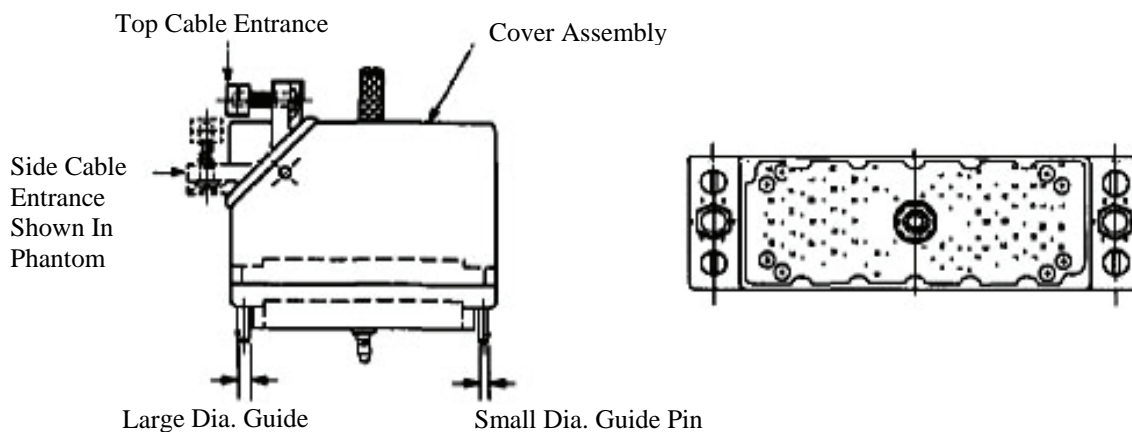


Figure 3. M28731/9 thru M28731/18 Insert Configuration (Sheet 2)

56 CONTACTS

Plug (Exposed Contacts)
Military Prefix M28731/13



Receptacle (Recessed Contacts)
Military Prefix M28731/14

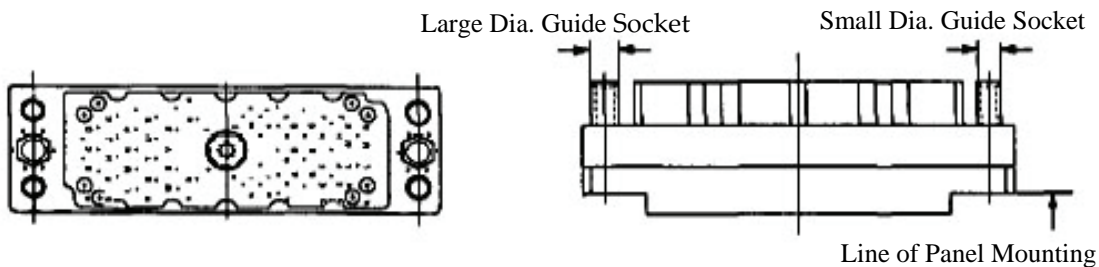
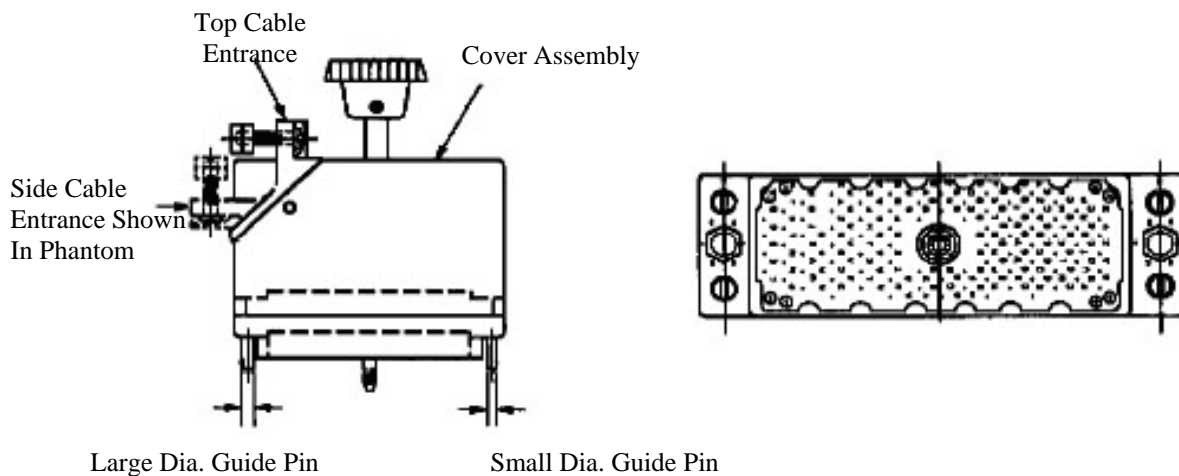


Figure 3. M28731/9 thru M28731/18 Insert Configuration (Sheet 3)

90 CONTACTS

Plug (Exposed Contacts)
Military Prefix M28731/15



RECEPTACLE (RECESSED CONTACTS)
Military Prefix M28731/16

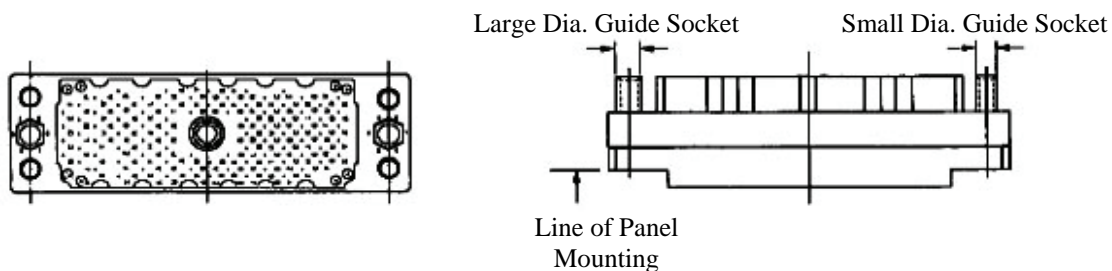
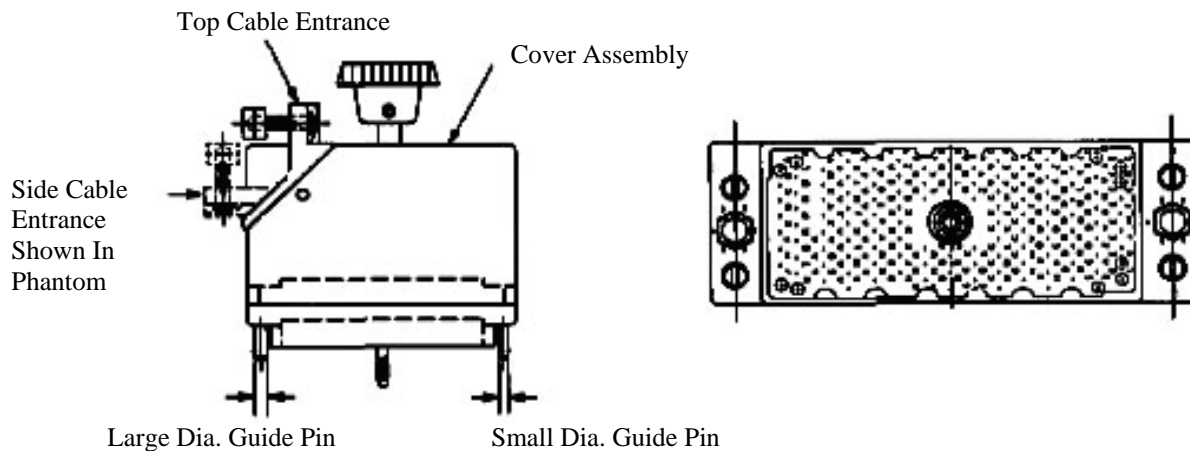


Figure 3. M28731/9 thru M28731/18 Insert Configuration (Sheet 4)

120 CONTACTS

Plug (Exposed Contacts)
Military Prefix M28731/17



RECEPTACLE (RECESSED CONTACTS)
Military Prefix M28731/18

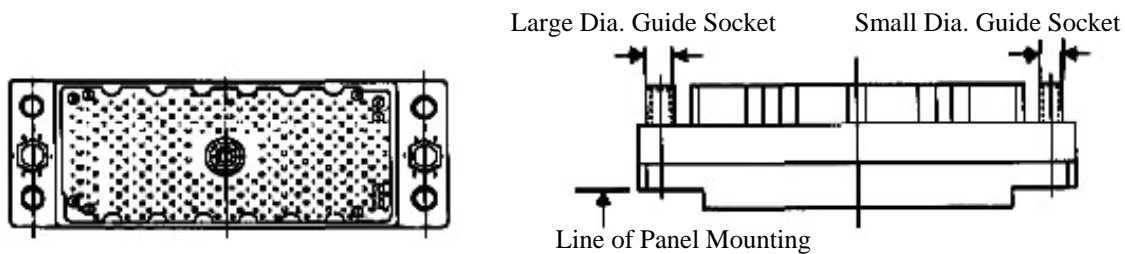


Figure 3. M28731/9 thru M28731/18 Insert Configuration (Sheet 5)

PLUG (EXPOSED CONTACTS)
Military Prefix M28731/3

RECEPTACLE (RECESSED CONTACTS)
Military Prefix M28731/4

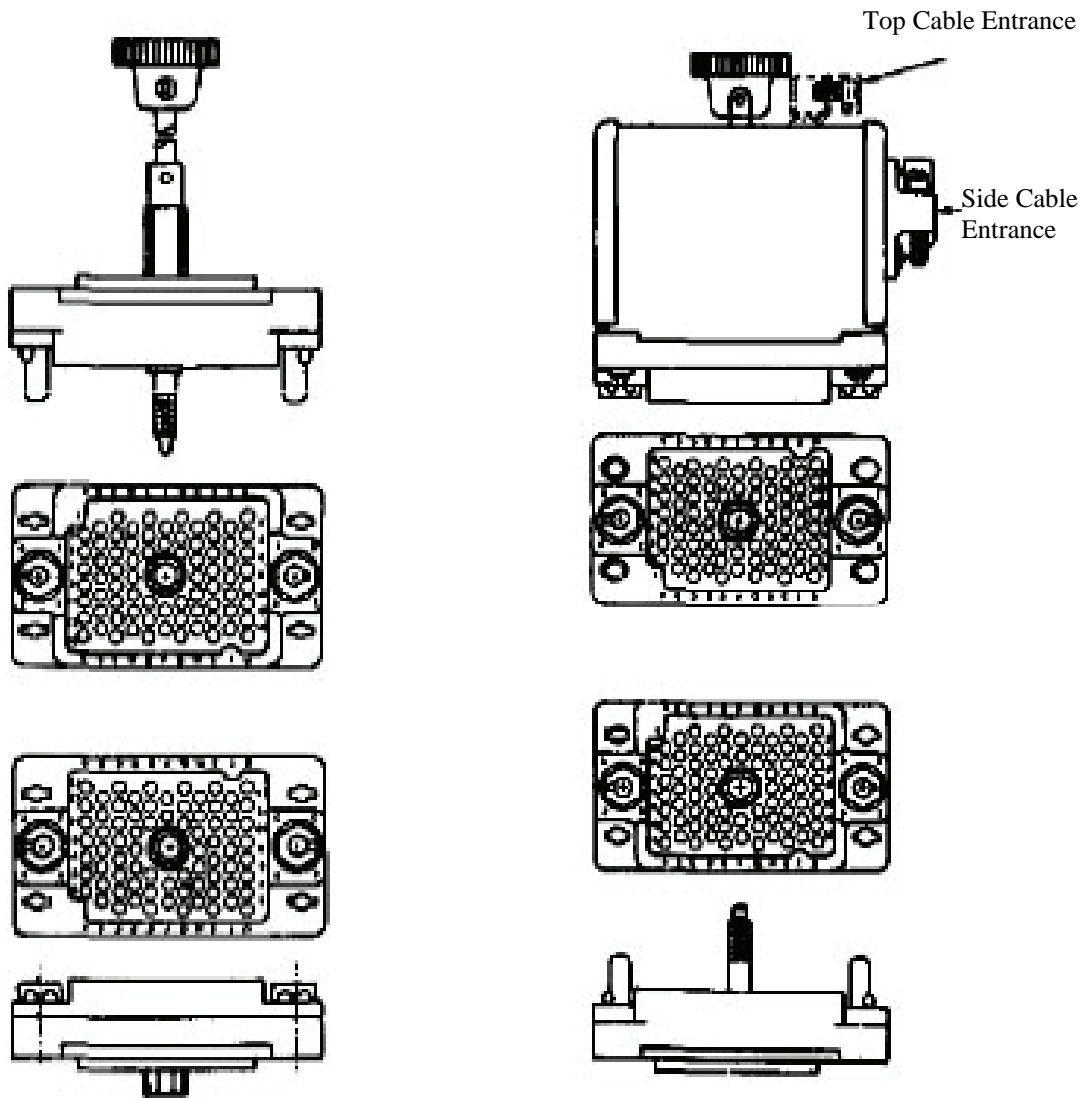
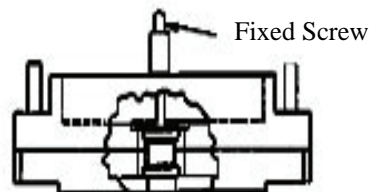
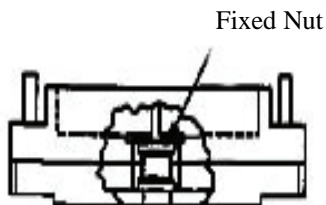
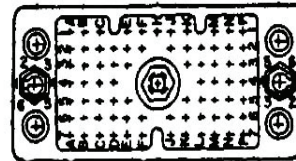
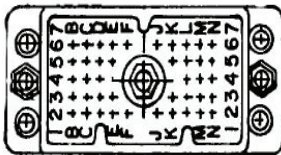
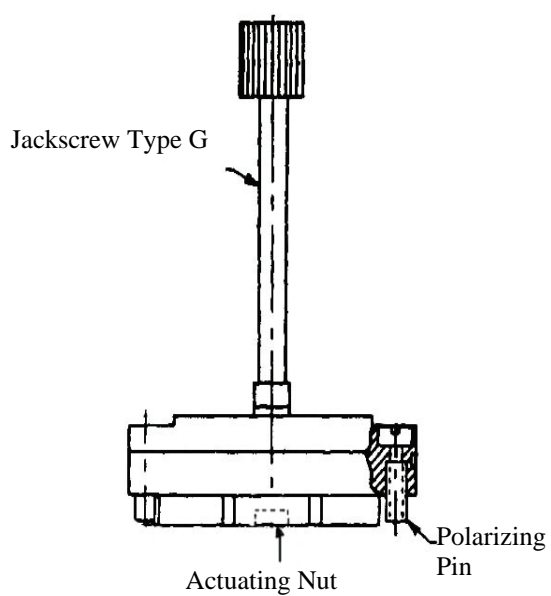
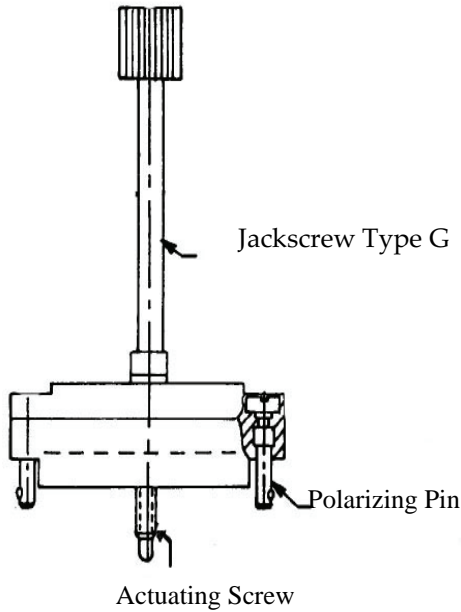


Figure 4. M28731/3 and M28731/4 Insert Configuration

Plug (Exposed Contacts)
Military Prefix M28731/29

Receptacle (Recessed Contacts)
Military Prefix M28731/30

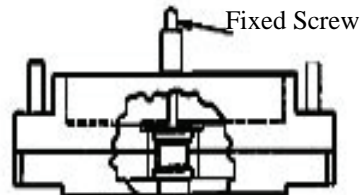
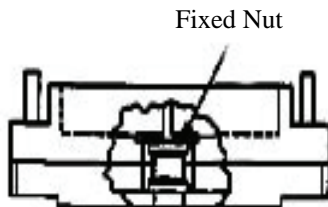
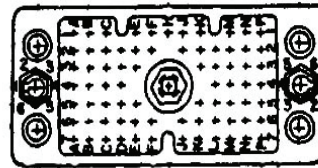
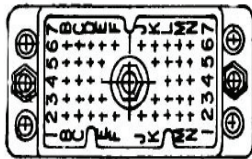
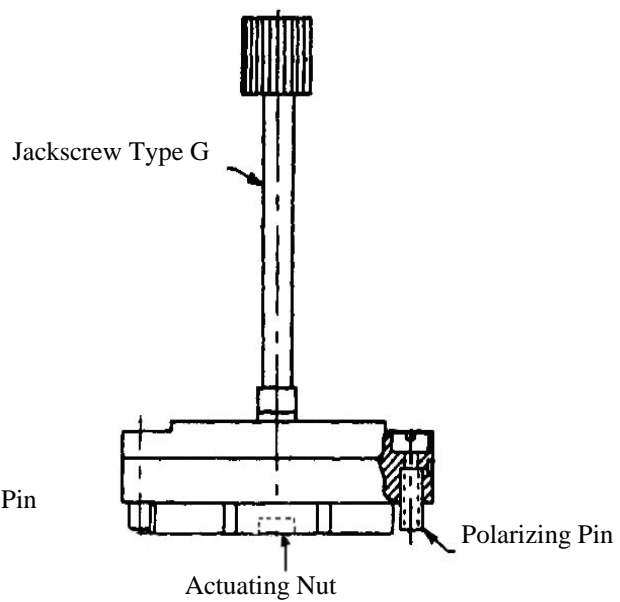
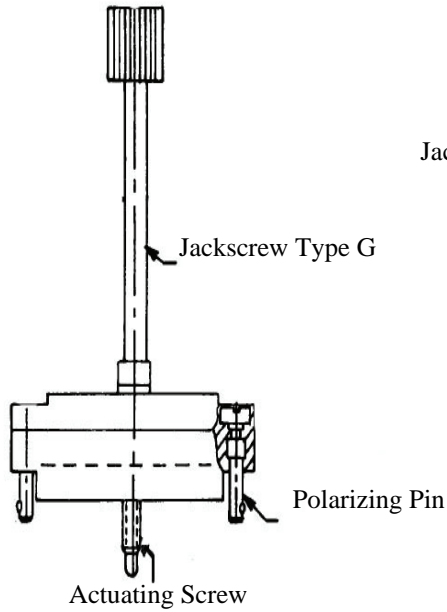


NOTE:
Jackscrew Type G, Fixed Nut, Fixed Screw Are Examples Only.
Refer To Table 1 For Break Down.

Figure 5. M28731/29 thru M28731/34 Insert Configuration (Sheet 1 of 3)

Plug (Exposed Contacts)
 Military Prefix M28731/31

Receptacle (Recessed Contacts)
 Military Prefix M28731/32

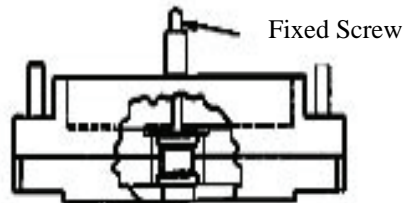
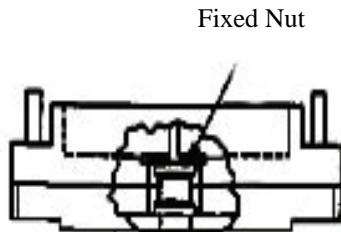
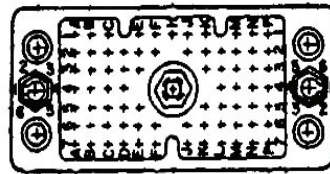
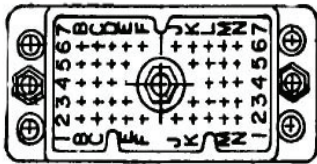
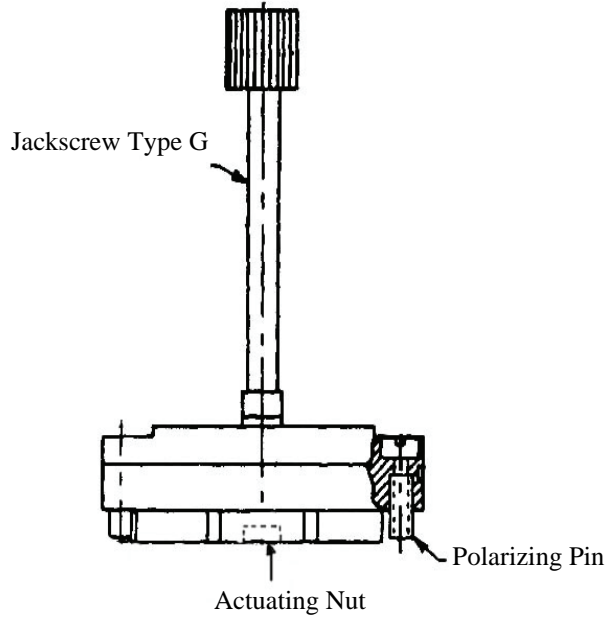
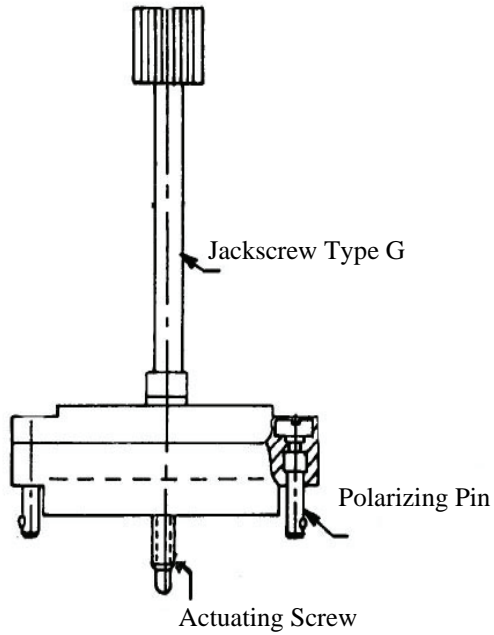


NOTE:
 Jackscrew Type G, Fixed Nut, Fixed Screw Are Examples Only.
 Refer To Table 1 For Break Down.

Figure 5. M28731/29 thru M28731/34 Insert Configuration (Sheet 2)

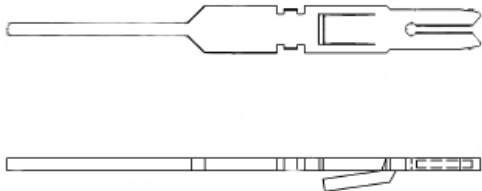
Plug (Exposed Contacts)
 Military Prefix M28731/33

Receptacle (Recessed Contacts)
 Military Prefix M28731/34

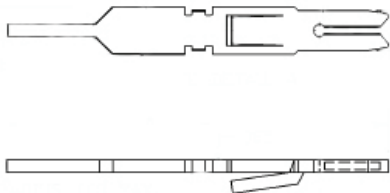


NOTE:
 Jackscrew Type G, Fixed Nut, Fixed Screw Are Examples Only.
 Refer To Table 1 For Break Down.

Figure 5. M28731/29 thru M28731/34 Insert Configuration (Sheet 3)



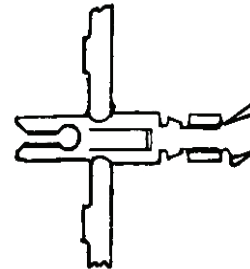
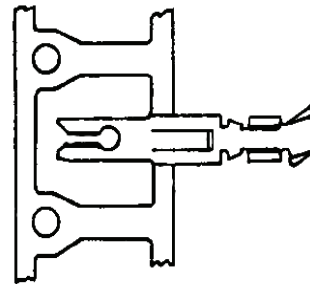
M28731/26-0001
 Solderless Wrap Tail - .024 x .025x .597



M28731/26-0002
 Solderless Wrap Tail - .024 x .025 x .170



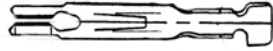
M28731/20-0001
 Wire Crimp Tail (Contacts Loose)



M28731/20-0002
 Wire Crimp Tail (Contacts on for Machine Crimping)

Contact Tool	
Nomenclature	Military Part No.
Insert Tool	Mil-I-81969/13-01
Removal Tool	Mil-I-81969/11-01
Crimp Tool	Mil-C-22520/17-01

Figure 6. M28731/3, M28731/4, and M28731/9 thru M28731/18 Contacts



M28731/35-0001
Crimp Loose Contact



M28731/36-0001
Wire Wrapable Removable Contact



M28731/35-0002
Reel Crimp Contact

Contact Tool	
Nomenclature	Military Part No.
Insert Tool	Mil-I-81969/5-01
Removal Tool	Mil-I-81969/4-02
Crimp Tool	Mil-C-22520/17-02

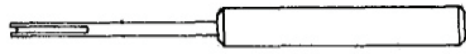
Figure 7. M28731/29 thru M28731/34 Contacts

Table 2. MIL-DTL-28731 Contact Tooling

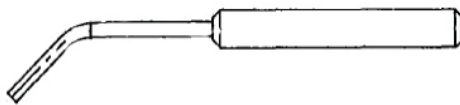
Connector Series	Insertion Tool	Removal Tool	Wire Wrap Tool	Crimp Tool
M28731/3, M28731/4 and M28731/9 thru M28731/18	MIL-I-81969/13-01	MIL-I-81969/11-01	Cooper Tools 14YB3 * 14HP1C^	MIL-C-22520/17-01
M28731/29 thru M28731/34	MIL-I-81969/5-01	MIL-I-81969/4-02	Cooper Tools 14YB3 * 14HP1C^	MIL-C-22520/17-02

* For in shop use only.

^ For on aircraft and in shop use.



Top View



Side View

Figure 8. MIL-I-81969 Typical Installation Tool



Figure 9. MIL-C-28731 Typical Removal Tool

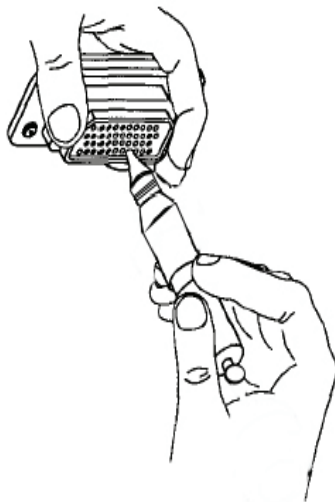


Figure 10. MIL-DTL-28731 Contact Removal

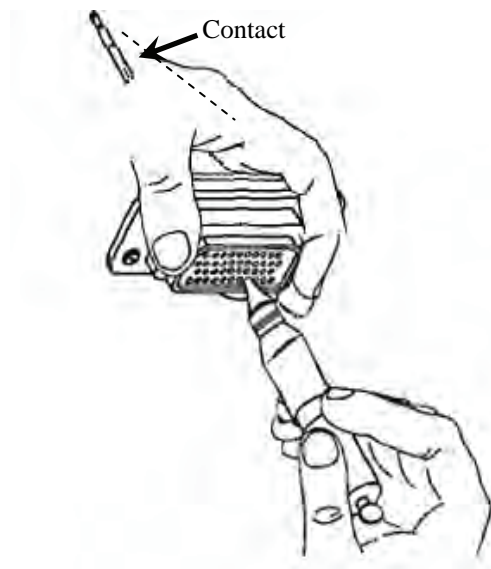
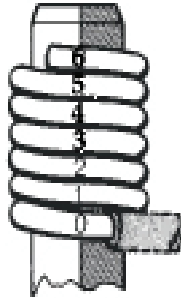
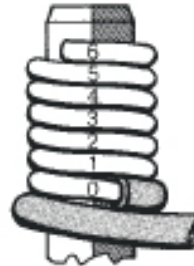


Figure 11. MIL-DTL-28731 Contact Removed



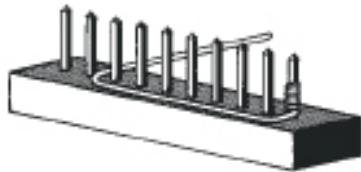
Standard connection: (not modified): The standard wrapping bit wraps only the stripped part of the wire on the terminal.



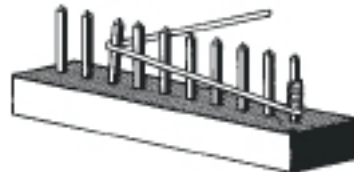
Modified connection: The insulation of a connection made on the second level may overlap the last turn of the connection wrapped on level one. The modified wrapping bit will wrap one turn of insulation at the base of the connection.

The **modified C.S.W. bits** cut the wire, strip the insulation and wrap the wire in one operation.

Figure 12. Wire Wrapping Methods

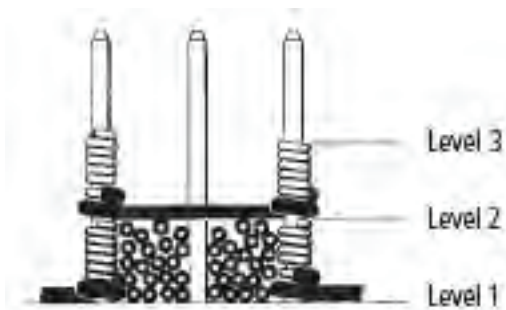


Correct Routing



Incorrect Routing

Figure 13. Wire Wrap Routing



The simple rules of wire wrapping

1. Only two connections on the same terminal (Level 3 is kept as a reserve for change and repair).
2. Wrap both ends of a wire on the same level.
3. Wrap long wires first.
4. Removal of connections: simply unwrap and do not reuse the unwrapped wire.

Figure 14. Wire Wrapping Simple Rules



Overlapped

Too much back force or improperly selected bit.



Spiraled connection

The tool has been pulled backwards during the wrapping process.



Too much "Pig Tail"

The last turn of connection is not formed against the terminal damaged wrapping bit ratio between terminal width and thickness too large.

Figure 15. Wrong Wire Wrapping Configurations

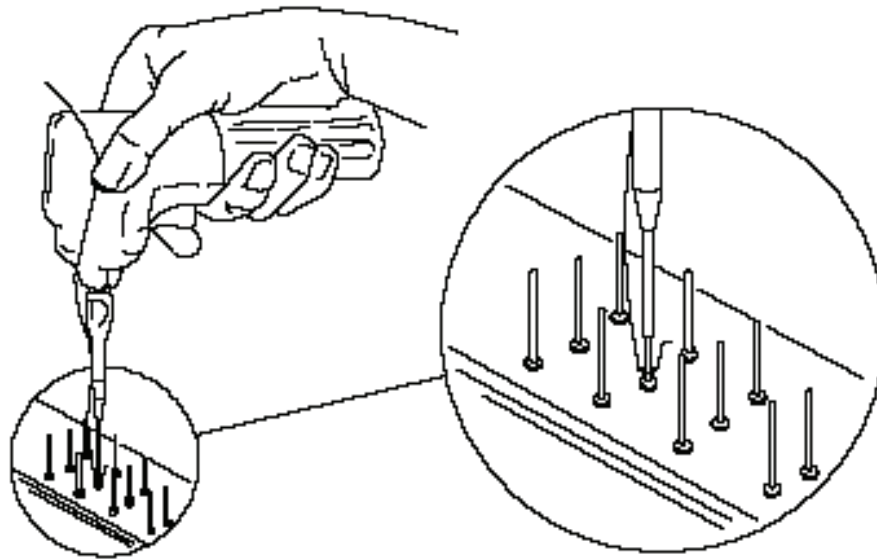


Figure 16. Wire Wrapping Example

INSTALLATION PRACTICES
CONNECTOR ACCESSORIES
MIL-DTL-28731

Reference Material

Connectors.....	WP 004 02
Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel.....	MIL-DTL-28731
Installation Practices, Aircraft Electric and Electronic Wiring	NAVAIR 01-1A-505-1

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
MIL-DTL_28731 Connector Accessories	1
Shield Installation.....	2
Shield Removal	1
Shields.....	1
Strain Relief Clamps	2
Introduction.....	1
Connector Accessories	1

Record of Applicable Technical Directives

None

- INTRODUCTION.**
- This Work Package (WP) covers connector accessories used with MIL-DTL-28731 connectors, their function, assembly, and procurement information.
- CONNECTOR ACCESSORIES.**
- Connector accessories are components added to a connector to enhance its operational characteristics. These accessories are divided into the following categories:
 - Shields (Figure 1 thru 4)
 - Strain Relief Clamps (Figure 5)
- MIL-DTL-28731 CONNECTOR ACCESSORIES.**
- SHIELDS.** A shield is an attachment on the back end of an insulator. It contains an integral clamp mounted either at the top or side (Figures 1 thru 4).
- Connector shields and clamps. Shields and clamps shall be die-cast aluminum or corrosion-resistant steel. Diecast aluminum, if used, shall conform to composition number 13, A13, A380, or 360 or ASTM B85, and workmanship in accordance with ASTM B85. Sheet metal shall conform to FED-STD-66. All shields and clamps (except nylon strap) shall be plated in accordance with finish no. M225 of MIL-F-14072.
- SHIELD REMOVAL.** Shields are used to protect and add strength to connectors. When modification or repair to connector is necessary, the

shield must be removed. Remove shield in accordance with following procedure:



- a. Loosen cable clamp and, if installed, strain relief clamp.
- b. Remove four screws from either the side or bottom.
- c. Remove shield.

Wires can be pinched between metal parts. Ensure no wires are between metal parts before tightening, and while tightening any hardware.

- b. Tighten four screws from either the side or bottom.

- c. Tighten cable clamp and, if used, strain relief clamp.

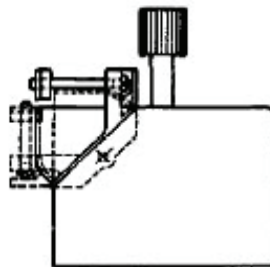
9. **SHIELD INSTALLATION.** Upon completion of maintenance or modification, the shield must be replaced. Install shield in accordance with the following procedure:

- a. Position shield on cable and connector.

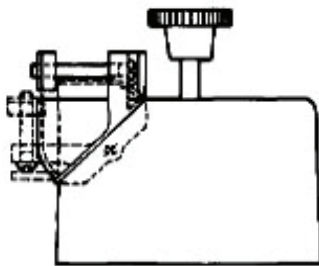
10. **STRAIN RELIEF CLAMPS.** Strain relief clamps are used to prevent tension on the cable from being transferred to the wire terminations. (Figure 5).

Used On M28731/9 Thru M28731/18 And M28731/29 Thru M28731/34

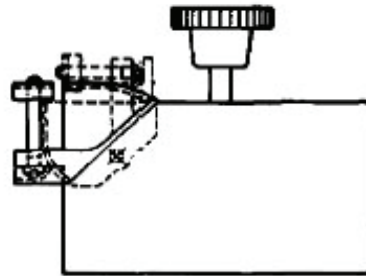
Material: Cast Aluminum Alloy #380



Cover With .820 X .614 Cable Clamp



Cover With 1.000 X .800 Cable Clamp



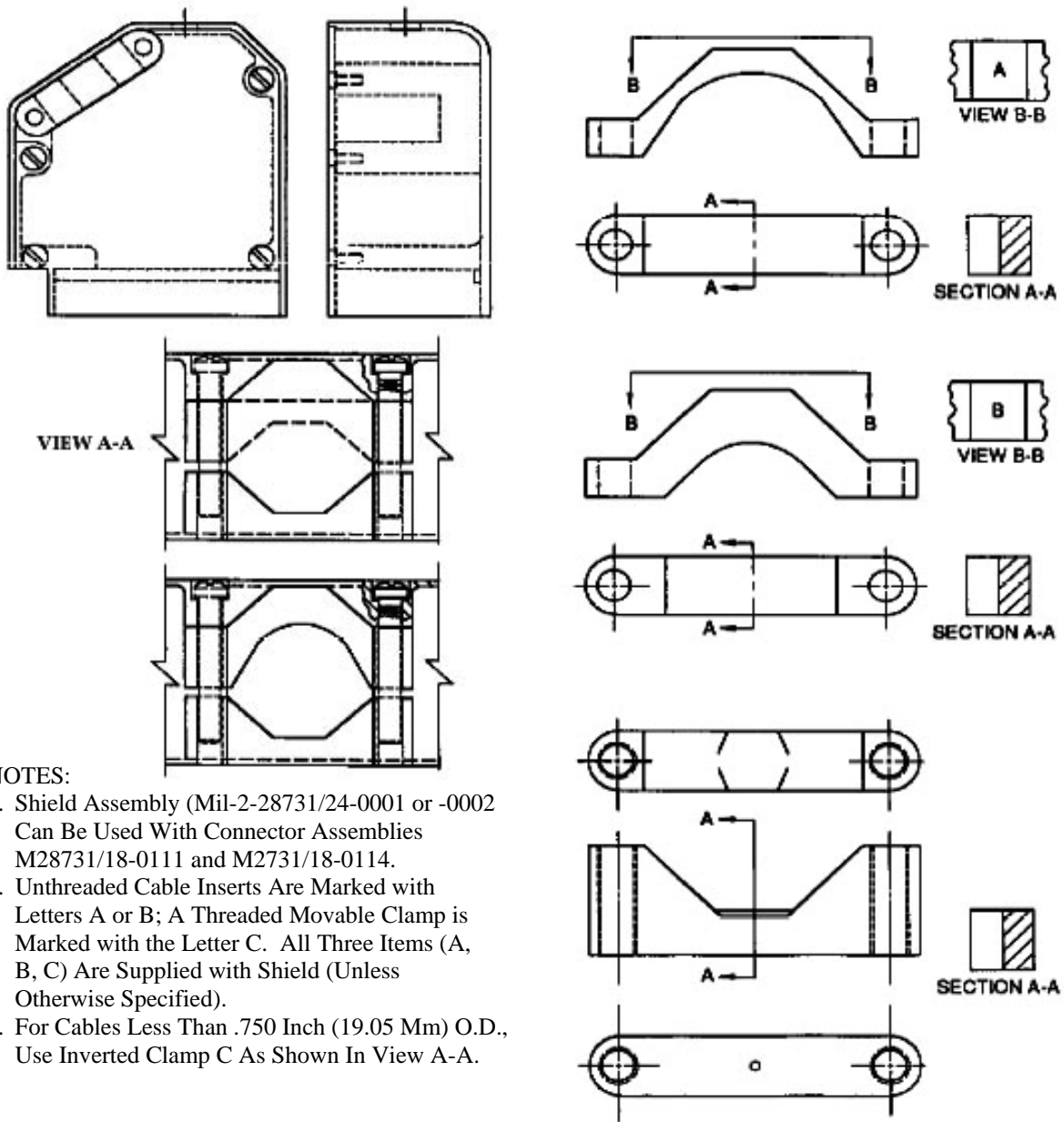
Cover With 1.100 X 1.085 Cable Clamp

Figure 1. Aluminum Shield (Sheet 1 of 2)

MIL-DTL-28731/19E

Figure 1. Part or Identifying Number (PIN) information.		
PIN shield	For use with connector specification	Wire bundle opening ref
M28731/19-0001 M28731/19-0002	MIL-C-28731/9 and /10	.454 Dia.
M28731/19-0003 M28731/19-0004	MIL-C-28731/11, /12, /29, and /30	.650 x .500
M28731/19-0005 M28731/19-0006	MIL-C-28731/11, /12, /29, and /30	.650 x .608
M28731/19-0007 M28731/19-0008	MIL-C-28731/13, /14, /31 and /32	.650 x .500
M28731/19-0009 M28731/19-0010	MIL-C-28731/13, /14, /31 and /32	.650 x .608
M28731/19-0011 M28731/19-0012	MIL-C-28731/15, /16, /33 and MIL-DTL-28731/34	.800 Dia.
M28731/19-0013 M28731/19-0014	MIL-C-28731/17 and /18	1.080 x .800
M28731/19-0015 M28731/19-0016	MIL-C-28731/11, /12, /29 and /30	.820 x .614
M28731/19-0017 M28731/19-0018	MIL-C-28731/13, /14 /31 and /32	.820 x .614
M28731/19-0019 M28731/19-0020	MIL-C-28731/15, /16, /33 and MIL-DTL-28731/34	.800 x 1.000
M28731/19-0021 M28731/19-0022	MIL-C-28731/17 and /18	1.100 x 1.085

Figure 1. Aluminum Shield (Sheet 2)



NOTES:

- Shield Assembly (Mil-2-28731/24-0001 or -0002 Can Be Used With Connector Assemblies M28731/18-0111 and M2731/18-0114.
- Unthreaded Cable Inserts Are Marked with Letters A or B; A Threaded Movable Clamp is Marked with the Letter C. All Three Items (A, B, C) Are Supplied with Shield (Unless Otherwise Specified).
- For Cables Less Than .750 Inch (19.05 Mm) O.D., Use Inverted Clamp C As Shown In View A-A.

Inserts		Movable Clamp	Typical Cable Size		
A	B		Cables	O.D.	
Yes		Yes	2SWU-24	1.590 MAX. (40.39)	
		Yes	2AU40	1.380/1.325 (30.05/33.66)	
		Yes	3SU14	1.290/1.200(32.77/30.48)	
	Yes	Yes	MHOF-44	1.000/.925(25.40/23.50)	
		Yes	Yes	2U-45	.870/.830(22.10/21.08)

Figure 2. 45° Cable Opening Shield

Used On M28731/34-0007 Connectors Only

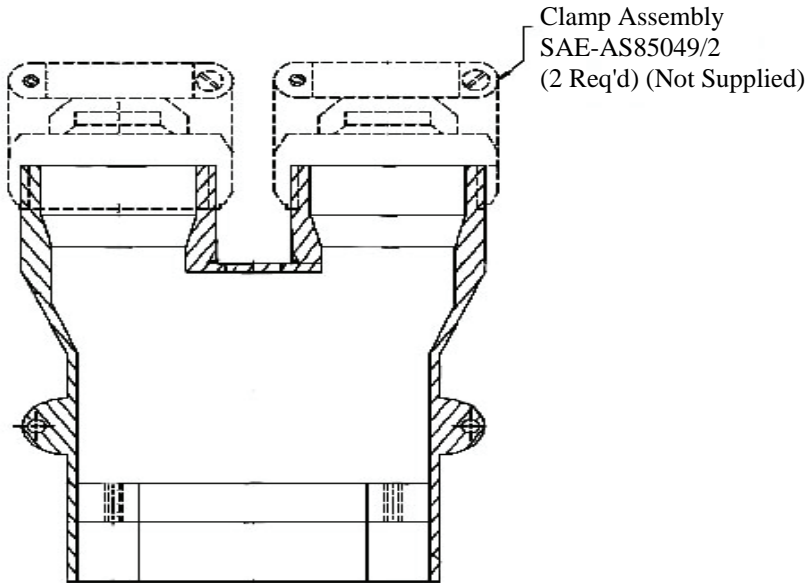


Figure 3. Rectangular Shield MIL-DTL-28731/37

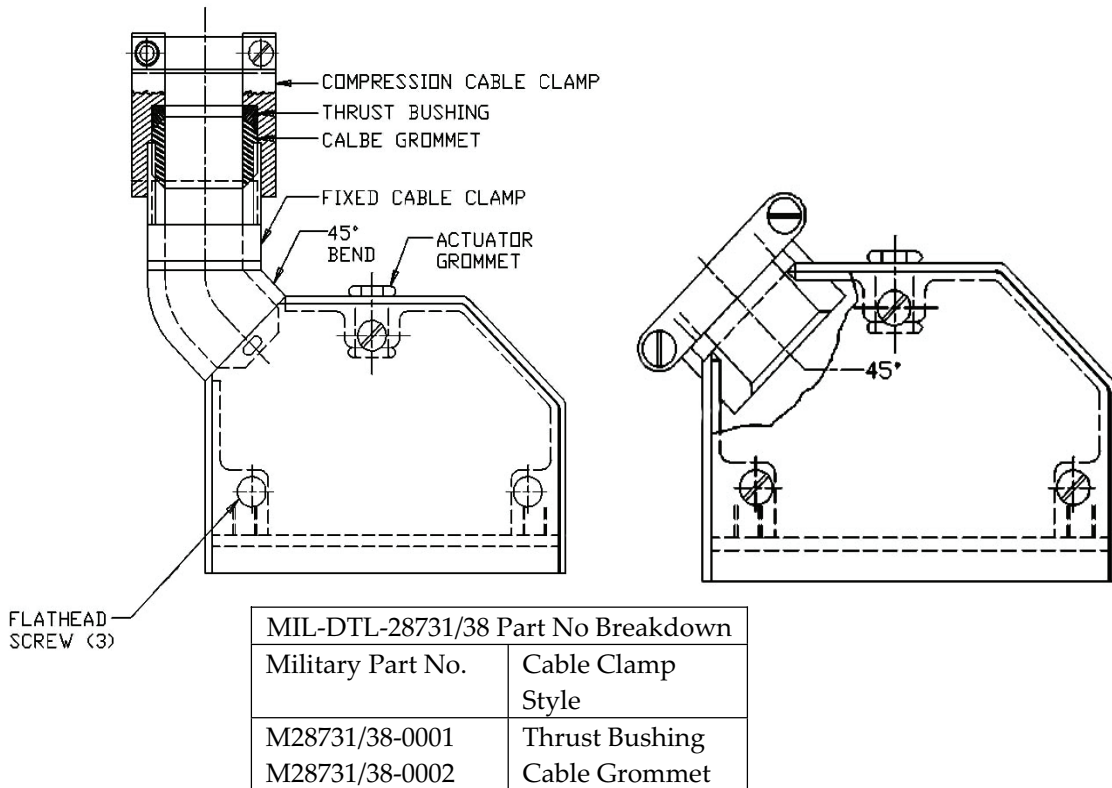
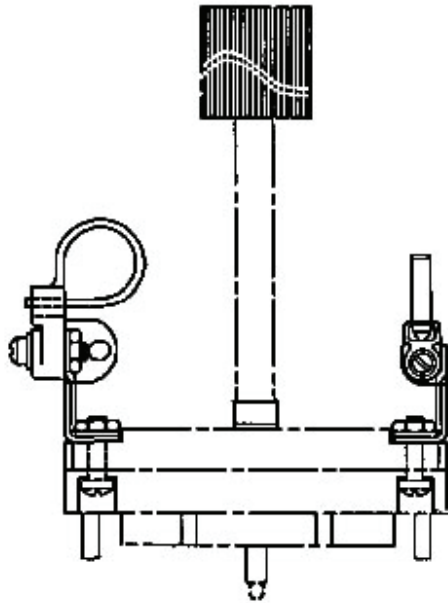
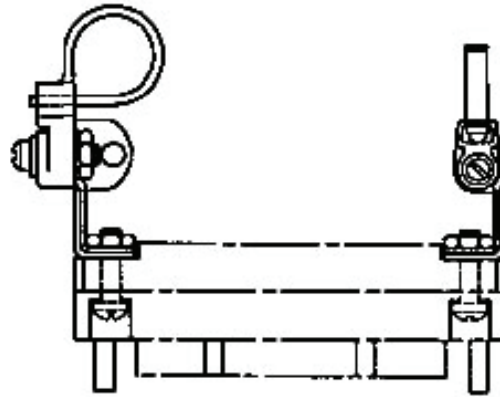


Figure 4. Rectangular Shield MIL-DTL-28731/38



30-8026-9601
Cable Connector



30-8026-9602
Panel Mtd. Connector

Figure 5. Strain Relief Clamp

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

005 00

Page 1 /(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 28748**

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-DTL-28748	005 03
Connectors MIL-DTL-28748	005 02
Introduction	005 01

INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-DTL-28748

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-DTL-28748. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification

Requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-DTL-28748

Reference Material

Connector Accessories 005 03
Connectors, Electrical, Rectangular, Rack and Panel, Solder Type
and Crimp Type Contacts, General Specification for MIL-DTL-28748
Contacts, Electrical Connector, General Specification for SAE AS39029
Installation Practices, Aircraft Electric and Electronic Wiring NAVAIR 01-1A-505-1

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	38
Connector Sealing	38
Contact Insertion	38
Contact Removal	38
Connector Buildup, Solder Contacts	38
Connector Cleaning and Preservation	38
Introduction	2
Description	2
MIL-DTL-28748 Connectors	2
Connector Shells	2
Contact Application	5
Contacts	4
Crimp Removable Contacts	4
Solder Contacts	4
Coupling	2
Design and Construction	3
Mounted Connector	3
Un-mounted Connector	3
Insert Arrangement	4
Connectors M28748/1	4
Connectors M28748/2	4
Connectors M28748/3	4
Connectors M28748/4	4
Connectors M28748/5	4
Connectors M28748/6	4
Connectors M28748/7	4
Connectors M28748/8	4
Connectors M28748/9	4
Connectors M28748/10	4
Connectors M28748/13	4
Connectors M28748/15	4
Connectors M28748/16	4
Connectors M28748/18	4
Connectors M28748/19	4
Connectors M28748/20	4
Connectors M28748/21	4

Connectors M28748/14.....4
 Insert Configuration.....4
 Inserts.....3
 Closed-Entry Socket Contacts3
 Contact Extraction3
 Contact Insertion.....3
 Contact Retaining Clip.....3
 Crimp Snap-in Contacts3
 Insert Retention4
 Interchangeability4
 Part Number.....
 Contact Options3
 Contacts3
 Insulator3
 Jackscrews or Guide pins.....3
 Polarizing Shell.....3
 Shield or Retaining Plate.....3
 Specification Sheet Number.....3
 Polarization.....3

Record of Applicable Technical Directives

None

Support Equipment Required

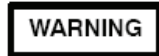
Part No./ Type Designation	Nomenclature
M22520/1-01	Tool, Crimp, Frame
M22520/1-03	Positioner
M22520/1-03A	Positioner
M22520/1-07	Positioner
M22520/2-01	Tool, Crimp, Frame
M22520/2-04	Positioner
M81969/18-01	Tool, Insertion
M81969/18-02	Tool, Insertion
M81969/20-01	Tool, Removal
M81969/20-02	Tool, Removal

Materials Required

Specification/ Part No.	Nomenclature
TT-I-735	Alcohol, Isopropyl

extraction, removable contacts, manufactured in accordance with MIL-DTL-28748 (Figure 1).

3. **DESCRIPTION.** These connectors are non-environmental, coupled by friction or jackscrew with polarization accomplished by shell key or polarizing boss and designed for -67°F (-55°C) to +257°F (+125°C) operating temperatures (Table 1).



This document includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. Consult applicable health and environmental regulations regarding its use, handling and disposition.

1. **INTRODUCTION.**

2. This Work Package (WP) covers rectangular, rack and panel, electrical connectors, having pin and socket, solder non-removable and crimp, front release, rear

4. **MIL-DTL-28748 CONNECTORS.**

5. **CONNECTOR SHELLS.** The connector shells are designed to positively retain insert and so constructed that insert cannot be removed.

6. **COUPLING.** Connectors shall be capable of being fully coupled and uncoupled without use of tools.

7. **POLARIZATION.** Polarization of the plug with its receptacle shall be accomplished by mechanical means with shells, protective shells, bosses, guide pins, guide sockets or jackscrews.

8. **PART NUMBER.** The following paragraphs contain the information necessary for proper selection and procurement of connector (Figures 2 thru 10).

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

9. **Specification Sheet Number.** The specification sheet number denotes pin or socket contacts (also Table 1).

10. **Insulator.** The insulator (insert) is identified by a letter code which denotes number of contacts, part number and insert configuration (Table 2).

11. **Shield or Retaining Plate.** The shield or retaining plate is identified by a letter or number, denoting shield/shield clamp location or retaining plate part number (also Figures 11 and 12).

12. **Polarizing Shell.** The polarizing shell is identified by a part number and letter code denoting shell type (also Figures 11 and 12).

13. **Jackscrews or Guide pins.** Jackscrews or guide pins are identified by part number and letter code denoting type (also Figures 11 and 12).

14. **Contacts.** Contacts, identified by letter and number denote contact size at 100 percent.

15. **Contact Options.** Contact options identified by letter and number denote a percentage of various size pins the insulator can accommodate.

16. **DESIGN AND CONSTRUCTION.** Connectors are designed and constructed to withstand normal handling incidental to installation and maintenance. They are designed so either the plug or receptacle can be the mounted connector and one or the other need not have a shell.

17. **Un-mounted Connector.** The un-mounted connector will always have a shield and long turnable jackscrews but will not have a retaining plate. Guidepins are used in place of jackscrews in certain applications (Figure 11).

18. **Mounted Connector.** The mounted connector will have a retaining plate, but no shield. A mounted connector having a shell will have a short turnable jackscrew. A mounted connector without a shell will have a fixed jackscrew. The jackscrews can be male or female (Figure 12).

19. **INSERTS.** Inserts are of diallyl phthalate material molded one-piece construction having electrical and mechanical characteristics suitable for the purpose intended. The impact strength shall be such that material shall not chip, crack, or break during assembly or normal maintenance.

20. **Crimp Snap-in Contacts.** Snap-in contacts designed to SAE AS39029 can be crimped with standard M22526/ crimp tool.

21. **Closed-Entry Socket Contacts.** These contacts eliminate damage from abuse by test probes and help to correct any misaligned pins during engagement.

22. **Contact Insertion.** Insertion is accomplished from rear of connector. When contact is fully inserted, the clip tines snap securely behind contact shoulders.

23. **Contact Extraction.** Extraction is accomplished with use of a removal tool. Contacts are front release, rear extraction.

24. **Contact Retaining Clip.** The contact retaining clip is completely encased in a tough plastic wafer to protect clip from damage.

25. Insert Retention. Insert retention is accomplished with a combination of screws and nuts. Nuts are not used if a shield is installed.

26. Keying is used in shell-enclosed connectors to obtain polarization, which assures correct location when mating a connector.

27. **INTERCHANGEABILITY**. All connectors having the same military part number shall be completely interchangeable with respect to installation and performance.

28. **INSERT ARRANGEMENT**. The insert arrangements (Table 2) contain connector part number, type, and number of contacts, and insert arrangement MS number. The following paragraphs contain information of connectors M28748/1 thru M28748/10, M28748/13 thru M28748/16 and M28748/18 thru M28748/21.

29. Connectors M28748/1. The M28748/1 connectors are size 16, with non-removable solder type pin contacts.

30. Connectors M28748/2. The M28748/2 connectors are size 16, with non-removable solder type socket contacts.

31. Connectors M28748/3. The M28748/3 connectors are size 16 and size 20, with crimp removable pin contacts.

32. Connectors M28748/4. The M28748/4 connectors are size 16 and size 20, with crimp removable socket contacts.

33. Connectors M28748/5. The M28748/5 connectors are size 20, with non-removable solder pin contacts.

34. Connectors M28748/6. The M28748/6 connectors are size 20, with non-removable solder socket contacts.

35. Connectors M28748/7. The M28748/7 connectors are size 22, with non-removable solder pin contacts.

36. Connectors M28748/8. The M28748/8 connectors are size 22, with non-removable solder socket contacts.

37. Connectors M28748/9. The M28748/9 connectors are size 16, with crimp removable pin contacts.

38. Connectors M28748/10. The M28748/10 connectors are size 16, with crimp removable socket contacts.

39. Connectors M28748/13. The M28748/13 connectors are size 22, with crimp removable pin contacts.

40. Connectors M28748/15. The M28748/15 connectors are hexagonal, rack and panel, solder cup or printed wiring board socket contacts, size 20.

41. Connectors M28748/16. The M28748/16 connectors are hexagonal, rack and panel, solder cup pin contacts, size 20.

42. Connectors M28748/18. The M28748/18 connectors are rectangular, rack and panel, printed wiring board (pwb) mount, straight through, pin contacts, size 22.

43. Connectors M28748/19. The M28748/19 connectors are rectangular, rack and panel, printed wiring board (pwb) mount, straight through, socket contacts, size 22.

44. Connectors M28748/20. The M28748/20 connectors are rectangular, rack and panel, printed wiring board (pwb) mount, right angle, pin contacts, size 22.

45. Connectors M28748/21. The M28748/21 connectors are rectangular, rack and panel, printed wiring board (pwb) mount, right angle, socket contacts, size 22.

46. Connectors M28748/14. The M28748/14 connectors are size 22, with crimp removable socket contacts.

47. **INSERT CONFIGURATION**. The insert configuration is the manner in which contacts are placed within insert in a standard configuration. All arrangements identified in Table 2 are illustrated (Figures 13 thru 18 and 21 thru 23).

48. **CONTACTS**. The type of contacts used on this type connector are as follows:

49. Solder contacts. Solder contacts are non-removable from the insert and have either eyelet or solder cup terminals. The solder cups are so designed that during soldering, no components will be damaged and no liquid solder can escape.

50. Crimp removable contacts. All pins and sockets will be capable of being assembled in the molded inserts, and be completely interchangeable with each other with respect to installation and performance. Tools will be

capable of properly inserting and removing the pin and socket contacts from the molded inserts.

51. **CONTACT APPLICATION.** Contacts used are manufactured in accordance with MIL-C-39029. The

contact part number is illustrated (Figure 19). The Basic Identification Number (BIN) or last three digits of contact part number, matches standard resistor color code (Figure 20)

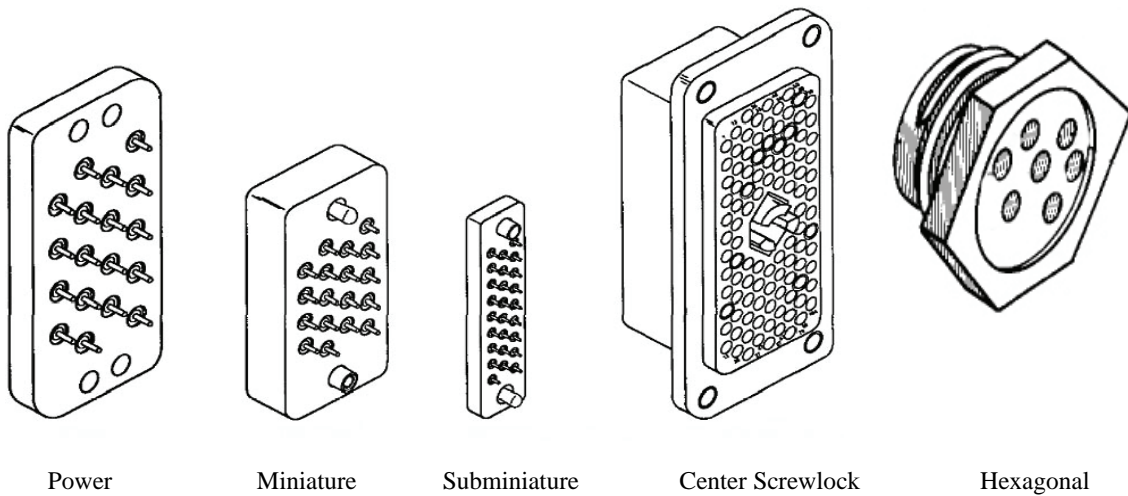
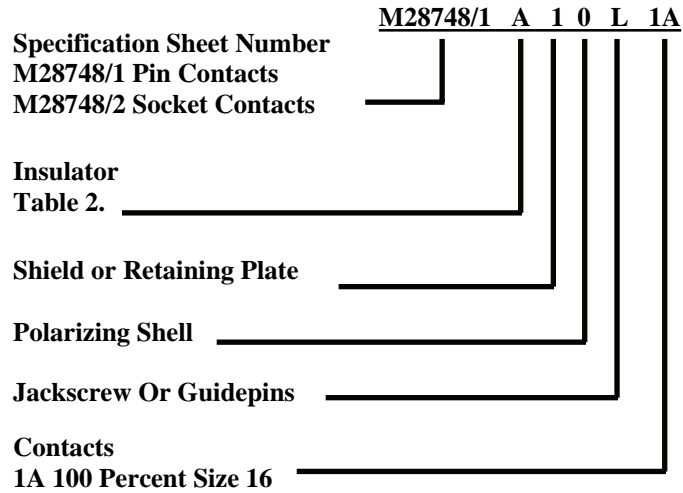


Figure 1. MIL-C-28748 Typical Connectors

Table 1. MIL-DTL-28748 Specifications

Specification Sheet Number	Contacts					Hood or Shell			
	Solder	Crimp		Size	Number	Environ- Mental	Material	Finish	Coupling Type
		Front Release	Rear Release						
M28748/1, /2	Yes	-	-	16	9 Thru 104	-	Optional	Cadmium Plate	Friction Or Screw
M28748/3, /4	-	Yes	-	16, 20	7 Thru 104	-	Optional	Cadmium Plate	Friction Or Screw
M28748/5, /6	Yes	-	-	20	7 Thru 104	-	Optional	Cadmium Plate	Friction Or Screw
M28748/7, /8	Yes	-	-	22	4 Thru 50	-	Optional	Cadmium Plate	Friction Or Screw
M28748/9, /10	-	Yes	-	16	10 Thru 212	-	Optional	Cadmium Plate	Friction Or Screw
M28748/13, /14	-	Yes	-	22	4 Thru 50	-	Optional	Cadmium Plate	Friction Or Screw
M28748/15, /16	Yes	-	-	20	4 Thru 12	-	Optional	Optional	Friction Or Screw
M28748/18, /19	Yes	-	-	22	4 Thru 50	-	-	-	Friction Or Screw
M28748/20, /21	Yes	-	-	22	4 Thru 50	-	-	-	Friction Or Screw

PART NUMBER DESIGNATION



Shield Or Retaining Plate

Part No. Code	Used With Insulator	Description	Ms Number
1*	A, B, C	Shield, Top Clamp	MS24132
2*		Shield, Side Clamp	
3*	D, E, F, H	Shield, Top Clamp	MS24133
4*		Shield, Side Clamp	
5@	G, J	Shield, Top Clamp	MS18193
6@		Shield, Side Clamp	
A#	A, B, C, D	Shield, Top Clamp	MS18192
B#	E, F, H	Shield, Side Clamp	
7	A, B, C	Retaining Plate	MS18198
8	D, E, F		MS18199
9	G, J		MS18200
0	All	No Shield Or Retaining Plate	

* Used When No Shell Is Specified

@ Used With Or Without Shells

Used When Shell Is Specified

Figure 2. M28748/1 and M28748/2 Part Number Breakdown (Sheet 1 of 2)

Polarizing Shell

M28748/1		Mates With		M28748/2	
Part No. Code	Polarizing Position/ MS Number	Shell Type	Part No. Code	Polarizing Position/ MS Number	Shell Type
A	A OF MS18203	Plug	A	A OF MS18204	Receptacle
B	B OF MS18203		B	B OF MS18204	
C	C OF MS18203		C	C OF MS18204	
D	D OF MS18203		D	D OF MS18204	
E	E OF MS18203		E	E OF MS18204	
F	F OF MS18203		F	F OF MS18204	
G	G OF MS18203		G	G OF MS18204	
H	Unpolarized Ms18203		H	Unpolarized Ms18204	
J	A OF MS18204	Receptacle	J	A OF MS18203	Plug
K	B OF MS18204		K	B OF MS18203	
L	C OF MS18204		L	C OF MS18203	
M	D OF MS18204		M	D OF MS18203	
N	E OF MS18204		N	E OF MS18203	
P	F OF MS18204		P	F OF MS18203	
Q	G OF MS18204		Q	G OF MS18203	
R	Unpolarized Ms18204		R	Unpolarized Ms18203	
O	No Shell Included		O	No Shell Included	

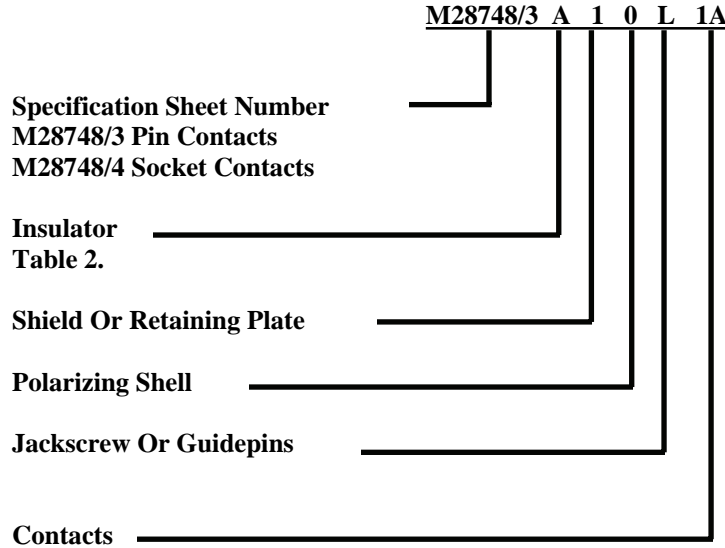
Jackscrew or Guidepins

Part No. Code	Description	MS Number
L	Long Jackscrews	MS18194
S*	Short Jackscrews	MS18195
F*	Fixed Jackscrews	MS18196
Q	Guidepins	MS18197
O	No Jackscrews Or Guidepins Included	

* Not Used With Shield

Figure 2. M28748/1 and M28748/2 Part Number Breakdown (Sheet 2)

PART NUMBER DESIGNATION



Shield or Retaining Plate

Part No. Code	Used With Insulator	Description	MS Number
1 2	A, B, C,D, E,F,G, H, K	Shield, Top Clamp Shield, Side Clamp	MS18192
3 4	J, L	Shield, Top Clamp Shield, Side Clamp	MS18193
5	B, C, D, E	Retaining Plate	MS18198
6	F, G, H, K		MS18199
7	J, L		MS18200
0	ALL	No Shield Or Retaining Plate	

Jackscrew or Guidepins

Part No. Codes	Description	MS Number
L	Long Jackscrews	MS18194
S*	Short Jackscrews	MS18195
F*	Fixed Jackscrews	MS18196
G	Guidepins	MS18197
O	No Jackscrews Or Guidepins Included	

* Not Used With Shield

Figure 3. M28748/3 and M28748/4 Part Number Breakdown (Sheet 1 of 3)

Polarizing Shell

M28748/3			Mates With		M28748/4	
Part No. Code	Polarizing Position/ MS Number	Shell Type	Part No. Code	Polarizing Position/ MS Number	Shell Type	
A	A OF MS18203	Plug	A	A OF MS18204	Receptacle	
B	B OF MS18203		B	B OF MS18204		
C	C OF MS18203		C	C OF MS18204		
D	D OF MS18203		D	D OF MS18204		
E	E OF MS18203		E	E OF MS18204		
F	F OF MS18203		F	F OF MS18204		
G	G OF MS18203		G	G OF MS18204		
H	Unpolarized MS18203		H	Unpolarized MS18204		
J	A OF MS18204	Receptacle	J	A OF MS18203	Plug	
K	B OF MS18204		K	B OF MS18203		
L	C OF MS18204		L	C OF MS18203		
M	D OF MS18204		M	D OF MS18203		
N	E OF MS18204		N	E OF MS18203		
P	F OF MS18204		P	F OF MS18203		
Q	G OF MS18204		Q	G OF MS18203		
R	Unpolarized MS18204		R	Unpolarized MS18203		
O	No Shell Included		O	No Shell Included		

M2874813 and M2874814 Contacts and Tools

Contact Size	M28748/3 Pin Contacts			M28748/4 Pin Contacts			Tools			
	MS Number	MIL-C-39029/Slash Sheet	Bin Code	MS Number	MIL-C-39029/Slash Sheet	Bin Code	Crimp Tool	Positioner	Installation	Removal
16-16	MS17803-16-16	34-273	273	MS17804-16-16	35-276	276	M22520/1-01	M22520/1-03	M81969/18-01	M81969/20-01
16-20	MS17803-16-20	34-272	272	MS17804-16-20	35-275	275				
20-20	MS17803-20-20	34-271	271	MS17804-20-20	35-274	274				
Shield	MS18232-1	40-281	281	MS18233-1	41-282	282	M22520/2-01* M22520/1-01@	M22520/2-04* M22520/1-07@	MS17805	MS17806

* Inner Contact
 @ Outer Contact

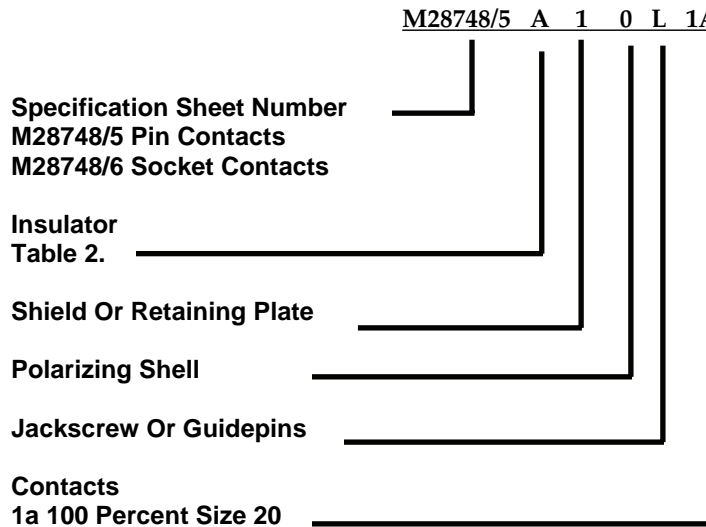
Figure 3. M28748/3 and M28748/4 Part Number Breakdown (Sheet 2)

Contact Options

Part No. Code	Percent			
	Size 16-16	Size 16-20	Shielded	Size 20-20
1A	100	0	0	0
1B	90	0	10	0
1c	60	0	20	0
1D	70	0	30	0
1E	60	0	40	0
1F	50	0	50	0
1G	40	0	60	0
1H	30	0	70	0
1J	20	0	60	0
1K	10	0	90	0
1L	0	0	100	0
2A	0	100	0	0
2B	0	90	10	0
2C	0	60	20	0
2D	0	70	30	0
2E	0	60	40	0
2F	0	50	50	0
2G	0	40	60	0
2H	0	30	70	0
2J	0	20	60	0
2K	0	10	90	0
3A	0	0	0	100
3B	0	0	10	90
3C	0	0	20	60
3D	0	0	30	70
3E	0	0	40	60
3F	0	0	50	50
3G	0	0	60	40
3H	0	0	70	30
3J	0	0	60	20
3K	0	0	90	10

Figure 3. M28748/3 and M28748/4 Part Number Breakdown (Sheet 3)

