

**NOTE**



All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  [ $\pm .005$ ] and angles have a tolerance of  $\pm 2^\circ$ . Figures and illustrations are for identification only and are not drawn to scale.

**1. INTRODUCTION**

This specification covers the requirements for the application of HD-20 Precision Formed Contacts. These contacts are available in three snap-in types: crimp, posted, and solder cup. The crimp snap-in contacts are available with or without an insulation support barrel for strain relief. The contacts accept a wire size range of 28 through 18 AWG and may be terminated to either stranded or solid wire.

After termination, these contacts are inserted into the cavities in the BACK of the connector housing and snap into place. Assembled connectors containing these contacts are available and designed to meet requirements of Military Specification MIL-C-24308.

When corresponding with TE Connectivity Personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

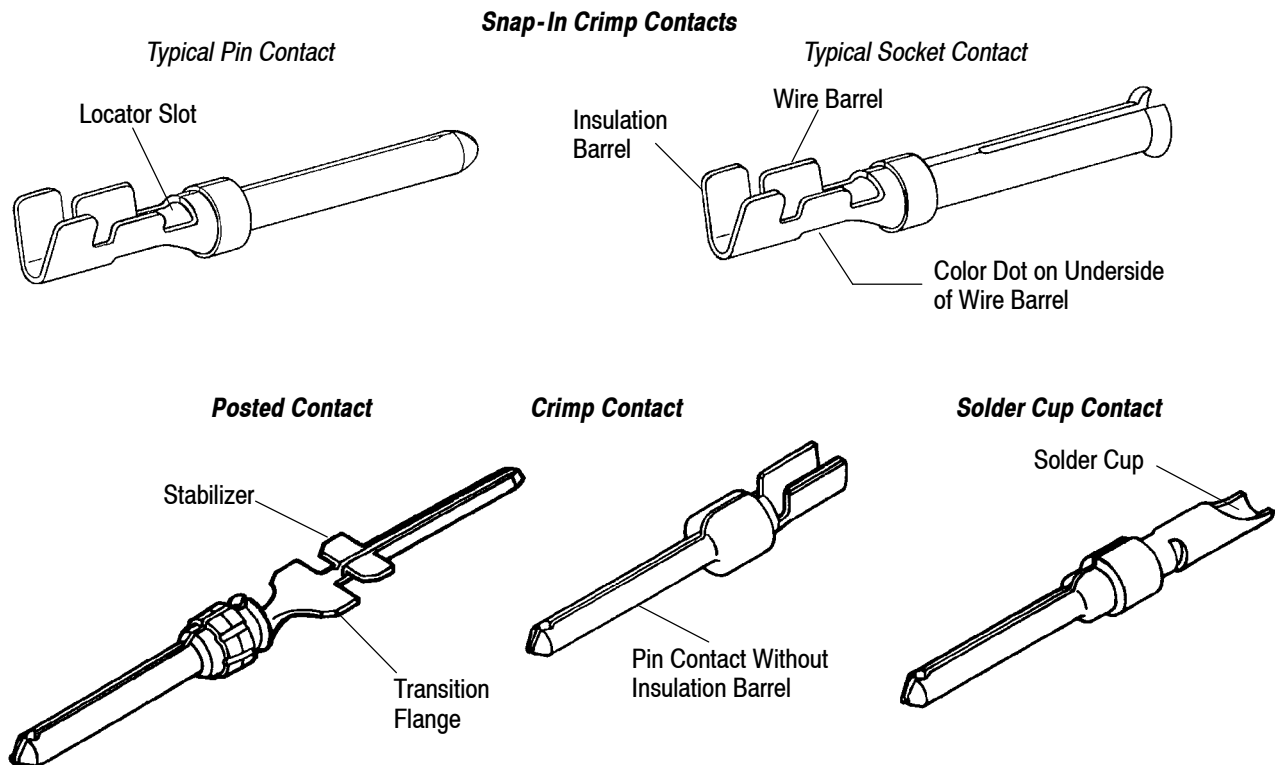


Figure 1

**2. REFERENCE MATERIAL**

**2.1. Revision Summary**

Revisions to this application specification include:

- Updated document to corporate requirements
- Corrected tensile strength for 18 AWG in table in Figure 3

## 2.2. Customer Assistance

Reference Product Base Part Number 66504 and Product Code 5899 are representative numbers of HD-20 Precision Formed Contacts. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a TE Representative or, after purchase, by calling Product Information at the number at the bottom of page 1.

## 2.3. Drawings

Customer Drawings for each product part number are available from the service network. The information contained in Customer Drawings takes priority if there is a conflict with this specification or with any technical documentation supplied by TE.

## 2.4. Manuals

Manual 402-40 is available from the service network. This manual provides information on various flux types and characteristics along with the commercial designation and flux removal procedures. A checklist is included in the manual as a guide for information on soldering problems.

## 2.5. Instructional Material

The following list includes available instruction sheets (408-series) that provide assembly procedures for product, operation, maintenance and repair of tooling, as well as setup and operation procedures of applicators; and customer manuals (409-series) that provides setup, operation, and maintenance of machines.

<u>Document Number</u>	<u>Document Title</u>
408-3295	Preparing Reel of Contacts for Application Tooling
408-7424	Checking Terminal Crimp Height Gaging Die Closure
408-7799	AMPLIMITE* Solder Pot Contacts (66569-3 and 66570-3)
408-8040	HD Quick-Change Applicators (Side-Feed Type) with Mechanical Feed System
408-8547	CERTI-CRIMP* II Straight Action Hand Tools
408-9404	Insertion/Extraction Tool 91285-1 and Replacement Tip Kits 543382-[ ]
408-9816	Handling of Reeled Products
409-5128	Basic AMP-O-LECTRIC* Model "K" Terminating Machine 565435-5
409-5842	AMP-O-LECTRIC Model "G" Terminating Machine 354500-[ ]
409-5852	AMPOMATOR* CLS Model III-G Lead-Making Machine 122500-[ ]
409-10012	AMP-O-MATIC* Side-Feed Stripper-Crimper III Machine No. 1320895-[ ]

## 3. REQUIREMENTS

### 3.1. Storage

#### A. Reeled Contacts

When using reeled contacts, store coil wound reels horizontally and traverse wound reels vertically.

#### B. Shelf Life

The contacts should remain in the shipping containers until ready for use to prevent deformation to the contacts and/or damage to the housings. The products should be used on a first in, first out basis to avoid storage contamination that could adversely affect signal transmissions.

#### C. Chemical Exposure

Do not store contacts near any chemicals listed below, as they may cause stress corrosion cracking in the components.

Alkalies	Ammonia	Citrates	Phosphates	Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur	Nitrites	Tartrates

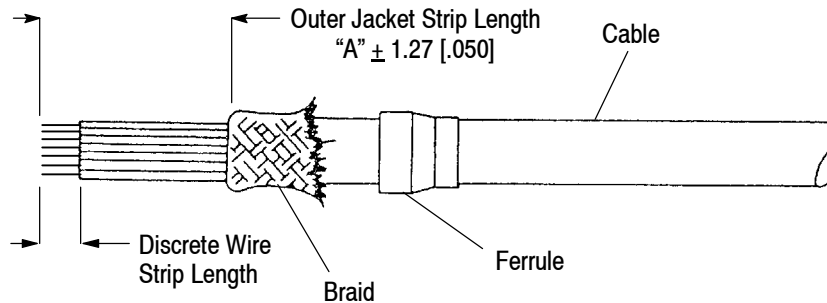
### 3.2. Wire Size and Preparation

The contacts will accept a wire size range of 28 to 18 AWG and may be terminated to either stranded or solid wire.

Figure 2 lists insulation stripping lengths as determined by the contact wire size range used. Also listed are acceptable wire insulation outside diameters for the contacts, and color codes used to easily identify loose-piece contacts.



DO NOT nick, scrape, or cut the wire conductor during the stripping operation.



OUTER JACKET STRIP LENGTH					
CONTACT POSITIONS			"A" LENGTH		
9			33.02 [1.300]		
15					
25					
37			43.18 [1.700]		
50			40.64 [1.600]		

DISCRETE WIRE					
CONTACT WIRE SIZE RANGE (AWG)	COLOR CODE (ON WIRE BARREL OF LOOSE PIECE CONTACTS ONLY)	INSULATION DIAMETER ACCEPTED	STRIP LENGTH ± 0.25 [.010]		
			MILLIMETERS	DECIMAL INCHES	FRACTIONAL INCHES
OPEN BARREL CONTACTS (With or Without Insulation Support)					
32-28	---	0.76-1.02 [.030-.040]	2.39	.094	3/32
28-24	BLUE	1.73 [.068] Max	2.77	.109	7/64
	BLACK	1.27-1.52 [.050-.060]	2.39	.094	3/32
26-22	YELLOW	0.76-1.02 [.030-.040]			
24-20	RED	1.27 [.050] Max	2.77	.109	7/64
		1.73 [.068] Max	2.39	.094	3/32
22-18	GREEN	1.27-1.52 [.050-.060]	2.77	.109	7/64
18 and Smaller	None	None Specified	3.96	.156	9/64

Figure 2

### 3.3. Crimped Contact Requirements

Contact shall be located in desired tooling and crimped according to the instructions packaged with that tooling. See Section 5, TOOLING of this document for details on tooling options and instructional materials.



Wire insulation shall NOT be cut or broken during the crimping operation, nor shall the insulation be crimped into the contact wire barrel. Reasonable care should be taken by tooling operators to provide undamaged wire terminations.

#### A. Contact Crimp Barrel Configurations

The contact wire barrel shall be crimped to an F-crimp configuration as shown in Section X-X of Figure 3. The insulation barrel (when present) shall be crimped to an O-crimp configuration. Refer to the table in Figure 3 for crimp dimensions.

## B. Contact Crimp Features

Figure 3 shows a typical contact as it should appear after crimping. Although a pin contact with insulation barrel is shown, the requirements apply equally to socket contacts and to contacts not having an insulation barrel.

### 1. Crimp Location

For optimum crimp effectiveness, the crimp must be within the area shown and must meet the crimp requirements provided in Figure 3. Effective crimp length shall be no less than the dimension given in Figure 3 and is defined as that portion of the wire barrel, excluding bellmouth(s), fully formed by the crimping tool. Instructions for adjusting, repairing, and inspecting tools are packaged with the tools.

### 2. Conductor Extension

The conductor may extend beyond the wire barrel to the maximum shown.

### 3. Wire Barrel Seam

The wire barrel seam must be closed with no evidence of loose wire strands visible in the seam.

### 4. Conductor/Insulation

The conductor and insulation must both be visible in the area between the insulation barrel and the wire barrel.

### 5. Bellmouth

Front and rear bellmouths shall be formed and adhere to the dimensions given.

### 6. Cutoff Tab

The cutoff tab shall be cut to the dimensions shown.

### 7. Burrs

The cutoff burr shall not exceed the dimensions shown.

### 8. Flash

The wire barrel flash shall not exceed the dimensions shown in Section X-X.