PART NUMBER DESIGNATION



Shield Or Retaining Plate

Part No. Code	Used With Insulator	Description	MS Number
1*	A, B, C	Shield, Top Clamp	MS24132
2*		Shield, Side Clamp	
3*	D, E, F, H	Shield, Top Clamp	MS24133
4*		Shield, Side Clamp	
5@	G, J	Shield, Top Clamp	MS18193
6@		Shield, Side Clamp	
A#	A, B, C, D	Shield, Top Clamp	MS18192
B#	E, F, H	Shield, Side Clamp	
7	A, B, C	Retaining Plate	MS18198
8	D, E, F		MS18199
9	G, J		MS18200
0	All	No Shield Or Retaining Plate	

* Used When No Shell Is Specified

@ Used With Or Without Shells

Used When Shell Is Specified

Figure 4. M28748/5 and M28748/6 Part Number Breakdown (Sheet 1 of 2)

Polarizing Shell

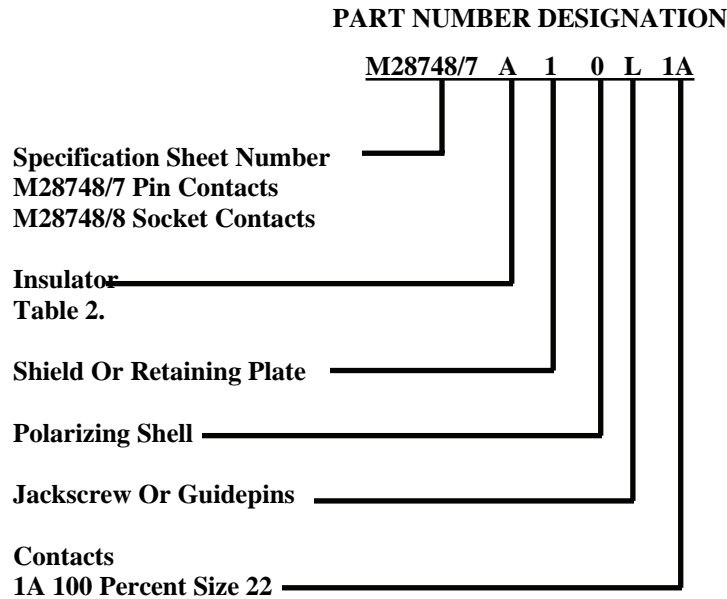
M28748/5		Mates With		M28748/6	
Part No. Code	Polarizing Position/ MS Number	Shell Type	Part No. Code	Polarizing Position/ MS Number	Shell Type
A	A OF MS18203	Plug	A	A OF MS18204	Receptacle
B	B OF MS18203		B	B OF MS18204	
C	C OF MS18203		C	C OF MS18204	
D	D OF MS18203		D	D OF MS18204	
E	E OF MS18203		E	E OF MS18204	
F	F OF MS18203		F	F OF MS18204	
G	G OF MS18203		G	G OF MS18204	
H	Unpolarized MS18203		H	Unpolarized MS18204	
J	A OF MS18204	Receptacle	J	A OF MS18203	Plug
K	B OF MS18204		K	B OF MS18203	
L	C OF MS18204		L	C OF MS18203	
M	D OF MS18204		M	D OF MS18203	
N	E OF MS18204		N	E OF MS18203	
P	F OF MS18204		P	F OF MS18203	
Q	G OF MS18204		Q	G OF MS18203	
R	Unpolarized MS18204		R	Unpolarized MS18203	
O	No Shell Included		O	No Shell Included	

Jackscrew Or GuidepinS

Part No. Code	Description	MS Number
L	Long Jackscrews	MS18194
S*	Short Jackscrews	MS18195
F*	Fixed Jackscrews	MS18196
Q	Guidepins	MS18197
O	No Jackscrews Or Guidepins Included	

* Not Used With Shield

Figure 4. M28748/5 and M28748/6 Part Number Breakdown (Sheet 2)



Shield

Part No. Code	Used With Insulator	Description	MS Number
1	All	Shield. Top Clamp	MS14071
2	C, D, E, F, G, H,	Shield, Side Clamp	
0	All	None Included	

Jackscrews Or Guidepins

Part No. Code	Description/MS Number
L	Long Jackscrews: Per Insulator Ms Number
F	Fixed Jackscrews: Per Insulator Ms Number
S	Short Jackscrews: Per Insulator Ms Number
G	Guidepins: Per Insulator Ms Number

Figure 5. M28748/7 and M28748/8 Part Number Breakdown (Sheet 1 of 2)

Polarizing Shell

M28748/3		Mates With		M28748/4	
Part No. Code	Polarizing Position/ MS Number	Shell Type	Part No. Code	Polarizing Position/ MS Number	Shell Type
A	A OF MS14072-1	Plug	A	A OF MS14072-2	Receptacle
B	B OF MS14072-1		B	B OF MS14072-2	
C	C OF MS14072-1		C	C OF MS14072-2	
D	D OF MS14072-1		D	D OF MS14072-2	
E	E OF MS14072-1		E	E OF MS14072-2	
F	F OF MS14072-1		F	F OF MS14072-2	
G	G OF MS14072-1		G	G OF MS14072-2	
H	Unpolarized MS14072-1		H	Unpolarized MS14072-2	
J	A OF MS14072-2	Receptacle	J	A OF MS14072-1	Plug
K	B OF MS14072-2		K	B OF MS14072-1	
L	C OF MS14072-2		L	C OF MS14072-1	
M	D OF MS14072-2		M	D OF MS14072-1	
N	E OF MS14072-2		N	E OF MS14072-1	
P	F OF MS14072-2		P	F OF MS14072-1	
Q	G OF MS14072-2		Q	G OF MS14072-1	
R	Unpolarized MS14072-2		R	Unpolarized MS14072-1	
O	No Included		O	No Included	

Figure 5. M28748/7 and M28748/8 Part Number Breakdown (Sheet 2)

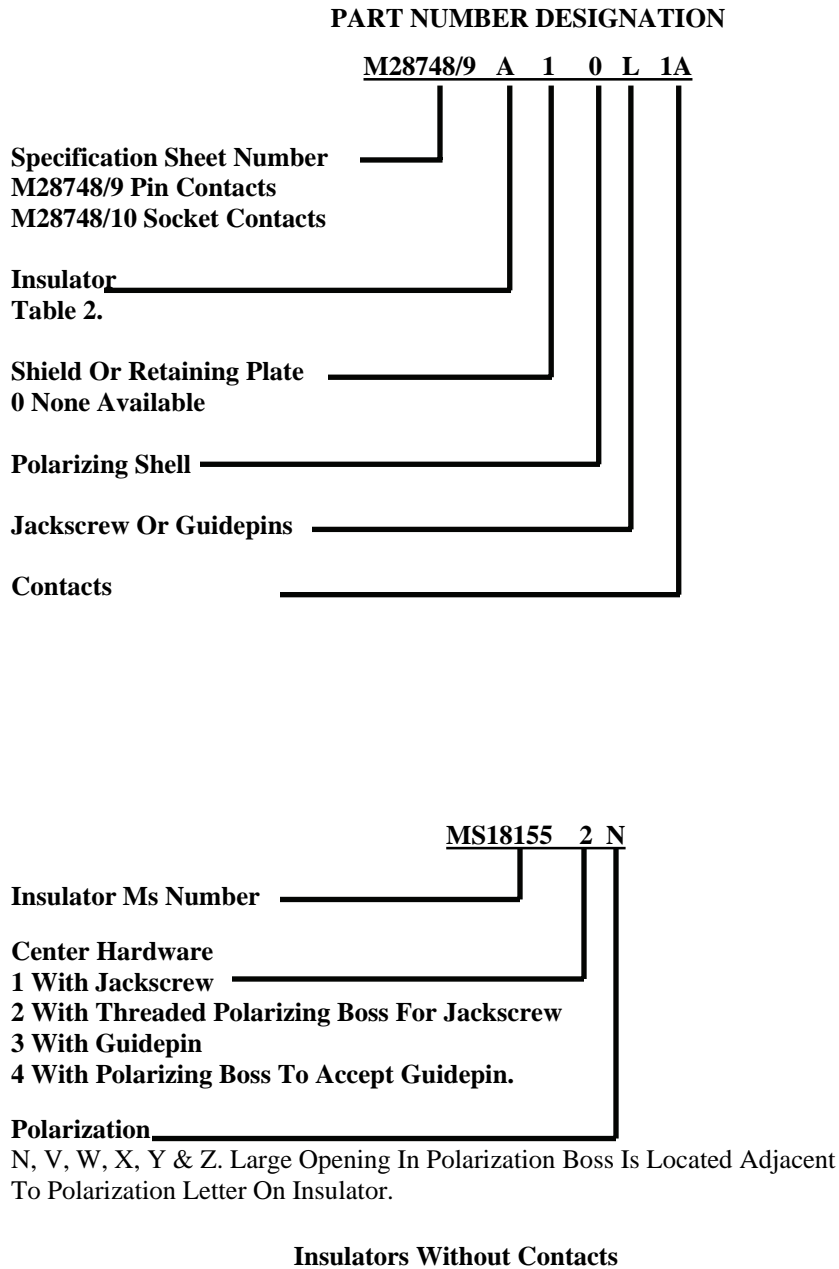


Figure 6. M28748/9 and M28748/10 Part Number Breakdown (Sheet 1 of 3)

Polarization

Polarization			Polarization		
Part No. Code	Position	For Use With	Part No. Code	Position	For Use With
A	N	Jackscrews	G	N	Guidepins
B	V		H	V	
C	W		J	W	
D	X		K	X	
E	Y		L	Y	
F	Z		M	Z	
N	N	Boss For Jackscrews	P	N	Boss For Guidepins
V	V		Q	V	
W	W		R	W	
X	X		S	X	
Y	Y		T	Y	
Z	Z		U	Z	

Jackscrews Or Guidepins

Part No. Code	Description/MS Number
L	Long Jackscrew
O	Boss For Jackscrew
G	Guidepin
B	Boss For Guidepin

Figure 6. M28748/9 and M28748/10 Part Number Breakdown (Sheet 2)

Contacts

Part No. Code	Percent		
	MS17807 Size 16-16*	MS17807 Size 16-20*	MS18232 Shielded@
1A	100	0	0
1B	90	0	10
1c	60	0	20
1D	70	0	30
1E	60	0	40
1F	50	0	50
1G	40	0	60
1H	30	0	70
1J	20	0	60
1K	10	0	90
1L	0	0	100
2A	0	100	0
2B	0	90	10
2C	0	60	20
2D	0	70	30
2E	0	60	40
2F	0	50	50
2G	0	40	60
2H	0	30	70
2J	0	20	60
2K	0	10	90

M26748/9 And M26748/10 Contact Part Numbers

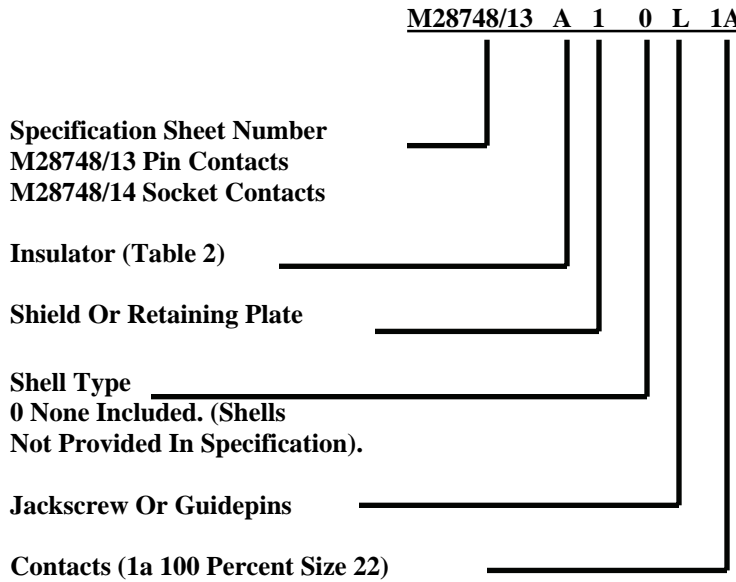
Contact Size	M28748/9 Pin Contacts			M28748/10 Socket Contacts		
	MS Number	MIL-C-39029/ Slash Sheet	Bin Code	MS Number	MIL-C-39029/ Slash Sheet	Bin Code
16-16*	MS17807-16-16	36-278	278	MS17807-16-16	37-280	280
16-20*	MS17807-16-20	36-277	277	MS17807-16-20	37-279	279
Shielded@	MS18232-1	40-281	281	MS18232-1	41-282	282

* Basic Crimp Tool: M22520/1-01
Positioner: M22520/1-03(A)
Installing Tool: M81969/18-01
Removal Tool: M81969/20-01

@ Basic Crimp Tool (Inner Contact)
M22520/2-01
Positioner: M22520/2-04
Basic Crimp Tool (Outer Contact)
Positioner: M22520/1-07
Installing Tool: M81969/18-01
Removal Tool: M81969/20-01

Figure 6. M28748/9 and M28748/10 Part Number Breakdown (Sheet 3)

PART NUMBER DESIGNATION



Jackscrews Or Guidepins

Part No. Code	Description
L	Long Jackscrews
F*	Fixed Jackscrews
S*	Short Jackscrews
G	Guidepins

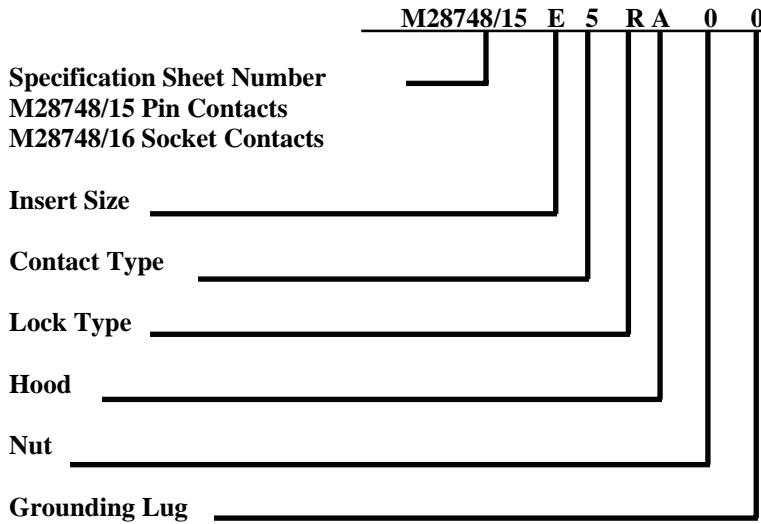
Shield

Part No. Code	Clamp Location
1	Top Side No Shield
2	
3	

Contact Style	Bin Code	Military Part Number	Supersedes	Basic Crimping Tool	Positioner	Installing Tool	Removal Tool
Pin	440	M39029/34-440	M39029/34-440	M22520/2-01	Buchanan 614412, Daniel K187, Or Equivalent	M81969/18-02	M81969/20-02
Socket	441	M39029/35-441	M39029/35-22-22	M22520/2-01	Buchanan 615695, Daniel K280, Or Equivalent	M81969/18-02	M81969/20-02

Figure 7. M28748/13 and M28748/14 Part Number Breakdown

PART NUMBER DESIGNATION



Insert Size

Insert Size	Number Of Contacts
A	4
B	5
C	7
D	9
E	10
F	12

Contact Type / Note 2	
1	Pwb 0.093 Inch
2	Pwb 0.125 Inch
3	Pwb 0.156 Inch
4	Pwb 0.187 Inch
5	Solder Cup
0	No Insert / Note 3

Lock Type / Note 4

R	Lock Ring
S	Lock Spring

Hoods

A	Aluminum (Yellow Chromate)
B	Aluminum (Black Anodize)
C	Plastic Long With Cable Clamp
D	Plastic Short With Cable Clamp
E	Plastic Long With Cable Clamp, Short Cable Opening
M	Plastic Hood Long, Small Cable Opening
P	Plastic Hood Long
R	Right Angle (Size 12)
S	Plastic Short
T	Plastic Short, Small Cable Opening
0	None

Nut

N	Brass Nut / Note 5
P	Nylon Nut
W	Lock Washer / Note 6
0	None

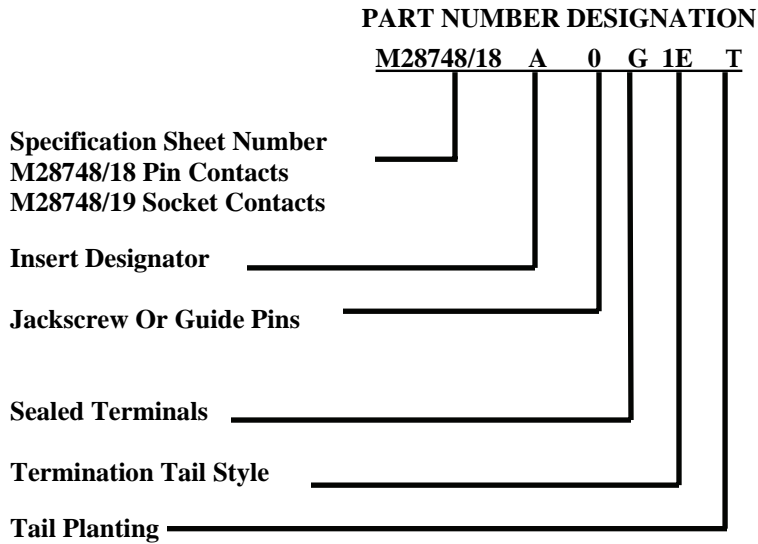
Ground Lug

G	Insert (Insert Size A (4) Only)
0	None

NOTES

- 1 – The number zero (0) is used to indicate which parts are not included.
- 2 – PWB (printed wire board) contacts not available for size 4 insert.
- 3 – Used as an indicator for size of hardware required for individual piece part ordering, permissible insert designators are A0, B0, and F0.
- 4 – When a lock spring or lock ring are ordered with mounting nut, a lock washer is furnished.
- 5 – For insert designator A (4 contacts) only, the nut can be used to ground and of the four contacts.
- 6 – To order lock washers individually use NASM35333-42, 44, 48 as applicable, cadmium finish.
- 7 – Do to space constraints and physical size of the lock ring, lock spring, nut and ground lug, the MIL marking requirements will only be indicated on the packaging.

Figure 8. M28748/15 and M28748/16 Part Number Breakdown



Insert

Insert Designator	No. Of Contacts
A	4
B	7
C	14
D	20
E	26
F	34
G	44
H	50

Jackscrew Or Guidepins

F	Fixed Jacks
G	Guidepins
0	None

Jackscrew Receptacle Or Guidepin Sockets Shall Be Located By The A Pin Contact.

Seal

S	Sealed
0	None

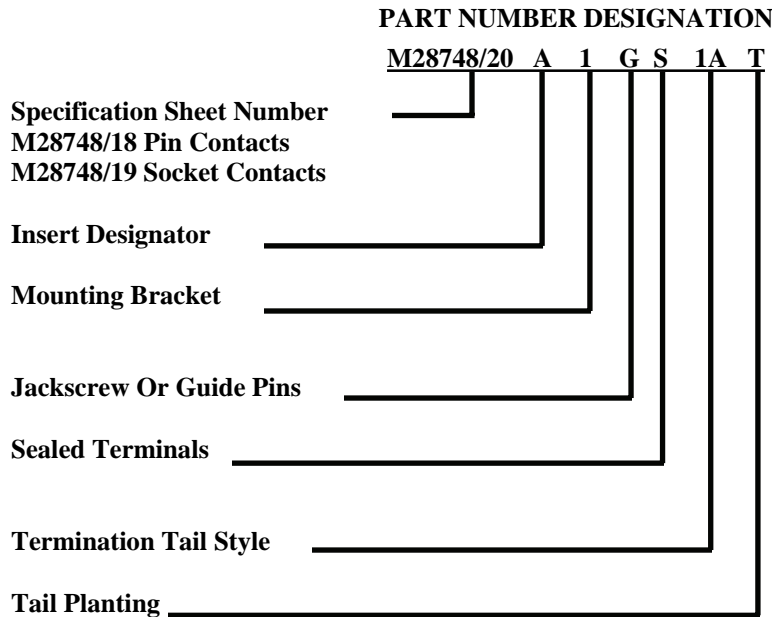
Termination Tail Style

1A	Straight Solder Tails 0.093 Inch
1B	Straight Solder Tails 0.125 Inch
1C	Straight Solder Tails 0.156 Inch
1D	Straight Solder Tails 0.187 Inch
1E	Wrap Post Tail 0.260 Inch
1F	Wrap Post Tail 0.390 Inch
1G	Wrap Post Tail 0.550 Inch

Tail Planting

T	Tin/Lead
G	Gold

Figure 9. M28748/18 and M28748/19 Part Number Breakdown



Insert

Insert Designator	No. Of Contacts
A	4
B	7
C	14
D	20
E	26
F	34
G	44
H	50

Mounting Bracket

Designator	Insert Size
1	4 AND 7
2	14, 20 AND 26
3	34, 44 AND 50
0	NONE

Jackscrew Or Guidepins

F	Fixed Jacks
G	Guidepins
0	None

Jackscrew Receptacle Or Guidepin Sockets Shall Be Located By The A

Termination Tail Style

1A	Right Angle – Solder Tail 0.093 Inch
1B	Right Angle – Solder Tail 0.125 Inch
1C	Right Angle – Solder Tail 0.156 Inch

Seal

S	Sealed
0	None

Tail Planting

T	Tin/Lead
G	Gold

Figure 10. M28748/20 and M28748/21 Part Number Breakdown

Table 2. MIL-DTL-28748 Insert Arrangement

Military Part Number Insert type	Contact Type	Number of Contacts	Mounting Style	Insert Arrangement MS Number
M28748/1A	Pin	9	-	MS18264
M28748/1B	Pin	14	-	MS18240
M28748/1C	Pin	20	-	MS18242
M28748/1D	Pin	34	-	MS18244
M28748/1E	Pin	42	-	MS18246
M28748/1F	Pin	50	-	MS18248
M28748/1G	Pin	66	-	MS18250
M28748/1H	Pin	75	-	MS18252
M28748/1J	Pin	104	-	MS18254
M28748/2A	Socket	9	-	MS18239
M28748/2B	Socket	14	-	MS18241
M28748/2C	Socket	20	-	MS18243
M28748/2D	Socket	34	-	MS18245
M28748/2E	Socket	42	-	MS18247
M28748/2F	Socket	50	-	MS18249
M28748/2G	Socket	66	-	MS18251
M28748/2H	Socket	75	-	MS18253
M28748/2J	Socket	104	-	MS18255
M28748/3A	Pin	7	-	MS14010
M28748/3B	Pin	9	-	MS14007
M28748/3C	Pin	14	-	MS18174
M28748/3D	Pin	20	-	MS18176
M28748/3E	Pin	26	-	MS14008
M28748/3F	Pin	34	-	MS18178
M28748/3G	Pin	42	-	MS18180
M28748/3H	Pin	50	-	MS18182
M28748/3J	Pin	66	-	MS18184
M28748/3K	Pin	75	-	MS18187
M28748/3L	Pin	104	-	MS18189
M28748/4A	Socket	7	-	MS14011
M28748/4B	Socket	9	-	MS14006
M28748/4C	Socket	14	-	MS18175
M28748/4D	Socket	20	-	MS18177
M28748/4E	Socket	26	-	MS14005
M28748/4F	Socket	34	-	MS18179
M28748/4G	Socket	42	-	MS18181
M28748/4H	Socket	50	-	MS18183
M28748/4J	Socket	66	-	MS18185
M28748/4K	Socket	75	-	MS18188
M28748/4L	Socket	104	-	MS18190

Table 2. MIL-DTL-28748 Insert Arrangement (Continued)

Military Part Number Insert Type	Contact Type	Number of Contacts	Mounting Style	Insert Arrangement MS Number
M28748/5A	Pin	7	-	MS24004
M28748/5B	Pin	9	-	MS18257
M28748/5C	Pin	14	-	MS24010
M28748/5D	Pin	20	-	MS24014
M28748/5E	Pin	26	-	MS24020
M28748/5F	Pin	34	-	MS24022
M28748/5G	Pin	42	-	MS18258
M28748/5H	Pin	50	-	MS24026
M28748/5J	Pin	75	-	MS18261
M28748/5K	Pin	104	-	MS18263
M28748/6A	Socket	7	-	MS24003
M28748/6B	Socket	9	-	MS18256
M28748/6C	Socket	14	-	MS24009
M28748/6D	Socket	20	-	MS24013
M28748/6E	Socket	26	-	MS24019
M28748/6F	Socket	34	-	MS24021
M28748/6G	Socket	42	-	MS18260
M28748/6H	Socket	50	-	MS24025
M28748/6J	Socket	75	-	MS18259
M28748/6K	Socket	104	-	MS18262
M28748/7A	Pin	4	-	MS14012
M28748/7B	Pin	7	-	MS14014
M28748/7C	Pin	14	-	MS14016
M28748/7D	Pin	20	-	MS14018
M28748/7E	Pin	26	-	MS14020
M28748/7F	Pin	34	-	MS14022
M28748/7G	Pin	44	-	MS14024
M28748/7H	Pin	50	-	MS14026
M28748/8A	Socket	4	-	MS14013
M28748/8B	Socket	7	-	MS14015
M28748/8C	Socket	14	-	MS14017
M28748/8D	Socket	20	-	MS14019
M28748/8E	Socket	26	-	MS14021
M28748/8F	Socket	34	-	MS14023
M28748/8G	Socket	44	-	MS14025
M28748/8H	Socket	50	-	MS14027
M28748/9A	Pin	10	Thru Hole	MS18155
M28748/9B	Pin	20	Thru Hole	MS18157
M28748/9C	Pin	36	Thru Hole	MS18159
M28748/9D	Pin	52	Thru Hole	MS18161

Table 2. MIL-DTL-28748 Insert Arrangement (Continued)

Military Part Number Insert Type	Contact Type	Number of Contacts	Mounting Style	Insert Arrangement MS Number
M28748/9E	Pin	80	Thru Hole	MS18163
M28748/9F	Pin	104	Thru Hole	MS17778
M28748/9G	Pin	158	Thru Hole	MS18165
M28748/9H	Pin	212	Thru Hole	MS18167
M28748/9J	Pin	10	Sleeve	MS18155
M28748/9K	Pin	20	Sleeve	MS18157
M28748/9L	Pin	36	Sleeve	MS18159
M28748/9M	Pin	52	Sleeve	MS18161
M28748/9N	Pin	80	Sleeve	MS18163
M28748/9P	Pin	104	Sleeve	MS17778
M28748/9R	Pin	158	Sleeve	MS18165
M28748/9S	Pin	212	Sleeve	MS18167
M28748/10A	Socket	10	Thru Hole	MS18156
M28748/10B	Socket	20	Thru Hole	MS18158
M28748/10C	Socket	36	Thru Hole	MS18160
M28748/10D	Socket	52	Thru Hole	MS18162
M28748/10E	Socket	80	Thru Hole	MS18164
M28748/10F	Socket	104	Thru Hole	MS17779
M28748/10G	Socket	158	Thru Hole	MS18166
M28748/10H	Socket	212	Thru Hole	MS18168
M28748/10J	Socket	10	Sleeve	MS18156
M28748/10K	Socket	20	Sleeve	MS18158
M28748/10L	Socket	36	Sleeve	MS18160
M28748/10M	Socket	52	Sleeve	MS18162
M28748/10N	Socket	80	Sleeve	MS18164
M28748/10P	Socket	104	Sleeve	MS17779
M28748/10R	Socket	158	Sleeve	MS18166
M28748/10S	Socket	212	Sleeve	MS18168
M28748/13A	Pin	4	-	M28748/13A
M28748/13B	Pin	7	-	M28748/13B
M28748/13C	Pin	14	-	M28748/13C
M28748/13D	Pin	20	-	M28748/13D
M28748/13E	Pin	26	-	M28748/13E
M28748/13F	Pin	34	-	M28748/13F
M28748/13G	Pin	44	-	M28748/13G
M28748/13H	Pin	50	-	M28748/13H
M28748/14A	Socket	4	-	M28748/14A
M28748/14B	Socket	7	-	M28748/14B
M28748/14C	Socket	14	-	M28748/14C

Table 2. MIL-DTL-28748 Insert Arrangement (Continued)

Military Part Number Insert Type	Contact Type	Number of Contacts	Mounting Style	Insert Arrangement MS Number
M28748/14D	Socket	20	-	M28748/14D
M28748/14E	Socket	26	-	M28748/14E
M28748/14F	Socket	34	-	M28748/14F
M28748/14G	Socket	44	-	M28748/14G
M28748/14H	Socket	50	-	M28748/14H
M28748/15A	Pin	4	Thru Hole	-
M28748/15B	Pin	5	Thru Hole	-
M28748/15C	Pin	7	Thru Hole	-
M28748/15D	Pin	9	Thru Hole	-
M28748/15E	Pin	10	Thru Hole	-
M28748/15F	Pin	12	Thru Hole	-
M28748/16A	Socket	4	Thru Hole	-
M28748/16B	Socket	5	Thru Hole	-
M28748/16C	Socket	7	Thru Hole	-
M28748/16D	Socket	9	Thru Hole	-
M28748/16E	Socket	10	Thru Hole	-
M28748/16F	Socket	12	Thru Hole	-
M28748/18A	Pin	4	Thru Hole	-
M28748/18B	Pin	7	Thru Hole	-
M28748/18C	Pin	14	Thru Hole	-
M28748/18D	Pin	20	Thru Hole	-
M28748/18E	Pin	26	Thru Hole	-
M28748/18F	Pin	34	Thru Hole	-
M28748/18G	Pin	44	Thru Hole	-
M28748/18H	Pin	50	Thru Hole	-
M28748/19A	Socket	4	Thru Hole	-
M28748/19B	Socket	7	Thru Hole	-
M28748/19C	Socket	14	Thru Hole	-
M28748/19D	Socket	20	Thru Hole	-
M28748/19E	Socket	26	Thru Hole	-
M28748/19F	Socket	34	Thru Hole	-
M28748/19G	Socket	44	Thru Hole	-
M28748/19H	Socket	50	Thru Hole	-
M28748/20A	Pin	4	Thru Hole	-
M28748/20B	Pin	7	Thru Hole	-
M28748/20C	Pin	14	Thru Hole	-
M28748/20D	Pin	20	Thru Hole	-
M28748/20E	Pin	26	Thru Hole	-
M28748/20F	Pin	34	Thru Hole	-
M28748/20G	Pin	44	Thru Hole	-

Table 2. MIL-DTL-28748 Insert Arrangement (Continued)

Military Part Number Insert Type	Contact Type	Number of Contacts	Mounting Style	Insert Arrangement MS Number
M28748/20H	Pin	50	Thru Hole	-
M28748/21A	Socket	4	Thru Hole	-
M28748/21B	Socket	7	Thru Hole	-
M28748/21C	Socket	14	Thru Hole	-
M28748/21D	Socket	20	Thru Hole	-
M28748/21E	Socket	26	Thru Hole	-
M28748/21F	Socket	34	Thru Hole	-
M28748/21G	Socket	44	Thru Hole	-
M28748/21H	Socket	50	Thru Hole	-

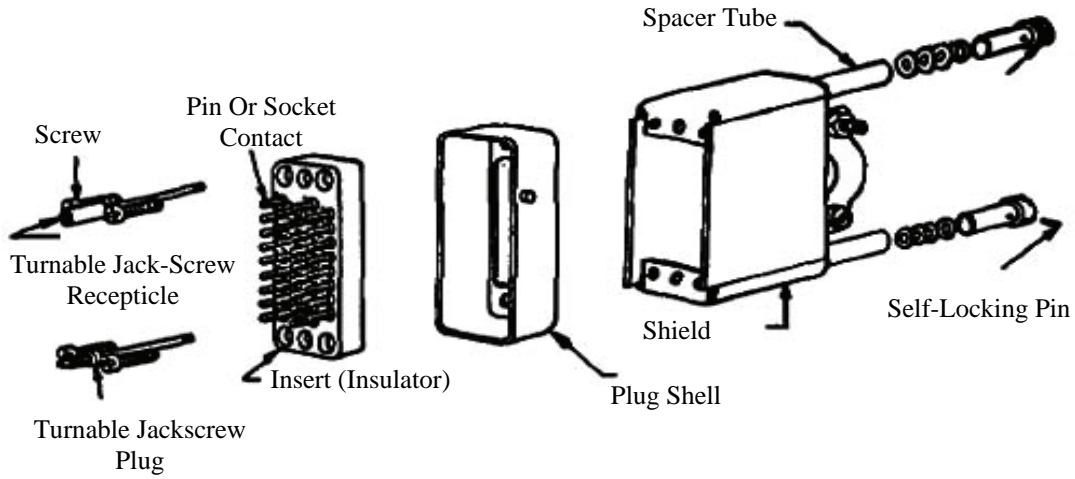
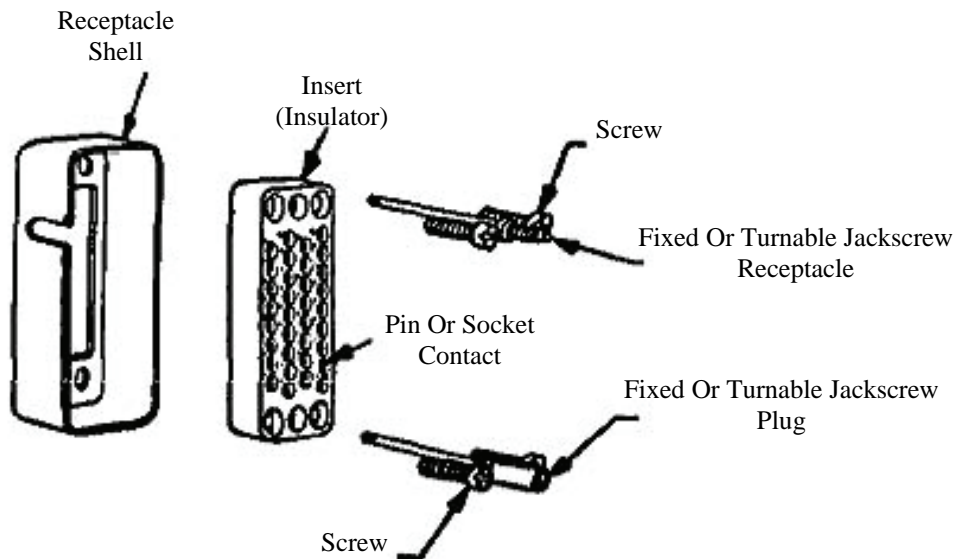


Figure 11. Typical Unmounted Connector



NOTE:
When The Shell Is Used, The Jackscrews
Are Turnable And The Nuts Are Not Used.

Figure 12. Typical Mounted Connector

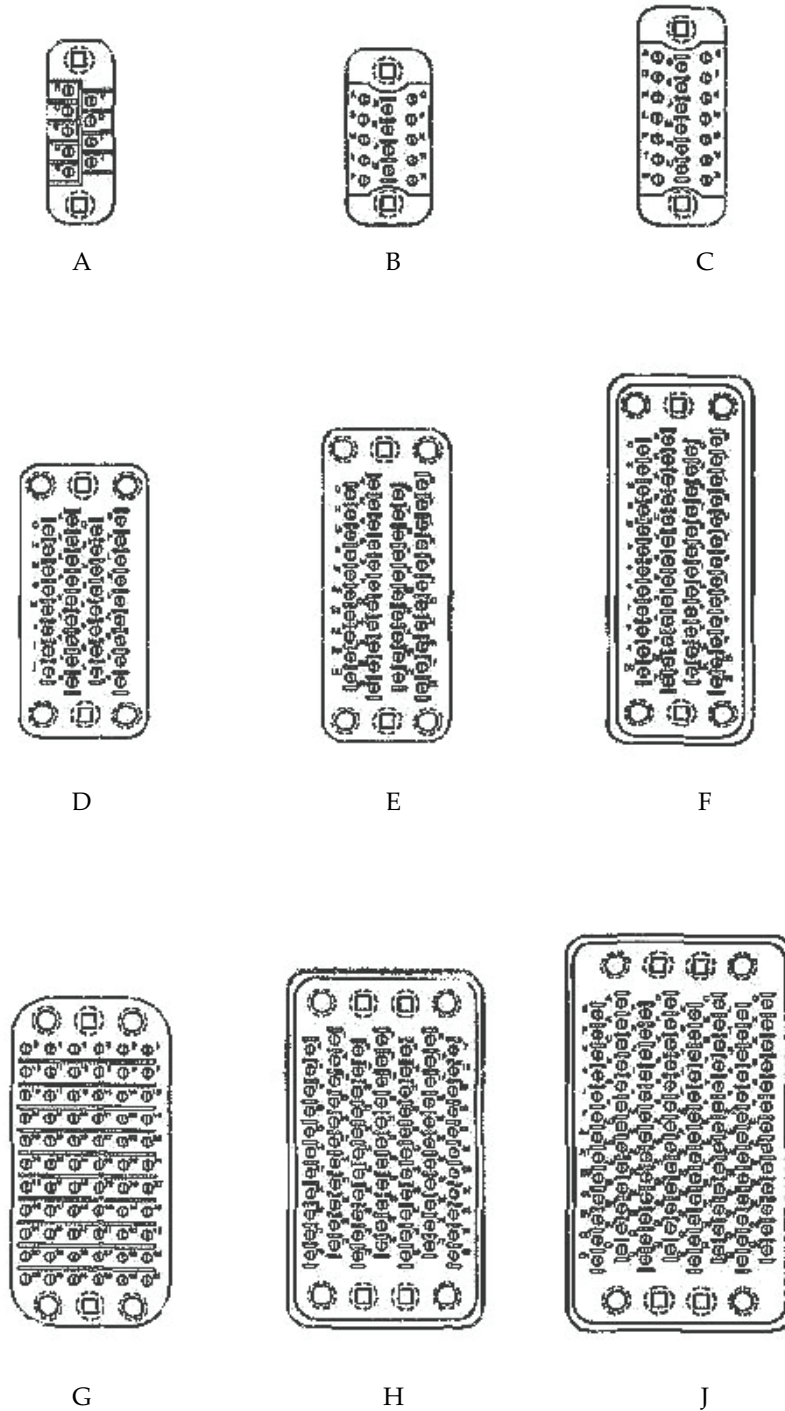
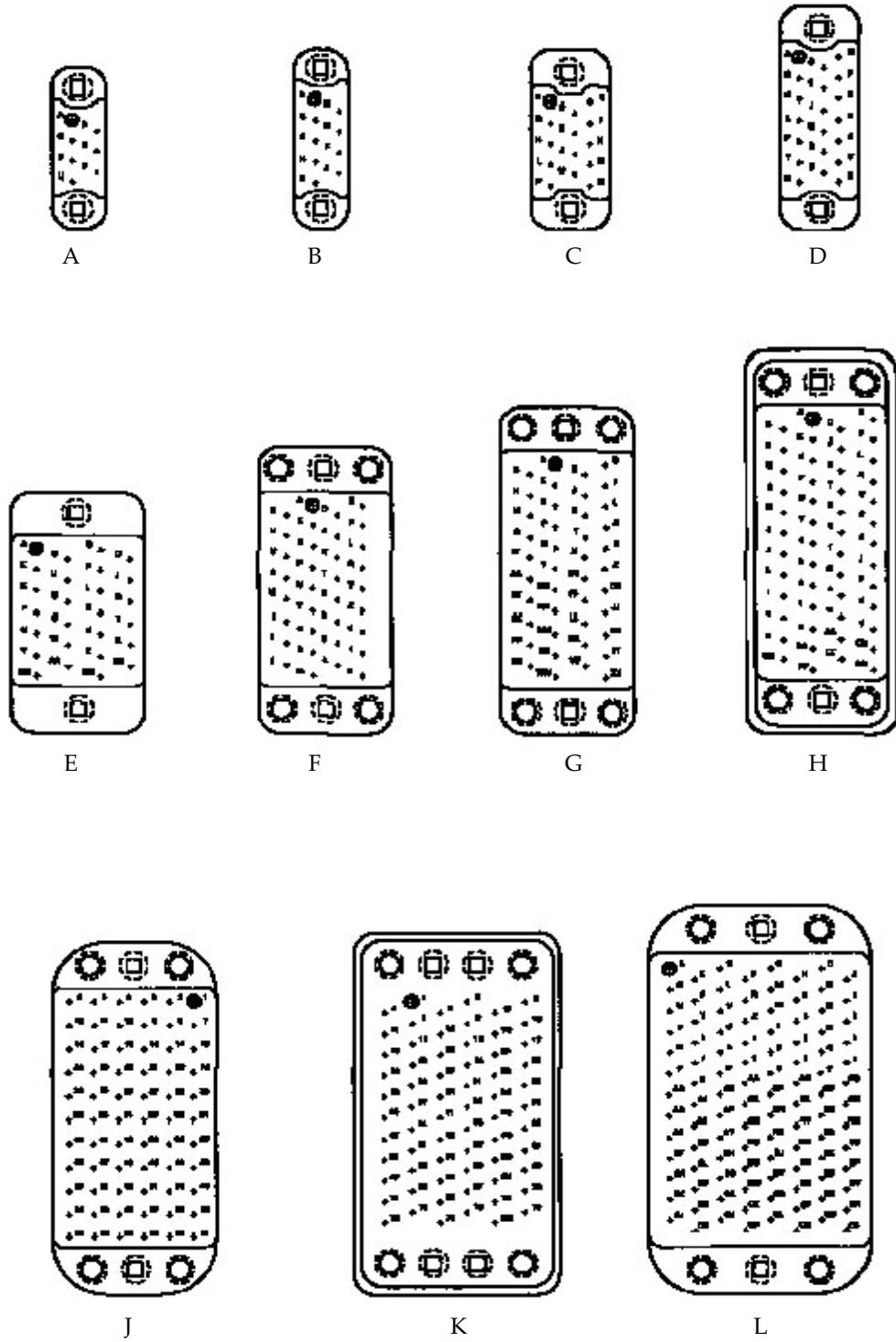
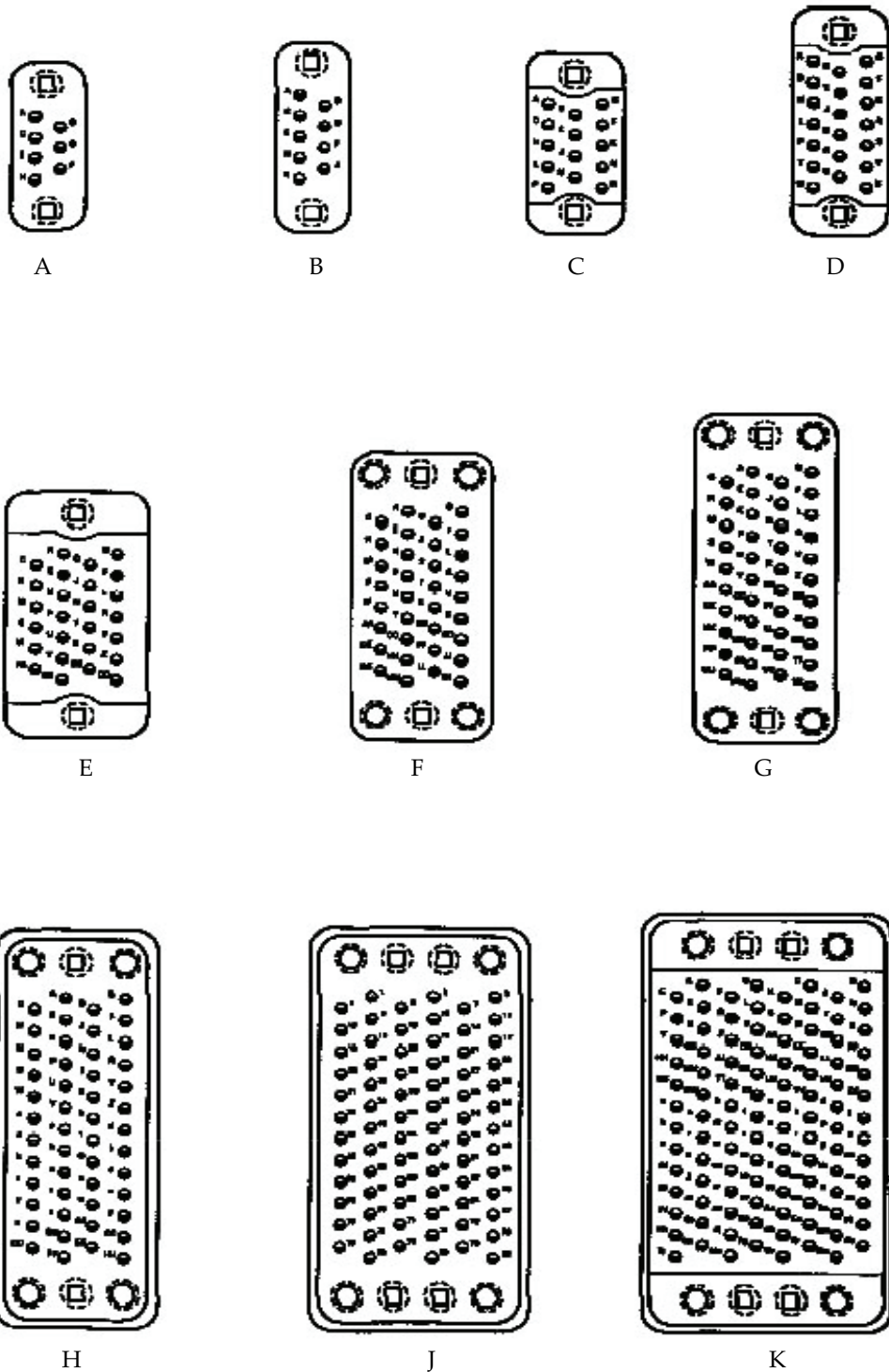


Figure 13. M28748/1 and M28748/2 Insert Configurations



NOTE:
For Contact Refer To Figure 3.

Figure 14. M28748/3 and M28748/4 Insert Configurations



NOTE: Wiring Side Of Pin Shown.

Figure 15. M28748/5 and M28748/6 Insert Configurations

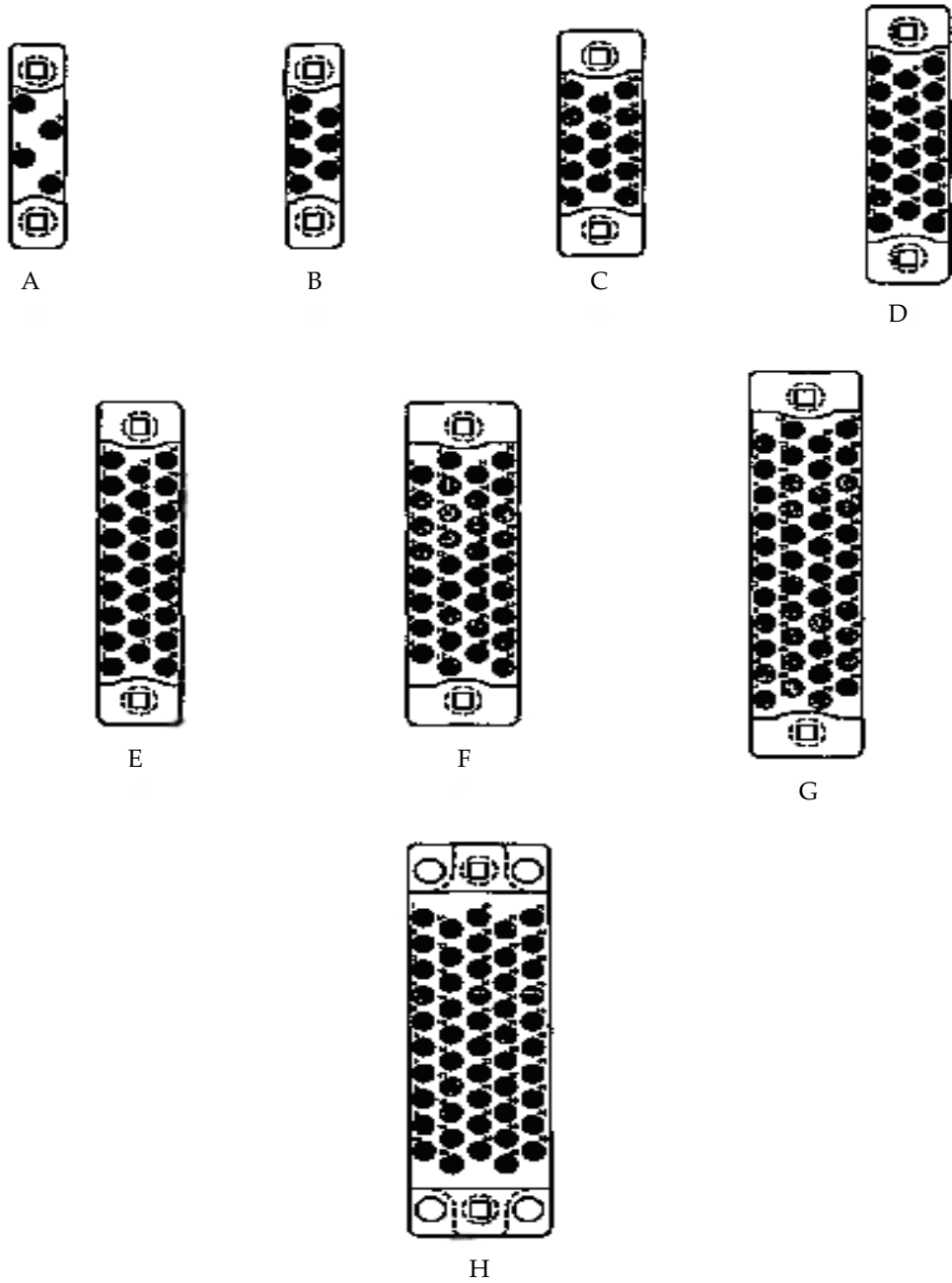
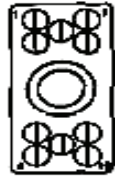
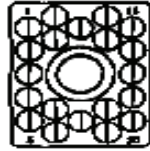


Figure 16. M28748/7 and M28748/8 Insert Configurations



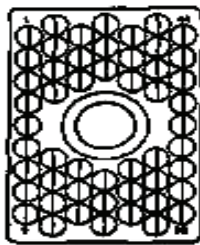
A OR J



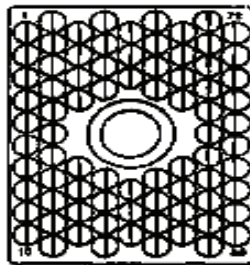
B OR K



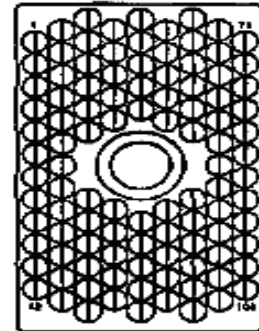
C OR L



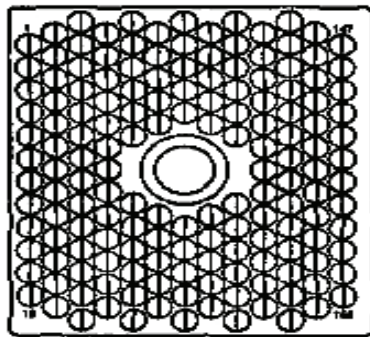
D OR M



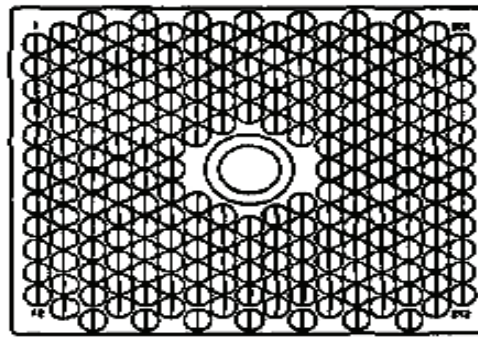
E OR N



F OR P



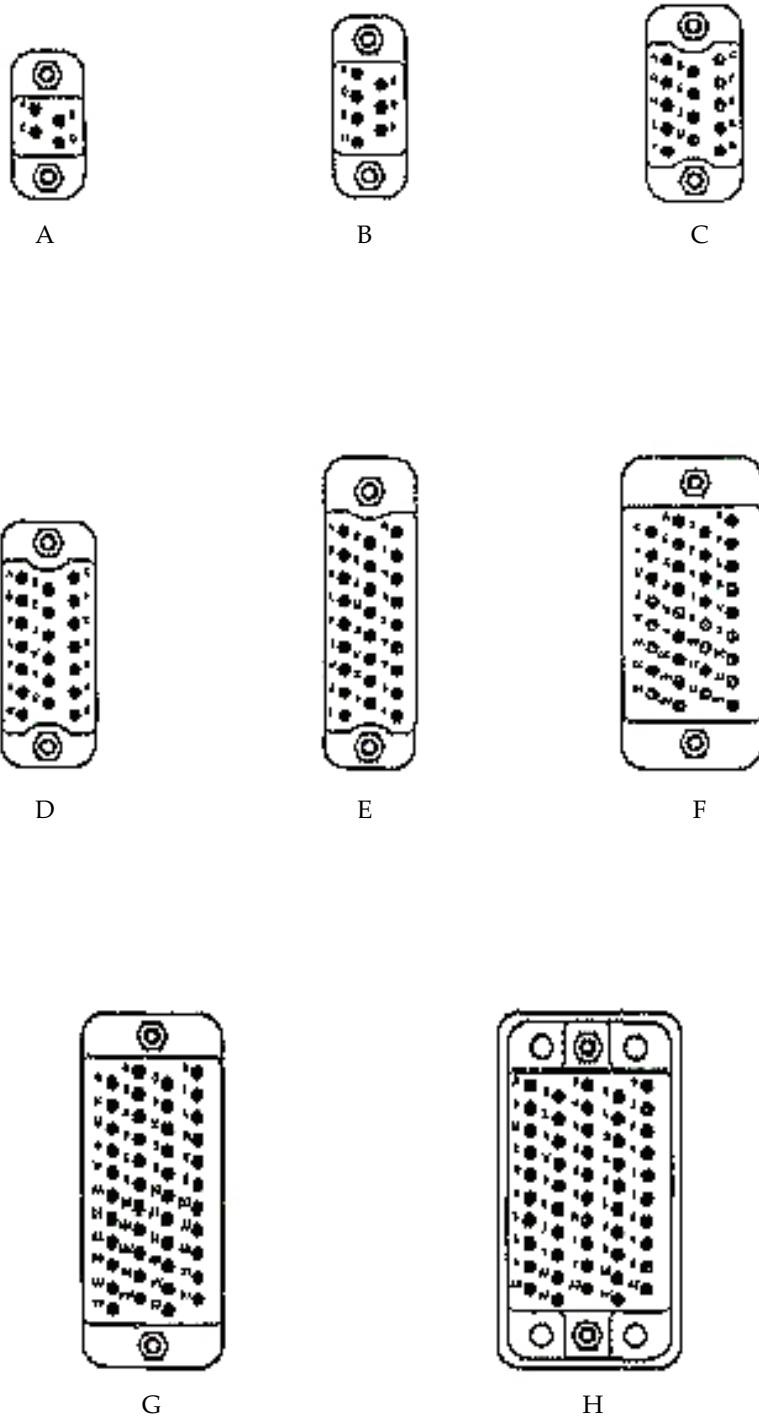
G OR R



H OR S

NOTE: Wiring Side Of Pin Is Shown.

Figure 17. M28748/9 and M28748/10 Insert Configurations



NOTE: Wiring Side Of Pin Shown.

Figure 18. M28748/13 and M28748/14 Insert Configurations

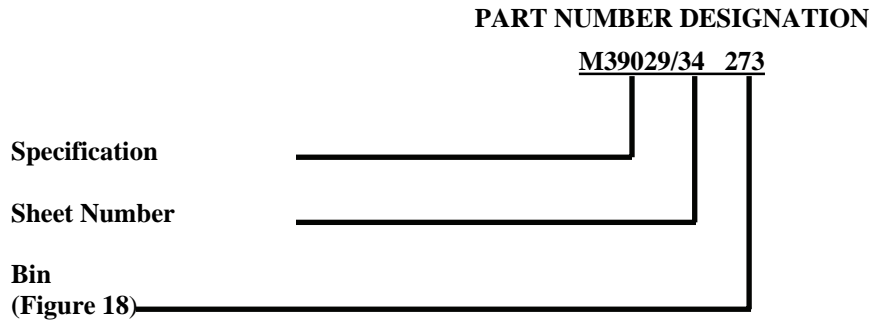
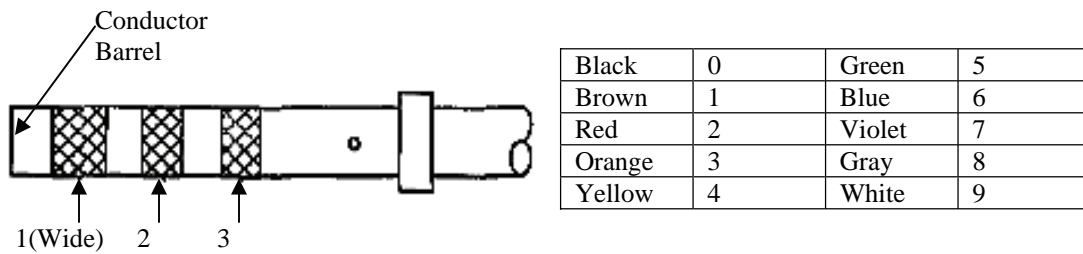


Figure 19. M39029 Part Number Breakdown



Example Bin Code: 463
 Yellow (Wide Band) / Blue / Orange

Figure 20. Basic Identification Code and Color Bands

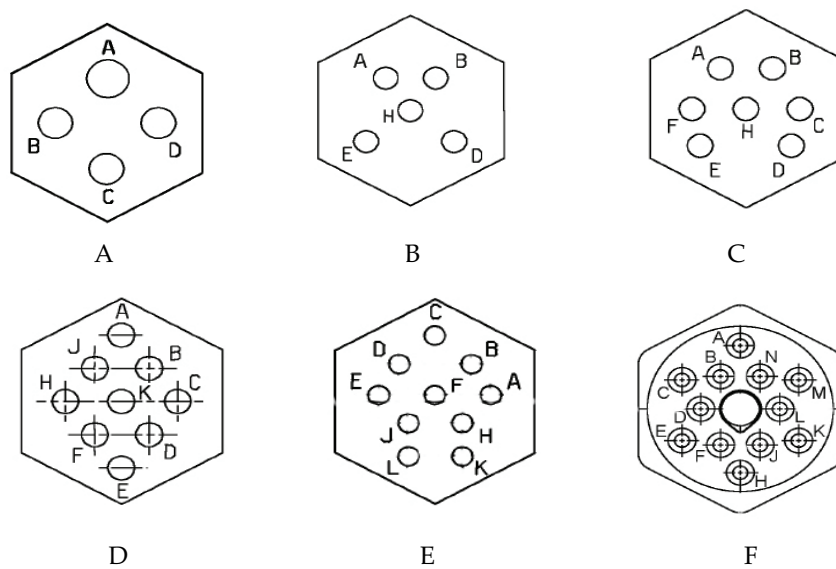


Figure 21. M28748/15 and M28748/16 Insert Configurations

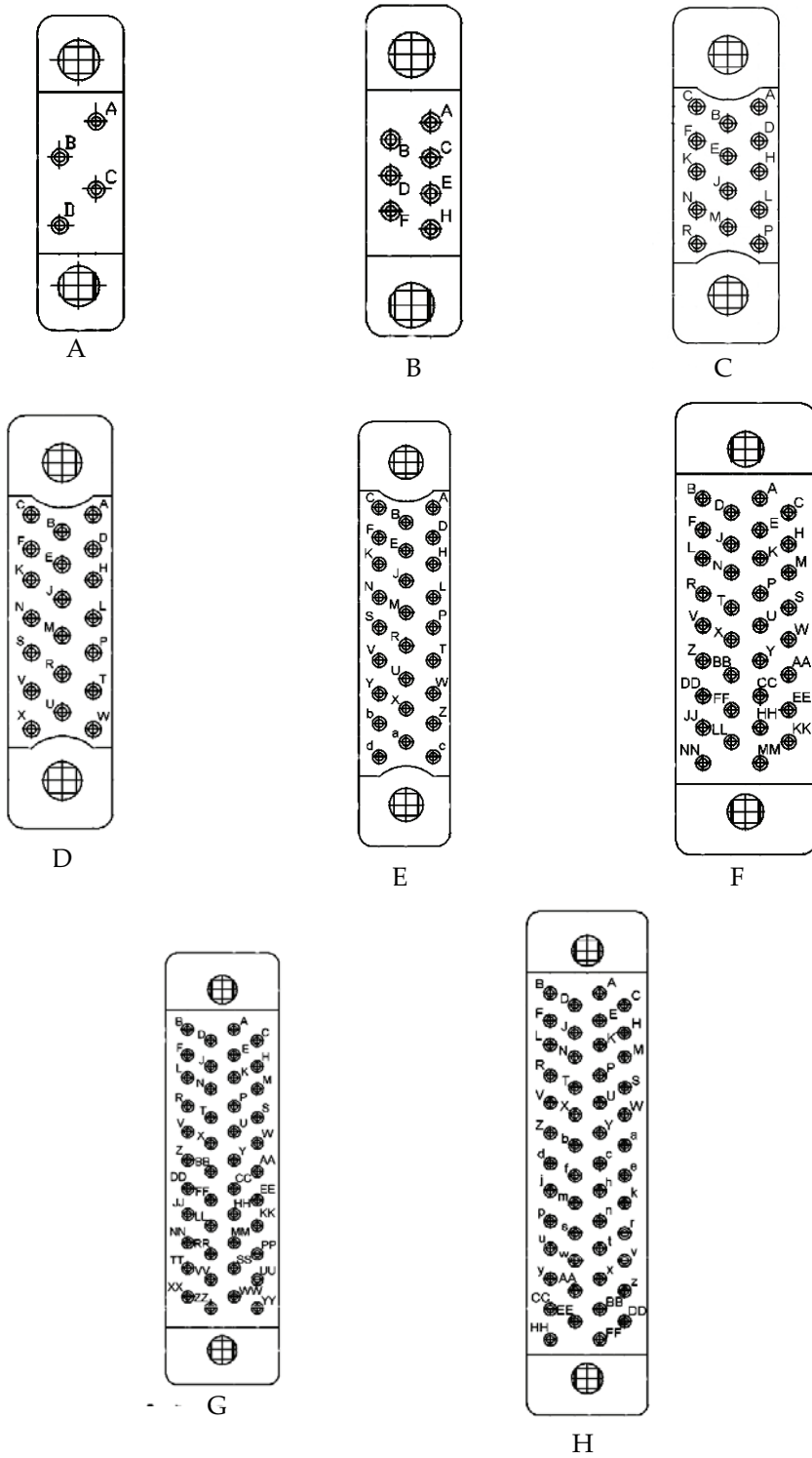


Figure 22. M28748/18 and M28748/19 Insert Configurations

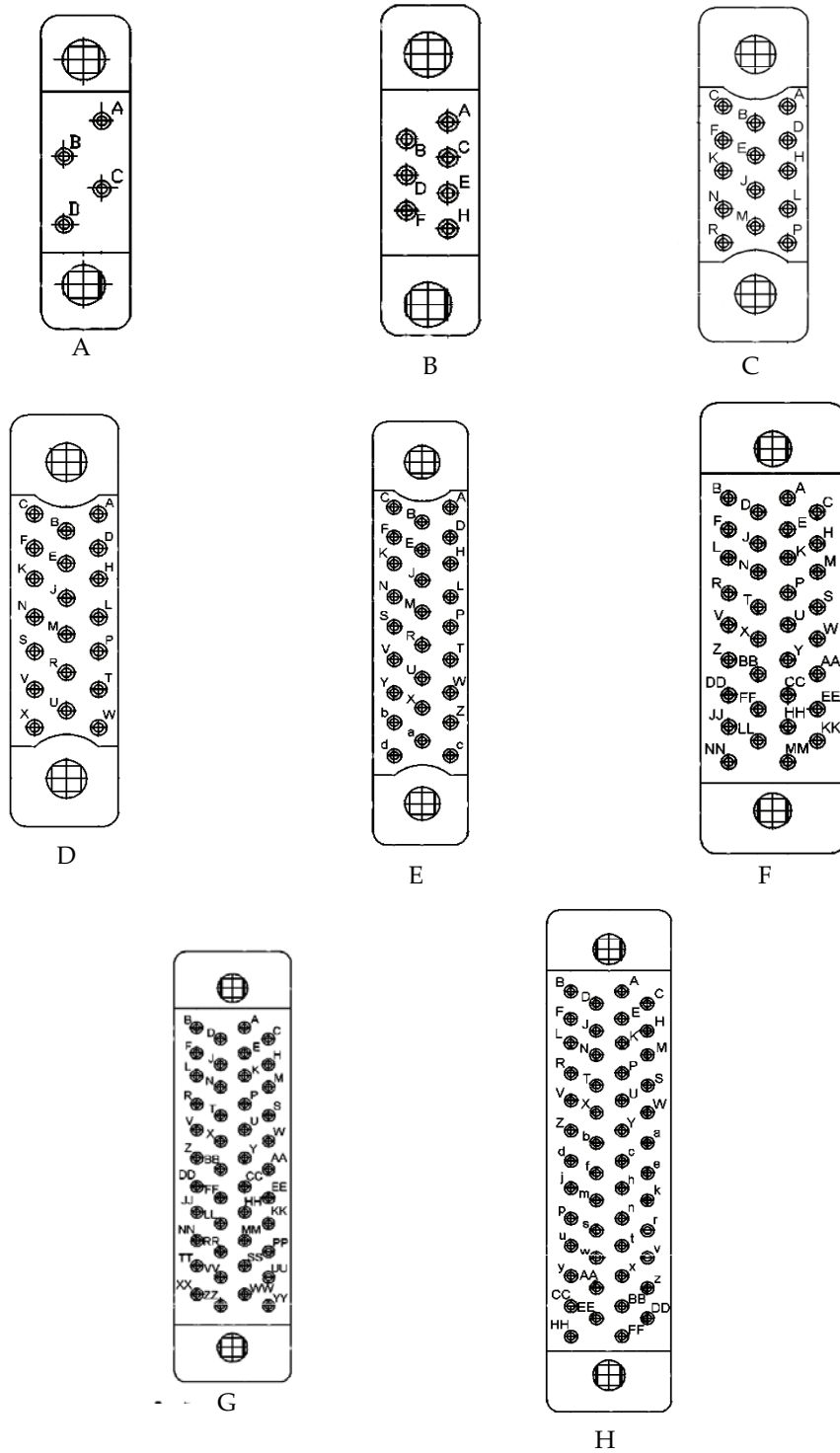
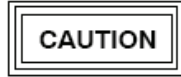


Figure 23. M28748/20 and M28748/21 Insert Configurations

51. **CONNECTOR BUILDUP.**

52. **CONTACT REMOVAL.** Perform the following procedures to remove contacts from connector. Refer to Figure 2 thru 10 for tooling information as they apply to each type of connector. Figure 24 shows a typical removal tool for this connector series.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

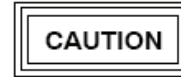
- a. Place wire of contact to be removed into slot of removal tool with tapered end of tool toward contact.
- b. Press tool into slot and slide tool back until tip opens and accepts wire.
- c. Push tool along wire and into contact cavity until it bottoms.
- d. Press wire into shoulder end of slot and hold firmly in place.
- e. Keeping tool axially aligned with contact cavity, pull tool, wire and contact from cavity.

53. **CONTACT INSERTION.** Perform the following procedure to insert contact into connector. Refer to Figure 2 thru 10 for tooling information as they apply to each type of connector. Figure 25 shows a typical removal tool for this connector series.

- a. Cut wire end square and strip 3/16 to 15/64 in. of insulation (NAVAIR01-1A-505-1, WP 009 00).
- b. Insert wire into crimp barrel of contact until it bottoms ensuring wire strands are visible through inspection hole of contact.

c. Crimp contact onto wire (NAVAIR 01-1A-505-1, WP 013 00).

d. Pull wire lightly to ensure a good crimp.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

- e. Inspect contact to ensure no wire strands are outside of contact crimp barrel.
- f. Insert tip of contact and wire into specified contact cavity ensuring contact and wire are axially aligned with cavity.
- g. Push contact into cavity until it bottoms and a click is heard.
- h. Pull lightly on wire to ensure wire retention.

54. **CONNECTOR SEALING.** All unused contact cavities shall be filled with un-crimped contact and followed by a sealing plug. Refer to NA 01-1A-505-1 WP 023 00, paragraphs 30 thru 31 for sealing plug information. If additional sealing is required refer to NAVAIR 01-1A-505-1, WP 025 00.

55. **CONNECTOR BUILDUP - SOLDER CONTACTS.**

56. For buildup procedures using solder contacts refer to NAVAIR 01-1A-505-1, WP 016 00.

57. **CONNECTOR CLEANING AND PRESERVATION.**

58. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1 WP 026 00.