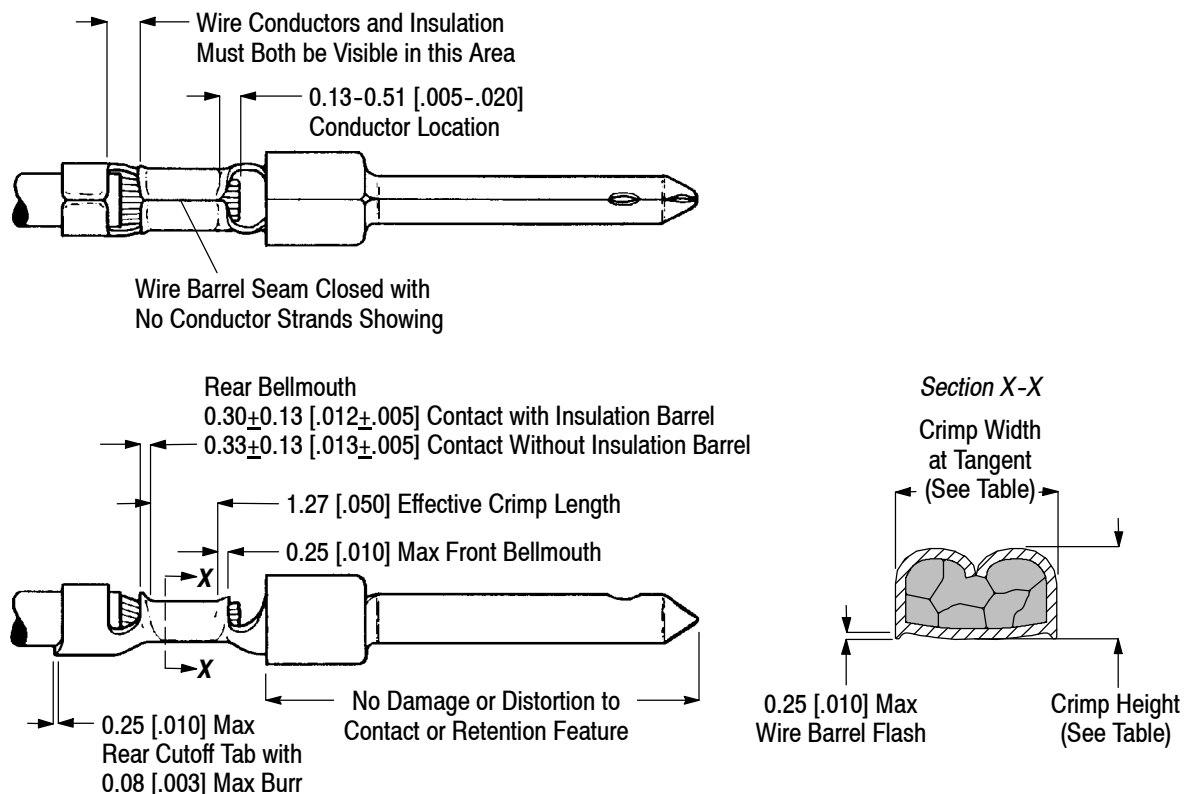


Figure 3 (cont'd)

**HAND TOOL WIRE CRIMP DIMENSIONS**

WIRE SIZE RANGE (AWG)	WIRE INSUL DIA ACCEPTED	SIZE OF WIRE APPLIED	WIRE BARREL CRIMP		INSULATION BARREL CRIMP		
			HEIGHT RANGE	WIDTH	WIDTH (Ref)	HEIGHT (Ref)	
32-28	0.76-1.02 [.030-.040]	32	0.58-0.46 [.023-.018]	0.84 [.033]	1.35-1.57 [.053-.062]	0.64-1.93 [.025-.076]	
		30	0.61-0.46 [.024-.018]				
		28	0.63-0.51 [.025-.020]				
28-24	1.73 [.068] Max	28	0.47-0.57 [.0185-.0225]	1.40 [.055]	---	---	
		26					
		24					
	0.76-1.02 [.030-.040]	1.27-1.52 [.050-.060]	28	0.67-0.77 [.0265-.0305]	1.07 [.042]	1.40 [.055]	1.27 [.050]
			26				
			24				
		28	1.40 [.055]			0.76 [.030]	
		26					
		24					
26-22	1.02-1.27 [.040-.050]	26	0.71-0.81 [.028-.032]	1.07 [.042]	1.40 [.055]	0.76 [.030]	
		24					
		22					0.81-0.91 [.032-.036]
24-20	1.73 [.068] Max	24	0.70-0.80 [.0275-.0315]	1.40 [.055]	---	---	
		22					
		20					
	1.27-1.52 [.050-.060]	24			1.40 [.055]	1.27 [.050]	
		22					
		20					
22-18	1.73 [.068] Max	22	0.84-0.94 [.033-.037]	1.57 [.062]	---	---	
		20					
		18					1.07-1.17 [.042-.046]

Figure 3 (cont'd)

**AUTOMATIC MACHINE WIRE CRIMP DIMENSIONS**

WIRE SIZE RANGE (AWG)	WIRE INSUL DIA ACCEPTED	SIZE OF WIRE APPLIED	WIRE BARREL CRIMP			INSULATION BARREL CRIMP	
			HEIGHT RANGE	TENSILE STRENGTH N [LB] Min	WIDTH	WIDTH (Ref)	HEIGHT (Ref)
32-28	0.76-1.02 [.030-.040]	32	0.58-0.46 [.023-.018]	8.01 [1.8]	0.84 [.033]	1.35-1.57 [.053-.062]	0.64-1.93 [.025-.076]
		30	0.61-0.46 [.024-.018]	10.01 [2.2]			
		28	0.63-0.51 [.025-.020]	11.12 [2.8]			
28-24	1.73 [.068] Max	28	0.66-0.76 [.026-.030]	12.01 [2.7]	1.07 [.042]	---	---
		26	0.71-0.81 [.028-.032]	20.02 [4.5]			
		24	0.76-0.86 [.030-.034]	35.91 [8.0]			
	1.27-1.52 [.050-.060]	28	0.64-0.69 [.025-.027]	12.01 [2.7]		1.35-1.57 [.053-.062]	1.14-1.93 [.045-.076]
		26	0.71-0.76 [.028-.030]	20.02 [4.5]			
		24	0.79-0.84 [.031-.033]	35.91 [8.0]			
	0.76-1.02 [.030-.040]	28	0.64-0.69 [.025-.027]	12.01 [2.7]		1.35-1.57 [.053-.062]	0.64-1.93 [.025-.076]
		26	0.74-0.79 [.029-.031]	20.02 [4.5]			
		24	0.79-0.84 [.031-.033]	35.91 [8.0]			
26-22	1.02-1.27 [.040-.050]	26	0.71-0.81 [.028-.032]	20.02 [4.5]	1.07 [.042]	1.35-1.57 [.053-.062]	0.64-1.93 [.025-.076]
		24	0.76-0.86 [.030-.034]	35.91 [8.0]			
		22	0.86-0.97 [.034-.038]	53.38 [12.0]			
24-20	1.73 [.068] Max	24	0.76-0.86 [.030-.034]	35.91 [8.0]	1.40 [.055]	---	---
		22	0.76-0.86 [.030-.034]	53.38 [12.0]			
		20	0.76-0.86 [.030-.034]	88.96 [20.0]			
	1.27-1.52 [.050-.060]	24	0.76-0.86 [.030-.034]	35.91 [8.0]		1.35-1.57 [.053-.062]	1.14-1.93 [.045-.076]
		22	0.76-0.86 [.030-.034]	53.38 [12.0]			
		20	0.76-0.86 [.030-.034]	88.96 [20.0]			
22-18	1.73 [.068] Max	22	0.84-0.94 [.033-.037]	53.38 [12.0]	1.57 [.062]	---	---
		20	0.89-0.99 [.035-.039]	88.96 [20.0]			
		18	1.07-1.17 [.042-.046]	120.10 [27.0]			

Figure 3 (end)

### 3.4. Crimped Contact Straightness

#### A. Twist or Roll

The crimped wire and insulation barrels must be aligned with the un-crimped portion of the contact to within the limit shown in Figure 4.

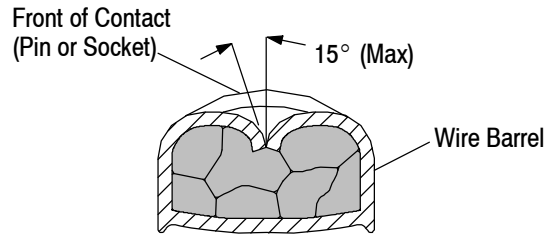
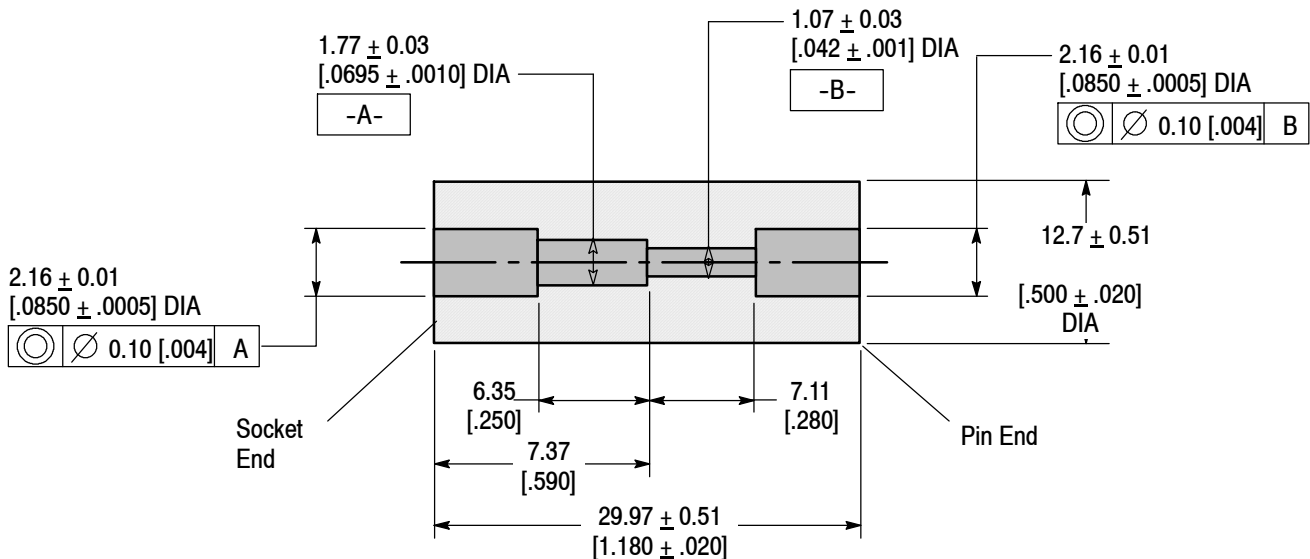


Figure 4

#### B. Straightness

Test questionable contacts using a straightness gage manufactured to the specifications of Figure 5. To be considered acceptable for use, a contact must fully enter the gage without binding.



**NOTES:** Material . . . . . Tool Steel, AISI Type 01 or 02  
 Hardness . . . . . Rockwell B99 Maximum  
 Finish . . . . . Black Oxide

Figure 5

### 3.5. Solder Cup Contacts

Observe the guidelines and procedures described in Instruction Sheet 408-7799 when solder cup contacts are required. Solder, clean, and dry all wire leads to contacts according to the following:

#### A. Flux Selection

Wire lead and contact wire barrel interior shall be fluxed prior to soldering using a mildly active rosin. Flux must be compatible with manufacturing, safety, and health guidelines.

#### B. Cleaning

After cleaning, removal of fluxes, residues, and activators is mandatory. Cleaning procedures and solvents depend on the type of flux used. See Figure 6.



Consideration must be given to toxicity and other safety and health requirements as recommended in the Material Safety Data Sheet supplied by the solder cleaning solvent manufacturer.

CLEANER		TIME (Minutes)	TEMPERATURES (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
Alpha 2110	Aqueous	1	132	270
Bioact EC-7	Solvent	5	100	212
Butyl Carbitol	Solvent	1	Room Ambient	
Isopropyl Alcohol	Solvent	5	100	212
Kester 5778	Aqueous	5	100	212
Kester 5779	Aqueous	5	100	212
Loncoterge 520	Aqueous	5	100	212
Loncoterge 530	Aqueous	5	100	212
Terpene Solvent	Solvent	5	100	212

Figure 6

### C. Drying

When drying cleaned assemblies, DO NOT exceed recommended temperature limitations. Excessive temperatures may cause degradation of the connector used as a stabilizer during the soldering process.

### D. Soldering Guideline

Manual 402-40 is available upon request and can be used as a guide in soldering. This manual gives various flux types and characteristics, commercial designation, and flux removal procedures. A checklist is included in the manual to aid in obtaining information pertaining to soldering problems.

### 3.6. Posted Contacts

Pin and socket contacts having 0.64 mm [.025 in.] square technology posted aft ends are available to fit HD-20 connectors. Posts 3.18 mm [.125 in.], 4.78 mm [.188 in.], 10.80 mm [.425 in.], and 16.54 mm [.651 in.] in length are offered, allowing a variety of mating or grounding options. When inserting posted contacts into housings, be careful to hold the contact by the transition flange. See Figure 1.

### 3.7. Repair/Replace

Use Insertion/Extraction Tool 91285-1 (Instruction Sheet 408-9404) to remove individual contacts from housings for replacement or for relocation to another housing cavity. Damaged or worn contacts may be replaced provided there is sufficient slack, after restripping the wire, to insert the new contact.



DO NOT re-use damaged or worn contacts. Instead, replace them with new contacts and discard the old ones.

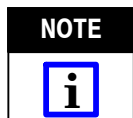
## 4. QUALIFICATION

No qualifications or approvals are required for HD-20 Precision Formed Contacts.

## 5. TOOLING

HD-20 Precision Formed Contacts can be terminated to wire using hand, semi-automatic, or automatic crimping tools. Recommended tooling, and instructional material, is provided in Figure 7.

All hand tools and applicators include integral dies. The automatic machines that hold applicators are also listed in the table along with related documentation.



The Model "K" AMP-O-LECTRIC Terminating Machine 565435-5 has been superseded by the Model "G" Terminating Machine 354500-1 for new applications. For existing applications, the Model "K" is still recommended because of the large number of installed machines.

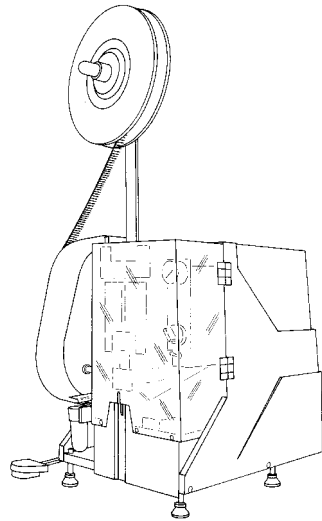
Alpha, Bioact, Butyl Carbitol, Kester, and Loncoterge are trademarks of their respective owners.



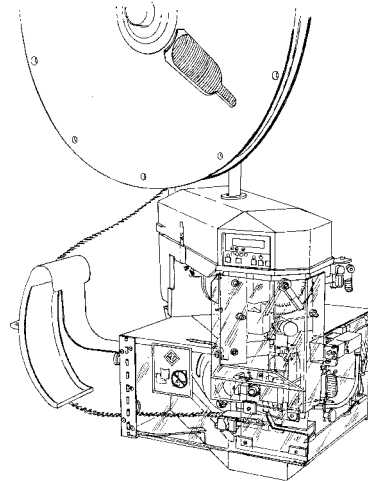
WIRE SIZE RANGE (AWG)	WIRE INSULATION DIAMETER ACCEPTED	HAND TOOL (408-8547)	APPLICATOR <sup>■</sup> (408-8040)	AUTOMATIC MACHINE	MACHINE DOCUMENT
32-28	0.76-1.02 [.030-.040]	---	680659-2	354500-1	409-5842
				565435-5	409-5128
28-24	1.73 [.068] Max	91548-1	466506-2	565435-5	409-5128
			466903-1	1320895-1	409-10012
	1.27-1.52 [.050-.060]	91549-1	466758-2	354500-1	409-5842
			466963-1	565435-5	409-5128
	0.76-1.02 [.030-.040]	91503-1 or 91549-1	466423-1	1320895-1	409-10012
			466423-2	122500-2, -3	409-5852
				356500-1, -2	409-5878
			466901-1	354500-1	409-5842
26-24	1.02-1.27 [.040-.050]	91525-1	567036-1	565435-5	409-5128
				122500-2, -3	409-5852
				356500-1, -2	409-5878
				662700-[ ]	409-5884
22			567036-2	1213400-1, -2	409-5878
				354500-1	409-5842
24-20	1.73 [.068] Max	91548-1	466505-1	354500-1	409-5842
			466505-2	122500-2, -3	409-5852
				356500-1, -2	409-5878
	466902-1	565435-5	409-5128		
	1.27-1.52 [.050-.060]	91503-1	466422-1	1320895-1	409-10012
			466422-2	122500-2, -3	409-5852
				356500-1, -2	409-5878
			466900-1	354500-1	409-5842
22-20	1.73 [.068] Max	91513-1	567033-1 or 567033-2	565435-5	409-5128
				122500-2, -3	409-5852
				356500-1, -2	409-5878
				662700-[ ]	409-5884
				1213400-1, -2	409-5878
18				354500-1	409-5842
				565435-5	409-5128

■ In order to use the same applicator in the AMPOMATOR CLS IV Lead-Making Machine and the AMP-O-LECTRIC Terminating Machine, the feed cam and wire stripper must be changed. See the Customer Manuals supplied with these machines.

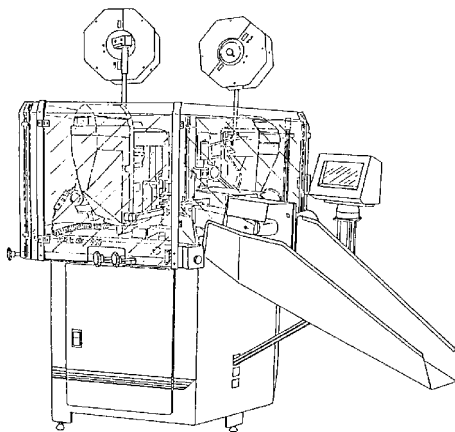
Figure 7 (cont'd)



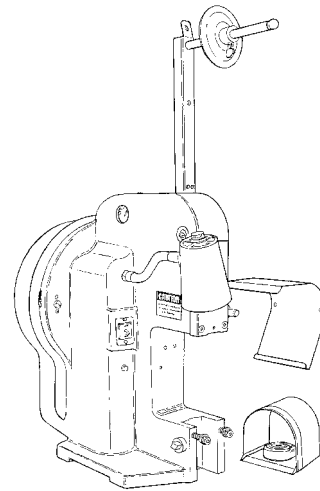
AMP-O-MATIC Side Feed Stripper-Crimper Model III Machine 1320895-[ ] (409-10012)



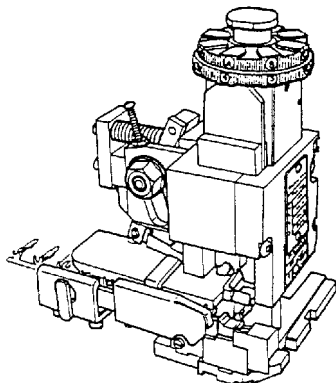
AMP-O-LECTRIC Model "G" Terminating Machine 354500-[ ] (409-5842)



AMPOMATOR CLS IV+ Lead-Making Machine (409-5878)  
AMPOMATOR CLS Model III-G Lead-Making Machine 122500-[ ] (409-5852)



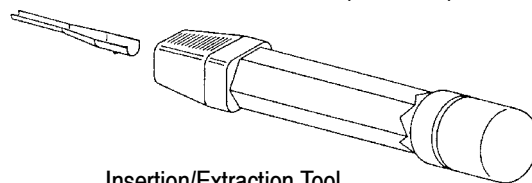
Basic AMP-O-LECTRIC Model "K" Terminating Machine 565435-5 (409-5128)



HD Quick Change Applicators (408-8040)



Typical Hand Tool (408-8547)



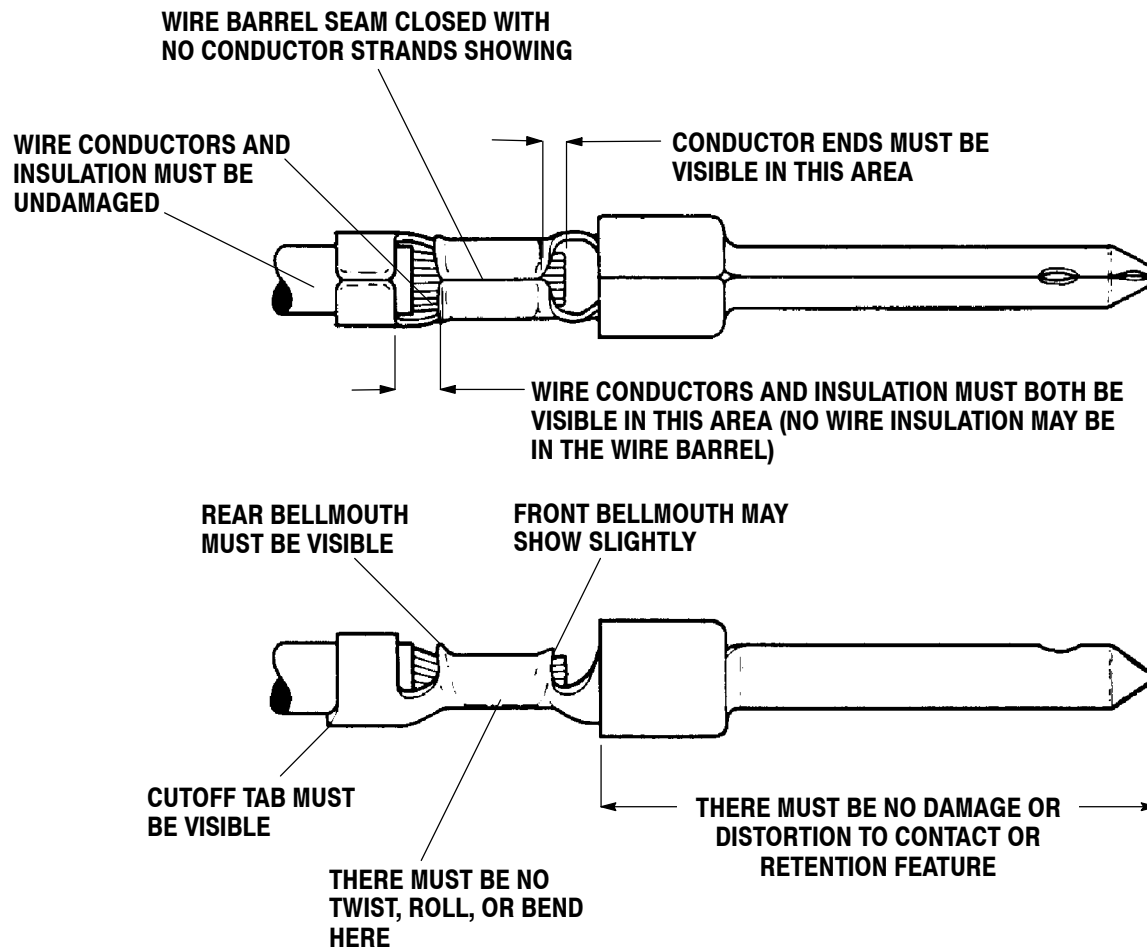
Insertion/Extraction Tool 91285-1 and Replacement Tip Kits 543382-[ ] (408-9404)

Figure 7 (end)

**6. VISUAL AID**

Figure 8 shows a typical application of HD-20 Precision Formed Contacts. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.