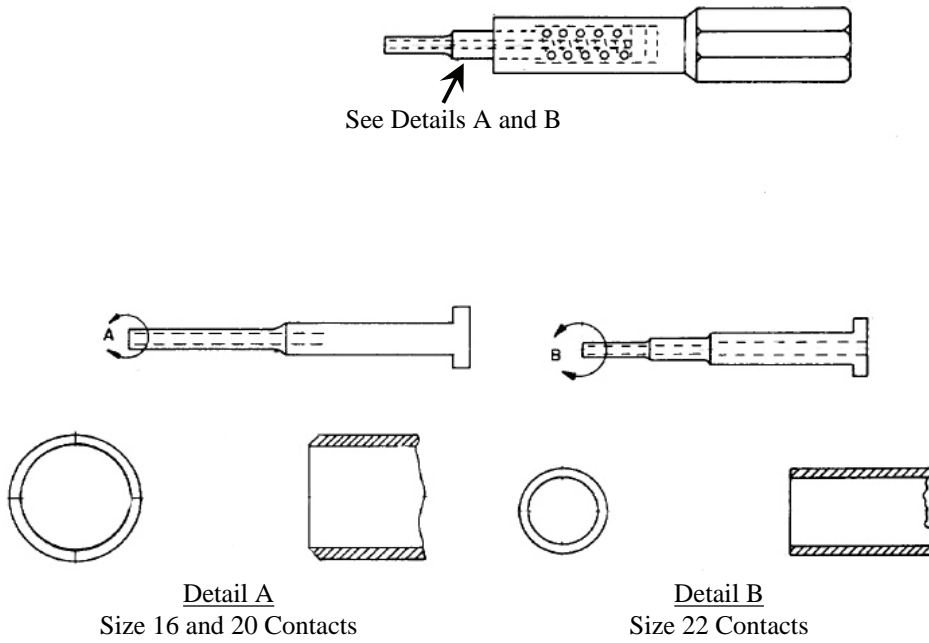


Figure 24. MIL-I-81969/20 Removal Tool

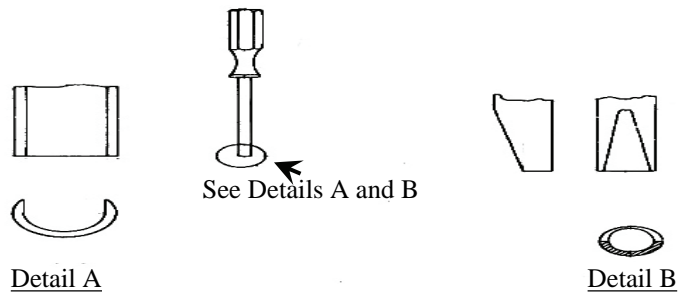


Figure 25. MIL-I-81969/18 Installation Tool

CONNECTOR ACCESSORIES

MIL-DTL-28747

Reference Material

Connectors..... 005 02
Connectors, Electrical, Rectangular, Rack and Panel, Solder Type
and Crimp Type Contacts, General Specification for..... MIL-DTL-28748
Installation Practices, Aircraft Electric and Electronic WiringNAVAIR 01-1A-505-1

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Introduction	1
MIL-DTL-28748 Connector Accessories	1
Guidepins	1
Jackscrews.....	1
Retaining Plates.....	1
Shells.....	1
Shield Installation	2
Shield Removal	2
Shields.....	1

Record of Applicable Technical Directives

None

1. **INTRODUCTION**

2. This Work Package (WP) covers connector accessories used with MIL-DTL-28748 connectors, their function, and procurement information.

3. **MIL-DTL-28748 CONNECTOR ACCESSORIES.**

4. Connector accessories are components added to a connector to enhance its operational characteristics MIL-DTL-28748 accessories are ordered as part of the basic connector assembly refer to WP 015 01. These accessories are divided into the following categories:

- a. Shields
- b. Retaining Plates
- c. Shells
- d. Guidepins
- e. Jackscrews

5. **SIELDS.** A shield is an attachment on the back side of an insulator. It contains an integral clamp mounted either on the top or side. All shields require long jackscrews (Figure 1).

6. **RETAINING PLATES.** Retaining plates are used for rack or panel mounting the connector. When a retaining plate is used there is no shield (Figure 2).

7. **SHELLS.** The shell supports and protects the insulator and is used to mount the connector to the equipment. It is also used for the attachment of coupling and/or shields (Figure 3).

8. **GUIDEPINS.** Guidepins are used to align plug and receptacle connector during mating (Figure 4).

9. **JACKSCREWS.** Jackscrews are used to mate the plug and receptacle connectors and are either long or short configuration. (Figure 5).

10. Protective shells, connector shields and accessories. Unless otherwise specified, protective shells, connector shields, and other accessories shall be made of a high grade aluminum alloy conforming to AMS-QQ-A-250/8, temper H-32 or corrosion-resistant steel conforming to ASTM A582, series 300 (nonmagnetic), or other material satisfactory to the Government. There shall be no assembly of protective shells, connector shields or other accessories made of different materials than specified herein.

11. Configuration of connector accessories for MIL-DTL-28748 connectors is part of connector part number. Refer to WP 005 02 for ordering of the connector assembly to include the accessories associated with them.

12. **SHIELD REMOVAL.** Shields are used to protect and add strength to connectors. When modification or repair to connector is necessary, the shield must be removed. Remove shield in accordance with following procedure:

a. Loosen cable clamp and, if installed, strain relief clamp.

b. Remove four screws from either the side or bottom.

c. Remove shield.

13. **SHIELD INSTALLATION.** Upon completion of maintenance or modification, the shield must be replaced. Install shield in accordance with the following procedure:

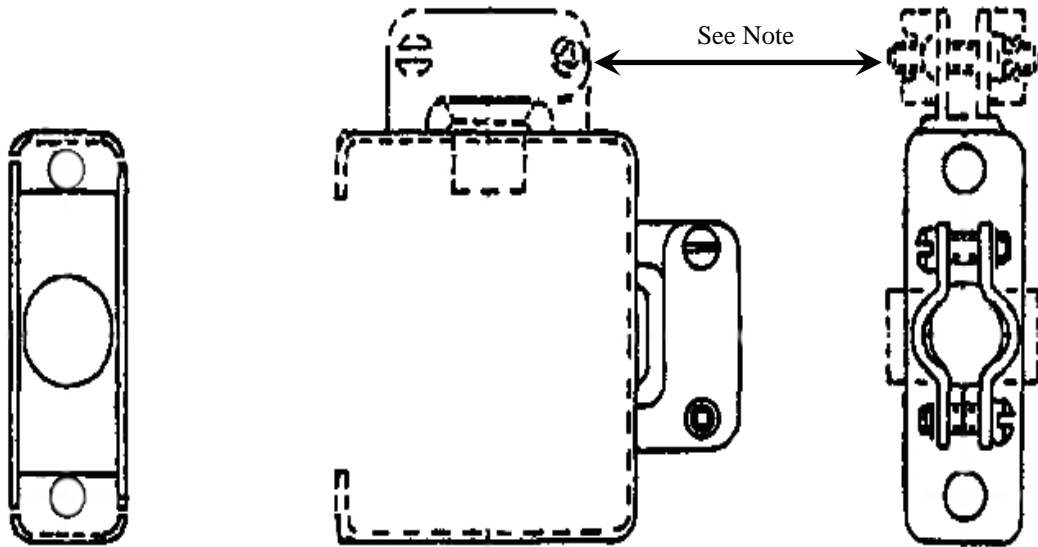
a. Position shield on cable and connector.

CAUTION

Wires can be pinched between metal parts. Ensure no wires are between metal parts before tightening, and while tightening any hardware.

b. Tighten four screws from either the side or bottom.

c. Tighten cable clamp and, if used, strain relief clamp.



Note: Optional Side entry configuration.

Figure 1. Typical shield

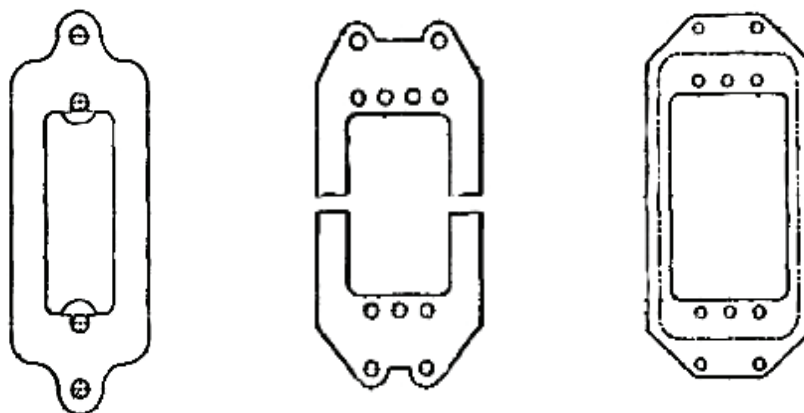


Figure 2. Typical Retaining Plate

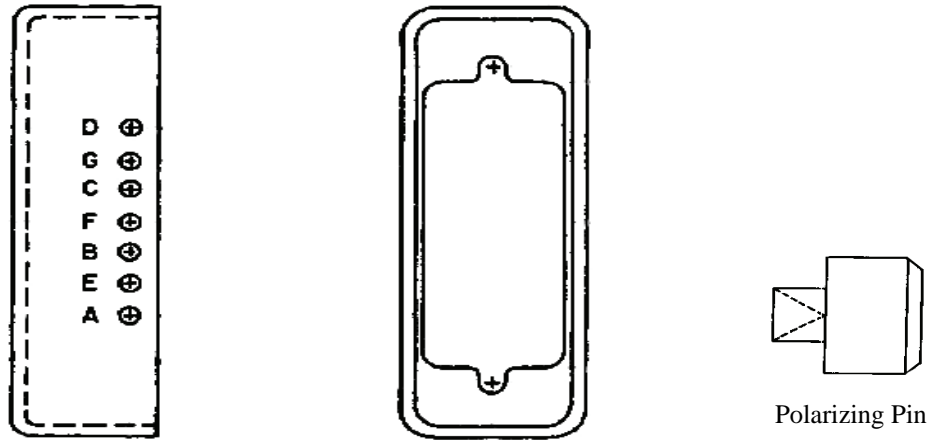


Figure 3. Typical Shell

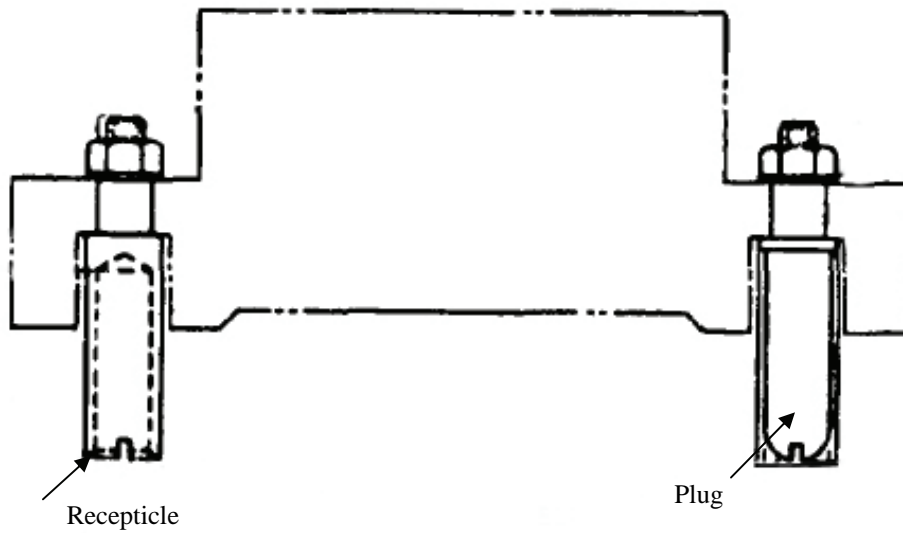
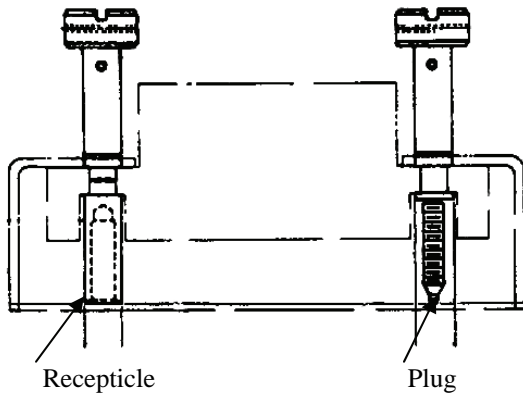
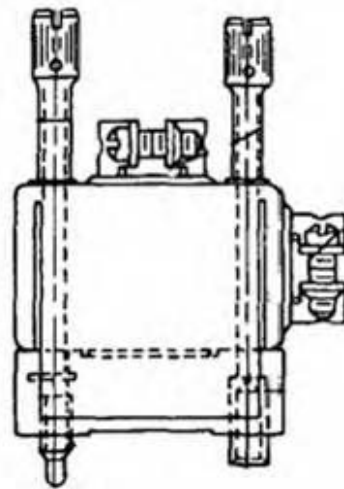


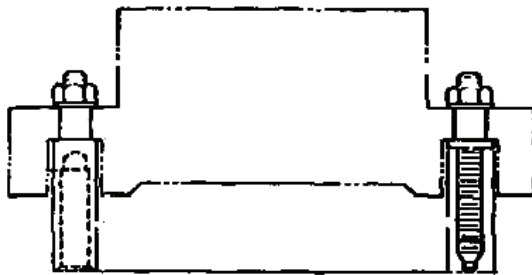
Figure 4. Typical Guidepins



Short Turnable Jackscrew



Long Turnable Jackscrew



Fixed Jackscrew

Figure 5. Typical Jackscrew

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

006 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 28804**

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-DTL-28804	006 03
Connectors MIL-DTL-28804	006 02
Introduction	006 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 28804**

1. **PURPOSE AND SCOPE.**

2. This manual covers all connectors manufactured in accordance with General Specification MIL-DTL-28804. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. **SPECIFICATION UPDATES (ASSIST SEARCH).**

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. **QUALIFIED PRODUCTS LIST (QPL).**

6. The Qualified Products List (QPL) is a list of products which have met the qualification requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-DTL-28804

Reference Material

Installation Practices, Aircraft Electric and Electronic Wiring NA 01-1A-505-1
Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew,
General Specification for MIL-DTL-28804

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	3
Connector Removal and Installation	4
Contact Crimping.....	4
Contact Insertion.....	4
Contact Removal.....	4
Wire Stripping.....	4
Connector Buildup, Solder Contacts	4
Connector Cleaning and Preservation	4
Introduction.....	2
Description.....	2
Wire Sealing	2
MIL-DTL-28804 Connectors.....	2
Contacts	3
Removable contacts	3
Solder contacts.....	3
Design and Construction.....	3
Insert Arrangements.....	3
Insert Configuration	3
Inserts.....	3
Interchangeability	3
Part Number.....	2
Dash Number	3
Military Designation.....	3
Polarization.....	3
Specification Sheet Number	3
Polarization	2
Usage	3
Class E connectors	3
Class G connectors	3
Class E connectors	3
Class P connectors	3
Class S connectors	3
Class SE connectors.....	3

Record of Applicable Technical Directives

None

Support Equipment Required

Part No./ Type Designation	Nomenclature
M22520/2-01	Tool, Crimp, Frame
M22520/2-34	Positioner
M81969/1-04	Tool, Insertion/Removal

Materials Required

Part No./ Type Designation	Nomenclature
TT-I-735 or equivalent.....	Alcohol, Isopropyl
H-B-643 (or equivalent).....	Brush, Acid Swabbing
MIL-F-14256 (or equivalent).....	Flux, Liquid
SnGOWRMAP3 (or equivalent).....	Solder

1. INTRODUCTION.

2. This Work Package (WP) covers environmental and non-environmental polarized subminiature connectors manufactured in accordance with MIL-DTL-28804. These connectors are designed for -67°F (-55°C) to +257°F (+125°C) operating temperature (Figure 1).

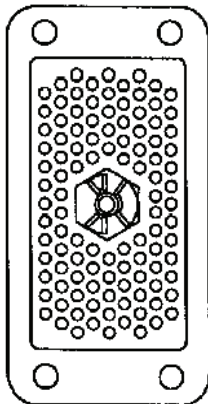


Figure 1. MIL-DTL-28804 Typical Connector

3. **DESCRIPTION.** The connectors covered by MIL-DTL-28804 are classified according to the five following classes (Table 1):

- a. G - General purpose, non-magnetic, high density, size 22, rear release crimp removable contacts.
- b. P - Environment resisting, potting type, nonmagnetic, high density, size 22, rear release crimp removable type contacts.
- c. E - Environment resisting, nonmagnetic, high density, size 22, rear release crimp removable contacts.
- d. S - Solder termination, general purpose, high density, non-removable size 22 contacts.
- e. SE - Solder termination, environment resisting, high density, non-removable size 22 contacts.

4. **WIRE SEALING.** Wire sealing is accomplished by the use of B grommet seal designed to seal against outside diameter of inserted wire. The outer diameter shall be within the range specified (Table 2).

5. MIL-DTL-28804 CONNECTORS.

6. **POLARIZATION.** Polarization is accomplished by hex keys and shall be accomplished before engagement of pins and sockets.

7. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 2).

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

8. **Military Designation.** The military designation is denoted by the letter M.

9. Specification Sheet Number. The specification sheet number denotes the class and contacts.

10. Dash Number. The dash number denotes the shell size and number of contacts.

11. Polarization. The polarization is designated by a letter code (Figure 3).

12. **DESIGN AND CONSTRUCTION**. Connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.

13. **INSERTS**. Inserts are molded or bonded one-piece construction of thermoplastic polyester material. The insert is designed to permit individual insertion and extraction of contacts without use of a retention ring, or removal of insert or sealing members.

14. **INTERCHANGEABILITY**. All MIL-DTL-28804 connectors having the same part number are completely interchangeable with respect to installation and performance. Solder and crimp contact connectors are intermateable.

15. **USAGE**. MIL-DTL-28804 connectors are used in equipment wherein presence of residual magnetism must be held to very low levels to avoid interference with nearby sensitive instrumentation as listed below:

16. Class G connectors. Class G connectors are intended for use in non-environmental resisting applications where the operating temperature range of -67°F (-55°) to +257°F (+125°C) is experienced. Crimp contact connectors have the additional advantage of possessing rear removable crimp type contacts.

17. Class P connectors. Class P connectors are intended for environmental resisting applications where sealing around wires is accomplished by potting.

18. Class E connectors. Class E connectors are intended for environmental resisting applications.

19. Provisions are made for sealing around wire at rear of connectors. Crimp contact connectors have the advantage of possessing rear release crimp type contacts.

20. Class S connectors. Class S connectors are supplied with non-removable solder post terminations. This connector is intended for use with flexible printed

circuits conforming to the pin pattern. Thread inserts are provided for securing printed circuit to rear of connector.

21. Class SE connectors. Class SE connectors are supplied with non-removable solder post terminations and interfacial seal. They are for use with the same circuitry as the class S connectors.

22. **INSERT ARRANGEMENTS**. The insert arrangement is the number and size of contacts available by shell size (Table 3).

23. **INSERT CONFIGURATION**. The insert configuration is the manner in which contacts are placed within insert in a, standard configuration (Figure 4).

24. **CONTACTS**. The type of contacts used on MIL-DTL-28804 connectors are as follows:

25. Solder Contacts. Solder contacts are non-removable from the insert and have solder post terminals.

26. Removable Contacts. Removable contacts are in accordance with MIL-DTL-28804/9 (pin) and MIL-DTL-28804/10 (socket). The inserts are designed to provide positive individual contact retention, and individual contact release from the rear of the connector, using M81969/1-01 tool. Crimp barrels are designed to be crimped by a M22520/2-01 tool (Figure 5).

27. **CONNECTOR BUILDUP**.

28. **WIRE STRIPPING**. Strip wire in accordance with following procedure:

a. Cut wire to proper length. Ensure enough wire remains for adequate strain relief without leaving excess slack.

b. Strip insulation from end of wire (NAVAIR 01-1A-505-1, WP 009 00).

29. **CONTACT CRIMPING**. Crimp contact in accordance with following procedure:

a. Insert wire into crimp barrel of contact until it bottoms, ensuring wire strands are visible through inspection hole of contact.

b. Using M22520/2-01 crimp tool, crimp contact to wire (NAVAIR 01-1A-505-1, WP 013 00).

30. **CONTACT INSERTION.** Insert wired and unwired contacts in accordance with following procedure:

a. Insert tip of contact and wire into specified contact cavity, ensuring contact and wire are axially aligned with cavity.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

b. Push contact using M81969/1-04 insertion tool, into cavity until it bottoms and a click is heard (Figure 6).

31. **CONTACT REMOVAL.** Remove contacts from connector in accordance with following procedure:

WARNING

Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.

a. Place wire of contact to be removed into slot of M81969/1-04 removal tool with tapered end of tool toward contact.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

b. Press tool into slot and slide tool back until tip opens and accepts wire.

c. Push tool along wire and into contact cavity until it bottoms.

d. Press wire into shoulder end of slot and hold firmly in place.

e. Keeping tool axially aligned with contact, pull tool, wire and contact from cavity (Figure 7).

32. **CONNECTOR REMOVAL AND INSTALLATION.** If the connector is severely damaged or cannot be repaired using the above procedures, replace the connector as follows:

a. Starting from outside of damaged connector, tag wires and remove all contacts from connector (Paragraph 31). If contact cannot be removed, cut wire as close to connector as possible and attach new contact (Paragraphs 28 and 29).

b. Starting from center of new connector, insert contact into correct cavity (Paragraph 30). Remove tag from wire. Repeat step until all contacts are installed in new connector.

33. **CONNECTOR BUILDUP SOLDER CONTACTS.**

34. For buildup procedures for solder contacts refer to NAVAIR 01-1A-505-1, WP 016 00.

35. **CONNECTOR CLEANING AND PRESERVATION.**

36. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00

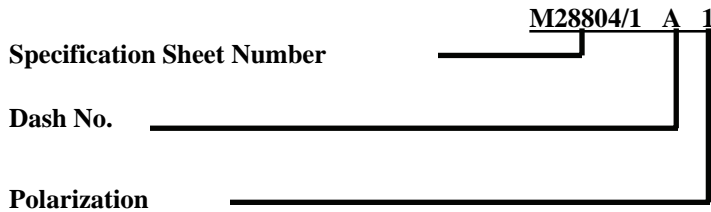
Table 1. MIL-DTL-28804 Description

Specification/ Sheet Number	Contacts					Environ- mental			Coupling Type
	Solder	Crimp		Size	Number		Material	Finish	
		Front Release	Rear Release						
M28804/1, /2	-	-	Yes	22	14 ´ 244	-	All Plastic	-	Center Screw
M28804/3, /4	-	-	Yes	22	14 ´ 244	Yes	All Plastic	-	Center Screw
M28804/5, /6	-	-	Yes	22	14 ´ 244	Yes	All Plastic	-	Center Screw
M28804/7, /8	PCB	-	-	22	14 ´ 244	-	All Plastic	-	Center Screw
M28804/11	PCB	-	-	22	14 ´ 244	Yes	All Plastic	-	Center Screw

Table 2. Wire Size and Diameters

Wire Size (AWG)	Finished Wire OD (inch)	
	Minimum	Maximum
26, 24, 22	0.030	0.054

PART NUMBER DESIGNATION



Specification Sheet No.	
M28804/1	Class G Non-Environmental Receptacle, Crimp Removable Socket Contacts.
M28804/2	Class G Non-Environmental Plug, Crimp Removable Pin Contacts.
M28804/3	Class E Environmental Receptacle, Crimp Removable Socket Contacts.
M28804/4	Class E Environmental Plug, Crimp Removable Pin Contacts.
M28804/5	Class P Environmental Potting Type Receptacle, Crimp Removable Socket Contacts.
M28804/6	Class P Environmental Potting Type Plug, Crimp Removable Socket Contacts.
M28804/7	Class S Non-Environmental Receptacle, Solder Tail Socket Contacts.
M28804/8	Class S Non-Environmental Plug, Solder Tail Pin Contacts.
M28804/9	Size 22 Removable Pin Contacts.
M28804/10	Size 22 Removable Socket Contact.
M28804/11	Class Se Environmental Plug, Interfacial Seal, Solder Tail Pin Contacts.

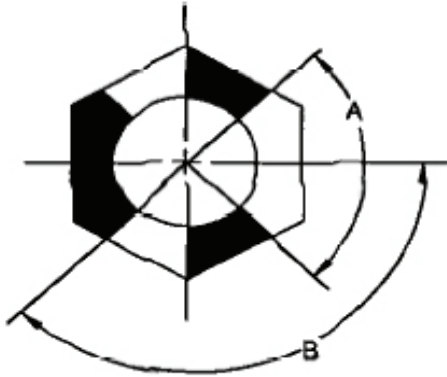
Dash No.	
1	Shell Size 8, 14 Contacts Standard Hardware
2	Shell Size 10, 38 Contacts Standard Hardware
3	Shell Size 12, 88 Contacts Standard Hardware
4	Shell Size 14, 108 Contacts Standard Hardware
5	Shell Size 16, 132 Contacts Standard Hardware
6	Shell Size 18, 244 Contacts Standard Hardware
7	Shell Size 8, 14 Contacts Reversed Hardware
8	Shell Size 10, 38 Contacts Reversed Hardware
9	Shell Size 12, 88 Contacts Reversed Hardware
10	Shell Size 14, 108 Contacts Reversed Hardware
11	Shell Size 16, 132 Contacts Reversed Hardware
12	Shell Size 18, 244 Contacts Reversed Hardware

Standard Hardware Consists Of Receptacle With Fixed Jacksocket. Plug With Turnable Jackscrew.

Reversed Hardware Consists Of Receptacle With Turnable Jacksocket, Plug With Fixed Jackscrew.

Figure 2. MIL-DTL-28804 Part Number Breakdown

To Polarize Connectors, Boss Is Mounted In The Insulator With The Largest Opening Adjacent To The Polarization Letter On The Insulator. Two Types Of Bosses Are Used To Prevent 180° Mismatching Since The Contact Arrangements Are Symmetrical.



POLARIZATION	A	B
N, V, W	90°	135°
X, Y, Z	85°	137°30'

Figure 3. MIL-DTL-28804 Polarization Key

Table 3. MIL-DTL-28804 Insert Arrangements

Shell Size Insert Arrangement	Contact Size	Number of Contacts	Remarks (Notes 1 and 2)
8	22	14	Standard Hardware
8	22	14	Reversed Hardware
10	22	38	Standard Hardware
10	22	38	Reversed Hardware
12	22	88	Standard Hardware
12	22	88	Reversed Hardware
14	22	108	Standard Hardware
14	22	108	Reversed Hardware
16	22	132	Standard Hardware
16	22	132	Reversed Hardware
18	22	244	Standard Hardware
18	22	244	Reversed Hardware

NOTES:

1. Standard hardware consists of receptacle with fixed jackscrew; plug with turnable jackscrew.
2. Reversed hardware consists of receptacle with turnable jackscrew; plug with fixed jackscrew.

Face View Of Pin Insulators Shown

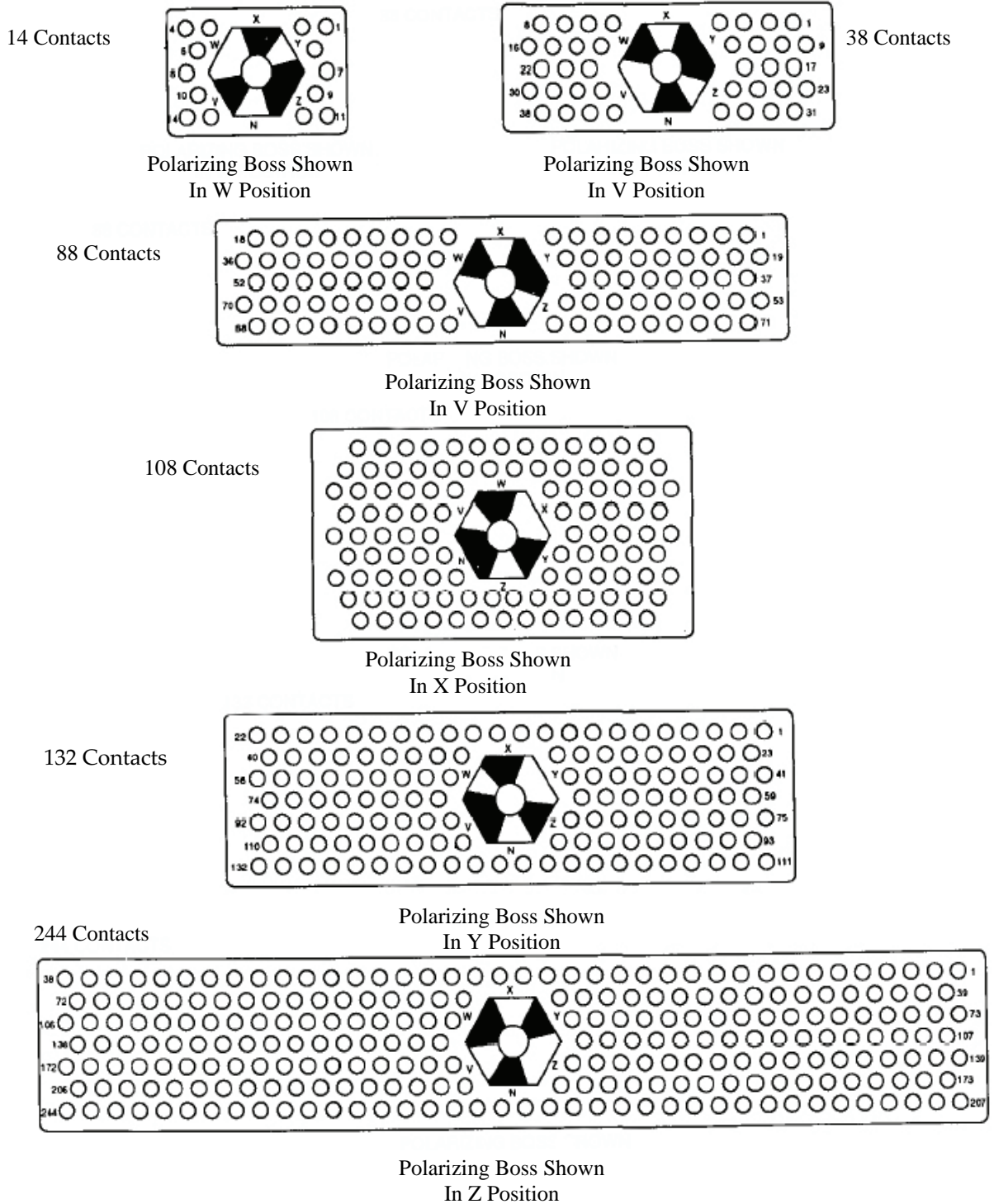


Figure 4. MIL-DTL-28804 Insert Configurations

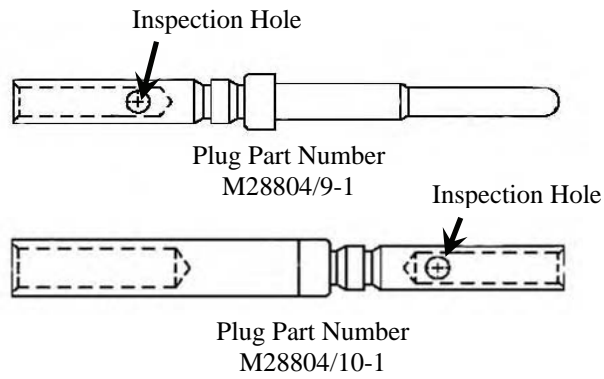


Figure 5. MIL-DTL-28804 Contact Part Number

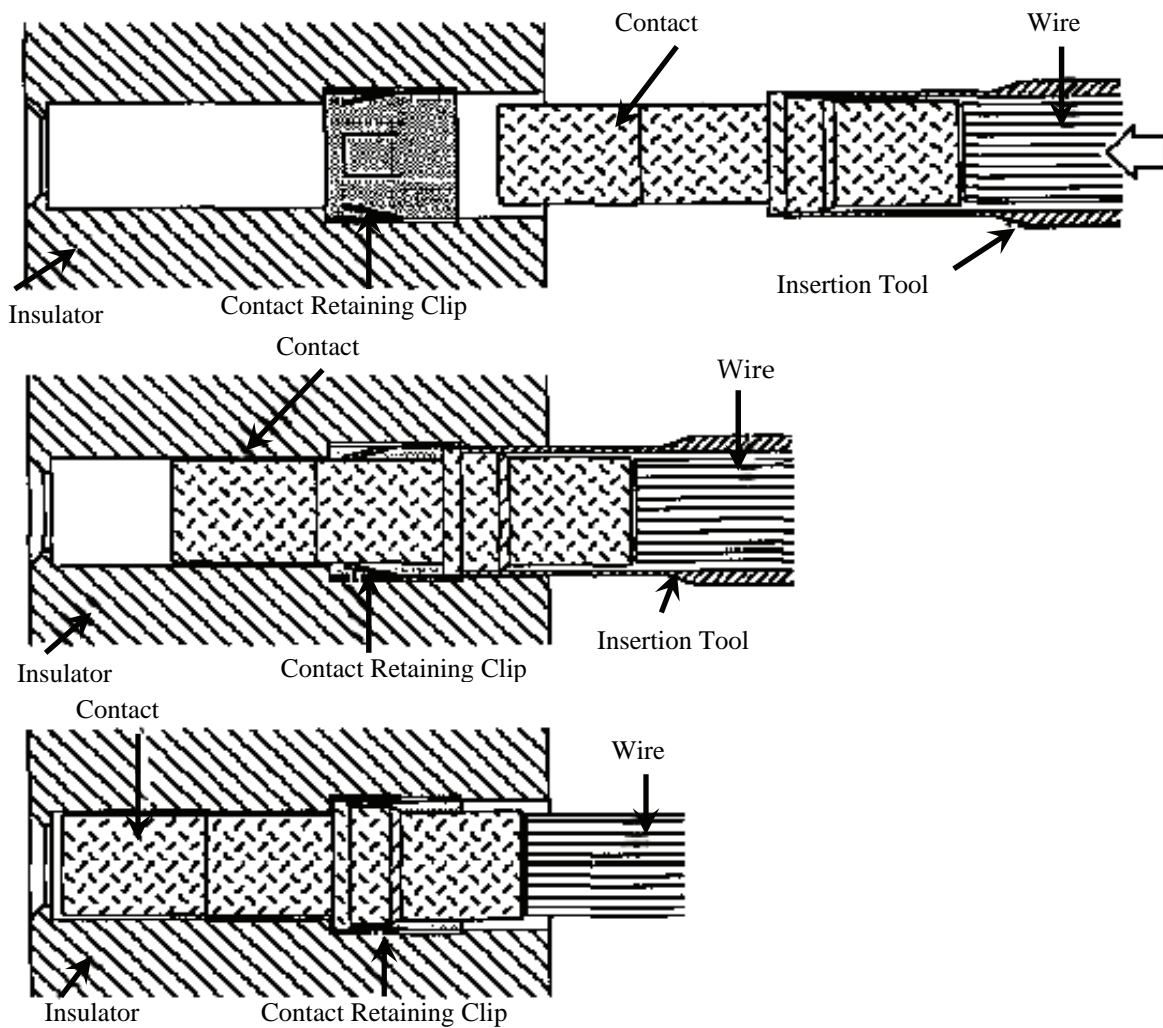


Figure 6. Contact Insertion

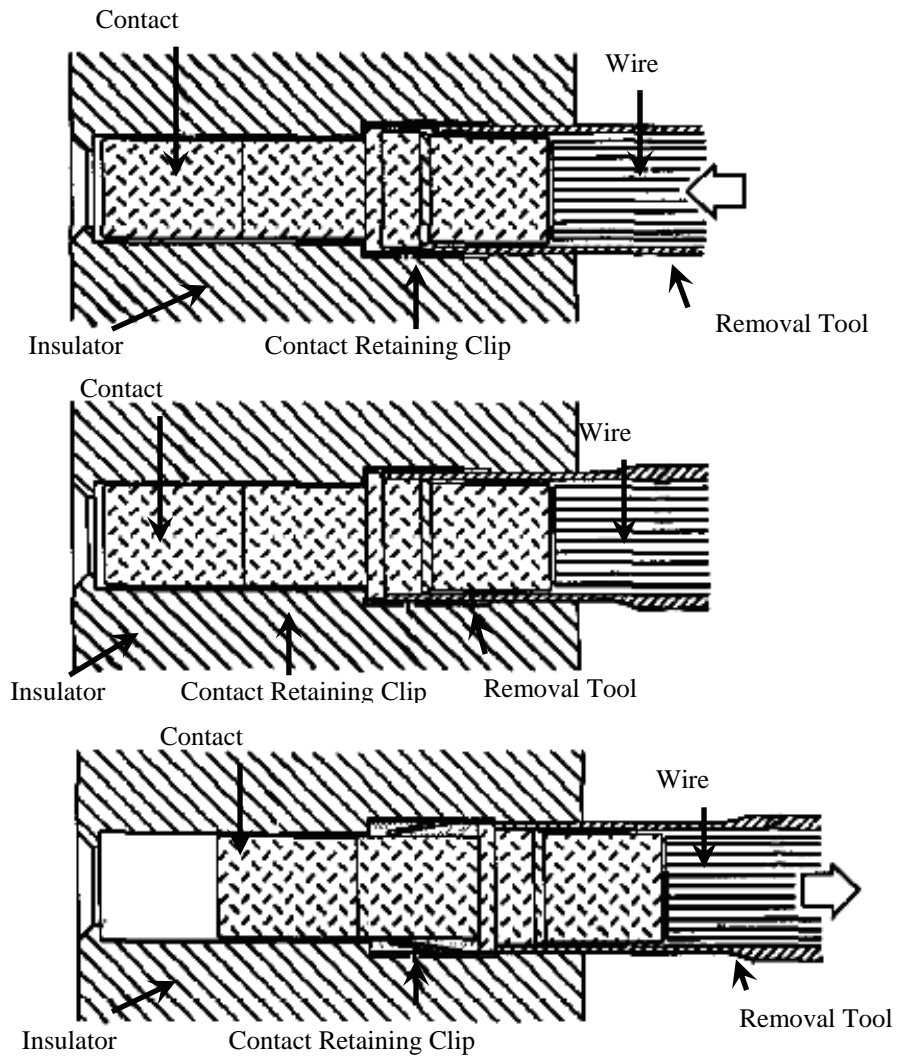


Figure 7. Contact Removal

CONNECTOR ACCESSORIES

MIL-DTL-28804

Reference Material

None

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Backshells	1
Introduction.....	1
MIL-DTL-28804 Connector Accessories	1

Record of Applicable Technical Directives

None

1. **INTRODUCTION.**

2. This Work Package (WP) covers connector accessories used with MIL-DTL-28804 connectors, their function and procurement information.

3. **MIL-DTL-28804 CONNECTOR ACCESSORIES.**

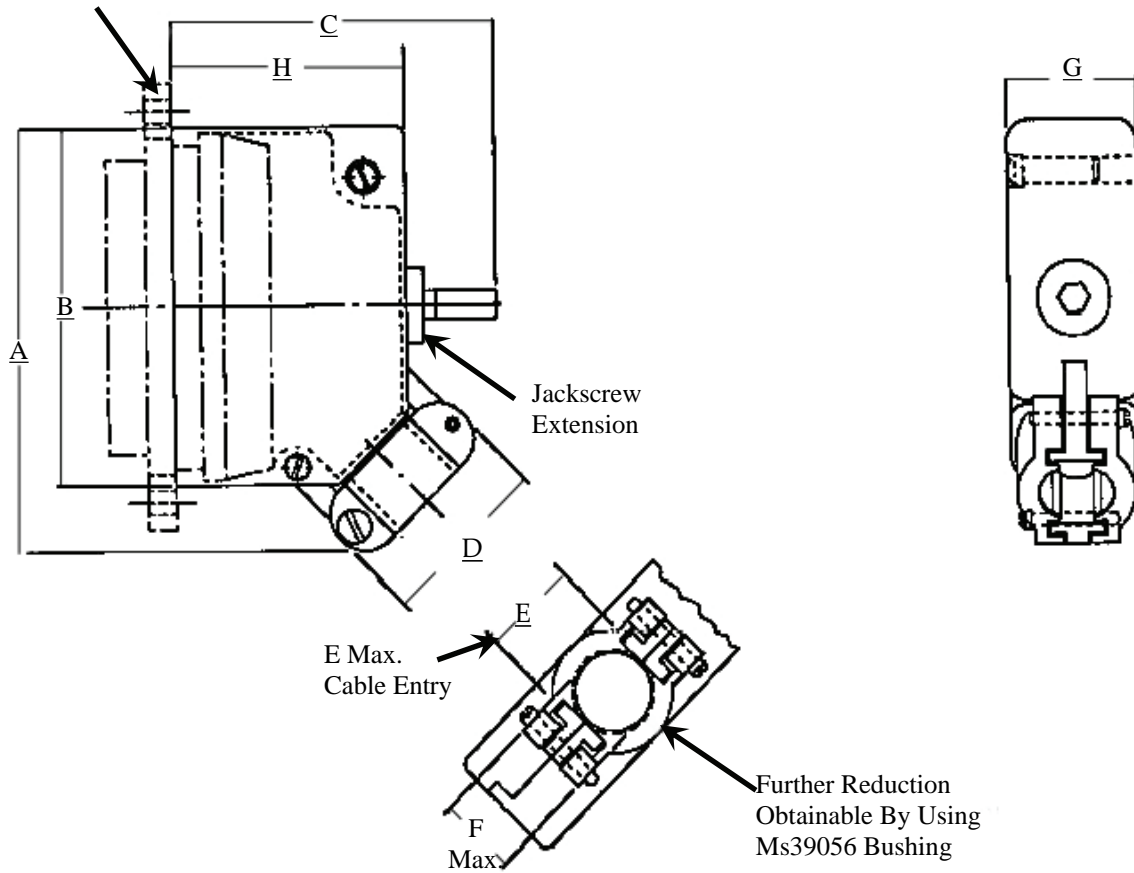
4. Connector accessories are components added to a connector to enhance its operational characteristics.

5. **BACKSHELLS.** Backshells are devices that protect contact terminations. They contain integral cable clamps (Figure 1).

Use Only With Crimp Removable
Rear Release Connector (Not For Solder Type)

Material:	
Back Shell And Clamp	Aluminum Alloy A380 Per AMS 4291G
Screws & Extension	Cres.
Finish:	
Back Shell And Clamp	Anodize Per Mil-A-8625, Type Ii, Class 2, Dyed Black
Screws & Extension	Passivated

Connector Body



Ordering Nomenclature with Extension	Ordering Nomenclature without Extension	Shell Size	No. of Contacts	A	B	C	D	E	F	G	H
RAC0038H00*	RAC0038H00	10	38	1.96	1.41	1.85	1.01	.43	.43	.73	1.460
RAC0088H00*	RAC0088H00	12	88	2.70	2.25	1.91	1.18	.60	.60	.73	1.460
RAC0108H00*	RAC0108H00	14	108	2.30	1.64	2.19	1.28	.70	.70	1.08	1.675
RAC0132H00*	RAC0132H00	16	132	2.78	2.26	1.97	1.34	.76	.76		1.460
RAC0244H00*	RAC0244H00	18	244	4.02	3.60	2.20	1.67	1.10	.76	.91	1.715

NOTE

* Insert 5 For Environmental And Potting

Figure 1. MIL-DTL-28804 Backshells

ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-C- 81659

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-C-81659	007 03
Connectors MIL-C-81659	007 02
Introduction	007 01

INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-C- 81659

1. **PURPOSE AND SCOPE.**

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-C-81659. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. **SPECIFICATION UPDATES (ASSIST SEARCH).**

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. **QUALIFIED PRODUCTS LIST (QPL).**

6. The Qualified Products List (QPL) is a list of products which have met the qualification requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-C-81659 SERIES 1 AND 2

Reference Material

Installation Practices, Aircraft Electric and Electronic Wiring	NAVAIR 01-1A-505-1
Connectors, Electrical, Rectangular, Crimp Contact, General Specification for	MIL-C-81659

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	24
Connector Buildup Solder Contacts	31
Connector Cleaning and Preservation.....	31
Connector Removal and Installation	31
Connector Sealing	26
Moisture Barrier.....	26
Sealing Plugs	26
Contact Crimping	24
Contact Insertion	25
Contact Removal	26
Broken Wire Contact Removal	29
Crimp Front Release Contacts	26
Crimp Rear Release Contact.....	26
Unwired Contact Removal.....	28
Wired Contact Removal.....	27
Wire Diameter Buildup	24
Wire Stripping	24
Introduction	3
Description	3
Class Description	3
Series Designation	4
Shell Designation.....	4
Types	3
Wire Sealing.....	4
MIL-C-81659, Series 1.....	4
Cable and Coaxial Contact Assembly	14
Coaxial Contacts	14
Contact Application.....	14
Contacts.....	10
Contact Availability	14
Crimp Removable Contacts	14
Installation and Removal Tools	14
Coupling	4
Design and Construction	10
Grommet Sealing Plugs.....	4
Insert Arrangements	10
Insert Configuration.....	10
Inserts	10

NAVAIR 01-1A-505-3
T.O. 00-25-255-2
TM1-1500-323-24-3

Closed-Entry Socket Contacts	10
Contact Extraction	10
Contact Insertion	10
Contact Retaining Clip	10
Crimp Snap-in Contacts	10
Interfacial Seal	10
Keying	10
Moisture Sealing	10
Peripheral Seal	10
Shell Seal	10
Wire Seal	10
Interchangeability	10
Part Number	4
Insert Designation	5
Military Specification	4
Series Designation	5
Shell Designation	5
Specification Sheet	5
Polarization	4
Power Contacts	14
Shell	4
Tooling	14
MIL-C-81659, Series 2	14
Cable and Coaxial Contact Assembly	22
Coaxial Contacts	22
Contact Application	22
Contacts	22
Contact Availability	22
Crimp Removable Contacts	22
Installation and Removal Tools	22
Coupling	14
Design and Construction	21
Grommet Sealing Plugs	14
Insert Arrangement	22
Insert Configuration	22
Inserts	21
Closed-Entry Socket Contacts	21
Contact Extraction	21
Contact Insertion	21
Contact Retaining Clip	21
Crimp Snap-in Contacts	21
Interfacial Seal	22
Keying	22
Moisture Sealing	21
Peripheral Seal	22
Shell Seal	21
Wire Seal	22
Interchangeability	21
Part Number	21
Insert Designation	21
Military Specification	21
Series Designation	21

Shell Designation..... 21
 Specification Sheet 21
 Polarization..... 14
 Power Contacts 22
 Shell..... 14
 Tooling 22

Record of Applicable Technical Directives

None

Support Equipment Required

Part No./ Type Designation	Nomenclature
HT-900B (or equivalent)	Heating Tool, Compressed Air /Nitrogen
M22520/1-01	Crimp Tool, Frame
M22520/1-02	Positioner
M22520/1-11	Positioner
M22520/2-01	Crimp Tool, Frame
M22520/2-08	Positioner
M22520/2-11	Positioner
M22520/2-23	Positioner
M22520/7-01	Crimp Tool, Frame
M22520/7-02	Positioner
M22520/7-03	Positioner
M81969/1-01	Tool, Insertion and Removal
M81969/1-02	Tool, Insertion and Removal
M81969/1-03	Tool, Insertion and Removal
M81969/14-01	Tool, Insertion and Removal
M81969/17-01	Tool, Insertion
M81969/19-01	Tool, Removal
M81969/28-02	Tool, Removal

Materials Required

Specification/ Part No.	Nomenclature
TT-I-735 Alcohol,	Isopropyl
SAE-AMS-I-23053	Insulating Sleeving, Heat Shrinkable
MIL-F-14256 (or equivalent)	Flux, Liquid
SnGOWRMAP3 (or equivalent)	Solder

7. INTRODUCTION

8. This Work Package (WP) covers two series of electrical, rectangular connectors with crimp type removable contacts. These connectors are provided with single, dual, triple, and quadruple insert shell configurations.

9. **DESCRIPTION.** The following paragraphs cover MIL-C-81659 connector classifications.

10. Types. There are four types for these connectors and are as follows:

- a. Type I - Short grommet seal (Series 1 only)
- b. Type II - Standard grommet seal
- c. Type III - Without grommet seal
- d. Type IV - Without interfacial and grommet seals

11. Class Description. These connectors have two classifications according to operating environment:



This document includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. Consult applicable health and environmental regulations regarding its use, handling and disposition.

- a. Class 1: -85°F (-65°C) to +237°F (+125°C),
Material: Aluminum, Cadmium plated.

NOTE

Nickel plated parts are not for Navy use or new design.

b. Class 2: -85°F (-65°C) to +392°F (+200°C),
Material: Aluminum, Electroless Nickel plated.

6. Shell Designation. The shell designation shall consist of a letter in accordance with the following:

a. A - A connector having a shell configuration to accommodate a keystone insert.

b. B - A connector having a shell configuration to accommodate a rectangular insert.

7. Series Designation. The series designation shall consist of a one digit number in accordance with the following:

a. Series 1 Front Release Contacts

b. Series 2 Rear Release Contacts

NOTE

Series 1 Specification Sheets have been canceled without replacement with the exception of "/9". The other / numbers have been retained for reference purposes only. If complete replacement is required, contact responsible engineering authority.

For identification of canceled specifications in this work package a "\$" sign will be placed in front of the canceled specification sheet number.

8. **WIRE SEALING**. Wire sealing is accomplished by the use of grommet seal which is designed to seal against outside diameter of inserted wire. The outer diameter shall be within applicable size range (Table

1). If not within specified limit, use Insulating Sleeving, SAE-AMS-I-23053 to build outside diameter to minimum dimension or if the wire exceeds maximum contact responsible engineering authority to provide alternate wire, contact, or insert.

9. **MIL-C-81659 SERIES 1**.

10. Series 1 connectors are front release, crimp pin, or socket contacts, environment resistant, class 1 or 2 and are single or double inserts.

11. **GROMMET SEALING PLUGS**. The grommets of environment resisting connectors are designed to accept sealing plugs in accordance with MS27488 to be used where unwired contacts are placed. For sealing plug information refer to NAVAIR 01-1A-505-1, WP 023 00. The connector, when ordered as a unit, will have sealing plugs enclosed so as to equal 15 percent of the number or contacts but not less than one.

12. **SHELL**. Shells, including mounting flanges, are of one-piece construction and designed to retain their inserts in one position by a mechanical means.

13. **COUPLING**. Connectors shall be capable of being fully coupled and uncoupled without use of tools.

14. **POLARIZATION**. Polarization of the mating plug and receptacle shall be accomplished by means of mating keys on the plug shell and keyways on the receptacle shell. Polarization shall be accomplished prior to contact engagement.

15. **PART NUMBER**. The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 1).

16. Military Specification. The military specification denotes military standard.

Table 1. Wire Sizes and Diameters

Contact Size	Wire Size (AWG)	Finished Wire Outside Dimensions			
		Minimum		Maximum	
		Inches	MM	Inches	MM
22	26, 24, 22	.030	0.76	.054	1.37
20	24, 22, 20	.040	1.02	.071	1.80
16	20, 18, 16	.068	1.73	.103	2.62
12	14, 12	.097	2.46	.135	3.43

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another.

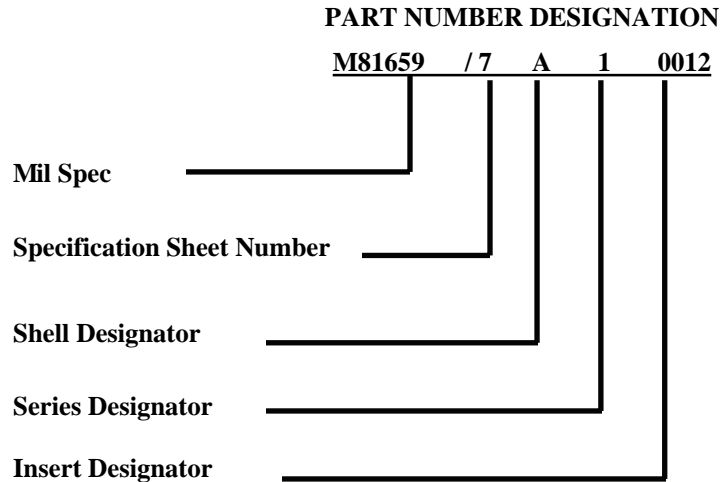
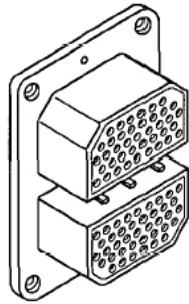
There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

9. Specification Sheet. The specification sheet will denote how many inserts, environmental, non-environmental, and type of class.

10. Shell Designation. The shell designation will consist of a letter identifying a keystone or rectangular insert.

11. Series Designation. The series designation will consist of a one digit number to determine front or rear release contact.

12. Insert Designation. The insert designation shall consist of a four digit number (Table 2, Figure 2).



SPECIFICATION SHEET

\$/1	Single Insert, Environmental Plug Shell, Class 1	\$/11	Double Insert, Environmental Receptacle Shell, Class 1
\$/2	Single Insert, Environmental Plug Shell, Class 2	\$/12	Double Insert, Environmental Receptacle Shell, Class 2
\$/3	Single Insert, Environmental Receptacle Shell, Class 1	\$/21	Double Insert, Environmental Plug Shell, Class 1
\$/4	Single Insert, Environmental Receptacle Shell, Class 2	\$/22	Double Insert, Environmental Plug Shell, Class 2
\$/5	Single Insert, Environmental Receptacle Shell, Class 2	\$/23	Double Insert, Environmental Plug Shell, Class 1
\$/6	Single Insert, Environmental Receptacle Shell, Class 2	\$/24	Double Insert, Environmental Plug Shell, Class 2
\$/7	Double Insert, Environmental Plug Shell, Class 1	\$/25	Double Insert, Environmental Receptacle Shell, Class 1
\$/8	Double Insert, Environmental Plug Shell, Class 2	\$/26	Double Insert, Environmental Receptacle Shell, Class 2
/9	Double Insert, Environmental Receptacle Shell, Class 1	\$/27	Double Insert, Environmental Receptacle Shell, Class 1
\$/10	Double Insert, Environmental Receptacle Shell, Class 2	\$/28	Double Insert, Environmental Receptacle Shell, Class 2

CLASS 1: -65°F (-65°C) To +257°F (+125°C) Operating Temperature, Material: Aluminum, Cadmium Plated

Class 2: -85°F (-65°C) Lo +392°F (+200°C) Operating Temperature, Material: Aluminum, Electroless Nickel Plated

Shell Designation

A - Keystone Insert Configuration.

B - Rectangular Insert Configuration.

Figure 1. MIL-C-81659 Series 1 Part Number Breakdown

Table 2. MIL-C-81659 Series 1 and 2 Insert Designation

Insert Designation	Shell Insert Position (Figure 2)			
	A	B	C	D
0001	26P	-	-	-
0002	26S	-	-	-
0003	26P	26P	-	-
0004	26S	26S	-	-
0005	26P	26P	26P	-
0006	26S	26S	26S	-
0007	26P	26P	26P	26P
0008	26S	26S	26S	26S
0009	40P	-	-	-
0010	40S	-	-	-
0011	40P	40P	-	-
0012	40S	40S	-	-
0013	40P	40P	40P	-
0014	40S	40S	40S	-
0015	40P	40P	40P	40P
0016	40S	40S	40S	40S
0017	45P	-	-	-
0018	45S	-	-	-
0019	45P	45P	-	-
0020	45S	45S	-	-
0021	45P	45P	45P	-
0022	45S	45S	45S	-
0023	45P	45P	45P	45P
0024	45S	45S	45S	45S
0025	57P	-	-	-
0026	57S	-	-	-
0027	57P	57P	-	-
0028	57S	57S	-	-
0029	57P	57P	57P	-
0030	57S	57S	57S	-
0031	57P	57P	57P	57P
0032	57S	57S	57S	57S
0033	67P	-	-	-
0034	67S	-	-	-
0035	67P	67P	-	-
0036	67S	67S	-	-
0037	67P	67P	67P	-
0038	67S	67S	67S	-
0039	67P	67P	67P	67P
0040	67S	67S	67S	67S
0041	106P	-	-	-
0043	-	-	-	-
	S			

Insert Designation	Shell Insert Position (Figure 2)			
	A	B	C	D
	P	P		
		S		
0045	106P	106P	106P	-
0046	106S	106S	106S	-
0047	106P	106P	106P	106P
0048	106S	106S	106S	106S
0057	106S	26P	-	-
0058	106P	26S	-	-
0059	26P	106S	-	-
0060	26S	106P	-	-
0061	26P	26P	26P	26P
0062	26S	26S	26S	26S
0063	10C3P	10C3P	C8P	67P
0064	10C3S	10C3S	C8S	67S
0065	C8P	C8P	C8P	-
0066	C8S	C8S	C8S	-
0067	C8P	C8P	106S	-
0068	C8S	C8S	106P	-
0069	C8P	33C4P	-	-
0070	C8S	33C4S	-	-
0071	67P	106S	-	-
0072	67S	106P	-	-
0073	67P	67P	C8P	-
0074	67S	67S	C8S	-
0075	67P	67P	106S	-
0076	67S	67S	106P	-
0077	67P	106S	33C4P	
0078	67S	106P	33C4S	
0079	67P	106S	67P	
0080	67S	106P	67S	
0081	67P	67P	33C4P	33C4P
0082	67S	67S	33C4S	33C4S
0083	D8P	-	-	-
0084	D8S	-	-	-
0085	C8P	C8P	67P	67P
0086	C8S	C8S	67S	67S
0087	106S	C8P	-	-
0088	106P	C8S	-	-
0089	106S	67P	-	-
0090	106P	67S	-	-
0091	67P	106S	67P	-
0092	67S	106P	67S	-

Table 2. MIL-C-81659 Series 1 and 2 Insert Designation (Continued)

Insert Designation	Shell Insert Position (Figure 2)			
	A	B	C	D
0094	106P	106P	33C4S	-
0095	106S	C8P	106S	106S
0096	106P	C8S	106P	106P
0097	106S	67P	106S	C8P
0098	106P	67S	106P	C8S
0099	106S	67P	C8P	C8P
0100	106P	67S	C8S	C8S
0101	106S	106S	67P	67P
0102	106P	106P	67S	67S
0103	33C4P	-	-	-
0104	33C4S	-	-	-
0105	33C4P	106S		
0106	33C4S	106P		
0107	33C4P	C8P		
0108	33C4S	C8S		
0109	C2P	40C1P		
0110	C2S	40C1S		
0111	C2P	57P		
0112	C2S	57S		
0113	C3P	67P		
0114	C3S	67S		
0115	C3P	106S		
0116	C3S	106P		
0117	C3P	106S		
0118	C3S	106P		
0119	10C3P	32C2P	-	-
0120	10C3S	32C2S	-	-
0121	32C2P	40C1P	-	-
0122	32C2S	40C1S	-	-
0123	32C2P	45P	-	-
0124	32C2S	45S	-	-
0125	32C2P	57P	-	-
0126	32C2S	57S	-	-
0127	32C2P	67P	-	-
0128	32C2S	67S	-	-

Insert Designation	Shell Insert Position (Figure 2)			
	A	B	C	D
0129	32C2P	106S	-	-
0130	32C2S	106P	-	-
0131	40C1P	40C1P	-	-
0132	40C1S	40C1S	-	-
0133	57P	106S	-	-
0135	C8P			
0136	C8S			
0137	10C3P			
0138	10C3S			
0139	32C2P			
0140	32C2S			
0141	40C1P			
0142	40C1S			
0143	67C3P			
0144	67C3S			
0145	C8P	57P		
0146	C8S	57S		
0147	57P	26P		
0148	57S	26S		
0149	32C4P			
0150	32C4S			
0151	32C4P	106S		
0152	32C4S	106P		
0153	67C3P	67C3P	32C4P	32C4P
0154	67C3S	67C3S	32C4S	32C4S
0155	C8P	32C4P		
0156	C8S	32C4S		
0157	106S	106S	32C4P	
0158	106P	106P	32C4S	
0159	32C4P	C8P		
0160	32C4S	C8S		
0161	67C3P	106S	32C4P	
0162	67C3S	106P	32C4S	

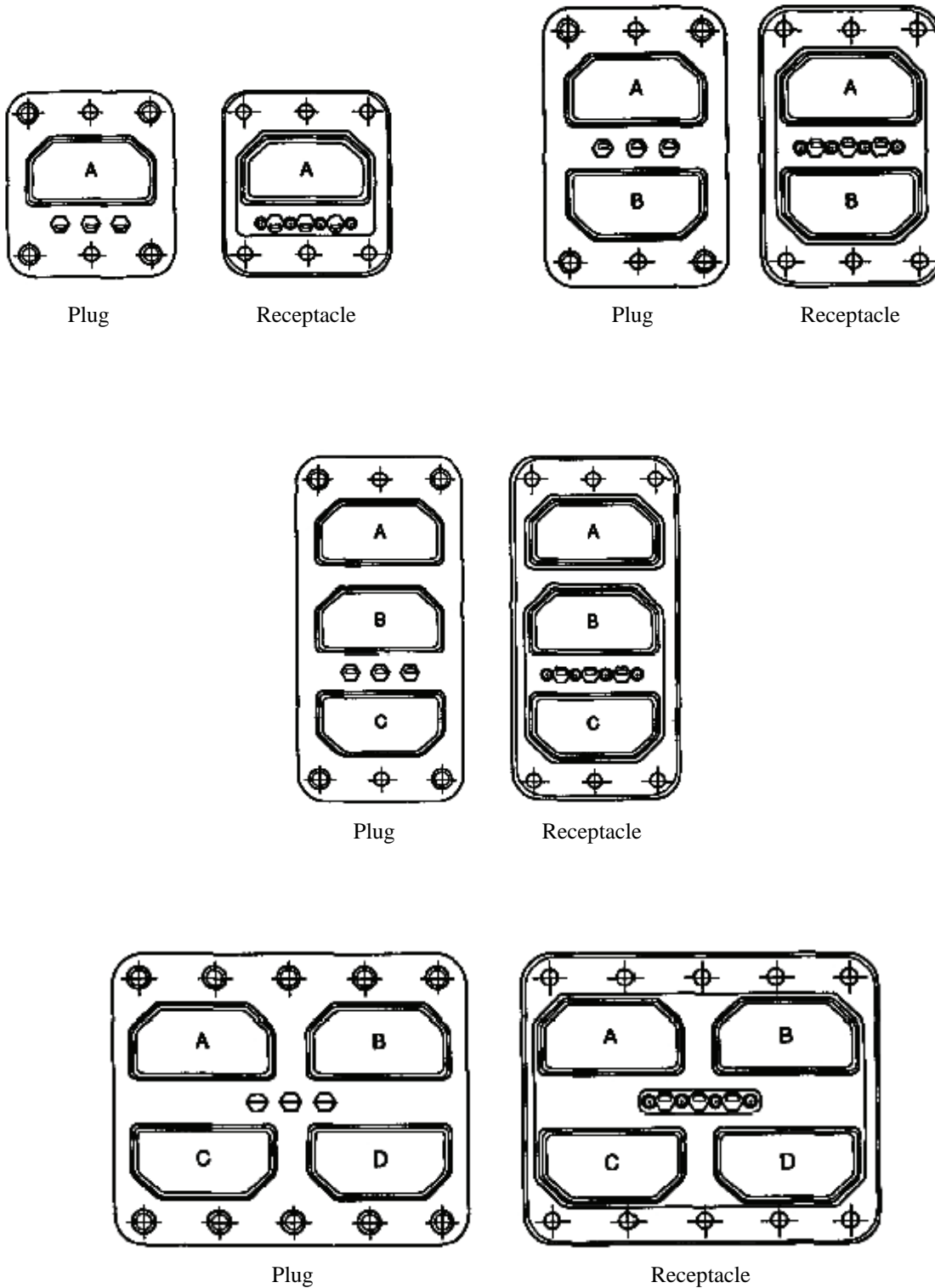


Figure 2. MIL-C-81659 Series 1 and 2 Shell Insert Position

9. **INTERCHANGEABILITY.** Receptacles of a given size and design manufactured by one qualified source will be capable of mating associated plugs manufactured by other qualified sources. The connector assemblies having the same part number will be directly and completely interchangeable with each other with respect to installation and performance.

10. **DESIGN AND CONSTRUCTION.** The connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.

11. **INSERTS.** The resilient and nonresilient material used for all inserts shall be a high grade dielectric having electrical and mechanical characteristics suitable for the purpose intended. The impact strength shall be such that material shall not chip, crack, or break during assembly or normal maintenance.

12. **Crimp Snap-in Contacts.** Snap-in contacts designed to SAE-AS-39029 can be crimped with standard M22520/ crimp tool.

13. **Closed-Entry Socket Contacts.** These contacts eliminate damage from abuse by test probes and help to correct any misaligned pins during engagement.

14. **Contact Insertion.** Insertion is accomplished from rear of connector. When contact is fully inserted, the clip tines snap securely behind contact shoulders.

15. **Contact Extraction.** Extraction is accomplished with use of a removal tool.

16. **Contact Retaining Clip.** The contact retaining clip is completely encased in a tough plastic wafer to protect clip from damage.

17. **Moisture Sealing.** Complete sealing is achieved by combining four seals, shell, peripheral, interfacial, and wire seal.

18. **Shell Seal.** This seal is accomplished when plug shell pushes against sealing ring in receptacle when connectors are mated.

19. **Peripheral Seal.** This seal is around the edge of a pin insulator and designed so that when mating the connector, tension is put on seal and greatly reduces compression set.

20. **Interfacial Seal.** This seal is achieved by insulator faces meeting when the plug and receptacle are mated.

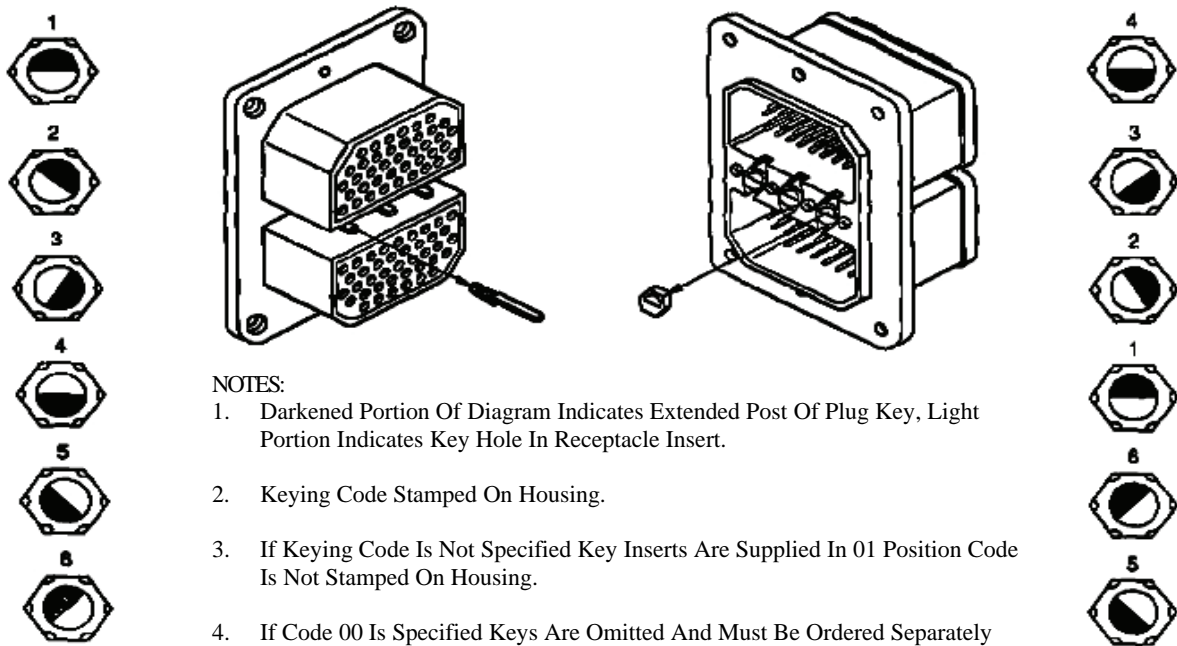
21. **Wire Seal.** This seal is accomplished by a multiple ripple design, exceeding wire sealing requirements of MIL-C-81659.

22. **Keying.** Keying is used in shell-enclosed connectors to obtain polarization, which assures correct location when mating a connector (Figure 3).

23. **INSERT ARRANGEMENTS.** The insert arrangement is the number and size of the contacts available by shell size (Table 3).

24. **INSERT CONFIGURATION.** The insert configuration is the manner in which contacts are placed within insert in a standard configuration. All arrangements identified in Table 3 are illustrated (Figure 4).

25. **CONTACTS.** Contacts are designed to prevent damaged contact retention device or sealing member during insertion or removal of contacts.



NOTES:

1. Darkened Portion Of Diagram Indicates Extended Post Of Plug Key, Light Portion Indicates Key Hole In Receptacle Insert.
2. Keying Code Stamped On Housing.
3. If Keying Code Is Not Specified Key Inserts Are Supplied In 01 Position Code Is Not Stamped On Housing.
4. If Code 00 Is Specified Keys Are Omitted And Must Be Ordered Separately Code Is Not Stamped On Housing.
5. Key Diagrams Show Mating Face Of Connector Top Up.