**NOTE: CRIMPED CONTACT WITH INSULATION BARREL SHOWN; SAME REQUIREMENTS ALSO APPLY TO CONTACTS WITHOUT INSULATION BARREL**



**FIGURE 8. VISUAL AID**

**NOTE**



All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  [ $\pm .005$ ] and angles have a tolerance of  $\pm 2^\circ$ . Figures and illustrations are for identification only and are not drawn to scale.

## 1. INTRODUCTION

This specification covers the requirements for the application of AMPLIMITE HDP-20 and Economy Crimp Snap Subminiature D Commercial Connectors with all-plastic contact retention. These commercial connectors are available with or without shielding or shielding enclosure kits. Contacts are available in three snap-in types: crimp, posted, and solder cup. The crimp snap-in contacts are available with or without an insulation support barrel for strain relief. Refer to Application Specification 114-10000 for information on these HD-20 Precision Formed Contacts. Various accessories are compatible with the connectors and kits. Assembled connectors are designed to meet the requirements of Military Specification MIL-C-24308.

AMPLIMITE HDP-20 Connectors come in a variety of sizes for your production needs and are adaptable to a variety of mounting and hardware requirements. Using a keystone mating face configuration, these connectors incorporate multiple polarization and mating alignment features, allowing flexibility in system design. The plug connector has an integral hood which protects the inserted pin contacts. The cavity rows are number-coded for your convenience. These connectors accept a contact with a wire size range of 28-18 AWG.

When corresponding with TE Connectivity Personnel, use the terminology provided on this specification to help facilitate your inquiry for information. Basic terms and features of components are provided in Figure 1.

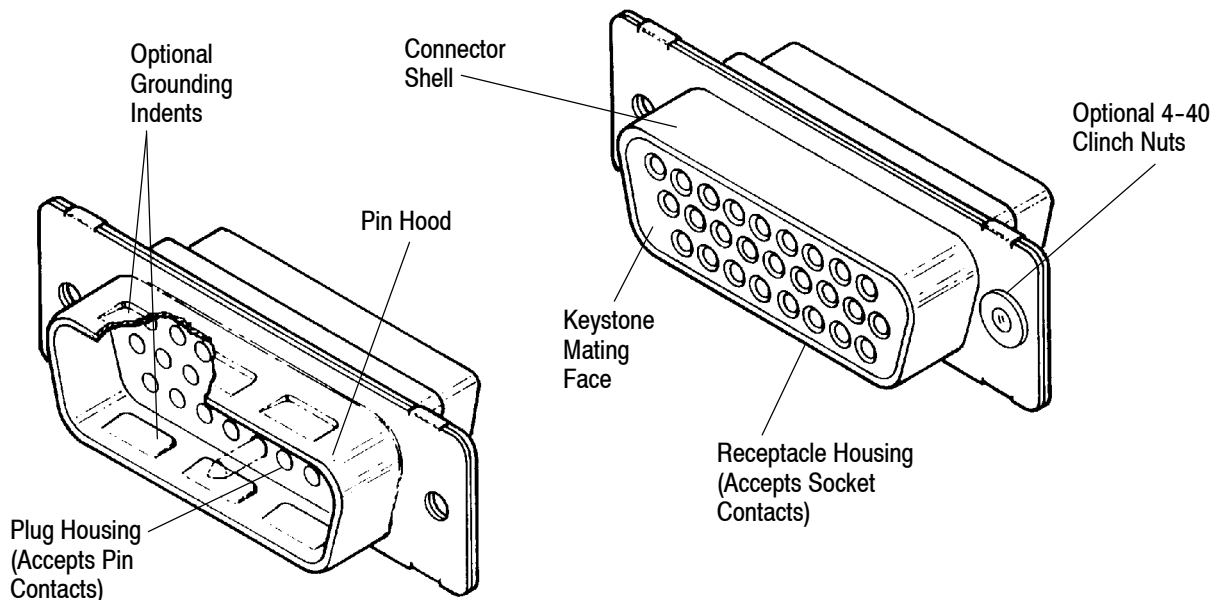


Figure 1

## 2. Reference Material

### 2.1. Revision Summary

This paragraph is reserved for a revision summary covering the most recent additions and changes made to this specification which include the following:

- Removed old logos from artwork.
- Updated document to corporate requirements.

## 2.2. Customer Assistance

Reference Part Number 205206 and Product Code 5091 are representative numbers of AMPLIMITE HDP-20 Subminiature D Commercial Connectors. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a local TE Representative or, after purchase, by calling the Tooling Assistance Center or the Product Information number at the bottom of page 1.

## 2.3. Drawings

Customer Drawings for each product part number are available from the service network. The information contained in Customer Drawings takes priority if there is a conflict with this specification or with any technical documentation supplied by TE.

## 2.4. Manuals

Manual 402-40 is available from the service network. This manual provides information on various flux types and characteristics along with the commercial designation and flux removal procedures. A checklist is included in the manual as required for information on soldering problems.

## 2.5. Specifications

### A. Product Specifications

Product Specifications 108-40005, 108-40030, 108-40032 provide product performance requirements and test information.

### B. Application Specifications

Application Specifications 114-10000, 114-25034, 114-40002, 114-40003, 114-40008, 114-40010, 114-40013, 114-40015, 114-40017, 114-40023, 114-40026, 114-40027, and 114-40028 contain design, inspection, and assembly procedures for AMPLIMITE HDP-20 Connectors.

## 2.6. Instructional Material

The following list includes available instruction sheets (408-series) that provide assembly procedures for product, operation, maintenance and repair of tooling; and customer manuals (409-series) that provide setup, operation, and maintenance of machines.

<u>Document Number</u>	<u>Document Title</u>
408-4245	Seating Fixture Assembly 543615-1 for AMPLIMITE HDP Series One-Piece Shield
408-6551	Slide Latch Kits and Locking Post Kits
408-6609	AMPLIMITE HD-20 Shielded Cable Clamp Kits
408-6769	AMPLIMITE HDP-20, HDP-22, and HDE-20 Right-Angle Metal Shielded Cable Clamp Kits
408-6906	Release Tool Kit 91266-2 for AMPLIMITE Connector Cable Clamps
408-7514	AMPLIMITE High Density (HDP-20) Connectors with Crimp-Type Contacts
408-7555	Cable Clamp Assemblies for AMPLIMITE HD-20 and HD-22 Connectors
408-7799	AMPLIMITE Solder Pot contacts (66569-3 and 66570-3)
408-7837	Female Screwlock Kits and Male Screw Retainer Kits
408-8083	Ferrule Applicator Assembly No. 812407-1
408-9010	Shielding Hardware Kits for AMPLIMITE HDP-20 and HDE-20 Connectors
408-9128	AMPLIMITE Latching Blocks
408-9130	AMPLIMITE Two-Piece Spring Latches for Straight Exit RFI/EMI Cable Clamps, Straight/90 Degree Exit Two-Piece Cable Clamps, and Universal Cable Clamps
408-9131	Two-Piece Spring Latches for AMPLIMITE Connectors Used with Post Molded Strain Relief
408-9172	Shielding Hardware Enclosure Kits for AMPLIMITE Connectors
408-9199	Shielding Enclosure Expansion Tool Kits 58241-1, -2, and -4
408-9238	Universal Cable Clamp Kits for AMPLIMITE Connectors
408-9242	Die Assemblies 58237-1 and 58237-2
408-9243	Crimping Die Assembly 58238-1 for AMPLIMITE Connectors
408-9315	Hand Crimping Tool 543344-1
408-9318	Crimping Die Assemblies 543013-[ ]
408-9404	Insertion/Extraction Tool 91285-1 and Replacement Tip Kits 543382

Document Number	Document Title
408-9507	Crimping Die Assemblies 543424-1 Through -8 for AMPLIMITE Connectors
408-9508	Crimping Die Assemblies 543425-1 and 543425-2 for AMPLIMITE Connectors
408-9721	Die Holder Assemblies 58449-1, -2, and -3
409-5842	AMP-O-LECTRIC* Model "G" Terminating Machine 354500-[ ]
409-5843	2700-Lb. Pneumatic Power Unit 312522-[ ]

**3. REQUIREMENTS**

**3.1. Storage**

**A. Ultraviolet Light**

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in housings.

**B. Shelf Life**

The connectors should remain in the shipping containers until ready for use to prevent damage to the housings. The products should be used on a first in, first out basis to avoid storage contamination that could adversely affect signal transmissions.

**C. Chemical Exposure**

Do not store housings near any chemicals listed below, as they may cause stress corrosion cracking in the components.

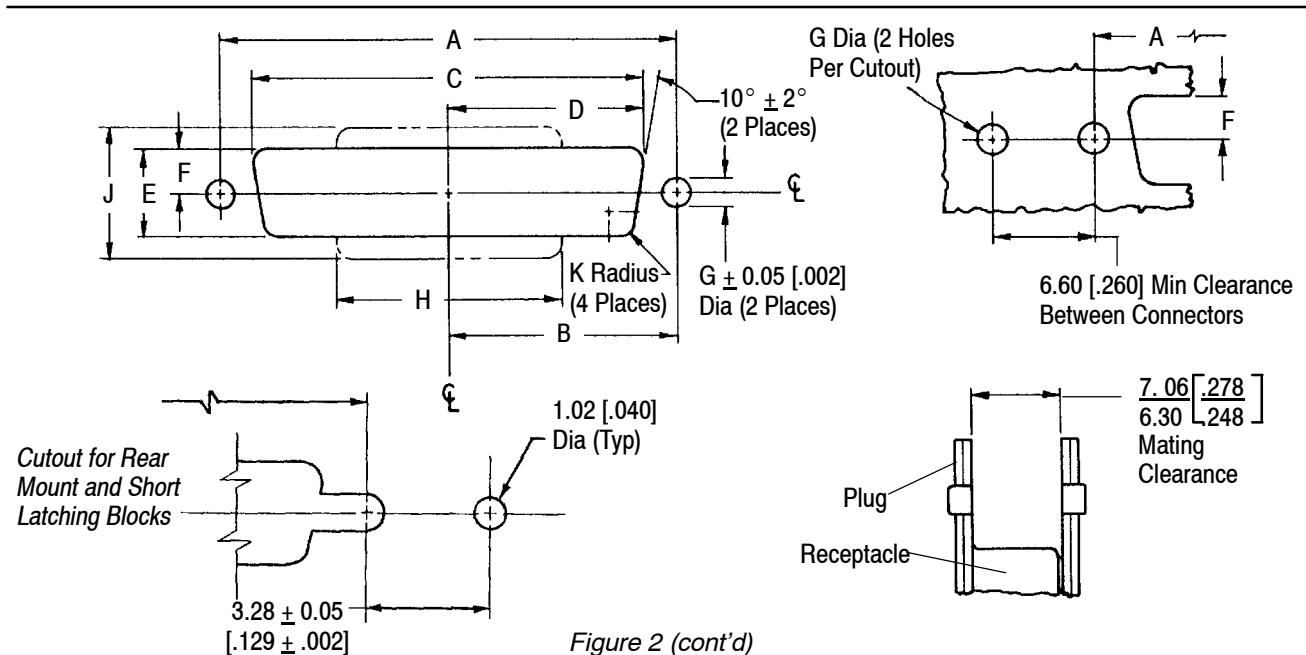
Alkalies	Carbonates	Phosphates	Citrates	Tartrates
Amines	Citrates	Sulfides	Nitrites	
Ammonia	Nitrites	Sulfur Compounds		

**NOTE** *Where the above environmental conditions exist, phosphor-bronze contacts are recommended instead of brass if available.*

**3.2. Mounting Panel Cutout**

AMPLIMITE HDP-20 Connectors are adaptable to rack-and-panel applications. We recommend mounting the plug to the panel and the receptacle to the rack. Figure 2 provides panel cutout, mating, and mounting clearance dimensions.

**NOTE** *Dimensions H and J apply when using cable clamps or latching blocks. Connectors with floating bushings are for use in drawer applications, or other difficult alignment situations.*



CONNECTOR POSITIONS AND SHELL SIZE	PANEL MTG POSN	FLOATING BUSHING	DIMENSIONS ± 0.05 [.002]									
			A	B	C	D	E	F	G	H●	J●	K
9 Position Size 1	Front	Yes	24.99 [.984]	12.50 [.492]	23.01 [.906]	11.51 [.453]	13.84 [.545]	6.93 [.273]	2.24 [.088]	---	---	2.11 [.083]
		No			22.20 [.874]	11.10 [.437]	13.03 [.513]	6.53 [.257]	3.05 [.120]	---	---	
	Rear	Yes			21.29 [.838]	10.64 [.419]	12.22 [.481]	6.12 [.241]	2.24 [.088]	---	---	3.35 [.132]
		No			20.47 [.806]	10.24 [.403]	11.40 [.449]	5.72 [.225]	3.05 [.120]	13.97 [.550]	19.05 [.750]	
15 Position Size 2	Front	Yes	33.32 [1.312]	16.66 [.656]	31.34 [1.234]	15.67 [.617]	13.84 [.545]	6.93 [.273]	2.24 [.088]	---	---	2.11 [.083]
		No			30.53 [1.202]	15.27 [.601]	13.03 [.513]	6.53 [.257]	3.05 [.120]	---	---	
	Rear	Yes			29.62 [1.166]	14.81 [.583]	12.22 [.481]	6.12 [.241]	2.24 [.088]	---	---	3.35 [.132]
		No			28.80 [1.134]	14.40 [.567]	11.40 [.449]	5.72 [.225]	3.05 [.120]	18.54 [.730]	19.05 [.750]	
25 Position Size 3	Front	Yes	47.04 [1.852]	23.52 [.926]	45.08 [1.775]	22.56 [.888]	13.84 [.545]	6.93 [.273]	2.24 [.088]	---	---	2.11 [.083]
		No			44.27 [1.743]	22.15 [.872]	13.03 [.513]	6.53 [.257]	3.05 [.120]	---	---	
	Rear	Yes			43.33 [1.706]	21.67 [.853]	12.22 [.481]	6.12 [.241]	2.24 [.088]	---	---	3.35 [.132]
		No			42.52 [1.674]	21.26 [.837]	11.40 [.449]	5.72 [.225]	3.05 [.120]	32.38 [1.275]	19.05 [.750]	
37 Position Size 4	Front	Yes	63.50 [2.500]	31.75 [1.250]	61.54 [2.423]	30.78 [1.212]	13.84 [.545]	6.93 [.273]	2.24 [.088]	---	---	2.11 [.083]
		No			60.73 [2.391]	30.38 [1.196]	13.03 [.513]	6.53 [.257]	3.05 [.120]	---	---	
	Rear	Yes			59.79 [2.354]	29.90 [1.177]	12.22 [.481]	6.12 [.241]	2.24 [.088]	---	---	3.35 [.132]
		No			59.08 [2.326]	29.54 [1.163]	11.40 [.449]	5.72 [.225]	3.05 [.120]	48.77 [1.920]	19.05 [.750]	
50 Position Size 5	Front	Yes	61.11 [2.406]	30.56 [1.203]	59.16 [2.329]	29.59 [1.165]	16.64 [.655]	8.33 [.328]	2.24 [.088]	---	---	2.11 [.083]
		No			58.34 [2.297]	29.18 [1.149]	15.82 [.623]	7.92 [.312]	3.05 [.120]	---	---	
	Rear	Yes			57.15 [2.250]	28.58 [1.125]	14.91 [.587]	7.47 [.291]	2.24 [.088]	---	---	3.35 [.132]
		No			56.34 [2.218]	28.17 [1.109]	14.10 [.555]	7.06 [.278]	3.05 [.120]	43.64 [1.718]	19.05 [.750]	

- Dimensions H and J apply when using cable clamps or latching blocks. Connectors with floating bushings are for use in drawer applications, or other difficult alignment situations.

Figure 2 (end)

### 3.3. Contact Insertion

Terminated contacts are inserted into the back of the connector housing, and snap in place. The cavity rows are numbered for your convenience. If your design does not require the use of all cavities, the contacts should be distributed evenly throughout the connector.

**NOTE**

After inserting a contact into the housing, pull back lightly on the wire to make sure the contact is fully seated.



### 3.4. Terminated Strip Length

Terminated strip length shall be as indicated in Figure 3.

TERMINATED STRIP LENGTH	
CONTACT POSN	"B" LENGTH
9	
15	33.02 [1.300]
25	
37	39.12 [1.540]
50	38.1 [1.500]

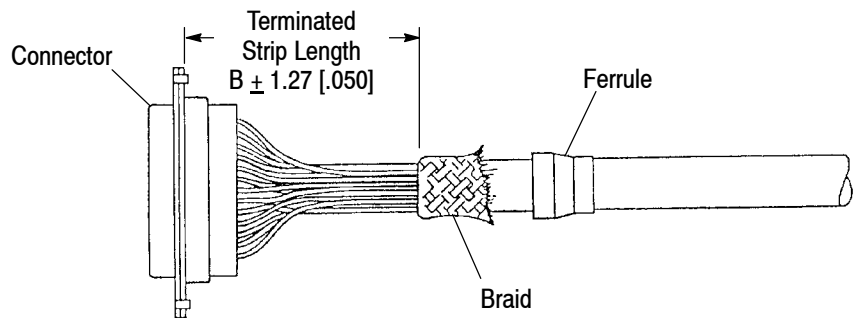


Figure 3

### 3.5. Ferrule Crimp Requirements

Slide the ferrule onto the cable prior to stripping the cable. Keep the larger diameter end of the ferrule toward the end to be terminated. If the ferrule has only one diameter, no orientation is required. After the wires and contacts have been terminated slide the ferrule until it is over the braid. Crimp the braid according to the instructions packaged with the appropriate tooling. See Figure 4 for ferrule crimp requirements.

**NOTE**

Trim excess braid flush with front of ferrule with a knife.



TERMINATED ASSY LENGTH	
CONTACT POSN	"F" LENGTH
9	
15	38.99 [1.535]
25	
37	48.06 [1.892]
50	47.65 [1.876]

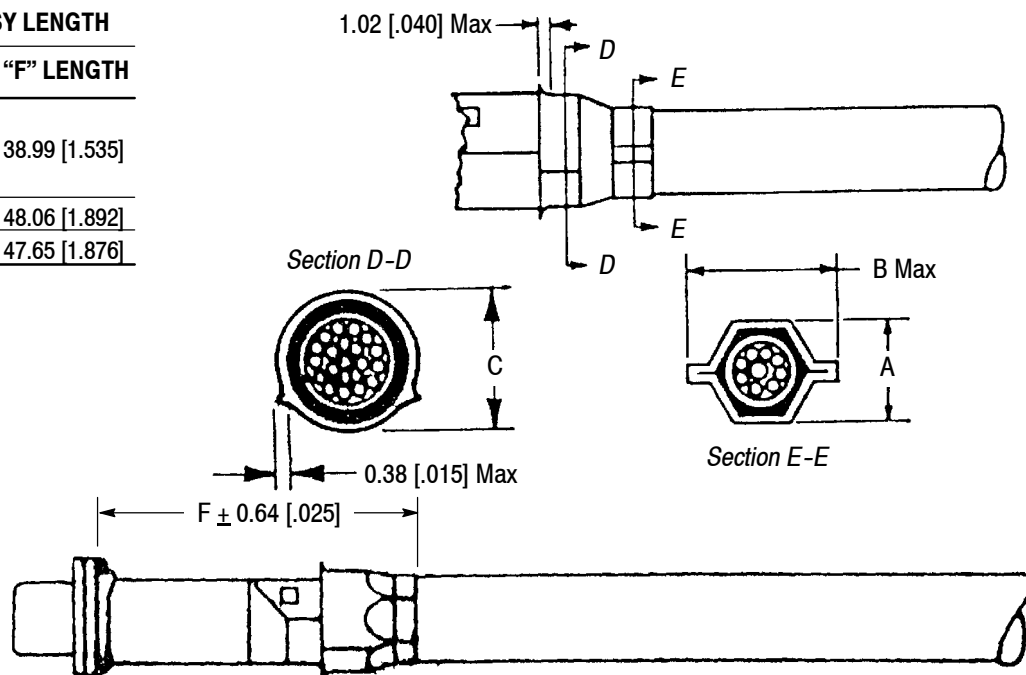


Figure 4 (cont'd)



CABLE DIAMETER ACCEPTED	CABLE CRIMP "A"	CABLE CRIMP "B"	SHIELD CRIMP "C"
4.19-4.83 [.165-.190]	$4.5 \pm 0.13$ [.177 $\pm$ .005]	10.21 [.402]	$10.9 \pm 0.13$ [.429 $\pm$ .005]
4.83-5.51 [.190-.217]	$5.41 \pm 0.13$ [.213 $\pm$ .005]	9.58 [.377]	
5.51-6.25 [.217-.246]	$6.07 \pm 0.13$ [.239 $\pm$ .005]	---	
6.25-7.21 [.246-.284]	$6.68 \pm 0.13$ [.263 $\pm$ .005]	10.85 [.427]	
7.21-8.23 [.284-.324]	$7.65 \pm 0.13$ [.301 $\pm$ .005]	---	
8.23-9.52 [.324-.375]	$8.66 \pm 0.13$ [.341 $\pm$ .005]	---	
9.52-11.10 [.375-.437]	$9.98 \pm 0.13$ [.393 $\pm$ .005]	---	
10.16-11.56 [.400-.455]	$10.49 \pm 0.13$ [.413 $\pm$ .005]	---	$13.72 \pm 0.2$ [.540 $\pm$ .008]
5.84-6.73 [.230-.265]	$6.43 \pm 0.2$ [.253 $\pm$ .008]	---	
8.58-9.78 [.338-.385]	$9.14 \pm 0.2$ [.360 $\pm$ .008]	11.84 [.466]	
9.52-10.97 [.375-.432]	$10.16 \pm 0.2$ [.400 $\pm$ .008]	12.95 [.510]	
10.72-12.45 [.422-.490]	$10.72 \pm 0.2$ [.422 $\pm$ .008]	16.00 [.630]	
12.19-14.27 [.480-.562]	$12.19 \pm 0.2$ [.480 $\pm$ .008]	16.00 [.630]	

Figure 4 (end)

### 3.6. Hardware and Accessories

The AMPLIMITE HDP-20 Connectors are compatible with the mounting hardware and accessories as shown in Figure 5. The instructional material listed (in parentheses) with each accessory provides details for product selection and assembly procedures.

#### A. Shielding Hardware Kits

Shielding Hardware Kits (Instruction Sheet 408-9010) and Shielding Hardware Enclosure Kits (Instruction Sheet 408-9172) are available for AMPLIMITE connectors. Hardware kits include a connector and inner and outer shield halves. Enclosure kits also include a protective flexible thermoplastic enclosure and two male jackscrews. The thermoplastic enclosure is assembled to the kit using Shielding Enclosure Expansion Tools with base PN 58241 (Instruction Sheet 408-9199). Cable ferrules must be purchased separately.

#### B. Cable Clamp Assembly Kits

Cable clamp assembly kits are available in straight/45° and straight/90° versions (Instruction Sheet 408-7555). The clamp assemblies can be mated using spring latches (Instruction Sheets 408-9130, 408-9131) and latching blocks (Instruction Sheet 408-9128), or using screwlocks and retainers (Instruction Sheet 408-7837).