Plug				Receptacle				Plug				Receptacle			
Pos.	Left Post	Center Post	Right Post	Pos.	Left Key	Center Key	Right Key	Pos.	Left Post	Center Post	Right Post	Pos.	Left Key	Center Key	Right Key
00	-	-	-	00	-	-	-	25	1	1	3	25	2	4	4
01	1	1	1	01	4	4	4	26	2	1	3	26	2	4	3
02	2	1	1	02	4	4	3	27	3	1	3	27	2	4	2
03	3	1	1	03	4	4	2	28	4	1	3	28	2	4	1
04	4	1	1	04	4	4	1	29	5	1	3	29	2	4	6
05	5	1	1	05	4	4	6	30	6	1	3	30	2	4	5
06	6	1	1	06	4	4	5	31	1	1	2	31	3	4	4
07	1	1	6	07	5	4	4	32	2	1	2	32	3	4	3
08	2	1	6	08	5	4	3	33	3	1	2	33	3	4	2
09	3	1	6	09	5	4	2	34	4	1	2	34	3	4	1
10	4	1	6	10	5	4	1	35	5	1	2	35	3	4	6
11	5	1	6	11	5	4	6	36	6	1	2	36	3	4	5
12	6	1	6	12	5	4	5	37	1	2	1	37	4	3	4
13	1	1	5	13	6	4	4	38	2	2	1	38	4	3	3
14	2	1	5	14	6	4	3	39	3	2	1	39	4	3	2
15	3	1	5	15	6	4	2	40	4	2	1	40	4	3	1
16	4	1	5	16	6	4	1	41	5	2	1	41	4	3	6
17	5	1	5	17	6	4	6	42	6	2	1	42	4	3	5
18	6	1	5	18	6	4	5	43	1	2	6	43	5	3	4
19	1	1	4	19	1	4	4	44	2	2	6	44	5	3	3
20	2	1	4	20	1	4	3	45	3	2	6	45	5	3	2
21	3	1	4	21	1	4	2	46	4	2	6	46	5	3	1
22	4	1	4	22	1	4	1	47	5	2	6	47	5	3	6
23	5	1	4	23	1	4	6	48	6	2	6	48	5	3	5
24	6	1	4	24	1	4	5	49	1	2	5	49	6	3	4

Figure 3. MIL-C-81659 Series 1 and 2 Polarization Positions

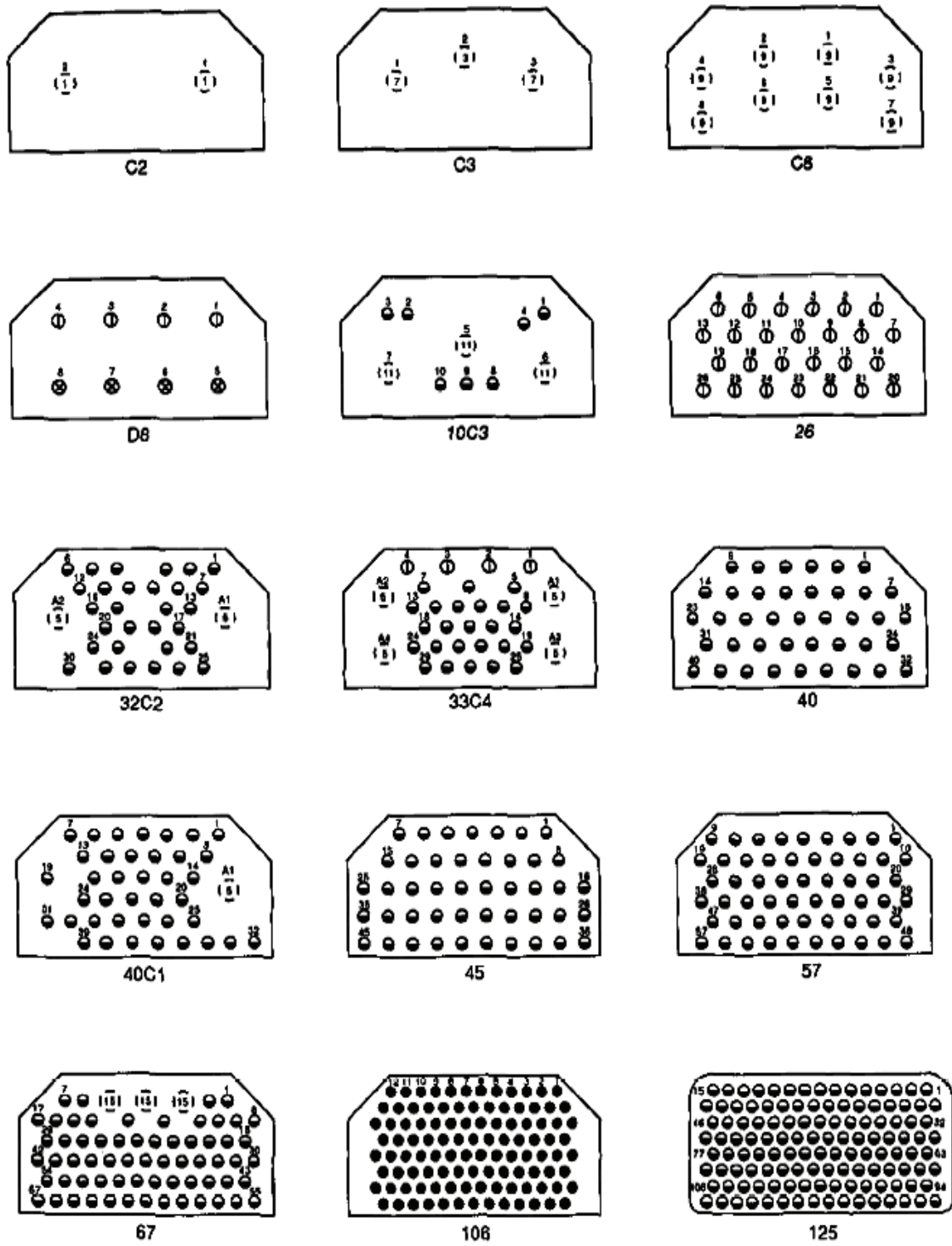


Figure 4. MIL-C-81659 Series 1 and 2 Insert Configurations

26. Crimp Removable Contacts. Crimp removable contacts may be used with all environment resisting classes of connectors.

27. Contact Availability. Crimp contacts are supplied with each connector unit package and consist of a full complement plus one spare per size for connectors of 26 contacts or less. Connectors with 26 or more contacts will have two spares of each size used. Contacts may also be ordered in individual quantities when necessary.

28. Installation and Removal Tools. The proper installation and removal tools must be used to assemble or disassemble the connector. The installation tool for Series 1 connectors is M81969/17-01 and the removal tool is M81969/19-01.

29. **CONTACT APPLICATION**. Contacts used in Series 1 connectors are manufactured in accordance with SAE-AS-39029. The part number breakdown is illustrated (Figure 5). The Basic Identification Number (BIN) or last three digits of contact part number, matches standard resistor color code (Figure 6).

30. **POWER CONTACTS**. Power contacts are used to connect single conductor wire through connectors. The power contacts range from size 16 thru 22 and are of crimp front release design. Contacts are listed by size. Match the required size to connector application, wire gage, and composition. Socket and pin contact part numbers are listed along with the corresponding color bands (Table 4).

31. **TOOLING**. The procedures for attaching power contacts to a single conductor wire is the same for this connector series. Select the proper tooling for the specific contact part number and refer to NAVAIR 01-1A-505-1, WP 013 00 for correct assembly and crimp procedures (Table 5).

32. **COAXIAL CONTACTS**. When routing coaxial cable through connectors, coaxial contacts are superior to other coaxial cable shield termination methods. The shield integrity is maintained across the contact body. Socket coaxial contacts have a pin center contact. Pin coaxial contacts have a socket center contact (Figure 7).

NOTE

Coaxial Contact Specification Sheets have been canceled without replacement. The numbers have been retained for reference purposes only. If replacement is required, contact responsible engineering authority.

For identification of canceled specifications in this WP a "\$" sign will be placed in front of the canceled specification sheet number.

33. **CABLE AND COAXIAL CONTACT ASSEMBLY**. To assemble coaxial to applicable cable, identify the cable, contact size, and tooling (Table 6, Figure 8).

34. **MIL-C-81659 SERIES 2**.

35. Series 2 connectors are rear release, crimp pin or socket contacts, environment and non-environment resistant, Class 1 or 2 and are single, double, triple or quadruple inserts.

36. **GROMMET SEALING PLUGS**. The grommets of environment resisting connectors are designed to accept sealing plugs in accordance with MS27488 to be used where unwired contacts are placed. The connector when ordered as a unit will have sealing plugs enclosed to equal 15 percent of the number of contacts but not less than one.

37. **SHELL**. Shells including mounting flanges are of one-piece construction and designed to retain their inserts in one position by mechanical means. Each plug and receptacle has at least one blue color band, which indicates rear release retention system, and is located to be readily visible.

38. **COUPLING**. Connectors shall be capable of being fully coupled and uncoupled without use of tools.

39. **POLARIZATION**. Polarization of the mating plug and receptacle shall be accomplished by means of mating keys on the plug shell and keyways on the receptacle shell. Polarization shall be accomplished prior to contact engagement.

Table 4. MIL-C-81659 Series 1 Power Contact Application

Contact Size	Wire Range	Socket Contact			Pin Contact		
		M39029/	Color Bands 1 st 2 nd 3 rd		M39029/	Color Bands 1 st 2 nd 3 rd	
22	22-26	3-107	BRN BLK VIO		2-104	BRN BLK YEL	
20	20-24	3-108	BRN BLK GRA		2-105	BRN BLK GRN	
16	16-20	3-109	BRN BLK WHT		2-106	BRN BLK BLU	

Table 5. MIL-C-81659 Series 1 Power Contact Tooling

Contact M39029/	Crimp Tool Frame M22520/	Turret Head or Positioner M22520/	Insertion Tool M81969/	Removal Tool M81969/
2-104	2-01	2-11	-	-
2-105	1-01 or 2-01	1-02 or 2-11	-	-
2-106	1-01	1-02	17-01	19-01
3-107	2-01	2-11	-	-
3-108	1-01 or 2-01	1-02 or 2-11	-	-
3-109	1-01	1-02	17-01	19-01

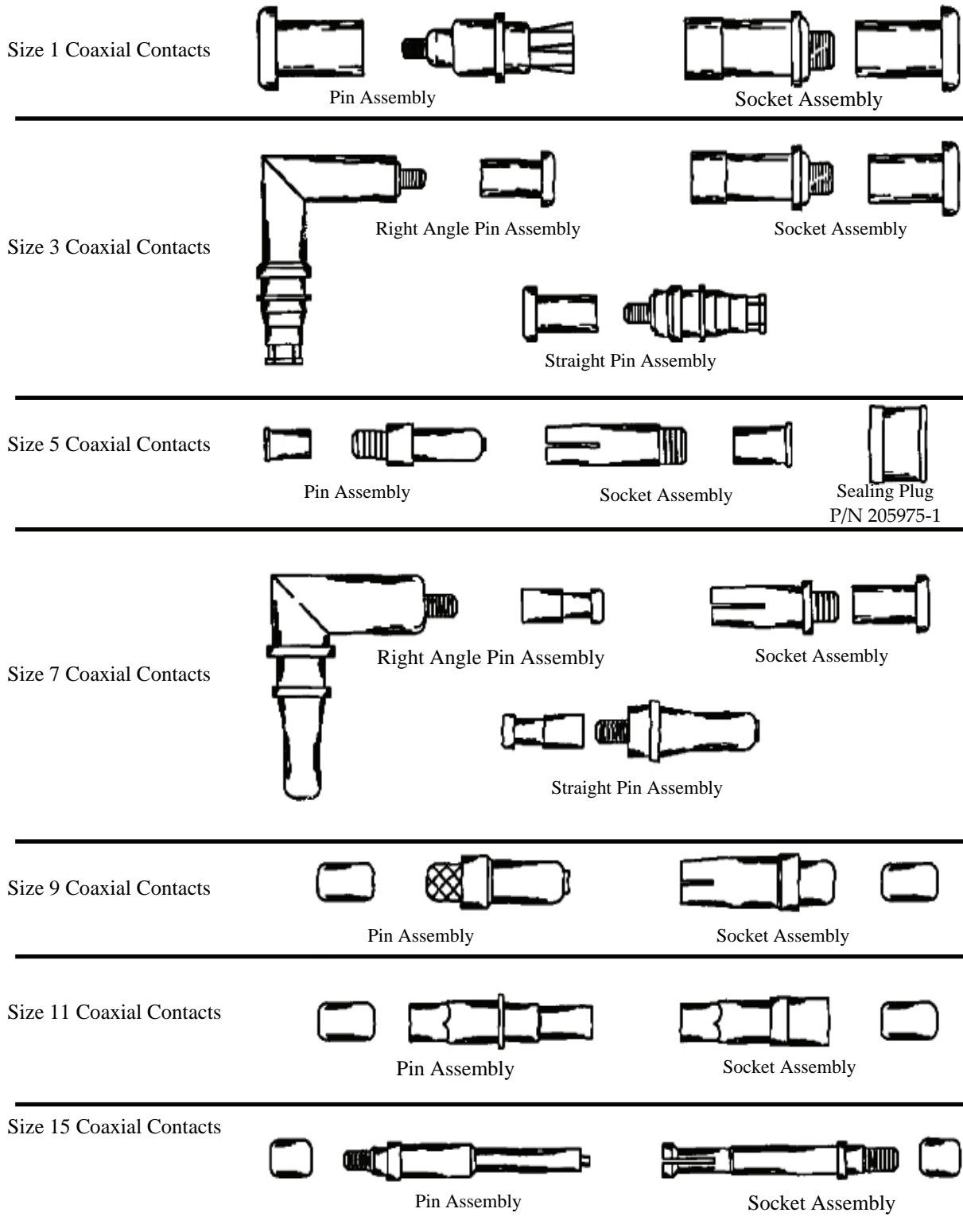
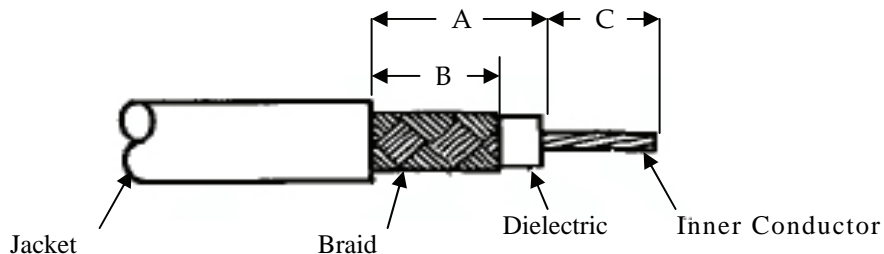


Figure 7. MIL-C-81659 Series 1 and 2 Coaxial Contacts

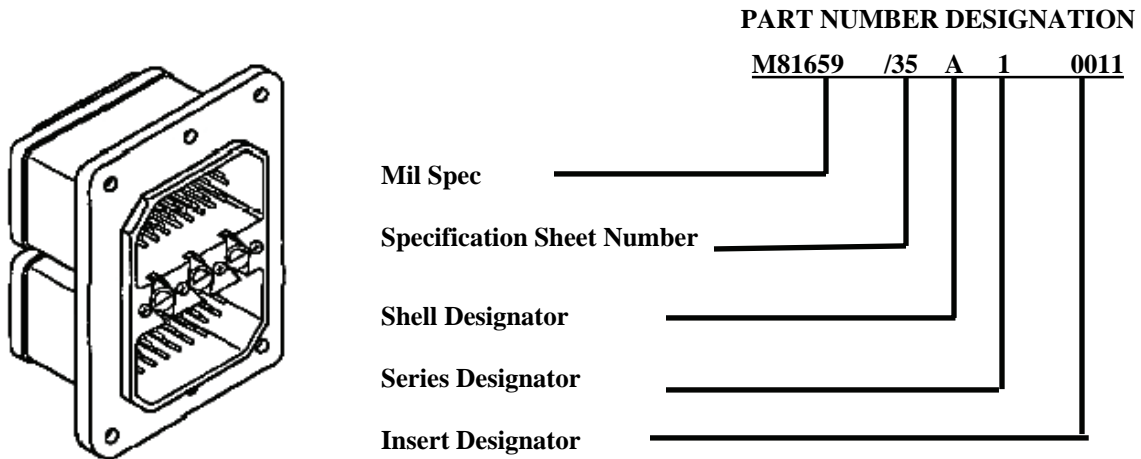
Table 6. MIL-C-81659 Series 1 and 2 Coaxial Contact Application and Tooling

Contact Size	Cable Type	Pin Military P/N	Socket Military P/N	Center Contact Crimping Tool No.
1	141 Semi-rigid	\$MS3168-001	-	M22520/2-01
(Straight Exit)	214	-	\$MS3169-001	-
(Straight Exit)	213	-	-	-
3	214	-	\$MS3171-001	-
(Straight Exit)	213	-	-	-
(Straight Exit)	58C, 141A, 165	\$MS3170-001 -	- -	M22520/2-01 -
3 (90° Exit)	223, 142B	\$MS3170-002	-	M22520/2-01
(90° Exit)	58C, 141A	\$MS3172-001	\$MS3173-001	M22520/2-01
(90° Exit)	223, 141B, 142	\$MS3172-002	\$MS3173-002	M22520/2-01
5	141 Semi-rigid	-	-	M22520/2-01
(Straight Exit)	180, 195	-	-	M22520/2-01
(Straight Exit)	174, 188, 316	-	-	M22520/2-01
(Straight Exit)	179, 187	-	-	M22520/2-01
(Straight Exit)	178, 196	-	-	M22520/2-01
7	58C, 141A	-	\$MS3175-001	M22520/2-01
(Straight Exit)	223, 141B	-	-	M22520/2-01
(Straight Exit)	174, 188, 316	\$MS3174-001	-	M22520/2-01
7 (90° Exit)	174, 188, 316	\$MS3174-002	-	M22520/2-01
(90° Exit)	58C, 141A	-	\$MS3177-001	M22520/2-01
9	141 Semi-rigid	\$MS3176-001	-	M22520/2-01
(Straight Exit)	174, 188, 316	-	-	M22520/2-01
(Straight Exit)	196 Dbl. Braid	-	-	M22520/2-01
11		NO PART NUMBER AVAILABLE		
(Straight Exit)	58C			
	115			
15	174, 188, 316	-	-	M22520/2-01
(Straight	179, 187	-	-	M22520/2-01
Exit)	178, 196	-	-	M22520/2-01



Cable Type	A (inch)	B (inch)	C (inch)
RG-59/u RG-62/u	13/32 to 27/64	27/64 to 7/16	5/16 to 21/64
RG-58/u	13/32 to 27/64	7/16 to 15/32	5/16 to 21/64
RG-180/u RG-195/u	13/32 to 27/64	7/16 to 15/32	5/16 to 21/64
RG-174/u RG-179/u RG-187/u RG-188/u	13/32 to 27/64	7/16 to 15/32	5/16 to 21/64
RG-178/u RG-196/u	13/32 to 27/64	15/32 to 31/64	5/16 to 21/64
RG-58/u	5/16 to 21/64	15/64 to 1/4	1/16 to 3/32
RG-178/u RG-196/u	25/64 to 13/32	17/64 to 19/64	1/16 to 3/32
RG-178/u RG-196/u	23/64 to 25/64	7/32 to 1/4	1/16 to 5/64
RG-58/u with nylon braid over jacket	13/32 to 27/64	7/16 to 15/32	5/16 to 21/64

Figure 8. MIL-C-81659 Series 1 and 2 Strip Dimensions



SPECIFICATION SHEET

/29	Single Insert, Environmental Plug Shell, Class 1	/43	Quadruple Insert, Environmental Receptacle Shell, Class 1
\$/30	Single Insert, Environmental Plug Shell, Class 2	\$/44	Quadruple Insert, Environmental Receptacle Shell, Class 2
/31	Single Insert, Environmental Receptacle Shell, Class 1	/61	Single Insert, Environmental Receptacle Shell, Less Grommet
\$/32	Single Insert, Environmental Receptacle Shell, Class 2	/62	Double Insert, Environmental Receptacle Shell, Less Grommet
/33	Double Insert, Environmental Plug Shell, Class 1	/63	Triple Insert, Environmental Receptacle Shell, Less Grommet
\$/34	Single Insert, Environmental Receptacle Shell, Class 2	/64	Quadruple Insert, Environmental Receptacle Shell, Less Grommet
/35	Double Insert, Environmental Plug Shell, Class 1	/65	Single Insert, Non-Environmental Plug Shell
\$/36	Double Insert, Environmental Plug Shell, Class 2	/66	Single Insert, Non-Environmental Receptacle Shell
/37	Triple Insert, Environmental Plug Shell, Class 1	/67	Single Insert, Non-Environmental Receptacle Shell, Clinch Nuts
\$/38	Triple Insert, Environmental Plug Shell, Class 2	/68	Single Insert, Non-Environmental Receptacle Shell, Floating Eyelets
/39	Triple Insert, Environmental Receptacle Shell, Class 1	/69	Double Insert, Non-Environmental Plug Shell
\$/40	Triple Insert, Environmental Receptacle Shell, Class 2	/70	Double Insert, Non-Environmental Receptacle Shell
/41	Quadruple Insert, Environmental Plug Shell, Class 1	/71	Double Insert, Non-Environmental Receptacle Shell, Clinch Nuts
\$/42	Quadruple Insert, Environmental Plug Shell, Class 2	/72	Double Insert, Non-Environmental Receptacle Shell, Floating Eyelets

"\$" = specification sheet has been canceled without replacement, for reference purposes only.

Figure 9. MIL-C-81659 Series 2 Part Number Breakdown (Sheet 1 of 2)

Class 1: -65°F (-65°C) To +257°F (+125°C) Operating Temperature, Material: Aluminum, Cadmium Plated
Class 2: -85°F (-65°C) Lo +392°F (+200°C) Operating Temperature, Material: Aluminum, Electroless Nickel Plated

Shell Designation:

A - Keystone Insert Configuration.

B - Rectangular Insert Configuration.

Series Designation:

1- Front Release Contacts.

2 - Rear Release Contacts.

Insert Designation

(Table 2)

Figure 9. MIL-C-81659 Series 2 Part Number Breakdown (Sheet 2)

40. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 9).

41. Military Specification. The military specification denotes military standard.

42. Specification Sheet. The specification sheet will denote how many inserts, environmental, non-environmental and type of class.

43. Shell Designation. The shell designation will consist of a letter identifying a keystone or rectangular insert.

44. Series Designation. The series designation will consist of a one digit number to determine front or rear release contacts.

45. Insert Designation. The insert designation shall consist of a four digit number (Table 2, Figure 2).

46. **INTERCHANGEABILITY.** Receptacles of a given size and design manufactured by one qualified source will be capable of mating associated plugs manufactured by other qualified sources. The connector assemblies having the same part number will be directly and completely interchangeable with each other with respect to installation and performance.

47. **DESIGN AND CONSTRUCTION.** The connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.

48. **INSERTS:** The resilient and non-resilient material used for all inserts shall be a high grade dielectric having electrical and mechanical characteristics suitable for the purpose intended. The impact strength shall be such that material shall not chip, crack, or break during assembly or normal maintenance.

49. Crimp Snap-in Contacts. Snap-in contacts designed to SAE-AS-39029 can be crimped with standard M22520/ crimp tool.

50. Closed-Entry Socket Contacts. These contacts eliminate damage from abuse by test probes and help to correct any misaligned pins during engagement.

51. Contact Insertion. Insertion is accomplished from rear of connector. When contact is fully inserted, the clip tines snap securely behind contact shoulders.

52. Contact Extraction. Extraction is accomplished with use of a removal tool.

53. Contact Retaining Clip. The contact retaining clip is completely encased in a tough plastic wafer to protect clip from damage.

54. Moisture Sealing. Complete sealing is achieved by combining four seals, shell, peripheral, interfacial, and wire seal.

55. Shell Seal. This seal is affected when plug shell pushes against sealing ring in receptacle when connectors are mated.

56. Peripheral Seal. This seal is around the edge of pin insulator and designed so that when mating the connector, tension is put on seal and greatly reduces compression set.

57. Interfacial Seal. This seal is achieved by insulator faces meeting when the plug and receptacle are mated.

58. Wire Seal. This seal is accomplished by a multiple ripple design, exceeding wire sealing requirements of MIL-C-81659.

59. Keying. Keying is used in shell-enclosed connectors to obtain polarization, which assures correct location when mating a connector (Figure 3).

60. **INSERT ARRANGEMENT**. The insert arrangement is the number and size of the contacts available by shell size (Table 3).

61. **INSERT CONFIGURATION**. The insert configuration is the manner in which contacts are placed within insert in a standard configuration. All arrangements identified in Table 3 are illustrated (Figure 4).

62. **CONTACTS**. Contacts are designed to prevent damaged contact retention device or sealing member during insertion or removal of contacts.

63. Crimp Removable Contacts. Crimp removable contacts may be used with all environmental resisting classes of connectors.

64. Contact Availability. Crimp contacts are supplied with each connector unit package and consist of a full complement plus one spare per size for connectors of 26 contacts or less. Connectors with more than 26 contacts will have two spares of each size used. Contacts may also be ordered in individual quantities when necessary.

65. Installation and Removal Tools. The proper installation and removal tools must be used to assemble or disassemble the connector. The installation tool for Series 2 connectors is M81969/1-01 and the removal tool is M81969/14-01.

66. **CONTACT APPLICATION**. Contacts used are manufactured in accordance with SAE-AS-39029. The contact part number breakdown is illustrated (Figure 10). The Basic Identification Number (BIN) or last three digits of contact part number, matches standard resistor color code (Figure 11).

67. **POWER CONTACTS**. Power contacts are used to connect single conductor wire through connectors. Power contacts range from size 12 through 22 and are of crimp, rear-release design. Contacts are listed by size. Match the required size to connector application, wire gage, and composition. Socket and pin contact part numbers are listed along with the corresponding color bands (Table 6).

68. **TOOLING**. The procedures for attaching power contacts to a single conductor wire, is the same for this connector series, as for series 1. Select the proper tooling for the specific contact part number and refer to NAVAIR 01-1A-505-1 WP 013 00 for correct assembly and crimp procedures (Table 7).

69. **COAXIAL CONTACTS**. When routing coaxial cable through connectors, coaxial contacts are superior to other coaxial cable shield termination methods. The shield integrity is maintained across the contact body. Socket coaxial contacts have a pin center contact. Pin coaxial contacts have a socket center contact (Figure 8).

NOTE

Coaxial Contact Specification Sheets have been canceled without replacement. The numbers have been retained for reference purposes only. If replacement is required, contact responsible engineering authority.

For identification of canceled specifications in this WP a "\$" sign will be placed in front of the canceled specification sheet number.

70. **CABLE AND COAXIAL CONTACT ASSEMBLY**. To assemble the coaxial contacts to the applicable cable, identify the cable, contact size and tooling (Table 6, Figure 7).

Table 7. MIL-C-81659 Series 2 Power Contacts Application

Contact Size	Wire Range	Socket Contact			Pin Contact				
		M39029/	Color Bands 1 st 2 nd 3 rd			M39029/	Color Bands 1 st 2 nd 3 rd		
22	22-26	12-148	BRN	YEL	GRA	11-144	BRN	YEL	YEL
20	20-24	12-149	BRN	YEL	WHT	11-145	BRN	YEL	GRN
16	16-20	12-150	BRN	GRN	BLK	11-146	BRN	YEL	BLU
12	12-14	12-151	BRN	GRN	BRN	11-147	BRN	YEL	VIO

PART NUMBER DESIGNATION

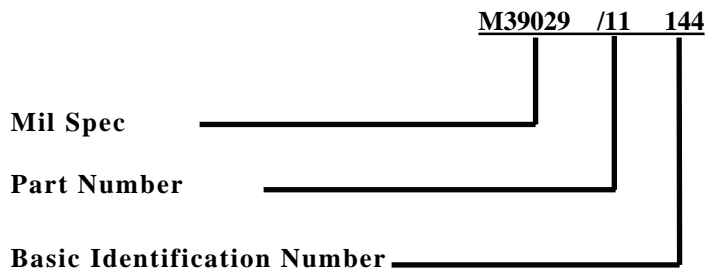
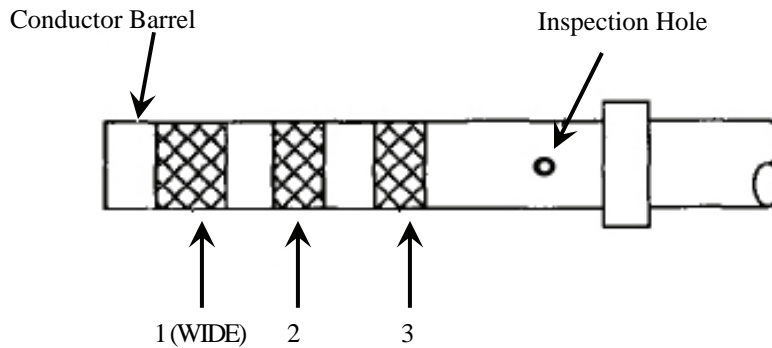


Figure 10. MIL-C-39029/ Part Number Breakdown



Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Gray	8
Yellow	4	White	9
Example Bin Code: 463			
Yellow(Wide Band) / Blue / Orange			

Figure 11. Basic Identification Number and Color Bands

Table 8. MIL-C-81659 Series 2 Power Contact Tooling

Contact M39029/	Crimp Tool Frame M22520/	Turret Head or Positioner M22520/	Insertion Tool M81969/	Removal Tool M81969/
11-144	2-01	2-23	1-01	1-01
11-145	2-01 or 7-01	2-08 or 7-02	1-02	1-02
11-146	1-01 or 7-01	1-02 or 7-03	1-03	1-03
11-147	1-01	1-11	-	28-02
12-148	2-01	2-23	1-01	1-01
12-149	2-01 or 7-01	2-08 or 7-02	1-02	1-02
12-150	1-01 or 7-01	1-02 or 7-03	1-03	1-03
12-151	1-01	1-11	-	28-02

71. **CONNECTOR BUILDUP.**

72. **WIRE DIAMETER BUILDUP.** If wire outside diameter is not large enough to fill wire sealing grommet holes, buildup wire outside diameter by applying heat-shrinkable insulating sleeving. This must be accomplished prior to contact insertion. Refer to paragraph 8 (this WP) for additional information.

73. **WIRE STRIPPING.** Strip wire in accordance with the following procedure:

a. Cut wire to proper length. Ensure enough wire remains for adequate strain relief without leaving excess slack.

b. Strip insulation from end (NAVAIR 01-1A-505-1, WP 009 00). Select proper contact for connector and wire (Table 4 or 7).

74. **CONTACT CRIMPING.** Crimp contact in accordance with following procedure:

- a. Select correct crimp tool (Table 5 or 8).
- b. Perform die closure check, install positioner, and set selector knob for gage of wire.
- c. Insert stripped wire into contact conductor barrel. Ensure all wire strands are inside contact conductor barrel and visible in contact inspection hole (Figure 12).

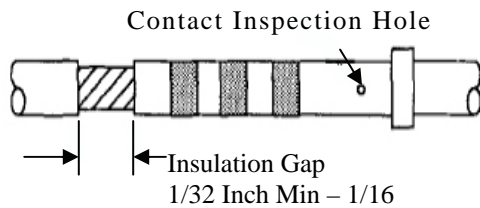


Figure 12. Insulation Gap

- d. If insulation gap is too large, trim conductor as required. If insulation gap is too small, trim insulation as required.
- e. Crimp contact to wire.

75. **CONTACT INSERTION.** Insert wired or unwired contacts in accordance with following procedure:

- a. Remove sealing plug and/or contact from contact cavity (Paragraph 91).
- b. Ensure wire or cable on contact is routed through connector backshell.
- c. Select correct insertion tool (Table 5 or 8).



Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.



Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors.

Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

- d. Place wire and contact assembly into tip of insertion tool (Figure 13). Ensure tool tip is over conductor barrel and butted against contact shoulder.
- e. Insert tip of contact into cavity. Start contact insertion near connector center cavities and work outward.
- f. Axially align contact with contact cavity.
- g. With firm even pressure, press tool against contact shoulder and seat contact in cavity (Figure 14). A slight click may be heard as retention tines snap into place behind contact shoulder.
- h. Pull tool straight out of contact cavity. Remove tool from wire. Pull back lightly on wire to ensure contact is properly seated.
- i. Seal connector as required (paragraph 88).

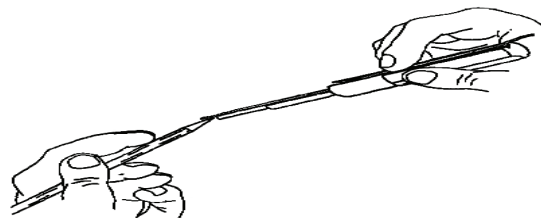


Figure 13. Inserting Contact into Insertion Tool (Typical)

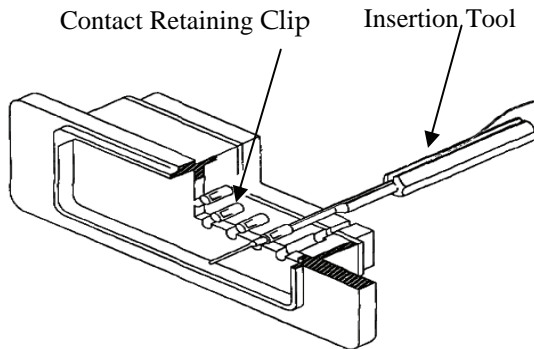


Figure 14. Contact Insertion

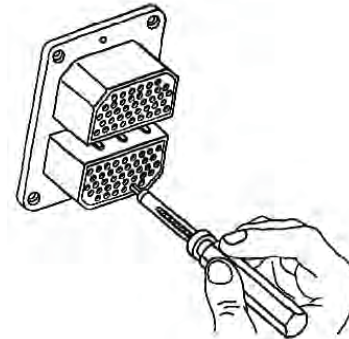


Figure 15. Contact Removal

76. CONNECTOR SEALING.

77. Sealing Plugs. Seal connector in accordance with following procedure:

- a. Fill all unused cavities with uncrimped contacts (paragraph 87).
- b. Insert sealing plug, large diameter end first, until bottomed in contact cavity. Do not insert further than knob. Fill all cavities that have uncrimped contacts. For grommet sealing plug selection refer to NAVAIR 01-1A-505-1, WP 023 00.

90. Moisture Barrier. For connector sealing procedures, including application of sealant to grommet sealed connectors, refer to NAVAIR 01-1A-505-1, WP 025 00.

91. **CONTACT REMOVAL**. The following paragraphs give contact removal for front and rear release crimp contacts.

92. Crimp Front Release Contacts. Remove wired, unwired, and broken wire contacts in accordance with following procedure:

- a. Select correct removal tool (Table 5 or 8).
- b. If contact is unwired, remove sealing plug from cavity of contact to be removed.
- c. Working from the front (mating end) of connector, slide hollow end of removal tool over contact (Figure 15).

WARNING

Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors.

Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

d. Holding removal tool at right angle to front insert face, push tool straight toward rear of connector, firmly pressing tool to positive stop when tool bottoms in insert, cavity.

e. Maintain pressure on tool handle and slide collar of tool forward until it stops. Contact will be partially ejected from rear of connector insert.

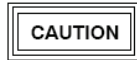
f. Remove tool by pulling straight back to clear connector insert face. Remove contact out the rear of connector by pulling lightly on wire or using a mating contact to push out released contact.

93. Crimp Rear Release Contact. Remove wired, unwired, and broken wire contacts in accordance with the following paragraphs.

94. Wired Contact Removal.



Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.



Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

- a. Select correct removal tool (Table 5 or 8).

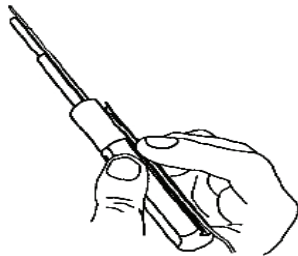


Figure 16. Inserting Wire into Removal Tool

- b. Place wire of contact to be removed into removal tool, with tip facing connector insert (Figure 16).

- c. Slide removal tool along wire at a right angle to connector insert face and along with contact cavity (Figure 17).

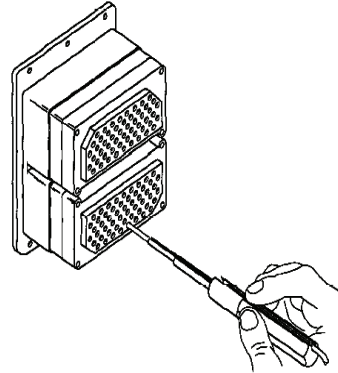


Figure 17. Removal Tool on Wire

- d. Insert tool into contact cavity until tool tip bottoms against contact shoulder (Figure 18). A slight increase in resistance will be noticed just before the tool tip bottoms. This will spread the retention clip and release its hold on the contact.

- e. Press wire firmly against removal tool and pull wire straight out from contact cavity (Figure 19)

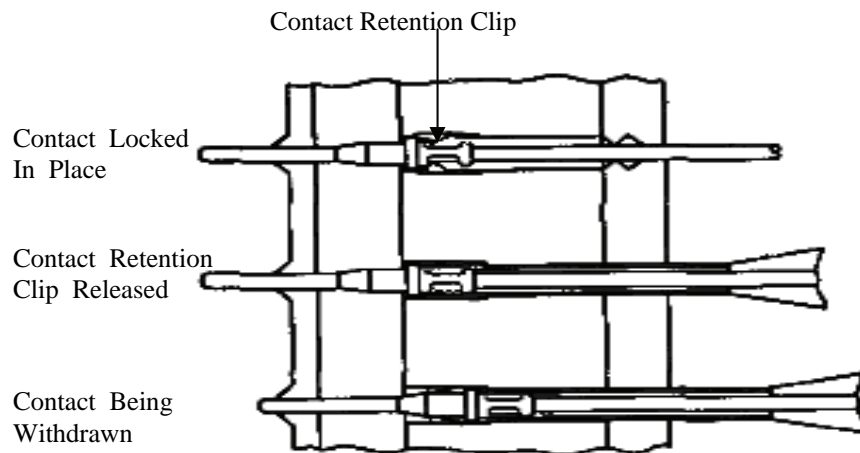


Figure 18. Unlocking Contact Mechanism

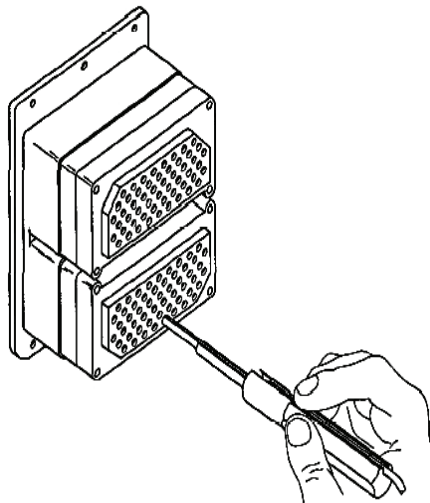


Figure 19. Removing Contact from Connector

95. Unwired Contact Removal.



Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.



Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

- a. Select correct unwired removal tool (Table 5 or 8).
- b. With rear of connector exposed, remove sealing form insert cavity of contact to be removed.
- c. Press and hold tool plunger until tip of tool is aligned with contact to be removed.
- d. Axially align removal tool with contact to be removed.
- e. Insert removal tool tip into contact cavity to butt contact wire barrel; then slide removal sleeve over contact and exert pressure until sleeve bottoms. (Figure 20).

f. Remove tool and unlocked contact from connector by withdrawing tool from connector (Figure 21).

g. Remove contact from removal tool by pressing plunger.

96. Broken Wire Contact Removal.

WARNING

Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

a. Select correct removal tool (Table 5 or 8).

CAUTION

Removal of a contact with a broken wire shall not be attempted with an unwired removal tool.

Use of unwired removal tool requires that the tip be jammed onto the contact wire barrel.

If wire strands occupy wire barrel, the tool and the connector may be damaged.

b. Insert tip of removal tool about 1/8 inch into cavity at rear of connector.

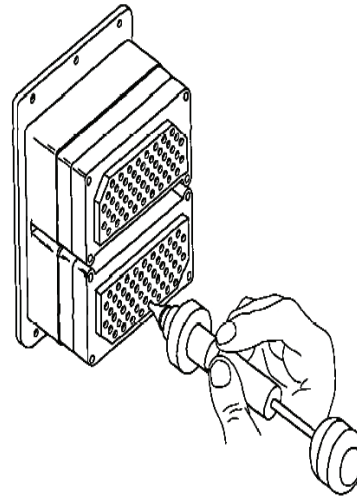


Figure 20. Unwired Contact Removal Tool

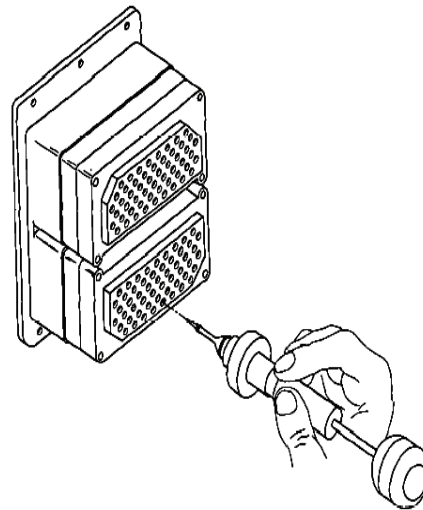


Figure 21. Extracting Contact from Connector

CAUTION

Wire strands may be encountered at any point up to 5/16 inch of tool insertion. It is important not to jam any strands of wire up to this point.

Withdraw removal tool anytime during insertion when it cannot be advanced into connector using these procedures. Inspect tool tip for nicks, cracks, mushrooming, and other damage that will prevent functioning. Replace removal tool and repeat procedure, if required.

NOTE

Refer to Figure 22 for approximate dimensions of a size 22 contact and cavity. The dimensions in this procedure are based on a size 22 contact.

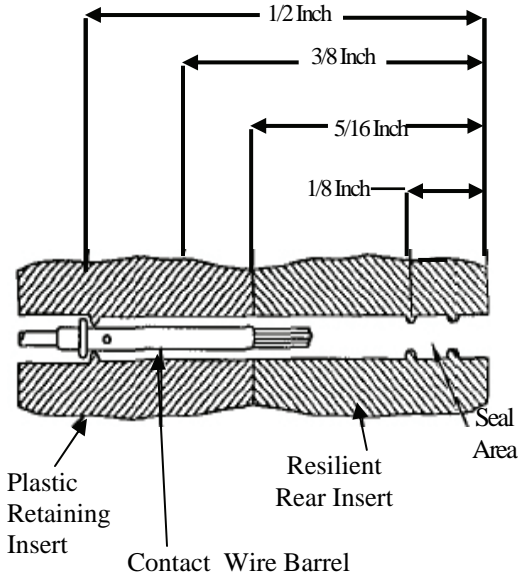


Figure 22. Typical Connector Dimensions

c. Gently insert removal tool into cavity in about 1/16 inch units, releasing tool after each unit if resistance is felt.

NOTE

Rotating removal tool works splayed wire strands into slot of tool, allowing tool to pass.

Removal tool may be blocked at rear of contact by plastic insert or additional strands of broken wire.

d. If resistance is felt before removal tool reaches back end of contact, withdraw tool slightly, rotate about 1/6 of a turn, and reinsert tool. Repeat rotating and insertion procedure until tool passes with minimum additional force to 5/16 inch depth back end of contact (Figure 23).

e. Wiggle removal tool gently to help it into insert bore and over back of contact. Additional rotation may be required if broken strands are encountered.

f. Continue insertion of removal tool until positive stop is felt at about 1/2 inch depth.

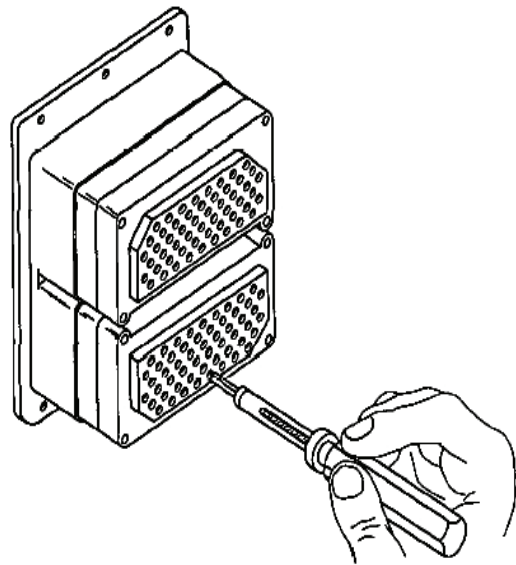


Figure 23. Unlocking Contact Retention Mechanism of Broken Contact

g. Exert axial pressure on engaging end of contact, using appropriate pin or socket as pusher. If contact does not move, seat removal tool more firmly.

h. Push contact completely out of rear of connector before disengaging removal tool (Figure 24).

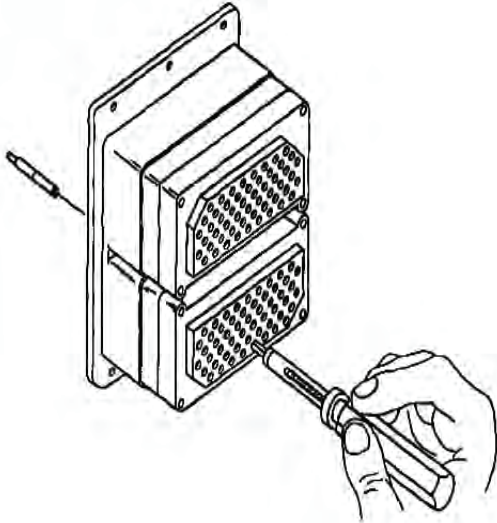


Figure 24. Broken Wire Contact Removal

96. **CONNECTOR REMOVAL AND INSTALLATION.** If connector is severely damaged or cannot be repaired using the above procedures, proceed as follows:

a. Starting from outside of damaged connector, tag wires and remove all contacts from connector (paragraph 91). If contact cannot be removed, cut wire as close to connector as possible and attach new contact (paragraphs 85 and 86).

b. Starting from center of new connector, insert contact into correct cavity (paragraph 87). Repeat procedure until all contacts are installed in new connector.

97. **CONNECTOR BUILDUP SOLDER CONTACTS.**

98. For buildup procedures for solder contacts refer to NAVAIR 01-1A-505-1, WP 016 00.

99. **CONNECTOR CLEANING AND PRESERVATION.**

100. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00.

CONNECTOR ACCESSORIES

MIL-C-81659

Reference Material

Installation Practices, Aircraft Electric and Electronic Wiring.....NAVAIR 01-1A-505-1
Connectors, Electrical, Rectangular, Rack and Panel, Solder Type
and Crimp Type Contacts, General Specification for..... MIL-C-28748
Connectors.....007 02

Alphabetical Index

Subject	Page No.
Introduction	1
MIL-C-81659 Connector Accessories	1
Dust Caps	1
Housings	1
Junction Shells	2
Sealing Plugs	1
Strain Relief and Cable Clamps	2
Cable Clamps	2
Strain Relief	2

Record of Applicable Technical Directives

None

1. **INTRODUCTION.**

2. This Work Package (WP) covers connector accessories used with MIL-C-81659 Series 1 and 2 connectors, their function, and procurement information.

3. **CONNECTOR ACCESSORIES.** Connector accessories are components added to a connector to enhance its operational characteristics. These accessories are divided into the following categories:

- a. Sealing Plugs
- b. Dust Caps
- c. Housings
- d. Strain Reliefs and Cable Clamps
- e. Junction Shells

4. **MIL-C-81659 SERIES 1 AND 2 CONNECTOR ACCESSORIES.**

5. **SEALING PLUGS.** Sealing plugs are used where unwired contacts are placed to maintain environmental resistance. Sealing Plugs are sized according to contact size (Figure 1).

6. **DUST CAPS.** Protective covers, more commonly called dust caps are used to prevent dirt and dust from entering the connector. They are also used to protect pins, sockets and coupling devices during shipping and storage (Figure 2).

7. **HOUSINGS.** The housing or shell is the connector holder can be obtained in one to four types. They usually are supplied with the connector and are identified in the part number when ordering (Figure 3).

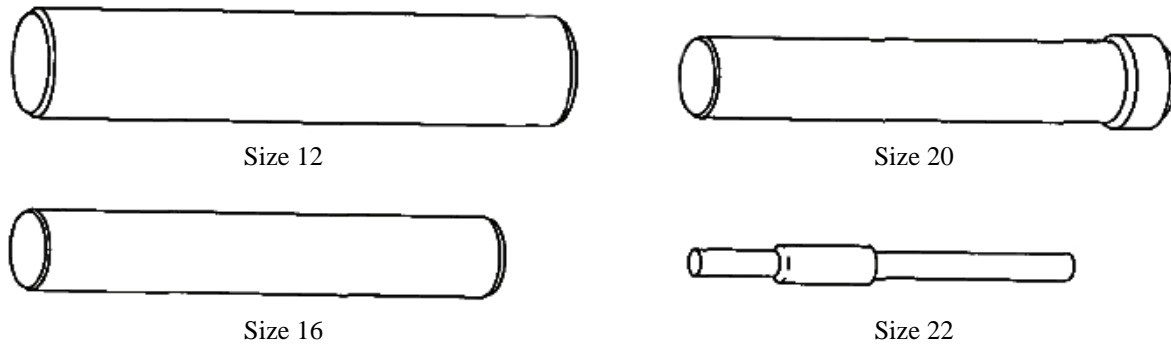
8. **STRAIN RELIEFS AND CABLE CLAMPS.**
The following two paragraphs explain the two types of cable support or clamping devices.

9. **Cable Clamps.** A cable clamp is a support or clamping device which requires use of an intermediate component for attachment to back of connector (Figure 4).

10. **Strain Reliefs.** A strain relief is a support or clamping device which attaches directly to connector

(Figure 4). Vendor parts are shown, however any qualified vendor with suitable product meeting form, fit and function, may be used.

11. **JUNCTION SHELLS.** Junction shells are attached to the rear of the connector to prevent wires from being pulled out (Figure 5). Vendor parts are shown, however any qualified vendor with suitable product meeting form, fit and function, may be used.



Contact Size	Part No.	Color
12	MS27488-12	Yellow
16	MS27488-16	Blue
20	MS27488-20	Red
22	MS27488-22	Black

Figure 1. Sealing Plugs

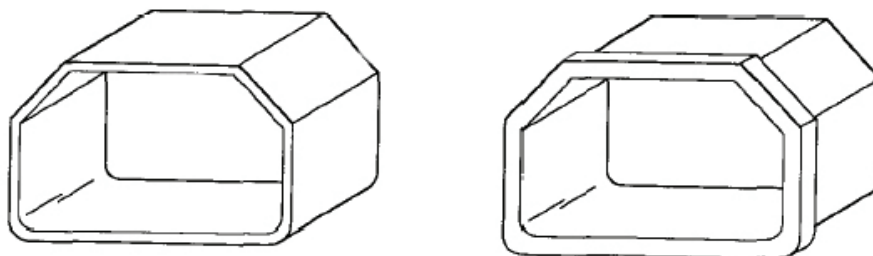


Figure 2. Typical Dust Caps

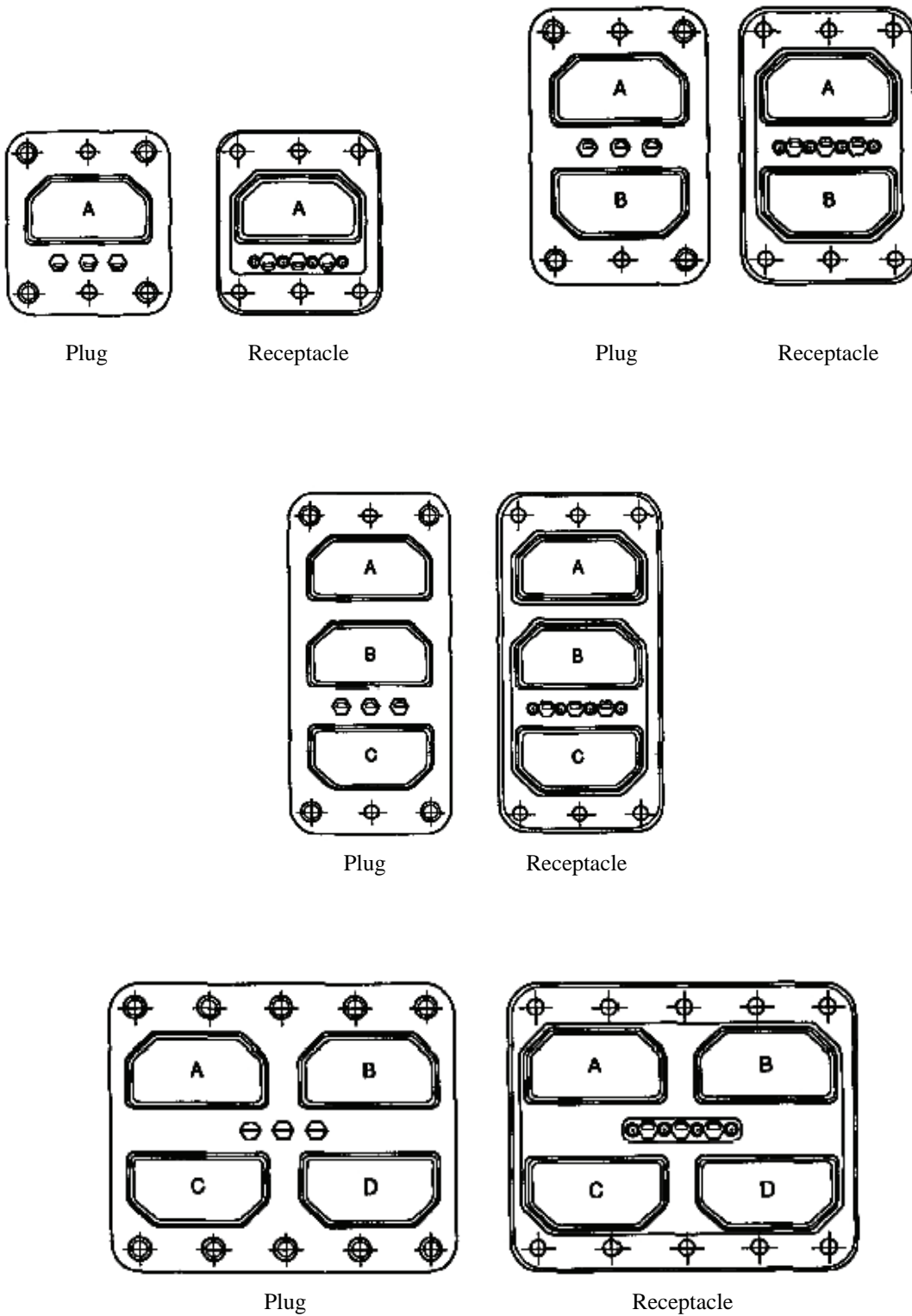
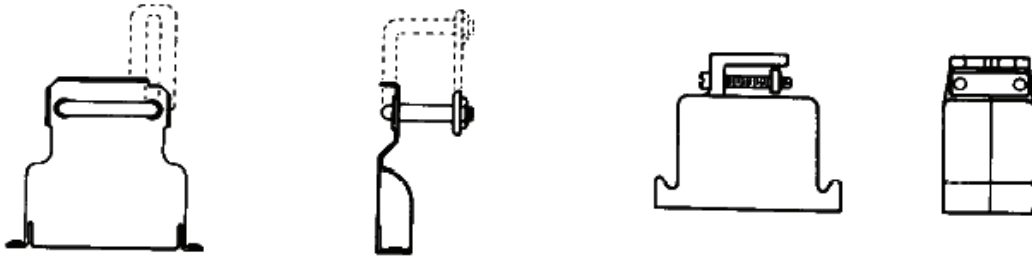


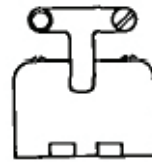
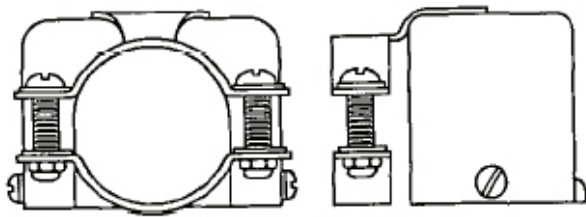
Figure 3. Housings



W Strain Relief Clamp 90°

W Shield & Cable Clamp 180°

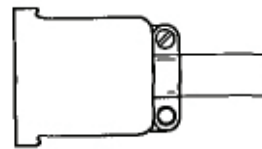
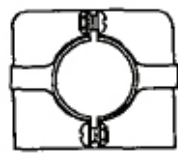
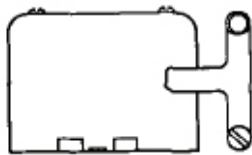
Figure 4 Strain Relief and Cable Clamp



STYLE
 DPXA
 DPX2

PART NUMBER
 20745-21
 20745-8

Straight Junction Shell

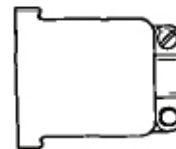


STYLE
 DPXA-RIGHT
 DPXA-LEFT
 DPX2°-RIGHT
 DPX2°-LEFT

PART NUMBER
 20745-22
 20745-23
 20745-10
 20745-11

22017 Diecast Straight Junction Shell

90° Angle



**22017-1 Diecast 90° Angle
 Junction Shell**

**22017-2 Diecast Straight
 Junction Shell (Long)**

Figure 5. Junction Shells

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

008 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 83733**

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-DTL-83733.....	008 03
Connectors MIL-DTL-83733	008 02
Introduction	008 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 83733**

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-DTL-83733. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-DTL-83733

Reference Material

Connectors, Electrical, Miniature, Rectangular Type, Rack to PanelMIL-DTL-83733
 Contacts, Electrical Connector, Crimp Removable, General Specification for..... SAE-AS-39029
 Installation Practices, Aircraft Electric and Electronic WiringNAVAIR 01-1A-505-1
 Environment Resistant, General Specification for
 Connector Accessories MIL-DTL-83733..... 008 03

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	15
Connector Cleaning and Preservation	21
Connector Removal and Installation	21
Connector Sealing	17
Moisture Barrier	17
Sealing Plugs.....	17
Contact Crimping	15
Contact Insertion	16
Contact Removal	17
Broken Wire Contact Removal	20
Wired Contact Removal.....	17
Unwired Contact Removal.....	19
Wire Stripping.....	15
Introduction	3
Description	3
MIL-DTL-83733 Connectors	3
Cable and Coaxial Contact Assembly	13
Coaxial Contacts	11
Connector Shells	3
Contact Application	11
Contacts.....	7
Contact Availability	7
Crimp Removable Contacts	7
Design and Construction	4
Insert Arrangement.....	7
Insert Configuration	7
Inserts	4
Closed-Entry Socket Contacts.....	4
Contact Extraction.....	4
Contact Insertion	4
Contact Retaining Clip.....	4
Interfacial Seal	4
Moisture Sealing	4
Peripheral Seal	4
Shell Seal	4

Wire Seal.....	4
Interchangeability.....	7
Mounting.....	3
Part Number.....	3
Class.....	4
Insert Configuration.....	4
Military Designation.....	4
Shell Size.....	4
Specification Sheet Number.....	4
Polarization.....	3
Power Contacts.....	11
Sealing Plugs.....	3
Thermocouple Contact.....	13
Wrappost Contacts.....	13
Tooling.....	11
Usage.....	13

Record of Applicable Technical Directives

None

Support Equipment Required

Support Equipment Required (Cont)

Part No./ Type Designation	Nomenclature
Cooper Tools 14YB3 (or equivalent)	Powered Tool, Wire Wrapping
Cooper Tools 14HP1C (or equivalent)	Manual Tool, Wire Wrapping
Gardner-Denver Model 14BIAL, (or equivalent)	Powered Tool, Wire Wrapping
HT-900B (or equivalent)	Heating Tool, Compressed Air/ Nitrogen
M22520/1-01.....	Tool, Crimp, Frame
M22520/1-02.....	Positioner
M22520/2-01.....	Tool, Crimp, Frame
M22520/2-09.....	Positioner
M22520/2-12.....	Positioner
M22520/2-30.....	Positioner
M22520/5-01.....	Tool, Crimp, Frame
M22520/5-08.....	Positioner
M81969/14-01.....	Tool, Insertion/ Removal
M81969/14-02.....	Tool, Insertion/ Removal
M81969/14-03.....	Tool, Insertion/ Removal

Part No./ Type Designation	Nomenclature
M81969/14-04.....	Tool, Insertion/ Removal
Standard Pneumatic 615-1 (or equivalent)	Powered Tool, Wire Wrapping
-	Heat Sink
-	Iron, Soldering

Materials Required

Specification/ Part No.	Nomenclature
MIL-I-23053.....	Insulating, Sleeving, Heat-Shrinkable
TT-I-735.....	Alcohol, Isopropyl

1. **INTRODUCTION.**

2. This Work Package (WP) pertains to connectors manufactured in accordance with MIL-DTL-83733.

NOTE

All the MIL-DTL-83733 connectors are electroless nickel plated in accordance with SAE-AMS2404. These connectors are not for Navy use. If replacement of existing MIL-DTL-83733 connectors for Naval use is required, consult responsible engineering authority.

3. **DESCRIPTION.** The connectors covered by MIL-DTL-83733 have the following features:

- a. Environment resistant at sea level and high altitudes.
- b. Continuous operation at temperatures ranging from -85°F (-65°C) to +392°F (+200°C).
- c. A non-removable, integral, resilient peripheral seal in the receptacle shell which will engage the mating plug before mating is completed.
- d. Voltage service ratings I and II.
- e. Fluid Resistant.
- f. Designed to prevent inadvertent electrical contact and provide contact protection during mating.

4. **MIL-DTL-83733 CONNECTORS.**

5. MIL-DTL-83733 connectors are environment and fluid resisting, miniature, rectangular, rack to panel electrical connectors, both military and commercial, having pin and socket rear release, removable crimp contacts with fixed or float mounting (Figure 1).

6. **SEALING PLUGS.** The connector when ordered as a unit will have sealing plugs enclosed equal to ten percent of the number of contacts, but not less than one sealing plug per unit package. The sealing plugs are used in both plugs and receptacles.

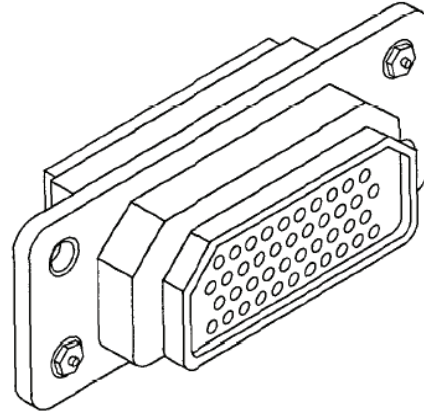


Figure 1. MIL-DTL-83733 Typical Connector

7. **CONNECTOR SHELLS.** The connector shells are made from high grade aluminum alloy to form a solid shell designed to positively retain inserts. The engaging skirts have a keystone shape to prevent mating when either connector is rotated 180 degrees from the correct mating position.

8. **POLARIZATION.** Polarization is accomplished by a keystone shape shell design with polarization accomplished before engagement of pins or sockets.

9. **MOUNTING.** Rack to panel connector shells are capable of being interchangeably mounted in a fixed or floating position. Fixed mounted connectors will mate properly with float mounted connectors. Shells are provided with either captive clinch nuts for fixed mounting of will be provided with or have provisions to allow installation of spring mounts, bushings, or guide pins.

10. **Mounting Styles.** Figure 2 provides mounting styles for MIL-DTL-83733 connectors. Bushing and spring mount assemblies are separate accessories, refer to WP 008 03.

11. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 3).

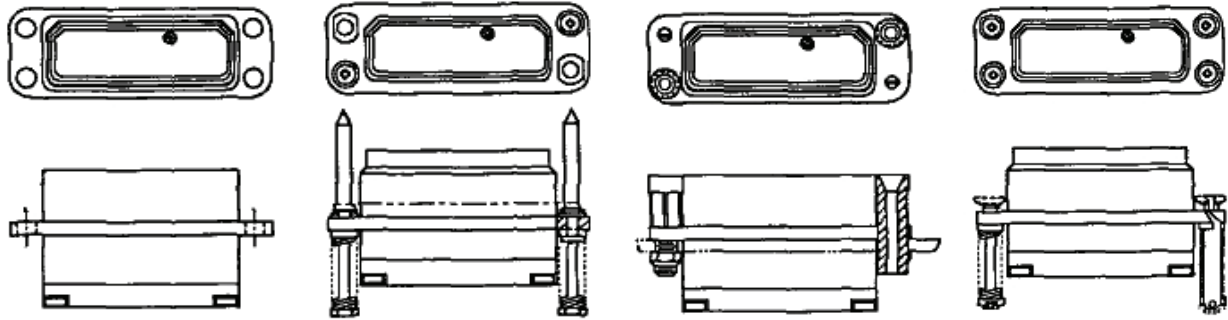
NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

12. Military Designation. The military designation is denoted by the letter "M".
13. Specification Sheet Number. The specification number sheet denotes the shell style.
14. Class. The class indicates the environment resistant abilities.
15. Shell Size. The shell size is indicated by a letter, A or B.
16. Insert Configuration. The insert configuration denotes service rating and number of contacts.
17. **DESIGN AND CONSTRUCTION**. Connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.
18. **INSERTS**. The inserts are non-removable, mechanically retained and bonded in the shell. The insert and wire sealing members are essentially one integral part, consisting of one or more parts bonded

together, designed to provide suitable sealing and support around wires. The insert is designed to provide positive locking of individual contacts.

19. Crimp Snap-in Contacts. Snap-in contacts designed to SAE-AS-39029 can be crimped with standard M22520 crimp tools.
20. Closed-Entry Socket Contacts. These contacts eliminate damage from abuse by test probes and help to correct any misaligned pins during engagement.
21. Contact Insertion. Insertion is accomplished from rear of connector. When contact is fully inserted, the clip tines snap securely behind contact shoulders.
22. Contact Extraction. Extraction is accomplished with use of a removal tool.
23. Contact Retaining Clip. The contact retaining clip is completely encased in a tough plastic wafer to protect clip from damage.
24. Moisture Sealing. Complete sealing is achieved by combining four seals, shell, peripheral, interfacial, and wire seal.
25. Shell Seal. This seal is affected when plug shell pushes against sealing ring in receptacle when connectors are mated.
26. Peripheral Seal. This seal is around the edge of pin insulator and designed so that when mating the connector, tension is put on seal and greatly reduces compression set.
27. Interfacial Seal. This seal is achieved by insulator faces meeting when the plug and receptacle are mated.
28. Wire Seal. This seal is accomplished by a multiple ripple design, exceeding wire sealing requirements of MIL-DTL-83733.

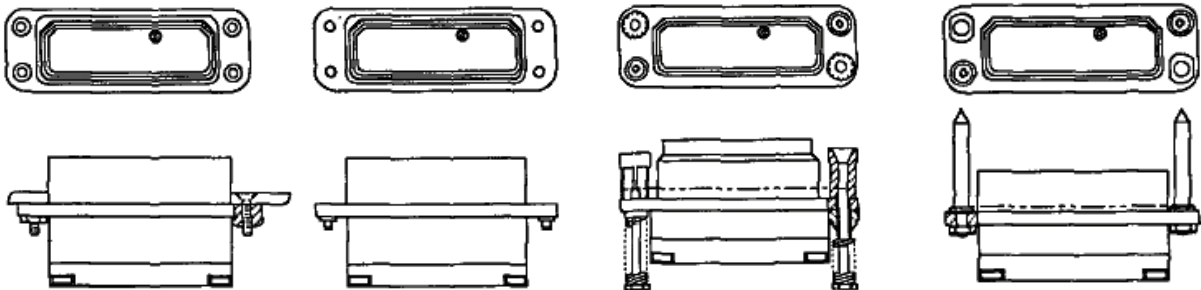


MIL-C-83733/1
 Standard Hole
 Mounting

MIL-C-83733/2
 With Guide Pins And
 Spring Mounting

MIL-C-83733/3
 With Guide
 Sockets

MIL-C-83733/4
 With Captive
 Springs

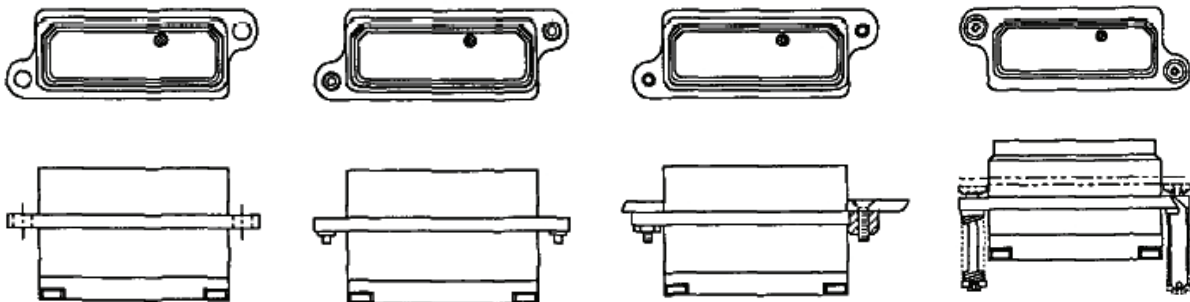


MIL-C-83733/5
 Bushing
 Mounting

MIL-C-83733/6
 Clinch Nut
 Mounting

MIL-C-83733/7
 With Guide Sockets
 And Spring Mounting

MIL-C-83733/8
 With
 Guide Pins



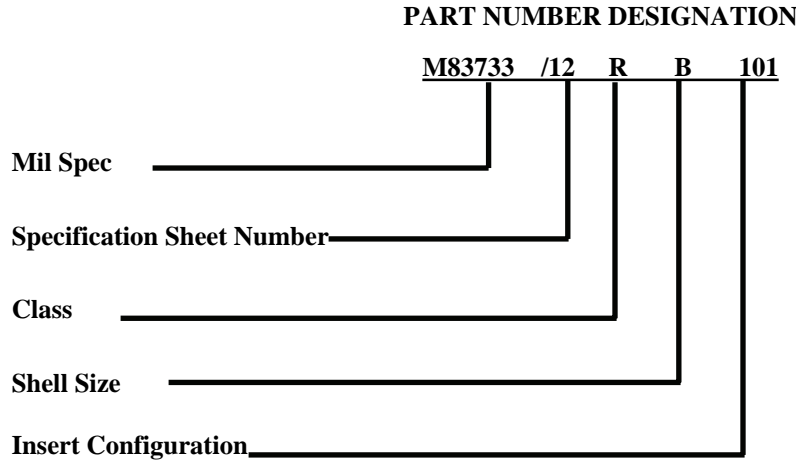
MIL-C-83733/9
 Staggered Standard
 Hole Mounting

MIL-C-83733/10
 Staggered
 Bushing Mounting

MIL-C-83733/11
 Staggered
 Clinch Nut Mounting

MIL-C-83733/4
 Staggered
 Spring Mounting

Figure 2. MIL-DTL-83733 Connector Mounting Styles



Specification Sheet

/1	Pin Insert, Receptacle Shell, Thru Hole Mounting.	/11	Pin Insert, Receptacle Shell, Staggered Clinch Nut Mounting.
/2	Socket Insert, Plug Shell, With Guide Pins And Spring Mounting.	/12	Socket Insert, Plug Shell, With Staggered Spring Mounting.
/3	Pin Insert, Receptacle Shell, With Guide Socket Mounting.	/13	Shielded Pin Contact For B71C Contact Arrangement.
/4	Socket Insert, Plug Shell, With Captive Spring Mounting.	/14	Shielded Socket Contact For B71C Contact Arrangement.
/5	Pin Insert, Receptacle Shell, Bushing Mounting.	Class R Environmental Shell Size A Small Shell B Large Shell See Table 2 Insert Configuration See Table: 2 And Figure: 5	
/6	Pin Insert, Receptacle Shell, Clinch Nut Mounting.		
/7	Socket Insert, Plug Shell, With Guide Sockets And Spring Mounting.		
/8	Pin Insert, Receptacle Shell, Guide Pin Mounting.		
/9	Pin Insert, Receptacle Shell, Staggered Hole Mounting.		
/10	Pin Insert, Receptacle Shell, Staggered Bushing Mounting.		

Figure 3. MIL-DTL-83733 Part Number Breakdown

29. **INTERCHANGEABILITY.** Refer to Table 1 for the mating capabilities of MIL-DTL-83733 connectors.