#### C. Shielded Cable Clamp Assembly Kits

Metal RFI/EMI Shielded Cable Clamp Assemblies come in two-piece kits, and are available in both straight-exit (Instruction Sheet 408-6609) and 90°-exit (Instruction Sheet 408-6769) versions. Unlike the hardware kits, these cable clamp kits allow the cable to be fully prepared and terminated to the connector before shield installation. The straight-exit shield is attached to the connector using saddle washers and screws. The 90°-exit shield is attached using slide latches and screws.

#### D. Jacketed Shielded Cable

For applications using jacketed shielded cable with AMPLIMITE shields (see subparagraph C), two ferrule options are available. A split-ring ferrule is used with a foil or braided shield and is not crimped. An inner and an outer crimped ferrule are used with applications using braid-shielded cable only.

#### E. Slide Latch Assemblies and Clips

One-Piece Slide Latch or Two-Piece Slide Latch Clips (Instruction Sheet 408-6551) attach to the connector mating face. The mating connector uses Locking Post Assemblies which latch into the slide latch assembly.

**F. Universal Cable Clamp Kits**

Universal Cable Clamp Kits (Instruction Sheet 408-9238) are available for connectors with a number 3 shell size (25 position) only. Each kit consists of two cable clamp halves, a two-piece braid termination clamp set (shielded versions only), a cable clamp wedge set, and mounting screws. Release Tool Kit 91266-2 (Instruction Sheet 408-6906) is used to release assembled universal cable clamp halves.

**G. One Piece Economy Shielding Hardware**

AMPLIMITE One-Piece Economy Shielding Hardware is available for AMPLIMITE Size 1, 2, and 3 connectors. These press-on hardware shields must be seated with Seating Fixture 543615-1 (Instruction Sheet 408-4245). The shielding hardware is copper with tin overplating and is available in straight 90° exit versions only.

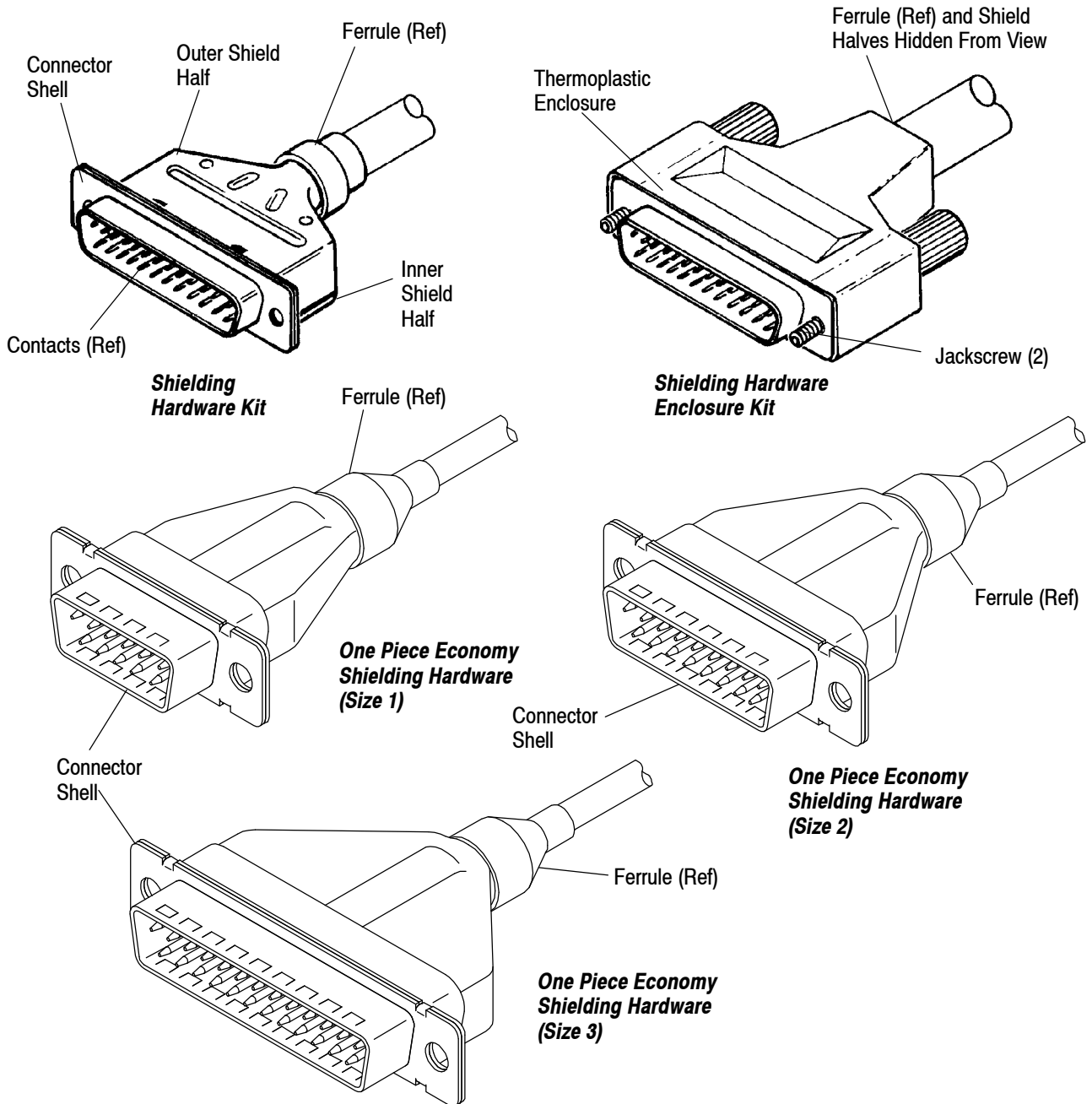
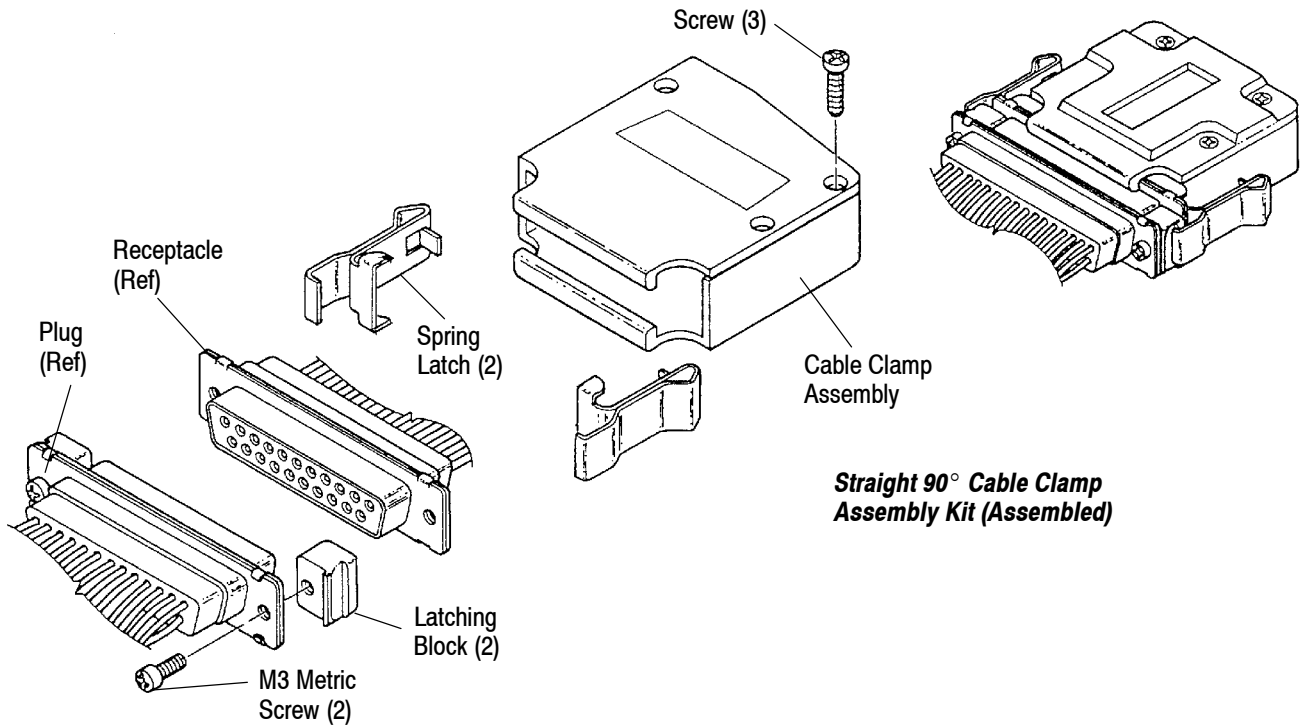
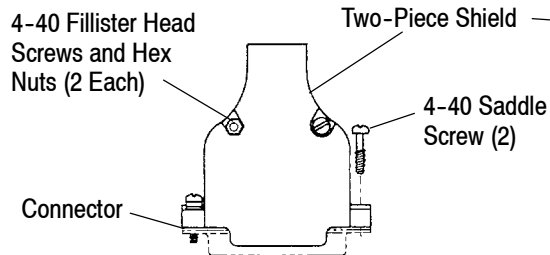
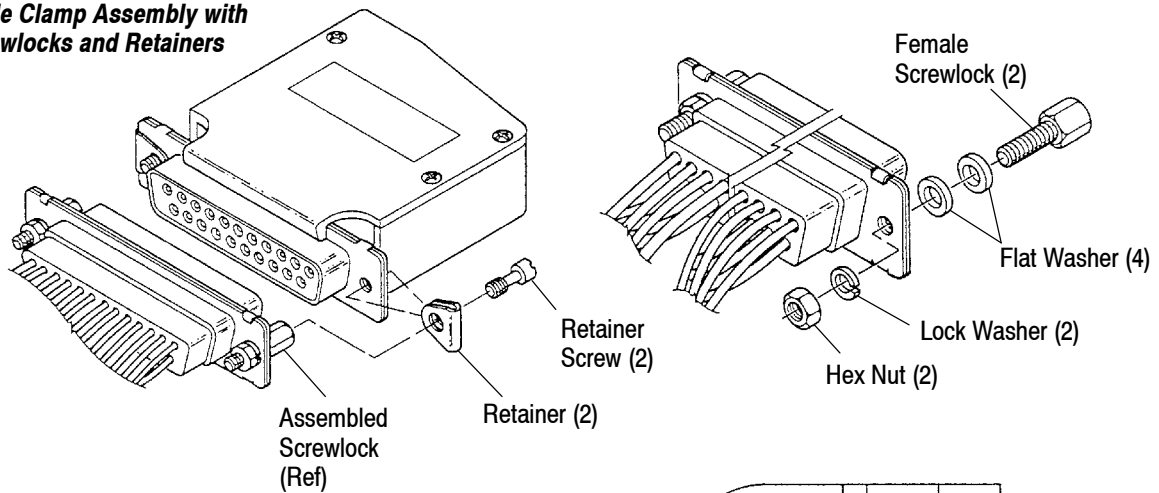


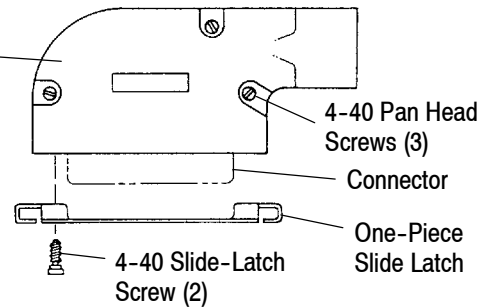
Figure 5 (cont'd)



**Cable Clamp Assembly with Screwlocks and Retainers**



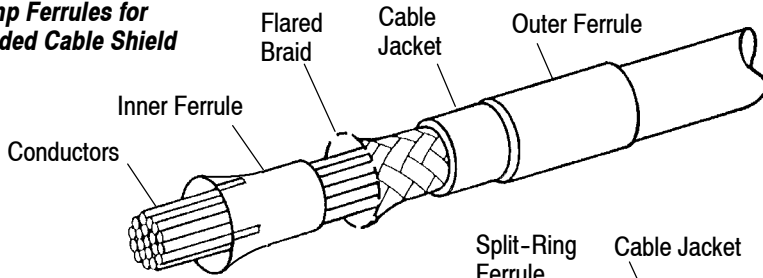
**Straight Exit RFI/EMI Shielded Cable Clamp Assembly Kit**



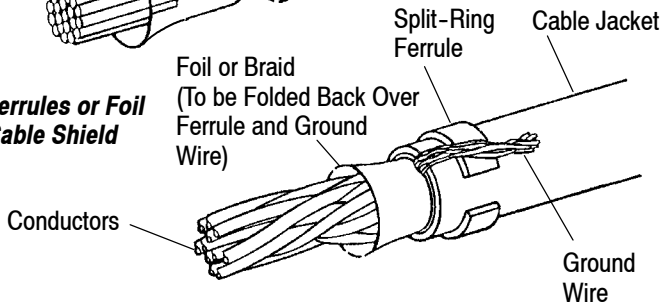
**90° Exit RFI/EMI Shielded Cable Clamp Assembly Kit**

Figure 5 (cont'd)

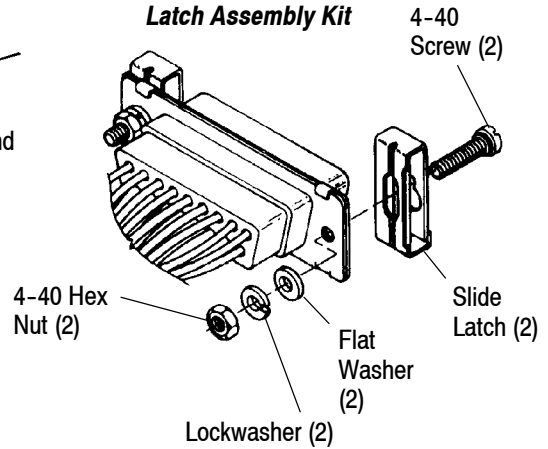
**Crimp Ferrules for Braided Cable Shield**



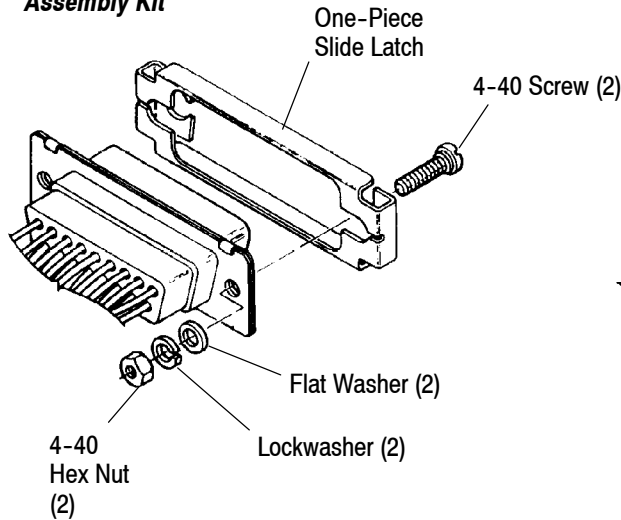
**Split-Ring Ferrules or Foil or Braided Cable Shield**



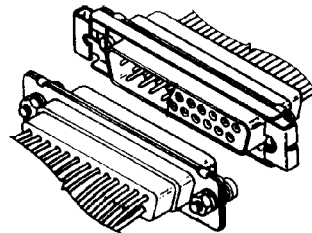
**Two-Piece Slide Latch Assembly Kit**



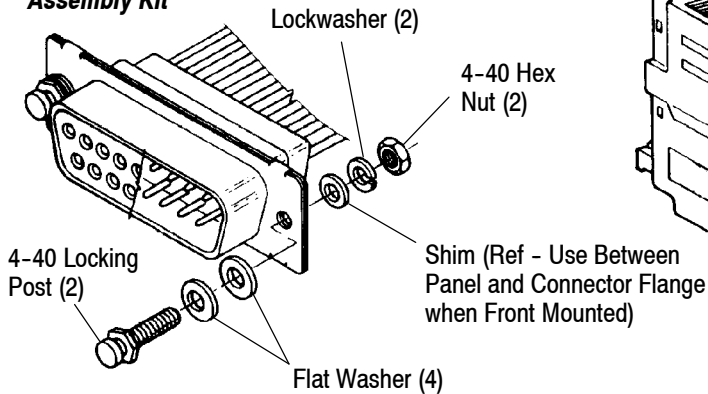
**One-Piece Slide Latch Assembly Kit**



**Typical Slide Latch Application**

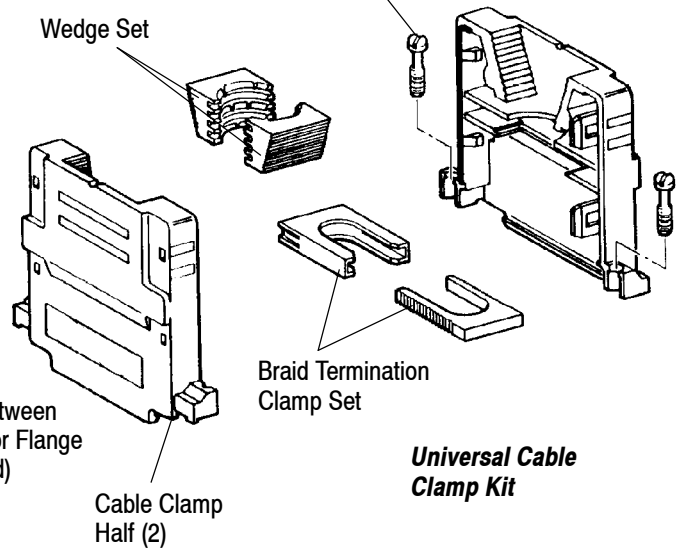


**Locking Post Assembly Kit**



**Mounting Screw (2)**

**Wedge Set**



**Universal Cable Clamp Kit**


■ One-piece slide latches for shell sizes 1, 4, and 5 cannot be used with cable clamps that extend beyond the front of the connector flange.

Figure 5 (end)

### 3.7. Repair

Use Insertion/Extraction Tool 91285-1 (Instruction Sheet 408-9404) to remove individual contacts from housings for replacement or for relocation to another housing cavity. Damaged or worn contacts may be replaced provided there is sufficient slack, after restripping the wire, to insert the new contact.

**CAUTION** *DO NOT re-use damaged or worn contacts. Instead, replace them with new contacts and discard the old ones.*



### 4. QUALIFICATION

AMPLIMITE HDP-20 Subminiature D Commercial Connectors are Listed by Underwriters Laboratories Inc. (UL) in File Number E-28476 and Certified by CSA International in File Number LR-16455. These connector assemblies will also mate with any size 20 Subminiature D complying with the dimensions in Military Standard MIL-C-24308.

### 5. TOOLING

AMPLIMITE HDP-20 Connector ferrules can be terminated to wire using hand, semi-automatic, or automatic crimping tools. Recommended tooling, and instructional material, is provided in Figures 6 and 7.

AMPLIMITE HDP Series One-Piece Shield can be applied by using Seating Fixture 543615-1. The seating fixture assembly is designed to fully seat a one-piece shield for an RFI/EMI shielded AMPLIMITE HDP Connector Assembly for customer-applied overmolding. Refer to Instruction Sheet 408-4245 for specific instructions on this application.

#### 5.1. Braid Shielded Cable

Inner and outer crimp ferrules, used with braid-shielded cable only, are crimped with the tooling listed in the table in Figure 6. These arrangements are able to stand alone, or may be used with a variety of shielded and unshielded cable clamps.

The dies listed in this table must be inserted into corresponding tooling. Hand tool dies 543013-[ ] (Instruction Sheet 408-9318) fit Hand Crimping Tool 543344-1 (Instruction Sheet 408-9315), while applicator dies (no publication) fit Ferrule Applicator Assembly 812407-1 (Instruction Sheet 408-8083). The applicator is powered by the AMP-O-LECTRIC Model "G" Terminating Machine 354500-[ ] (Customer Manual 409-5842).

The exact cable clamp used determines inner ferrule size and shape. The inner ferrule, in turn, determines the dies. Some ferrules are stepped, and some straight; some stepped ferrules have a large flared end, some a smaller flare. These differences are noted in the table.

CONNECTOR OR CABLE CLAMP SHELL SIZE	CABLE DIAMETER ACCEPTED	INNER FERRULE TYPE (SIZE)	HAND TOOL DIE SET	HAND TOOL DIE SET MARKING	APPLICATOR DIE SET
9 Position Size 1	4.83-6.10 [.190-.240]	Stepped	543013-2	B-1	813809-1
		Straight	543013-1	A-1	
	5.84-7.11 [.230-.280]	Stepped	1-543013-7	B-8	813809-7
		Straight	543013-6	B-3	813809-5
15 Position Size 2	4.83-6.10 [.190-.240]	Stepped (Large)	543013-3	C-1	813809-1
		Stepped (Small)	543013-2	B-1	
	5.84-7.11 [.230-.280]	Stepped	1-543013-6	C-8	813809-7
	7.62-8.89 [.300-.350]	Stepped	543013-4	C-2	813809-2
	8.00-9.27 [.315-.365]	Straight	543013-6	B-3	813809-5
	9.65-10.92 [.380-.430]	Straight	543013-7	C-4	813809-3

Figure 6 (cont'd)

CONNECTOR OR CABLE CLAMP SHELL SIZE	CABLE DIAMETER ACCEPTED	INNER FERRULE TYPE (SIZE)	HAND TOOL DIE SET	HAND TOOL DIE SET MARKING	APPLICATOR DIE SET
25 Position Size 3	4.83-6.10 [.190-.240]	Stepped	543013-3	C-1	813809-1
	5.84-7.11 [.230-.280]	Stepped	1-543013-6	C-8	813809-7
	7.62-8.89 [.300-.350]	Stepped (Small)	543013-4	C-2	813809-2
		Stepped (Large)	543013-5	D-2	
	9.65-10.92 [.380-.430]	Straight	543013-7	C-4	813809-3
		Stepped	543013-8	D-4	
11.94-13.46 [.470-.530]	Straight	1-543013-0	D-5	813809-4	
37 Position Size 4	4.83-6.10 [.190-.240]	Stepped	543013-3	C-1	813809-1
	5.84-7.11 [.230-.280]	Stepped	1-543013-6	C-8	813809-7
	7.62-8.89 [.300-.350]	Stepped	543013-4	C-2	813809-2
	9.65-10.92 [.380-.430]	Straight	543013-7	C-4	813809-3
		Stepped	543013-9	E-4	
	12.06-13.34 [.475-.525]	Stepped	1-543013-1	E-5	813809-4
	14.99-16.51 [.590-.650]	Straight	1-543013-3	E-6	—
50 Position Size 5	4.83-6.10 [.190-.240]	Stepped	543013-2	B-1	813809-1
	7.62-8.89 [.300-.350]	Stepped	543013-5	D-2	813809-2
	8.00-9.27 [.315-.365]	Straight	543013-6	B-3	813809-5
	9.65-10.92 [.380-.430]	Stepped	543013-8	D-4	813809-3
	11.94-13.46 [.470-.530]	Straight	1-543013-0	D-5	813809-4
		Stepped	1-543013-2	F-5	
	15.24-16.51 [.600-.650]	Stepped	1-543013-4	F-6	—
17.78-19.05 [.700-.750]	Straight	1-543013-5	F-7	813809-8	