30. **INSERT ARRANGEMENT.** The insert arrangement is number and size of contacts available by shell size (Table 2).

31. **INSERT CONFIGURATION.** The insert configuration is the manner in which contacts are placed within insert in a standard configuration. The contact symbol identifies size of contact in insert (Figure 4). All arrangements identified in Table 2 are illustrated (Figure 5).

32. **CONTACTS.** Contacts are designed to prevent damage to contact retention device or sealing member during insertion or removal of contacts.

33. **Crimp Removable Contacts.** Crimp removable contacts may be used with all environment resisting classes of connectors.

34. **Contact Availability.** Crimp contacts are supplied with each connector unit package and consist of a full complement of plugs, one spare per size for connectors of 26 contacts or less and two spares per size for connectors having more than 26 contacts. No spares for shielded contacts are provided. Contacts may also be ordered in individual quantities when necessary.

Table 1. MIL-DTL-83733 Connector Mating Capabilities

Receptacle	Connector Type	Mating Plug	Connector Type
M83733/01	Standard Hole Mounting	M83733/04	With Captive Springs
M83733/03	With Guide Sockets	M83733/02	With Guide Pins And Spring Mounting
M83733/05	Bushing Mounting	M83733/04	With Captive Springs
M83733/06	Clinch Nut Mounting	M83733/04	With Captive Springs
M83733/08	With Guide Pins	M83733/07	With Guide Sockets And Spring Mounting
M83733/09	Staggered Standard Hole Mounting	M83733/12	Staggered Spring Mounting
M83733/10	Staggered Bushing Mounting	M83733/12	Staggered Spring Mounting
M83733/11	Staggered Clinch Nut Mounting	M83733/12	Staggered Spring Mounting

Table 2. MIL-DTL-83733 Insert Arrangements

Shell Size Insert Arrangement	Service Rating (Note)	Contact Size					Number of Contacts
		12	16	20	22D	Shielded 12	
A018	I	18	-	-	-	-	18
A032	I	-	32	-	-	-	32
A051	I	-	-	51	-	-	51
A131	II	-	-	-	131	-	131
B048	I	18	30	-	-	-	48
B064	I	-	64	-	-	-	64
B071	I	15	-	56	-	-	71
B078	I	-	40	38	-	-	78
B101	I	-	-	101	-	-	101
B185	II	-	-	-	185	-	185
B71C	I and 500 VDC	-	-	56	-	15	71

NOTE:

Condition	Service Rating I		Service Rating II	
	Mated	Unmated	Mated	Unmated
Sea Level	1800	1800	1300	1300
50,000 Feet	1000	600	800	550
70,000 Feet	1000	400	800	350
110,000 Feet	1000	200	800	200

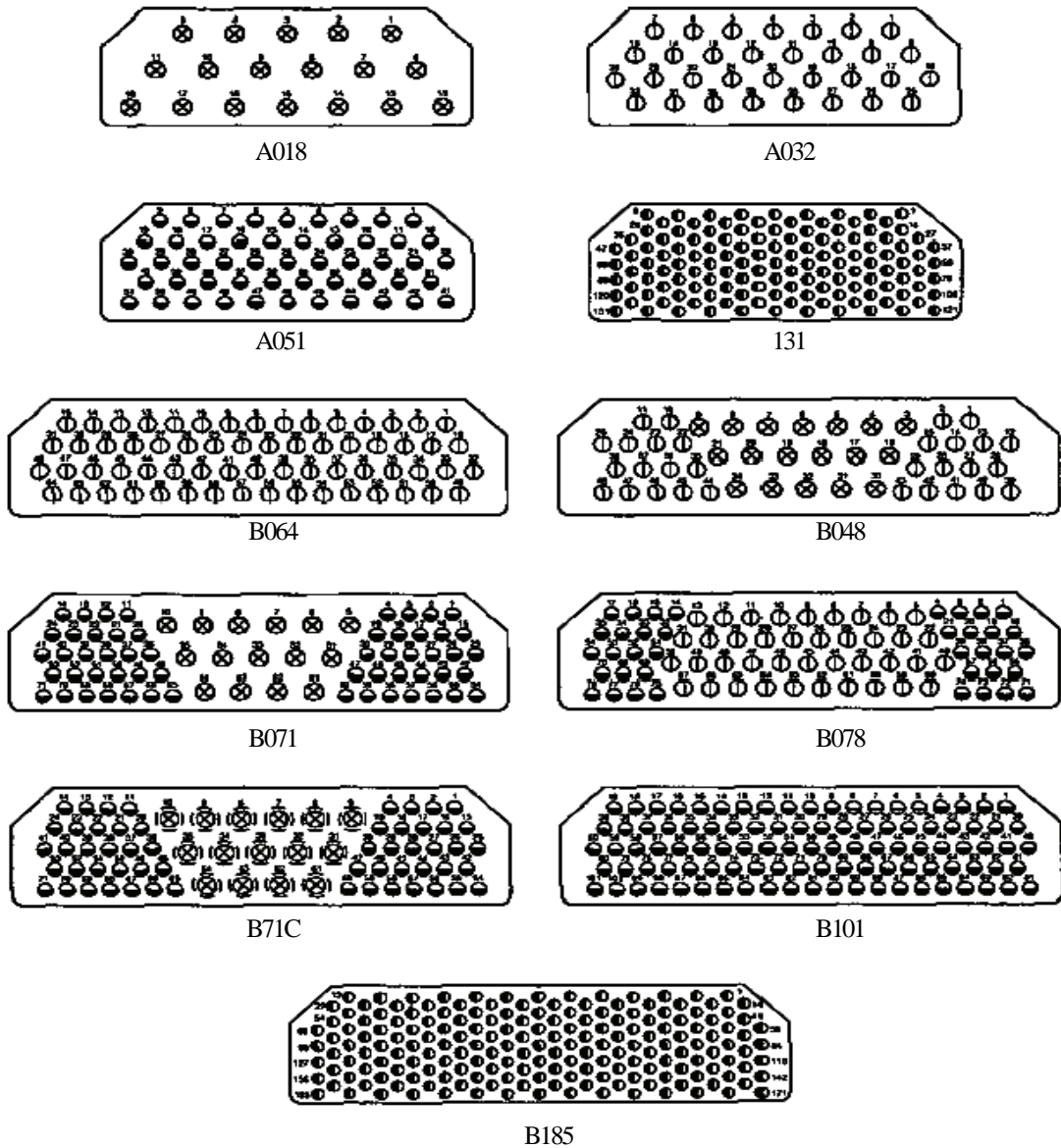


Figure 4. MIL-DTL-83733 Insert Configurations

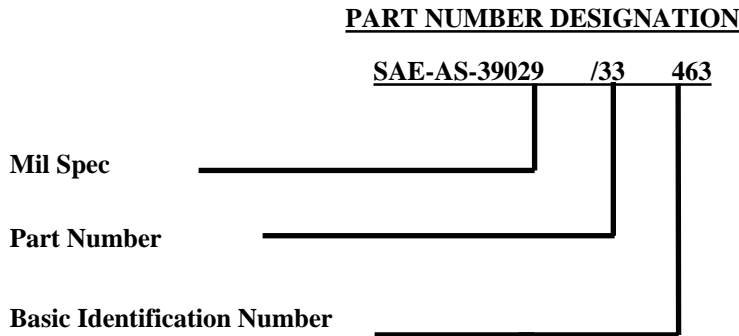
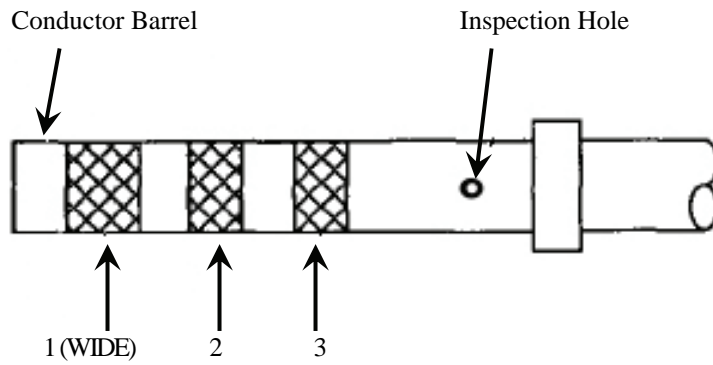


Figure 5. SAE-AS-39029/ Part Number Breakdown



Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Gray	8
Yellow	4	White	9
Example Bin Code: 463			
Yellow(Wide Band) / Blue / Orange			

Figure 6. Basic Identification Number and Color Bands

35. **CONTACT APPLICATION.** Contacts used are manufactured in accordance with SAE-AS-39029. The contact part number breakdown is illustrated (Figure 6). The Basic Identification Number (BIN) or last three digits of contact part number, matches the standard resistor color code (Figure 7).

36. **POWER CONTACTS.** Power contacts are used to connect single conductor wire through connectors. The power contacts (Table 3) range from size 12 thru 22D and are crimp rear insertion, rear-release design. Contacts are listed by size. Match the required size to the connector application, wire gage, and composition. Socket and pin contact part numbers are listed along with corresponding color bands.

37. **TOOLING.** The procedure for attaching power contacts to a single conductor wire are the same for this connector series. Select proper tooling for specific contact part number (Table 4) and refer to NAVAIR 01-1A-505-1, WP 013 00 for correct assembly and crimp procedures.

38. **COAXIAL CONTACTS.** When routing coaxial cable through connectors, coaxial contacts are superior to other coaxial cable shield termination methods. The shield integrity is maintained across the contact body. Socket and pin contact part numbers are listed along with corresponding color bands. The coaxial contacts are size 12 only (Table 3).

Table 3. MIL-DTL-83733 Power and Coaxial Contacts Application

Contact Size	Wire Gage (AWG) Or Cable Type	Socket Contacts			Pin Contacts				
		M39029/	Color Bands			M39029/	Color Bands		
			1 st	2 nd	3 rd		1 st	2 nd	3 rd
22D	22-26	57-354	OR	GN	YE	58-360	OR	BL	BK
20	20-24	5-115	BN	BN	GN	4-110	BN	BN	BK
16	16-18	5-116	BN	BN	BL	4-111	BN	BN	BN
12	12-14	5-118	BN	BN	GY	4-113	BN	BN	OR
12	RG-179/U	51-341	OR	YE	BN	50-340	OR	YE	BK
Shielded									

Table 4. MIL-DTL-83733 Power and Coaxial Contacts Tooling

Socket Contacts M39029/	Pin Contacts M39029	Crimp Tool Frame M22520/	Positioner M22520/	Insertion Tool M81969/	Removal Tool M81969/	Unwired Removal Tool M81969/
57-354	58-360	2-01	2-09	14-01	14-01	-
5-115	4-110	2-01	2-12	14-11	14-11	30-05
5-116	4-111	1-01	1-02	14-03	14-03	30-06
5-118	4-113	1-01	1-02	14-04	14-04	30-07
51-541	50-340	5-01 (OUTER)	5-08 (OUTER)	14-04	14-04	-
		2-01 (INNER)	2-30 (INNER)			

Table 5. MIL-DTL-83733 Thermocouple Contacts

Contact Size	Wire Gage (AWG) Or Cable Type	Socket Contacts			Pin Contacts			Material			
		M39029/	Color Bands 1 st 2 nd 3 rd			M39029/	Color Bands 1 st 2 nd 3 rd			Material	Coating
20	20	9-132	BR	OR	RD	10-138	BR	OR	GR	Copper	Gold
20	20	9-133	BR	OR	OR	10-139	BR	OR	WH	Constantan	None
20	20	9-134	BR	OR	YE	10-140	BR	YE	BK	Alumel	None
20	20	9-135	BR	OR	GN	10-141	BR	YE	BN	Chromel	None
20	20	9-133	BR	OR	BL	10-142	BR	YE	RD	Iron	Cadmium
16	16	9-514	GN	BR	YE	10-519	GN	BR	WH	Copper	Gold
16	16	9-515	GN	BR	GN	10-520	GN	RD	BK	Constantan	None
16	16	9-516	GN	BR	BL	10-521	GN	RD	BN	Alumel	None
16	16	9-517	GN	BR	VO	10-522	GN	RD	RD	Chromel	None
16	16	9-518	GN	BR	GR	10-523	GN	RD	OR	Iron	Cadmium

NOTE: New terminology applies to thermocouple conductors as follows:

Constantan: Copper – Nickel Alloy

Alumel: Nickel – Aluminum Alloy

Chromel: Nickel - Chromium

Table 6. MIL-DTL-83733 Thermocouple Contacts Tooling

Socket Contacts M39029/	Pin Contacts M39029	Crimp Tool Frame M22520/	Positioner M22520/	Insertion Tool M81969/	Removal Tool M81969/	Unwired Removal Tool M81969/
9-132	10-138	2-01	2-02	14-02	14-02	30-05
9-133	10-139					
9-134	10-140					
9-135	10-141					
9-133	10-142					
9-514	10-519	1-01	1-02	14-03	14-03	30-05
9-515	10-520					
9-516	10-521					
9-517	10-522					
9-518	10-523					

Table 7. MIL-DTL-83733 Wrappost Contact and Tooling

Contact Size	Socket Contacts		Pin Contacts			
	M39029/ Mates with 57-354		M39029/	Color Bands 1 st 2 nd 3 rd		
22			71-392	OR	WH	RD

Usage data: These contacts are for use only on internal wiring of equipment and equipment panels.
This contact is only used in the M83733/1 for this series connector.
Use Installation/Removal Tool: M81969/1-04

39. **CABLE AND COAXIAL CONTACT ASSEMBLY.** To assemble coaxial contacts to applicable cable identify cable by part number. Select proper tooling by contact part number (Table 4). Assemble contacts shown (Figures 8 and 9).

40. **THERMOCOUPLE CONTACT.** A thermocouple contact is unplated, although sometimes coated, and consists of the same material as the thermocouple conductor on which the contact is being crimped. The thermocouple contact has the same configuration as the power contact. See table 5 for part number and tables 6 for tooling.

41. **Wrappost Contacts.** Wrappost, or wire wrapped contacts, are used for solderless wire wrapping which

is a highly reliable method for making point-to-point mechanical and electrical connections between wires and terminals. Refer to WP 004 02 maintenance procedures and tooling information, as well as to NAVAIR 01-1A-505-1, WP 003 00 Table 2 for more explanation on wire wrapping. See table 7 for contact selection for the MIL-C-83733/1 connector which employs wrappost connections.

42. **USAGE.** MIL-DTL-83733 connectors are intended for use in applications wherein extremes of temperature, humidity, and barometric pressure are experienced. They are not intended for use at operating temperatures higher than 392°F (200°C) for extended periods.

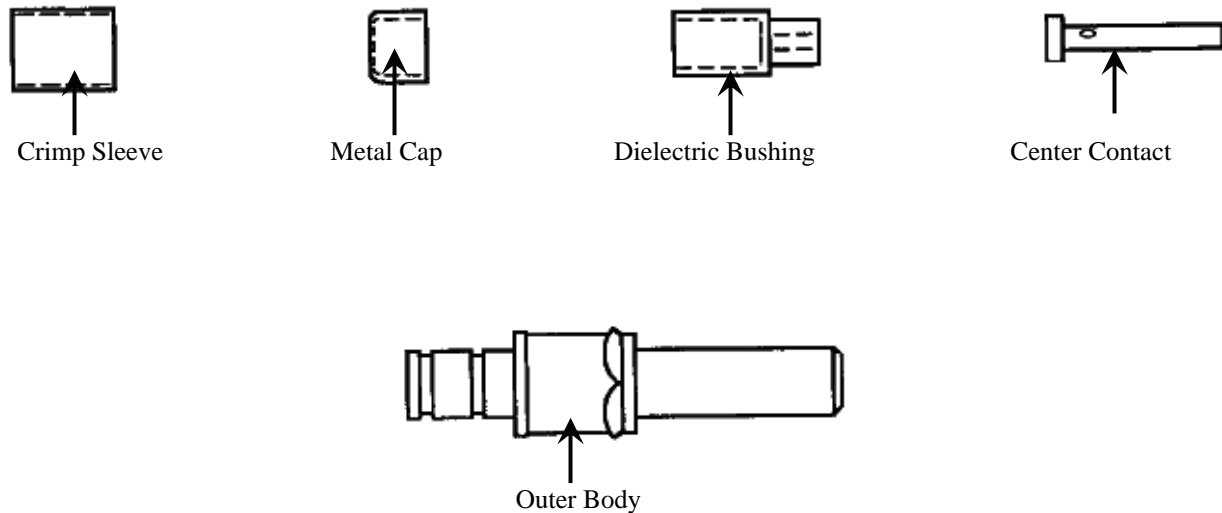
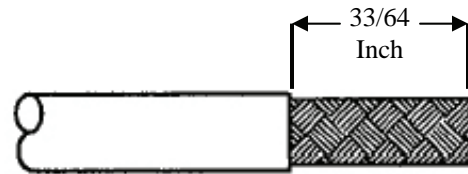
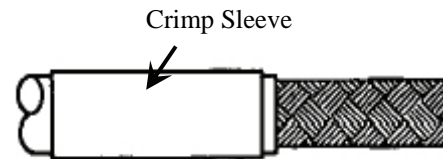


Figure 7. Shielded Contact Assembly

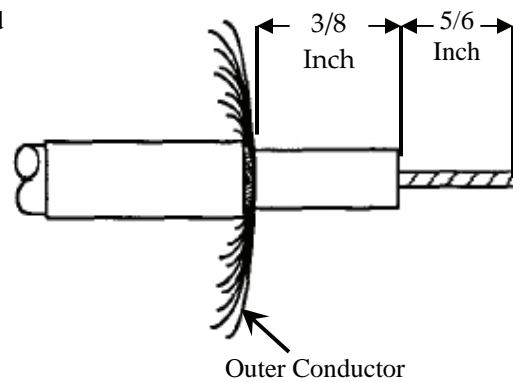
- A. Cut Cable End Square and Remove Outer Jacket To $\frac{33}{64}$ Inch Dimension. For Cable Stripping Refer To Navair 01-1A-505-1.



- B. Slide Crimp Sleeve Onto The Cable Out Of The Way.



- C. Comb And Fold Out Outer Conductor. Strip Dielectric, And Trim Inner Conductor To 5.164 Inch Diameter.



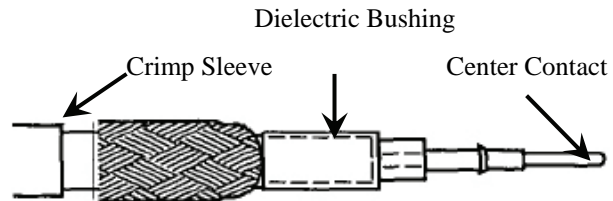
- D. If Applicable, Slide Metal Cap, Small Bore First, Over Stripped Center Conductor And Dielectric.

- E. Slide Dielectric Bushing On (Large Diameter First) Until It Butts Combed Outer Conductor.

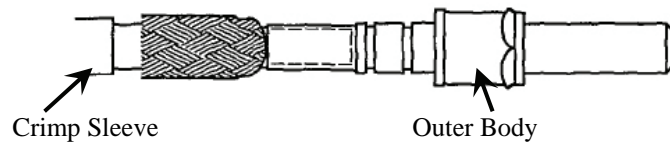


Figure 8. Coaxial Cable and Shielded Contact Assembly (Sheet 1 of 2)

- F. Tin Center Conductor And Solder Onto Center Contact. Maintain A Butt Condition Between Contact And Dielectric While Soldering In Place.



- G. Insert Center Contact Assembly Into Contact Outer Body Until It Bottoms. If Previously Installed. Slide Metal Gap Onto Outer Contact Ferrule Until It Bottoms.



- H. Fold Outer Conductor Strands Evenly Over Ferrule End Of Outer Contact Body And Metal Cap, If Installed, And Position Crimp Sleeve Over Them Approximately 1/16 Inch From Contact Shoulder.

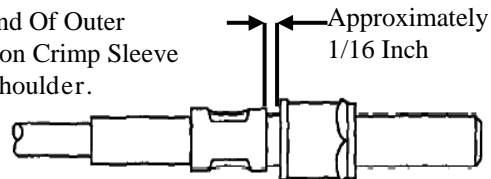


Figure 8. Coaxial Cable and Shielded Contact Assembly (Sheet 2)

43. **CONNECTOR BUILDUP.**

44. **WIRE STRIPPING.** Strip wire in accordance with following procedure:

a. Cut wire to proper length. Ensure enough wire remains for adequate strain relief without leaving excess slack.

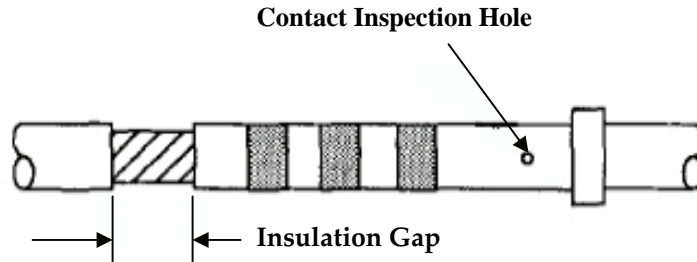
b. Strip insulation from end (NAVAIR 01-1A-505-1, WP 016 00). Select contact (Table 3).

45. **CONTACT CRIMPING.** Crimp contact in accordance with following procedure:

a. Select correct crimp tool (Table 4, 6 or 7).

b. Perform die closure check, install positioner, and set selector knob for gage of wire (NAVAIR 01-1A-505-1, WP 013 00).

c. Insert stripped wire into contact conductor barrel. Ensure all wire strands are inside contact conductor barrel and visible in contact inspection hole (Figure 9).



Contact Size	Wire AWG	Insulation Gap
22	24	1/32 Inch MIN. 1/16 Inch MAX.
	22	
20	20	11/32 Inch MIN. 5/64 Inch MAX
16	20	
	16	
12	12	

Figure 9. Insulation Gap

d. If insulation gap is too large, trim conductor as required. If insulation gap is too small, trim insulation as required.

e. Crimp contact to wire.

46. **CONTACT INSERTION.** Insert wired or unwired contacts in accordance with following procedure:

a. Remove sealing plug and/or contact from contact cavity (Paragraph 50).

b. Ensure wire or cable on contact is routed through connector backshell.

c. Select correct insertion tool (Table 4, 6 or 7).

WARNING

Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

e. Insert tip of contact into cavity. Start contact insertion near connector center cavities and work outward.

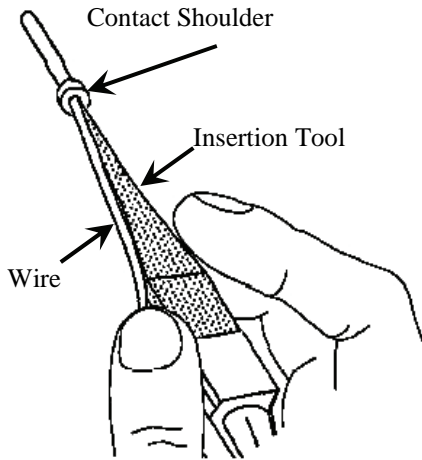


Figure 10. Inserting Contact into Insertion Tool

f. Axially align contact with contact cavity.

g. With firm even pressure, press tool against contact shoulder and seat contact into cavity (Figure 11). A slight click may be heard as retention tines snap into place behind contact shoulder.

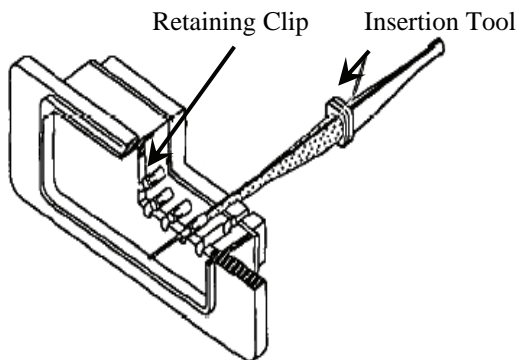


Figure 11. Contact Insertion

h. Pull tool straight out of contact cavity. Remove tool from wire. Pull back lightly on wire to ensure contact is properly seated.

i. Seal connector as required (Paragraph 47).

47. **CONNECTOR SEALING.**

48. Sealing Plugs. Seal connector in accordance with following procedure:

a. Fill all unused cavities with uncrimped contacts (Paragraph 46).

b. Insert sealing plug, large diameter end first, until bottomed in contact cavity. Do not insert further than knob. Fill all cavities that have uncrimped contacts. For grommet sealing plug selection refer to NAVAIR 01-1A-505-1, WP 023 00.

49. Moisture Barrier. For connector sealing procedures, including application of sealant to grommet sealed connectors, refer to NAVAIR 01-1A-505-1, WP 025 00.

50. **CONTACT REMOVAL.** Remove wired, unwired, and broken wire contacts in accordance with following paragraphs.

51. Wired Contact Removal.

a. Select correct removal tool (Table 4, 6 or 7).

WARNING

Metal tool tips are sharp and can cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

b. Place wire of contact to be removed into removal tool, with white tip facing connector insert (Figure 12).

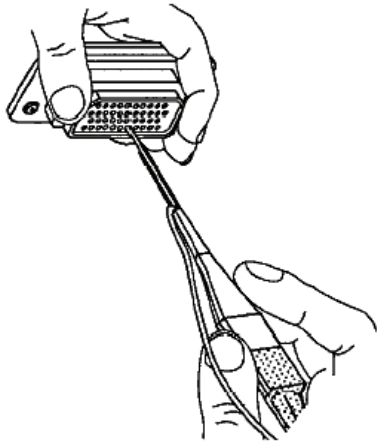


Figure 12. Inserting Wire into Removal Tool

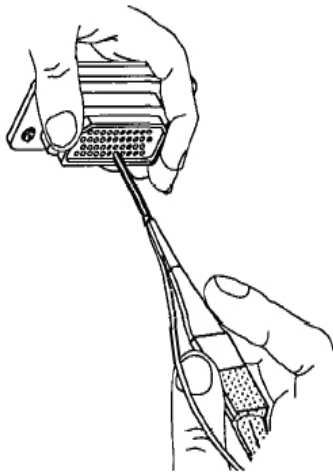


Figure 13. Removal Tool on Wire

c. Slide removal tool along wire at a right angle to connector insert face and align with contact cavity (Figure 13).

d. Insert tool into contact cavity until tool tip bottoms against contact shoulder (Figure 14). A slight increase in resistance will be noticed just before the tool tip bottoms. This will spread the retention clip and release its hold on the contact.

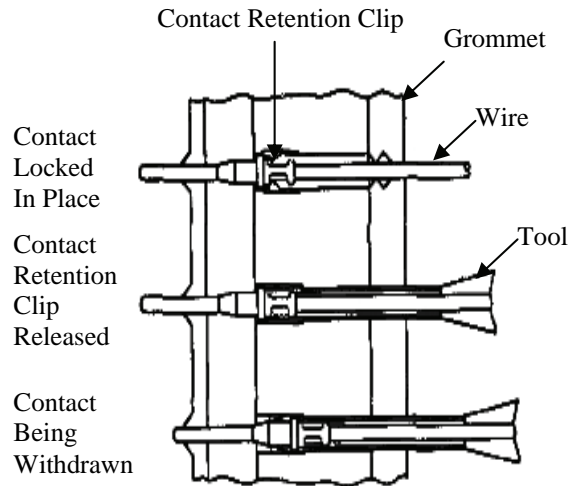


Figure 14. Unlocking Contact Mechanism

e. Press wire firmly against serrated edge of removal tool and pull wire straight out from contact cavity (Figure 15).

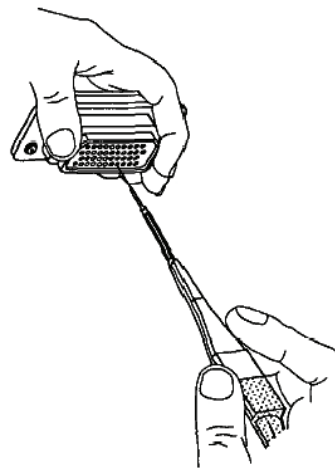
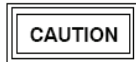


Figure 15. Removing Contact from Connector

52. Unwired Contact Removal.



Metal tool tips are sharp and cause injury to personnel and/or damage to connectors.



Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

- a. Select correct unwired removal tool (Table 4, 6 or 7 and Figure 16).

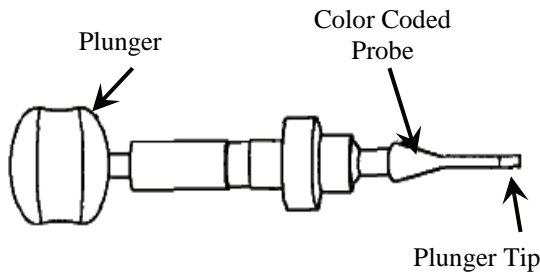


Figure 16. Unwired Contact Removal Tool

- b. With rear of connector exposed, remove sealing plug from insert cavity of contact to be removed.
- c. Press and hold tool plunger until tip of tool is aligned with contact to be removed.
- d. Axially align removal tool with contact to be removed.

- e. Insert removal tool tip into contact cavity to butt contact wire barrel; then slide removal tool sleeve over contact and exert pressure until sleeve bottoms (Figure 17).

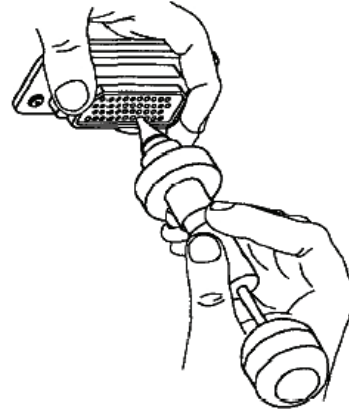


Figure 17. Unlocking Contact Retention Mechanism

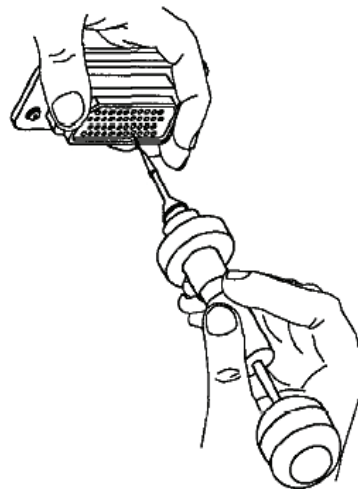


Figure 18. Extracting Contact from Connector

- f. Remove tool and unlocked contact from connector by withdrawing tool from connector (Figure 18).

g. Remove contact from removal tool by pressing plunger.

53. Broken Wire Contact Removal.

WARNING

Metal tool tips are sharp and cause injury to personnel and/or damage to connectors.

CAUTION

Present metal tooling in some instances has damaged the wire sealing grommet at the end of the connectors. Plastic tools are preferred.

Caution should be exercised in the use of tooling.

Inspect tips of metal tools for distortion of probe before use as connector damage can occur.

- a. Select correct removal tool (Table 4, 6 or 7).
- b. Insert tip of removal tool about 1/8 inch into cavity at rear of connector.

CAUTION

Wire strands may be encountered at any point up to 5/16 inch of tool insertion. It is important not to jam any strands of wire up to this point.

Withdraw removal tool anytime during insertion when it cannot be advanced into connector using these procedures. Inspect tool tip for nicks, cracks, mushrooming, and other damage that will prevent is functioning. Replace removal tool and repeat procedure, if required.

NOTE

Refer to figure 19 for approximate dimensions of a size 22 contact and cavity. The dimensions in this procedure are based on a size 22 contact.

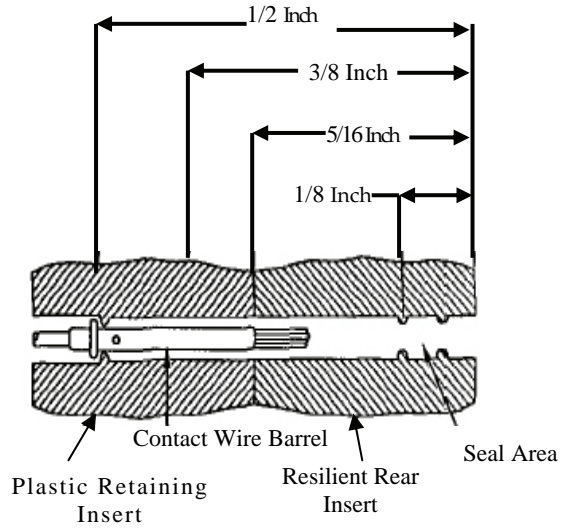


Figure 19. Typical Connector Dimensions

- c. Gently insert removal tool into cavity in about 1/16 inch units, releasing tool after each unit if resistance is felt.

NOTE

Rotating removal tool works splayed wire strands into slot of tool, allowing tool to pass.

Removal tool may be blocked at rear of contact by plastic insert or additional strands of broken wire.

- d. If resistance is felt before removal tool reaches back end of contact, withdraw tool slightly, rotate about 1/6 of a turn, and reinsert tool. Repeat rotating and insertion procedure until tool passes with minimum additional force to 5/16-inch depth back end of contact (Figure 19 and 20).

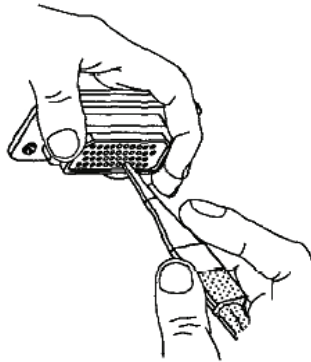


Figure 20. Unlocking Contact Retention Mechanism of Broken Wire Contact

e. Wiggle removal tool gently to help it into insert bore and over back of contact. Additional rotation may be required if broken strands are encountered.

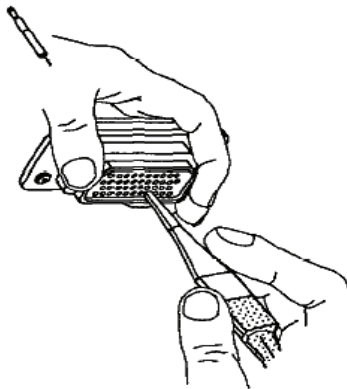


Figure 21. Broken Wire Contact Removal

f. Continue insertion of removal tool until positive stop is felt at about 1/2 inch depth.

g. Exert axial pressure on engaging end of contact, using appropriate pin or socket as pusher. (If contact does not move, seat removal tool more firmly).

h. Push contact completely out rear of connector before disengaging removal tool (Figure 21).

54. CONNECTOR REMOVAL AND INSTALLATION.

55. If the connector is severely damaged or cannot be repaired using the above procedures, proceed as follows:

a. Starting from outside of damaged connector, tag wires and remove all contacts from connector (Paragraph 50). If contact cannot be removed, cut wire as close to connector as possible and attach new contact (Paragraphs 44 and 45).

b. Starting from center of new connector, insert contact into correct cavity (Paragraph 46). Remove tag from wire. Repeat procedure until all contacts are installed in new connector.

56. CONNECTOR CLEANING AND PRESERVATION.

57. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00.

CONNECTOR ACCESSORIES

MIL-DTL-83733

Reference Material

Connectors, Electrical, Rectangular, Rack and Panel, Solder Type
and Crimp Type Contacts, General Specification for..... MIL-DTL-83733
Installation Practices, Aircraft Electric and Electronic Wiring.....NAVAIR 01-1A-505-1
Connectors.....008 02

Alphabetical Index

Subject	Page No.
MIL-DTL-83733 Connector Accessories	1
Dust Caps	1
Mounting Accessories.....	1
Jackscrews and Coupling Nuts.....	1
Spring Mounts.....	1
Sealing Plugs	1
Introduction	1

Record of Applicable Technical Directives

None

1. **INTRODUCTION**

2. This Work Package (WP) covers connector accessories used with MIL-DTL-83733 connectors, their function, and procurement information.

3. **MIL-DTL-83733 CONNECTOR ACCESSORIES.**

4. Connector accessories are components added to a connector to enhance its operational characteristics.

5. **DUST CAPS.** Protective covers are more commonly called dust caps. The purpose of dust caps is to prevent dirt from entering connectors, pins and sockets and to protect coupling device from damage during shipping and storage (Table 1).

6. **MOUNTING ACCESSORIES.** Connectors for rectangular or staggered mounting are available in both two and four-spring mount assemblies (WP 008 02, Figure 2), or the same shell style may be ordered

to accommodate self locking bushings for fixed mounting (Table 2).

7. **Spring Mounts.** The spring mount version is designed to compensate for panel space variations while ensuring electrical and environmental integrity (Figure 1).

8. **Jackscrews and Coupling Nuts.** The jackscrew and coupling nut version is designed for cord to-cord and cord-to-panel applications (Figure 2).

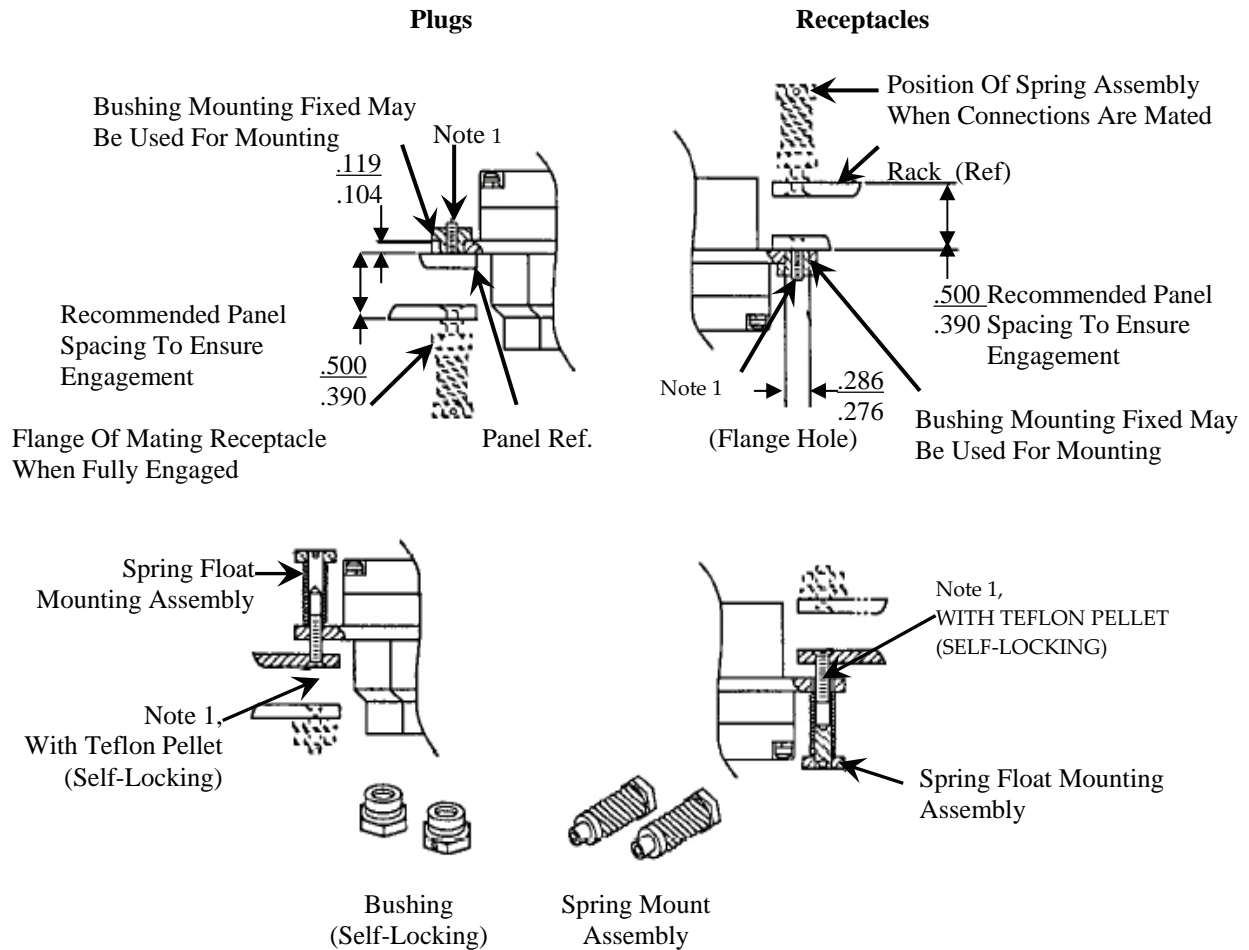
9. **SEALING PLUGS.** Part number MS27488 plugs are inserted to fill a cavity in a connector insert. Its function is to seal all unoccupied apertures in insert, especially in environmental connectors (Figure 3). Refer to NAVAIR 01-1A-505-1 WP 023 00 for additional information on grommet sealing plugs.

Table 1 Dust Caps

Plastic Type			Metal/Environmental Type		
Series	Style	Part Number	Series	Style	Part Number
DPKA	RECEPTACLE	DPKA-60	DPKA	RECEPTACLE	DPKA-60A
	PLUG	DPKA-59		PLUG	DPKA-59A
DPKB	RECEPTACLE	DPKB-60	DPKB	RECEPTACLE	DPKB-60A
	PLUG	DPKB-59		PLUG	DPKB-59A

Table 2. Mounting Accessories

Nomenclature	Part Number	Application
Bushing (Self-Locking)	MS24700-1 (Aluminum)	M83733-01 M83733-05
	MS24700-2 (Stainless Steel)	M83733-09 M83733-10 M83733-12
	M83733/17	M83733-01 M83733-09 M83733-10 M83733-12
Coupling Nut Assembly	335-0002-000	
Jackscrew Assembly	305-0007-000	



Note 1: Recommended screw #6-32UNC-2A (3/8 Long).

Figure 1. Bushing and Spring Mounts

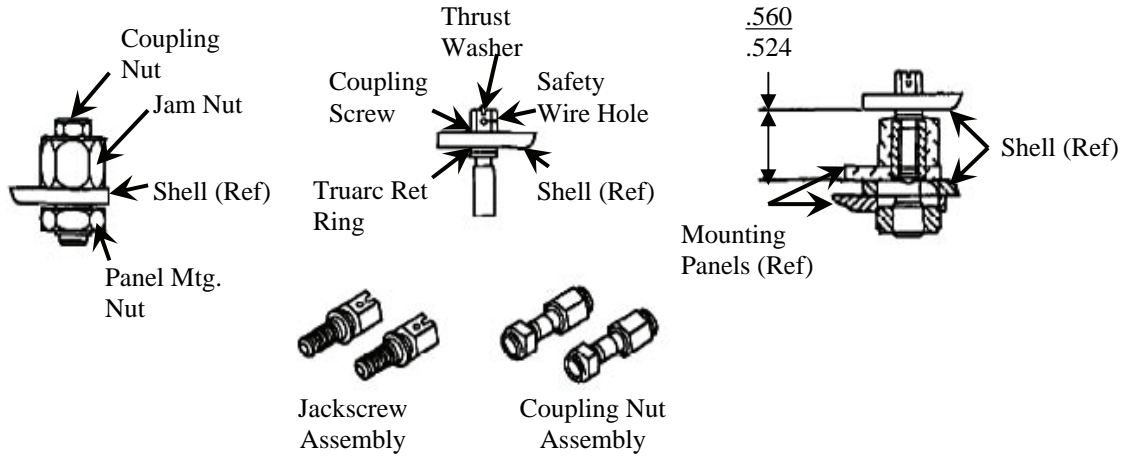
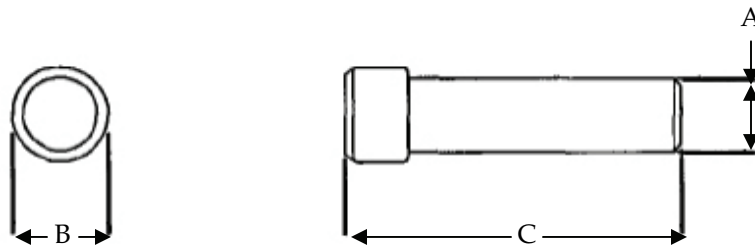


Figure 2. Jackscrew and Coupling Nuts



Part Number	Material	Wire Size	Color	Dimensions		
				A	B	C
MS27488-12	Teflon	12	Yellow	7/64	5/32	1/2
MS27488-16	Teflon	16	Blue	5/64	1/8	1/2
MS27488-20	Teflon	20	Red	5/64	3/32	1/2
MS27488-22	Teflon	22	Black	3/64	1/16	1/2

Figure 3. Sealing Plugs

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

009 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 21617**

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-DTL-21617.....	009 03
Connectors MIL- DTL-21617	009 02
Introduction	009 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-DTL-21617**

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-DTL-21617. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification

requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-DTL-21617

Reference Material

Connector, Plug and Receptacle, Electrical, Rectangular, Polarized	
Shell, Miniature Type	MIL-DTL-21617
Installation Practices, Aircraft Electric and Electronic Wiring	NAVAIR 01-1A-505-1
Connect Accessories MIL-DTL-21617009 03

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	7
Connector Cleaning and Preservation	10
Connector Removal and Installation	10
Soldering Hollow Cup Cylindrical Contact	9
Tinning	8
Unsoldering Conductor Wire from Contact	7
Removing Conductor Wire	7
Removing Solder	7
Introduction	2
Description	2
MIL-DTL-21617 Connectors	2
Connector Shells	2
Contacts	6
Design and Construction	2
Insert Arrangement	6
Insert Configuration	6
Inserts	2
Part Number	2
Contact Type	2
Insert Configuration	2
Military Prefix	2
Shell Style	2
Polarization	2
Shell Removal and Installation	6

Record of Applicable Technical Directives

None

Support Equipment Required

Part No./ Type Designation	Nomenclature
HT-900B (or equivalent)	Heating Tool, Compressed Air/Nitrogen
-	Heat Sink
-	Iron, Solder

Materials Required

Specification/ Part No.	Nomenclature
MIL-I-23053 (or equivalent)	Insulating, Sleeving, Heat Shrinkable
TT-I-735	Alcohol, Isopropyl
MIL-F-14256 (or equivalent)	Flux, Liquid
Sn60WRMAP3 (or equivalent)	Solder

1. INTRODUCTION.

2. This Work Package (WP) covers connectors manufactured in accordance with MIL-DTL-21617. Repair procedures as well as ordering information is included.

3. **DESCRIPTION.** These connectors are non-environmental rectangular rack and panel mounted. They feature non-removable solder contacts in eight arrangements.



This document includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. Consult applicable health and environmental regulations regarding its use, handling and disposition.

4. MIL-DTL-21617 CONNECTORS.

5. **CONNECTOR SHELLS.** The connector shells are designed to positively retain the insert and so constructed that the insert cannot be removed. The shells are die castings aluminum and are cadmium plated.

6. **POLARIZATION.** Polarization is accomplished by use of tapered corners and will mate with existing field equipment.

7. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 1, Tables 1 and 2).

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

8. **Military Prefix.** The military prefix denotes military standard.

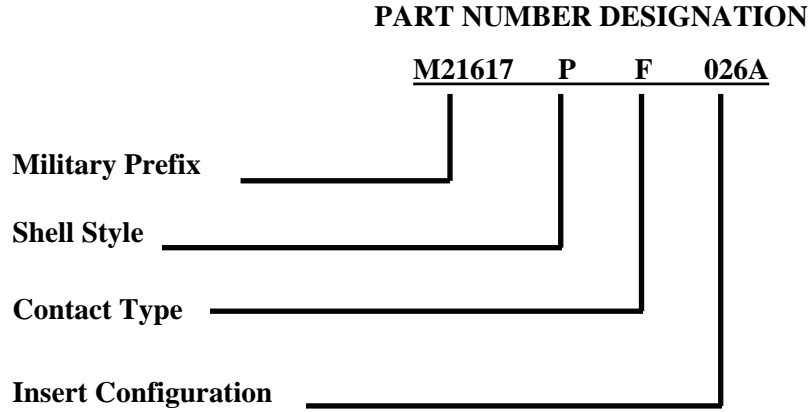
9. **Shell Style.** The shell style is identified by a letter denoting a plug or receptacle shell.

10. **Contact Type.** The contact type is identified by a letter denoting: socket or pin contacts.

11. **Insert Configuration.** The insert configuration is an alpha-numeric designation denoting the number of contacts, contact size, and contact mix.

12. **DESIGN AND CONSTRUCTION.** Connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.

13. **INSERTS.** The resilient material used has electrical and mechanical characteristics suitable for the purpose intended. The impact strength shall be such that material shall not chip, crack, or break during assembly or normal maintenance.



Shell Style	Contact Type
P – Plug	F – Socket
J – Receptacle	M - Pin

Figure 1. MIL-DTL-21617 Part Number Breakdown

Table 1. MIL-DTL-21617 Insert Arrangements

Shell Size Insert Arrangement	Service Rating (Note)	Contact Size				Number of Contacts
		20	16	8	4	
004A	E			2	2	4
007C	F			7		7
008A	PINS a,b,c,e,f,g = D PINS d & h = E		6	2		8
013A	D		13			13
016C	PINS 1-3 = F PINS 4-7 = D PINS 8-16 = A	13		3		16
017A	D	17				17
023A	PINS 1-14 = A PINS 15-23 = D	23				23
026A	A		26			26
032A	PINS 1-6 = D PINS 7-32 = A	29	3			32
040A	A	40				40

NOTE:

MS Service Code	Maximum Withstanding Voltage At Sea Level AC voltage at 60 Hz	Recommended Operating Voltage At Sea Level AC voltage at 60 Hz	Effective Creepage Distance Nom.	Mechanical Spacing Nom.
A	1500	350	1/8	1/16
D	2000	500	3/16	1/8
E	2800	900	1/4	3/16
F	1,000 VAC, Center to outer coaxial contacts	N/A	N/A	N/A

Table 2. MIL-DTL-21617 Specification Sheet to Insert Arrangement

Specification Sheet	Pin	Socket
MIL-DTL-21617/1		004A
MIL-DTL-21617/2	004A	
MIL-DTL-21617/3 *	004A	
MIL-DTL-21617/4		008A
MIL-DTL-21617/5	008A	
MIL-DTL-21617/6 *	008A	
MIL-DTL-21617/7		013A
MIL-DTL-21617/8	013A	
MIL-DTL-21617/9 *	013A	
MIL-DTL-21617/10		017A
MIL-DTL-21617/11	017A	
MIL-DTL-21617/12 *	017A	
MIL-DTL-21617/13		023A
MIL-DTL-21617/14	023A	
MIL-DTL-21617/15 *	023A	
MIL-DTL-21617/16		026A
MIL-DTL-21617/17	026A	
MIL-DTL-21617/18 *	026A	
MIL-DTL-21617/19		032A
MIL-DTL-21617/20	032A	
MIL-DTL-21617/21 *	032A	
MIL-DTL-21617/22		040A
MIL-DTL-21617/23	040A	
MIL-DTL-21617/24 *	040A	
MIL-DTL-21617/25		007C
MIL-DTL-21617/26	007C	
MIL-DTL-21617/27		016C
MIL-DTL-21617/28	016C	
* = Pressurized connector		

14. **INSERT ARRANGEMENT.** The insert arrangement is the number and size of contacts available by shell size (Table 1).

15. **INSERT CONFIGURATION.** The insert configuration is the manner in which contacts are placed within insert in a standard configuration. All arrangements identified in Table 1 are illustrated (Figure 2).

16. **CONTACTS.** Contacts are fixed, non-removable, and solderable.

17. **SHELL REMOVAL AND INSTALLATION.** For backshell removal and installation refer to WP 009 03.

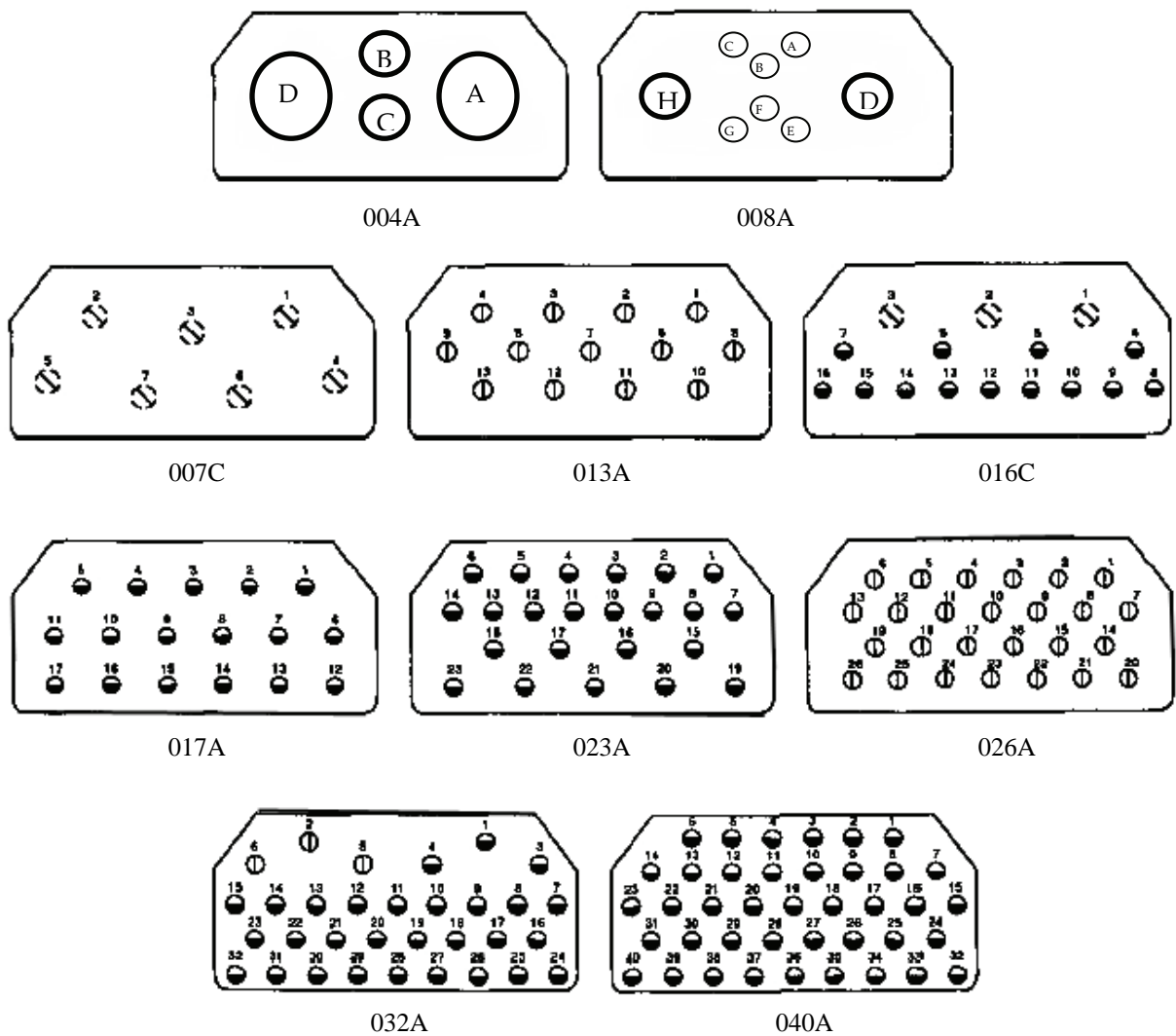


Figure 2. MIL-DTL-21617 Insert Configurations

18. CONNECTOR BUILDUP.

19. For additional detailed information concerning soldering procedures and solder type connectors refer to NAVAIR 01-1A-505-1, WP 016 00.

20. UNSOLDERING CONDUCTOR WIRE FROM CONTACT.

WARNING

Safety glasses shall be worn during all wire cutting, stripping, and soldering operations.

Solder contains lead and other hazardous materials. Avoid oral contact with hands during soldering operations and always wash hands immediately after soldering.

Become familiar with Material Safety Data sheets (MSDS) for all materials used and use proper personal protection equipment (PPE).

Under no circumstances will either acid flux or inorganic chloride flux, whether as liquids or as flux-core solders, be used for securing connections on electrical or electronic equipment.

CAUTION

When heating contacts of DEJ-9MS connectors, a heat sinking device must be attached to the solder cup of the connector contact. Failure to do so can result in damage to the connector filter.

Repair of lead-free circuit cards is NOT permitted.

CAUTION

The use of lead-free solder in place of tin-lead solder is expressly prohibited as part of any of the repair processes addressed throughout this technical manual. Any contamination of a lead-free assembly with tin-lead solder may significantly reduce the reliability of the assembly.

Use extreme care not to damage contacts or adjacent wires.

21. Removing Conductor Wire. Apply heat to solder cup using soldering iron until solder melts; then remove wire (Figure 3).

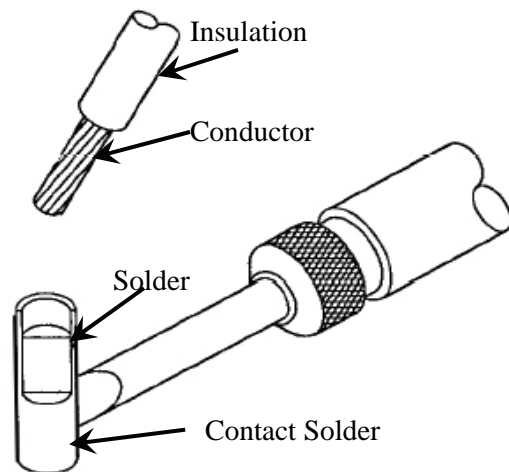


Figure 3. Conductor Wire Removal

22. Removing Solder.

a. Remove solder from solder cup by wicking with a stranded conductor or braided shield and liquid flux.

b. When wicking with stranded conductor or braided shield place wire on soldered connection and apply heat using soldering iron (Figure 4).

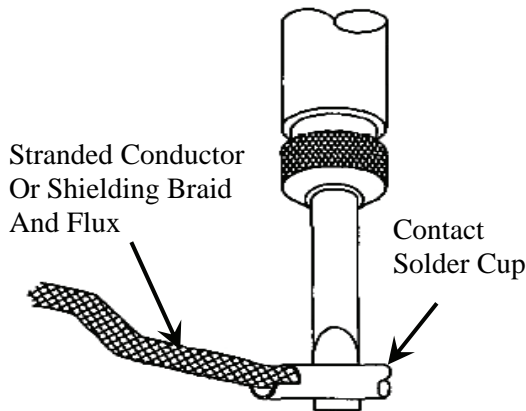


Figure 4. Removing Solder from Solder Cup by Wicking

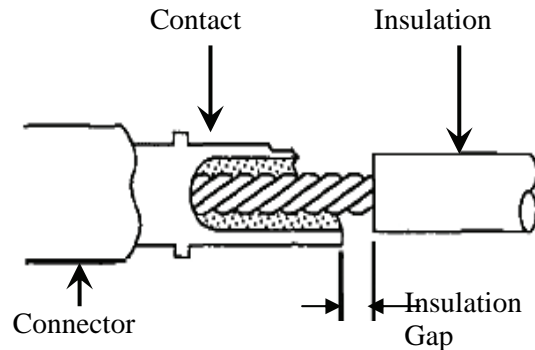
23. **TINNING.** Before wires are soldered to connectors, the exposed ends are tinned to hold the strands solidly together. The tinning operation is considered satisfactory when the ends and sides of the wire strands are fused together with a uniform coat of solder.

- a. Strip wires (NAVAIR 01-1A-505-1, WP 009 00).
- b. Insert stripped wire until bottomed in contact solder cup. Verify insulation gap is within specified limits (Figure 5). Trim conductor or insulation as required.



Isopropyl Alcohol (TT-I-735)

- c. Brush back of connector insert, solder cups, and wires with isopropyl alcohol, using acid swabbing brush to remove foreign materials.



Contact Size	Wire AWG	Insulation Gap
22D	26	
22M		
22	24	1/32 Inch Min.
	22	1/16 Inch Max.
20	20	
16	20	
	18	
	16	1/32 Inch Min.
12	14	5/64 Inch Max.
	12	
8	8	1/32 Inch Min.
		3/8 Inch Max.

Figure 5. Insulation Gap



Flux (Mil-F-14256)



Lead, Solder (SNGOWRMAP3, or SN63WRMAP3)

- d. Tin wire tips using soldering iron and solder (Figure 6). Tin wire for one-half its exposed length.

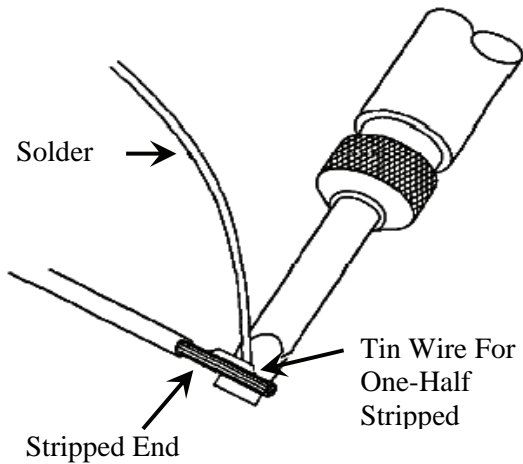


Figure 6. Tinning Wire using Soldering Iron

24. SOLDERING HOLLOW CUP CYLINDRICAL CONTACT.

- a. Position connector at an angle with the open end of cup toward the technician. Ensure wire to be soldered is routed through connector backshell.
- b. Direct soldering iron at contact solder cup until solder flows (Figure 7).

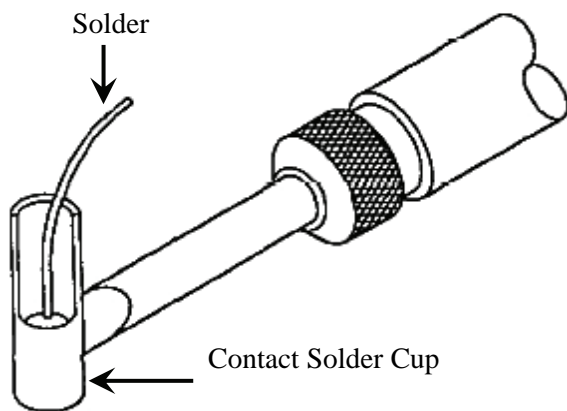


Figure 7. Filling Solder Cup with Solder

- c. Pre-fill contact solder cup with enough solder to ensure that total of pre-filled solder and pre-tinned wire will fill cup without overflowing when wire is inserted.

- d. While maintaining contact solder cup at soldering temperature, insert wire into contact solder cup and slide heat source to base of contact solder cup (Figure 8).

- e. Ensure wire is bottomed in contact before soldering iron is removed (Figure 9).

- f. After solder cools, it shall form a fillet extending from conductor to tip of solder cup (Figure 10).

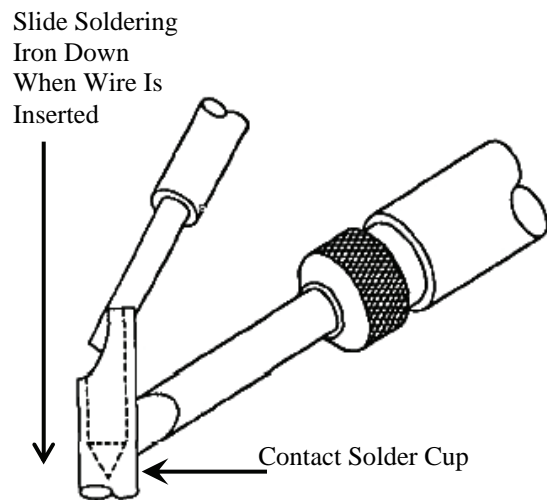


Figure 8. Inserting wire into Solder

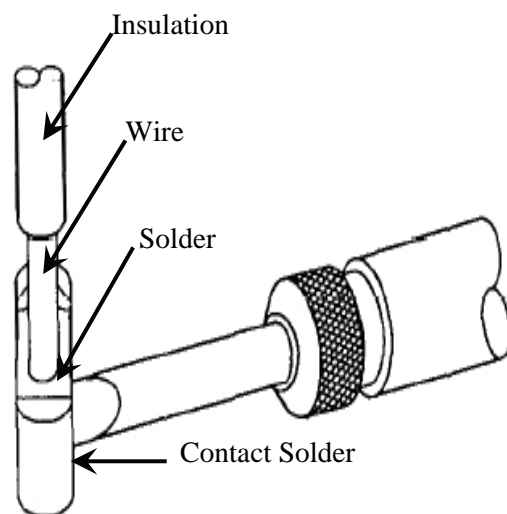


Figure 9. Wire Inserted into Contact



Isopropyl Alcohol (TT-I-735)

- g. After solder joints cool, clean residual flux with isopropyl alcohol and acid swabbing brush.
- h. Blow dry excess residue with clean, dry oil-free air or nitrogen (if applicable).
- i. Visually check soldered contact for proper insulation gap (Figure 5).
- j. Ensure excess heat and solder has not caused excessive wicking under insulation. Ensure insulation is not blistered or burned.

25. CONNECTOR REMOVAL AND INSTALLATION. If the connector is severely damaged or cannot be repaired using the above

procedures, proceed with the connector replacement as follows:

- c. Starting from outside of damaged connector, tag wires and unsolder all wires from contacts (Paragraph 20).
- d. Starting from center of new connector, solder tinned wire to contact (Paragraphs 23 and 24).
- e. Remove tag from wire.
- f. Repeat procedure until all contacts are installed in new connector.

26. CONNECTOR CLEANING AND PRESERVATION.

- a. For connector cleaning and corrosion control procedure refer to NAVAIR 01-1A-505-1, WP 026 00.

CONNECTOR ACCESSORIES

MIL-DTL-21617

Reference Material

NONE

Alphabetical Index

Subject	Page No.
Connector Accessories	1
Dust Caps	1
Shell Installation	2
Shell Removal	2
Shells	1
Introduction	1

Record of Applicable Technical Directives

None

1. **INTRODUCTION**

2. This Work Package (WP) covers connector accessories used with MIL-DTL-21617 connectors, their function, and procurement information.

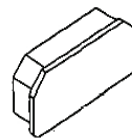
3. **MIL-DTL-21617 CONNECTOR ACCESSORIES.**

4. Connector accessories are components added to a connector to enhance its operational characteristics. These accessories are divided into the following categories.

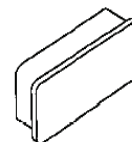
- a. Dust Caps
- b. Shells
- c.

5. **DUST CAPS.** Dust caps are devices that are installed on unmated connectors. They protect the connector from airborne contaminants during shipping and storage (Figure 1). Vendor part numbers given as reference only, any qualified vendor with suitable product may be used.

6. **SHELLS.** Shells are devices that protect the contact terminations. They contain integral cable clamps (Figure 2). Vendor part numbers given as reference only, any qualified vendor with suitable product may be used.



DPX-6 for 34 Shells
025-0762-000
Receptacle



DPX-59 for 33 Shells 025-
0749-000 Plug

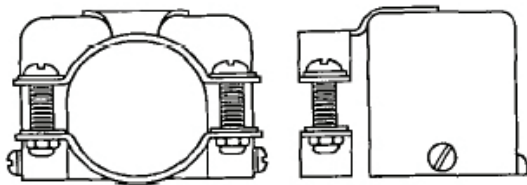
Figure 1. Dust Caps

SHELL REMOVAL. Shells are used to protect and add strength to connectors. When modification or repair to connector is necessary, the shell must be removed. Remove shell in accordance with following procedure:

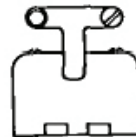
- a. Loosen cable clamp.
- b. Loosen screw on each side of connector securing shell to connector.
- c. Remove shell.

7. SHELL INSTALLATION. Upon completion of maintenance or modification the shell must be replaced. Install shell in accordance with following procedure:

- a. Position shell on cable and connector.
- b. Tighten screw on each side of connector securing shell to connector.
- c. Tighten cable clamp.



**20754-12 90° ANGLE DPX2
 JUNCTION SHELL**

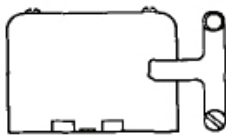


**STYLE
 DPXA
 DPX2**

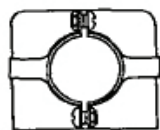


**PART NUMBER
 20745-21
 20745-8**

Straight Junction Shell

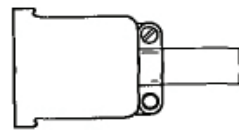


**STYLE
 DPXA-RIGHT
 DPXA-LEFT
 DPX2°-RIGHT
 DPX2°-LEFT**

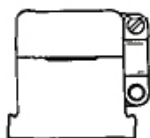


**PART NUMBER
 20745-22
 20745-23
 20745-10
 20745-11**

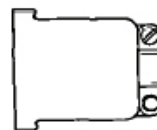
90° Angle



22017 Diecast Straight Junction Shell



22017-1 Diecast 90° Angle Junction Shell



22017-2 Diecast Straight Junction Shell (Long)

Figure 2. Junction Shells

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

010 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 26518**

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-DTL-26518.....	010 03
Connectors MIL- DTL-26518	010 02
Introduction	010 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-DTL-26518**

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-DTL-26518. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-DTL-26518

Reference Material

Installation Practices, Aircraft Electric and Electronic WiringNAVAIR 01-1A-505-1
Installation Practices, Aircraft, Electric and Electronic Wiring,
Contacts, Electrical Connector, General Specification for SAE-AS-39029
Connector Accessories MIL-DTL-26518..... 010 03

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	16
Connector Removal and Installation	21
Connector Sealing	18
Moisture Barrier	18
Sealing Plugs.....	18
Contact Crimping	16
Contact Insertion	17
Contact Removal.....	18
Broken Wire Contact Removal	20
Crimp Front Release Contacts	18
Crimp Rear Release Contact	18
Wired Contact Removal.....	18
Unwired Contact Removal.....	19
Wire Diameter Buildup.....	16
Wire Stripping.....	16
Connector Cleaning and Preservation	21
Connector Buildup, Solder Contacts	21
Introduction	2
Description	3
Wire Sealing.....	3
MIL-DTL-26518 Connectors	3
Cable and Coaxial Contact Assembly	8
Coaxial Contacts	8
Connector Shells	3
Contact Application	8
Contacts.....	5
Contact Availability	5
Crimp Removable Contacts	5
Fixed Contacts	5
Design and Construction	3
Insert Arrangement.....	5
Insert Configuration	5
Inserts.....	5
Closed-Entry Socket Contacts.....	5
Contact Extraction.....	5
Contact Insertion	5

Contact Retaining Clip	5
Crimp Snap-in	5
Peripheral Seal	5
Interchangeability	5
Mounting.....	3
Part Number.....	3
Class.....	3
Insert Configuration.....	3
Military Designation.....	3
Shell Size	3
Polarization	3
Power Contacts	8
Sealing Plugs.....	3
Tooling.....	8
Usage	8

Record of Applicable Technical Directives

None

Support Equipment Required

Materials Required

Part No./ Type Designation	Nomenclature
HT-900B (or equivalent)	Heat Gun
M22520/1-01	Tool, Crimp, Frame
M22520/1-02	Positioner
M22520/2-01	Tool, Crimp, Frame
M22520/2-02	Positioner
M22520/2-23	Positioner
M22520/2-24	Positioner
M22520/5-01	Tool, Crimp, Frame
M22520/5-08	Die Set
M22520/5-10	Die Set
M22520/10-01	Tool, Crimp, Frame
M22520/10-05(A).....	Die Set
M22529/10-96	Die Set
M81969/17-03	Tool, Insertion
M81969/17-04	Tool, Insertion
M81969/17-06	Tool, Insertion
M81969/17-06	Tool, Insertion
M81969/19-03	Tool, Removal
M81969/19-07	Tool, Removal
M81969/19-08	Tool, Removal
M81969/19-09	Tool, Removal
---	Handle, Torque 10-50 Inch-ounces

Specification/ Part No.	Nomenclature
MIL-I-23053 /	Sleeving, Insulating
SAE-AMS-I-23053	Heat-Shrinkable

1. **INTRODUCTION.**

2. This Work Package (WP) covers miniature, high density, rectangular, rack and panel, environment resistant and hermetic connectors, both military and commercial, having pin and socket, front and rear release crimp removable power and coaxial contacts with fixed or float mounting (Figure 1).

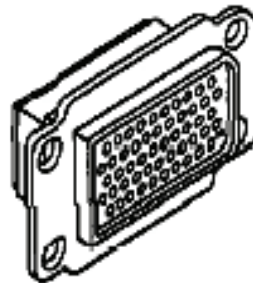


Figure 1. MIL-DTL-26518 Typical Connector

3. **DESCRIPTION.** The connectors covered by MIL-DTL-26518 have the following features:

- a. Environment resistant at sea level and high altitudes.
- b. Continuous operation at temperatures ranging from -67°F (-55°C) to +460°F (+238°C).
- c. Fluid resistant
- d. Designed to ensure correct orientation of the mating halves prior to mating.

4. **WIRE SEALING.** Wire sealing is accomplished by use of a grommet seal designed to seal against outside diameter of inserted wire. If wire outside diameter is not large enough to fill wire sealing grommet holes, buildup wire outside diameter by applying heat-shrinkable insulating sleeving (SAE-AMS-I-23053). This must be accomplished prior to contact insertion. The wire outer diameter shall be within the applicable size range specified (Table 1).

5. **MIL-DTL-26518 CONNECTORS**

6. **SEALING PLUGS.** Insulated plugs are provided for sealing spare contact holes. The connector when ordered as a unit will have sealing plugs enclosed to equal 15 percent of the number of contacts but not less than three. The sealing plugs are used in both plugs and receptacles.

7. **CONNECTOR SHELLS.** The connector shells are of one piece construction and designed to positively retain the inserts.

8. **POLARIZATION.** Polarization of MIL-DTL-26518 connectors is accomplished by variation of the keystone corner method in that two corners have a curvature and two are square.

9. **MOUNTING.** Connectors can be mounted in either a fixed position by means of a self-locking bushing or in a floating position by means of a spring loaded mounting assembly which must be ordered separately (WP 010 03).

10. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 2).

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

11. **Military Designation.** The military designation denotes the type of contact and mating face.

12. **Class.** Class indicates the environment resistant abilities.

13. **Shell Size.** The shell size is indicated by a progressive lettering system.

14. **Insert Configuration.** The insert configuration is indicated by a number denoting the number and size of contacts used.

15. **DESIGN AND CONSTRUCTION.** Connectors are designed so that neither the pins nor sockets will be damaged during normal mating of counterpart connectors.

Table 1. Wire Diameters

Contact Size	Wire Size	Minimum OD (inch)	Maximum OD (inch)
20	24,22,20	0.040	0.090
16	18,16	0.068	0.130
12	14,12	0.106	0.170
1 Shielded (Note 1)	22	0.096	0.120
2 Shielded (Note 2)	20	0.095	0.145

NOTES:
1. Number 1 shielded contact is interchangeable with size number 12 contact and conforms to M39029/54.
2. Number 2 shielded contact is interchangeable with size number 8 contact and conforms to M39029/55.

PART NUMBER DESIGNATION



MILITARY DESIGNATION	
MS24285	Socket Insert Shell, Resilient Mating Face.
MS24286	Pin Insert Shell, Resilient Mating Face
MS27399	Socket Insert Shell, Hard Dielectric Mating Face
NOTE: MS24700 Fixed Bushing And MS24695 Spring Loaded Mounting Assembly Are Ordered Separately.	

Class
R Environmental Resisting
H Hermetic.

Shell Size
A, B or C (Figure 4)

Insert Configuration
1,2,3,4,Or 5 (Table 2 And Figure

Figure 2. MIL-DTL-26518 Part Number Breakdown

16. **INSERTS.** Inserts are molded or bonded one-piece construction. Connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.

17. Crimp Snap-in. Contacts Snap-in contacts designed to SAE-AS-39029 can be crimped with standard M22520 crimp tool.

18. Closed-Entry Socket Contacts. These contacts eliminate damage from abuse by test probes and help to correct any misaligned pins during engagement.

19. Contact Insertion. Insertion is accomplished from rear of connector. When contact is fully inserted, the clip tines snap securely behind contact shoulders.

20. Contact Extraction. Extraction is accomplished with use of a removal tool.

21. Contact Retaining Clip. The contact retaining clip is completely encased in a tough plastic wafer to protect clip from damage.

22. Peripheral Seal. The pin insert has a dynamic peripheral seal which contacts the mating connector shell before mating is completed. The socket insert, which is resilient, has a integral-molded static peripheral seal which contacts the mating connector insert before insert faces make contact.

23. **INTERCHANGEABILITY.** All connectors having the same military part number shall be completely interchangeable with respect to installation and performance.

24. **INSERT ARRANGEMENT.** The insert arrangement is the number and size of contacts available by shell size (Table 2).

25. **INSERT CONFIGURATION.** The insert configuration is the manner in which the contacts are placed within the connector insert. All arrangements identified in Table 2 are illustrated (Figure 3).

26. **CONTACTS.** Contacts are designed to prevent damage to contact retention device or sealing member during insertion or removal of contacts.

27. Fixed Contacts. Contacts in hermetically sealed or thru-bulkhead receptacles are fixed non-removable and solder-able.

28. Crimp Removable Contacts. Crimp removable contacts may be used with all environment resisting classes of connectors.

29. Contact Availability. Crimp contacts are supplied with each connector unit package. There are contacts to complete the insert arrangement and have at least two spares.

Table 2. MIL-DTL-26518 Insert Arrangements

Shell Size Insert Arrangement	Contact Size					Number of Contacts
	20	16	12	#1 Shielded (Note 1)	#2 Shielded (Note 2)	
MIL-DTL-26518						
A1	102	-	-	-	-	102
A2	65	-	12	-	-	77
A3	82	10	-	-	-	92
A4	33	-	-	-	9	42
A5	-	50	-	-	-	50
B1	52	-	-	-	-	52
B2	36	4	-	1	-	41
B3	-	-	18	-	-	18
B4	-	26	-	-	-	26

NOTES:
1. Interchangeable with size 12 contact
2. Interchangeable with size 8 contact

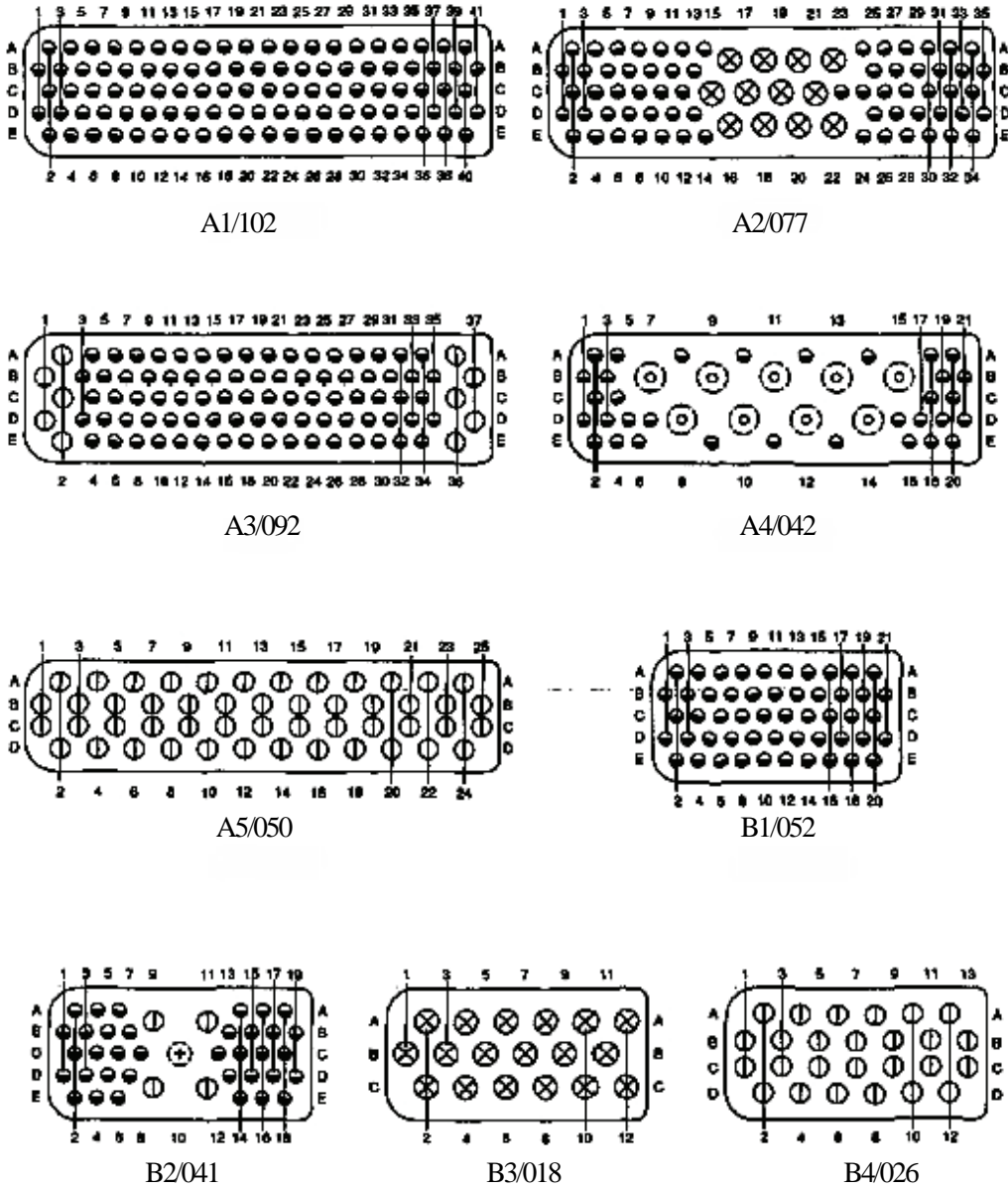


Figure 3. MIL-DTL-26518 Insert Configurations

30. **CONTACT APPLICATION.** Contacts used are manufactured in accordance with SAE-AS-39029. The contact part number breakdown is illustrated (Figure 4). The Basic Identification Number (BIN) or last three digits of contact part number, match standard resistor color code (Figure 5).

31. **POWER CONTACTS.** Power contacts are used to connect single conductor wire through connectors. The power contacts (Table 3) range from size 12 thru 20 and are crimp front release design. Contacts are listed by size. Match the required size to the connector application, wire gage, and composition. Socket and pin contact part numbers are listed along with corresponding color bands.

32. **TOOLING.** The procedure for attaching power contacts to a single conductor wire are the same for this connector series. Select proper tooling for specific contact part number (Table 4) and refer to NAVAIR 01-1A-505-1, WP 013 00 for correct assembly and crimp procedures.

33. **COAXIAL CONTACTS.** When routing coaxial cable through connectors, coaxial contacts are superior to other coaxial cable shield termination

methods. The shield integrity is maintained across the contact body. The coaxial cable groups listed (Table 5) can be interconnected through MIL-DTL-26518 connector size 8 and 12 contact cavities. Match the required contact size to connector application and cable group. When crimping center contact for these cables, use crimp tool selector knob settings specified. Socket and pin contact part numbers are listed along with corresponding color bands (Figure 6). M39029/54 contacts are front release and M39029/55 contacts are rear release.

34. **CABLE AND COAXIAL CONTACT ASSEMBLY.** To assemble coaxial contacts to applicable cable identify cable by part number. Select proper tooling by contact part number (Table 6). Assemble contacts shown (Figures 7 and 8).

35. **USAGE.** MIL-DTL-26518 connectors are intended for applications wherein extremes of temperature, humidity, and barometric pressure are experienced. They are not intended for use at operating temperatures higher than 460°F (238°C) for extended periods.

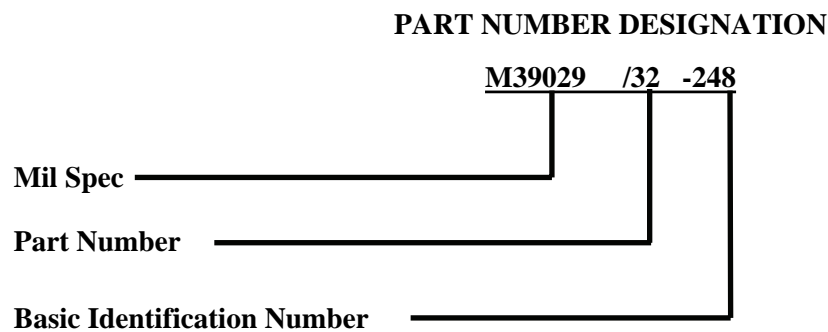
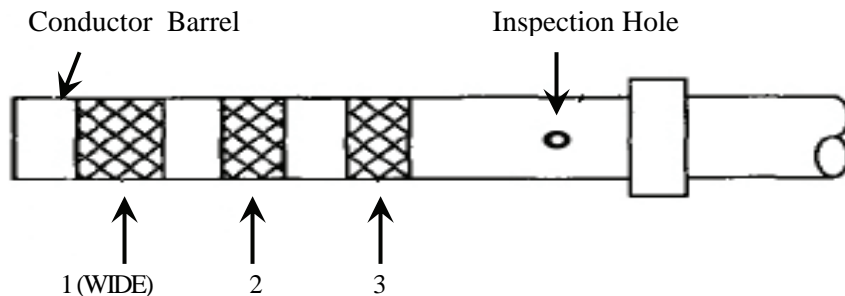


Figure 4. SAE-AS-39029/32 Part Number Breakdown



Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Gray	8
Yellow	4	White	9
Example Bin Code: 463			
Yellow(Wide Band) / Blue / Orange			

Figure 5. Basic Identification Number and Color Bands

Table 3. MIL-DTL-26518 Power Contact Application

Contact Size	Wire Range	Socket Contact			Pin Contact		
		M39029/	Color Bands 1 st 2 nd 3 rd		M39029/	Color Bands 1 st 2 nd 3 rd	
20	20-24	32-260	RED BLU BLK		31-241	RED YEL BRN	
16	16-20	32-248	RED YEL GRA		31-229	RED RED GRA	
12	12-14	32-254	RED GRN YEL		31-235	RED ORN GRN	

Table 4. MIL-DTL-26518 Power Contact Tooling

Contact M39029/	Crimp Tool Frame M22520/	Turret Head or Positioner M22520/	Insertion Tool M81969/	Removal Tool M81969/
31-229	1-01	1-02	17-04	19-08
31-235	1-01	1-02	17-05	19-09
31-241	1-01 or 2-01	1-02 or 2-02	17-03	19-07
32-248	1-01	1-02	17-04	19-08
32-254	1-01	1-02	17-05	19-09
32-260	1-01 or 2-01	1-02 or 2-02	17-03	19-07

Table 5. MIL-DTL-26518 Coaxial Contact Application

Contact Size	Wire Range	Socket Contact			Pin Contact		
		M39029/	Color Bands 1 st 2 nd 3 rd		M39029/	Color Bands 1 st 2 nd 3 rd	
12	(Note 1)	55-344	ORN YEL YEL		55-342	ORN YEL RED	
8	(Note 2)	55-345	ORN YEL GRN		55-343	ORN YEL ORN	

NOTES:
1. RG161/U, RG174/U, RG179/U, RG187/U, RG188/U, Shielded Wire, Name WC 27500
2. Name WC 27500

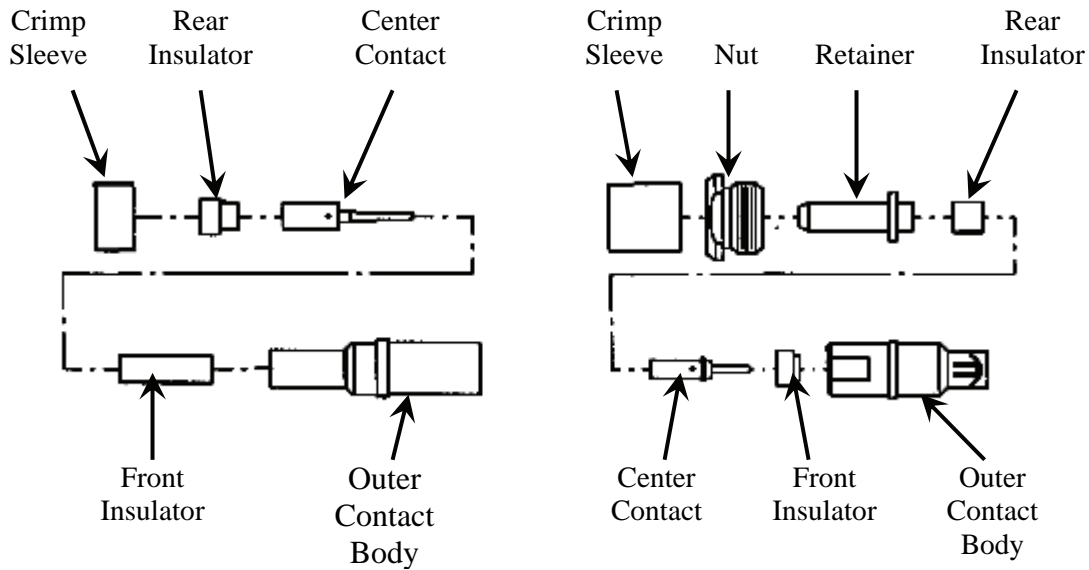


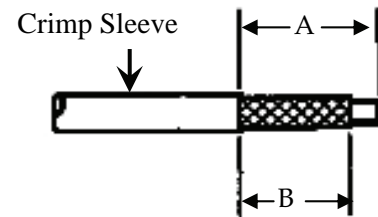
Figure 6. MIL-DTL-26518 Shielded Contact Assemblies

Table 6. MIL-DTL-26518 Coaxial Contact Tooling

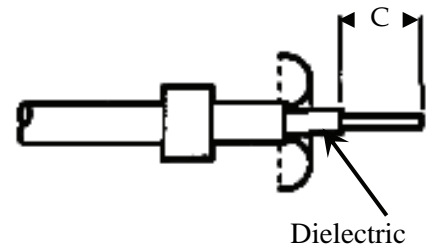
Contact	Strip Dimension (Inch)			Center Contact		Crimp Sleeve		Insertion Tool	Removal Tool
	A	B	C	Crimp Tool Frame	Positioner	Crimp Tool Frame	Die Set Positioner		
M39029/				M22520/	M22520/	M22520/	M22520/	M81969/	M81969/
54-342	7/32	5/64	7/64	2-01	2-23	5-01 or 10-01	5-08 or 10-05(A)	17-05	19-09
54-343	7/32	7/64	9/64	2-01	2-24	5-01 or 10-01	5-10 or 10-06	17-06	19-03
55-344	7/32	5-64	7/64	2-01	2-23	5-01 or 10-01	5-08 or 10-05(A)	17-05	19-09
55-345	7/32	7/64	9/64	2-01	2-24	5-01 or 10-01	5-10 or 10-06	17-06	19-03

A. Cut Cable End Square, Leaving Enough Cable for Adequate Strain Relief without Excess Slack.

B. Slide Crimp Sleeve over Cable. Using Coaxial Cable Stripper, Strip Jacket Dimension A from End And Trim Shield To Dimension B (Table 6) From Jacket.

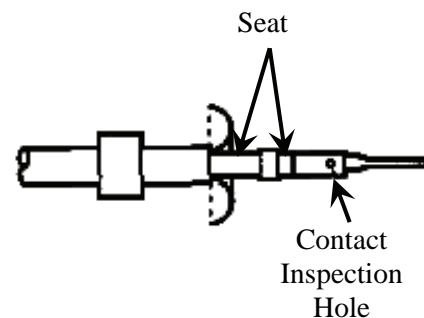


C. Flare Shield. Do Not Comb Out Individual Shield Strands. Using Sharp Knife, Strip Dielectric to Dimension C (Table 6).



D. Slide Rear Insulator, Large Diameter First, Over Center Conductor. Seat Rear Insulator against Dielectric.

E. Insert Center Conductor into Center Contact, Trim Center Conductor As Required To Seat Center Contact against Rear Insulator. Ensure Center Conductor Remains Visible In Contact Inspection Hole.



F. Crimp Center Contact Using Crimp Tool Rear Front Frame And Positioner Specified And Selector Insulator Knob Setting For Cable.

G. If Front Insulator Is Not Captivated Inside Contact Body, Slide Front Insulator, Large Inside Diameter First, Over Center Contact.

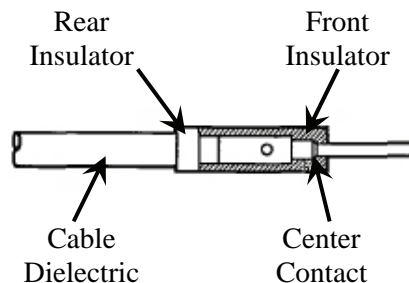
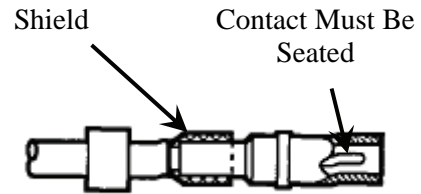
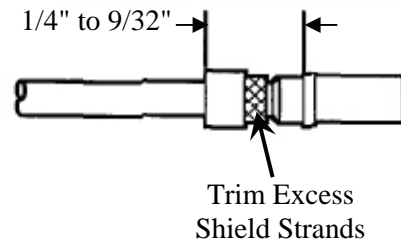


Figure 7. MIL-DTL-26518 Size 12 Shielded Contact Assembly (Sheet 1 of 2)

H. Slide Contact Body over Center Contact Assembly And Under Shield Until Fully Seated.



I. Arrange Shield As Close To Original Lay As Possible. Slide Crimp Sleeve Over Shield And Obtain 1/4 To 9/32 Inch Dimension. Trim Excess Shield Ahead Of Crimp Sleeve.



J. After Correctly Locating Crimp Sleeve, Crimp Using Tooling Specified In Table 6.

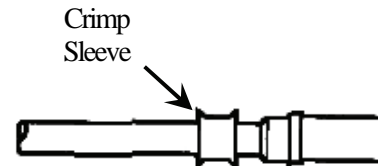
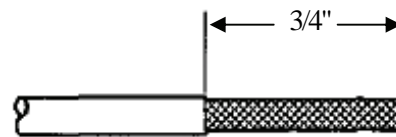
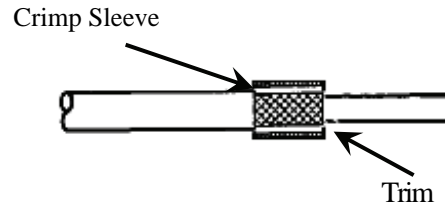


Figure 7. MIL-DTL-26518 Size 12 Shielded Contact Assembly (Sheet 2)

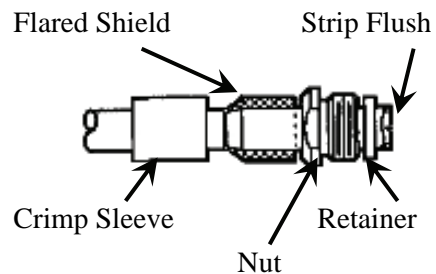
A. Cut Cable End Square, Leaving Enough Cable For Adequate Strain Relief Without Excess Slack. Using Coaxial Cable Stripper, Strip Jacket 3/4 Inch From End.



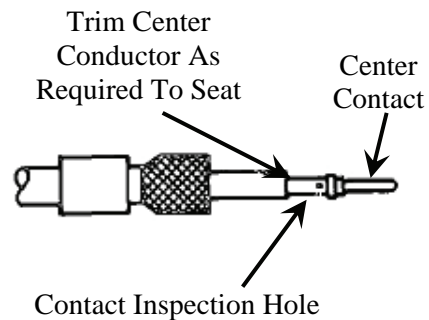
B. Slide Crimp Sleeve over Shield Until Flush With Edge Of Jacket. Trim Shield Flush With Edge Of Crimp Sleeve.



C. Flare Shield. Do Not Comb Out Individual Shield Strands. Slide Nut over Retainer. Slide Retainer Assembly over Dielectric and Under Shield Until Seated Against Shield and Jacket. Using Sharp Knife, Strip Dielectric Flush With End of Retainer.



D. Remove Retainer Assembly. Insert Center Conductor Into Center Contact. Trim Center Conductor As Required To Seat Center Conductor Remains Visible In Contact Inspection Hole.

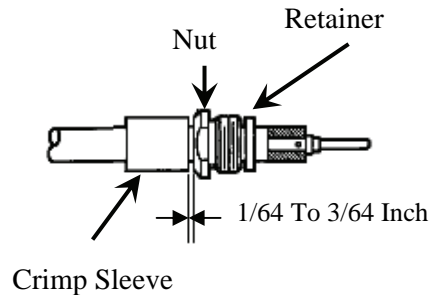


E. Crimp Center Contact Using M22520/2-01 Crimp Tool Frame and M22520/2-23 Positioner. Ensure Center Conductor Remains Visible In Contact Inspection Hole.

Figure 8. MIL-DTL-26518 Size 8 Shielded Contact Assembly (Sheet 1 of 2)

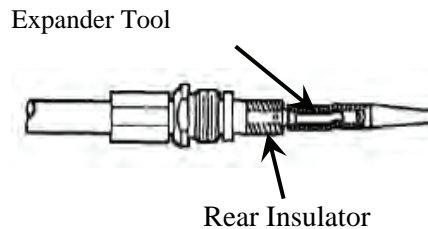
F. Slide Retainer Assembly Over Center Contact and under Shield. Retainer Must Seat Against Shield.

G. Arrange Shield As Close To Original Lay As Possible. Slide Crimp Sleeve over Shield and Retainer until Gap of 0.010 to 0.050 Inch Exits between Nut and Crimp Sleeve.

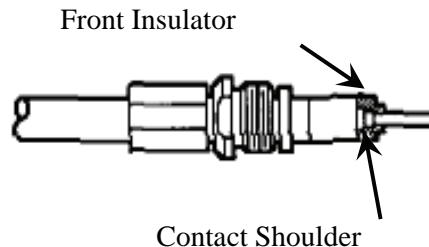


H. Using M22520/01 Crimp Tool Frame and M22520/5-08 Die Set, Or M22520/10-01 Crimp Tool Frame and M22520/10-05 Die Set, Secure Crimp Sleeve By Crimping In Die Closure B (Table 6). Nut Must Rotate Freely After Crimping.

I. Install Expander Tool From Expander Tool Kit over Center Contact. Slide Rear Insulator over Expander Tool until Seated Behind Contact Shoulder.



J. Slide Front Insulator, Large Diameter First, Over Center Contact until Seated Against Contact Shoulder.



K. Slide Contact Body Over Center Contact Assembly. Thread Nut Into Contact Body until Retainer is Seated in Contact Body.

L. Using Wrench, Hold Outer Contact Body. Using Torque Handle And Adapter, Tighten Nut To 33 ± 3 Inch-Ounces.

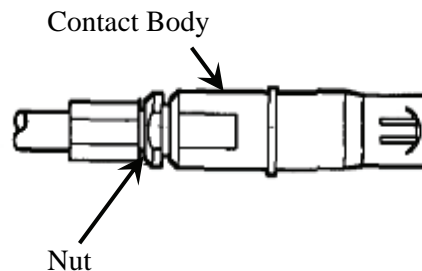


Figure 8. MIL-DTL-26518 Size 8 Shielded Contact Assembly (Sheet 2)

36. CONNECTOR BUILDUP.

37. WIRE DIAMETER BUILDUP. If wire outside diameter is not large enough to fill wire sealing grommet holes, buildup wire outside diameter by applying heat-shrinkable insulating sleeving (SAE-AMS-I-23053). This must be accomplished prior to contact insertion. The outer diameter shall be within the applicable size range specified (Table 7).

38. WIRE STRIPPING. Strip wire in accordance with following procedure:

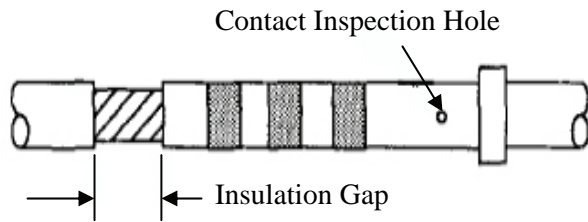
- a. Cut wire to proper length. Ensure enough wire remains for adequate strain relief without leaving excess slack.
- b. Strip insulation from end (NAVAIR 01-1A-505-1 WP 009). Select contact (Table 3 or 5).

39. CONTACT CRIMPING. Crimp contact in accordance with following procedure:

- a. Select correct crimp tool (Table 4 or 6).
- b. Perform die closure check, install positioner and set selector knob for gage of wire.
- c. Insert stripped wire into contact conductor barrel. Ensure all wire strands are inside contact conductor barrel and visible in contact inspection hole (Figure 9).
- d. If insulation gap is too large, trim conductor as required. If insulation gap is too small, trim insulation as required.
- e. Crimp contact to wire.

Table 7. Wires and Diameters

Contact Size	Wire Size (AWG)	Finished Wire Outside Dimensions	
		Minimum (Inches)	Maximum (Inches)
20	24	0.040	0.090
20	22	0.040	0.090
20	20	0.040	0.090
16	18	0.068	0.130
16	16	0.068	0.130
16	14	0.106	0.170
12 Shielded	12	0.106	0.170



Contact Size	Wire AWG	Insulation Gap
22D	26	1/32" Min. 1/16" Max.
22M		
22	24	
	22	
20	20	1/32" Min. 5/64" Max.
16	20	
	18	
	16	
12	14	1/32" Min. Twice Dia. Wire Insulation Max
	12	
8	10	
	8	

Figure 9. Insulation Gap

40. **CONTACT INSERTION.** Insert wired or unwired contacts in accordance with following procedure:

- a. Remove sealing plug and/or contact from contact cavity (Paragraph 44).
- b. Ensure wire or cable on contact is routed through connector backshell.
- c. Select correct insertion tool (Table 4 or 6).
- d. Place wire and contact assembly into colored tip of insertion tool (Figure 10). Ensure tool tip is over conductor barrel and butted against contact shoulder.
- e. Insert tip of contact into cavity. Start contact insertion near connector center cavities and work outward.

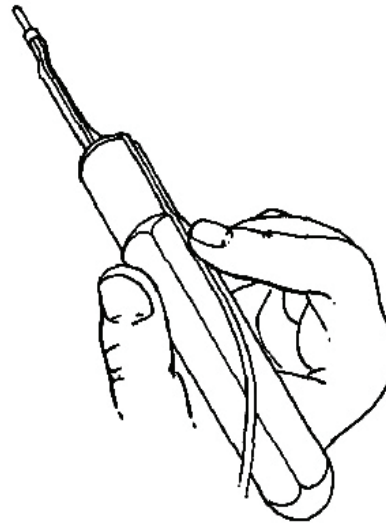


Figure 10. Inserting Contact into Insertion Tool

- f. Axially align contact with contact cavity.
- g. With firm even pressure, press tool against contact shoulder and seat contact into cavity (Figure 11). A slight click may be heard as retention tines snap into place behind contact shoulder.
- h. Pull tool straight out of contact cavity. Remove tool from wire. Pull back lightly on wire to ensure contact is properly seated.

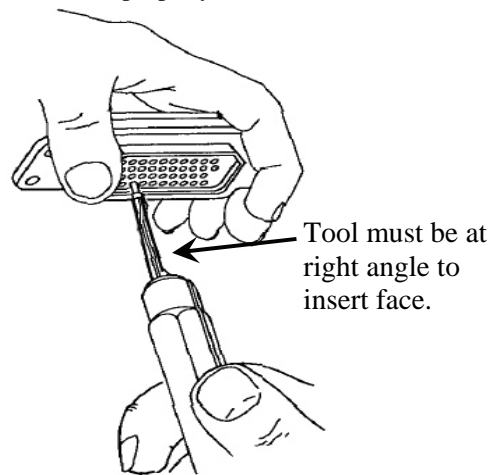


Figure 11. Contact Insertion

i. Seal connector as required (Paragraph 41) and install backshell.

41. CONNECTOR SEALING.

42. Sealing Plugs. Seal connector in accordance with following procedure:

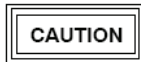
a. Fill all unused cavities with un-crimped contacts (Paragraph 40).

b. Insert sealing plug, large diameter end first, until bottomed in contact cavity. Do not insert further than knob. Fill all cavities that have un-crimped contacts. For grommet sealing plug selection refer to NAVAIR 01-1A-505-1, WP 023 00.

43. Moisture Barrier. For connector sealing procedures, including application of sealant to grommet sealed connectors, refer to NAVAIR 01-1A-505-1, WP 025 00.

44. **CONTACT REMOVAL**. The following paragraphs give contact removal for front and rear release crimp contacts.

45. Crimp Front Release Contacts. Remove wired, unwired, and broken wire contacts in accordance with following procedures:



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

a. Select correct removal tool (Table 4 or 6).
b. If contact is unwired, remove sealing plug from cavity of contact to be removed.

c. Working from the front (mating end) of connector, slide hollow end of removal tool over contact (Figure 12).

d. Holding removal tool at right angle to front insert face, push tool straight toward rear of connector, firmly pressing tool to positive stop when tool bottoms in insert cavity.

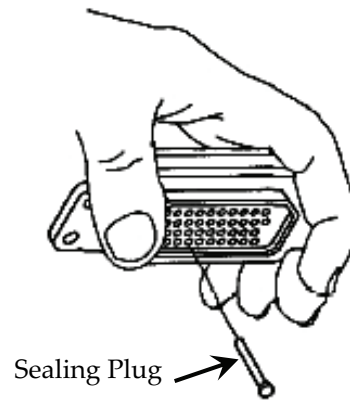


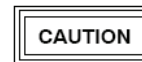
Figure 12. Inserting Sealing Plug Into Contact Cavity

e. Maintain pressure on tool handle and slide collar of tool forward until it stops. Contact will be partially ejected from rear of connector insert.

f. Remove tool by pulling straight back to clear connector insert face. Remove contact out the rear of connector by pulling lightly on wire or using a mating contact to push out released contact.

46. Crimp Rear Release Contact. Remove wired, unwired and broken wire contacts in accordance with the following paragraphs.

47. Wired Contact Removal.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

a. Select correct removal tool (Table 4 or 6).
b. Place wire of contact to be removed into removal tool, with tip facing connector insert (Figure 13).

c. Slide removal tool along wire at a right angle to connector insert face and align with contact cavity (Figure 14).

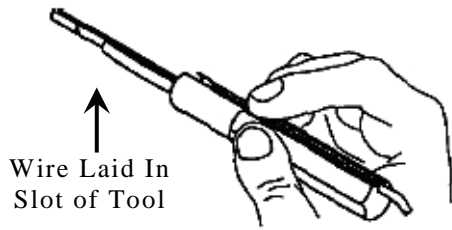


Figure 13. Inserting Wire into Removal Tool

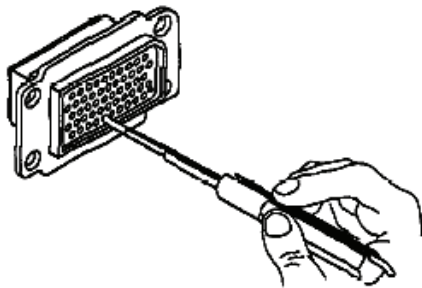


Figure 14. Removal Tool on Wire

d. Insert tool into contact cavity until tool tip bottoms against contact shoulder (Figure 15). A slight increase in resistance will be noticed just before the tool tip bottoms. This will spread the retention clips and release its hold on the contact.

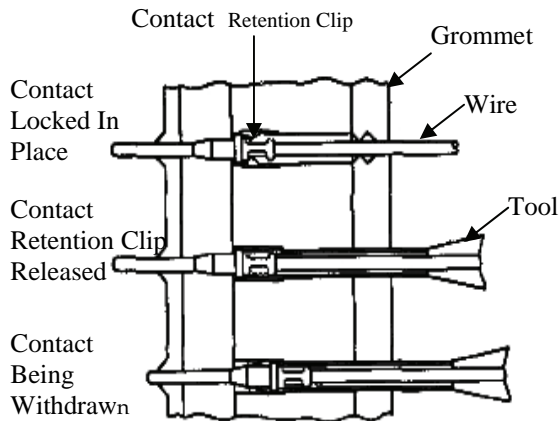


Figure 15. Unlocking Contact

e. Press wire firmly against removal tool and pull wire straight out from contact cavity (Figure 16).

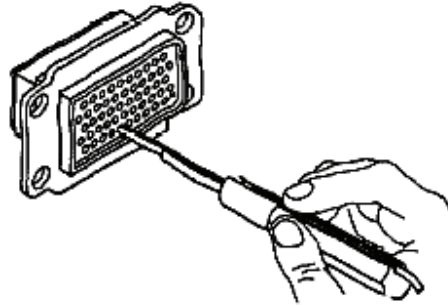
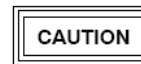


Figure 16. Removing Contact from Connector

48. Unwired Contact Removal.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

- a. Select correct removal tool (Table 4 or 6).
- b. With rear of connector exposed, remove sealing plug from insert cavity of contact to be removed.
- c. Press and hold tool plunger until tip of tool is aligned with contact to be removed.
- d. Axially align removal tool with contact to be removed.
- e. Insert removal tool tip into contact cavity to butt contact wire barrel; then slide removal sleeve over contact and exert pressure until sleeve bottoms. (Figure 17).
- f. Remove tool and unlocked contact from connector by withdrawing tool from connector (Figure 18).
- g. Remove contact from removal tool by pressing plunger.

49. Broken Wire Contact Removal.

CAUTION

Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

- a. Select correct removal tool (Table 4 or 6).

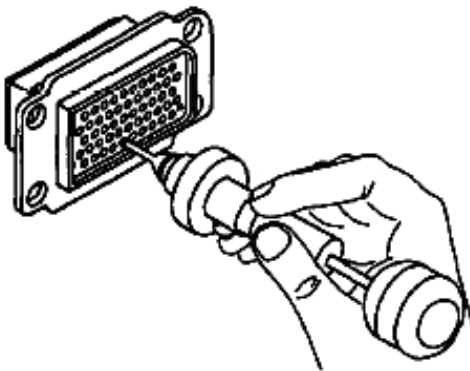


Figure 17. Unlocking Contact Retention Mechanism with Unwired Contact Removal Tool

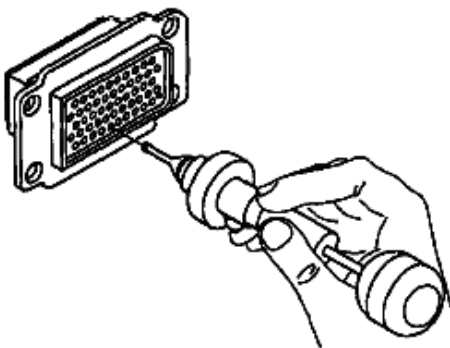


Figure 18. Extracting Contact from Connector

CAUTION

Removal of a contact with a broken wire shall not be attempted with an unwired removal tool. Use of unwired removal tools require that the tip be jammed onto the contact wire barrel. If wire strands occupy wire barrel, the tool and the connector may be damaged.

- b. Insert tip of removal tool into cavity at rear of connector.

CAUTION

Wire strands may be encountered at any point up to 5/16 inch of tool insertion. It is important not to jam any strands of wire up to this point.

Withdraw removal tool anytime during insertion when it cannot be advanced into connector using these procedures. Inspect tool tip for nicks, cracks, mushrooming, and other damage that will prevent functioning. Replace removal tool and repeat procedure, if required.

NOTE

Refer to Figure 19 for approximate dimensions of a size 22 contact and cavity. The dimensions in this procedure are based on a size 22 contact.

- c. Gently insert removal tool into cavity in about 1/16 inch units, releasing tool after each unit if resistance is felt.

NOTE

Rotating removal tool works splayed wire strands into slot of tool, allowing tool to pass.

Removal tool may be blocked at rear of contact by plastic insert or additional strands of broken wire.

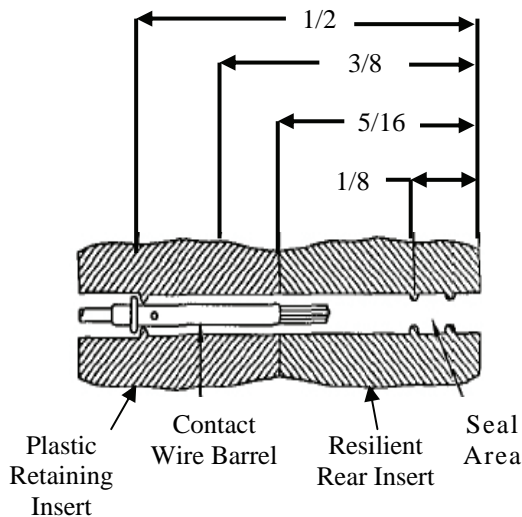


Figure 19. Typical Connector Dimensions

d. If resistance is felt before removal tool reaches back end of contact, withdraw tool slightly, rotate about 1/6 of a turn, and reinsert tool. Repeat rotating and insertion procedure until tool passes with minimum additional force to 5/16 inch depth back end of contact (Figure 20).

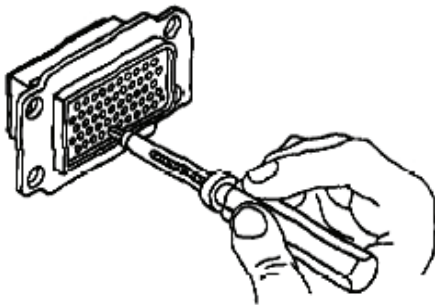


Figure 20. Unlocking Contact Retention Mechanism of Broken Wire Contact

e. Wiggle removal tool gently to help it into insert bore and over back of contact. Additional rotation may be required if broken strands are encountered.

f. Continue insertion of removal tool until positive stop is felt at about 1/2 inch depth.

g. Exert axial pressure on engaging end of contact, using appropriate pin or socket as pusher. If contact does not move, seat removal tool more firmly.

h. Push contact completely out of rear of connector before disengaging removal tool (Figure 21).

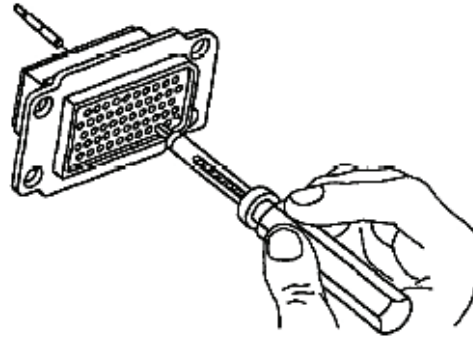


Figure 21. Broken Wire Contact Removal

50. CONNECTOR REMOVAL AND INSTALLATION. If the connector is severely damaged or cannot be repaired using the above procedures, proceed as follows:

a. Starting from outside of damaged connector, tag wires and remove all contacts from connector (Paragraph 44). If contact cannot be removed, cut wire as close to connector as possible and attach new contact (Paragraphs 38 and 39).

b. Starting from center of new connector, insert contact into correct cavity (Paragraph 40). Remove tag from wire. Repeat procedure until all contacts are installed in the new connector.

51. CONNECTOR BUILDUP, SOLDER CONTACTS.

52. For buildup procedures of solder contacts, refer to NAVAIR 01-1A-505-1, WP 016 00.

53. CONNECTOR CLEANING AND PRESERVATION.

54. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00.

CONNECTOR ACCESSORIES

MIL-DTL-26518

Reference Material

Connectors, Electrical, Miniature, Rack and Panel, Environment Resisting,
 200°C Ambient Temperature..... MIL-DTL-26518
 Plug, End Seal, Electrical Connector..... MS27488
 Spring Loaded Mounting Assembly, Connector, Rack and Panel, Miniature MS24695
 Connectors MIL-DTL-26518 010 02

Alphabetical Index

Subject	Page No.
Introduction	1
MIL-DTL-26518 Connector Accessories	1
Backshells.....	2
EMI/RFI Backshells	1
Environmental Backshells	1
Non-Environmental Backshells.....	1
Cable Clamps/Strain Reliefs.....	2
Cable Clamps	2
Strain Reliefs	2
Dust Caps	2
Spring Mount Assembly.....	2

Record of Applicable Technical Directives

None

1. **INTRODUCTION**

2. This Work Package (WP) covers connector accessories used with MIL-DTL-26518 connectors, their function, and procurement information.

3. **MIL-DTL-26518 CONNECTOR ACCESSORIES.**

4. Connector accessories are components added to a connector to enhance its operational characteristics.

5. **BACKSHELLS.** Backshells are the most complex connector accessories and, simply stated, are any device added to the rear or wiring side of a connector (Figure 1).

6. **Non-Environmental.** The non-environmental backshell is used when moisture protection is not required.

7. **Environmental Backshells.** The environmental is used when moisture entry protection is required. This protection is afforded by the use of gaskets, extra grommets, and other sealing devices.

8. **EMI/RFI Backshells.** EMI/RFI backshells are designed to ground or shield a connector to reduce electromagnetic radiation and radio frequency interference from other equipment. This backshell is used when moisture entry and EMI/RFI protection is needed.

9. **CABLE CLAMPS/STRAIN RELIEFS.** The following two paragraphs explain the two types of cable support or clamping devices.

10. **Cable Clamps.** A cable clamp is a support or clamping device which requires use of an intermediate component for attachment to back of connector (Figure 1).

11. **Strain Reliefs.** A strain relief is a support or clamping device which attaches directly to connector (Figure 1).

12. **DUST CAPS.** Protective covers are more commonly called dust caps. The purpose of dust caps is to prevent dirt from entering connectors, pin and sockets and to protect coupling device from damage (Figure 2).

13. **SEALING PLUGS.** Sealing plugs are used where unwired contacts are placed to maintain environmental resistance. Sealing Plugs are sized according to contact size (Figure 3).

14. **SPRING MOUNT ASSEMBLY.** Spring mount assemblies are used to mount the connector in a floating position (Figure 4).

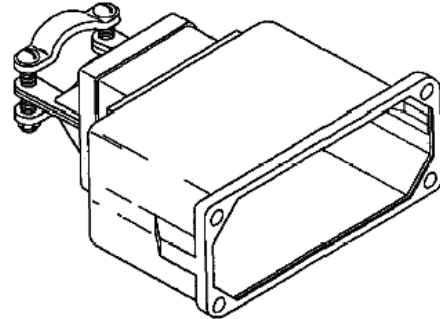
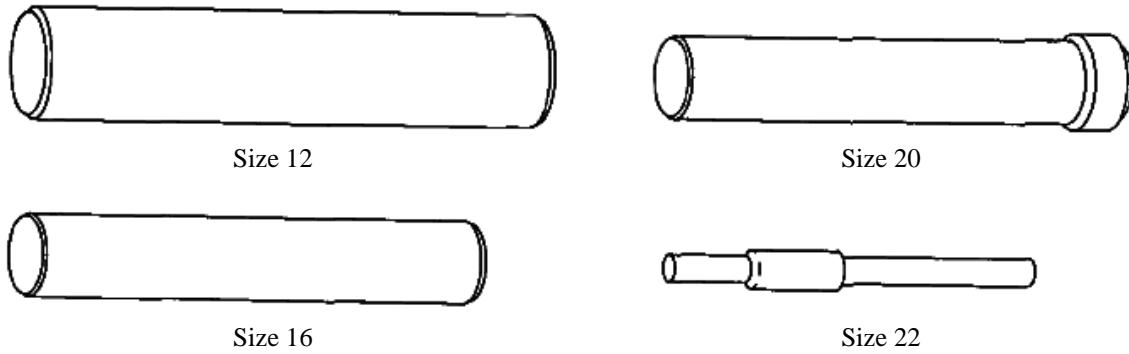


Figure 1. Non-Environmental Backshells

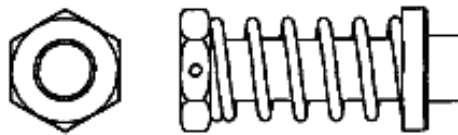


Figure 2. Dust Caps



Contact Size	Part No.	Color
12	MS27488-12	Yellow
16	MS27488-16	Blue
20	MS27488-20	Red
22	MS27488-22	Black

Figure 3. Sealing Plugs



Part Number MS24695

MS pin 1/	A (spring) MS24697	
	Approximate free length	Spring dash number
MS24695-1	.755 (19.18 mm)	-1
MS24695-2	.875 (22.23 mm)	-2
MS24695-3		-3

Figure 4. Spring Mount Assembly

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

011 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-DTL- 83513**

<u>TITLE</u>	<u>WP NUMBER</u>
Connector Accessories MIL-DTL-83513	011 03
Connectors MIL- DTL-83513	011 02
Introduction	011 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-DTL-83513**

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-DTL-83513. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification

requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-DTL-83513

Reference Material

Installation Practices, Aircraft Electric and Electronic WiringNAVAIR 01-1A-505-1
 Connectors, D MicrominiatureMIL-DTL-83513
 Connector Accessories MIL-DTL-83513 011 03

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	6
Crimping	6
Wire Stripping.....	6
Connector Buildup, Solder Contacts	6
Connector Cleaning and Preservation	6
Introduction	2
Description	2
MIL-DTL-83513 Connectors	2
Connector Class	2
Class M	2
Class P.....	2
Connector Shells	2
Contacts.....	5
Crimp Contacts	6
Solder Contacts	5
Design and Construction	2
Insert Configuration	5
Inserts.....	5
Interchangeability.....	5
Part Number	2
Bell Finish.....	2
Insert Configuration	2
Specification Sheet.....	2
Wire Type	2
Polarization	2

Record of Applicable Technical Directives

None

Support Equipment Required

Materials Required

Part No./ Type Designation	Nomenclature	Specification/ Part No.	Nomenclature
None		None	

1. **INTRODUCTION.**

2. This Work Package (WP) covers all pertinent data necessary for the maintenance and use of connectors manufactured in accordance with MIL-DTL-83513. These are polarized shell, microminiature, rectangular connectors, not intended for use in blind mating rack and panel applications.

3. **DESCRIPTION.** The MIL-DTL-83513 connectors (Figure 1) are either metal or plastic shell plugs and receptacles with non-removable crimp or solder contacts. They are capable of continuous operation within a temperature range of -67°F (-55°C) to + 257°F (+125°C). Connectors can be front or rear mountable (front mounting preferred). MIL-DTL-83513 connectors are pre-wired/pre-pinned; maintenance is limited to the installation and connection of the wire or pin (for Printed Circuit Board (PCB) connectors). For connection of the wires/pins refer to applicable connection method being used.

WARNING

This document includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. Consult applicable health and environmental regulations regarding its use, handling and disposition.

NOTE

Nickel plated parts are not for Navy use or new design.

4. **MIL-DTL-83513 CONNECTORS.**

5. **CONNECTOR SHELLS.** The connector shells are designed to positively retain the insert and so constructed that the insert can not be removed.

6. **POLARIZATION.** Polarization is accomplished by a keystone shape shell design with polarization accomplished before engagement of pins or sockets.

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

7. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 2).

8. **Specification Sheet.** The specification sheet denotes military standard (Table 1).

9. **Insert Configuration.** The insert configuration is the insert arrangement by number and size of contacts used.

10. **Bell Finish.** The shell finish denotes the exterior finish for Class M connectors only.

11. **Wire Type.** The wire type denotes the type of wire used for the connector.

12. **DESIGN AND CONSTRUCTION.** Connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.

13. **CONNECTOR CLASS.** There are two class connectors as follows:

14. **Class M.** Class M is used when there is exposure to high humidity.

15. **Class P.** Class P is used in low humidity.

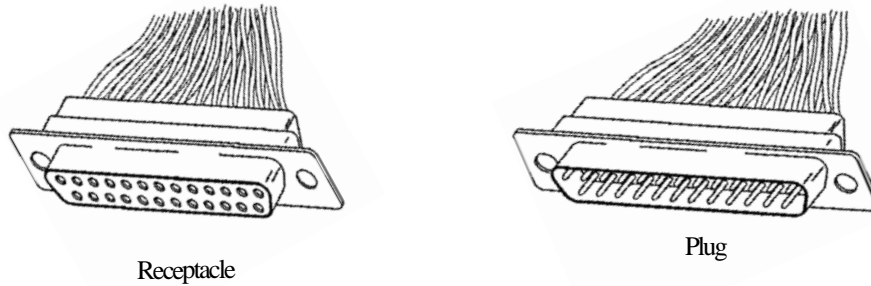
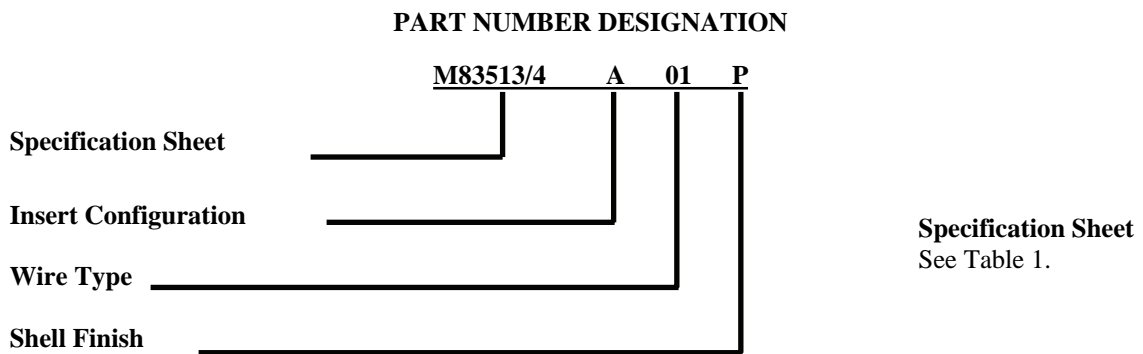


Figure 1. MIL-DTL-83513 Typical Connector

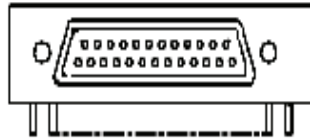


Insert Configuration	
A	9 Contacts
B	15 Contacts
C	21 Contacts
D	25 Contacts
E	31 Contacts
F	37 Contacts
G	51 Contacts
H	100 Contacts (Class M Connectors Only)

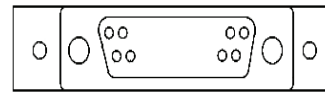
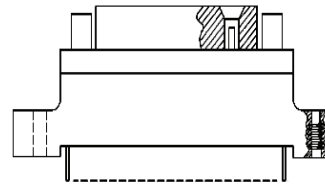
Wire Type (M83513/3, /4, /8 And /9 Only)	
01	M22759/11-26-9, 18 In. Long
02	M22759/11-26-9, 36 In. Long
03	M22759/11-26-(*), 18 In. Long
04	M22759/11-26-(*), 36 In. Long
05	Qq-W-343, Type S, 25 AWG, Gold Plated, .5 In. Long
06	Qq-W-343, Type S, 25 AWG, Gold Plated, 1.0 In. Long
07	Qq-W-343, Type S, 25 AWG, Tin Plated, .5 In. Long
08	Qq-W-343, Type S, 25 AWG, Tin Plated, 1.0 In. Long
* Color Code Per Mil-Std-681, System 1	

Shell Finish (Class M Connectors Only)	
C	Standard Cadmium Or Zinc Plated
N	Electroless Nickel For Air Force Space Application (Not For Navy Use Or New Design)
P	Passivated Stainless Steel

Figure 2. MIL-DTL-83513 Part Number Breakdown



Typical 90° PCB
Connector



Typical Straight PCB
Connector

Figure 3. MIL-DTL-83513 Typical Printed Circuit Board (PCB) Connector

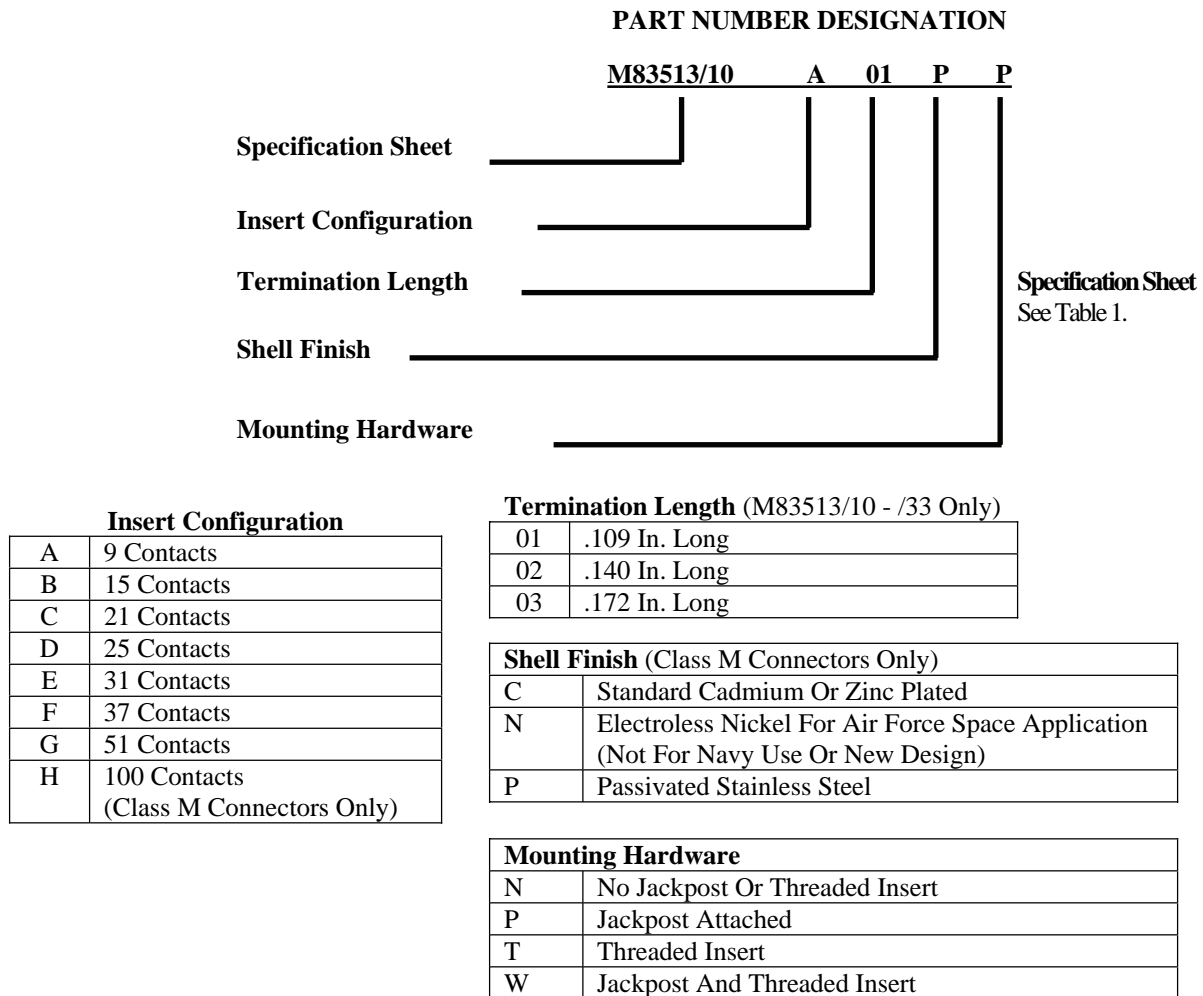


Figure 4. MIL-C-83513 PCB Part Number Breakdown

16. **INSERTS.** Inserts are designed so that they will not readily chip, crack, or break in normal service. They are molded or bonded into the metal shell (Class M). Pin inserts provide adequate protection against a socket contacting a pin before the mating pair of connectors has been polarized. The insert is designed so that it cannot be removed from the shell (Class M). The contact retention system provides positive retention.

17. **INTERCHANGEABILITY.** All connectors having the same military part number are completely interchangeable with respect to installation and performance. Solder and crimp contact connectors are inter-mateable.

18. **INSERT CONFIGURATION.** The insert configuration is the manner in which contacts are placed within connector insert (Figure 3).

19. **CONTACTS.** Contacts are of the reverse gender type. The live pin is installed in a protective insulator with the static socket protruding from a shrouded insulator. Contacts used on connector are as follows:

20. **Solder Contacts.** Solder contacts are non-removable from the insert and designed so that during soldering no components shall be damaged and no liquid solder can escape.

21. Crimp Contacts. Crimp contacts are non-removable from the insert.

22. **CONNECTOR BUILDUP**.

23. **WIRE STRIPPING**. Wire stripping procedures are accomplished in accordance with NAVAIR 01-1A-505-1, WP 009 00.

24. **CRIMPING**. Crimping procedures are accomplished in accordance with NAVAIR 01-1A-505-1, WP013 00.

25. **CONNECTOR BUILDUP, SOLDER CONTACTS**.

26. For buildup procedures for solder contacts refer to NAVAIR 01-1A-505-1, WP 016 00.

27. **CONNECTOR CLEANING AND PRESERVATION**.

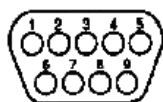
28. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00.

Table 1. MIL-DTL-83513 Military Prefix Specification

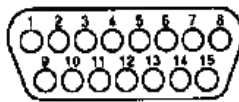
Specification	Description		
Pre-wired Connectors			
M83513/1	Class M, Metal Shell Plug,	Non-removable Solder Pin Contacts	
M83513/2	Class M, Metal Shell Receptacle,	Non-removable Solder Socket Contacts	
M83513/3	Class M, Metal Shell Plug,	Non-removable Crimp Pin Contacts	
M83513/4	Class M, Metal Shell Receptacle,	Non-removable Crimp Socket Contacts	
M83513/5	Connector Mounting Hardware		
M83513/6	Class P, All Plastic Plug,	Non-removable Solder Pin Contacts	
M83513/7	Class P, All Plastic Receptacle,	Non-removable Solder Socket Contacts	
M83513/8	Class P, All Plastic Plug,	Non-removable Crimp Pin Contacts	
M83513/9	Class P, All Plastic Receptacle,	Non-removable Crimp Socket Contacts	
Printed Circuit Board (PCB) Connectors			
M83513/10	Class M, Metal Shell Plug,	Narrow Profile, 9-37	Non-removable 90° PCB Contacts
M83513/11	Class M, Metal Shell Plug,	Narrow Profile, 51	Non-removable 90° PCB Contacts
M83513/12	Class M, Metal Shell Plug,	Narrow Profile, 100	Non-removable 90° PCB Contacts
M83513/13	Class M, Metal Shell Receptacle,	Narrow Profile, 9-37	Non-removable 90° PCB Contacts
M83513/14	Class M, Metal Shell Receptacle,	Narrow Profile, 51	Non-removable 90° PCB Contacts
M83513/15	Class M, Metal Shell Receptacle,	Narrow Profile, 100	Non-removable 90° PCB Contacts
M83513/16	Class M, Metal Shell Plug,	Standard Profile, 9-37	Non-removable 90° PCB Contacts
M83513/17	Class M, Metal Shell Plug,	Standard Profile, 51	Non-removable 90° PCB Contacts
M83513/18	Class M, Metal Shell Plug,	Standard Profile, 100	Non-removable 90° PCB Contacts
M83513/19	Class M, Metal Shell Receptacle,	Standard Profile, 9-37	Non-removable 90° PCB Contacts
M83513/20	Class M, Metal Shell Receptacle,	Standard Profile, 51	Non-removable 90° PCB Contacts
M83513/21	Class M, Metal Shell Receptacle,	Standard Profile, 100	Non-removable 90° PCB Contacts
M83513/22	Class M, Metal Shell Plug,	9-37	Non-removable Straight PCB Contacts
M83513/23	Class M, Metal Shell Plug,	51	Non-removable Straight PCB Contacts
M83513/24	Class M, Metal Shell Plug,	100	Non-removable Straight PCB Contacts
M83513/25	Class M, Metal Shell Receptacle,	9-37	Non-removable Straight PCB Contacts
M83513/26	Class M, Metal Shell Receptacle,	51	Non-removable Straight PCB Contacts
M83513/27	Class M, Metal Shell Receptacle,	100	Non-removable Straight PCB Contacts
M83513/28	Class M, Metal Shell Plug,	Standard Profile, 9-37	Non-removable Straight PCB Contacts
M83513/29	Class M, Metal Shell Plug,	Standard Profile, 51	Non-removable Straight PCB Contacts
M83513/30	Class M, Metal Shell Plug,	Standard Profile, 100	Non-removable Straight PCB Contacts

Table 1. MIL-DTL-83513 Military Prefix Specification (Continued)

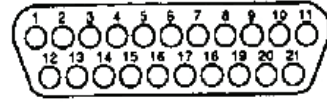
Specification	Description		
Printed Circuit Board (PCB) Connectors			
M83513/31	Class M, Metal Shell Receptacle,	Standard Profile, 9-	Non-removable Straight PCB Contacts
M83513/32	Class M, Metal Shell Receptacle,	Standard Profile, 51	Non-removable Straight PCB Contacts
M83513/33	Class M, Metal Shell Receptacle,	Standard Profile, 100	Non-removable Straight PCB Contacts



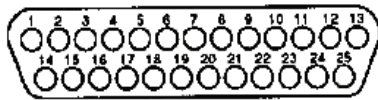
9 Contacts



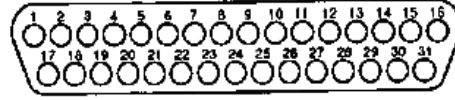
15 Contacts



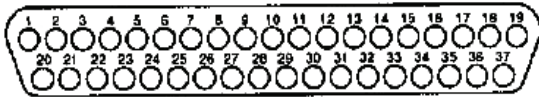
21 Contacts



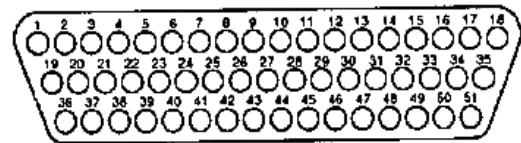
25 Contacts



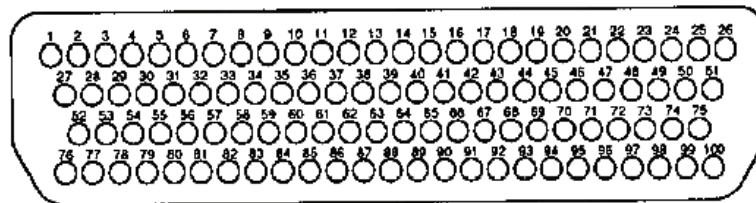
31 Contacts



37 Contacts



51 Contacts



100 Contacts

Figure 5. MIL-DTL-83513 Insert Configurations

CONNECTOR ACCESSORIES

MIL-DTL-83513

Reference Material

Connectors, D Microminiature	MIL-DTL-83513
Connectors, MIL-DTL-83513	011 02

Alphabetical Index

Subject	Page No.
Introduction	1
MIL-DTL-83513 Mounting Hardware	1
Mounting Hardware.....	1
90° Angle Mounting Bracket	1
Edgeboard Mounting Bracket	3
Jackpost Kit.....	1
Jackpost/Jackscrew Assembly.....	1
Mounting Key and Clip.....	3
Mounting Screw Bracket.....	3
Panel Mounting Kit.....	3
Screw Lock Assembly.....	1
Screw Mounting	8

Record of Applicable Technical Directives

None

Support Equipment Required	
Part No./ Type Designation	Nomenclature
None	
Materials Required	
Specification/ Part No.	Nomenclature
None	
1. <u>INTRODUCTION.</u>	
2. This Work Package (WP) contains the mounting hardware for MIL-DTL-83513 connectors. Vendor part numbers given as reference only, any qualified vendor with suitable product may be used.	
	3. <u>MIL-DTL-83513 MOUNTING HARDWARE.</u>
	4. MOUNTING HARDWARE. Mounting hardware is not factory installed and comes unassembled.
	5. Screw Lock Assembly. The screw lock assembly can be used for front mounting only (Figure 1). The lock screw torque value is 4.0 in./lbs.
	6. Jackpost Kit. The 100 pin connector uses jackpost kit for mounting purposes (Figure 2). Jackpost kit consists of two assemblies.
	7. Jackpost/Jackscrew Assembly. The 9 thru 51 pin connectors use jackpost/jackscrew assembly (Figure 3).
	8. 90° Angle Mounting Bracket. The 90° angle mounting bracket (Figure 4) is for connectors shown in Table 1.