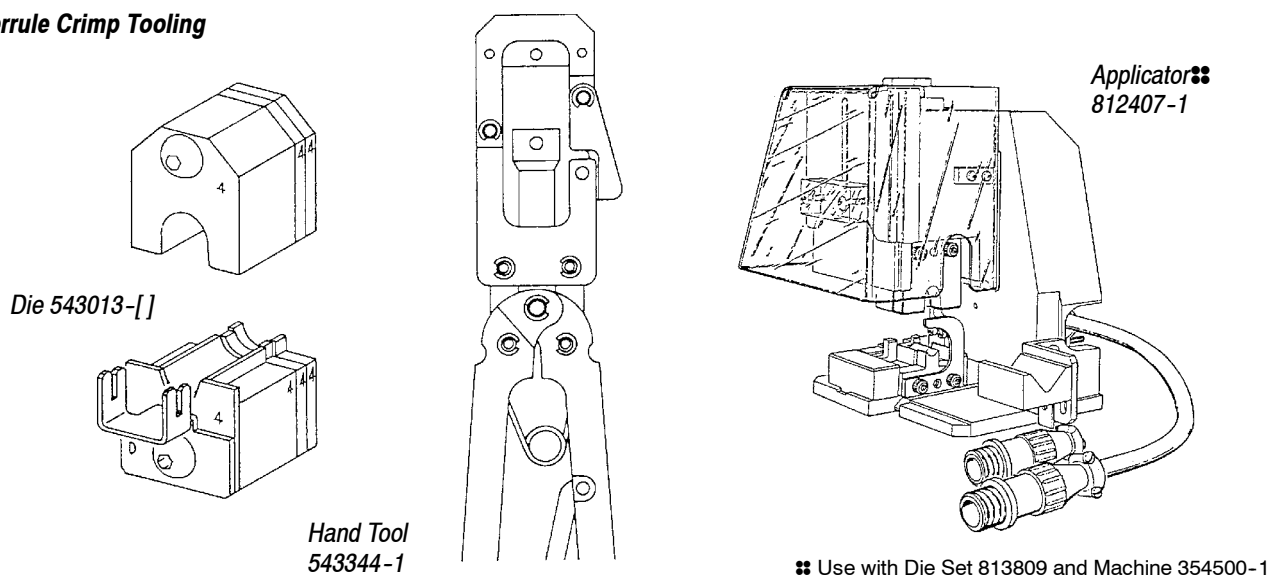
**Ferrule Crimp Tooling**


Figure 6 (cont'd)

**Miscellaneous Tooling**

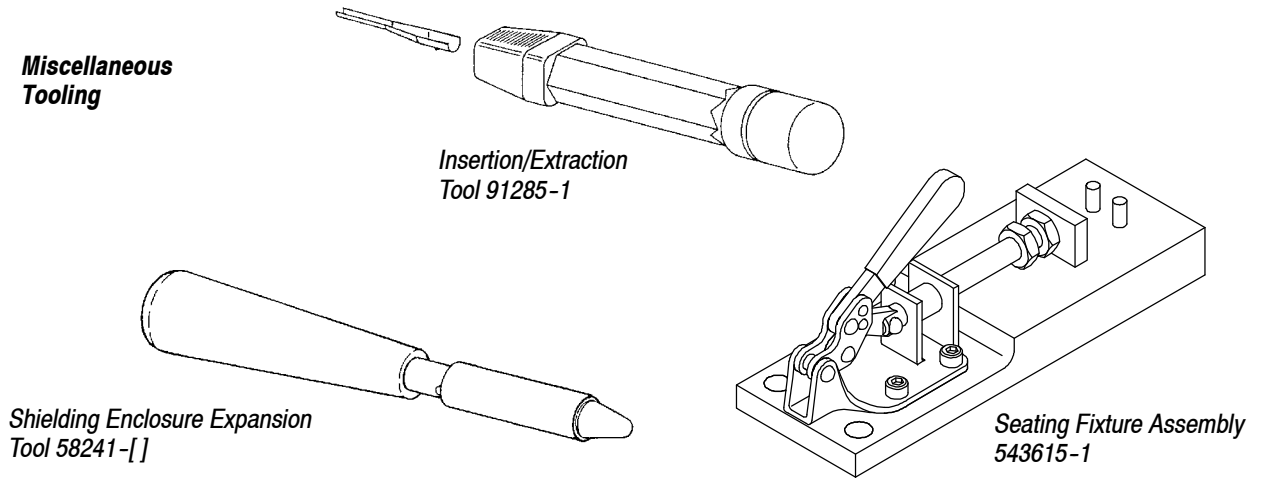


Figure 6 (end)

**5.2. Single Cable-to-Shield Ferrules**

The dies listed in the table in Figure 7 must be inserted into the hand tools and automatic machine die holder that uses them. Die sets with base PN 58237 (Instruction Sheet 408-9242) and 58238 (Instruction Sheet 408-9243) are used in Hand Crimping Tool 543344-1 (Instruction Sheet 408-9315), or in Die Holder 58449-1 (Instruction Sheet 408-9721) powered by Pneumatic Power Unit 312522-3 (Customer Manual 409-5843). Die sets with base PN 543424 (Instruction Sheet 408-9507) and 543425 (Instruction Sheet 408-9508) are used in Hand Crimping Tool 543344-1 (Instruction Sheet 408-9315) only.

**NOTE**

*Crimp dimensions for ferrules will fall within proper guidelines when dies are seated in the appropriate tooling and properly gaged. Gaging information is contained in instruction sheets corresponding to the dies. All braided cable shielding should be folded forward and distributed evenly before sliding and crimping the ferrule into place.*

HARDWARE SHELL SIZE	CABLE DIAMETER ACCEPTED	DIE SET
1, 2, 3	4.19-4.83 [.165-.190]	543424-3
	4.83-5.51 [.190-.217]	543424-2
	5.51-6.25 [.217-.246]	543424-8
	6.25-7.21 [.246-.284]	543424-1
	7.21-8.23 [.284-.324]	543424-7
	8.23-9.52 [.324-.375]	543424-6
	9.52-11.10 [.375-.437]	543424-5
	10.16-11.56 [.400-.455]	543424-4
4, 5	5.84-6.73 [.230-.265]	543425-2
	8.58-9.78 [.338-.385]	543425-1
	9.52-10.97 [.375-.432]	58238-1
	10.72-12.45 [.422-.490]	58237-2
	12.19-14.27 [.480-.562]	58237-1

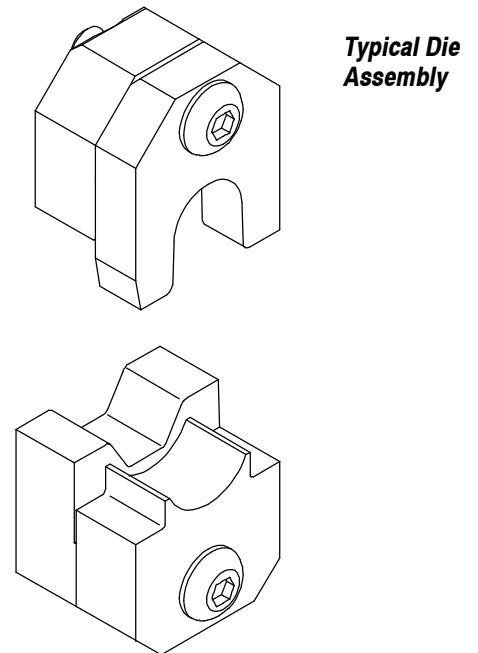


Figure 7

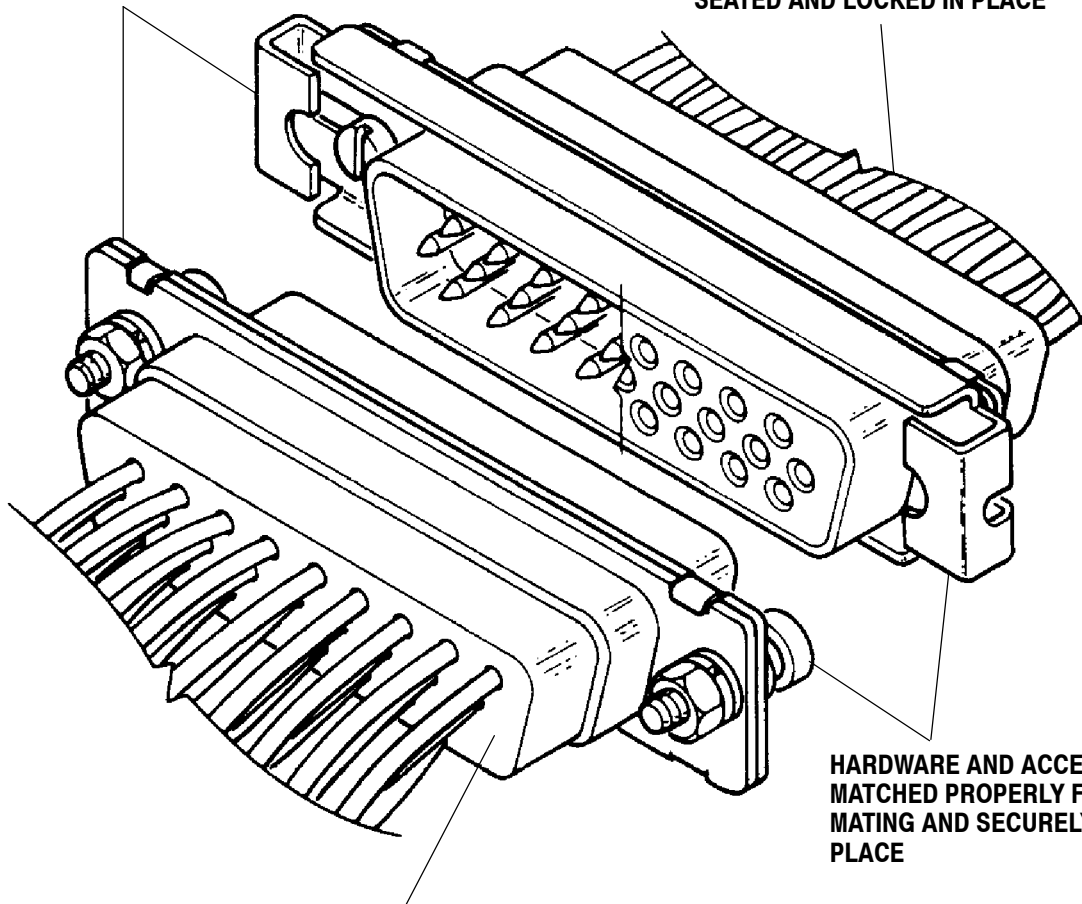


**6. VISUAL AID**

Figure 8 shows a typical application of an AMPLIMITE HDP-20 Subminiature D Commercial Connector with Snap-In Contacts. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.

**MATING CONNECTOR ASSEMBLIES  
MUST MATCH IN BOTH SHELL SIZE  
AND NUMBER OF POSITIONS**

**PULL LIGHTLY ON EACH INDIVIDUAL WIRE  
TO BE SURE THAT CONTACTS ARE FULLY  
SEATED AND LOCKED IN PLACE**



**HARDWARE AND ACCESSORIES  
MATCHED PROPERLY FOR  
MATING AND SECURELY IN  
PLACE**

**CONNECTOR MUST BE UNDAMAGED  
BY ASSEMBLY AND TIGHTENING OF  
HARDWARE KIT OR ACCESSORIES**

**TYPICAL APPLICATION (SHOWS  
FREE-HANGING CONNECTORS  
WITH LOCKING POSTS AND  
SLIDE LATCHES)**

**FIGURE 8. VISUAL AID**