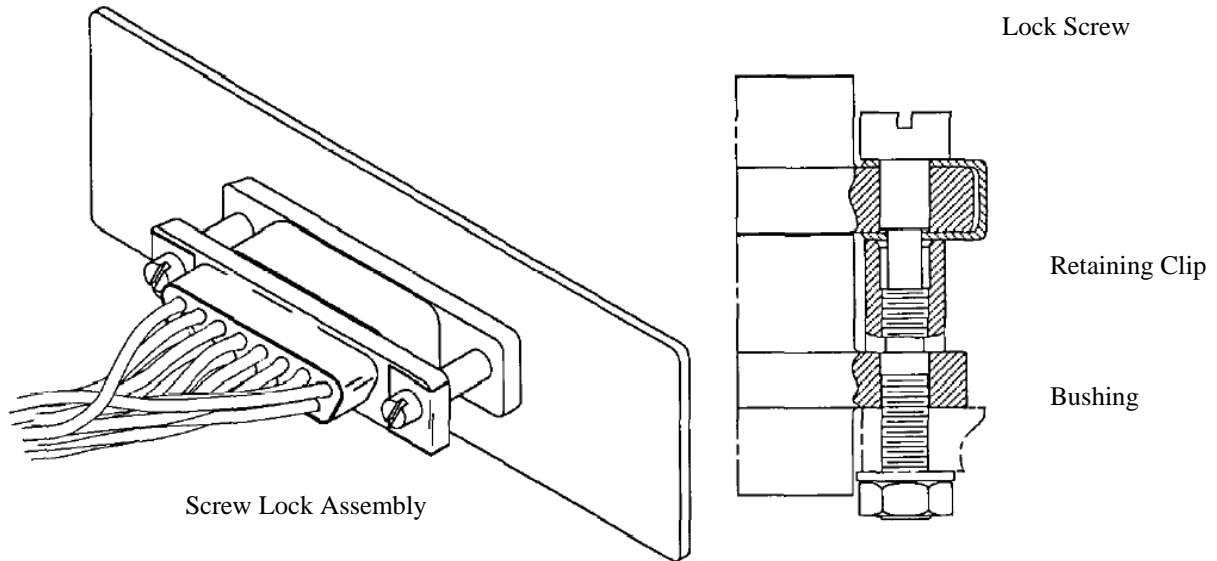


Figure 1. Screw Lock Assembly Part Number 322-9500-000

Table 1. 90° Angle Mounting Brackets

Connector	Bracket Part Number
9 Thru 37 Pin	015-9516-002
51 Pin	015-9516-003
100 Pin	015-9528-000

Connector Shown For Reference Only

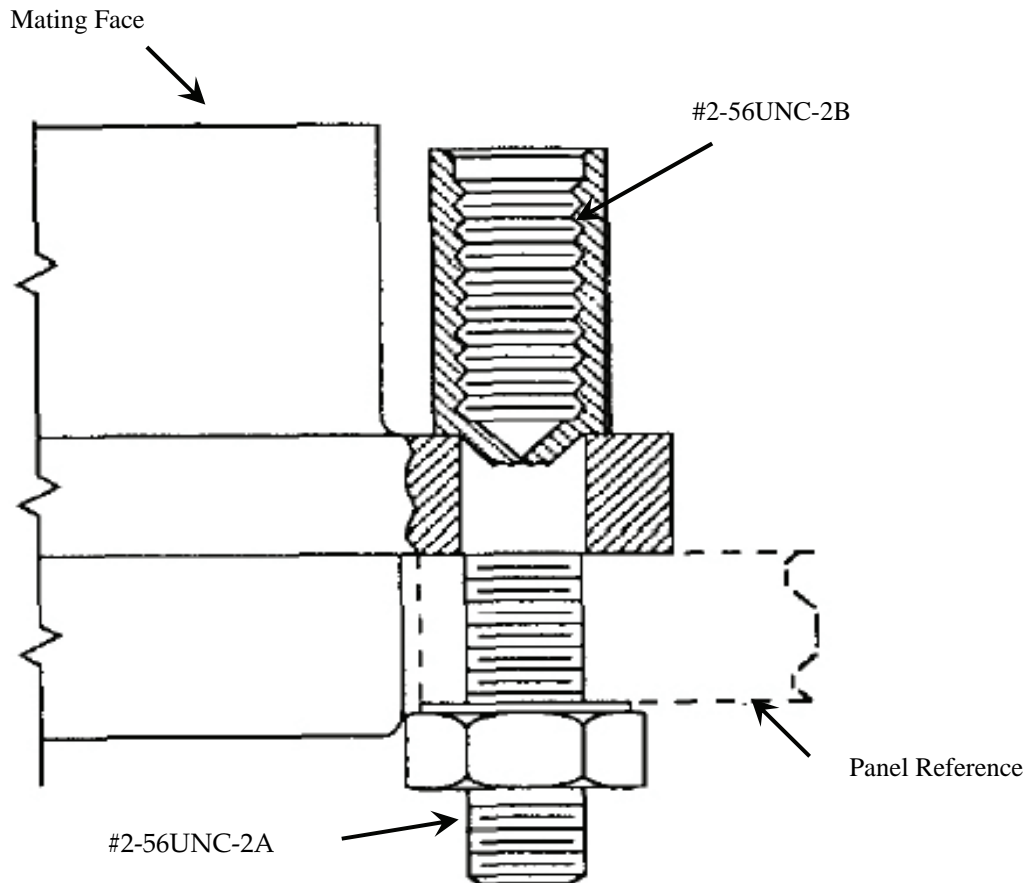


Figure 2. Jackpost Kit Part Number 320-9505-000

9. Panel Mounting Kit. The recommended method of front mounting is with metal panel mounting keys (Figure 5). Panel mounting keys are available with or without coupling retention clips.

10. Mounting Screw Bracket. Mounting screw brackets (Figure 6) may be used instead of panel mounting keys.

11. Edgeboard Mounting Bracket. Edgeboard mounting bracket (Figure 7) has left or right hand type. The edgeboard mounting bracket and coupling clip assembly kit contains a set of left and right hand types.

12. Mounting Key and Clip. Mounting key and clip (Figure 8) are used for panel mounting, cable to cable, or inline mounting (Figure 9). Two clips are required for mounting purposes.

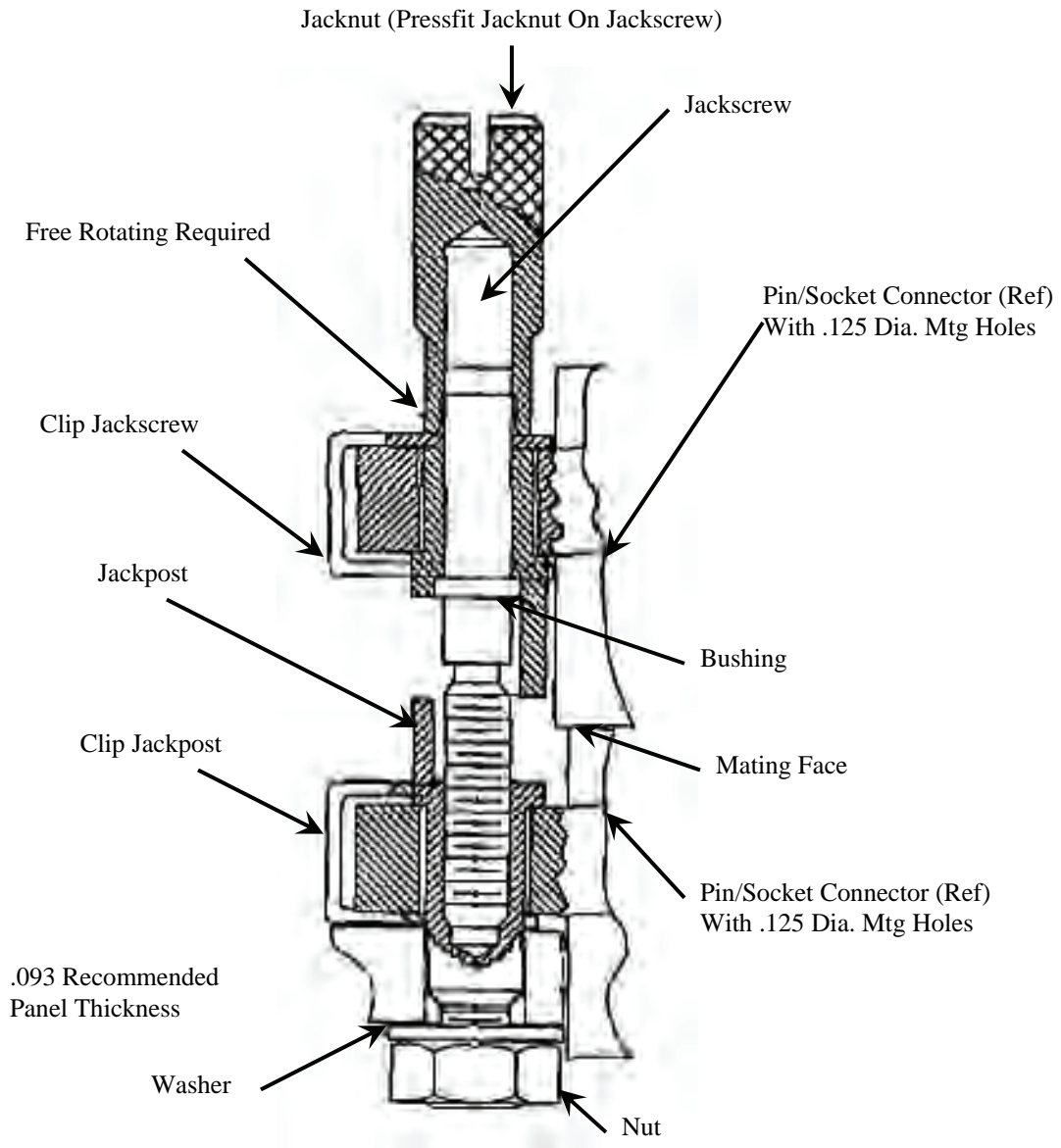


Figure 3. Jackpost/Jackscrew Assembly Part Number 320-9511-000

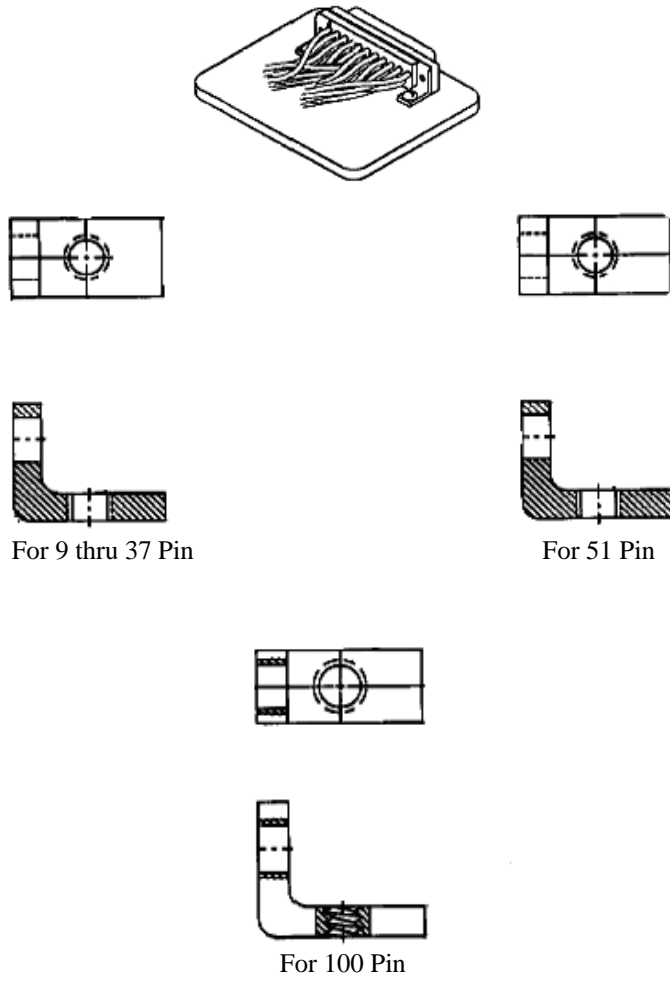
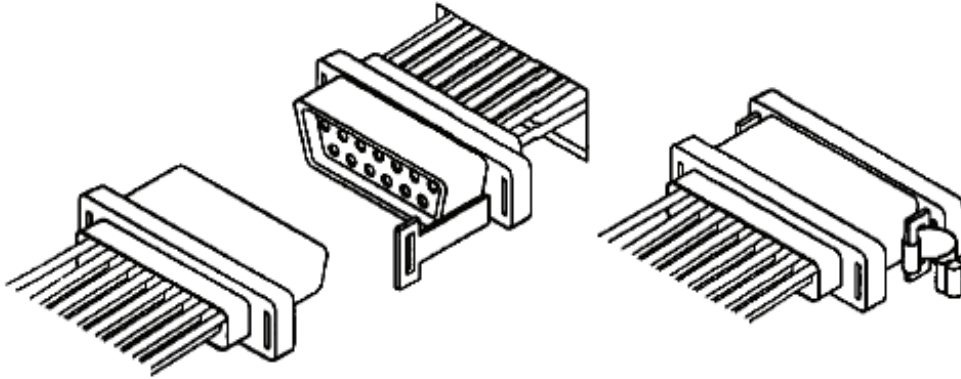


Figure 4. 90° Angle Mounting Bracket



Panel Mounting Key
Part Number 201-9100-000

Coupling Retention Clip
Part Number 294-9100-000

Figure 5. Panel Mounting Key

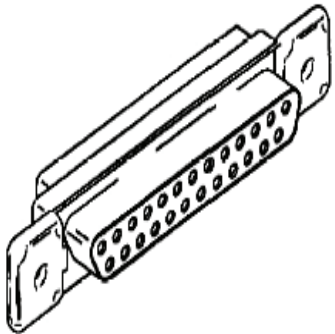
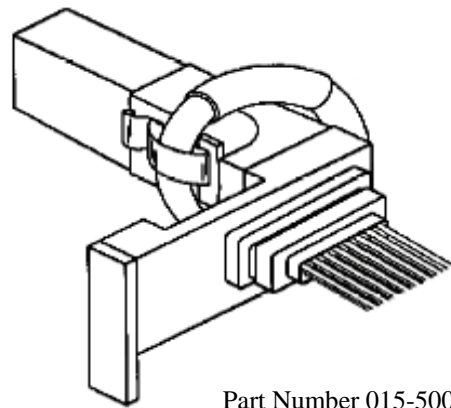
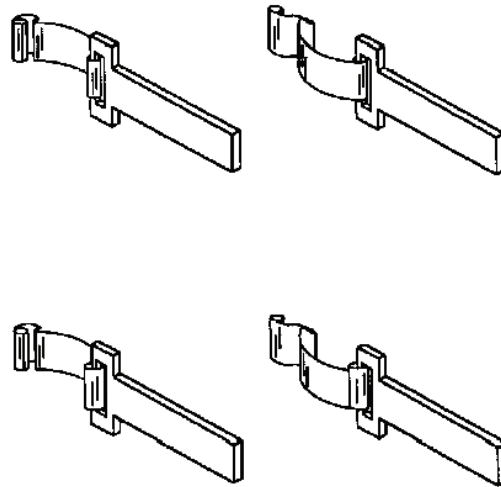


Figure 6. Mounting Screw Bracket
Part Number 015-9100-000



Part Number 015-5009-000

Figure 7. Edgeboard Mounting Bracket



Part Number 096-0001-000
(2 Required)

Figure 8. Mounting Key and Clip

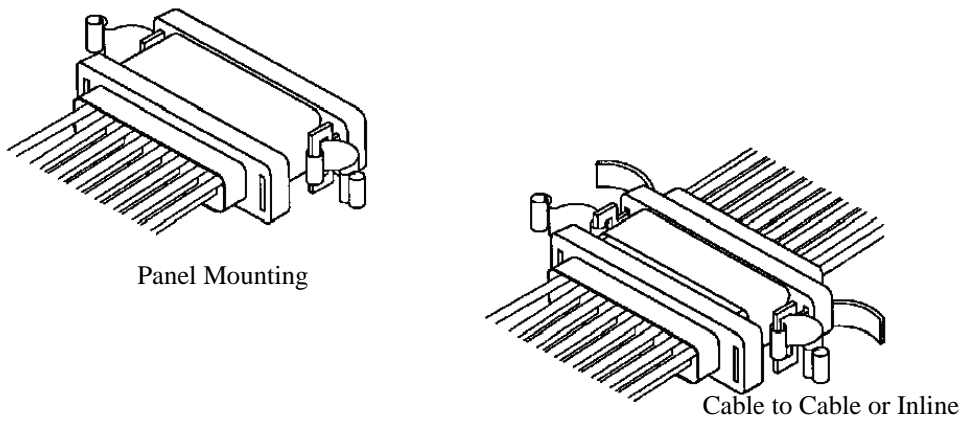


Figure 9. Key and Clip Mounting Methods

13. Screw Mounting. Table 2 has the various screw mounting assemblies. Screw mounting assemblies (Figure 10) use either a slot head or 1/16 inch Allen head. The jacknut assembly mates with all lockscrew and jackscrew assemblies.

14. There are two types of additional mounting, float mount and screw mount. Float mount needs no accessories and screw mount has two types of jackscrews (Figure 11).

Table 2. Screw Mounting Assembly

Mounting Assembly	Slot Head/ 1/16 In. Allen Head	Military Part Number
Jackscrew Assy. (High Profile)	Slot Head	M83513/5-06
Jackscrew Assy. (High Profile)	Allen Head	M83513/5-03
Jackscrew Assy. (Low Profile)	Slot Head	M83513/5-05
Jackscrew Assy. (Low Profile)	Allen Head	M83513/5-02
Jackpost Assy.	---	M83513/5-07
Jackscrew Assy. (High Profile)	Slot Head	M83513/5-16
Jackscrew Assy. (High Profile)	Allen Head	M83513/5-13
Jackscrew Assy. (Low Profile)	Slot Head	M83513/5-15
Jackscrew Assy. (Low Profile)	Allen Head	M83513/5-12
Jackpost Assy.	---	M83513/5-17

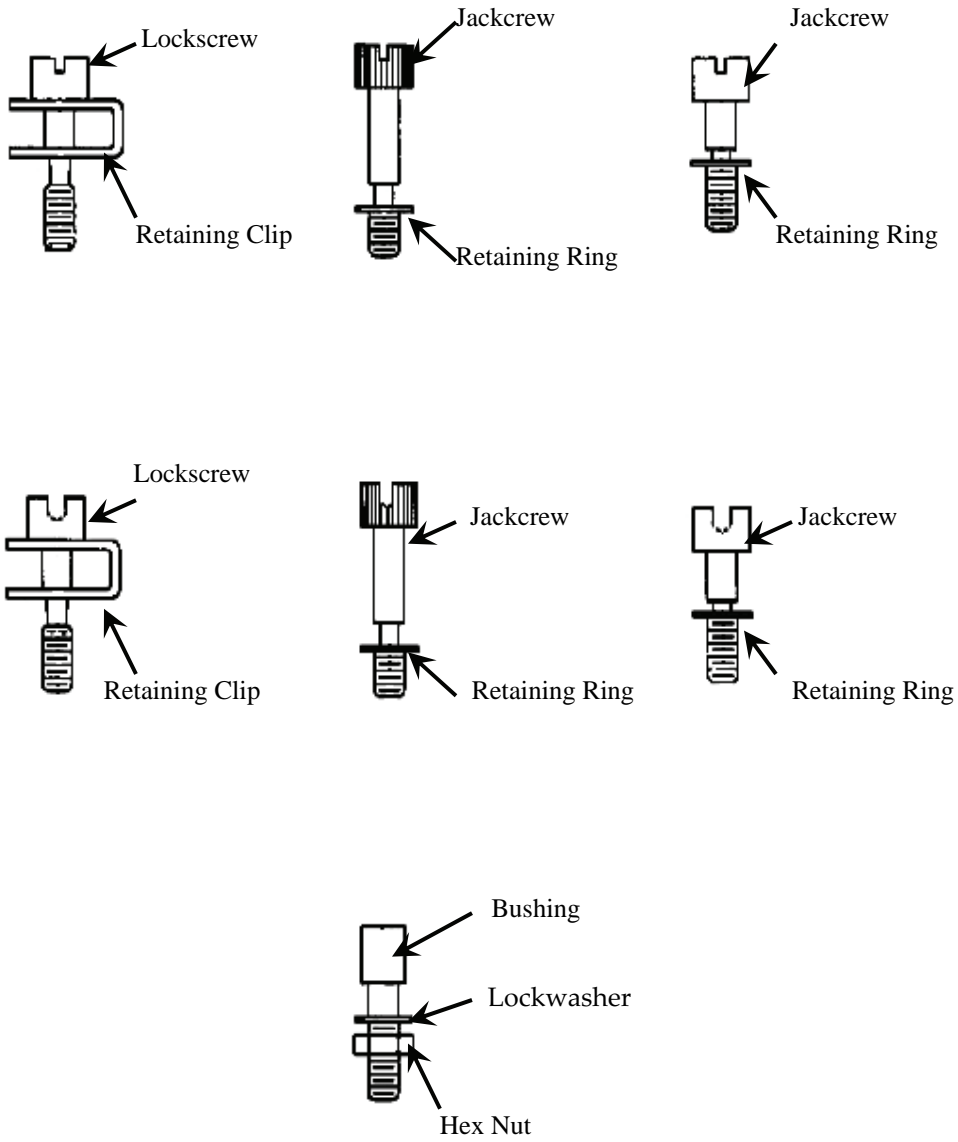
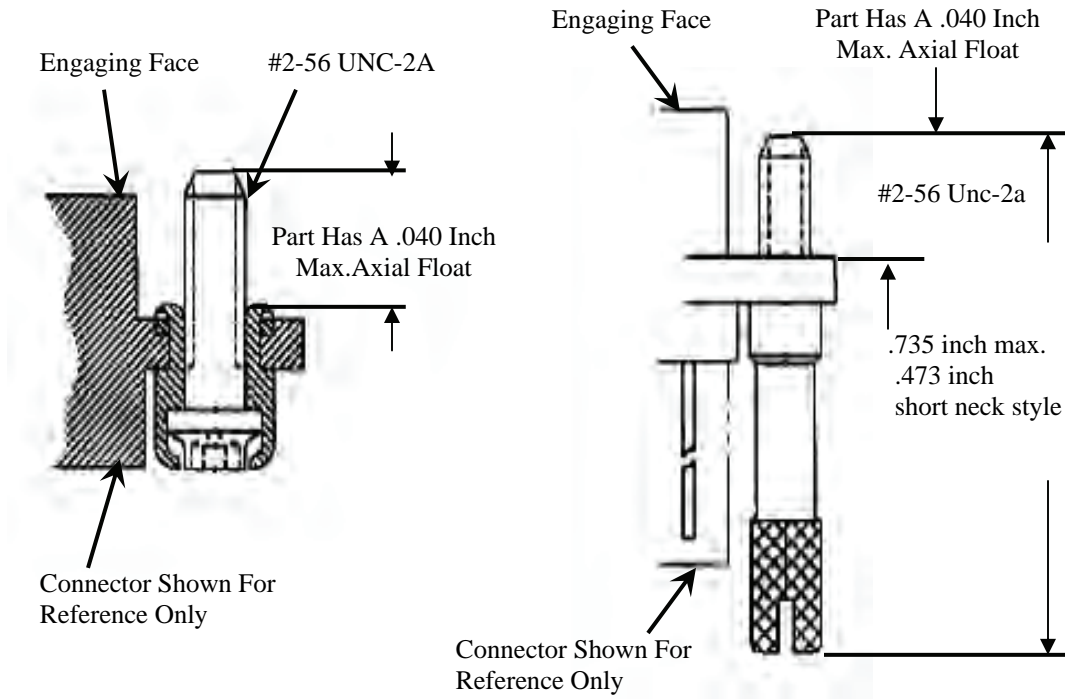


Figure 10. Screw Mounting Assemblies



Jackcrew Low Profile

Jackcrew Standard

Figure 11. Jackscrew for Screw Mount

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

012 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS MIL-C- 85028**

<u>Title</u>	<u>WP Number</u>
Connector Accessories MIL-C-85028	012 03
Connectors MIL- C-85028	012 02
Introduction	012 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS MIL-C-85028**

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers all connectors manufactured in accordance with General Specification MIL-C-85028. It includes: power, thermocouple, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification

requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MIL-C-85028

Reference Material

Connector, Electrical, Rectangular, Individual Contact Sealing, Polarized
Center Jackscrew, General Specification for.....MIL-C-85028
Installation Practices, Aircraft Electric and Electronic WiringNAVAIR 01-1A-505-1
Connect Accessories MIL-C-85028 012 03

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	11
Connector Sealing	12
Moisture Barrier	12
Sealing Plugs.....	12
Contact Crimping	11
Contact Insertion	11
Contact Removal.....	12
Broken Wire Contact Removal	14
Unwired Contact Removal.....	14
Wired Contact Removal.....	12
Interface Seal Installation.....	16
Interface Seal Removal	16
Wire Stripping.....	11
Connector Removal and Installation	16
Connector Cleaning and Preservation	16
Introduction	2
Description	2
MIL-C-85028 Connectors	2
Backshell Removal and Installation	10
Contact Application	7
Contacts.....	7
Design and Construction	3
Insert Configuration	4
Inserts	3
Closed-Entry Socket Contacts.....	4
Contact Extraction.....	4
Contact Insertion	4
Contact Retainer Clip.....	4
Crimped Snap-in Contacts	4
Seals	4
Interchangeability.....	3
Part Number	3
Center Hardware	3
Contact Designator.....	3
Contact Style.....	3
Insert Configuration	3
Military Designation	3

Alphabetical Index (Continued)

<u>Subject</u>	<u>Page No.</u>
Polarization.....	3
Specification Sheet Number.....	3
Polarization.....	2
Power Contacts	7
Tooling	10
Wire Sealing.....	4

Record of Applicable Technical Directives

None

Support Equipment Required

Part No./ Type Designation	Nomenclature
M22520/1-01	Tool, Crimp, Frame
M22520/1-11	Positioner
M81969/21-01	Tool, Insertion/Removal
M81969/22-01	Tool, Removal
M81969/23-01	Tool, Insertion
M81969/23-02	Tool, Insertion

wire seals and backshells used with recessed jackscrews have 45 or 90 degree cable entries.

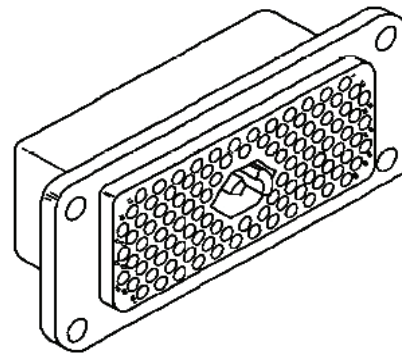


Figure 1. MIL-C-85028 Typical Connector

Materials Required

Specification/ Part No.	Nomenclature
	None

1. INTRODUCTION.

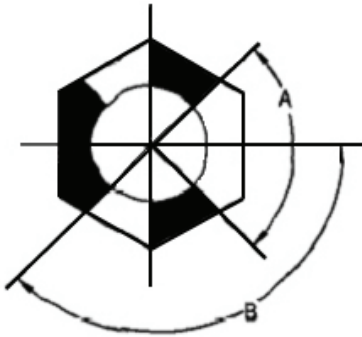
2. This Work Package (WP) covers environment and fluid resisting, rectangular, rack and panel connectors, manufactured in accordance with MIL-C-85028, both military and commercial, having individually sealing pin and socket crimp removable contacts, designed for -85°F (-65°C) to +302°F (+150°C) operating temperature (Figure 1).

3. **DESCRIPTION.** The MIL-C-85028 connectors incorporate polarized center jackscrews, contacts have

4. MIL-C-85028 CONNECTORS.

5. **POLARIZATION.** Polarization is accomplished by means of three integral keys and matching keyway on the counterpart center boss. Polarization is accomplished before initial engagement of contacts (Figure 2).

To Polarize Connectors, Boss Is Mounted In The Insulator With The Largest Opening Adjacent To The Polarization Letter On The Insulator. Two Types Of Bosses Are Used To Prevent 180° Mismatching Since The Contact Arrangements Are Symmetrical.



Polarization	A	B
N, V, W	90°	135°
X, Y, Z	80°	140°

Figure 2. MIL-C-85028 Polarization Key

NOTE

As all NAVAIR connector and accessory documents are transitioned to non-government standards, (the Society of Automotive Engineers (SAE), will become the preparing activity and the Navy will adopt the documents), the drawing number prefix will change from MS to AS. The main part number designation remains the same, with the "M" prefix, such as M81511/17-08. At times the entire item may be superseded by another. There are many cases where documents have been cancelled without replacements, each case was reviewed and some information has been retained in this volume "for reference use only".

- 6. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 3).
- 7. **Military Designation.** The military designation is denoted by the letter M.
- 8. **Specification Sheet Number.** The specification sheet number denotes the basic number of the specification sheet.

- 9. **Insert Configuration.** The insert configuration is the insert arrangement by number and size of contacts used.
- 10. **Contact Style.** The contact style is indicated by letter to show a full complement of applicable contacts.
- 11. **Contact Designator.** The contact designator is a number which indicates the contact wire barrel size.
- 12. **Center Hardware.** The connector center hardware is designated by a letter.
- 13. **Polarization.** The connector center hardware polarization is designated by a letter (Figure 2).
- 14. **DESIGN AND CONSTRUCTION.** Connectors and accessories are designed and constructed to withstand normal handling incidental to installation and maintenance.
- 15. **INTERCHANGEABILITY.** All connectors having the same part number are completely interchangeable with each other with respect to installation and performance.
- 16. **INSERTS.** Inserts are of one-piece construction and will not chip, crack, or break during assembly or normal maintenance.

NAVAIR 01-1A-505-3
T.O. 00-25-255-2
TM1-1500-323-24-3

012 02
Page 4

17. Crimped Snap-in Contacts. Snap-in contacts designed to SAE-AS-39029 can be crimped with standard M22520/1 crimp tool.

18. Closed-Entry Socket Contacts. These contacts eliminate damage from abuse by test probes and help to correct any misaligned pins during engagement.

19. Contact Insertion. Insertion is accomplished from rear of connector. When contact is fully inserted, the clip tines snap securely behind contact shoulders.

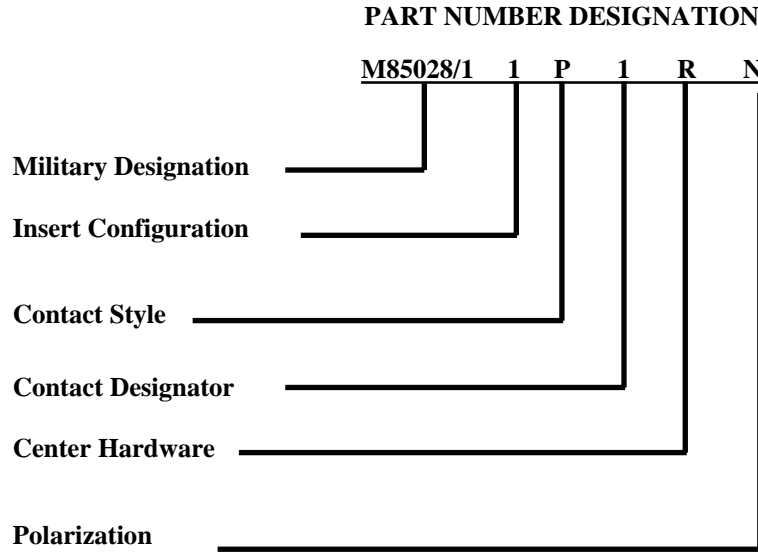
20. Contact Extraction. Extraction is accomplished with use of a removal tool.

21. Contact Retainer Clip. The contact retaining clip is completely encased in a tough plastic wafer to protect clip from damage.

22. Seals. Interfacial and rear seals are designed and constructed in such a manner that they become an integral part of any individual contact. Each seal can be removed and replaced. Seals are illustrated (Figures 4 thru 6).

23. **WIRE SEALING**. Wire sealing is accomplished by use of a grommet seal which is designed to seal against outside diameter of inserted wire. The outer diameter shall be within the applicable size range as specified (Table 1). Select wire seal using Figure 5.

24. **INSERT CONFIGURATION**. The insert configuration is the manner in which the contacts are placed within the connector insert (Figure 7).



Military Designation

M85028/1	Plug, Environmental, Crimp Removable Pin Contacts.
M85028/2	Receptacle, Environmental, Crimp Removable Socket Contacts.

Contact Style

P	Pin.
S	Socket.
Pa	Less Pin Contacts.
Sb	Less Socket Contacts

Insert Configuration (Figure 6)

1	52 Contacts.	Plug And Receptacle With Type R Jackscrew
2	60 Contacts.	
3	104 Contacts.	
4	158 Contacts.	
5	212 Contacts.	
6	52 Contacts.	Receptacle With Type J Jackscrew
7	60 Contacts.	
8	104 Contacts,	
9	158 Contacts,	
10	212 Contacts.	

Contact Designator

0	No Contacts.
1	Contacts For 24-26 AWG Wire.
2	Contacts For 20-24 AWG Wire.
3	Contacts For 16-20 AWG Wire.

Center Hardware

F	Boss (Receptacle Only).
J	Extended Turnable Jackscrew (Plug Only)
R	Recessed Turnable jackscrew (Plug Only)

Figure 3. MIL-C-85028 Part Number Breakdown

Table 1. Wire Diameters

Contact Size	Wire Size	Minimum OD (inch)	Maximum OD (inch)
16-24	24-28	0.041	0.055
16-20	20-24	0.051	0.070
16-16	16-20	0.066	0.087

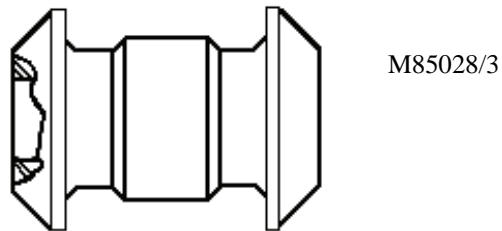
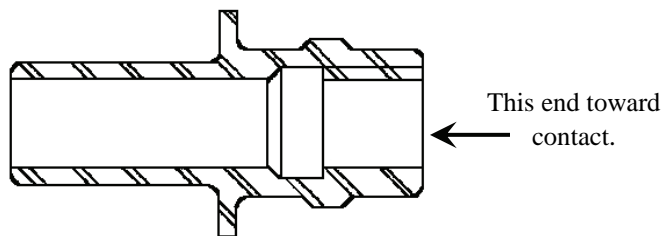


Figure 4. Interfacial Seal



Part Number	Wire Range	Wire Seal	
		Material	Color
M85028/5-1	24 - 28	Rubber	Red
M85028/5-2	20 - 24	Rubber	Lavender
M85028/5-3	16 - 20	Rubber	Brown

Figure 5. Wire Seal

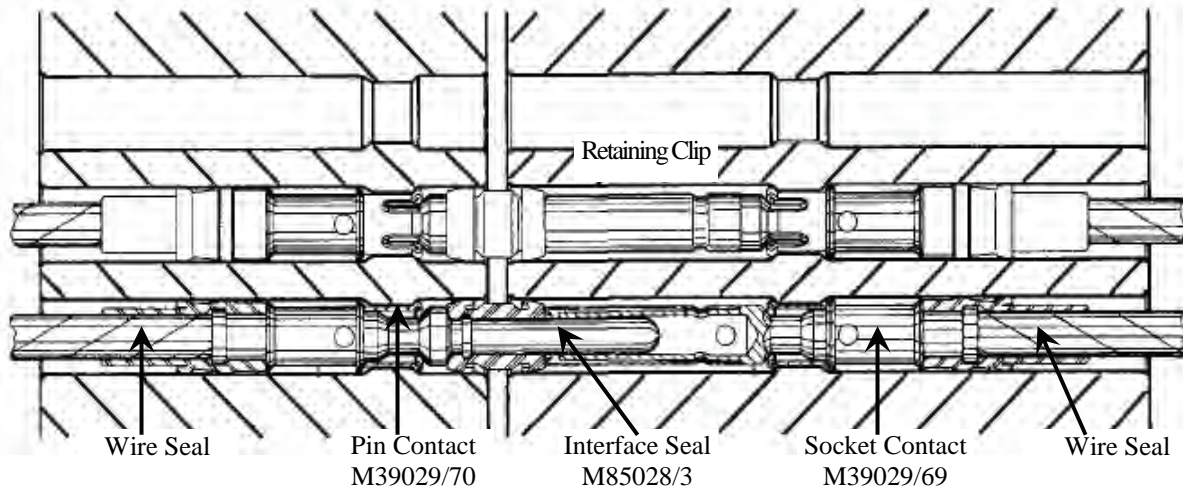


Figure 6. Seal Locations

25. **CONTACTS.** The contacts used in MIL-C-85028 connectors are crimp rear-removable power contacts with pull-thru insertion design.

26. **CONTACT APPLICATION.** Contacts used are manufactured in accordance with SAE-AS-39029. The part number breakdown is illustrated (Figure 8). The Basic Identification Number (BIN) or last three digits of contact part number, matches standard resistor color code (Figure 9).

27. **POWER CONTACTS.** Power contacts are used to connect single conductor wire through connectors. The power contacts are size 16 and are crimp, rear-release design. Contacts are listed by size. Match the required size to connector application, wire gage, and composition. Socket and pin contact part numbers are listed along with corresponding color bands (Table 2).

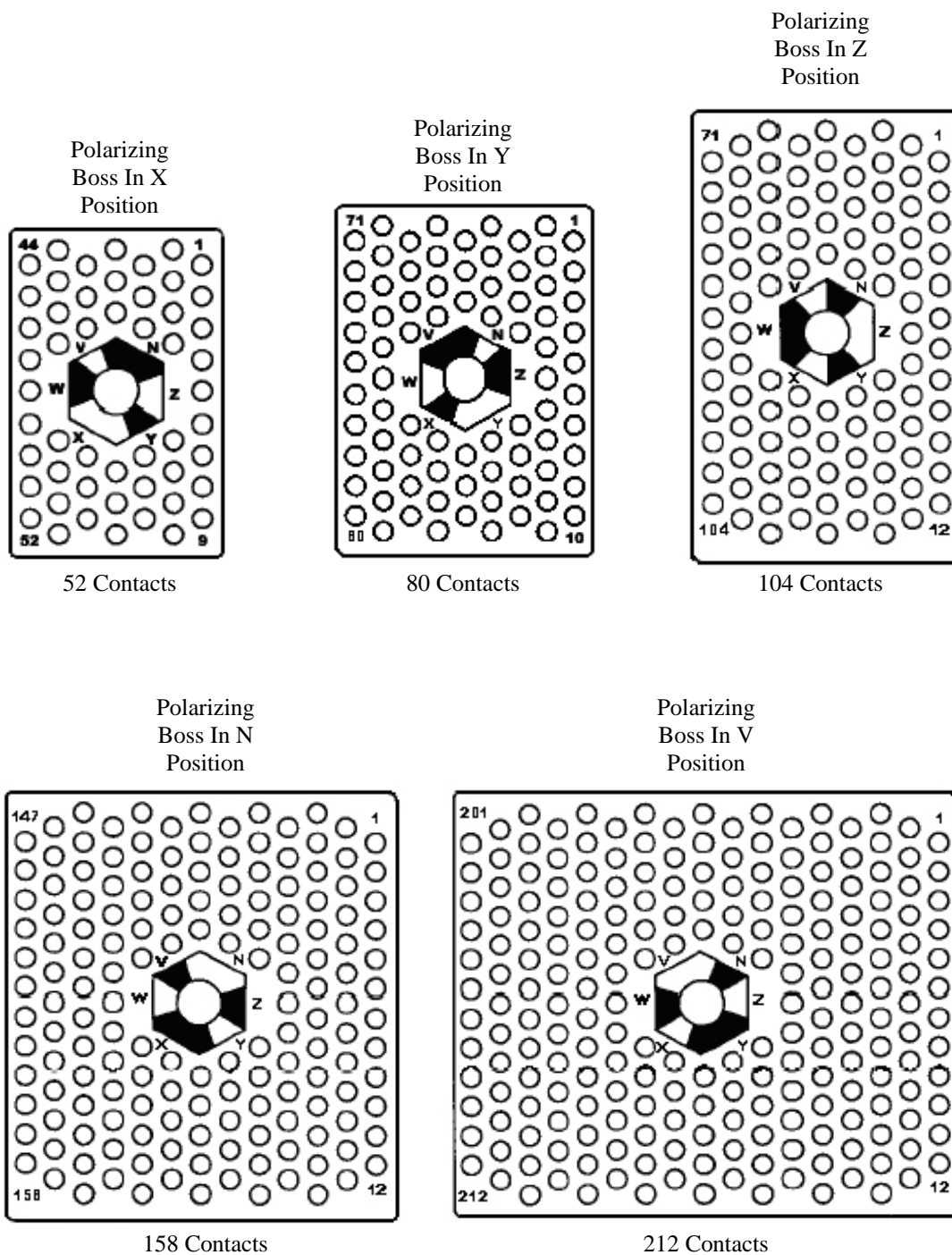


Figure 7. MIL-C-85028 Insert Configurations

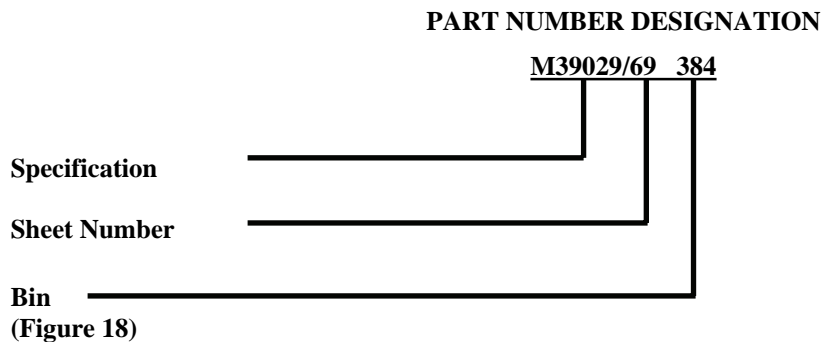
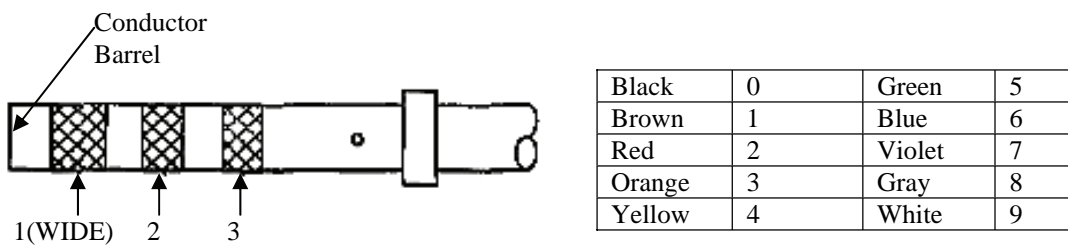


Figure 8. M39029 Contact Part Number Breakdown



Example Bin Code: 384
Orange (Wide Band) / Gray / Yellow

Figure 9. Basic Contact Identification Code and Color Bands

Table 2. MIL-C-85028 Power Contact Application

Contact Size	Wire Range	Socket Contacts				Pin Contacts			
		M39029/	Color Bands			M39029/	Color Bands		
			1 st	2 nd	3 rd		1 st	2 nd	3 rd
16-24	24-28	69-384	OR	GY	YE	70-387	OR	GY	VI
16-60	20-24	69-385	OR	GY	GN	70-388	OR	GY	GY
16-16	16-20	69-386	OR	GY	BL	70-389	OR	GY	WH

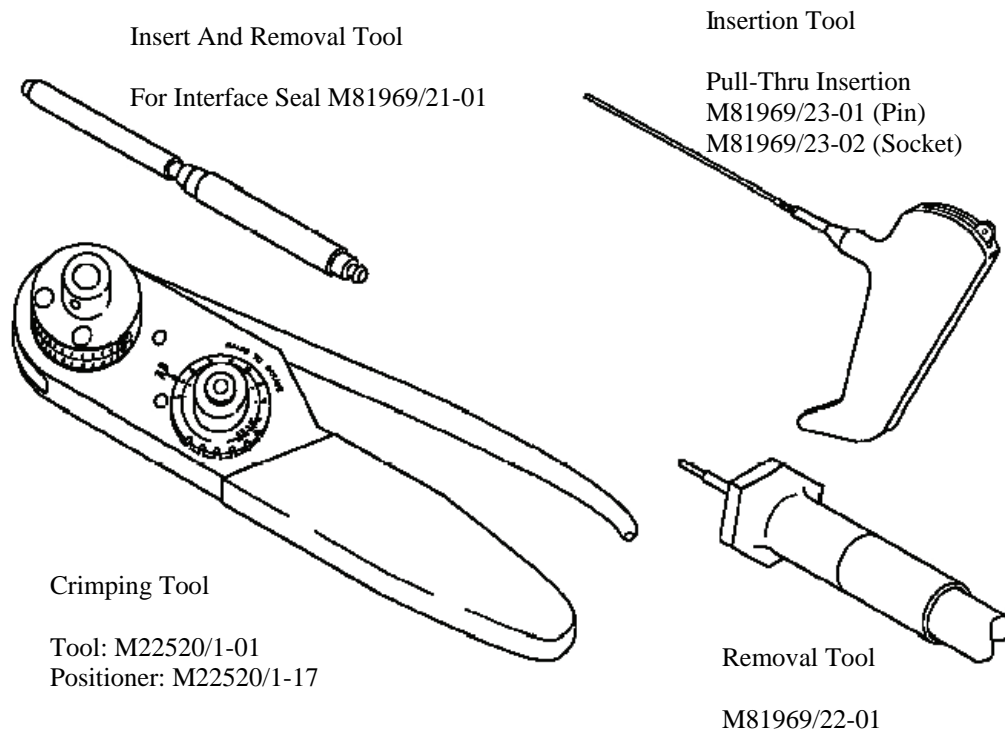


Figure 10. MIL-C-85028 Power Contact Tooling

28. **TOOLING.** The procedure for attaching power contacts to a single conductor wire are the same for this connector series. Select proper tooling (Figure 10) and refer to NAVAIR 01-1A-505-1, WP 013 00 for correct assembly and crimp procedures.

29. **BACKSHELL REMOVAL AND INSTALLATION.** For backshell removal and installation refer to WP 012 03.

- a. Cut wire to proper length. Ensure enough wire remains for adequate strain relief without leaving excess slack.
- b. Select wire seal as required (Figure 5) and slide seal over wire, small end first.
- c. Strip insulation from end (NAVAIR 01-1A-505-1, WP 009 00). Select contact (Table 2).

30. **CONNECTOR BUILDUP.**

31. **WIRE STRIPPING.** Strip wire in accordance with following procedure:

32. **CONTACT CRIMPING.** Crimp contact in accordance with following procedure:

- a. Select correct crimp tool (Figure 10).
- b. Perform die closure check, install positioner, and set selector knob for gage of wire.
- c. Insert stripped wire into contact conductor barrel. Ensure all wire strands are inside contact conductor barrel and visible in contact inspection hole (Figure 11).
- d. If insulation gap is too large, trim conductor as required. If insulation gap is too small, trim insulation as required (Figure 11).
- e. Crimp contact to wire.

33. **CONTACT INSERTION.** Insert wired, or unwired contacts in accordance with following procedure:

- a. Remove sealing plug and/or contact from contact cavity (Paragraph 38).
- b. Ensure wire or cable on contact is routed through connector backshell.
- c. Select correct insertion tool (Figure 10).
- d. Place wire and contact assembly into insertion tool (Figure 12). Ensure tool tip is over conductor barrel and butted against contact shoulder.
- e. Insert tip of contact into cavity. Start contact insertion near connector center cavities and work outward.
- f. Axially align contact with contact cavity.
- g. With firm even pressure, press tool against contact shoulder and seat contact into cavity (Figure 13). A slight click may be heard as retention tines snap into place behind contact shoulder.
- h. Pull tool straight out of contact cavity. Remove tool from wire. Pull back lightly on wire to ensure contact is properly seated.
- i. Seal connector as required (Paragraph 35) and install backshell.

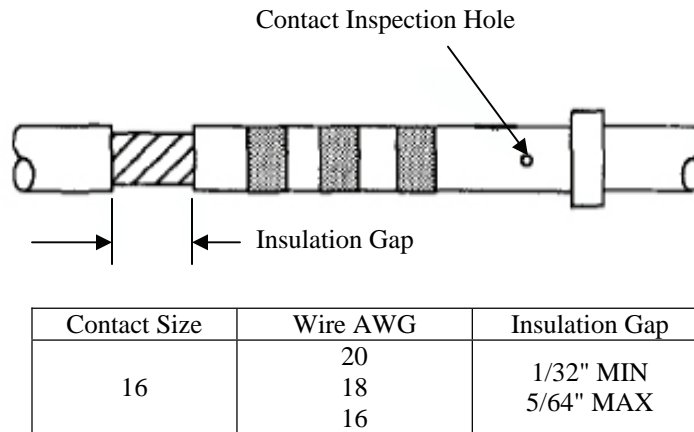


Figure 11. Insulation Gap

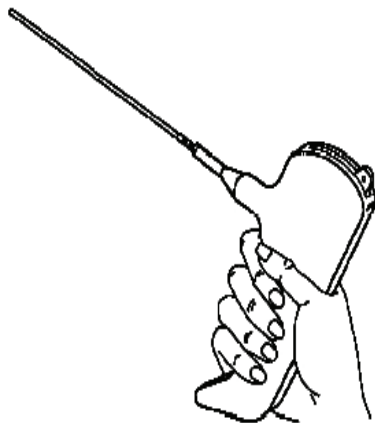


Figure 12. Inserting Contact into Insertion Tool

34. **CONNECTOR SEALING.**

35. Sealing Plugs. Seal connector in accordance with following procedure:

- a. Fill all unused cavities with un-crimped contacts (Paragraph 34).
- b. Insert M85028/4 sealing plug, small diameter first, until bottomed in contact cavity (Figure 14). Do not insert further than knob. Fill all cavities that have un-crimped contacts.

36. Moisture Barrier. For connector sealing procedures, including application of sealant to grommet sealed connectors refer to NAVAIR 01-IA-505-1, WP 025 00.

37. **CONTACT REMOVAL.** Remove wired, unwired, and broken wire contacts in accordance with following procedures:

38. Wired Contact Removal.

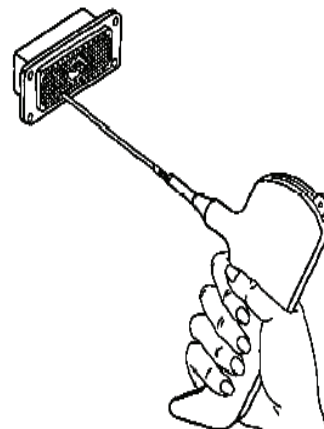


Figure 13. Contact Insertion

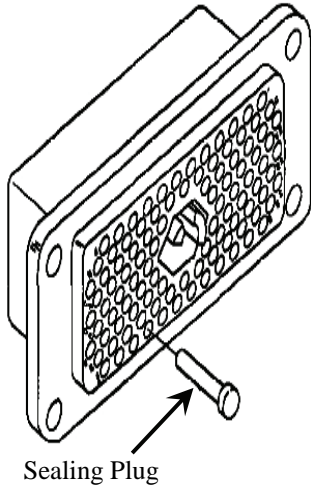


Figure 14 Inserting Sealing Plug into Contact Cavity



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

- a. Select correct removal tool (Figure 10).
- b. Place wire of contact to be removed into removal tool (Figure 15).

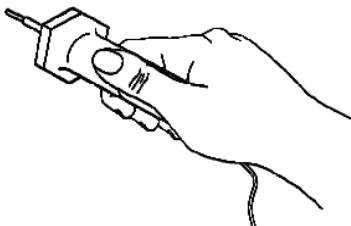


Figure 15 Inserting Wire into Removal Tool

- c. Slide removal tool along wire at a right angle to connector insert face and align with contact cavity (Figure 16).

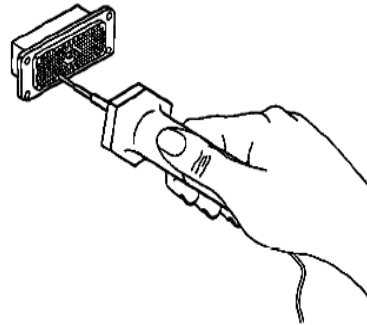


Figure 16. Removal Tool on Wire.

- d. Insert tool into contact cavity until tool tip bottoms against contact shoulder (Figure 17). A slight increase in resistance will be noticed just before the tool tip bottoms. This will spread the retention clip and release its hold on the contact.

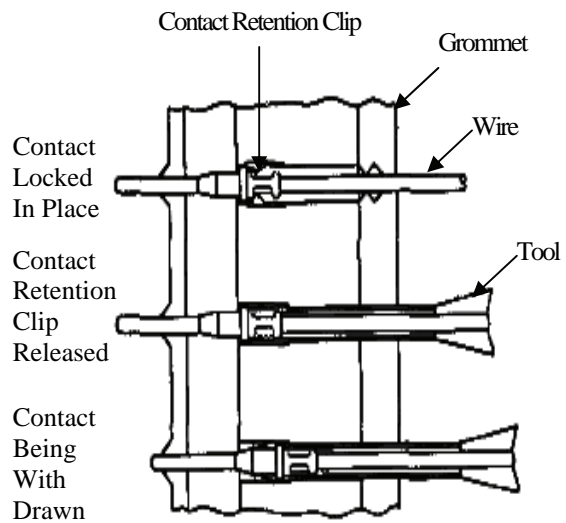


Figure 17. Unlocking Contact Mechanism

- e. Press wire firmly against serrated edge of removal tool and pull wire straight out from contact cavity (Figure 18).

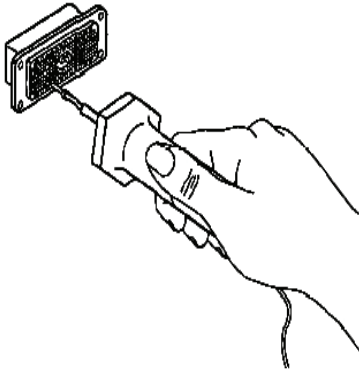


Figure 18. Removing Contact from Connector Mechanism

39. Unwired Contact Removal.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

- a. Select correct removal tool (Figure 10).
- b. With rear of connector exposed, remove sealing plug from insert cavity of contact to be removed.
- c. Press and hold tool until tip of tool is aligned with contact to be removed.
- d. Axially align removal tool with contact to be removed.
- e. Insert removal tool tip into contact cavity to butt contact wire barrel; then slide removal tool sleeve over contact and exert pressure until sleeve bottoms (Figure 19).

- f. Remove tool and unlocked contact from connector by withdrawing tool from connector (Figure 20).

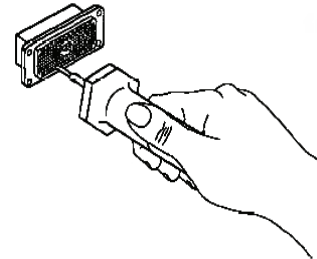


Figure 19. Unlocking Contact Retention Mechanism with Unwired Contact Removal Tool

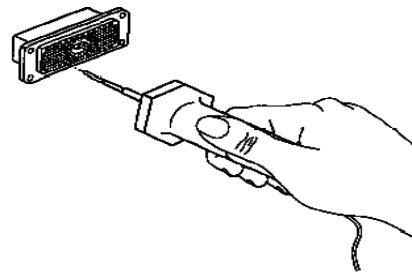
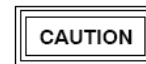


Figure 20. Extracting Contact from Connector Mechanism

40. Broken Wire Contact Removal.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

- a. Select correct removal tool (Figure 10).
- b. Insert tip of removal tool about 1/8 inch into cavity at rear of connector.

CAUTION

Wire strands may be encountered at any point up to 5/16 inch of tool insertion. It is important not to jam any strands of wire up to this point.

Withdraw removal tool anytime during insertion when it cannot be advanced into connector using these procedures.

Inspect tool tip for nicks, cracks, mushrooming, and other damage that will prevent functioning. Replace removal tool and repeat procedure, if required.

NOTE

Refer to Figure 21 for approximate dimensions of a size 22 contact and cavity. The dimensions in this procedure are based on a size 22 contact.

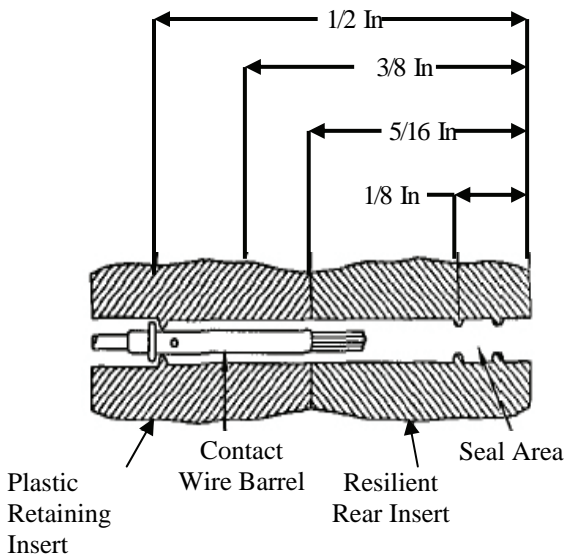


Figure 21. Typical Connector Dimensions

c. Gently insert removal tool into cavity in about 1/16 inch units, releasing tool after each unit if resistance is felt.

NOTE

Rotating removal tool works splayed wire strands into slot of tool, allowing tool to pass.

Removal tool may be blocked at rear of contact by plastic insert or additional strands of broken wire.

d. If resistance is felt before removal tool reaches back end of contact, withdraw tool slightly, rotate about 1/6 of a turn, and reinsert tool. Repeat rotating and insertion procedure until tool passes with minimum additional force to 5/16 inch depth back end of contact (Figure 22).

e. Wiggle removal tool gently to help it into insert bore and over back of contact. Additional rotation may be required if broken strands are encountered.

f. Continue insertion of removal tool until positive stop is felt at about 1/2 inch depth.

g. Exert axial pressure on engaging end of contact, using appropriate pin or socket as pusher. If contact does not move, seat removal tool more firmly.

CAUTION

When removing broken wire contacts ensure wire sealing grommet is not damaged. A new connector must be installed (Paragraph 43) if a broken wire contact cannot be removed.

h. Push contact completely out of rear of connector before disengaging removal tool (Figure 23).

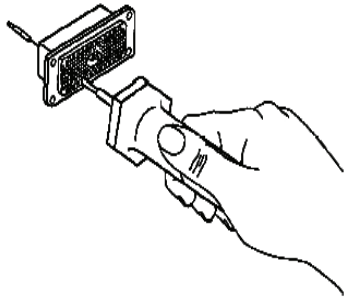


Figure 23. Broken Wire Contact Removal

41. **INTERFACE SEAL REMOVAL.** Select proper tool (Figures 4 and 10) and remove interface seal.

42. **INTERFACE SEAL INSTALLATION.** Select the correct tool (Figures 4 and 10) and install interface seal.

43. **CONNECTOR REMOVAL AND INSTALLATION.**

If the connector is severely damaged or cannot be repaired using the above procedures, proceed with its replacement as follows:

a. Starting from outside of damaged connector, tag wires and remove all contacts from connector (Paragraph 38). If contact cannot be removed, cut wire as close to connector as possible and attach new contact (Paragraphs 32 and 33).

b. Starting from center of new connector, insert contact into correct cavity (Paragraph 34). Remove tag from wire. Repeat procedure until all contacts are installed in new connector.

44. **CONNECTOR CLEANING AND PRESERVATION.**

45. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00.

CONNECTOR ACCESSORIES

MIL-C-85028

Reference Material

Connector, Electrical, Rectangular, Individual Contact Sealing, Polarized
Center Jackscrew, General Specification for.....MIL-C-85028
Connectors MIL-C-85028 012 02

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Accessories	
Backshell Installation	
Backshell Removal.....	
Backshells.....	
Dust Caps	
Introduction	

Record of Applicable Technical Directives

None

1. INTRODUCTION

2. This Work Package (WP) covers connector accessories used with MIL-C-85028 connectors, their function, and procurement information.

3. CONNECTOR ACCESSORIES.

4. Connector accessories are components added to a connector to enhance its operational characteristics.

5. **BACKSHELLS.** A backshell is an attachment on the back of an insert. It contains an integral mounted cable clamp at either a 90 degree or 45 degree angle and are designed for use with a recessed jackscrew. (Figure 1).

6. **BACKSHELL REMOVAL.** To remove the backshell perform the following procedures:

- a. Loosen cable clamp
- b. Unscrew four screws.
- c. Remove backshell

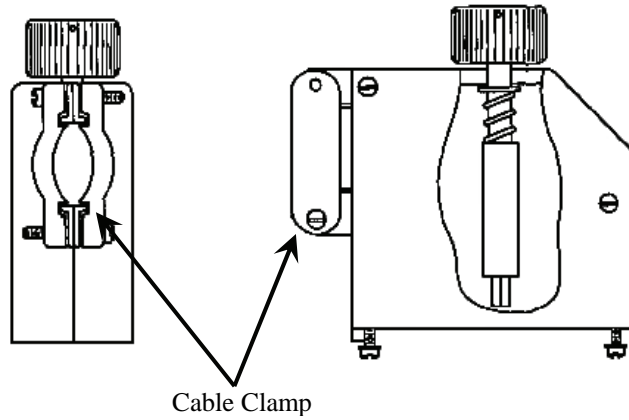
7. **BACKSHELL INSTALLATION.** Perform the following procedures to install backshell on connector:

- a. Position backshell on connector.
- b. Tighten four screws.
- c. Tighten cable clamp.

8. **DUST CAPS.** Protective covers are more commonly called dust caps. The purpose of dust caps is to prevent dirt from entering connectors, pins and sockets and to prevent damage to coupling device (Figure 2).

Material:	
Hood	Aluminum Alloy
Screw	Cres Steel
Lockwasher	Cres Steel
Finish:	
Hood	Cadmium Plate
Screw	Passivated
Lockwasher	Passivated

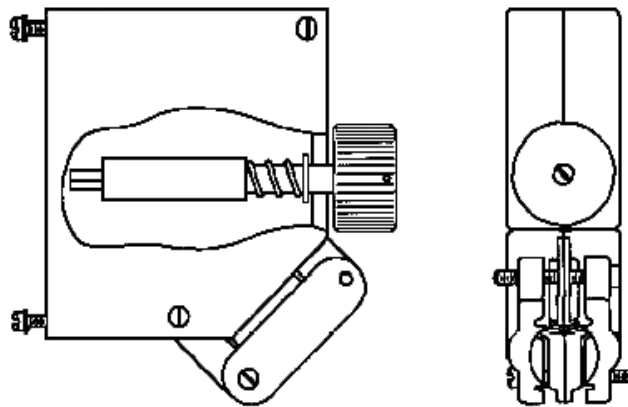
PART NUMBER	SHELL SIZE
MAC0052H900	52
MAC0080H900	80
MAC0104H900	104
MAC0158H900	158
MAC0212H900	212



90° Backshell

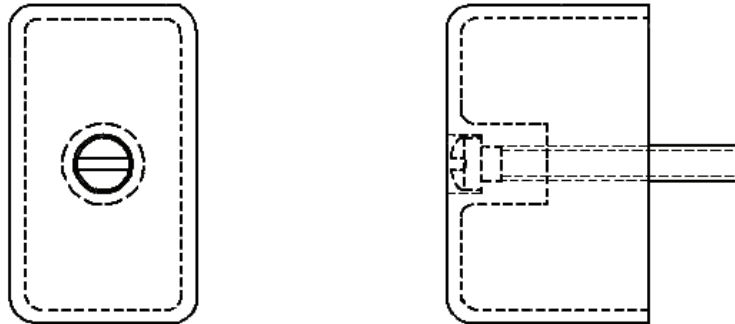
Material:	
Hood	Aluminum Alloy
Screw	Cres Steel
Lockwasher	Cres Steel
Finish:	
Hood	Cadmium Plate
Lockwasher	Passivated
Screw	Passivated

PART NUMBER	SHELL SIZE
MAC0052H450	52
MAC0080H450	80
MAC0104H450	104
MAC0158H450	158
MAC0212H450	212



45° Backshell

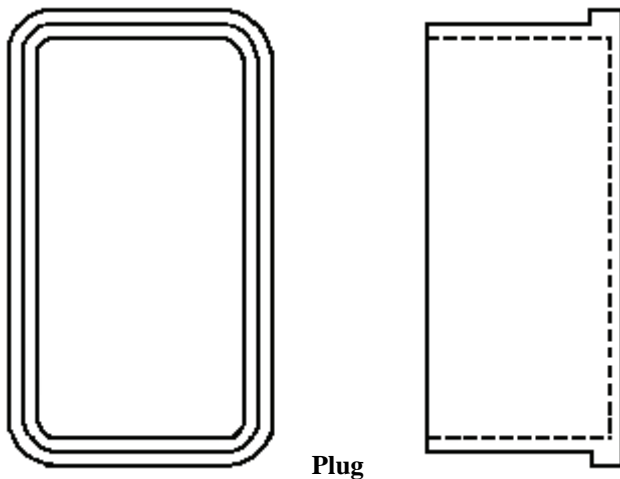
Figure 1. Backshell



Receptacles

Material:	
Dust Cover	Hi-Density Polyethylene (Commercial Grade, Color Green)
Fillister Head Screw	Stainless Steel
Finish:	
Fillister Head Screw	Passivated

Part Number	Shell Size
MAC0052H000	52
MAC0080H000	80
MAC0104H000	104
MAC0158H000	158
MAC0212H000	212



Plug

Part Number	Shell Size
MAC0052H010	52
MAC0080H010	80
MAC0104H010	104
MAC0158H010	158
MAC0212H010	212

Figure 2. Dust Caps

NAVAIR 01-1A-505-3

T.O. 00-25-255-2

TM1-1500-323-24-3

1 September 2007

013 00

Page 1/(2 Blank)

**ALPHABETICAL INDEX
INSTALLATION PRACTICES
CONNECTORS, MULTIPLE TERMINATION (MTC)**

TITLE

WP NUMBER

Connectors MTC	012 02
Introduction	012 01

**INTRODUCTION
INSTALLATION PRACTICES
CONNECTORS, MULTIPLE TERMINATION (MTC)**

1. PURPOSE AND SCOPE.

2. This Work Package (WP) covers connectors manufactured in accordance with Vendor Specifications for Multiple Termination Connectors. These connectors are also commonly referred to as wafer connectors. This WP includes: power, coaxial contacts and all associated tooling and accessories.

3. SPECIFICATION UPDATES (ASSIST SEARCH).

4. The most up to date government specifications and Qualified Products Lists (QPLs) can be obtained from the Quick Search section of the ASSIST website, the address is <http://assist.daps.mil/quicksearch>. Non-government standards can be obtained through a license with a document service such as Information Handling Services (IHS) or purchased individually from the Society of Automotive Engineers (SAE).

5. QUALIFIED PRODUCTS LIST (QPL).

6. The Qualified Products List (QPL) is a list of products which have met the qualification requirements stated in the applicable specification. These requirements include appropriate product identification and performance/testing parameters. The list contains the government part number and the manufacturer's part number. The name of the manufacturer, office and manufacturing plant address, CAGE (Commercial and Government Entity) code, assembly plant, or distributor as applicable, is also included in the back of the QPL. The component specification will identify the appropriate quality assurance provisions such as QPL, First Article testing, or user verified test results. NAVAIR Patuxent River (<http://www.navair.navy.mil/qpl/>) now has an operational website where the latest QPL revision can be accessed, along with all outstanding QPL change letters as they are written. This enables all users to have access to the latest procurement information without relying on the publication of a new QPL revision. When the QPL is revised, all outstanding QPL change letters are incorporated in the latest revision.

CONNECTORS

MULTIPLE TERMINATION (MTC)

Reference Material

Installation Practices, Aircraft Electric and Electronic Wiring	NAVAIR 01-1A-505-1
Connectors MTC	012 02
Introduction	012 01

Alphabetical Index

<u>Subject</u>	<u>Page No.</u>
Connector Buildup	17
Contact Insertion	17
Contact Crimping	17
Contact Removal	17
Broken Wire Contact Removal	18
Wired Contact Removal	17
Wire Stripping	17
Connector Buildup, Solder Contacts	19
MTC Wire Connection Procedures	19
MTC Wire Removal Procedures	19
Connector Cleaning and Preservation	24
Connector Coupling	24
Connector Removal and Installation	18
Introduction	2
Description	2
Multiple Terminal Connectors	2
Cable and Coaxial Contact Assembly	10
Coaxial Contacts	10
Contacts	10
Design and Construction	7
Interchangeability	7
Insert Configuration	10
Inserts	7
Contact Extraction	10
Contact Insertion	10
Contact Retainer Clip	10
Crimp Snap-in Contacts	10
Part Number	2
Basic Vendor MTC Designation	2
Housing Configuration	2
Mating Designation Number	2
Plating	7
Plug or Receptacle Designation	3
Shell Size	3
Polarization	2
Power Contacts	10
Tooling	10

Alphabetical Index (Continued)

<u>Subject</u>	<u>Page No.</u>
Coaxial Cable Stripping	10
Heating Procedures	11
Holding Fixture Setup	11
Inspection	12
Repair and Rework	12

Record of Applicable Technical Directives

None

Support Equipment Required

Part No./ Type Designation	Nomenclature
DMC-216	Tool Kit

Materials Required

Specification/Part No.	Nomenclature
TT-I-735 or equivalent	Alcohol, Isopropyl
H-B-643 (or equivalent)	Brush, Acid Swabbing
MIL-F-14256 (or equivalent)	Flux, Liquid
SnGOWRMAP3 (or equivalent)	Solder



This document includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. Consult applicable health and environmental regulations regarding its use, handling and disposition.

NOTE

Nickel plated parts are not for Navy use or new design.

1. INTRODUCTION.

2. This Work Package (WP) covers environment-resisting, rectangular, stacked and panel mounted connectors, manufactured in accordance with commercial MTC specifications (commonly referred to as wafer connector), having pin and socket crimp removable or solder, power, signal and coaxial contacts, for use with flat cable or round wire (Figure 1).

3. **DESCRIPTION.** MTC rectangular connectors using jack screws, or quick disconnect hardware can be stacked or panel-mounted next to each other without any provision for grip space, a feature that can save significant panel area. MTC connectors are available in 1-inch and 2-inch configurations. Modular removable inserts with size 22 and/or size 16 contact cavities can be combined into the 1-inch and 2-inch MTC housings.

4. MULTIPLE TERMINATION CONNECTORS.

5. **POLARIZATION.** Polarization is accomplished by the user inserting a key that aligns with the un-keyed mating connector.

6. **PART NUMBER.** The following paragraphs contain information necessary for proper selection and procurement of connector (Figure 2).

7. Basic Vendor MTC Designation. The basic vendor MTC designation is denoted by MTC100.

8. Mating Designation Number. Mating designation number denotes the mating style.

9. Housing Configuration. The housing configuration is standard or Electro Magnetic Interference (EMI).

10. Shell Size. The shell size is indicated by letter number one or two which is the shell width in inches.

11. Plug or Receptacle Designation. The plug or receptacle designation is indicated by a letter (P = Plug, R = Receptacle flangeless, F = Receptacle flanged).

12. Plating. The connector plating is designated by a number, 2 for nickel (not for Navy or new design use), or 3 for Cadmium over Nickel plating.

13. **DESIGN AND CONSTRUCTION**. Connectors and accessories are designed and constructed to

withstand normal handling incidental to installation and maintenance.

14. **INTERCHANGEABILITY**. All connectors having the same part number are completely interchangeable with each other with respect to installation and performance.

15. **INSERTS**. MTC inserts are available in 20-cavity and 5-cavity versions. The 20-cavity insert accepts size 20-22 crimp contacts (24 AWG to 20 AWG wire). The 5-cavity insert accepts size 16-14 crimp contacts. Insertion/extraction of the contacts is rear release. See Figure 3.

Electrical Connector Cable/Panel Mounting MTC-100

To Define A Connector Select A Shell And Two Wafers

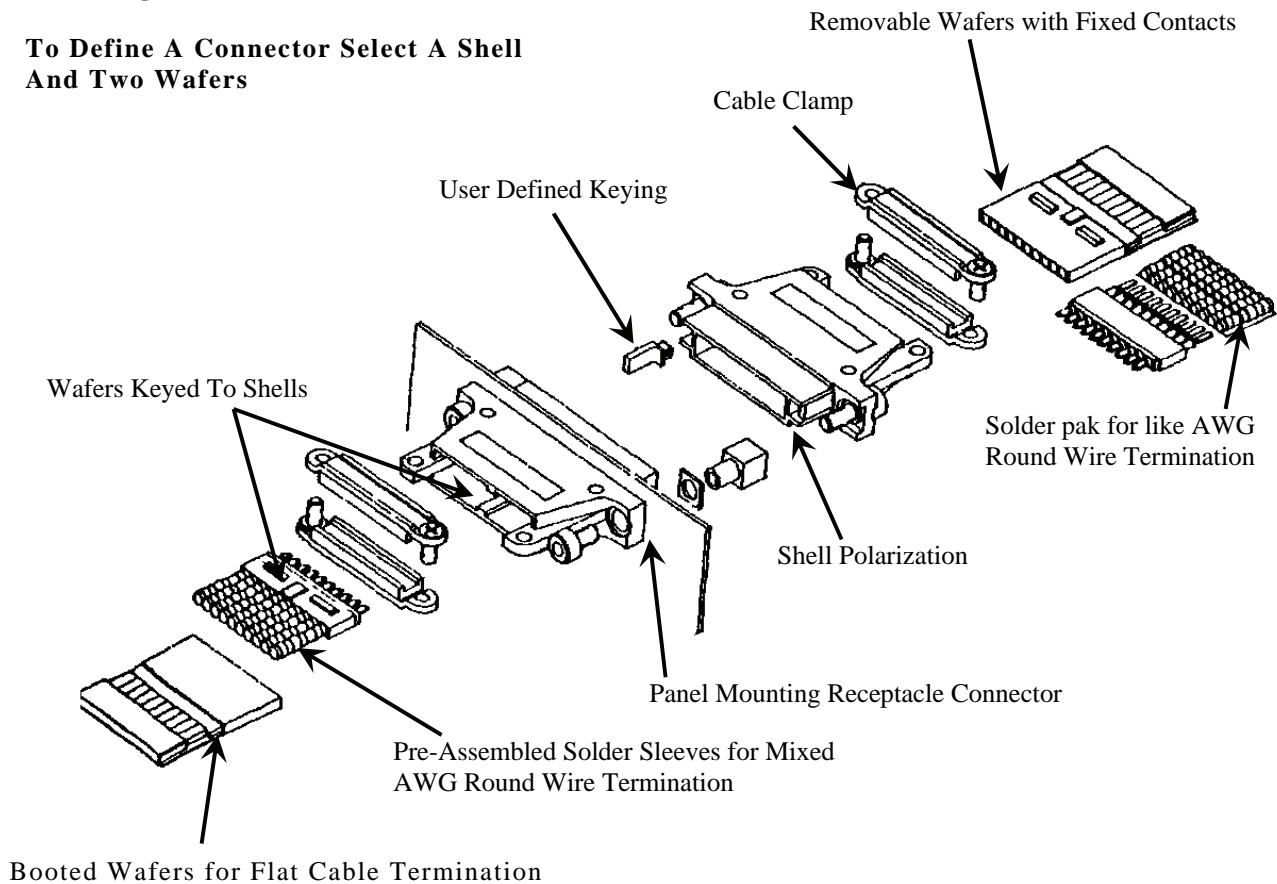


Figure 1. MTC Breakdown

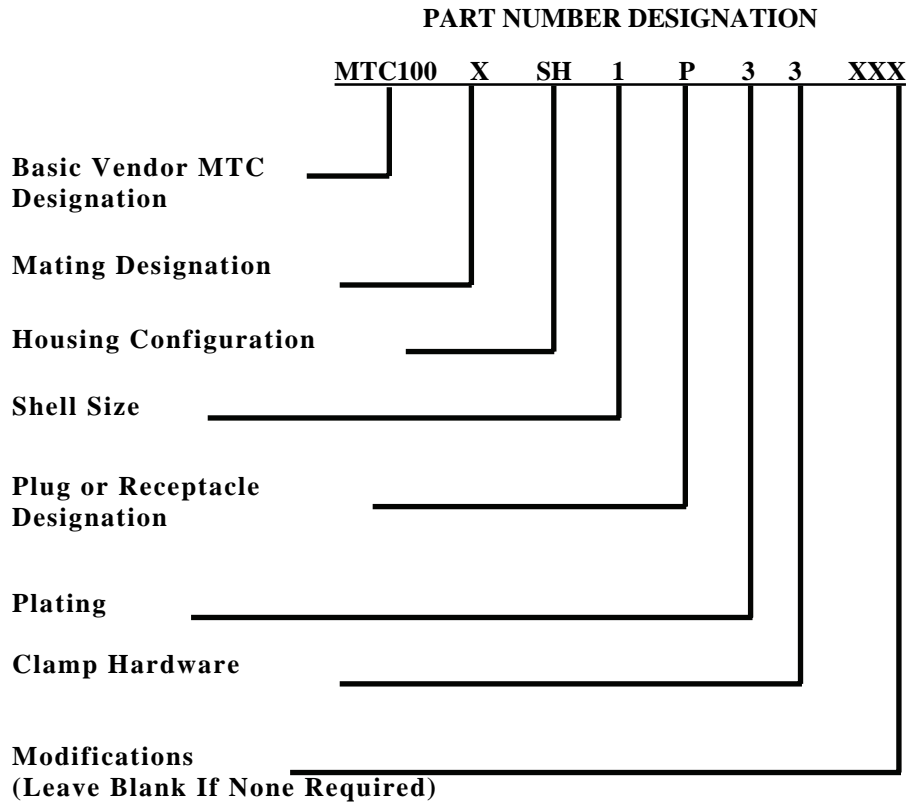


Figure 2. MTC Part Number Breakdown Sheet 1 of 3

Mating Designation

Q	Quick-Disconnect Mating Hardware
Blank	Jackscrew Mating Hardware

Housing Configuration

Jh	Standard Housing
Sh	Emi Housing
Yh	Special Type (Refer To Individual Specification Control Drawing For Description)

Shell Size

1	1 Inch Shell
2	2 Inch Shell

Plug Or Receptacle Designation

P	Plug
R	Receptacle Flangeless
F	Receptacle Flanged ("J Type" Has Non-Conductive Fluorosilicone Gasket; "S Type" Has Conductive Fluorosilicone Gasket.)

Figure 2. MTC Part Number Breakdown Sheet 2

Plating

1	Black Anodized
2	Nickel Plating (Not For Use By Navy Or On New Design)
3	Cadmium Over Nickel Plating

Clamp Hardware

1	Without Cable Clamp And Without Ears
2	With Cable Clamp And Ears On Shell
3	Without Cable Clamp And With Ears

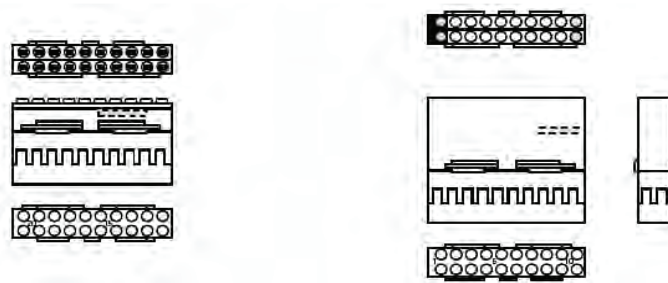
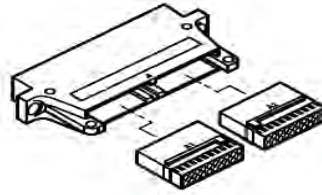
Modifications

001	Same As Standard Assy With Ears Except Without Clamps
007	Same As Standard Assy Except Metal Parts Are Plated Cadmium Over Nickel, Supplied With Mtc50 Mounting / Mating Hardware
014	Same As Standard Assy Except Additional Triangular Keying Pins Included
020	Same As Standard Assy Except Supplied With Mtc50 Mounting/Mating Hardware
028	Same As Standard Assy Except Supplied Without Hardware

Figure 2. MTC Part Number Breakdown sheet 3

Table 1. Coaxial cable types accommodated

Coaxial Contact	Coaxial Cable Type	Contact Cavity Size
D-602-0140 And D-602-0171	M17/093-Rg178 *	16
	M17-094-Rg179	
	M17/113-Rg316	
	5026a1x*X	
	5026d1x*X	
	5028a1x*X	
	5030a1x*X	
	7528a1x*X	
7530a1x*X		



20 Cavity Insert

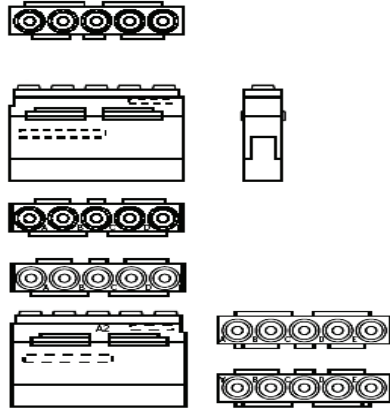
1 Inch Shell	
Insert Part Number	Contact Part Number
MTCP122-20P (Pin Contact)	CTA-0166
MTCP122-20S (Socket Contact)	CTA-0165
2 Inch Shell	
Insert Part Number	Contact Part Number
MTCP122-20P1 (Pin Contact)	CTA-0166
MTCP122-20P2 (Pin Contact)	CTA-0166
MTCP122-20S1 (Socket Contact)	CTA-0165
MTCP122-20S2 (Socket Contact)	CTA-0165

Note: Strip Dimension 0.195 – 0.215 Inches

Insertion and Extraction Tools

Pin Contact CTA-0166		Socket Contact CTA-0165	
Positioner	CE-1605900	Positioner	CE-1606000
Installation Process	ES-61413	Installation Process	ES-61413
Contact Removal	CTA-1160	Contact Removal	CTA-1160
Insert Extraction	CTA-0161	Insert Extraction	CTA-0161

Figure 3. MTC Inserts sheet 1 of 2



5 Cavity Insert

1 Inch Shell	
Insert Part Number	Contact Part Number
MTCP116-05P1 (Pin Contact)	CTA-0079 (Power) D-602-0140 (Coaxial)
MTCP116-05S1 (Socket Contact)	CTA-0078 (Power) D-602-0171 (Coaxial)
2 Inch Shell	
Insert Part Number	Contact Part Number
MTCP116-05P1 (Pin Contact)	Same As 1 Inch
MTCP116-05P2 (Pin Contact)	Same As 1 Inch
MTCP116-05S1 (Socket Contact)	Same As 1 Inch
MTCP116-05S2 (Socket Contact)	Same As 1 Inch

Note: Strip Dimension 0.215 – 0.250 Inches

Insert and Extraction Tools

Power Pin Contact CTA-0079		Power Socket Contact CTA-0078	
Positioner	M22520/1-04	Positioner	
Crimp	M22520/1-01	Installation Process	
Contact Removal	M81969/8-02 Or 14-01	Contact Removal	
Insert Extraction	M81969/8-01 Or 14-01	Insert Extraction	
Coaxial Pin Contact D-602-0140 (AS39029/76)		Coaxial Socket Contact D-602-0171 (AS39029/78)	
Basic Holding Fixture	ADL319 Or AD1567	Basic Holding Fixture	AD1319 Or AD1567
Adapter	AD1319-78 Or -27	Adapter	AD1319-27
Repair Holding Fixture	AD1565	Repair Holding Fixture	AD1572
Contact Removal	M81969/8-07 Or /14-03	Contact Removal	M81969/8-07 Or /14-03
Insert Extraction	M81969/8-08 Or /14-03	Insert Extraction	M81969/8-08 Or /14-03

Figure 3. MTC Inserts Sheet 2

16. Crimp Snap-in Contacts. Snap-in contacts can be crimped with kit crimp tool M22520/1-01 (Figure 3).

17. Contact Insertion. Insertion is accomplished from rear of connector. When contact is fully inserted, the clip tines snap securely behind contact shoulders.

18. Contact Extraction. Extraction is accomplished with use of a removal tool (Figure 3).

19. Contact Retainer Clip. The contact retaining clip is completely encased in a tough plastic wafer to protect the clip from damage.

20. **INSERT CONFIGURATION**. The insert configuration is the manner in which the contacts are placed within the connector insert (Figure 3).

21. **CONTACTS**. The contacts used in MTC-type connectors are crimp, rear-removable power contacts with pull-thru insertion design.

22. **POWER CONTACTS**. Power contacts are used to connect single conductor wire through connectors. The power contacts are size 16 and are crimp rear-release design. Contacts are listed by size. Socket and pin contact part numbers are listed in Figure 3.

23. **COAXIAL CONTACTS**. When routing coaxial cable through connectors, coaxial contacts are superior to other coaxial cable shield termination methods. The shield integrity is maintained across the contact body. The coaxial cable groups listed (Table 1) can be interconnected through MTC contact cavities. Socket and pin contact part numbers are listed in Figure 3.

WARNING

Coaxial contacts are a copper alloy and may contain up to 2% Beryllium.

Do not remove outer plating and use caution when handling broken contacts.

24. **CABLE AND COAXIAL CONTACT ASSEMBLY**. To assemble coaxial contacts to applicable cable identify cable by part number. Select proper tooling by contact part number (Figure 3). Select strip method (Figure 4). Remove wafer per paragraph 26 and Figure 5. Assemble contacts shown

(Figure 6), using holding fixture (Figure 7). AS39029/76 and AS39029/78 coaxial contacts may be substituted for vendor contacts covered in this work package, refer to NAVAIR 01-1A-505-2, WP 003 02 for contact build up.

25. **TOOLING**. The procedure for attaching power contacts to a single conductor wire are the same for this connector series. Select proper tooling (Figure 3) and refer to NAVAIR 01-1A-505-1, WP 013 00 for correct assembly and crimp procedures.

26. Remove wafer from connector using wafer removal tool (Figure 5).

27. Coaxial Cable Stripping.

a. Determine the proper cable stripping method (conventional or braid fold-back), based on the diameter of the cable over the braid (Figure 4). Strip in accordance with NAVAIR 01-1A-505-1, WP 009.

b. Prepare the coaxial cable to the dimensions shown in the applicable example in figure 8. For RG-178B/U cable slip D-600-0018 dielectric barrier between the shield braid and the cable dielectric.

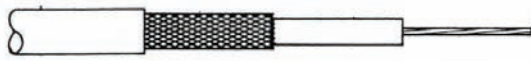
c. Straighten the center conductor and make sure that stranded center conductor is twisted into its original lay.

d. Pre-tin stranded center conductor and unplated solid center conductor

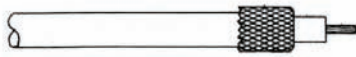
e. Make sure that the shield braid is trimmed evenly and that no loose strands are extending out across the exposed dielectric or cable jacket.

f. Smooth the braid ends flat against the dielectric or cable jacket.

g. If the center-conductor strip length is 0.215 inch as shown in examples B and D of Figure 6, fold the center conductor back on it self as shown in Figure 9.



Conventional Stripping Method



Braid Fold-Back Stripping Method

Figure 4 Coaxial Cable Stripping Methods

28. Holding Fixture Setup

- a. Install the appropriate adapter (Figure 3) onto the AD-1319 holding fixture.
- b. Insert a contact in the adapter and set up as shown in figure 7. Ensure that the contact is inserted in the appropriate end of the adapter: D-602-0141 and D-602-0171 outer socket contacts in the "S" end. If using a hot-air heating tool, the spacer collar is not needed, but may be left in place.

29. Heating Procedures.

- a. Insert the contact/cable assembly into the appropriate end of the adapter (Figure 7) or repair holding fixture (Figure 7).
- b. D-602-0141 or D-602-0171 outer socket contacts in the "S" end.
- c. Clamp the cable in the AD-1319 (or AD-1567) holding fixture.

NOTE

The cable must remain fully inserted in the contact.

The contact must be fully inserted in the adapter.

The cable must be straight between the contact and the cable clamp.

- d. Attach the appropriate reflector and other applicable accessories to the heating tool.

NOTE

For the AA-400 Super Heater use the: No. 979663 Mini-Solder Sleeve reflector (required) and AA-400-140 magnifier bracket assembly (optional).

For the CV-5300 MiniGun use the MG-1 reflector 4.

- e. Turn the heating tool on and allow to warm up. (See instructions for tool used.)



The heating tools have hot nozzle surfaces and produce hot air that can cause burns. To prevent burns, do not touch the nozzle and keep hands and fingers away from the hot air stream.

- f. Heat the contact as follows:

- 1). Using the holding fixture, position the contact in the heating tool reflector as shown in Figure 10, with the forward inspection window centered in the reflector
- 2). Continue heating until the small solder preform in the forward inspection window has melted and flowed. The large solder preform in the rear inspection window should have melted and flowed by this time; if it has not, direct hot air at the rear inspection window until it does.

NOTE

If contact is UNDERHEATED, there will be visible remnants of the original shapes of the solder performs. An under heated contact must be reheated.

If contact is OVERHEATED, solder will wick away from the joint areas, leaving no solder fillets. An overheated contact must be removed and a new contact installed.

- g. After the contact has cooled for at least 10 seconds, remove the contact and cable from the holding fixture.

h. Inspect the completed termination according to the following paragraph.

30. Inspection. If contacts are under heated, over-heated, or improperly assembled, they must be reworked.

a. Inspect for Proper Assembly.

1). Inspect the completed termination for correct assembly according to the following criteria:

2). The cable shield must extend into the contact at least as far as the front edge of the rear inspection windows.

3). The center conductor must be visible through one of the forward inspection windows.

b. Inspection for Proper Heating.

1). Inspect the completed termination for proper heating according to the following criteria:

2). The solder preform in the forward inspection windows must be melted and flowed so that:

a) None of the original preform shape remains. Any remaining preform shape indicates underheating.

b) Solder fillet is visible between the center conductor and the inner contact soldering surface, Insufficient visible solder indicates overheating.

3). The solder preform in the rear inspection window must be melted and flowed so that:

a) None of the original preform shape remains. Any remaining preform shape indicates underheating. The original position of the solder preform may be visible in the form of a contrasting band.

b) Solder fillet is visible between cable braid and contact body. Insufficient visible solder indicates overheating.

4). The insulating sleeve must be fully shrunk onto the cable braid and jacket at the rear of the contact.

5). The insulating sleeve must not be darkened so as to obscure the solder joints or hinder inspection. If the solder joints cannot be seen due to darkening of the sleeve material, the termination is overheated.

6). The coaxial cable insulation must not show signs of damage or overheating outside of the insulating sleeve.

31. Repair and Rework

a. Under heated Terminations. Reheat under heated areas as directed in paragraph 29 and re-inspect per paragraph 30. Avoid reheating areas that have been properly heated.

b. Over heated or Improperly Assembled Terminations.

1). Remove the contact from the cable as directed in below.

2). Check the cable for damage and incorrect stripping. If the cable is damaged, cut off the damaged portion and re-strip cable end as described in paragraph 27.

3). If stripping is incorrect, re-strip as required paragraph 27.

4). Install new contact (Paragraph 28 thru 30).

c. Removing Contact from Coaxial Cable.

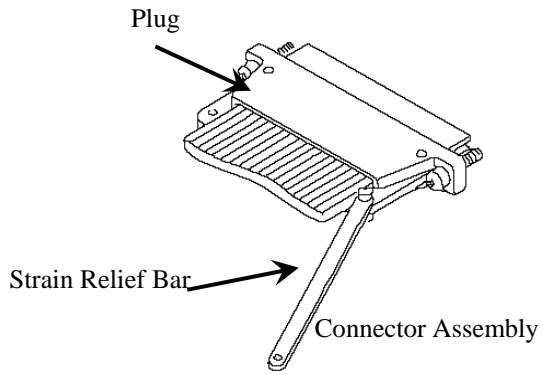
1). Use a sharp knife or razor blade to score the outer insulating sleeve full length on two opposite sides of the contact. Avoid cutting into cable jacket.

2). Peel off the outer insulating sleeve.

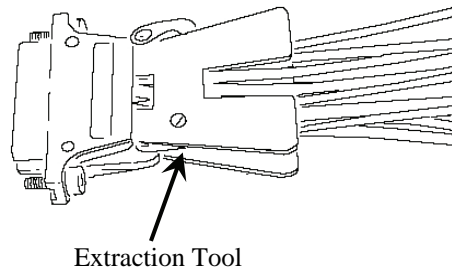
WARNING

Safety glasses must be worn during the following operation. Hot solder can fly off the wires and cause burns to unprotected eyes.

3). Holding the contact with pliers, heat the contact until the solder melts, and quickly pulls the heated contact off the cable.



A



B

Figure 5. MTC Wire Removal Procedures (Sheet 1 of 2)

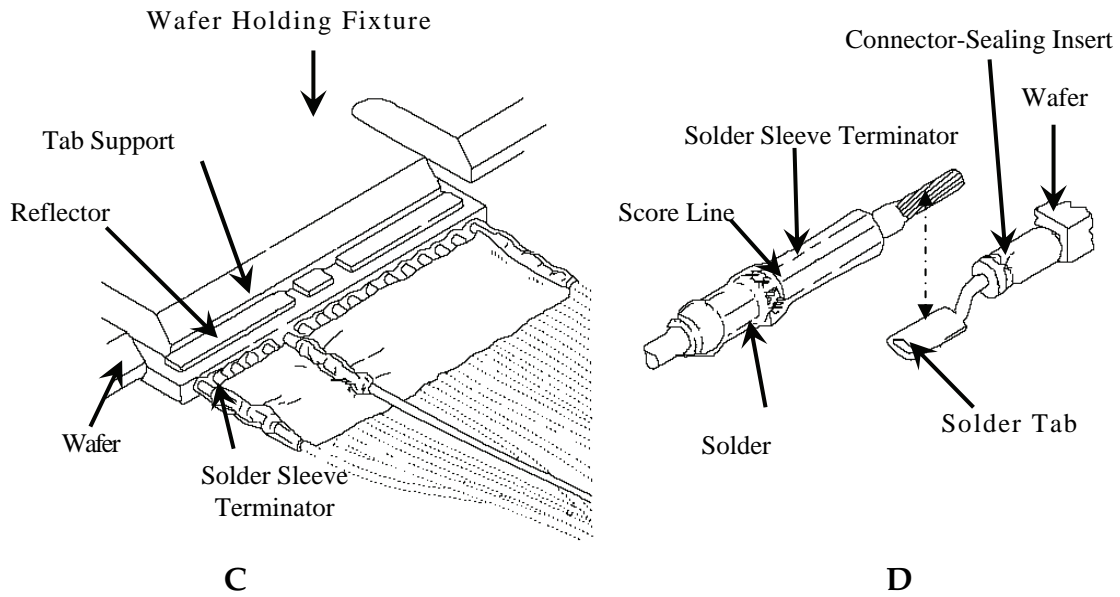


Figure 5. MTC Wire Removal Procedures (Sheet 2)

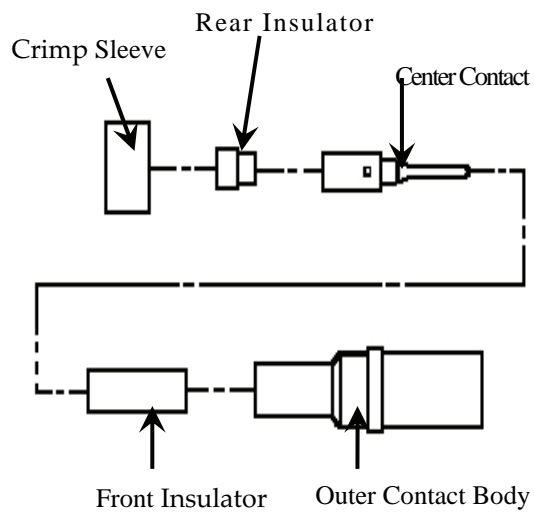


Figure 6. Coaxial contact breakdown

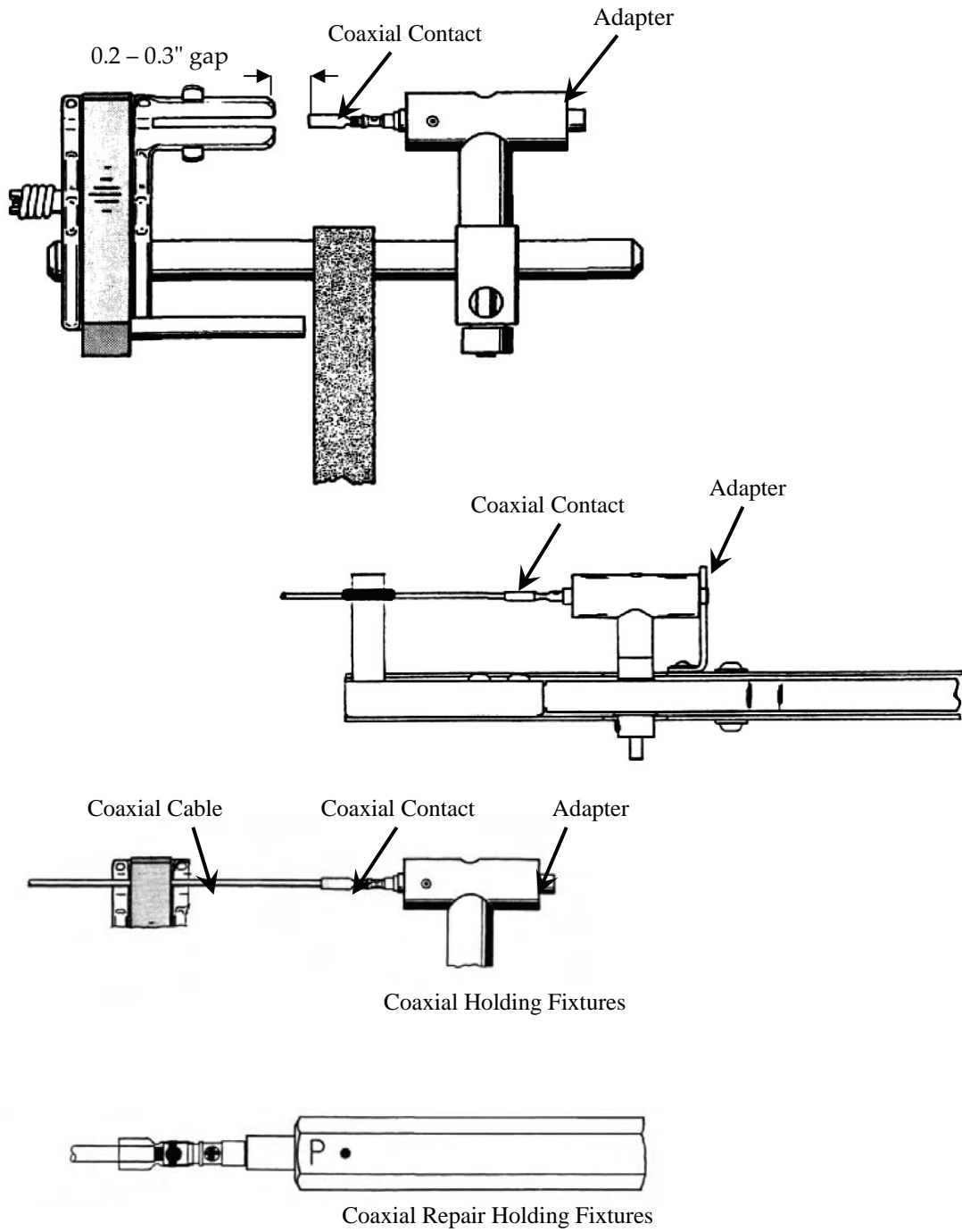


Figure 7. MTC Coaxial Contact Holding Fixtures

Coaxial Cable Stripping Method	Coaxial Cable Center Conductor Size	Stripping Example Below
Standard	AWG 30 and larger	A
	AWG 32 and smaller	B
Braid fold-back	AWG 30 and larger	C
	AWG 32 and smaller	D

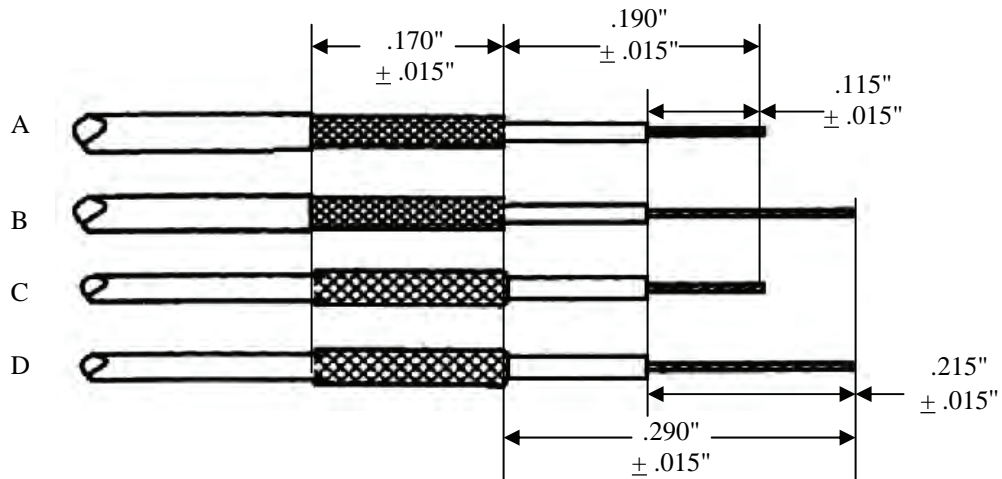


Figure 8. Coaxial Cable Stripping Method Selection

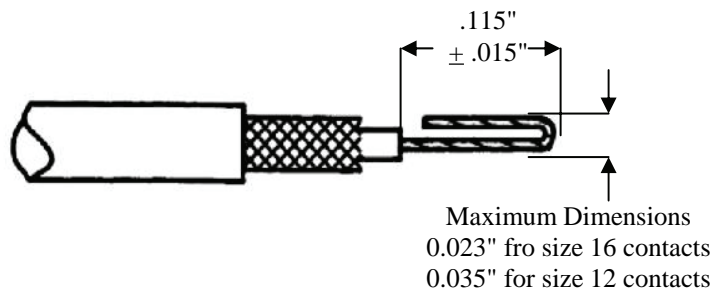


Figure 9. Small Diameter Center Conductor Fold-Back

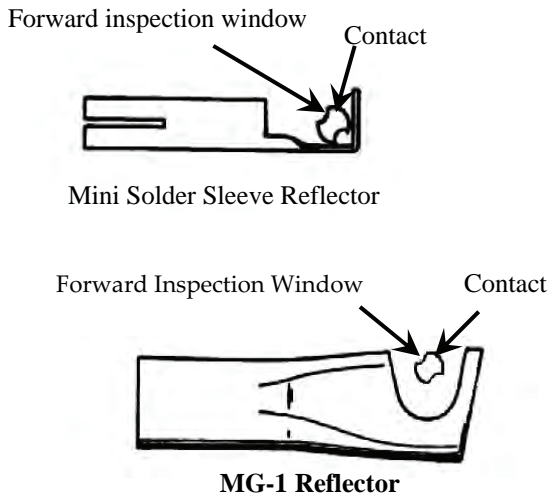


Figure 10. Contact Position in Heat Gun Reflector

32. **CONNECTOR BUILDUP.**

33. **WIRE STRIPPING.** Strip wire in accordance with following procedure:

a. Cut wire to proper length. Ensure enough wire remains for adequate strain relief without leaving excess slack.

b. Strip insulation from end (NAVAIR 01-1A-505-1, WP 009 00). Select contact (Figure 3).

34. **CONTACT CRIMPING.** Crimp contact in accordance with following procedure:

a. Select correct crimp tool (Figure 3).

b. Perform die closure check, install positioner, and set selector knob for gage of wire.

c. Insert stripped wire into contact conductor barrel. Ensure all wire strands are inside contact conductor barrel and visible in contact inspection hole.

d. If insulation gap is too large, trim conductor as required. If insulation gap is too small, trim insulation as required.

e. Crimp contact to wire.

35. **CONTACT INSERTION.** Insert wired or unwired contacts in accordance with following procedure:

a. Ensure wire or cable on contact is routed through connector backshell.

b. Select correct insertion tool (Figure 3).

c. Place wire and contact assembly into insertion tool. Ensure tool tip is over conductor barrel and butted against contact shoulder.

d. Insert tip of contact into cavity. Start contact insertion near connector center cavities and work outward.

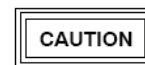
e. Axially align contact with contact cavity.

f. With firm, even pressure, press tool against contact shoulder and seat contact into cavity. A slight click may be heard as retention tines snap into place behind contact shoulder.

g. Pull tool straight out of contact cavity. Remove tool from wire. Pull back lightly on wire to ensure contact is properly seated.

36. **CONTACT REMOVAL.** Remove wired, unwired, and broken wire contacts in accordance with following procedures:

37. **Wired Contact Removal.**



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

a. Select correct removal tool (Figure 3).

b. Place wire of contact to be removed into removal tool.

c. Slide removal tool along wire at a right angle to connector insert face and align with contact cavity.

d. Insert tool into contact cavity until tool tip bottoms against contact shoulder. A slight increase in resistance will be noticed just before the tool tip bottoms. This will spread the retention clip and release its hold on the contact.

e. Press wire firmly against serrated edge of removal tool and pull wire straight out from contact cavity.

38. Broken Wire Contact Removal.



Caution should be exercised in the use of tooling. Inspect tips of metal tools for distortion of the probe before use, as damage to the wire sealing grommet of the connector can occur.

a. Select correct removal tool (Figure 3).

b. Insert tip of removal tool about 1/8 inch into cavity at rear of connector.



Wire strands may be encountered at any point up to 5/16 inch of tool insertion. It is important not to jam any strands of wire up to this point.

Withdraw removal tool anytime during insertion when it cannot be advanced into connector using these procedures.

Inspect tool tip for nicks, cracks, mushrooming, and other damage that will prevent functioning. Replace removal tool and repeat procedure, if required.

c. Gently insert removal tool into cavity in about 1/16 inch units, releasing tool after each unit if resistance is felt.

NOTE

Rotating removal tool works splayed wire strands into slot of tool, allowing tool to pass.

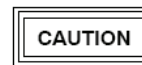
Removal tool may be blocked at rear of contact by plastic insert or additional strands of broken wire.

d. If resistance is felt before removal tool reaches back end of contact, withdraw tool slightly, rotate about 1/6 of a turn, and reinsert tool. Repeat rotating and insertion procedure until tool passes with minimum additional force to 5/16 inch depth back end of contact.

e. Wiggle removal tool gently to help it into insert bore and over back of contact. Additional rotation may be required if broken strands are encountered.

f. Continue insertion of removal tool until positive stop is felt at about 1/2 inch depth.

g. Exert axial pressure on engaging end of contact, using appropriate pin or socket as pusher. If contact does not move, seat removal tool more firmly.



When removing broken wire contacts ensure wire sealing grommet is not damaged. A new connector must be installed (Paragraph 39) if a broken wire contact cannot be removed.

h. Push contact completely out of rear of connector before disengaging removal tool.

39. **CONNECTOR REMOVAL AND**

INSTALLATION. If the connector is severely damaged or cannot be repaired using the above procedures, proceed as follows:

a. Starting from outside of damaged connector, tag wires and remove all contacts from connector (Paragraph 36). If contact cannot be removed, cut wire as close to connector as possible and attach new contact (Paragraphs 33 and 34).

b. Starting from center of new connector, insert contact into correct cavity (Paragraph 35). Remove tag from wire. Repeat procedure until all contacts are installed in new connector.

40. CONNECTOR BUILDUP, SOLDER CONTACTS.

41. MTC Wire Removal Procedures.

WARNING

Before disconnecting plugs from receptacles, insure that all related circuits, including battery power, are de-energized and applicable circuit breakers are open to prevent severe shock or death to personnel.

CAUTION

To remove or install MTC, alternately turn screws a little at both sides to release connector evenly and prevent damage to connectors, wires, and cables.

Insure that pins are straight before inserting a plug into a receptacle; forcing the plug to engage at even a minimum angle could result in damage to pins.

To prevent damage from the effects of normal aircraft vibration, all cable supports removed during repair shall be reinstalled.

Connectors normally will be torqued to 6-10 inch-pounds. Do not force or over-torque connectors. Damage could result to pins or connectors. To remove wire from MTC, follow these procedures.

- a. After removing strain relief bar, insert wafer extraction tool into rear of connector and gently pull the wiring harness to release the wafer from the shell (Figure 5, details A and B).
- b. Clamp the appropriate wafer holding fixture in a convenient position and insert wafer into holding fixture, detail C.
- c. Score the solder sleeve terminator on the wire to be removed lengthwise. Do not completely cut through the sleeve, detail D.

- d. Construct a reflector shield from aluminum tape or foil and position behind the tab to be repaired and in front of all other tabs as shown in detail C.

WARNING

Extreme care shall be exercised when using a heat producing device. Failure to observe this warning may cause injury to personnel and damage to equipment.

- e. Using an approved hot air heater (NAVAIR 01-1A-505-1, WP 012 00), direct hot air at the solder joint only. When the solder melts, pull the wire straight off with tweezers, detail D.

- f. Heat the solder tab. Use tweezers to remove any remaining sleeve material.

42. MTC Wire Connection Procedures. To connect wire to MTC, follow these procedures.

CAUTION

To prevent electrostatic discharge damage to sensitive electronic components when working on installed harnesses, the static grounding bus shall be used whenever any solder sleeve terminators are installed, either on the wafer or anywhere on the wires.

To remove or install MTC, alternately turn screws a little at both sides to release connector evenly and prevent damage to connectors, wires, and cables.

Insure that pins are straight before inserting a plug into a receptacle; forcing the plug to engage at even a minimum angle could result in damage to pins.

To prevent damage from the effects of normal aircraft vibration, all wiring harness supports removed during repair shall be reinstalled.

Connectors normally will be torqued to 6-10 inch-pounds. Do not force or over-torque connectors. Damage could result to pins or connector.

- a. Clamp appropriate wafer into wafer retainer (Figure 11, detail A or B).
- b. Strip wire to be terminated as shown in detail C.
- c. Install a connector sealing insert as shown in detail D. When terminating shielded cable, first install shield termination sleeve and then install conductor termination sleeve, detail G.
- d. Slide a solder sleeve termination over wire to be connected with the preinstalled seal ring located away from the wafer, detail D.
- e. Position the stripped wire end as shown and slide solder sleeve termination to contact wafer body, detail D.
- f. Construct a reflector shield from aluminum tape or foil and position behind the tab being connected and in front of all other tabs, detail E.

- g. Using an approved heater, direct hot air at the solder until it melts and flows, detail D.
- h. When installing clamp or restraining bar, apply thread-locking compound, MIL-S-46163A, grade J, to captive screws prior to installation.

NOTE

Allow solder to cool before disturbing.

- i. Shielded wire shields are soldered to the shield bus bar, detail G.
- j. Remove reflector shield and verify the following conditions as shown in detail F. Also, see Table 2 and Table 3 for corrective action.
- k. Insert wafer in rear of MTC shell, observing proper keying, detail J.

Table 2. Correction of Unacceptable Solder Conditions

UNACCEPTABLE CONDITION	CORRECTIVE ACTION
NOTE Isolate terminal with foil before reheating.	
End of wire not in cupped area of the wafer terminal	Reheat and pull wire strands into the cupped area
Conductor end or strands can be seen along the side of the terminal from the backside of the wafer	Reheat and pull wire strands into the cupped area of the terminal
Conductor not overlapping the terminal at least 0.080 inch	Reheat and push wire farther onto terminal
Conductor overlapping terminal beyond the cupped area	Reheat and pull wire back into the cupped area
Sealing inserts not melted or sleeving not shrunk	Reheat until inserts melted and sleeving fully shrunk
Sleeving overlapping insulation less than 0.040 inch	Reheat and push wire farther into sleeving unless this would cause the wire strands to extend past the cupped area of the terminal. Otherwise, remove the sleeving, re-strip the wire, and re-solder with a new solder sleeve
Sleeving farther from wafer body than 0.040 inch	Remove sleeve and re-solder with a new solder sleeve
Solder ring discernible	Reheat
Solder fillet not discernible	Replace the solder sleeve
Sleeving too brown to see joint	Replace the solder sleeve
Wire strands penetrating or protruding into the sleeving	Replace the solder sleeve. Smooth or re-strip wire before re-soldering

Table 2. Correction of Unacceptable Solder Conditions (Continued)

UNACCEPTABLE CONDITION	CORRECTIVE ACTION
Insulation overlapping area of the terminal	Reheat and pull wire back until the insulation is clear of the cupped area. Insulation can be against the terminal but not on it
Insulation gap exceeds 0.45 inch	Reheat and adjust wire toward the terminal until the insulation gap is acceptable

Table 3. Corrective Actions for Unacceptable Shield Bus Bar Terminations

UNACCEPTABLE CONDITION	CORRECTIVE ACTION
Shield not overlapping bus tab at least 0.20 inch	Reheat and reposition shield
Solder ring still discernible or fillet not formed between shield and bus tab	Reheat until preform flows, loses ring shape, and wets the shield and tab
Sleeve so dark that joint is not discernible	Replace solder sleeve
Fillet not discernible between shield and tab due to wicking	Replace solder sleeve
Shield braiding puncturing or protruding into sleeve	Remove sleeve; smooth braiding. Re-solder with new sleeve
Sleeve or insulation burned or damaged	Remove sleeve, replace wire as necessary, and re-solder with new sleeve

43. **CONNECTOR COUPLING.** Mating connectors must be correctly aligned and securely attached.

engage at even a minimum angle may result in damage to the pins.

44. Alignment.

WARNING

Before coupling connectors, insure that all related circuits, including battery power, are de-energized and applicable circuit breakers are open to prevent severe shock or death to personnel.

CAUTION

Insure that pins are straight before inserting a plug into a receptacle; forcing the plug to

a. Alignment consists of matching the key and keyway (remove dust covers to see key and/ or keyways). Before positioning the mating connectors together, check key and keyway alignment (Figure 11, detail J) and ensure their correct positioning.

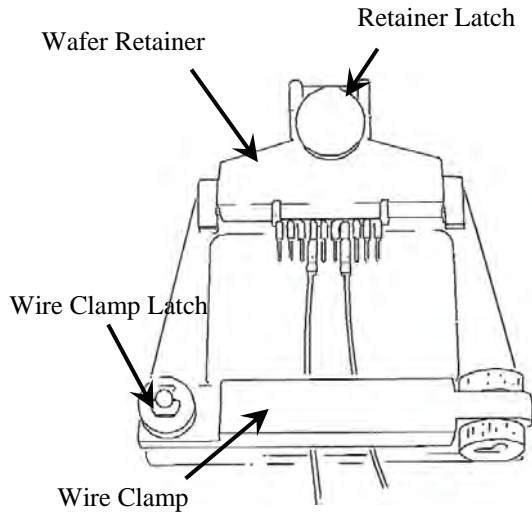
b. On a wafer connector, the A-wafer pins go into a wafer sockets. Also, the keys must mate. On wafer connectors, the keys are plastic inserts which can be keyed (Figure 11, detail J) when installing new connectors.

c. Wafer connectors mate by pushing the correctly aligned plug into the receptacle. The matched joint is secured with screws and nuts on the sides of the connectors. Spacers may be added or

removed as needed to be compatible with panel thickness and attain a snug fit at the attachment points. Wafer connections are sometimes grouped together and attached with screws that go through a stack of connector housings as shown in Figure 11, detail H.

45. CONNECTOR CLEANING AND PRESERVATION.

46. For connector cleaning and corrosion control procedures refer to NAVAIR 01-1A-505-1, WP 026 00



A

B

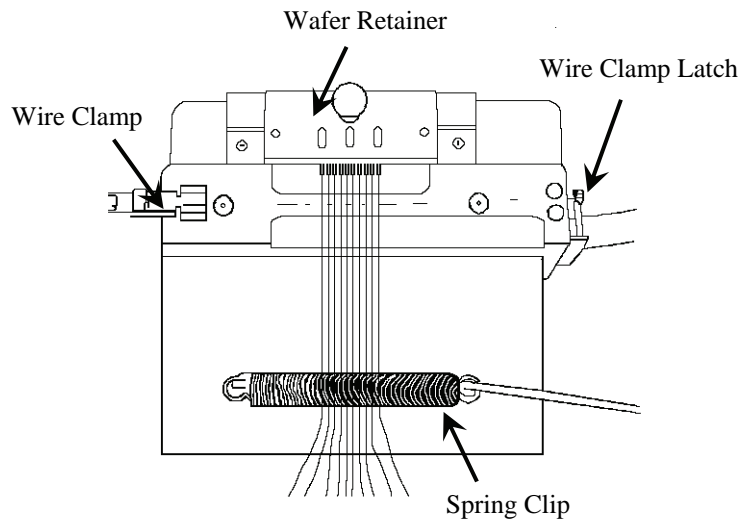
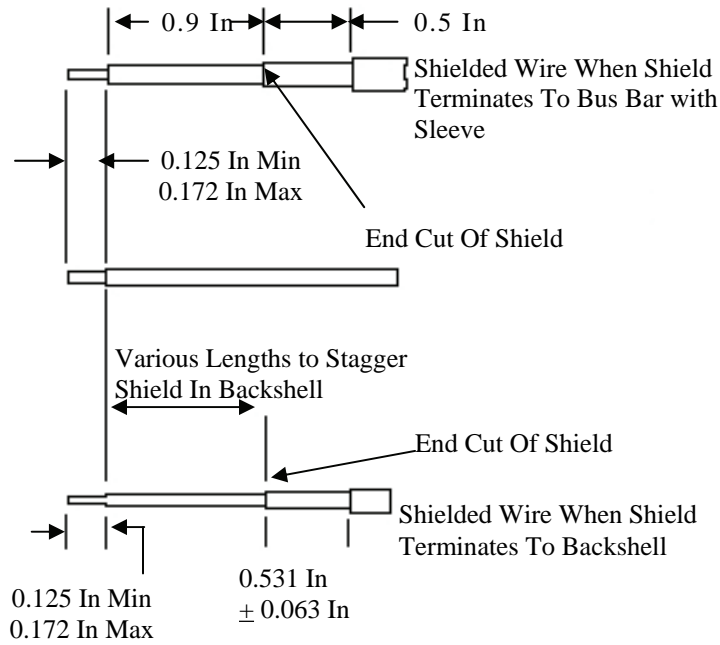


Figure 11. MTC Wire Connection Procedures (Sheet 1 of 4)



C

D

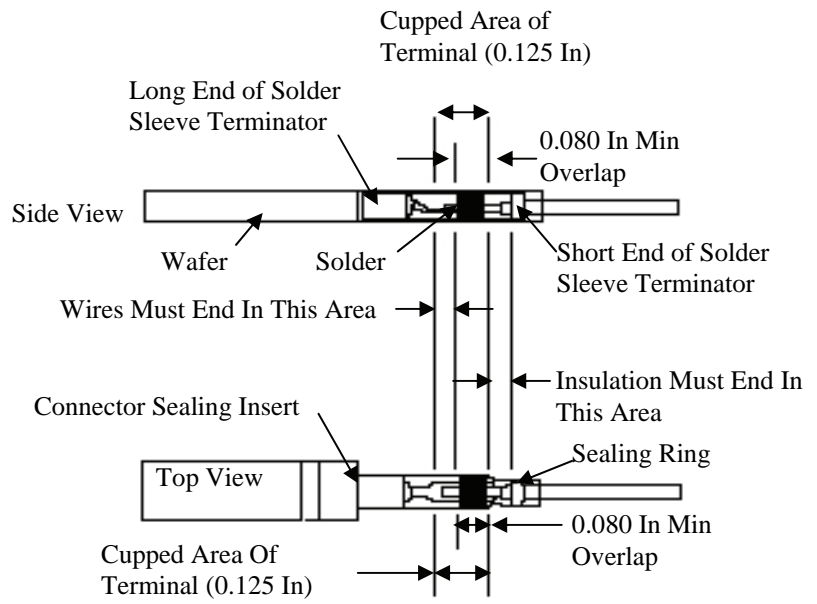
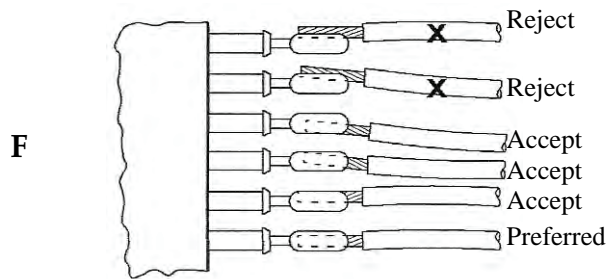
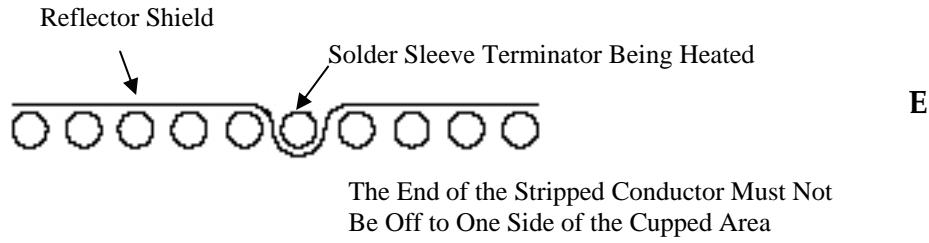


Figure 11. MTC Wire Connection Procedures (Sheet 2)



Bottom View

Note:
 Sleeves Left off This View to Show
 Alignment of Wires More Clearly

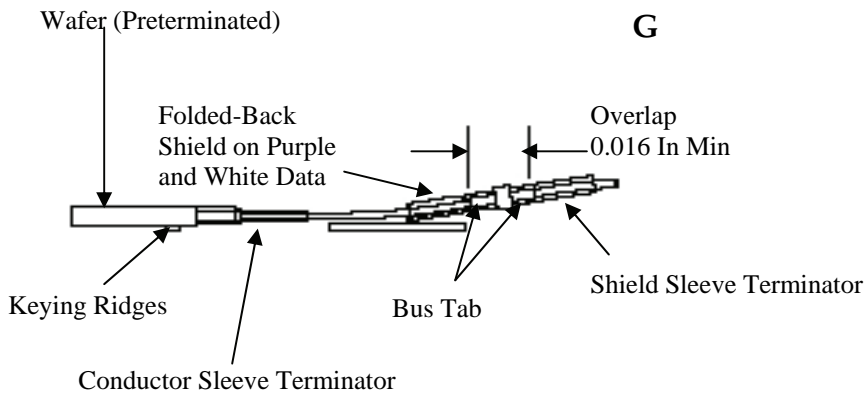
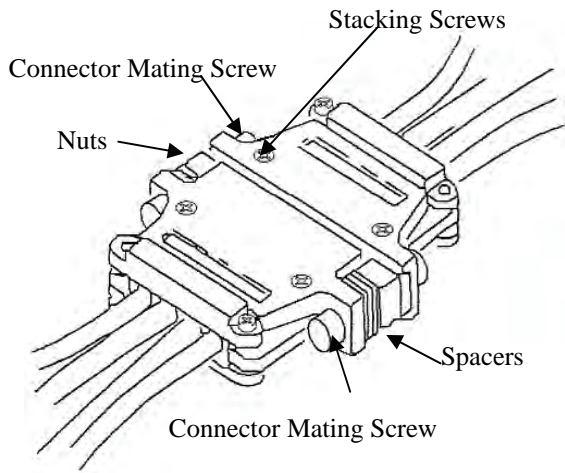
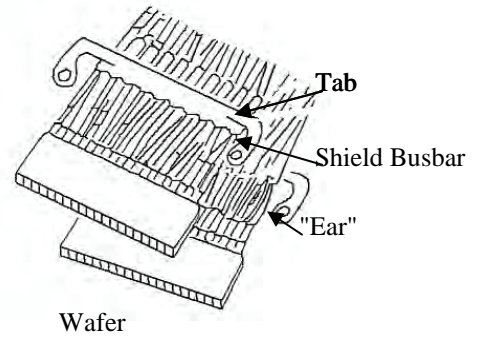


Figure 11. MTC Wire Connection Procedures (Sheet 3)



H



I

J

Dash No.	Vender Keying	Plug Key Position (Plug Polarization)	Receptacle Key Position (Receptacle Polarization)
51	AA		
52	AB		
53	AC		
54	AD		
55	BA		
56	BB		
57	BC		
58	BD		
59	CA		
510	CB		
511	CC		
512	CD		
513	DA		
514	DB		
515	DC		
516	DD		

Figure 11. MTC Wire Connection Procedures (Sheet 4)

COMPONENT PART NUMBER INDEX

Part Number	Nomenclature	Obsolescence (If applicable) See Note:	Work Package	Section
015-5009-000 ()	Edgeboard Mounting Bracket		011	03
015-9100-000 ()	Mounting Screw Bracket		011	03
015-9516-002 ()	Bracket, Mounting, Connector, D Microminiature		011	03
015-9516-003 ()	Bracket, Mounting, Connector, D Microminiature		011	03
015-9528-000 ()	Bracket, Mounting, Connector, D Microminiature		011	03
025-0749-000 ()	Cap, Dust, Plastic		009	03
025-0762-000 ()	Cap, Dust, Plastic		009	03
096-0001-000 ()	Mounting Key and Clip		011	03
201-9100-000 ()	Panel Mounting Key		011	03
20745-10 ()	Junction Shell, 90°		007	03
			009	03
20745-11 ()	Junction Shell, 90°		007	03
			009	03
20745-21 ()	Junction Shell, Straight		007	03
			009	03
20745-22 ()	Junction Shell, 90°		007	03
			009	03
20745-23 ()	Junction Shell, 90°		007	03
			009	03
20745-8 ()	Junction Shell, Straight		007	03
			009	03
22017/1 ()	Junction Shell, 90°, Diecast		007	03
			009	03
22017/-2 ()	Junction Shell, Straight , Diecast		007	03
			009	03
294-9100-000 ()	Coupling Retention Clip		011	03
305-0007-000 ()	Jackscrew Assembly		008	03
30-8026-9601 ()	Strain Relief Clamp		004	03
320-9505-000 ()	Kit, Jackpost		011	03
320-9511-000 ()	Jackpost/Jackscrew Assembly		011	03
335-0002-000 ()	Coupling Nut Assembly		008	03
DPKA-59 ()	Cap, Dust, Plastic		008	03
DPKA-59A ()	Cap, Dust, Metal		008	03

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) <i>See Note:</i>	Work Package	Section
DPKA-60 ()	Cap, Dust, Plastic		008	03
DPKA-60A ()	Cap, Dust, Metal		008	03
DPKB-59 ()	Cap, Dust, Plastic		008	03
DPKB-59A ()	Cap, Dust, Metal		008	03
DPKB-60 ()	Cap, Dust, Plastic		008	03
DPKB-60A ()	Cap, Dust, Metal		008	03
M21617 ()	Connector, Plug and Receptacle, Electrical, Rectangular, Polarized Shell, Miniature Type		009	02
M24308/1 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/2 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/23 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/24 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/25 ()	Screwlock Assembly		003	03
M24308/25 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/26 ()	Screwlock Assembly		003	03
M24308/26 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/27 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/28 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/3 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/4 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/5 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) See Note:	Work Package	Section
M24308/6 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/7 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/8 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M24308/9 ()	Connector, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		003	02
M28713/6 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel	NONE		
M28731/1 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel	M28731/29		
M28731/10 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/11 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/12 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/13 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/14 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/15 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/16 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/17 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/18 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) See Note:	Work Package	Section
M28731/19 ()	Shield		004	03
M28731/2 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel	M28731/30		
M28731/27 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel	NONE		
M28731/28 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel	NONE		
M28731/29 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/3 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/30 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/31 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/32 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/33 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/34 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/38 ()	Shield		004	03
M28731/4 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28731/5 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel	NONE		
M28731/9 ()	Connectors, Electric, Rectangular, Non-Environmental, Miniature, Polarized Shell, Rack and Panel		004	02
M28748/1 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) <i>See Note:</i>	Work Package	Section
M28748/10 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/13 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/14 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/15 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/16 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/18 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/19 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/2 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/20 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/21 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/3 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/4 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/5 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/6 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/7 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) See Note:	Work Package	Section
M28748/8 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28748/9 ()	Connectors, Electrical, Rectangular, Rack and Panel, Solder Type and Crimp Type Contacts		005	02
M28804/1 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/10 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/11 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/2 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/3 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/4 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/5 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/6 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/7 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/8 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M28804/9 ()	Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew		006	02
M81659/1 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/10 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/11 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/12 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/2 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/21 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/22 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/23 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) <i>See Note:</i>	Work Package	Section
M81659/24 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/25 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/26 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/27 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/28 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/29 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/3 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/30 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2	M81659/65	007	02
M81659/31 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/32 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2	M81659/66	007	02
M81659/33 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/34 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2	M81659/67	007	02
M81659/35 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/36 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2	M81659/68	007	02
M81659/37 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/38 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2	M81659/69	007	02
M81659/39 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/4 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/40 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2	M81659/70	007	02
M81659/41 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/42 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2	M81659/71	007	02
M81659/43 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) See Note:	Work Package	Section
M81659/44 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2	M81659/72	007	02
M81659/5 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/6 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/61 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/62 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/63 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/64 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/65 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/66 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/67 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/68 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/69 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/7 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/70 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/71 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/72 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 2		007	02
M81659/8 ()	Connectors, Electrical, Rectangular, Crimp Contact, Series 1	NONE	007	02
M81659/9	Connectors, Electrical, Rectangular, Crimp Contact, Series 1		007	02
M83513/1 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Nonremovable Solder Pin Contacts		011	02
M83513/10 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Narrow Profile, 9-37 Nonremovable 90° PCB Contacts		011	02
M83513/11 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Narrow Profile, 51 Nonremovable 90° PCB Contacts		011	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) <i>See Note:</i>	Work Package	Section
M83513/12 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Narrow Profile, 100 Nonremovable 90° PCB Contacts		011	02
M83513/13 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Narrow Profile, 9-37 Nonremovable 90° PCB Contacts		011	02
M83513/14 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Narrow Profile, 51 Nonremovable 90° PCB Contacts		011	02
M83513/15 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Narrow Profile, 100 Nonremovable 90° PCB Contacts		011	02
M83513/16 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Standard Profile, 9-37 Nonremovable 90° PCB Contacts		011	02
M83513/17 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Standard Profile, 51 Nonremovable 90° PCB Contacts		011	02
M83513/18 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Standard Profile, 100 Nonremovable 90° PCB Contacts		011	02
M83513/19	Connector, D Microminiature, Class M, Metal Shell Receptacle, Standard Profile, 9-37 Nonremovable 90° PCB Contacts		011	02
M83513/2 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Nonremovable Solder Socket Contacts		011	02
M83513/20 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Standard Profile, 51 Nonremovable 90° PCB Contacts		011	02
M83513/21 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Standard Profile, 100 Nonremovable 90° PCB Contacts		011	02
M83513/22 ()	Connector, D Microminiature, Class M, Metal Shell Plug, 9-37 Nonremovable Straight PCB Contacts		011	02
M83513/23 ()	Connector, D Microminiature, Class M, Metal Shell Plug, 51 Nonremovable Straight PCB Contacts		011	02
M83513/24 ()	Connector, D Microminiature, Class M, Metal Shell Plug, 100 Nonremovable Straight PCB Contacts		011	02
M83513/25 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, 9-37 Nonremovable Straight PCB Contacts		011	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) <i>See Note:</i>	Work Package	Section
M83513/26 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, 51 Nonremovable Straight PCB Contacts		011	02
M83513/27 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, 100 Nonremovable Straight PCB Contacts		011	02
M83513/28 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Standard Profile, 9-37 Nonremovable Straight PCB Contacts		011	02
M83513/29 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Standard Profile, 51 Nonremovable Straight PCB Contacts		011	02
M83513/3 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Nonremovable Crimp Pin Contacts		011	02
M83513/30 ()	Connector, D Microminiature, Class M, Metal Shell Plug, Standard Profile, 100 Nonremovable Straight PCB Contacts		011	02
M83513/31 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Standard Profile, 9-37 Nonremovable Straight PCB Contacts		011	02
M83513/32 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Standard Profile, 51 Nonremovable Straight PCB Contacts		011	02
M83513/33 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Standard Profile, 100 Nonremovable Straight PCB Contacts		011	02
M83513/4 ()	Connector, D Microminiature, Class M, Metal Shell Receptacle, Nonremovable Crimp Socket Contacts		011	02
M83513/5 ()	Jackscrew Assembly		011	03
M83513/5 ()	Mounting Hardware, Connector, D Microminiature		011	02
M83513/6 ()	Connector, D Microminiature, Class P, All Plastic Plug, Nonremovable Solder Pin Contacts		011	02
M83513/7 ()	Connector, D Microminiature, Class P, All Plastic Receptacle, Nonremovable Solder Socket Contacts		011	02
M83513/8 ()	Connector, D Microminiature, Class P, All Plastic Plug, Nonremovable Crimp Pin Contacts		011	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) See Note:	Work Package	Section
M83733/1 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/10 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/11 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/12 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/17 ()	Spring Mount Assembly		008	03
M83733/2 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/3 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/4 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/5 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/6 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/7 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/8 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M83733/9 ()	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environment Resistant		008	02
M85028/1 ()	Connector, Electrical, Rectangular, Individual Contact Sealing, Polarized, Center Jackscrew		012	02
M85028/2 ()	Connector, Electrical, Rectangular, Individual Contact Sealing, Polarized, Center Jackscrew		012	02
M85028/5-1 ()	Seal, Wire, Red		012	02

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) See Note:	Work Package	Section
M85028/5-2 ()	Seal, Wire, Lavender		012	02
M85028/5-3 ()	Seal, Wire, Brown		012	02
M85049/48 ()	Straight Shield		003	03
M85049/49 ()	Right Angle Shield with Clamp		003	03
M85049/50 ()	Right Angle Shield with Clamp		003	03
MAC0052H000 ()	Cap, Dust, Receptacle		012	03
MAC0052H010 ()	Cap, Dust, Plug		012	03
MAC0052H450 ()	Backshell 45°		012	03
MAC0052H900 ()	Backshell 90°		012	03
MAC0080H000 ()	Cap, Dust, Receptacle		012	03
MAC0080H010 ()	Cap, Dust, Plug		012	03
MAC0080H450 ()	Backshell 45°		012	03
MAC0080H900 ()	Backshell 90°		012	03
MAC0104H000 ()	Cap, Dust, Receptacle		012	03
MAC0104H010 ()	Cap, Dust, Plug		012	03
MAC0104H450 ()	Backshell 45°		012	03
MAC0104H900 ()	Backshell 90°		012	03
MAC0158H000 ()	Cap, Dust, Receptacle		012	03
MAC0158H010 ()	Cap, Dust, Plug		012	03
MAC0158H450 ()	Backshell 45°		012	03
MAC0158H900 ()	Backshell 90°		012	03
MAC0212H000 ()	Cap, Dust, Receptacle		012	03
MAC0212H010 ()	Cap, Dust, Plug		012	03
MAC0212H450 ()	Backshell 45°		012	03
MAC0212H900 ()	Backshell 45°		012	03
MS24285 ()	Connector, Electrical, Miniature, Rack and Panel, Environment Resistant, 200°C Ambient Temperature		010	02
MS24286 ()	Connector, Electrical, Miniature, Rack and Panel, Environment Resistant, 200°C Ambient Temperature		010	02
MS24695-1 ()	Spring Mount Assembly		010	03
MS24695-2 ()	Spring Mount Assembly		010	03
MS24695-3 ()	Spring Mount Assembly		010	03
MS24700-1 ()	Bushing, Self-locking, Aluminum		008	03
MS24700-2 ()	Bushing, Self-locking, Stainless Steel		008	03

COMPONENT PART NUMBER INDEX (Continued)

Part Number	Nomenclature	Obsolescence (If applicable) See Note:	Work Package	Section
MS27488-12 ()	Sealing Plug, Yellow		007	03
			008	03
			010	03
MS27488-16 ()	Sealing Plug, Blue		007	03
			008	03
			010	03
MS27488-20 ()	Sealing Plug, Red		007	03
			008	03
			010	03
MS27488-22 ()	Sealing Plug, Black		007	03
			008	03
			010	03
MS39056 ()	Bushing		006	03
MTC100 ()	Connector, Multiple Termination (MTC)		013	02
RAC0038H00 ()	Backshell, Non-environmental		006	03
RAC0038H005 ()	Backshell, Environmental		006	03
RAC0088H00 ()	Backshell, Non-environmental		006	03
RAC0088H005 ()	Backshell, Environmental		006	03
RAC0108H00 ()	Backshell, Non-environmental		006	03
RAC0108H005 ()	Backshell, Environmental		006	03
RAC0132H00 ()	Backshell, Non-environmental		006	03
RAC0132H005 ()	Backshell, Environmental		006	03
RAC0244H00 ()	Backshell, Non-environmental		006	03
RAC0244H005 ()	Backshell, Environmental		006	03

Note: If part number shown it is obsolete. If None is shown then the part number to the left is obsolete and has no replacement available.

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:



JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0803201

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 311333,
requirements for TM 1-1500-323-24-3.

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@wherever.army.mil

To: 2028@redstone.army.mil

Subject: DA Form 2028

1 **From: Joe Smith**
2 *Unit: home*
3 **Address: 4300 Park**
4 **City:** Hometown
5 **St: MO**
6 **Zip: 77777**
7 **Date Sent:** 19--OCT--93
8 **Pub no:** 55--2840--229--23
9 **Pub Title: TM**
10 **Publication Date:** 04--JUL--85
11 *Change Number: 7*
12 *Submitter Rank:* MSG
13 **Submitter FName:** Joe
14 *Submitter MName:* T
15 **Submitter LName:** Smith
16 **Submitter Phone:** 123--123--1234
17 **Problem: 1**
18 *Page: 2*
19 *Paragraph: 3*
20 *Line: 4*
21 *NSN: 5*
22 *Reference: 6*
23 *Figure: 7*
24 *Table: 8*
25 *Item: 9*
26 *Total: 123*

27 **Text:**

This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE 8/30/02
TO: (Forward to proponent of publication or form)(Include ZIP Code) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM--MMC--MA--NP Redstone Arsenal, AL 35898						FROM: (Activity and location)(Include ZIP Code) MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	
PART 1 - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER TM 9-1005-433-24						DATE 16 Sep 2002	TITLE Organizational, Direct Support, And General Support Maintenance Manual for Machine Gun, .50 Caliber M3P and M3P Machine Gun Electrical Test Set Used On Avenger Air Defense Weapon System
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON	
1	WP0005 PG 3		2			Test or Corrective Action column should identify a different WP number.	
EXAMPLE							
* Reference to line numbers within the paragraph or subparagraph.							
TYPED NAME, GRADE OR TITLE MSG, Jane Q. Doe, SFC						TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION 788-1234	SIGNATURE

TO: (Forward direct to addressee listed in publication) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	FROM: (Activity and location) (Include ZIP Code) MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	DATE 8/30/02
---	---	------------------------

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER			DATE	TITLE				
PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION
<div style="font-size: 100px; opacity: 0.5; transform: rotate(-30deg); pointer-events: none;"> EXAMPLE </div>								

PART III - REMARKS (Any general remarks or recommendations or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)

EXAMPLE

TYPED NAME, GRADE OR TITLE MSG, Jane Q. Doe, SFC	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION 788-1234	SIGNATURE
--	--	-----------

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25--30; the proponent agency is ODISC4.						Use PartII(reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE
TO: (Forward to proponent of publication or form)(Include ZIP Code) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898						FROM: (Activity and location)(Include ZIP Code)	
PART 1 --ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER						DATE	TITLE
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON	
* Reference to line numbers within the paragraph or subparagraph.							
TYPED NAME, GRADE OR TITLE						TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE

TO: <i>(Forward direct to addressee listed in publication)</i> Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	FROM: <i>(Activity and location) (Include ZIP Code)</i>	DATE
---	--	-------------

PART II --REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER			DATE	TITLE				
PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III --REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
----------------------------	--	-----------

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigram = .035 ounce
 1 decagram = 10 grams = .35 ounce
 1 hectogram = 10 decagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. Ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. Inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. Inches
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius °C temperature
----	------------------------	----------------------------	------------------------

PIN: 084659-000

This fine document...

Was brought to you by me:



[Liberated Manuals -- free army and government manuals](#)

Why do I do it? I am tired of sleazy CD-ROM sellers, who take publicly available information, slap “watermarks” and other junk on it, and sell it. Those masters of search engine manipulation make sure that their sites that sell free information, come up first in search engines. They did not create it... They did not even scan it... Why should they get your money? Why are not letting you give those free manuals to your friends?

I am setting this document FREE. This document was made by the US Government and is NOT protected by Copyright. Feel free to share, republish, sell and so on.

I am not asking you for donations, fees or handouts. If you can, please provide a link to liberatedmanuals.com, so that free manuals come up first in search engines:

<A HREF=<http://www.liberatedmanuals.com/>>Free Military and Government Manuals

- Sincerely
Igor Chudov
<http://igor.chudov.com/>
- [Chicago Machinery Movers](#)